Advanced Authentication 6.2

Administration Guide

February 2019

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About NetIQ Corporation

We are a global, enterprise software company, with a focus on the three persistent challenges in your environment: Change, complexity and risk—and how we can help you control them.

Our Viewpoint

Adapting to change and managing complexity and risk are nothing new

In fact, of all the challenges you face, these are perhaps the most prominent variables that deny you the control you need to securely measure, monitor, and manage your physical, virtual, and cloud computing environments.

Enabling critical business services, better and faster

We believe that providing as much control as possible to IT organizations is the only way to enable timelier and cost effective delivery of services. Persistent pressures like change and complexity will only continue to increase as organizations continue to change and the technologies needed to manage them become inherently more complex.

Our Philosophy

Selling intelligent solutions, not just software

In order to provide reliable control, we first make sure we understand the real-world scenarios in which IT organizations like yours operate—day in and day out. That's the only way we can develop practical, intelligent IT solutions that successfully yield proven, measurable results. And that's so much more rewarding than simply selling software.

Driving your success is our passion

We place your success at the heart of how we do business. From product inception to deployment, we understand that you need IT solutions that work well and integrate seamlessly with your existing investments; you need ongoing support and training post-deployment; and you need someone that is truly easy to work with—for a change. Ultimately, when you succeed, we all succeed.

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- Security Management
- Systems & Application Management
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About this Book

This Administration Guide is intended for system administrators and describes the procedure of Advanced Authentication Server appliance configuration.

Intended Audience

This book provides information for individuals responsible for understanding administration concepts and implementing a secure, distributed administration model.

1 Advanced Authentication Overview

Advanced Authentication™ is a multi-factor authentication solution that enables you to protect your sensitive data by using a more advanced way of authentication on top of the typical username and password authentication. With Advanced Authentication, you can authenticate on diverse platforms by using different types of authenticators such as Fingerprint, Card, and OTP. Advanced Authentication provides a single authentication framework that ensures secure access to all your devices with minimal administration.

Authentication comprises of the following three factors:

- Something that you know such as password, PIN, and security questions.
- Something that you have such as smartcard, token, and mobile phone.
- Something that you are such as biometrics (fingerprint or iris).

You can achieve multi-factor or strong authentication by using any two factors out of this list. For example, multi-factor authentication can include combination of a password and a token or a smartcard and a fingerprint.

This section contains the following topics:

- "How Is Advanced Authentication Better Than Other Solutions" on page 13
- "Key Features" on page 13
- "Advanced Authentication Server Components" on page 14
- "Architecture" on page 16
- "Terminologies" on page 20

How Is Advanced Authentication Better Than Other Solutions

Advanced Authentication leverages the needs of users to authenticate on different platforms with different needs. The following points explain how Advanced Authentication is different from other solutions:

- Works on multiple platforms such as Windows, Mac OS X, Linux, and so on.
- Supports multi-site configurations that helps organizations to distribute the authentication globally.

Key Features

- **Multi-factor Authentication**: The solution provides a flexibility of combining more than twenty authentication methods to create authentication chains. You can assign these chains to different events to use the specific authentication chains for different kinds of endpoints.

- **Supports Multiple Repositories:** Advanced Authentication supports Active Directory, Active Directory Lightweight Domain Services, NetIQ eDirectory, and other RFC 2037 and RFC 2037 bis compliant LDAP repositories.
- **Supports Distributed Environments**: Advanced Authentication works on geographically distributed environments containing high loads.
- **Multitenancy**: A single Advanced Authentication solution can support multiple tenants to serve multiple customers with different environments.
- **Supports Multiple Platforms:** Advanced Authentication works on various platforms such as Windows, Linux, and Mac OS.
- **Helpdesk**: Advanced Authentication provides a separate role of Helpdesk or Security officer. A user with Helpdesk or Security Officer role can manage authenticators for the end users through the Helpdesk portal.
- **Supports the RADIUS Server**: Advanced Authentication Server contains a built-in RADIUS server to provide strong authentication for third-party RADIUS clients. Also, it can act as a RADIUS client for the third-party RADIUS servers.
- **Supports ADFS 3 and 4, OAuth 2.0, and SAML 2.0:** Advanced Authentication integrates with Active Directory Federation Services, OAuth 2.0, and SAML 2.0. This enables you to perform strong authentication for the users who need to access the third-party consumer applications.
- **Reporting**: Advance Authentication provides the Reporting portal that enables you to access different security reports. You can also create customized reports based on your requirement.
- **Syslog support**: Advanced Authentication provides the central logging server that can be used for log forwarding. You can configure the solution to forward logs to an external Syslog server.
- **FIPS 140-2 Compliant Encryption**: Advanced Authentication adheres to Federal Information Processing Standard (FIPS) 140-2.
- **Supports Localization**: Advanced Authentication supports several languages such as Arabic, Chinese, Dutch, and Danish.

Advanced Authentication Server Components

Advanced Authentication server comprises of the following components:

- **Administration Portal**

  For more information, see “Administration Portal” on page 15
- **Self-Service Portal**

  For more information, see “Self-Service Portal” on page 15
- **Helpdesk Portal**

  For more information, see “Helpdesk Portal” on page 16
- **Reporting Portal**

  For more information, see “Reporting Portal” on page 16

Administration Portal

Administration Portal is a centralized portal that helps you to configure and manage various authentication settings such as methods, events, and so on. You can also configure various policies that are required for authentication. You can perform the following tasks:

- **Add repositories**: A repository is a database that stores users information. For example: An organization, Digital Airlines contains an Active Directory that stores all of the user's information such as username, telephone, address, and so on. Administrator can add this Active Directory to Advanced Authentication solution to help different departments in the organization such as the IT, finance, HR, and Engineering departments to authenticate based on their requirements. For more information about how to add repositories, see "Adding a Repository".
- **Configure methods**: A method or an authenticator helps to confirm the identification of a user (or in some cases, a machine) that is trying to log on or access resources. You can configure the required settings for the appropriate methods depending on the requirement by each department. For more information about how to configure methods, see "Configuring Methods".
- **Create chains:** A chain is a combination of methods. Users must authenticate with all the methods in a chain. For example, a chain with Fingerprint and Card method can be applicable for the IT department and a chain with Smartphone, LDAP Password, and HOTP is applicable for the Engineering department. For more information about how to create chains, see "Creating a Chain".
- **Configure events**: An event is triggered by an external device or application that needs to perform authentication such as a Windows machine, a RADIUS client, a third party client and so on. After creating the chain, Administrator maps the chain to an appropriate event. For more information about how to configure events, see "Configuring Events".
- **Map endpoints**: An endpoint is a device on which you can authenticate. Endpoints can be computers, Laptops, tablets, and so on. For more information about how to configure endpoints, see "Managing Endpoints".
- **Configure policies**: An administrator can manage policies that are specific to users, devices, or locations to control a user's authentication. In Advanced Authentication, you can manage the policies in a centralized policy editor. For more information about how to configure policies, see "Configuring Policies".

Self-Service Portal

The Self-Service Portal allows users to manage the available authentication methods. This portal consists of **Enrolled authenticators** and **Add authenticator**. T**he Enrolled authenticators** section displays all the methods that users have enrolled. The **Add authenticator** section displays additional methods available for enrollment. You must configure and enable the Authenticators Management event to enable users to access the Self-Service portal. For more information on Self-Service portal, see *Advanced Authentication- User* guide.

Helpdesk Portal

The Helpdesk Portal allows the helpdesk administrators to enroll and manage the authentication methods for users. Helpdesk administrators can also link authenticators of a user to help authenticate to another user's account. For more information on Helpdesk portal, see the *Advanced Authentication- Helpdesk Administrator* guide.

Reporting Portal

The Reporting Portal allows you to create or customize security reports that provide information about user authentication. It also helps you understand the processor and memory loads. For more information on Reporting portal, see "Reporting".

Architecture

Advanced Authentication architecture is based on the following three levels of architecture:

- Basic Architecture

  For more information, see "Basic Architecture" on page 16
- Enterprise Level Architecture

  For more information, see "Enterprise Level Architecture" on page 17
- Enterprise Architecture With A Load Balancer

  For more information, see "Enterprise Architecture With A Load Balancer" on page 19

Basic Architecture

The basic architecture of Advanced Authentication is a simple configuration that requires only one Advanced Authentication server.

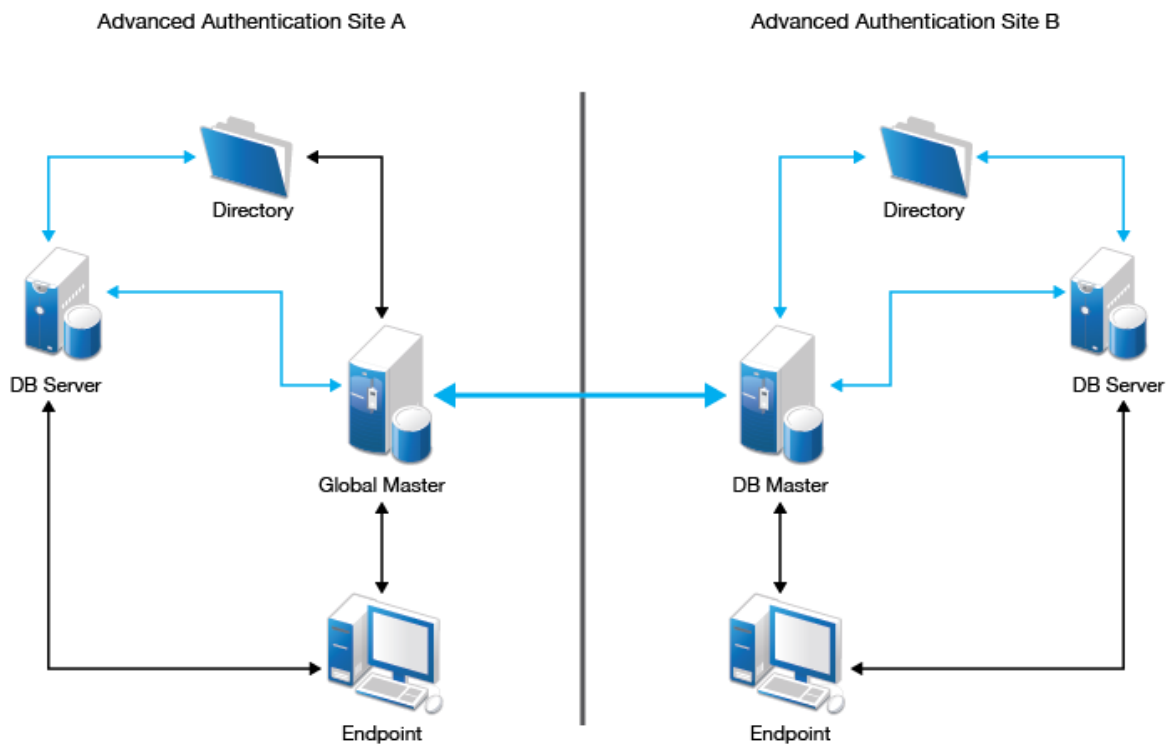
An Advanced Authentication server is connected to a directory such as Active Directory Domain Services, NetIQ eDirectory, Active Directory Lightweight Directory Service or other compliant LDAP directories. An Event Endpoint can be Windows, Linux or Mac OS X machine, NetIQ Access Manager, NetIQ CloudAccess, or RADIUS Client to authenticate through the RADIUS Server that is built-in the Advanced Authentication Server. For a complete list of supported events, see Configuring Events.

Enterprise Level Architecture

In the enterprise level architecture of Advanced Authentication, you can create several sites for different geographical locations.

For example, the Figure 1-1 on page 17 displays two Advanced Authentication sites, **Site A** and **Site B.**

Figure 1-1 *Enterprise Level Architecture*



- **Site A**: The first site that is created for headquarters in New York. The first Advanced Authentication server of site A contains the **Global Master** and **Registrar** roles. This server contains a master database and it can be used to register new sites and servers.
- **Site B**: Another site created for the office in London. The structure of site B is similar to site A. The Global Master in another site has the DB Master role. DB servers interact with the DB Master.

  DB Server provides a database that is used for backup and fail-over. You can create a maximum of two DB servers per site. When the Global Master is unavailable, the DB server responds to the database requests. When the Global Master becomes available again, the DB server synchronizes with the Global Master and the Global Master becomes the primary point of contact for database requests again.

  Endpoints interact with Global Master or DB Master servers. When these servers are not available, they interact with DB servers.

NOTE: DB servers connect to each other directly. If the Global Master is down, the DB servers will replicate.

A Global Master must have a connection to each of the LDAP servers. Hence in a data center with Global Master, you must have LDAP servers for all the used domains.

Master servers do not initiate a connection to the DB servers. Master servers initiate connection to Master servers only. DB servers initiate connection to the DB Master of the same site and Registrar only.

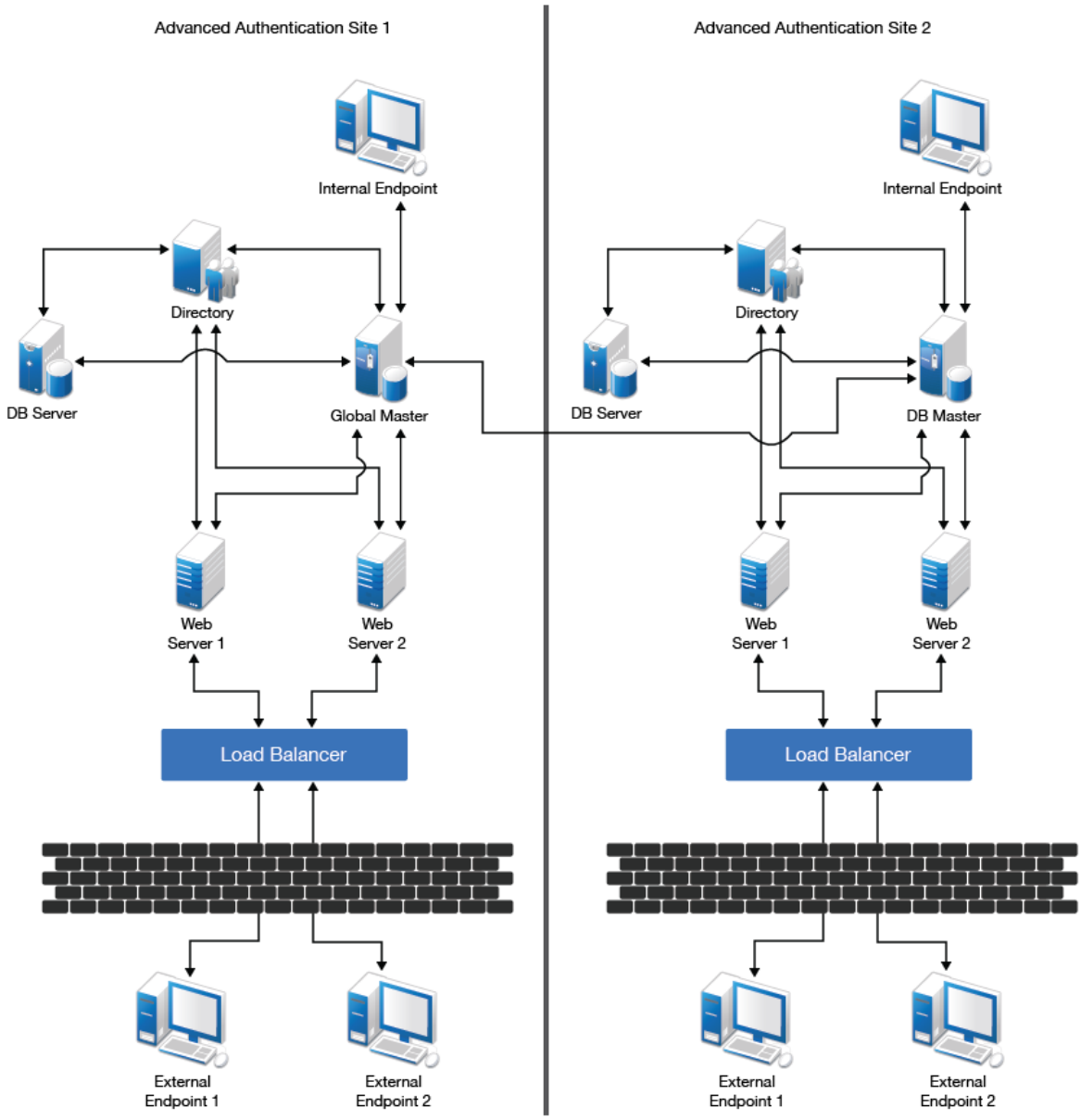
IMPORTANT: Ensure to take regular snapshots or to clone the primary site to protect from any hardware issues or any other accidental failures. It is recommended to do it each time after you change the configuration of repositories, methods, chains, events and policies, or add or remove servers in the cluster.

You can convert DB server of primary site to Global Master. This requires corresponding DNS changes. Nothing can be done if Global Master and all the database servers are lost.

Enterprise Architecture With A Load Balancer

The enterprise architecture with a load balancer contains web servers and load balancers along with the components in Enterprise Level Architecture. Figure 1-2 on page 19 illustrates the Enterprise architecture with a load balancer.

Figure 1-2 *Enterprise Architecture with Load Balancer*



- **Web Servers**: Web server does not contain a database. It responds to the authentication requests and connects to Global Master. You need more web servers to serve more workload. It is not recommended to deploy more than 5-6 web servers per site.
- **Load Balancer**: A load balancer provides an ability to serve authentication requests from **External Endpoints**. A load balancer is a third-party component. It must be configured to interact with Web servers.

WARNING: Do not place the Advanced Authentication server in Demilitarized Zone (DMZ). It is recommended to use Load Balancer to process authentication requests from the external endpoints.

For example, if the Global Master server (GMS) of a cluster goes down, the DB server of the site is promoted as the new GMS of the cluster. Here, another server is promoted as the new DB server of site A. The IP address of the new GMS remains the same as the previous GMS. For example the IP address of the old GMS is 1.1.1.1, then the IP of the new GMS will remain the same and the Load balancer is aware of this change. For information about how to restore the operations when a GMS is broken, see "Restoring Operations When a Global Master Server is Broken".

NOTE: To view an example of configuring a load balancer for an Advanced Authentication cluster, see "Installing a Load Balancer for Advanced Authentication Cluster".

Terminologies

- "Authentication Method" on page 20
- "Authentication Chain" on page 20
- "Authentication Event" on page 20
- "Endpoint" on page 21
- "Tenant" on page 21

Authentication Method

An authentication method verifies the identity of an individual who wants to access data, resources, or applications. Validating that identity establishes a trust relationship for further interactions.

Authentication Chain

An authentication chain is a combination of authentication methods. A user must pass all methods in the chain to be successfully authenticated. For example, if you create a chain with LDAP Password and SMS, a user must first specify the LDAP Password. If the password is correct, the system sends an SMS with a One-Time-Password (OTP) to the user's mobile. The user must specify the correct OTP to be authenticated.

You can create chains with multiple methods that are applicable for highly secure environments. You can create authentication chains for specific group of users in the repositories.

Authentication Event

An authentication event is triggered by an external device or application that needs to perform authentication. It can be triggered by a RADIUS Client (Citrix Netscaler, Cisco VPN, Juniper VPN and so on) or an API request. Each event can be configured with one or more authentication chains that enables a user to authenticate.

Endpoint

An endpoint is a device on which you can authenticate. Endpoints can be computers, Laptops, tablets, Smartphones, and so on.

Tenant

A tenant is a company with a group of users sharing common access with specific privileges. In Advanced Authentication, tenants have the privileges to customize some of the configuration settings.

Configuring Advanced Authentication

Advanced Authentication Server Appliance is intended for processing requests for authentication coming from the Advanced Authentication system users.

This chapter contains the following sections:

- Chapter 2, “Managing the Appliance,” on page 25
- Chapter 3, “Configuring Global Master Server,” on page 39
- Chapter 4, “Logging In to the Advanced Authentication Administration Portal,” on page 41
- Chapter 5, “Configuring Advanced Authentication Server Appliance,” on page 43
- Chapter 6, “Sample Configurations,” on page 169
- Chapter 7, “Configuring a Cluster,” on page 183
- Chapter 8, “Enrolling the Authentication Methods,” on page 197

2 Managing the Appliance

After installing the appliance, you can edit the configurations such as administrative passwords for the `root` user, network settings, and certificate settings in the Configuration portal. You must perform these tasks only from the Console because native Linux tools do not recognize the configuration requirements and dependencies of the Advanced Authentication services.

IMPORTANT: NetIQ delivers and updates the Advanced Authentication appliance as a single unit including the operating system, the Advanced Authentication application, and associated runtime components. NetIQ does not recommend adding any additional software components to the appliance. Any support issues that arise with the customer supplied components might require removal before the support issues are resolved.

To access the Configuration console, perform the following steps:

1. In a web browser, specify the DNS name or the IP address of the appliance with the port number 9443. For example:

   `https://10.10.10.1:9443`

   or

   `https://mycompany.example.com:9443`

2. Specify **root** or **vaadmin** as the user name and specify the password for the appliance, then click **Sign in**.
3. Continue using the Appliance Configuration tools.

The Configuration console displays the following options:

- "Configuring Network Setting" on page 26
- "Configuring Time Settings" on page 27
- "Managing Digital Certificates" on page 27
- "Accessing System Services" on page 30
- "Configuring the Firewall" on page 30
- "Setting Administrative Passwords" on page 34
- "Adding a Field Patch to the Appliance" on page 35
- "Sending Information to Support" on page 35
- "Performing an Online Update" on page 36
- "Performing Offline Updates" on page 36
- "Adding Additional Hosts to the Hosts File" on page 36
- "Performing a Product Upgrade" on page 36
- "Rebooting or Shutting Down the Appliance" on page 36
- "Logging Out" on page 37

Configuring Network Setting

You can configure settings for the DNS servers, search domains, gateway, and NICs for the appliance in the **Network** tab. You might need to modify these settings after the initial setup if you move the appliance VM to a new host server, or move the host server to a new domain in your network environment. You can also optionally restrict the networks that are allowed to access the appliance.

To configure network settings for the appliance:

1. Log in to the Configuration Console as the `root` user.
2. Click **Network**.
3. In the **DNS Configuration** section, you can modify the DNS name servers, search domains, and gateway settings for your appliance network.

   If **Search Domains** is left blank, it is auto-populated with the domain of the appliance hostname. For example, if the hostname of the appliance is `ptm.mycompany.com`, the domain is auto-populated with `mycompany.com`.
4. In the **NIC Configuration** section, you can modify the IP address, hostname, and network mask of any NIC associated with the appliance.
   - **4a** Click the ID of the NIC.
   - **4b** Edit the IP address, hostname, or network mask for the selected NIC.
   - **4c** Click **OK**.
   - **4d** Repeat the Step 4a to Step 4c for each NIC that you want to configure.
5. (Optional) In the **Appliance Administration UI (port 9443) Access Restrictions** section, do one of the following:
   - Specify the IP address of each network for which you want to allow access to the appliance. Only the listed networks are allowed.
   - Leave this section blank to allow any network to access the appliance.

   NOTE: After you configure the appliance, changes to your appliance network environment can impact the appliance communications.
6. Click **OK**.
7. Restart the server.

Configuring the Proxy Settings

If access to internet in your company is possible only through the proxy server, you must configure the proxy settings to enable the Advanced Authentication appliance to communicate with the proxy server.

To configure the proxy settings in the Advanced Authentication server appliance

1. Open the YaST Proxy Configuration module. To open the yast configuration module, specify `yast2 proxy` in the command line as root user, or select **Network Services > Proxy** from YaST Control Center.
2. Select **Enable Proxy**.
3. Specify the URL for the protocols in the **Proxy Settings** section.

This URL is used for the proxy. The URL must include the colon (:) and port number. For example, http://<ip address>:<port number>.

4 Specify the user name and password in the **Proxy Authentication** section if the proxy server requires authentication.

5 Click **Test Proxy Settings** to validate the connection between the appliance and proxy server.

6 Click **OK**.

7 Reboot the appliance.

Configuring Time Settings

You can configure the Network Time Protocol (NTP) server, the geographic region, and the time zone where you have deployed the appliance with the Time settings.

To configure time parameters for the appliance:

1 Log in to the Configuration Console as the `root` user.

2 Click **Time**.

3 Change the following time configuration options as appropriate:

NTP Server: Specify the NTP server that you want to use for time synchronization.

Region: Select the geographic region where your appliance is located.

Time Zone: Select the time zone where your appliance is located.

4 Click **OK**.

NOTE: The time on Advanced Authentication servers must be synchronized. Ensure that the NTP port 123 (UDP) is open on your corporate firewalls to allow Advanced Authentication servers to sync time on the predefined NTP servers or specify your internal NTP servers.

Managing Digital Certificates

You can add and activate certificates for the appliance in the **Digital Certificates** tab. You can create your own certificate and then have it signed by a CA, or you can use an existing certificate and key pair.

IMPORTANT: In this section, you can only manage certificates for the Advanced Authentication appliance (port 9443). To change the certificates for the Advanced Authentication application (port 443), goto the **Server Options** tab in the Administration portal.

The appliance is shipped with a self-signed digital certificate. Instead of using this self-signed certificate, it is recommended that you use a trusted server certificate that is signed by a trusted certificate authority (CA) such as VeriSign or Equifax.

To change the digital certificate for appliance, perform the following tasks:

- "Using the Digital Certificate Tool" on page 28
- "Using an Existing Certificate and Key Pair" on page 29
- "Activating the Certificate" on page 29

Using the Digital Certificate Tool

- "Creating a New Self-Signed Certificate" on page 28
- "Getting Your Certificate Officially Signed" on page 29

Creating a New Self-Signed Certificate

1. Log in to the Configuration Console as the `root` user.
2. Click **Digital Certificates**.
3. In the **Key Store** list, select **Web Application Certificates**.
4. Click **File** > **New Certificate (Key Pair)** and specify the following information:

   4a **General**

   Alias: Specify a name that you want to use to identify and manage this certificate.

   Validity (days): Specify for how long you want the certificate to remain valid.

   4b **Algorithm Details**

   Key Algorithm: Select either **RSA** or **DSA**.

   Key Size: Select the preferred key size.

   Signature Algorithm: Select the preferred signature algorithm.

   4c **Owner Information**

   Common Name (CN): This must match the server name in the URL in order for browsers to accept the certificate for SSL communication.

   Organization (O): (Optional) Large organization name. For example, My Company.

   Organizational Unit (OU): (Optional) Small organization name, such as a department or division. For example, Purchasing.

   Two-letter Country Code (C): (Optional) Two-letter country code. For example, US.

   State or Province (ST): (Optional) State or province name. For example, Utah.

   City or Locality (L): (Optional) City name. For example, Provo.

5. Click **OK** to create the certificate.

   After the certificate is created, it is self-signed.
6. Make the certificate official, as described in Creating a New Self-Signed Certificate.

Getting Your Certificate Officially Signed

1. On the Digital Certificates page, select the certificate that you just created, then click **File** > **Certificate Requests** > **Generate CSR**.
2. Complete the process of emailing your digital certificate to a certificate authority (CA), such as Verisign.

   The CA takes your Certificate Signing Request (CSR) and generates an official certificate based on the information in the CSR. The CA then emails the new certificate and certificate chain back to you.
3. After you have received the official certificate and certificate chain from the CA:
   - **3a** Revisit the Digital Certificates page.
   - **3b** Click **File** > **Import** > **Trusted Certificate**.
   - **3c** Click **Browse** and select the trusted certificate chain that you received from the CA, then click **OK**.
   - **3d** Select the self-signed certificate, then click **File** > **Certification Request** > **Import CA Reply**.
   - **3e** Click **Browse** and select the official certificate to be used to update the certificate information.

     On the **Digital Certificates** page, the name in the **Issuer** column for your certificate changes to the name of the CA that stamped your certificate.
4. Activate the certificate, as described in "Activating the Certificate" on page 29.

Using an Existing Certificate and Key Pair

When you use an existing certificate and key pair, use a `.P12` key pair format.

1. Log in to the Configuration Console as the `root` user.
2. Click **Digital Certificates**.
3. In the **Key Store** menu, select **JVM Certificates**.
4. Click **File** > **Import** > **Trusted Certificate**.
5. Click **Browse** and select your existing certificate, then click **OK**.
6. Click **File** > **Import** > **Trusted Certificate**.
7. Click **Browse** and select your existing certificate chain for the certificate that you selected in Step 4, then click **OK**.
8. Click **File** > **Import** > **Key Pair**.
9. Click **Browse** and select your `.P12` key pair file, specify your password if required, then click **OK**.
10. Continue with "Activating the Certificate" on page 29.

Activating the Certificate

1. On the **Digital Certificates** page, in the **Key Store** list, select **Web Application Certificates**.
2. Select the certificate that you want to make active and click **Set as Active**, then click **Yes**.

3 Select the certificate and click **View Info** to verify that the certificate and certificate chains are created appropriately.

4 Click **Close**, when you have activated the certificate successfully.

Accessing System Services

You can view the status of services running on the appliance in the **System Services** tab. System services include the following:

- SSH

To access the System Services page:

1 Log in to the Configuration Console as the `root` user.

2 Click **System Services**.

You can perform the following actions:

- Starting, Stopping, or Restarting System Services
- Making System Services Automatic or Manual

Starting, Stopping, or Restarting System Services

You can start, stop, or restart the SSH or the Advanced Authentication service.

To start, stop, or restart a service on the appliance:

1 Click **System Services**.

2 Select the service that you want to start, stop, or restart.

3 Click **Action**, then select **Start**, **Stop**, or **Restart**.

Making System Services Automatic or Manual

1 Click **System Services**.

2 Select the service that you want to make automatic or manual.

3 Click **Options**, then select either **Set as Automatic** or **Set as Manual**.

You can click **Refresh List** to refresh the list of the services.

Configuring the Firewall

You can view your current firewall configuration directly from the appliance in the **Firewall** tab. By default, all ports are blocked except those that are required by the appliance. For example, the Login page for the Configuration Console uses port 9443, so this port is open by default.

NOTE: To have a seamless experience with the appliance, ensure that you do not block the ports with your firewall settings.

To view firewall settings for the appliance:

1 Log in to the Configuration Console as the `root` user.

2 Click **Firewall**.

The Firewall page lists port numbers with the current status of each port number. The page is not editable.

Configuring the Ports and Firewall

IMPORTANT: The Advanced Authentication server uses ports 443 and 80. These ports cannot be changed.

Port forwarding is not recommended in a production environment because the entire appliance is available through the internet. It is recommended to use reverse proxy to map only the specific URLs.

By default, the Advanced Authentication server uses the following RFC standard ports.

Service	Port	Protocol	Usage
REST	443	HTTPS	All Communications
Administration portal, Self-Service portal, Helpdesk portal, Reporting portal, and Search card portal	443	HTTPS	All Communications (`<AAServer>/admin`, `<AAServer>/account`, `<AAServer>/helpdesk`, `<AAServer>/report`)
Database replication	5432	TCP	Database replication between DB servers. The port must be opened to the Master server of the same site (or to the Global Master server for the installation of DB Master Server in the new sites) only for the installation of new server. Then the port can be closed.
Database replication	8080	TCP	Database replication between DB servers
DNS	53	TCP, UDP	DNS
NTP	123	UDP	NTP, used for time synchronization
LDAP	389	TCP, UDP	LDAP (if used with repository)
LDAPS	636	TCP,UDP	LDAP over TLS/SSL (if used with repository)
Dashboard and Reporting portal	9200, 9300	HTTPS	Collecting statistics from the Advanced Authentication servers in the cluster
SQL	1433	TCP, 1434 UDP	Microsoft SQL Server (if used with repository)

Advanced Authentication server uses the following ports for the different methods:

Service	Port	Protocol	Usage
RADIUS	1812	UDP	Authentication
RADIUS	1813	UDP	Accounting
E-Mail Service	Variable	SMTP	E-Mail Traffic
Voice Call Service	Variable	HTTPS	All Communications (`<AAServer>/twilio/status`, `<AAServer>/twilio/gather`)
Smartphone	Variable	HTTPS	All Communications (`<AAServer>/smartphone`)
Smartphone Push Service	443	HTTPS	Communication between Advanced Authentication and `proxy.authasas.com` (push service)
SMS	Variable	HTTPS	Communication to a used SMS service
Swisscom Mobile ID	Variable	HTTPS	Communication to the specified Swisscom Mobile ID service URL
Voice OTP Service	Variable	HTTPS	All Communications (`<AAServer>/twilio/otp`)
Face Recognition	443	HTTPS	Microsoft Cognitive Services (URL specified in **Administration portal > Methods > Face Recognition > Endpoint URL**)

IMPORTANT: For reverse proxy, you can use any port. For example, `https://dnsname:888/smartphone`. A reverse proxy redirect is done from port 888 to port 443 internally to appliance. Port 888 is used from outside, but port 443 is used inside the appliance.

The following table lists the ports of the common appliance:

Port	Description
22	SSH port for the appliance
25	SMTP and SMTPS outbound ports
80	Standard Web server ports
1099	Java RMI port
7380	Ganglia RRD-REST ports
9080	Apache/HTTPD port
9090, 9443	Jetty port for the appliance (Administrator Interface)

Use SuSEfirewall2 (https://www.suse.com/documentation/sled11/book_security/data/sec_fire_suse.html) to change the firewall settings. For example, execute the following commands to enable port 9443 for external network:

```
SuSEfirewall2 open EXT TCP 9443
SuSEfirewall2 stop
SuSEfirewall2 start
systemctl stop aauth
systemctl restart docker
systemctl start aauth
```

The following table lists the URLs to access the external address for Advanced Authentication.

URL	Port	Description
`docker.io`	443	Required to download the docker updates
`docker.com`		
`redis.io`		
`ftp.novell.com`	21	Required to upload the logs for sending information to the Support team. For more information, see "Sending Information to Support"
`www.novell.com`	80	Required for the testing of YaST Proxy. For more information, see "Configuring the Proxy Settings"
`nu.novell.com` and	443	Required for all the SUSE products
`secure-www.novell.com`		
`proxy.authasas.com`	443	Required for the push service in Smartphone authentication

NOTE: Granting access to `docker.io`, `docker.com`, and `redis.io` is required only for the helm chart and not for the appliance.

Advanced Authentication uses the following URLs.

URL	Used for
Advanced Authentication Server	
/static/*, /rest/user/api	Web portals
/admin	Administration portal
/account	Self-Service portal
/helpdesk	Helpdesk portal
/report	Reporting portal
/api	REST API calls
/adfs	ADFS plug-in

URL	Used for
/osp	SAML 2.0, OAUTH 2.0 integrations
/search-card	Search Card portal
Authentication Agent	
/oob/{oob_proc_id:[0-9a-zA-Z-]{3,32}}	Authentication Agent
Smartphone	
/smartphone/adddevice/{path}/{enc_dev_id}	
/smartphone/confirm/{path}	
/smartphone/pushid/{path}	
/smartphone/requestsalt/{path}	
/smartphone/saltpushid/{path}	
Twilio (SMS, Voice Call, Voice OTP)	
/twilio/gather/{proc_id}	
/twilio/otp/{proc_id}	
/twilio/otp_anon/{tenant_id}/{otp}	
/twilio/status/{proc_id}	

Setting Administrative Passwords

You can modify the passwords and SSH access permissions for the appliance administrator: the `root` user in the **Administrative Passwords** tab. If your password policy requires it, you must modify passwords periodically or if you reassign responsibility for the appliance administration to another person.

NOTE: The `vaadmin` helps to manage virtual-machine-level settings and service configurations that affect an entire service and its interactions with other services.

The `vaadmin` user can use the **Administrative Passwords** page to perform the following tasks:

- Modify the `vaadmin` user password. To change a password, you must provide the old password.
- The vaadmin user automatically has permissions necessary to remotely access the appliance with SSH instead of using a VMware client. The SSH service must be enabled and running to allow SSH access.

  NOTE: The SSH service is disabled and is not running by default. For information about how to start SSH on the appliance, see Accessing System Services.

The `root` user can use the **Administrative Passwords** page to perform the following tasks:

- Modify the `root` user password. To change a password, you must provide the old password.

- Enable or disable the `root` user SSH access to the appliance.

  When you select **Allow root access to SSH**, the root user is able to SSH to the appliance.

To manage the administrative access as the `vaadmin` user:

1. Log in to the Configuration Console as the `vaadmin` user.
2. Click **Administrative Passwords**.
3. Specify a new password for the `vaadmin` administrator. You must also specify the current `vaadmin` password.
4. Click **OK**.

To manage the administrative access as the `root` user:

1. Log in to the Configuration Console as the `root` user.
2. Click **Administrative Passwords**.
3. Specify a new password for the `root` administrator. You must also specify the current `root` password.
4. (Optional) Select or deselect **Allow root access to SSH**.
5. Click **OK**.

Adding a Field Patch to the Appliance

You can add patches provided by engineering in the **Field Patch** tab. A field patch is not a complete patch and must only be used until a complete patch is released.

For more information about how to manage the field patch updates, see Updating Advanced Authentication to a Field Patch.

Sending Information to Support

You can send the configuration information of appliance to Technical Support (https://www.netiq.com/support/) by uploading files directly to FTP, or by downloading the files to your management workstation and sending them by an alternative method to the Support team.

To send configuration files to Technical Support:

1. Log in to the Configuration Console as the `root` user.
2. Click **Support**.
3. Use one of the following methods to send the appliance's configuration files to Technical Support (https://www.netiq.com/support/):
   - Select **Automatically send the configuration to Micro Focus using FTP** to initiate the FTP transfer of configuration information.
   - Select **Download and save the configuration file locally, then send it to Micro Focus manually** to download configuration information to your management workstation. You can then send the information to Technical Support (https://www.netiq.com/support/) using a method of your choice.
4. Click **OK** to complete the process.

Performing an Online Update

Use the **Online Update** option to register for the online update service from the Customer Center. You can install updates automatically or manually to update the appliance. For more information on the OpenSUSE online updates, see OpenSUSE patch vs update (https://lukerawlins.com/opensuse-patch-vs-update/).

For more information about registering for online update service and scheduling an update, see "Registering To and Performing the Online Updates".

Performing Offline Updates

For performing offline updates for SLES, see "Performing the Offline Updates" in the *Advanced Authentication- Server Installation and Upgrade* guide.

Adding Additional Hosts to the Hosts File

You can add additional entries to the `hosts` file for the Advanced Authentication appliance. You must add the entry to the `/etc/opt/novell/base/hosts.appliance` file. This is a manual process. You cannot change the host entries in any other way.

1. Access the command line console of the appliance.
2. Navigate to `/etc/opt/novell/base/hosts.appliance`.
3. Open the file in a text editor, then add the additional entries to the `hosts` file.
4. Save and close the file.
5. Reboot the appliance.

Performing a Product Upgrade

You can upgrade your appliance using the **Product Upgrade** option.

For more information about upgrade and migration, see Upgrading Advanced Authentication.

Rebooting or Shutting Down the Appliance

You might need to initiate a graceful shutdown or to restart the appliance for maintenance. It is recommended to use the Configuration Console options than Power Off/On option in the hypervisor's VM management tool.

1. Log in to the Configuration Console as the `root` user.
2. In the upper right corner of the Appliance Configuration pane, click **Reboot** or click **Shutdown**.

Logging Out

For security reasons, you should sign out to exit your management session with the appliance, then close your web browser. Your session terminates automatically when you close your web browser.

To sign out of the Configuration Console:

1. In the upper-right corner of the Configuration Console page, next to the user name, click **Logout**.
2. Close the web browser.

3 Configuring Global Master Server

After installing Advanced Authentication server, you must configure the mode on which the appliance runs. The first server is the **Global Master/ Server Registrar**. This is the server with master database. DB Master, DB servers, and Web servers are connected to the master database.

To configure the first server, perform the following steps:

1. Ensure that you install the Advanced Authentication server.
2. Open the Advanced Authentication Configuration Wizard for the server: https://<server_host_name> (the URL is displayed after you install Advanced Authentication server).
3. Select **New Cluster** and click **Next** on the first **Server Mode** screen of the Configuration Wizard.
4. Specify the server DNS hostname in **My DNS hostname** and click **Next** on the **DNS hostname** screen.

   NOTE: You must specify a **DNS hostname** instead of an IP address because appliance does not support the changing of IP address.

5. Specify a password for the `LOCAL\admin` account and confirm it and click **Next** on the **Password** screen.
6. Click **Create** to generate an encryption key file on the **Create encryption key** screen.

   NOTE: FIPS 140-2 is enabled by default to comply with the FIPS 140-2 encryption.

7. Click **Next**.

4 Logging In to the Advanced Authentication Administration Portal

After you set up an applicable server mode, the Advanced Authentication Administration portal is displayed.

To log in to the Advanced Authentication Administration portal, perform the following steps:

1. Specify the administrator's credentials in the format: `repository\user` (**local\admin** by default).

   NOTE: You can also use the format `user@repository`, if the Multitenancy mode is disabled.

2. Click **Next**.
3. The **Admin Password** chain is selected by default as the only available chain. Specify the password that you specified while setting up the DB Master server mode.
4. Click **Next**.

   The Dashboard page is displayed.

5. You can change the language from the list on the upper-right corner of the Administration portal.

   The languages supported are: Arabic, Canadian French, Chinese Simplified, Chinese Traditional, Danish, Dutch, English, French, German, Italian, Japanese, Polish, Portuguese (Brazilian), Russian, Spanish, Hebrew, and Swedish.

IMPORTANT: Password of **local\admin** account expires by default. For uninterrupted access to the Administration portal, it is strongly recommended to add authorized users or group of users from a configured repository to the **FULL ADMINS** role. Then you must assign chains, which contain methods that are enrolled for users, to the **AdminUI** event (at a minimum with an LDAP Password).

NOTE: It is not recommended to access the Advanced Authentication Administration portal through a load balancer, as the replicated data may not be displayed.

5 Configuring Advanced Authentication Server Appliance

In the Administration portal, you can configure and manage various authentication settings such as methods, events, and so on. You can also configure various policies that are required for authentication.

Advanced Authentication Administration portal contains the Help option that guides you on how to configure all settings for your authentication framework. The Help section provides you with information on the specific section you are working on.

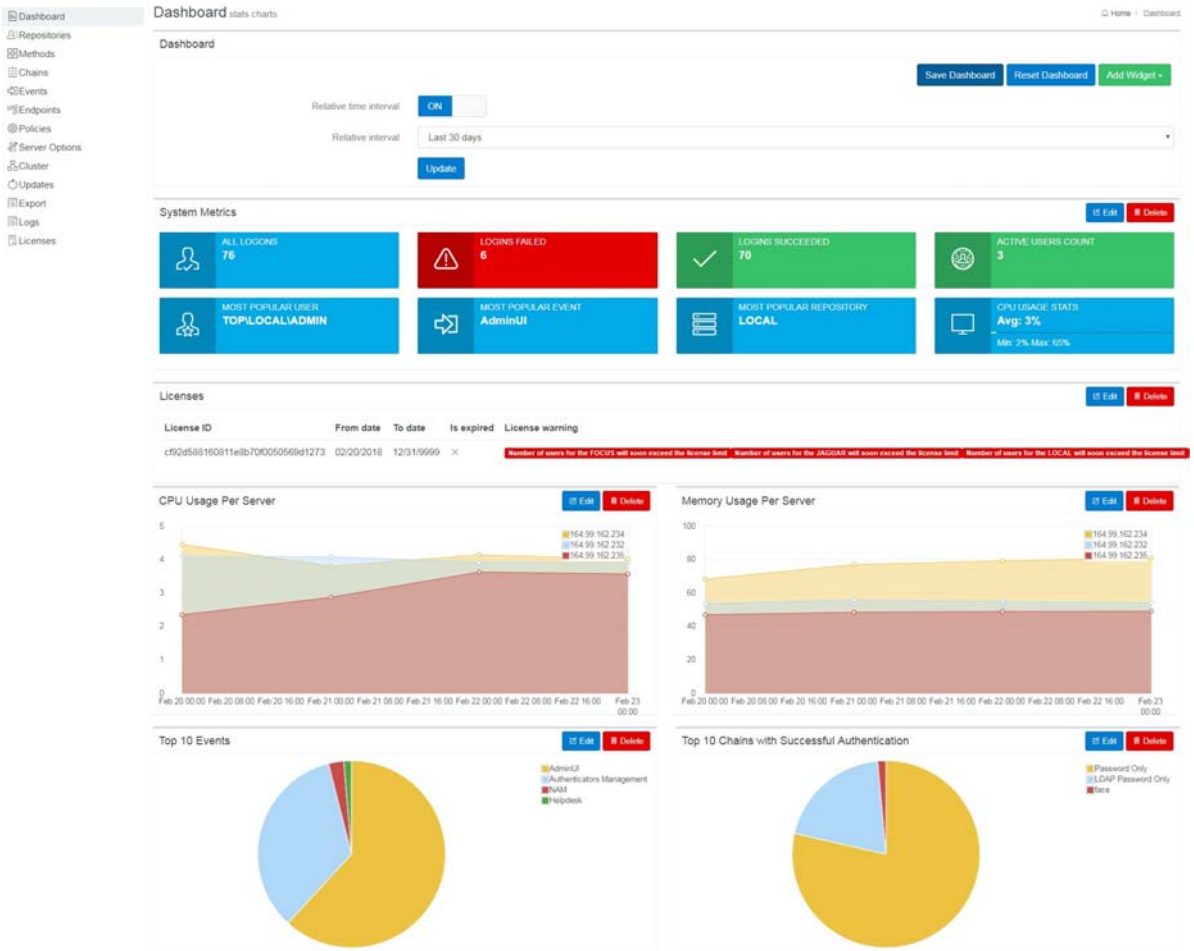
This chapter contains the following sections:

- "Managing Dashboard" on page 43
- "Adding a Tenant" on page 51
- "Adding a Repository" on page 51
- "Configuring Methods" on page 63
- "Creating a Chain" on page 105
- "Configuring Events" on page 108
- "Managing Endpoints" on page 118
- "Configuring Policies" on page 119
- "Configuring the Server Options" on page 156
- "Adding a License" on page 157
- "Exporting and Importing the Database" on page 158
- "Adding a Report" on page 161

Managing Dashboard

After you login into the Advanced Authentication Administration console, the Dashboard is displayed. Dashboard contains widgets that you can add or customize to view a graphical representation of data. The information in the Dashboard helps administrators to track memory utilization, tenant information, successful or failed logins, and so forth.

You can view the Dashboard for all the tenants or specific tenants.



You can perform the following to manage the Dashboard:

- Add widgets
- Customize Dashboard
- Update Dashboard
- Customize the Default Widgets
- Export Widgets

Adding Widgets

To add widgets, perform the following steps:

1. Click **Add widget** in the top-right corner of the **Dashboard** screen.
2. Select the widget from the list that you want to add to the dashboard.
3. Specify the appropriate details for the widget in the **Add Widget** screen.
4. Click **OK**.

You can add the following types of widgets:

- Pie chart

- Stacked chart
- Activity stream
- Enroll activity stream
- Users
- Authenticators
- Licenses
- Events count line chart
- Events count line chart grouped by field
- Distinct Events Count Line Chart
- Distinct Events Count Line Chart Grouped by Field

Pie Chart

This widget displays the information collected on a specific parameter and represents information in the Pie chart format. You can also sort the parameter is ascending and descending order.

Stacked Chart

This widget displays a stacked bar chart that classifies and compares different categories of **Field 1** and **Field 2** parameters to track the maximum and minimum number of logons. X-axis represents categories of the **Field 2** parameter. Y-axis represents logon count. Segments in each vertical bar represents categories of **Field 1** parameter. Different colors are used to depict different categories and label for each category is displayed in upper-right corner of the widget.

Activity Stream

This widget displays information about user, tenant, chain, method used for authentication, and the result.

Enroll Activity Stream

This widget displays information about enrolled users: last log on time, tenant, user, method used for authentication, and event type.

Users

This widget displays information about the enrolled users: tenant name, user name, enrollment status and last log on time.

Authenticators

This widget displays information about the enrolled authenticators: tenant name, user name, event category, method, comment and owner of the account.

Licenses

This widget displays information about the license id, license validity dates (such as From and To dates), license expire status and license warnings (regarding license expiry, exceed in user count)

Event Count Line Chart

This widget tracks and displays logon count of all events in the appliance. The X-axis (horizontal) represents time and Y-axis (vertical) represents logon count. Each data point on the chart represents numbers of user logged on at a specific time. All the data points are plotted and connected with a line to track the maximum and minimum number of logons.

Events Count Line Chart Grouped by Field

This widget tracks and displays logon count of specific parameter. The X-axis (horizontal) represents time and Y-axis (vertical) represents logon count. Data points of different colors represent specific category of the selected parameter. The label for each category is displayed in upper-right corner of the widget. All the data points are plotted and connected with a line to track the maximum and minimum number of logons.

Distinct Events Count Line Chart

This widget tracks and displays distinct count of all categories in the selected parameter (Distinct values by field). X-axis (horizontal) represents time and Y-axis (vertical) represents distinct logon count. Each data point on the chart represents unique logon count at a specific time. All the data points are plotted and connected with a line to track the maximum and minimum number of distinct logons.

For example: If the Distinct events count line chart widget is customized as follows:

- **Interval** set to **1 hour**.
- **Distinct values by field** is set to **User name**.

The widget displays number of unique users logged in to all events for the time duration of 1 hour.

Distinct Events Count Line Chart Grouped by Field

This widget displays and classifies distinct logon count of each event. The X-axis (horizontal) represents time and Y-axis (vertical) represents distinct logon count. Each data point on the chart represents unique logon count of particular event at a specific time. All the data points are plotted and connected with a line to track the maximum and minimum number of distinct logons to particular event.

Customizing Dashboard

You can customize the Dashboard by moving the widgets or deleting the unused widgets.

To move the widgets, click on the widget and the drag icon appears. You can then drag and drop the widget to the desired location of the Dashboard.

To delete unused widgets, click **Delete** on the top of each widget.

After customizing the dashboard, click **Save Dashboard** on the upper-right corner of the **Dashboard** screen.

Updating Dashboard to View Real Time or Historical Data

You can update Dashboard to view the data based on the time interval or historical data.

Viewing Dashboard based on Time Interval

To view records based on real time interval, perform the following steps:

1. Set **Relative time interval** to **ON** in the **Dashboard** section.
2. Select the time interval from **Relative interval**. By default, time interval is set to **Last 15 minutes**.
3. Click **Update**.

Viewing Dashboard for Previous Records

To view previous records, perform the following steps:

1. Set **Relative time interval** to **OFF** in the **Dashboard** section.
2. Select the **Date range**.
3. Click **Update**.

Customizing the Default Widgets

To customize the widget, click **Edit** and select the appropriate filters. You can edit the widget title and customize the display based on the following filter factors:

- **Event type**: Select preferred event type. Options available are **All logon events**, **Failed logon events** and **Successful logon events**.
- **Interval**: Select Time interval.
- **Size**: Select number of records.
- **Sort**: Select sorting order. Options available are ascending or descending order.
- **Field**: Select the parameter based on which the data must be collected to display on the widget. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on.
- **Users**: Select specific user.
- **Events**: Select specific event.
- **Chains**: Select specific chain.

Following are the default widgets when you login. You can edit these widgets according to your need:

- “Server Metrics” on page 48
- “CPU and Memory Usage Per Server” on page 48
- “Tenants” on page 48
- “Authentications” on page 49

- “Logons Per Result” on page 49
- “Total Users” on page 49
- “Total Users Per Event” on page 49
- “Activity Stream” on page 49
- “Successful/Failed Logons” on page 49
- “Top Events With Successful Logon Per Chain” on page 49
- “Top Events With Failed Logon Per Method” on page 49
- “Top 10 Events” on page 49
- “Top 10 chains With Successful Result” on page 49
- “Top 10 Servers” on page 49
- “Top 10 Tenants” on page 50
- “Top 10 Repositories” on page 50
- “Top 5 Events for Logons” on page 50
- “Top 5 Users for Logons” on page 50
- “Top 10 Users With Failed Logon” on page 50
- “Top 10 Users” on page 50
- “Top 10 Events” on page 50
- “Top 10 Methods With Failed Result” on page 50

Server Metrics

This widget displays statistics about user’s login, popularity and so on. The following section defines each server metric:

- **All Logons**: Total number of logins.
- **Failed Login**: Total number of failed logins by the users.
- **Succeeded Login**: Total number of successful logins by the users.
- **Active Users Count:** The number of active users.
- **Most Popular User**: The user that has used the console most.
- **Most Popular Event**: The event that users have used the most.
- **Most Popular Repo**: The repository that users have used the most.
- **CPU Usage Stats**: The average percentage of CPU usage.

CPU and Memory Usage Per Server

These widgets display information about percentage of CPU and memory usage of server for the set time interval. These widgets display average CPU and memory usage.

Tenants

This widget displays information about the tenants and their login.

Authentications

This widget displays the total logon count for time interval.

Logons Per Result

This widget displays two lines: one for successful logons and one for failed logons.

Total Users

This widget displays the total number of logged in users for time interval.

Total Users Per Event

This widget displays the total number of logged in users for each event.

Activity Stream

This widget displays information about user, tenant, chain, method used for authentication, and the result.

Successful/Failed Logons

This widget displays information about the successful or failed users login.

Top Events With Successful Logon Per Chain

This widget displays the top events based on the successful logon for each chain.

Top Events With Failed Logon Per Method

This widget displays the top events based on the failed logon for each chain.

Top 10 Events

This widget displays the top ten events the user has performed.

Top 10 chains With Successful Result

This widget displays the top ten chains the user has successfully authenticated with.

Top 10 Servers

This widget displays the top ten servers the user has used to authenticate.

Top 10 Tenants

This widget displays the top ten tenants.

Top 10 Repositories

This widget displays the top ten repositories.

Top 5 Events for Logons

This widget displays the top five events for login.

Top 5 Users for Logons

This widget displays the top five users for login.

Top 10 Users With Failed Logon

This widget displays the top ten users who have failed in the login attempt.

Top 10 Users

This widget displays the top ten users.

Top 10 Events

This widget displays the top ten events.

Top 10 Methods With Failed Result

This widget displays the top ten methods with failed authentication results.

Exporting Widgets

When you export a widget, Advanced Authentication creates a copy of the selected widget in the **Reports** section. You must navigate to **Reports** page to download the exported file on your local drive.

To export a widget, perform the following steps:

1. Select the preferred widget on the **Dashboard** page.
2. Click **Export** and select preferred format. Formats available are:
   - .csv
   - .json
3. Click **Reports**.
4. Click the exported file name in the **Exported reports** section, to download on the local drive.

Adding a Tenant

A tenant is a company with a group of users sharing common access with specific privileges. Each company has a tenant administrator. The tenant administrator has the privilege to configure settings for methods, chains, events, and so on.

Multitenancy is a feature where a single instance of Advanced Authentication solution supports multiple tenants. The multitenancy feature is optional and is disabled by default. To enable Multitenancy, see the policy Multitenancy options.

To add a tenant, perform the following steps:

1. Click **Tenants** > **Add**.
2. Specify the name, description, and password for the tenant administrator.
3. Click **Save**.

For the tenants added, you can view the number of configured repositories and the license expiry date. In the **Edit tenant** page, you can view the number of users and change the password for the tenant administrator.

NOTE: A tenant administrator cannot add another tenant and cannot access the **Server options**, **Cluster**, and **Updates** sections. For more information, see the Tenant Administration Guide.

Adding a Repository

A repository is a central location where the user's data is stored. Advanced Authentication uses the repository only to retrieve the user information and configurations in Advanced Authentication do not affect the repository. The authentication templates are stored inside the appliance and are fully encrypted.

Advanced Authentication supports any LDAP compliant directory such as Active Directory Domain Services, NetIQ eDirectory, Active Directory Lightweight Directory Services, OpenLDAP, and OpenDJ. Advanced Authentication also supports the SQL database.

When you add a new repository, you can match the users in the repository to the authentication chains. You require only the read permission to access a repository.

You can add the following repositories:

- Any LDAP repository
- SQL database
- External repository

Adding an LDAP Repository

To add a repository, perform the following steps:

1. Click **Repositories > Add**.
2. Select an applicable repository type from the **LDAP type** list. The options are:
   - **AD** for Active Directory Domain Services

- **AD LDS** for Active Directory Lightweight Domain Services
- **eDirectory** for NetIQ eDirectory
- **Other** for OpenLDAP, OpenDJ and other types

For **AD**, a repository name is automatically set to the NetBIOS name of the domain. For other LDAP repository types, you need to specify the name in **Name**.

3 Specify a container for the users in **Base DN**. When you select the **Subtree** option, Advanced Authentication performs a search for the users in all the child nodes. You can change the search scope by selecting the **Search one level only** option.

4 Specify a user account in **User** and specify the password of the user in **Password**. Ensure that the user's password has no expiry.

5 You can specify a container for the groups in **Group DN (optional)**. When you select the **Subtree** option, Advanced Authentication performs a search for the groups in all the child nodes. You can change the search scope by selecting the **Search one level only** option.

6 If you have selected **AD** as the **LDAP type**, you can perform the DNS discovery either automatically or manually.

- Automatic DNS discovery
- Manual DNS Discovery

Automatically Performing the DNS Discovery

1. Select **DNS discovery** in the **LDAP servers** option.
2. Specify the **DNS zone**.
3. Specify the **Site name** (optional).
4. The **Use SSL** option is set to **OFF** by default. This indicates that the DNS discovery is done on a non-SSL mode for the port 389. An `_ldap` SRV record is retrieved from the DNS server when this option is disabled. For example, `_ldap._tcp.test2.local2`.

   To use SSL for DNS discovery on port 636, turn **Use SSL** to **ON**. An `_ldaps` SRV record is retrieved from the DNS server. For example, `_ldaps._tcp.test2.local2`. However, administrators must create the SRV record on the DNS server before using the SSL option.
5. Click **Perform DNS Discovery**.

   When the DNS discovery is done, the DNS servers list is updated every three hours.

Manually Performing the DNS Discovery

1. Select the **Manual setting** option in the **LDAP servers** option to add LDAP servers manually.
2. Click **Add server**. You can add the different servers in your network. The list is used as a pool of servers. Each time the connection is open, a random server is selected in the pool and unavailable servers are discarded.
3. Specify an LDAP server's **Address** and **Port**.
4. Turn **SSL** to **ON** to use SSL (if applicable).

NOTE: If you specify an RODC (Read Only Domain Controller) in the LDAP server, the server uses this DC for read requests (get groups, get user info) and for logon requests (LDAP Password method and bind requests for Advanced Authentication LDAP user). These

requests are redirected to a writable DC because RODC is installed in untrusted locations and does not have copies of the user's passwords. Therefore, if a writable DC is not available, Advanced Authentication will not be able to bind to the LDAP repository.

To solve this issue, you must enable the password replication of a user account specified in Step 4. To do this, you must add the account to the **Allowed RODC Password Replication Group**.

However, even when you enable such replication, users cannot use the LDAP Password method because user's passwords are not replicated. It is recommended not to replicate passwords of all the users. For more information, see the article Understanding "Read Only Domain Controller" authentication.

NOTE: A Global Master must have connection to each of the LDAP servers. Therefore, in a data center with Global Master, you must have LDAP servers for all the used domains. In the secondary sites, ensure that the LDAP servers list contains only local LDAP servers to prevent an Advanced Authentication server to communicate to an LDAP Server that is located remotely. This is because communication to servers that are located far may result in delays.

---

5. Click the save icon next to server's credentials.

   Add additional servers (if applicable).

7 (Conditional) To configure custom attributes, expand Advanced Settings. The Advanced Settings are required for OpenDJ, OpenLDAP, and in some cases for NetIQ eDirectory.

8 Click **Save**.

NOTE: If you use NetIQ eDirectory with the option **Require TLS for Simple Bind with Password** enabled, you may get the error: `Can't bind to LDAP: confidentialityRequired`. To fix the error, you must either disable the option or do the following:

1. Click **LDAP > LDAP Options > Connections** in the NetIQ eDirectory Administration portal.
2. Set **Client Certificate** to **Not Requested**.
3. Set a correct port number and select **SSL** in the Repository settings.
4. Click **Sync now** with the added repository.

---

9 You can change the search scope and the **Group DN (optional)** functionality. In Advanced Authentication 5.2, you had to specify a common **Base DN** for users and groups.

10 To verify the synchronization of a repository, click **Edit** and you can view the information in **Last sync**.

11 Click **Full synchronization** to perform a complete synchronization of the repository.

NOTE: Full synchronization can be initiated only on the Global Master server.

Advanced Authentication performs automatic synchronization of modified objects (fast synchronization) on an hourly basis for AD repositories only. The fast synchronization is used to remove the users who are no longer a member of the groups that are assigned to the authentication chain of Advanced Authentication. It allows to free up their license.

The complete synchronization (**Full synchronization**) is performed on a weekly basis for all types of repositories.

NOTE: If an LDAP server is unavailable for 2.5 seconds, Advanced Authentication excludes it from the LDAP requests for a period of 3 minutes.

Advanced Settings

Advanced Settings allow you to customize attributes that Advanced Authentication reads from a repository. Click **+** to expand the **Advanced Settings**. The following list describes the different attributes in Advanced Settings:

- "User Lookup Attributes" on page 54
- "User Name Attributes" on page 54
- "User Mail Attributes" on page 54
- "User Cell Phone Attributes" on page 54
- "Group Lookup Attributes" on page 55
- "Group Name Attributes" on page 55
- "Verify SSL Certificate" on page 56
- "Enable Paged Search" on page 56
- "Enable Nested Groups Support" on page 56
- "Framed IPv4 Address Attribute" on page 56
- "Used Attributes" on page 57

User Lookup Attributes

Advanced Authentication validates the specified attributes for an entered user name.

For Active Directory (AD), the default attributes are `sAMAccountName` and `userPrincipalName`. For other repositories, `cn` is the default attribute.

User Name Attributes

Advanced Authentication shows a name from the first, non-empty specified field for an entered user name.

For AD, the default attributes are `sAMAccountName` and `userPrincipalName`. For other repositories, `cn` is the default attribute.

User Mail Attributes

Advanced Authentication validates the specified attributes to retrieve a user's email address.

Default attributes are `mail` and `otherMailbox`.

User Cell Phone Attributes

Advanced Authentication validates the specified attributes to retrieve a user's phone number. These attributes are used for methods such as SMS OTP, Voice, and Voice OTP. Previously, the first attribute of **User cell phone attributes** was used as a default attribute for authenticating with SMS OTP, Voice, and Voice OTP methods. Now, users can use different phone numbers for these methods. For example, Bob wants to authenticate with SMS OTP, Voice, and Voice OTP methods. He has a cell

phone number, a home phone number, and an IP phone number and wants to use these numbers for each of these methods. He can define these phone numbers in the respective settings of these methods.

Default attributes: `mobile`, `otherMobile`.

NOTE: If you have multiple repositories, you must use the same configuration of **User cell phone attributes** for all the repositories.

Group Lookup Attributes

Advanced Authentication validates the specified attributes for an entered group name.

For Active Directory, the default attribute is `sAMAccountName`. For other repositories, `cn` is the default attribute.

Group Name Attributes

Advanced Authentication shows a name from the first, non-empty specified field for an entered group name.

For Active Directory, the default attribute is `sAMAccountName`. For other repositories, `cn` is the default attribute.

Advanced Authentication supports the RFC 2037 and RFC 2037 bis. RFC 2037 determines a standard LDAP schema and contains a `memberUid` attribute (POSIX style). RFC 2037 bis determines an updated LDAP schema and contains a member attribute. Active Directory, LDS, and eDir support RFC 2037 bis. OpenLDAP contains `posixAccount` and `posixGroup` that follows RFC 2037.

Advanced Authentication supports the following attributes for the Group Name attributes:

Attribute	Default Value	Value for the Repository
`User Object Class`	`user`	OpenDJ and OpenLDAP: `person`
`Group Object Class`	`group`	OpenDJ: `groupOfNames` OpenLDAP: `posixGroup`
`Group Member Attribute`	`member`	`OpenDJ: member` OpenLDAP: `memberUid`. If a required group contains `groupOfNames` class, disable **POSIX style groups**. If the group contains `posixGroup`, enable **POSIX style groups.** ◆ `User UID attribute` This attribute is available only when **POSIX style groups** is **ON**. Default value: `uid`.

Attribute	Default Value	Value for the Repository
`Object ID Attribute` This attribute is available only for **other LDAP type** only.	entryUUID	

NOTE: For information about the Logon filter settings (Legacy logon tag and MFA logon tag), see Configuring Logon Filter.

Verify SSL Certificate

Enable **Verify SSL Certificate** to ensure that the LDAP connection to appliance is secured with a valid self-signed SSL certificate. This helps to prevent any attacks on the LDAP connection and ensures safe authentication. Click **Browse** to browse the self-signed certificate.

Enable Paged Search

The **Enable paged search** option allows LDAP repositories to support paged search in which the repositories can retrieve a result of a query set in small portions. By default, this option is set to **ON**. For openLDAP (with file-based backend), the option must be set to **OFF.**

NOTE: You must not disable the option for Active Directory repositories. It can also affect the performance on other supported repositories such as NetIQ eDirectory.

Enable Nested Groups Support

This option allows you to enable or disable nested groups support. By default, the **Enable nested groups support** option is set to **ON.**

If **Enable nested groups support** option is set to **ON,** then Advanced Authentication will authenticate all the users of the group and its nested groups assigned to a chain. If **Enable nested groups support** option is set to **OFF,** then Advanced Authentication will authenticate only the members of the group assigned to the chain. The members of the nested groups cannot access the chain.

Consider there is a group by name **All Users** assigned to **SMS Authentication** chain and the **All Users** group has subgroups **Contractors** and **Suppliers.** When **Enable nested groups support** option is set to **ON,** then Advanced Authentication will authenticate **All Users** group and the nested groups **Contractors** and **Suppliers** for **SMS Authentication** chain. When the option is set to **OFF,** then Advanced Authentication will authenticate only the members of **All Users** group and the nested group members will not have access to **SMS Authentication** chain. This improves the login performance of the appliance.

Framed IPv4 Address Attribute

This attribute is applicable for the RADIUS Server event.

For Active Directory, when the **Framed IPv4 Address** is blank, the Advanced Authentication RADIUS server returns value of the `msRADIUSFramedIPAddress` attribute as `Framed-IP-Address` after you log in with the RADIUS event. When you specify any other attribute in **Framed IPv4 Address attribute**, then the value of the specified attribute is returned as the `Framed-IP-Address` instead

of the `msRADIUSFramedIPAddress` attribute value. You can configure the `Framed-IP-Address` in **Active Directory Users and Computers** > **Dial-in** > **Assign Static IP Addresses** and click **Static IP Addresses**. It supports only IPv4.

For the other repositories, when the **Framed IPv4 Address** is blank, the Advanced Authentication RADIUS server returns value of the `radiusFramedIPAddress` attribute as `Framed-IP-Address` after you log in with the RADIUS event. When you specify any other attribute in **Framed IPv4 Address attribute**, then the value of the specified attribute is returned as the `Framed-IP-Address` instead of the `radiusFramedIPAddress` attribute value.

Used Attributes

The following table describes the attributes that the appliance uses in the supported directories.

Attribute Name	LDAP Name	Description	Type	Supported in Active Directory	Supported in LDS	Supported in eDirectory
CN (Common Name)	`CN`	An identifier of an object	String	✓	✓	✓
Mobile	`Mobile`	A phone number of an object's cellular or mobile phone	Phone number	✓	✓	✓
Email Address	`mail`	An email address of a user	Email address	✓	✓	✓
User-Principal-Name (UPN)	`userPrincipalName`	An Internet based format login name for a user	String	✓	✓	✓
SAM-Account-Name	`sAMAccountName`	The login name used to support clients and servers running earlier versions of operating systems such as Windows NT 4.0	String	✓	×	×
GUID	`GUID`	An assured unique value for any object	Octet String	×	×	✓
Object Class	`Object Class`	An unordered list of object classes	String	✓	✓	✓
Member	`Member`	A list that indicates the objects associated with a group or list	String	✓	✓	✓
User-Account-Control	`userAccountControl`	Flags that control the behavior of a user account	Enumeration	✓	×	×

Attribute Name	LDAP Name	Description	Type	Supported in Active Directory	Supported in LDS	Supported in eDirectory
ms-DS-User-Account-Control-Computed	`msDS-User-Account-Control-Computed`	Flags that are similar to `userAccountControl`, but the attribute's value can contain additional bits that are not persisted	Enumeration	✓	✓	×
Primary-Group-ID	`primaryGroupID`	A relative identifier (RID) for the primary group of a user	Enumeration	✓	×	×
Object-Guid	`objectGUID`	A unique identifier for an object	Octet String	✓	✓	×
object-Sid	`objectSid`	A Binary value that specifies the security identifier (SID) of the user	Octet String	✓	✓	×
Logon-Hours	`logonHours`	Hours that the user is allowed to logon to the domain	Octet String	✓	×	×
USN-Changed	`uSNChanged`	An update sequence number (USN) assigned by the local directory for the latest change including creation	Interval	✓	✓	×

NOTE: The `sAMAccountName` and `userPrincipalName` attributes are supported only for AD DS repository. The Active Directory LDS and eDirectory repositories do not support the attributes.

LDAP Queries for Repository Sync

Active Directory DS and AD LDS Queries

1. Search users

```
(&(usnChanged>=217368)(&(objectClass=user)(|(cn=*)(sAMAccountName=*)(userPrincipalName=*))))
```

Requested attributes:

```
['objectSID', 'sAMAccountName', 'objectClass', 'logonHours',
'primaryGroupId', 'otherMobile', 'mobile', 'userAccountControl', 'cn',
'usnChanged', 'userPrincipalName', 'msDS-User-Account-Control-Computed',
'objectGUID', 'mail', 'otherMailbox', 'GUID']
```

2. Search groups

```
(&(usnChanged>=217368)(&(objectClass=group)(|(cn=*)(sAMAccountName=*))))
```

Requested attributes:

```
['objectSID', 'sAMAccountName', 'objectClass', 'logonHours',
'primaryGroupId', 'userAccountControl', 'cn', 'usnChanged', 'msDS-User-
Account-Control-Computed', 'objectGUID', 'GUID']
```

eDirectory Queries

The queries are the same as for Active Directory DS and Active Directory LDS, except for 'usnChanged' (this filter is not used).

1. Search users

```
(&(objectClass=user)(|(cn=*)(sAMAccountName=*)(userPrincipalName=*)))
```

Requested attributes:

```
['objectSID', 'sAMAccountName', 'objectClass', 'logonHours',
'primaryGroupId', 'otherMobile', 'mobile', 'userAccountControl', 'cn',
'userPrincipalName', 'msDS-User-Account-Control-Computed', 'objectGUID',
'mail', 'otherMailbox', 'GUID']
```

2. Search groups

```
(&(objectClass=group)(|(cn=*)(sAMAccountName=*)))
```

Requested attributes:

```
['objectSID', 'sAMAccountName', 'objectClass', 'logonHours',
'primaryGroupId', 'userAccountControl', 'cn', 'msDS-User-Account-Control-
Computed', 'objectGUID', 'GUID']
```

LDAP Queries During Logon

For Active Directory LDS queries, the attributes are same as Active Directory DS except for the `objectSid` (the filter is not used in queries on membership in groups).

In the examples below, the username is pjones, base_dn is DC=company,DC=com

Active Directory DS and Active Directory LDS queries

1. Basic user information

```
(&(objectClass=user)(|(cn=pjones)(sAMAccountName=pjones)(userPrincipalName
=pjones)))
```

Requested attributes:

```
(&(objectClass=user)(objectGUID=\0f\d1\14\49\bc\cc\04\44\b7\bf\19\06\15\c6
\82\55))
```

Requested attributes:

```
['otherMobile', 'GUID', 'userAccountControl', 'msDS-User-Account-Control-
Computed', 'mobile', 'primaryGroupId', 'cn', 'objectGUID',
'userPrincipalName', 'objectSID', 'mail', 'sAMAccountName', 'objectClass',
'logonHours', 'otherMailbox']
```

2. Group membership information for user

Active Directory specific query using objectSid filter:

```
(|(member=CN=pjones,CN=Users,DC=company,DC=com)(objectSid=S-1-5-21-
3303523795-413055529-2892985274-513))
```

Requested attributes:

```
['GUID', 'userAccountControl', 'msDS-User-Account-Control-Computed',
'primaryGroupId', 'objectGUID', 'cn', 'objectSID', 'objectClass',
'sAMAccountName', 'logonHours']
```

3. Iteratively query about each group received from above query

```
(member=CN=Performance Monitor Users,CN=Builtin,DC=company,DC=com)
```

Requested attributes:

```
['GUID', 'userAccountControl', 'msDS-User-Account-Control-Computed',
'primaryGroupId', 'objectGUID', 'cn', 'objectSID', 'objectClass',
'sAMAccountName', 'logonHours']
```

eDirectory Queries

Basic user information

```
(&(objectClass=user)(|(cn=pjones)(sAMAccountName=pjones)(userPrincipalName
=pjones)))
```

Requested attributes:

```
['otherMobile', 'GUID', 'userAccountControl', 'msDS-User-Account-Control-
Computed', 'mobile', 'primaryGroupId', 'cn', 'objectGUID',
'userPrincipalName', 'objectSID', 'mail', 'sAMAccountName', 'objectClass',
'logonHours', 'otherMailbox']
```

```
(&(objectClass=user)(GUID=\57\b6\c2\c1\b9\7f\4b\40\b9\70\5f\9a\1d\76\6c\d2
))
```

Requested attributes:

```
['otherMobile', 'GUID', 'userAccountControl', 'msDS-User-Account-Control-
Computed', 'mobile', 'primaryGroupId', 'cn', 'objectGUID',
'userPrincipalName', 'objectSID', 'mail', 'sAMAccountName', 'objectClass',
'logonHours', 'otherMailbox']
```

Group membership information for user

```
(member=cn=pjones,o=AAF)
```

Requested attributes:

```
['GUID', 'userAccountControl', 'msDS-User-Account-Control-Computed',
'primaryGroupId', 'objectGUID', 'cn', 'objectSID', 'objectClass',
'sAMAccountName', 'logonHours']
```

Search groups

```
(&(objectClass=group)(GUID=<group_GUID>))
```

Requested attributes:

```
['cn', 'objectClass', 'GUID', 'loginDisabled', 'loginExpirationTime',
'lockedByIntruder', 'radiusFramedIPAddress']
```

Adding an SQL Database

You can add an MSSQL database to be consumed as a repository by Advanced Authentication. The following version of SQL servers are supported:

- Microsoft SQL Server 2016
- PostgreSQL 11
- MySQL 5.5

To add an SQL database, perform the following steps:

1. Click **Repositories > Add SQL repo**.
2. Specify the following details of the SQL database:
   - **Name**: Name of the repository.
   - **Database type**: Select one of the following options:
     - **MSSQL** (Select the option for Microsoft SQL Server)
     - **MYSQL**
     - **POSTGRESQL**
   - **DB host**: IP address of the database host.
   - **DB name:** Name of the database.
   - **DB user**: Name of the database user.
   - **Password**: Password of the database.
   - **Table or view name**: Name of the table or view in the database.
   - **User's id column** and **User's id type**: User's id column and id type in the database.
   - **User's name column** and **User's name type**: The username column and the type in which the name is specified.
   - **User's phone column**, and **User's email column**: The phone and email column in the database.

IMPORTANT

- The LDAP Password method is not applicable for the users in SQL repository. The Password method for the users is not enrolled automatically and can be enrolled manually by the Helpdesk administrator only.
- You must disable the **Ask credentials of management user** in the Helpdesk Options policy for the SQL repository. This enables the helpdesk administrator to set an authenticator for a user, without getting authenticated with the user's password on the **User to Manage** page of the Helpdesk portal.
- The SQL repository supports auto enrollment of Email OTP, SMS OTP, and Voice OTP methods. If you use only these methods, you can create a chain with one or some of these methods. You do not need the Helpdesk administrator's assistance for the enrollment of these methods. It is not recommended to use a single factor chain with only one of these methods as it is not secure.

Adding an External Repository

You can add an external repository that will act as a Repo Agent. This agent will act as an intermediate between the LDAP repository and Advanced Authentication. This agent will take care of all the synchronizations of the repositories even when the Advanced Authentication is hosted on cloud.

To add a Repo Agent, perform the following steps:

1. Click **Repositories > Add External repo**.
2. Specify the following details of the external repository:
   - **Name**: Name of the repository.

     NOTE: Name of the repository must be the same as what is defined in the Repo Agent. The name of the repository must not contain spaces.

   - **Username**: Name of the user using the repository.
   - **Password**: Password of the repository.

     NOTE: The **Username** and **Password** are defined in the `secret.json` file of the Repo Agent. For information about the `secret.json` file, see Setting Up the Config Folder of Repo Agent.

3. Add external server configurations:
   - **3a** Click **Add Server.**
   - **3b** Specify the IP address of the Repo Agent in **Address**.
   - **3c** Specify the port number of the server in **Port**. For example, 9443.
   - **3d** Click the save icon next to the server credentials.
4. Click **Choose File** to upload the CA certificate for the agent.

   For more information about uploading the CA certificates, see "Setting Up the Repo Agent for Certificates and Services" in the *Advanced Authentication - Repo Agent* guide.
5. Click **Save**.

Local Repository

The Local repository contains the Advanced Authentication server data. You can manage users and set roles for users in the local repository.

To edit a local repository, perform the following steps:

1. Click **Edit** in the **LOCAL** section of **Repositories**.
2. In the **Global Roles** tab, you can manage the Helpdesk administrators as **ENROLL ADMINS,** Advanced Authentication administrators as **FULL ADMINS**, and an additional privilege to share the authenticators to the Helpdesk administrators as **SHAREAUTH ADMINS**.

By default, there are no ENROLL ADMINS and the account LOCAL\ADMIN is specified as FULL ADMIN. You can change this by adding the user names from local or the repositories in **Members**.

NOTE: By default the helpdesk administrator cannot share the authenticators. Only when the helpdesk administrator is added in **Members** in the **SHAREAUTH ADMINS**, the helpdesk administrator will be able to share the authenticators. However, the **Enable sharing of authenticators in** "Authenticator Management Options Policy" policy must be enabled to share authenticators.

---

3 Click **Save**.

4 In the **Users** tab, you can manage the local users.

To add the new local account, click **Add** and specify the required information of the user.

5 In the **Settings** tab, you can edit the name of the Local repository.

Configuring Methods

A method is a way of authenticating the identity of an individual who attempts to access an endpoint. Advanced Authentication provides several such methods.

To configure an authentication method for Advanced Authentication, perform the following steps:

1 Click **Methods**.

2 Click the **Edit** icon next to the authentication method.

3 Make the required changes.

4 Click **Save**.

Customizing Method Names

You can translate the method name to a preferred language in the **Custom names** section. The translated method name will appear in the following portals, clients, and events:

- Portals: Administration, Helpdesk, Self-Service, and Reporting
- Clients: Windows, Linux PAM, and Mac OS X
- Events: OSP, RADIUS, and custom events.

To customize and translate the method name to a specific language, perform the following steps:

1 Open the method for which you want to localize the method name.

2 Specify the method name in a specific language field in the **Custom names** section.

3 Click **Save**.

Tenancy Settings

A top administrator can enforce the configurations of a method on secondary tenants. After configuring a method, you can lock the settings for that specific tenant. The tenant cannot edit the locked settings in the tenant administrator console.

To enforce the configurations for a specific tenant, perform the following steps:

1. Click the Edit icon next to the authentication method for which you want to enforce the configurations.
2. In **Tenancy settings**, click **+**.
3. Move the tenant to whom you want to enforce the configurations from **Available** to **Used** list in the **Force the configuration for the tenants** section.
4. After you add a tenant, the **Hide forced settings** option is displayed. You can turn this option to **ON** if you want to hide the settings that you have enforced on the tenant.
5. Click **Save**.

After configuring the authentication methods, you must create an authentication chain and map the configured methods to the chain. You can also create a chain with a single method. For example, you can create different authentication chains for an organization that has two departments, IT and Finance. For the IT department, you can create a chain with **Password** and **Smartphone** methods. For the Finance department, a chain with only the **Fingerprint** method can be created. For more information about creating chains, see "Creating a Chain".

The methods do not appear in the Self-Service portal until you include them in a chain, and link that chain to an event.

You can configure the following methods in Advanced Authentication:

- BankID
- Bluetooth
- Card
- Email OTP
- Emergency Password
- Facial Recognition
- FIDO 2.0
- Fingerprint
- LDAP Password
- OATH OTP
- Password
- PKI
- RADIUS Client
- Security Questions
- Smartphone
- SMS OTP
- Swisscom Mobile ID
- FIDO U2F
- Voice
- Voice OTP

- Web Authentication Method
- Windows Hello

BankID

Advanced Authentication provides the BankID method that facilitates users to authenticate with their personal identification number. Advanced Authentication supports both the desktop and the mobile versions of BankID. In this method, the user must configure the BankID app with the personal identification number, activation, and security code. The security code is mapped with the personal identification number.

NOTE: The user must ensure to set the security code with six digits in non-sequential format (for example: 221144) in the BankID app.

While enrolling the user, the specified identification number is saved as a template in the Advanced Authentication database. This method allows the users to get authenticated by specifying their secret code configured on the BankID app.

When a user wants to authenticate on an endpoint such as a laptop or a website with the BankID method. In this scenario, the authentication flow is as follows:

1. When the authentication request is initiated, the endpoint contacts the Advanced Authentication server.
2. The Advanced Authentication server validates the user's credentials.
3. After validating the credentials, the Advanced Authentication server sends a request to the BankID app.
4. User opens the BankID app, specifies the **Security Code**.
   - Click **Identify** on the Mobile app.
   - Click **Verify my identity** on the Desktop app.
5. The Security code is sent to the BankID server to validate.
6. The BankID server validates the authentication and the endpoint gets authenticated.

To configure the BankID method, perform the following steps:

NOTE: Ensure that you have the BankID client SSL certificate as a pre-requisite.

---

1. Click **Browse** then select the client SSL certificate from the local drive.

   The certificate must be in PKCS12 format.
2. Specify **Private key password**.
3. Set **Enable Test Mode** to **ON**, to allow the user to test the authenticator with valid test BankID.

   If you set this option to **OFF**, users must use valid production BankID to enroll the authenticator.
4. Click **Save**.

Bluetooth

In the **Bluetooth** method, you can enroll your smartphone or a mobile device. For example, Bob wants to be authenticated through the Bluetooth method. He enrolls the Bluetooth method on the Advanced Authentication Self-Service portal. He can get authenticated with the Bluetooth method only when his smartphone is in the range.

By default, the **Enable reaction on device removal** option is enabled. When this option is enabled and a user tries to logs in to Windows using Bluetooth, Windows gets locked automatically in the following scenario:

- When the Bluetooth device is disabled
- When the Bluetooth device is out of range

NOTE: It is recommended to combine the Bluetooth method with another authentication method in a chain to enhance the security.

Card

The **Card** authentication happens when a user places a contactless card on a card reader.

Advanced Authentication supports the Microsoft policy Interactive logon: Smart card removal behavior that allows you to specify an action on the card event. You can configure the policy to perform a force log off or lock a user session when a user places a card on the reader. Only Microsoft Windows supports this policy.

By default, the **Enable Tap&Go** option is disabled. When this option is disabled, a card must be placed on the reader when a user logs in. When the user removes the card from the reader, the Windows Client runs an action that is specified in the Interactive logon: Smart card removal behavior policy. When you set this option to **ON**, users can tap a card to perform the following actions (depending on the Interactive logon: Smart card removal behavior policy) without keeping their cards on the reader:

- To log in
- To lock a session
- To log off

NOTE: The policy is supported for Microsoft Windows only and it is not supported for the PKI authenticators.

When you enable Single-sign on (SSO) for Remote Desktop, the Interactive logon: Smart card removal behavior policy (https://docs.microsoft.com/en-us/windows/security/threat-protection/security-policy-settings/interactive-logon-smart-card-removal-behavior) is ignored. You must disable SSO to make it working.

Email OTP

In the **Email OTP** authentication method, the server sends an email with a one-time password (OTP) to the user's e-mail address. The user must specify the OTP on the device where the user needs to get authenticated. It is a best practice to use the Email OTP authentication method with other methods such as **Password** or **LDAP Password** to achieve multi-factor authentication and to prohibit malicious users from sending SPAM mails to a user's email box with authentication requests.

To configure the Email OTP method, specify the following details:

Parameter	Description
OTP period	Lifetime of an OTP token in seconds. The default OTP period is 120 seconds. Maximum value for the OTP period is 86400 seconds.
OTP format	Length of an OTP token. The default value is 6 digits.
Subject	Subject of the mail.
Format	Format of an email message. The default format is **Plain Text**. The **HTML** format allows to use embedded images. You can specify an **HTML** format of the message in **HTML**.
Body	For the **Plain Text** format, you can specify the following variables: ◆ {user}: Username. ◆ {endpoint}: Device that a user authenticates to. ◆ {event}: Name of the event where the user is trying to authenticate to. ◆ {otp}: One-Time-Password to be sent to the user.
Allow to override email address	Option that allows to prevent users from providing an email address that is not registered in the LDAP repository. The option is set to **ON** by default. Set to **OFF** to prevent users to specify a different email address during the enrollment.
Allow user enrollment without e-mail	Option to configure settings for the user to enroll the Email OTP authenticator without an email in the repository. Set this option to **OFF** to ensure that a user does not enroll the Email OTP authenticator without an email. The user gets an error message that you can specify in **Error message**. Set this option to **ON** to allow the user to enroll the Email OTP authenticator without an email.

Emergency Password

The **Emergency Password** method facilitates the use of a temporary password for users if they lose a smartcard or forget their smartphone. Only a helpdesk administrator can enroll the Emergency Password method for users.

WARNING: An administrator can misuse this method by trying to access other user's account. Full administrator must be vigilant to select the right helpdesk administrators.

To configure the Emergency Password method, specify the following details:

Parameter	Description
Minimum password length	The length of the password must be at least five characters long.
Password age (days)	The validity period of a password. The default value is 3 days.
Max logins	The maximum number of login attempts that a user can perform before the password gets expired. The default value is 10.
Complexity requirements	Set to **ON** to enforce users creating a complex password. Password must meet the following requirements: ◆ Contains at least one uppercase character ◆ Contains at least one lowercase character ◆ Contains at least one digit ◆ Contains at least one special character
Allow change options during enrollment	When set to **ON**, this option allows a helpdesk administrator to set **Start date**, **End date**, and **Maximum logons** manually in the Helpdesk portal. This manual configuration overrides the settings in the **Emergency Password** method.

Facial Recognition

Advanced Authentication provides advanced biometric authentication with the Facial Recognition method. This method allows users to get automatically authenticated by presenting their face. The image of the face is captured by an integrated or external camera and recorded by the Microsoft API server, when the user enrolls the method. When the user tries to authenticate on an application, the recorded image is compared with the actual image. If the images match, the user is authenticated.

IMPORTANT: It is recommended to combine the Facial recognition method with another method in a chain to enhance security.

You can configure the following settings for the Facial recognition method:

- "Generating Access Key and Endpoint URL" on page 69
- "Configuring Facial Recognition Method" on page 69

WARNING: To use the Facial recognition method for OAuth 2.0 and SAML 2.0 integrations, you must have the Advanced Authentication Device Service installed.

Generating Access Key and Endpoint URL

Before you configure the Facial Recognition method, you must generate the **Access Key** and **Endpoint URL** from the Microsoft Cognitive Services (https://azure.microsoft.com/en-in/services/cognitive-services/).

To generate the Access Key and Endpoint URL, perform the following steps:

1. Click **Get API** against **Face API**.
2. Agree to the license agreement.
3. Login with the preferred credentials.
4. Capture the **Access Key** and **Endpoint URL** for the Face API.

   While generating the access key for the Face API, two keys are displayed. You can use anyone of the two keys.

Configuring Facial Recognition Method

To configure the Facial Recognition method, perform the following steps:

1. Click **Methods > Facial Recognition**.
2. Specify the **Access Key** that you have generated in the Microsoft Cognitive Services. This key is used while authenticating the user.

   For information about how to generate the Access Key in the Microsoft Cognitive Services, see "Generating Access Key and Endpoint URL".
3. Specify the **Endpoint URL**. This URL is location based.

NOTE

- For a better quality of recognition, you must use cameras with a high definition of 720p and above.
- During enrollment, the captured images are placed on Microsoft servers and Microsoft Cognitive Services returns only the Face ID to Advanced Authentication. The Advanced Authentication stores this Face ID as enrolled authenticator. Therefore, when you change to another Access Key, the related enrollments are lost.
- This method is not supported for cache of Windows Client, Mac OS X Client, and Linux PAM Client.

FIDO 2.0

The FIDO 2.0 method facilitates users to use the devices that comply with FIDO standards for authenticating to any web-based environment. The devices can be built-into the platform or external devices connected through USB. The FIDO 2.0 method uses the Web Authentication (WebAuthn) API, and Client to Authenticator Protocol (CTAP). The WebAuthn enables strong authentication with public key cryptography and allows password-less authentication.

NOTE: Advanced Authentication FIDO 2.0 method supports the following:

- Firefox and Google Chrome browsers with the U2F device
- Microsoft Edge browser with Windows Hello authentication

While you use Google Chrome browser, it is required to set a valid domain name for your Advanced Authentication server rather than an IP address.

If users have enrolled the FIDO 2.0 method using the Windows Hello in Microsoft Edge 17 or earlier supported browser versions then they must authenticate using the same browser. After upgrading to the latest version of Edge that supports the FIDO 2.0 standards, users must re-enroll the FIDO 2.0 method.

For more information about the WebAuthn and FIDO 2.0 authenticators, see these articles: Web Authentication (https://w3c.github.io/webauthn/), Web API for FIDO 2.0 (https://www.w3.org/Submission/2015/SUBM-fido-web-api-20151120/), and Microsoft Web authentication (https://docs.microsoft.com/en-us/microsoft-edge/dev-guide/device/web-authentication).

An Example of Authenticating with the FIDO 2.0 Method

Thomas, an end user, has enrolled the FIDO 2.0 method in the Advanced Authentication Self-Service portal by using the FIDO compliant U2F token. He wants to authenticate to the `mycompany.com` website. When he opens the browser and follows the prompts to access the website. Then, he is required to touch the token when there is a flash. Thomas is validated with the device and gets authenticated to `mycompany.com`.

Fingerprint

The **Fingerprint** method is one of the strongest biometric authentication methods of Advanced Authentication. Users can authenticate with methods such as **Password** (something they know) and **Fingerprint** (something they are) for multi-factor authentication. Users need to place their finger on a fingerprint scanner to enroll and authenticate.

To configure the Fingerprint method, perform the following steps:

1. Set the **Similarity score threshold** by moving the slider to the desired score.

   NOTE: Default and recommended value for **Similarity score threshold** is 50. Reducing the score may result in different fingerprints getting validated.

2. Select the number of fingers that a user must enroll.

   It is recommended to specify a number that is more than 1 because if a finger is injured, the user can use the other enrolled finger.

   NOTE: If you want to allow the use of multi-finger reader for enrollment, ensure to select the number of fingers to be enrolled as 4, 6, 8, or 10.

3. Select the number of scans required for enrollee's each finger.

   NOTE: To improve the quality of the fingerprint enrollment, it is recommended to have multiple captures. The total number of captures including all the enrolled fingers must not exceed 25.

4 Set **Enable multi-finger reader to enroll** to **ON**, to allow users to enroll the Fingerprint method using the Green Bit DactyScan84c multi-finger reader. Users can set **Use multi-finger reader for enrollment** to **ON** and enroll with the multi-finger reader on the Self-Service portal. The Green Bit DactyScan84c device can scan one of the following fingers combination at a time:

- Four fingers of the right hand
- Four fingers of the left hand
- Two thumbs

To enforce the users to scan fingers using the Green Bit DactyScan84c reader, set **Force to use multi-finger reader** to **ON**.

5 Set **Specify fingers during enrollment** to **ON**, if you want to enforce selected fingers for a user to enroll.

6 Select the preferred fingers to enroll from the **Selected fingers** list.

7 Set **Enable Duress finger configuration** to **ON**, to allow users to assign one of the enrolled fingers as duress. In case of emergency or under a threat, user can authenticate with the duress finger. Authentication with the duress finger triggers an alert notification to the configured email address and phone number.

In the **Alert Configuration** section, specify the following details to configure the alert notification that is to be sent to the preferred email address and phone number:

Table 5-1

Parameter	Description
Email Alert Settings	
Email Recipient	The email address of recipient to whom you want to send the email alert.
Email Alert Subject	Subject of the email alert.
Format	Format of email alert. **Plain Text** is the default format. Other available option is **HTML**. If you select **HTML** format, specify the message in **HTML**.
Email Alert Body	Body of email alert. You can specify the following variables: ◆ {user}: Username. ◆ {endpoint}: Device that a user authenticates to. ◆ {event}: Name of the event where the user is trying to authenticate to.
SMS Alert Settings	
SMS Recipient	Phone number of recipient to whom you want to send the SMS alert.
SMS Alert Body	Text in the SMS that is sent to the recipient. You can specify the following variables: ◆ {user}: Username. ◆ {endpoint}: Device that a user authenticates to. ◆ {event}: Name of the event where the user is trying to authenticate to.

8 Click **Save.**

NOTE: Ensure that you configure the Mail Sender and SMS Sender policies with the sender details that are required to send an alert.

Example 1: Enrolling Multiple Fingers and Authenticating with One of the Enrolled Fingers

Consider Thomas, an administrator has performed the following steps to enforce users to enroll the Fingerprint method using the Greenbit DactyScan84c device. Users can authenticate to Linux workstation with the Fingerprint method.

1. Set **Force to use multi-finger reader** to **ON** in the Fingerprint method.
2. Created a chain with the Fingerprint method and added another preferred method such as LDAP password or Password.
3. Mapped the chain to the **Linux Logon** event.

Paul, an end user, logs in to the Self Service portal and clicks on the Fingerprint icon. He selects the four fingers of Right hand and enrolls using the Green Bit DactyScan device. After enrollment, Paul authenticates to his Linux workstation with the Nitgen device using one of the enrolled fingers. He gets authenticated successfully.

Example 2: Authenticating with a Duress Finger During an Emergency Situation

Consider Thomas, an administrator has performed the following steps to assign an enrolled finger as duress:

1. Set **Enable Duress finger configuration** to **ON** in the Fingerprint method.
2. Configured **Alert Configuration** with the alert notification text, mail address and phone number of a network security officer to send email and SMS.
3. Created a chain with the Fingerprint method along with preferred methods such as **LDAP password** and **Password**. Assigned the chain to **Networks** group.
4. Mapped the chain to the **Linux logon** event. Mail server is hosted on the Linux workstation.

Paul, a network staff, logs in to the Self Service portal and clicks on the Fingerprint icon. He enrolls the middle, index, ring and little fingers of the left hand. Later, he selects **Left index** from **Assign Duress Finger** drop down.

Assume, on an unfortunate day, a miscreant forcibly enters the organization and threatens Paul to authenticate to the Linux workstation. In this situation, Paul can use the duress finger (Left index finger) for authentication which triggers an alert notification to configured security personnel, who will take the necessary action.

LDAP Password

In the **LDAP Password** method, the Advanced Authentication client retrieves password that is stored in the user repository from the Advanced Authentication server.

To configure LDAP Password method, perform the following steps:

1 Set **Save LDAP password** to **ON**, the prompt for LDAP password synchronization is displayed only for the first time until the password is changed or reset.

NOTE: You can bypass the password synchronization dialog after the password change or reset by configuring the Password Filter. For configuring the Password Filter, see "Password Filter for Active Directory".

If you set this option to **OFF**:

- If the LDAP Password method is included in a chain, users will be prompted for synchronization each time.
- If the LDAP Password method is not included in a chain, users will not be prompted for synchronization.

2 Set **Enable SSPR integration** to **ON** if you want to enable the Self Service Password Reset integration for Advanced Authentication web portals.

- Specify the **SSPR link text**. This link is displayed on the login page where user specifies the LDAP Password.
- Specify the **SSPR URL**. This URL points to the Self Service Password Reset portal.

3 Set **Enable cached logon** to **ON** to validate user specified password with password stored (cached) in the Advanced Authentication server during authentication.

When the **Enable cached logon** option is set to **OFF** (default behavior), the Advanced Authentication server always contacts the LDAP server to validate the user password. It may cause performance issues.

If the user password does not match with the stored password or password is not stored on the Advanced Authentication server, then cached value gets reset and Advanced Authentication server contacts the LDAP server to validate the user password.

If the user specified password matches the cached password, the Advanced Authentication server validates user password with LDAP server in the background. If the validation failed, the password stored on Advanced Authentication Server gets reset, so next login will be without cache.

NOTE: The **Enable cached logon** option works only if any one of the following setting is set to **ON**:

- **Save LDAP password** in the **LDAP Password** method.
- **Enable local caching** in the **Cache Options** policy.

4 Click **Save**.

LDAP password is stored on the Advanced Authentication server at the following two places:

1. User data: It is used for OS logon (Windows Client, Mac OS X Client, and Linux PAM Client) and is stored when **Save LDAP password** option in **LDAP Password** method is set to **ON**.
2. LDAP password authenticator: It is used while using cached logon. The password is stored when the **Enable local caching** option is set to **ON** in the Cache Options Policy.

OATH OTP

OATH (Initiative for Open Authentication) is an industry-wide collaboration to develop an open reference architecture using open standards to promote the adoption of strong authentication using OTP.

Advanced Authentication supports the following two different types of OATH OTP:

- HOTP
- TOTP

You can configure the following settings for the OATH methods:

- Importing PSKC or CSV Files
- CSV File Format To Import OATH Compliant Tokens

HOTP

HOTP is a counter based one time password. To configure the HOTP authenticator, you can specify the following parameters:

- **OTP format**: The number of digits in the OTP token. The default value is 6 digits. The value must be the same as of the tokens you are using.
- **OTP window**: The size of OTP window defines number of valid OTP for authentication. When the counters are out of sync, this parameter determines the difference between the counter on the token and the server. Based on the difference, the server can recalculate the next OTP value to validate with the OTP received from the token. The server stores the last counter value (C) for which the user has provided a valid password. While verifying a new OTP from the token, the server validates C+1, C+2... until one of the OTP is identical, or till C+w, where w represents the OTP window.

  You can use the HOTP token such as Yubikey token to access not only Advanced Authentication, but also some websites or third-party services. After each use or when users press the token button accidentally, the HOTP counter on the token is increased by 1. Therefore, the counter will be out of sync between the token and Advanced Authentication server.

  For example, if the OTP window is set to 10 (by default), and the current counter value of the server is 100, then any OTP generated from the token with a counter value from 100 to 110 are valid for authentication.

  WARNING: Do not increase the HOTP window value to more than 100 as it may decrease the security by causing false matches.

During enrollment or HOTP counter synchronization in the Self-Service portal, **Enrollment HOTP window** that has a value of 100,000 is used. This is helps in the following:

- HOTP tokens may be used for a long period before the enrollment in Advanced Authentication and the value is unknown and can be equal to some thousands.
- Secure because users must provide 3 consequent HOTPs.

Configuring Yubikey for Advanced Authentication Server

1. Download and install the Yubikey Personalization Tool from Yubico.

To download the Yubikey Personalization Tool, see the Yubico website (https://www.yubico.com/products/services-software/download/yubikey-personalization-tools/).

2 Insert the Yubikey token.

   Ensure that the token is recognized. The recognition is indicated by a message `Yubikey is inserted` at the top-right corner of the Personalization tool.

3 Select **OATH-HOTP mode**.

4 Select **Configuration Slot 1**, generate the **OATH Token Identifier** and **Secret Key**.

5 In **Logging Settings**, select **Log configuration output**.

6 Select **Traditional format** or **Yubico format**.

7 Click **Write Configuration** and save the CSV file.

For information about how to enroll the HOTP method, see "HOTP "in the *Advanced Authentication-User* guide.

TOTP

TOTP is a time based one time password. To configure the TOTP authenticator, you can specify the following parameters:

- **OTP period (sec)**: The value to specify how often a new OTP is generated. The default value is 30 seconds. The maximum value for the OTP period is 360 seconds.
- **OTP format**: The number of digits in the OTP token. The default value is 6 digits. The value must be the same as the tokens you are using.
- **OTP window**: The value to specify the periods used by Advanced Authentication server for TOTP generation. For example, if you have a period of 30 and a window of 4, then the token is valid for 2*30 seconds before current time and 2*30 seconds after current time, which is ±2 minutes. These configurations are used because time can be out-of-sync between the token and the server and may impact the authentication. The maximum value for the OTP window is 64 periods.

  IMPORTANT: It is not recommended to use an OTP window equal to 32 and higher for 4-digit OTP because it reduces security.

- **Google Authenticator format of QR code (Key URI)**: Option to display the QR code for the TOTP enrollment of the software token in a format that is compatible with the Google Authenticator, Microsoft Authenticator, or the NetIQ Auth apps. When you disable the option, the displayed QR code can be scanned only with the NetIQ Auth smartphone app. Enable the option to allow enrollment with the Google Authenticator or Microsoft Authenticator apps. The QR code of Google Authenticator format can also be scanned with the NetIQ Auth app (supported by the last iOS and Android apps).

  IMPORTANT: OTP format must be set to 6 digits when you use the Google Authenticator format of QR code.

- **Allow manual enrollment**: When you enable the option, the **Specify the TOTP secret manually** section is displayed on the TOTP enrollment page of the Self-Service portal with the following parameters: **Secret**, **Period**, and **Google Authenticator format of secret (Base32)**. By default, the option is disabled and the settings are hidden. Enabling the option may result in security risks.

You must perform the following tasks to allow the users to enroll TOTP method using the Desktop OTP tool:

- Generating an Enrollment Link
- Sending an Enrollment Link Through Email

Generating an Enrollment Link

Users can click the enrollment link to enroll the TOTP authenticator automatically on the Desktop OTP tool and following the further steps as described in Desktop OTP Tool. To generate an enrollment link, you can encode the server URL, tenant ID, and category name to the Base64 format using any online tool. The generated link is then sent to the users through the email to access the Desktop OTP tool and enroll the TOTP authenticator. The users can create an account on the tool to enroll the TOTP authenticator in the Self-Service portal.

To generate the enrollment link in the Base64 format, perform the following steps:

1. To encode use the details such as server URL, tenant ID and category name in the following format:

   ```
   {"server_url":"<domain-name>","tenant_name":"<tenant-name>","category_name": "HOME"}
   ```

   For example, {"server_url": "aafserver.company.com", "tenant_name":"netiq", "category_name": "HOME"}

   You can specify the preferred category name for `category_name` parameter if you have added categories in the Event Categories policy. You can remove the parameter `category_name`, if you have not added any category.

   You can specify TOP for the `tenant_name` parameter, if the Multitenancy mode is disabled.

2. Encode the value including {} to Base64 (charset: UTF-8) format.

   For example, the encoded link is displayed as:

   eyJzZXJ2ZXJfdXJsIjogImFhZnNlcnZlci5jb21wYW55LmNvbSIsICJ0ZW5hbnRfbmFtZSI6Im5ldGlx4oCdLCAiY2F0ZWdvcnlfbmFtZSI6ICJIT01FIn0=

3. Copy the encoded link for further use.

Sending an Enrollment Link Through Email

1. Compose an email with the subject and body.

   For example, specify TOTP Enrollment Link in the Subject and body as follows:

   Hi Users, Click here to enroll for the TOTP authenticator using the Desktop OTP tool.

2. Right click on the preferred text and select **Hyperlink**.
3. Specify the encoded link and prefix `aaf-otp` in **Address**.

   For example, aaf-otp:eyJzZXJ2ZXJfdXJsIjogImFhZnNlcnZlci5jb21wYW55LmNvbSIsICJ0ZW5hbnRfbmFtZSI6Im5ldGlx4oCdLCAiY2F0ZWdvcnlfbmFtZSI6ICJIT01FIn0=

4. Specify the email address of the preferred users in **To** then click **Send**.

   User can click the hyperlink to open the Desktop OTP automatically.

Importing PSKC or CSV Files

You can import the PSKC or CSV files. These token files contain token information. To import these files, perform the following steps:

1. Click the **OATH Token** tab.
2. Click **Add**.
3. Click **Browse** and select a PSKC or CSV file.
4. Choose a **File type**. The options are:
   - **OATH compliant PSKC**: This file type must be compliant with OAuth. For example, HID OATH TOTP compliant tokens.
   - **OATH csv**: This file type must contain the format as described in CSV File Format To Import OATH Compliant Tokens. You cannot use the YubiKey CSV files.
   - **Yubico csv**: In this file type, you must use one of the supported **Log configuration output** (see **YubiKey Personalization Tool > Settings tab > Logging Settings**) formats with comma as a delimiter.
     - Traditional format: In this file type, **OATH Token Identifier** must be enabled.
     - Yubico format: This file type is supported only for **HOTP Length** set to **6 Digits** and **OATH Token Identifier** set to **All numeric**.

     IMPORTANT: **Moving Factor Seed** must not exceed 100000.
5. Add the encrypted PSKC files. For this, select **Password** or **Pre-shared key** in **PSKC file encryption type** and provide the information.You can select **Not encrypted**, if the PSKC file is not encrypted with either the password or key.
6. Click **Upload** to import tokens from the file.

NOTE: Advanced Authentication receives an **OTP format** from the imported tokens file and stores the information in the enrolled authenticator. Therefore, you need not change the default value of **OTP format** on the **Edit Method** tab.

When the tokens are imported, you can see the list and you must assign the tokens to users. This can be done in the following two ways:

- Click **Edit** next to the token and select **Owner** and click **Save**.
- A user can self-enroll a token in the Self-Service portal. Administrator must let the user know an appropriate value from the **Serial** column for the self-enrollment.

NOTE: **Tenancy settings** are not supported for the OATH tokens. Therefore, the configurations in the **OATH Tokens** tab cannot be enforced on tenant administrators.

CSV File Format To Import OATH Compliant Tokens

A CSV file, which is imported as OATH `csv` file in the **Administration portal > Methods** > **OATH OTP** > **OATH Tokens** tab, must contain fields with the following parameters:

- Token's serial number

- Token's seed
- (Optional) Type of the token: TOTP or HOTP (by default HOTP)
- (Optional) OTP length (default value is 6 digits)
- (Optional) Time step (default value is 30 seconds)

Comma is a delimiter.

The following is an example of a CSV file:

```
Token001, 15d2fa517d3c6b791bd4cc2044c241429307001f
Token002, 8c557fc050721037fd31e1d3345b5d3263263e0f, totp, 8
Token003, 658208efea5ac49d5331ba781e66f2c808cccc8e, hotp, 6
Token004, 89f0dfe1c90379da6a11aaca2fc1070f606efe36, totp, 6, 60
```

IMPORTANT: For the YubiKey tokens, you must use the traditional format of the CSV (check **YubiKey Personalization Tool > Settings tab > Logging Settings**) with comma as a delimiter. Use Yubico csv file type (**Advanced Authentication Administration portal > Methods > OATH OTP > OATH Tokens**).

Password

In the **Password** authentication method, you can configure security options for passwords that are stored in the appliance. For example, the l**ocal/admin** user who does not have an LDAP Password can use this option.

NOTE: Do not use the **Password** method in chains that contain only one factor. You must always combine the **Password** method with other factors.

You can configure the following options for the **Password** method:

- **Minimum password length**: The maximum length of the password.
- **Maximum password age**: The validity period of the password. The default value is 42 days. If you set the value to 0, the password never expires.
- **Complexity requirements**: Option to enable users to create a complex and not easily detectable password.Set to **ON** to enable this option. Password must meet the following requirements:
  - Contains at least one uppercase character
  - Contains at least one lowercase character
  - Contains at least one digit
  - Contains at least one special character

IMPORTANT: Advanced Authentication does not generate notifications about the password expiry. After the password expires, the local administrator cannot sign-in to the Administration portal and users using this method cannot get authenticated.

However, an administrator and a user can change their passwords in the Self-Service portal.

PKI

The Public Key Infrastructure (PKI) creates, stores, and distributes digital certificates. These certificates are used to verify whether a particular public key belongs to a specific entity.

Advanced Authentication supports the following two forms of PKI authentication:

- PKI Device
- Virtual Smartcard

PKI Device

PKI device stores the digital certificates and private keys securely. It uses the PKI infrastructure to store personal details of user such as private key, PIN, and digital certificate.

You can configure the following settings for the PKI method:

- "Adding the Trusted Root Certificates" on page 79
- "Disabling the Key-Pair Option" on page 81

Adding the Trusted Root Certificates

You must upload the trusted root certificates for the PKI method. These certificates must meet the following requirements:

- **Root CA** certificate is in the `.pem` format.
- All certificates in the certification path (except Root CA) contain **AIA** and **CDP** http link to check revocation status.
- The certificate for PKI device contains a key pair: public and private key in the x509 format. The certificates that do not comply with the requirements are ignored and hidden during enrollment.

For more information, see Single Tier PKI Hierarchy Deployment and Two Tier PKI Hierarchy Deployment.

To upload a new trusted root certificate, perform the following steps:

1. Click **Add** in the **Edit Method** page of PKI.
2. Click **Browse**.
3. Choose a `.pem` certificate file and click **Upload**.
4. Click **Save**.

NOTE: You must upload only the **Root CA** on appliance.

You can configure the PKI method (with certificates) in one of the following ways:

- Standalone Root CA
- Subordinate CA

NOTE: Advanced Authentication supports the p7b format of parent certificates. These p7b format files can contain certificates and chain certificates, but not the private key. They are Base64 encoded ASCII files with extensions `.p7b` or `.p7c`.

Configuring the Environment for a Standalone Root CA

1. Install **Web Server (IIS) Role**.
2. Create the `CertEnroll` Folder and grant **Share & NTFS** permissions to the **Cert Publishers** group.
3. Create **CertEnroll Virtual Directory** in IIS.
4. Enable **Double Escaping** on IIS Server.
5. Install **Enterprise Root CA** using Server Manager.
6. Enable **Object Access Auditing** on CA.
7. Configure the **AIA** and **CDP**.
8. Publish the Root CA Certificate to AIA.
9. Export **Root CA** in `.der` format and convert the format to `.pem`.
10. Export personal certificate (that was signed by Root CA) with private key and place it on a PKI device.

Configuring the Environment for a Subordinate CA

1. Install **Web Server (IIS) Role**.
2. Create the `CertEnroll Folder` and grant **Share & NTFS** permissions to **Cert Publishers** group.
3. Create **CertEnroll Virtual** Directory in IIS.
4. Enable **Double Escaping** on IIS Server.
5. Install the **Standalone Offline Root CA**.
6. Create a `CAPolicy.inf` for the standalone offline root CA.
7. Installing the **Standalone Offline Root CA**.
8. Enable **Auditing** on the Root CA.
9. Configure the **AIA** and **CDP**.
10. Install Enterprise Issuing CA.
11. Create `CAPolicy.inf` for Enterprise Root CA.
12. Publish the **Root CA Certificate** and **CRL**.
13. Install **Subordinate Issuing CA**.
14. Submit the Request and Issue subordinate **Issuing CA Certificate**.
15. Install the subordinate **Issuing CA Certificate**.
16. Configure **Certificate Revocation** and **CA Certificate Validity Periods.**
17. Enable **Auditing** on the Issuing CA.
18. Configure the **AIA** and **CDP**.
19. Install and configure the **Online Responder Role Service**.
20. Add the **OCSP URL** to the subordinate Issuing CA.

21 Configure and publish the **OCSP Response Signing Certificate** on the subordinate Issuing CA.

22 Configure **Revocation Configuration** on the **Online Responder**.

23 Configure **Group Policy** to provide the OCSP URL for the subordinate Issuing CA.

24 Export **Root CA** in `.der` format and convert the format to `.pem`.

25 Export personal certificate (that was signed by subordinate CA) with private key and place it on a PKI device.

Disabling the Key-Pair Option

The **Allow key-pair** option is enabled by default. This indicates that the enrollment of the PKI method can be done with either the CA certificates or through the key-pair generation. However, you can disable the key-pair based enrollment of the PKI device and enforce PKI enrollment only using a user certificate issued by the CA. To disable this option, set **Allow key-pair** to **OFF**.

Virtual Smartcard

Virtual Smartcard is an extension of PKI method. Advanced Authentication allows users to enroll the PKI method using a virtual smartcard that is imported to the browser on the user's system and used for authentication. Virtual smartcard is a certificate that contains information such as digital signature, expiration date, name of user, name of CA (Certificate Authority), and can be used in client SSL certificate. Typically, the certificate is available in `.pfx` format. The information available in the virtual smartcard is used to authenticate the user to any web environment.

NOTE: The virtual smartcard supports authentication to the OAuth 2.0 and SAML 2.0 events. The virtual smartcard does not support authentication to Advanced Authentication portals, such as Administration, Helpdesk, Self-Service, and Reporting.

To configure the virtual smartcard, perform the following steps:

NOTE: Before you configure the virtual smartcard support for the SAML 2.0 events, ensure to specify the **Identity Provider's URL** in format `https://webauth.domain_name` in the Web Authentication policy. Later, save the settings before downloading the SAML 2.0 metadata file.

NOTE: Before you configure virtual smartcard support for the PKI method, ensure to perform the following tasks:

- Resolve the IP address of Advanced Authentication server with the following host names on the DNS server:
  - `<aaserver_ip_address> <aaserver_hostname>`
  - `<aaserver_ip_address> <webauth.aaserver_hostname>`

- Define the following attributes in the third-party application that you want to integrate with Advanced Authentication server:
  - `authorization_endpoint = https://webauth.aaserver_hostname/osp/a/TOP/auth/oauth2/grant`
  - `token_endpoint = https://webauth.aaserver_hostname/osp/a/TOP/auth/oauth2/getattributes`

---

1. Configure the following settings in the **HTTPS Options** policy:
   - Set **Enable Client SSL for Webauth Service** to **ON** and upload Root CA certificate in the `.pem` format that is used by the Web server.
   - Set **Enable auto enrollment based on certificate** to **ON**. This enables you to allow users to auto-enroll the PKI method using virtual smartcard for the **OAuth 2.0** and **SAML 2.0** events.

     NOTE: The manual enrollment of the PKI method using the virtual smartcard is not supported. Therefore, it is required to set **Enable auto enrollment based on certificate** to **ON** in the **HTTPS Options**. With this configuration, the users can auto-enroll PKI method using virtual smartcard when they access **OAuth 2.0** event for the first time and select a valid certificate. This auto-enrollment happens irrespective of enrollment status of other method(s) that are available with the PKI method in the same authentication chain.

     To allow a user to login to the **OAuth 2.0** and **SAML 2.0** events before auto-enrolling the PKI method, ensure to add at least one more chain to the event (for example, a chain with only the LDAP Password method) below the PKI chain. The user must enroll all method(s) of new chain. During the first login attempt, the PKI method using the virtual smartcard gets enrolled automatically. For the sub-sequent log ins, the top chain in the list (which is PKI) is selected and user is authenticated automatically.
2. Upload Root CA certificate in the **Trusted root certificates** section of **PKI** method.
3. Import the client SSL certificate to the users browser.

   NOTE: The procedure to import the client SSL certificate varies on each browser.

   For more information about how to import the client SSL certificate to the Chrome browser, see Importing Client SSL Certificate to a Certificate Store.

An Example of Auto-enrolling PKI Method with the Virtual Smartcard

Consider the administrator has performed the following steps to allow auto-enrollment of the PKI method using the virtual smartcard:

- Created a chain with the PKI method and another chain with preferred methods such as **LDAP password** and **Password**.
- Mapped the chain to the **OAuth 2** event.
- Configure the following settings in the **HTTPS options** policy:
  - Set **Enable SSL Client Certificate** to **ON** and uploaded a valid CA certificate.
  - Set **Enable Auto Enrollment based on certificate** to **ON**.
- Imported the client certificate to the user's browser in the `.pfx` format containing details, such as digital signature, expiration date, name of user, name of CA and so on.

Mark, an end user, wants to auto-enroll the PKI method using the virtual smartcard. When he tries to access the `somecompany.com` website, the user name stored in the certificate gets filled in the user name field in the login form automatically. Mark is required to select the preferred certificate to validate his identity in the **User Identification Request** dialog box. Then, Mark must specify LDAP details for additional validation. If the specified details are valid, Mark gets auto-enrolled to the PKI method using the virtual smartcard without physical PKI token.

During subsequent logins, Mark may experience one of the following scenario:

- If there is a chain with only PKI method associated to the web authentication event, then Mark gets authenticated automatically.
- If there are more than one chain associated to the web authentication event, then Mark is prompted with the list of chains that contains PKI in addition to other available chains. In this case, he can select the chain with only PKI method to authenticate automatically or select preferred chain and provide corresponding details to authenticate successfully.

Importing Client SSL Certificate to a Certificate Store

To enable and achieve the virtual smartcard authentication to the web environment, it is required to import the Client SSL certificate to the browser.

NOTE: The procedure to import the client SSL certificate varies on each browser.

To import the client SSL certificate to Google Chrome browser, perform the following steps:

1. Navigate to **Settings > Manage Settings**.

   The **Certificates** wizard is displayed.
2. Click **Import** and select the client SSL certificate.

   Ensure that the certificate is in `.pfx` format.
3. Click **Next** and **Finish**.

   A message `Certificate has been imported successfully` is displayed.

RADIUS Client

In the **RADIUS Client** method, Advanced Authentication forwards the authentication request to a third-party RADIUS server. This can be any RADIUS server. For example, you can use RADIUS Client as an authentication method when you have a token solution such as RSA or Vasco. You want to migrate users to Advanced Authentication with the flexibility that users can use the old tokens while the new users can use any of the other supported authentication methods.

You can configure the following options for the **RADIUS Client** method:

- **Send the repository name**: Option for a repository name to be used automatically with a username. For example, company\pjones. Set to **ON** to enable the option.
- **NAS Identifier**: An attribute that contains a string identifying the NAS originating the Access-Request. It is only used in Access-Request packets. Either NAS-IP-Address or NAS-Identifier must be present in an Access-Request packet.
- **Timeout**: Specify the number of seconds till when the RADIUS client waits for the RADIUS server to reply before prompting an error `Connection time out`. The default value is 5 seconds.

- **Retries count**: Specify the number of times, the RADIUS client tries to connect to the RADIUS server. If a connection is not established during the retry attempts, a message `Failed to connect to the server` is displayed. The default value is set to 3. If set to 0, the RADIUS client does not try to connect after the first unsuccessful attempt.
- **Specify servers per site**: Option to configure the third-party RADIUS servers that are specific to a site. When set to **ON**, the sites available in the cluster are populated and you can add more than one servers to the preferred site.

  When this option is set to **OFF**, you can add single third-party RADIUS server details that are applicable for all sites in the cluster by specifying the following details:

  - **Server**: The Hostname or IP address of the third-party RADIUS server.
  - **Secret**: The shared secret between the RADIUS server and Advanced Authentication.
  - **Port**: The port to where the RADIUS authentication request is sent. The default port is 1812.

Security Questions

In **Security Questions** authentication method, an administrator can set up a series of predefined questions. A user must answer these questions to get authenticated. Security Questions are used when users forget their passwords.

Security questions are often easy to guess and can often bypass passwords. Therefore, Security Questions do not prove to be secure.

You must follow few guidelines to use this method. You must use **Good** security questions that meet five criteria. Ensure that the answers to a good security question are:

1. **Safe**: Cannot be guessed or researched.
2. **Stable**: Does not change over time.
3. **Memorable**: Can be remembered.
4. **Simple**: Precise, easy, and consistent.
5. **Many**: Has many possible answers.

Some examples of good, fair, and poor security questions according to goodsecurityquestions.com are as follows. For a full list of examples, see the website (http://goodsecurityquestions.com/.)

GOOD

- What is the first name of the person you first kissed?
- What is the last name of the teacher who gave you your first failing grade?
- What is the name of the place your wedding reception was held?
- In what city or town did you meet your spouse/partner?
- What was the make and model of your first car?

FAIR

- What was the name of your elementary / primary school?
- In what city or town does your nearest sibling live?

- What was the name of your first stuffed animal, doll, or action figure?
- What time of the day were you born? (hh:mm)
- What was your favorite place to visit as a child?

POOR

- What is your pet's name?
- In what year was your father born?
- In what county where you born?
- What is the color of your eyes?
- What is your favorite _____?

Configure the following options for the **Security Questions** method:

- **Minimum answer length**: The minimum number of characters an answer must contain.
- **Correct answers for logon**: The number of answers a user must answer correctly to get access.
- **Total questions for logon**: The number of questions that are presented to the user while authenticating.

For example, if the **Correct answers for logon** is set to 3 and the **Total questions for logon** is set to 5, the user needs to specify only 3 correct answers out of a set of 5 questions.

Adding Questions

You can add questions based on your requirement. These questions can be translated in languages that are supported by the Advanced Authentication portals. For example, you set a security questions as **What is your pet name?**. While enrolling and authenticating, this question will be displayed in the language that the user selects in the portal.

To add questions, perform the following:

1. Click **Add** to add a question in the **Question** window.
2. Specify the question in **Question**.
3. You can specify the question to be translated in the required language.

   This translated question is displayed in the portals and Clients based on the selected language.
4. Click the save icon to save the question related settings.

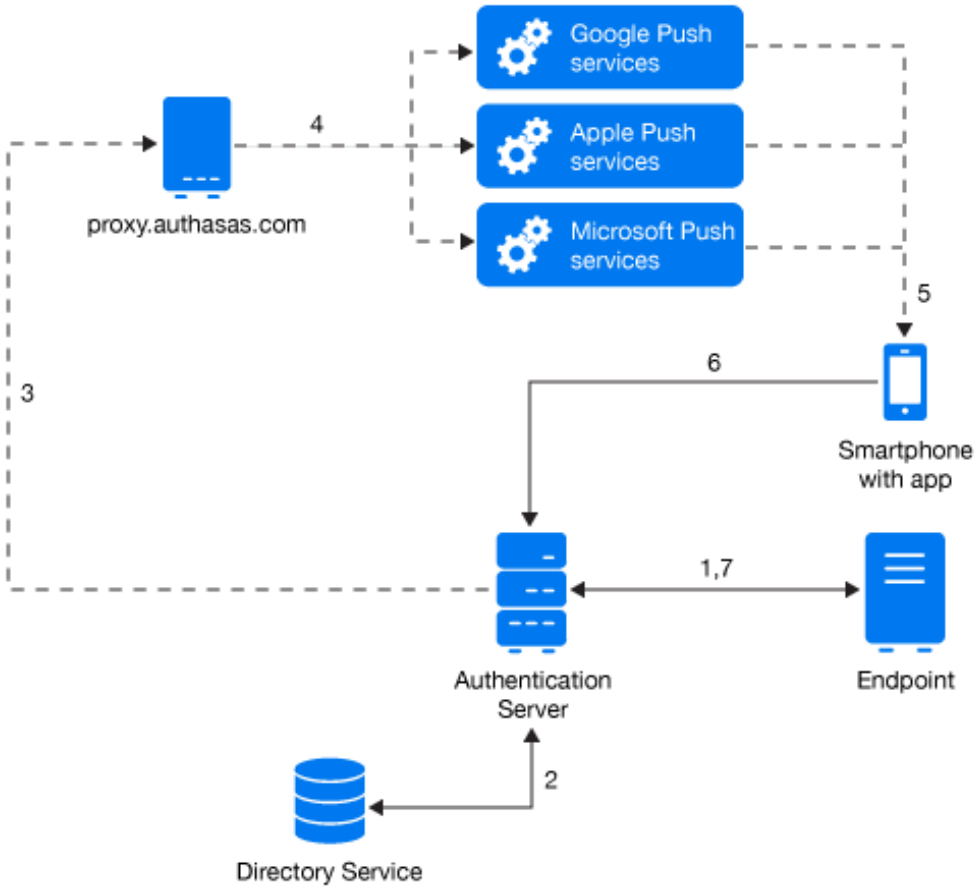
You can add more questions depending on the requirement.

Click **Save** to save the configuration settings for the Security questions method.

Smartphone

Advanced Authentication provides the **Smartphone** method that facilitates users to authenticate through their Smartphone. The authentication happens through the NetIQ smartphone app to perform the out-of-band authentication. The out-of-band authentication is typically a two-factor authentication that requires a secondary verification through a separate communication channel along with the ID and password.

The authentication flow for the Smartphone method in Advanced Authentication is described in the following image.



A user wants to authenticate on an endpoint such as a laptop or a website with the Smartphone method. The following steps describe the authentication flow:

1. When the authentication request is initiated, the endpoint contacts the Advanced Authentication server.
2. The Advanced Authentication server validates the user's credentials.
3. After validating the credentials, the Advanced Authentication server sends a push message to proxy.authasas.com.
4. Depending on the platform of the Smartphone, the server selects an appropriate push service and then forwards the push message to the Smartphone.
5. The push message is then delivered to the user's Smartphone to inform that an authentication request has been initiated.

6 When the user opens the Smartphone app, the app reaches the Advanced Authentication server to validate if there is an authentication needed. The authentication is indicated by the **Accept** and **Reject** options. The user's selection is then sent to the server.

7 Finally, the server validates the authentication and the endpoint gets authenticated.

HTTPS protocol is used for the communication.

This authentication method is recommended to use in combination with another method such as Password or LDAP Password to achieve multi-factor authentication and protect a user from getting SPAM push messages.

Access Configurations

The following are the configurations required for the Smartphone method.

- Advanced Authentication server must be accessible by the specified **Server URL** address from smartphones (HTTPS, outbound).
- Advanced Authentication server must have a permitted outbound connection to proxy.authasas.com (HTTPS).

Scenario for Authenticating with the Smartphone Method

Bob wants to authenticate on the **myexample.com** website. When he logs in to the website, the Smartphone authentication method sends a push message to Bob's mobile phone. When he opens the Smartphone app installed on his phone, he sees **Accept** and **Reject** options. If he selects the **Accept** option, the authentication request is sent over the mobile network (secure) back to the Authentication framework. Without specifying an OTP code, Bob has been authenticated to **myexample.com**.

When your smartphone does not have a network connection, you can use a backup OTP as offline authentication.

Configuring Enrollment Link

Users can enroll the Smartphone method either by a QR code or through a link sent to their email or SMS. You as an administrator must configure the link and send it to all the users whom you want to enroll the authenticator. You can use one of the following links as per the requirement:

```
https://<public_external_url>/smartphone/enroll
```

```
https://<public_external_url>/smartphone/enroll?category=cat1
```

```
https://<public_external_url>/smartphone/enroll?tenant=t1
```

```
https://<public_external_url>/smartphone/enroll?category=cat2&tenant=t1
```

Default category is `default`. Default tenant is T0P.

For more information about how to set the public external URLs, see Public External URLs (Load Balancers).

Configuring Smartphone Method

To configure the Smartphone method, specify the following details:

Parameter	Description
Push salt TTL	The lifetime of an authentication request sent to the smartphone.
Learn timeout	The time that is valid for the user to scan the QR code for enrollment.
Authentication salt TTL	The lifetime in which the out-of-band authentication needs to be accepted before authentication fails.
TOTP Length	The length of OTP token used for backup authentication.
TOTP step	The time a TOTP is displayed on a screen before the next OTP is generated. The default time is 30 seconds.
TOTP time window	The time in seconds in which the TOTP entered is accepted. The default time is 300 seconds.
Server URL	The URL of Advanced Authentication server to where the smartphone app connects for authentication.This URL points to the Public External URLs (Load Balancers) policy. For example, `http://<AAServerAddress>/smartphone` (/smartphone cannot be changed). Use http only for testing and https in a production environment. You need a valid certificate when using https.
Require PIN	Set to **ON** to enforce the **Enable PIN** setting for the Smartphone application. A user will not be able to edit the settings on the Smartphone **NOTE:** If the PIN is not set, then the user is prompted to set the PIN during authentication.
Minimum PIN length if the PIN is required	The minimum length of the PIN. The available options are 4,5, and 6.
Require biometrics	Set to **ON** to enforce the fingerprint setting for the Smartphone application. A user will not be able to edit the settings on the Smartphone.
Enroll TOTP method when enrolling Smartphone	Set to **ON** to enable enrolling the TOTP method automatically during the Smartphone method enrollment. The TOTP method is used in the offline mode authentication.
Prevent login from a rooted device	Set to **ON** to enable a root check for mobile devices. The smartphone app must detect whether the device is rooted and prevent login from that device. Rooted devices can provide administrative privileges to third-party software that is not secured and mostly not allowed by device vendors.

Parameter	Description
Use image on mobile devices	Select the option to use a customized image on your Smartphone app. Browse the image. This image is displayed in the About screen of your Smartphone app. The resolution of the image must be 2732×637 pixels. **NOTE:** The **Require PIN**, **Require biometrics**, and **Use image on mobile devices** policies are automatically applied on the smartphone if a user has an enrolled authenticator in the smartphone app and the app is open on one of the screens: **Authentication Requests**, **Enrolled Authenticators**, or **Requests History**. It takes 2 to 30 seconds to display the authentication request. ◆ If a user has configured a 4-digit PIN but a 6-digit PIN has been enforced by the administrator, then the user will be able to use the 4-digit PIN until the user decides to change the PIN. ◆ If **Require biometrics** is set in the policies, but a user's device does not support fingerprint, the policy will not be applied for the device. ◆ If a user has authenticators enrolled for two different Advanced Authentication servers with different policies, then the policies are combined for the device and the most secure policies are applied for the app.
Disable offline authentication	Select this option to disable users from authenticating using the Smartphone TOTP. By default this option is disabled and users can login using Smartphone even when Smartphone is not connected to a network. Enabling this option will disallow users to use the One-Time Password of the Smartphone method to login to the offline mode.
Advanced Settings ◆ **Vendor** ◆ **Google project ID**	These settings are optional. If you have an approved vendor whose certificate is uploaded to proxy.authasas.com, you can specify the Vendor ID of your iOS app or specify the **Google Project ID** for your Android app. The push notifications will be sent only to the app whose Vendor name or Google Project ID matches with the app. By default Advanced Authentication works with the NetIQ Auth apps.

Parameter	Description
Geo Zones	You can configure Geo-fencing with the Smartphone method. Geo-fencing allows you to authenticate with the Smartphone method with one more factor, which is the geographical location. When you enable geo-fencing, users will be able to authenticate with Smartphone from only allowed geographical locations. You must enable the policy Geo Fencing Options to use geo-fencing. To configure geo-fencing, you need to draw a boundary of the location to be authenticated with a polygon. To configure geo-fencing, perform the following steps: 1. Click **Add**. 2. Specify the name of the zone. 3. Click the Search icon and specify the address to locate the required geographical location. You can click the full-screen icon to view the map in the full screen. 4. Click the polygon icon in the menu bar of the map. 5. Click the starting point on the map and draw the boundary of the specific location to be authenticated. 6. Click to mark the end point of the boundary after you have finished drawing the geo zone. You can also edit the marked polygon by clicking the edit icon. 7. Click **Save**.

NOTE: To use geo-fencing, ensure that access to the location is enabled for the NetIQ Advanced Authentication app on the smartphone.

NOTE: You can customize the authentication request message that is displayed on the NetIQ Auth app using the Custom Messages policy.

For more information about customizing the authentication request message, see Customizing Authentication Request Message For Smartphone Method.

SMS OTP

In the **SMS OTP** authentication method, a one time password (OTP) is sent with the SMS text to the user's phone. The user receives the OTP and enters it on the device where the authentication is happening. The OTP must be used within a specific time frame. The OTPs delivered through text messages prevent phishing and malicious attacks. SMS OTP is recommended to be used with other methods, such as Password or LDAP Password.

NOTE: In the User's settings of a repository, ensure that a phone number without extension is used. An SMS is not sent to the user's mobile where the phone number contains an extension.

To configure the SMS OTP method, specify the following details:

- **OTP Period**: The lifetime of an OTP in seconds. The default value is 120 seconds.The maximum value for the OTP period is 360 seconds.
- **OTP format**: The number of digits in the OTP. The default value is 6.
- **Body**: The text in the SMS that is sent to the user. The following structure describes the text in the OTP:
  - {user}: Name of the user.
  - {endpoint}: Device the user is authenticating to.
  - {event}: Name of the event where the user is trying to authenticate to.
  - {otp}: One-Time Password.
- **User cell phone attribute**: The cell phone number of a user on which the OTP is sent through SMS. You can use custom attributes such as `mobile`, homePhone, `ip`Phone, and other attributes of a repository. You must define the attribute in "User Cell Phone Attributes" of the **Repositories** section.

  NOTE: If you do not configure the attribute in the method settings, then the first attribute defined in the "User Cell Phone Attributes" section of Repository configuration is used when the user tries to authenticate. For example, if you define `mobile` as the first attribute in **User cell phone attribute** and do not configure the attribute in method settings of **SMS OTP**, then while authenticating, the first attribute, which is the `mobile` attribute, is used for the **SMS OTP** method authentication.

- **Allow overriding phone number**: Option that allows to prevent users from providing a phone number that is not registered in the LDAP repository. The option is set to **ON** by default. Set to **OFF** to prevent users to specify a different phone number during the enrollment.
- **Allow user enrollment without a phone**: Option to configure settings for the user to enroll the SMS OTP authenticator without a phone number in the repository.

  Set this option to **OFF** to ensure that a user does not enroll the SMS OTP authenticator without a phone. The user gets an error message that you can specify in **Error message**.

  Set this option to **ON** to allow the user to enroll the SMS OTP authenticator without a phone.

Swisscom Mobile ID

In the **Swisscom Mobile ID** authentication method, a PKI- based mobile signature secure encryption technology is stored on a user's SIM card. When the user tries to authenticate, the Swisscom Mobile ID is validated against the user's mobile phone attribute in the repository. If the number is validated, the user gets authenticated.

To configure the Swisscom Mobile ID method, specify the following details:

- **Application Provider ID**: Identifier of the application provider.
- **Application Provider password**: Password of the application provider.
- **Swisscom Mobile ID service URL**: Interface of the Swisscom Mobile ID.
- **Notification message prefix**: Message that is displayed on the user's mobile as a notification.

In addition, you can upload the Swisscom client certificates as follows:

1. Browse **Client SSL certificate**. The required certificate must be in a `.pem` format and self-signed with a private key.
2. Specify **Private key password** for the certificate.
3. Click **Save**.

NOTE: Users must activate the Mobile ID service for the Swisscom SIM card.

For more information about the Swisscom Mobile ID method, see the Mobile ID Reference guide.

FIDO U2F

With the **FIDO U2F** authentication method, users can authenticate with the touch of a finger on the U2F device.

Advanced Authentication supports the Microsoft policy Interactive logon: Smart card removal behavior that allows you to specify an action on the U2F. You can configure the policy to perform a force log off or lock a session when a user removes the U2F device from a computer. This policy is supported for Windows only. When the user removes the U2F device from the computer, the Windows Client runs an action that is specified in the Interactive logon: Smart card removal behavior policy.

IMPORTANT: To use the FIDO U2F authentication for Access Manager in the **OAuth 2.0** event, you must configure an external web service to perform enrollment and authentication for one domain name. For more information, see Configuring a Web Server to Use the FIDO U2F Authentication.

The YubiKey tokens may flash with a delay when the token is initialized in a combination mode. For example, when authentication uses OTP and U2F methods. This may cause the users to wait for the token to flash before enrollment or authentication. Therefore, it is recommended to flash the tokens only in the U2F mode if the other modes are not needed.

You can configure the following settings for this method:

- "Configuring the Certificate Settings" on page 93
- "Configuring Facets" on page 93
- "Configuring Yubikey for Advanced Authentication Server" on page 94
- "Configuring a Web Server to Use the FIDO U2F Authentication" on page 94

Configuring the Certificate Settings

You can configure certificate settings for the FIDO U2F authentication method. By default, Advanced Authentication does not require the attestation certificate for authentication by the FIDO U2F compliant token. Ensure that you have a valid attestation certificate added for your FIDO U2F compliant token, when you configure this method. The Yubico and Feitian attestation certificates are pre-configured in the Advanced Authentication appliance.

To validate the attestation certificate for the FIDO U2F authentication, perform the following steps:

1. Set **Require attestation certificate** to **ON** to enable validation of attestation certificate.
2. Select the attestation certificate:
   - **2a** To use a default certificate, click **Add Default**.
   - **2b** To use a custom certificate instead of predefined device manufacturer certificate, perform the following steps:
     - **2b1** Click next to the default attestation certificate to remove the certificate.
     - **2b2** Click **Add** to add a custom certificate.
     - **2b3** Click **Browse** then select the custom certificate and click **Upload**.

       The certificate must be in the PEM format.

   To restore the deleted attestation certificate, click **Add Default**.

Configuring Facets

You can add a list of facets for the FIDO U2F tokens to work on multiple sub-domains of a single domain.

Previously, the U2F RFC standards allowed authentication only on the domain name on which the enrollment was done. But with the FIDO U2F standards update (https://fidoalliance.org/specs/fido-u2f-v1.2-ps-20170411/fido-appid-and-facets-v1.2-ps-20170411.html), the FIDO alliance introduces facets that allows users to authenticate even on domains on which the enrollment is not done.

For example, if a user enrolls a token on https://mytest.com and wants to get authenticated on https://u2f.mytest.com, you as an administrator can do this by adding `https://u2f.mytest.com` as a facet of the primary domain https://mytest.com.

WARNING: Even if you are not using the facets, ensure to configure **Facets** to enable users to authenticate with the FIDO U2F method. If the **Facets** is not configured, then while authenticating with FIDO U2F, the user is prompted with a message `The visited URL doesn't match the application ID or it is not in use`.

To add facets, perform the following steps:

1. Expand **Facets settings.**
2. Specify the facet in **Facets**. For example, you can specify `https://u2f.mytest.com`.
3. Click **Add** to add more facets.
4. Specify the main URL in **App ID**. This ID is used to identify applications. For example, `https://mytest.com`.

If the **App ID** is left blank, the first facet is used as the App ID.

From the above example, if a user logs in to `https://u2f.mytest.com` with the U2F token enrolled on `https://mytest.com`, the browser sends a plain GET request to the `https://URL/<tenant-ID/app-id.json` URL and waits for the list of allowed facets (sub-domains). If the list is returned, browser allows the user to use token on the URLs specified in the **Facets** list.

To ensure that FIDO U2F works on Chrome on the URL that is specified as the **App ID**, you must add this URL to **Facets**.

5 Click **Save**.

NOTE: Facets are supported only on Google Chrome. The support for sub-domains is not stabilized in Chrome, therefore you might get an error message `The visited URL doesn't match the application ID or it is not in use` during enrollment and authentication.

Configuring Yubikey for Advanced Authentication Server

1 Download and install the Yubikey Personalization Tool from Yubico.

To download the Yubikey Personalization Tool, see the Yubico website (https://www.yubico.com/products/services-software/download/yubikey-personalization-tools/).

2 Insert the Yubikey token.

Ensure that the token is recognized. The recognition is indicated by a message `Yubikey is inserted` at the top-right corner of the Personalization tool.

3 Select **Yubico OTP mode**.

4 Select **Configuration Slot 1**, generate the **Public Identity, Private Identity, and Secret Key.**

5 Click **Write Configuration** and specify the configurations.

6 Open the Advanced Authentication Self-Service portal and select U2F method.

7 Click **Save** to complete the enrollment.

Configuring a Web Server to Use the FIDO U2F Authentication

This section is applicable for Debian 8 Jessie. The procedure may differ for other distributives.

This sections explains how to configure web server to use the FIDO U2F authentication in NetIQ Access Manager for the **OAuth 2.0** event.

According to the FIDO U2F specification, both enrollment and authentication must be performed for one domain name. As NetIQ Access Manager and Advanced Authentication appliance are located on different servers, you must configure web server to enable performing the following actions:

- Port forwarding to Advanced Authentication appliance for the FIDO U2F method enrollment
- Port forwarding to NetIQ Access Manager for further authentication using FIDO U2F tokens

Perform the following actions to configure a web server to use the FIDO U2F authentication.

Installing Nginx Web Server

You must install the Nginx web server for URL forwarding.

To install Nginx, add the following two lines to the `/etc/apt/sources.list` file:

```
deb http://packages.dotdeb.org jessie all
deb-src http://packages.dotdeb.org jessie all
```

Preparing SSL Certificate

Run the following commands:

```
mkdir –p /etc/nginx/ssl
openssl req -x509 -nodes -days 365 -newkey rsa:2048 -keyout /etc/nginx/ssl/
proxy.key -out /etc/nginx/ssl/proxy.crt
```

Preparing Nginx Proxy Configuration

Add the following to the `/etc/nginx/sites-available/proxy` file:

```
server {
listen 443 ssl;
error_log /var/log/nginx/proxy.error.log info;
server_name nam.company.local;
ssl_certificate /etc/nginx/ssl/proxy.crt;
ssl_certificate_key /etc/nginx/ssl/proxy.key;
location ~ ^/account {

proxy_set_header X-Real-IP $remote_addr;
proxy_set_header X-Forwarded-Server $host;
proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
proxy_set_header Host $host;
proxy_pass https://<appliance_IP>$uri?$args;
}
location ~ ^/static {

proxy_set_header X-Real-IP $remote_addr;
proxy_set_header X-Forwarded-Server $host;
proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
proxy_set_header Host $host;
proxy_pass https://<appliance_IP>$uri?$args;
}
location ~ ^/admin {

proxy_set_header X-Real-IP $remote_addr;
proxy_set_header X-Forwarded-Server $host;
```

```
proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
proxy_set_header Host $host;
proxy_pass https://<appliance_IP>$uri?$args;
}
location / {

proxy_set_header X-Real-IP $remote_addr;
proxy_set_header X-Forwarded-Server $host;
proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
proxy_set_header Host $host;
proxy_read_timeout 300;
proxy_pass https://<NAM_IP>;
}
}
```

Create a link and restart the nginx service running the following commands:

```
ln -s /etc/nginx/sites-available/proxy /etc/nginx/sites-enabled/proxy
service nginx reload
```

Adding DNS Entries

Ensure that the NetIQ Access Manager name server corresponds to the IP address of web server.

Enrolling U2F FIDO

To enroll U2F, open the link `https://<NAM_FQDN>/account`. The Self-Service portal of Advanced Authentication server appliance is displayed.

Enroll the U2F method in the Self-Service portal. For information about enrolling, see "Enrolling the Authentication Methods".

Voice

In the **Voice** authentication method, a user receives a call with a PIN request, after which the user must specify the PIN on his or her phone.

The following workflow describes the Voice authentication method in Advanced Authentication:

1. A user tries to authenticate with the Voice method.
2. The user receives a call on the phone with a PIN request.
3. User must specify the PIN that has been enrolled in the Self-Service portal during the enrollment.
4. After the user specifies the PIN followed by a hash (#) symbol, user is authenticated with the Voice method.

IMPORTANT: Phone number with extensions are supported for this method.

Special characters "," and "x" are used to indicate wait time and can be used as separators between phone number and extension.

For example, if +123456789 is the phone number and 123 is the extension, then it can be specified as +123456789,,,,123.

In the above example, “,” is specified 4 times and this multiplied by 0.5 (default value in Twilio) indicates the wait time, which is 2 (4*0.5) seconds. First, call is sent to the number 123456789 and after a wait period of 2 seconds, the extension 123 is dialed.

To configure the Voice method, specify the following details:

- **Minimum PIN length**: The length of the PIN must be at least three characters long.
- **Maximum PIN age**: The validity period of a PIN. The default value is 42 days. If you set the age to 0, the PIN will not expire.
- **User cell phone attribute**: The cell phone number of a user that is used to call the user for voice authentication. You can use custom attributes such as `mobile`, homePhone, `ipPhone`, and other attributes of a repository. You must define the attribute in “User Cell Phone Attributes” of the **Repositories** section.

  NOTE: If you do not configure the attribute in the method settings, then the first attribute defined in the “User Cell Phone Attributes” section of Repository configuration is used when the user tries to authenticate. For example, if you define `mobile` as the first attribute in **User cell phone attribute** and do not configure the attribute in method settings of **Voice**, then while authenticating, the first attribute, which is the `mobile` attribute, is used for the **Voice** method authentication.

- **Allow overriding phone number**: Option that allows to prevent users from providing a phone number that is not registered in the LDAP repository. The option is set to **ON** by default. Set to **OFF** to prevent users to specify a different phone number during the enrollment.
- **Allow user enrollment without a phone**: Option to configure settings for the user to enroll the Voice authenticator without a phone number in the repository.

  Set this option to **OFF** to ensure that a user does not enroll the Voice authenticator without a phone. The user gets an error message that you can specify in **Error message**.

  Set this option to **ON** to allow the user to enroll the Voice authenticator without a phone.

IMPORTANT: Advanced Authentication does not notify a user about the expiry of a PIN.

Voice OTP

In the **Voice OTP** authentication method, a user receives an OTP over a call. The user must specify this OTP on the device where the authentication is happening. The OTP must be used within a specific time frame. Voice OTP is recommended to use with other methods, such as Password or LDAP Password.

To configure the Voice OTP method, specify the following details:

- **OTP period**: The time period for which the Voice OTP is valid. Default time is 120 seconds. The maximum value for the Voice OTP period is 360 seconds.
- **OTP format**: The length of the Voice OTP token. Default length is 4.
- **Body**: The text or number in the Voice OTP that is sent to the user. Here, you can specify the `{otp}` variable, which is the actual one-time password. To repeat the one-time password during the call you can specify: `Use the OTP for authentication: {otp}. OTP: {otp}`.

- **User cell phone attribute**: Cell phone number of a user that is used to send the OTP through a call. You can use custom attributes such as `mobile`, homePhone, `ipPhone`, and other attributes of a repository. You must define the attribute in "User Cell Phone Attributes" of the **Repositories** section.

  NOTE: If you do not configure the attribute in the method settings, then the first attribute defined in the "User Cell Phone Attributes" section of Repository configuration is used when the user tries to authenticate. For example, if you define `mobile` as the first attribute in **User cell phone attribute** and do not configure the attribute in method settings of **Voice OTP**, then while authenticating, the first attribute, which is the `mobile` attribute, is used for the **Voice OTP** method authentication.

- **Allow overriding phone number**: Option that allows to prevent users from providing a phone number that is not registered in the LDAP repository. The option is set to **ON** by default. Set to **OFF** to prevent users to specify a different phone number during the enrollment.
- **Allow user enrollment without a phone**: Option to configure settings for the user to enroll the Voice OTP authenticator without a phone number in the repository.

  Set this option to **OFF** to ensure that a user does not enroll the Voice OTP authenticator without a phone. The user gets an error message that you can specify in **Error message**.

  Set this option to **ON** to allow the user to enroll the Voice OTP authenticator without a phone.

Web Authentication Method

Advanced Authentication facilitates you to authenticate with different Identity Providers such as OAuth 2.0, OpenID Connect, and SAML 2.0 with the Web Authentication method. The Web Authentication method uses browser and http based authentication protocols and can be used in web environment or hybrid applications.

Before you configure the Web Authentication method, ensure that you set the correct Public external URLs (load balancers) that provisions Advanced Authentication to the users.

NOTE: Ensure that you use a valid certificate for the Advanced Authentication server. Users may face enrollment issues on the Internet Explorer and Microsoft Edge browsers, if the certificates are not valid.

To configure the Web Authentication method for Advanced Authentication, perform the following steps:

1. Click **Methods > Web Authentication**.
2. Click **Add** in **Identity providers**.
3. Select the **Authentication type**.
4. Click the arrow icon.

You can configure the Web Authentication method to use the following Identity Providers:

- SAML
- OpenID Connect
- OAuth 2.0

SAML for Advanced Authentication

To add the SAML Identity Provider, perform the following steps:

1. Specify the identity provider name in **Identity Provider**.
2. Select the **Available presets for Name ID Format**.

   The **Name ID Format** is automatically populated.

   or

   Specify manually in **Name ID Format**.
3. Click **Browse** to upload the **Identity Provider Metadata file**.

   WARNING: Ensure that you choose the Identity Provider Metadata file that is exported from a used Identity Provider. Do not use the metadata file exported from the **Administrative Portal > Policies > Web Authentication**.

   ---

4. Click the save icon.
5. In the **Upload SAML Service Provider signature certificate** section, you must upload a certificate file in the PEM format with a private key. This certificate is used by the Web Authentication method to sign a SAML `AuthnRequest` token.

   If the private key is protected by a password, specify the password in **Private key password**.
6. Click **Save**.

An Example Configuration with ADFS

Perform the following steps to add ADFS as an Identity Provider for the Web Authentication method.

1. Specify **myexample-adfs** as the **IdP provider name**.
2. Select **urn:oasis:names:tc:SAML:1.1:nameid-format:WindowsDomainQualifiedName** from **Available presets for Name ID Format**.

   The selected **Name ID Format** will be extracted from the SAML `AuthnResponse` token and saved as an authentication data (unique data which will be associated with the user).
3. Click **Browse** to upload the **IdP Metadata file** from the ADFS server.
4. Click the save icon.
5. In the **Upload SAML Service Provider signature certificate** section, upload a certificate file in the PEM format with a private key.

   If the private key is protected by a password, specify the password in **Private key password**.
6. Click **Save**.

Configuring the ADFS Identity Provider

1. Save the Service Provider metadata from Advanced Authentication to a file. Use the URL mentioned below to obtain the Service Provider metadata:

   `https://AAF_SERVER/webauth/TENANT/metadata`

   NOTE: The default TENANT is TOP. Use TOP as TENANT if you are not using multi-tenancy.

A sample Service Provider metadata is mentioned below:


```
<md:EntityDescriptor xmlns:md="urn:oasis:names:tc:SAML:2.0:metadata"
ID="_7a8608ad1cfbc149" entityID="https://www.d18r14.tk/webauth">
<md:SPSSODescriptor
protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol
urn:oasis:names:tc:SAML:1.1:protocol
urn:oasis:names:tc:SAML:1.0:protocol">
<md:KeyDescriptor>
<ds:KeyInfo xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
<ds:KeyName>https://www.d18r14.tk/webauth</ds:KeyName>
<ds:X509Data>
<ds:X509Certificate>
MIIEOzCCAyOgAwIBAgIJAJcsrIQZzcT0MA0GCSqGSIb3DQEBCwUAMIGyMQswCQYD
VQQGEwJDSDEcMBoGA1UECAwTR3JlYXRlciBadXJpY2ggQXJlYTEPMA0GA1UEBwwG
WnVyaWNoMRcwFQYDVQQKDA5NaWNybyBGb2N1cyBBRzERMA8GA1UECwwIQXV0aGFz
YXMxFzAVBgNVBAMMDm1pY3JvZm9jdXMuY29tMS8wLQYJKoZIhvcNAQkBFiBhbGV4
YW5kZXIuZ2FsaWxvdkBtaWNyb2ZvY3VzLmNvbTAgFw0xNjA1MjAwOTMyMzlaGA8y
MTE2MDQyNjA5MzIzOVowgbIxCzAJBgNVBAYTAkNIMRwwGgYDVQQIDBNHcmVhdGVy
IFp1cmljaCBBcmVhMQ8wDQYDVQQHDAZadXJpY2gxFzAVBgNVBAoMDk1pY3JvIEZv
Y3VzIEFHMREwDwYDVQQLDAhBdXRoYXNhczEXMBUGA1UEAwwObWljcm9mb2N1cy5j
b20xLzAtBgkqhkiG9w0BCQEWIGFsZXhhbmRlci5nYWxpbG92QG1pY3JvZm9jdXMu
Y29tMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEA5ZjKCY2x2ruYkW8e
/IgOa5y9xqSx4bUogYuZnAwLgZH2EIEx54T1YzKKc6a58t9tFU0Xb1Z47ay57g/B
A1oOOV4HOsl6SRG4lJojiOKSpLb1zZMqj3s1dd9hLE9KuScchApcJ5F8GxPf6YHO
VpY4d6e6Z+fS071lK3UHpjbLQ71yoDV+s+wJ+pmgsLxiyV/7A+CurxixibyXKx2x
jHvynZBPWf1P/goi54gbCZ1PjQnRPKfxUzRvWipH8T2xvfT0UAZL3HO8C6JJGZxQ
t82lw/za9tADH0CxPolL/JJyHeEGJAj07uw1wks6mEv8wZY5KkhuDpVv6BUl146+
tL5LSQIDAQABo1AwTjAdBgNVHQ4EFgQUoeHvvSDZn/GIul8Q6T0yleN9q48wHwYD
VR0jBBgwFoAUoeHvvSDZn/GIul8Q6T0yleN9q48wDAYDVR0TBAUwAwEB/zANBgkq
hkiG9w0BAQsFAAOCAQEAQ+T4XForCi/FFSpNLVxb7x/yO1eBi7JujH7CfNTKXUC3
STlTZiJaTLVXzNd9dvxSjzAoDy4NVV/T4KiA4ss7JCTPwGrD3S8k/a+GpogRzRcE
R1i/Z/bx2I4PmQk1g1z4lpuqnic0aIg/OVAE0+kwDBK3E0/pgpoSixAAvxEqM5tw
X9vdt3W/QCoAO3rFABRDboaLkslGbk80Q37tEASKFYm4/0fyB3PEv2uL0S6rP/+E
Fp1Xhlk/5MVRHNb0hLqpZmJxne96dnXpo+ZDeCCn87B3257eRFI1eUeAnxuw79vv
uterPobGSjjPm+y7sY2U3hLKsoVymRvqAohrd9kXSQ==
</ds:X509Certificate>
</ds:X509Data>
</ds:KeyInfo>
</md:KeyDescriptor>
<md:AssertionConsumerService
Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST"
Location="https://www.d18r14.tk/webauth/callback" index="0"/>
</md:SPSSODescriptor>
</md:EntityDescriptor>
```


2. In the ADFS Management console, click **Relying Party Trusts > Add relying party trust**.
3. In the **Add Relying Party Trust wizard**, click **Start**.
4. Select **Import data about the relying party from a file**.
5. Click **Browse** to upload the Advanced Authentication's metadata file that you created in **Step 1**.
6. Click **Next**.
7. Specify the **Display name**.
8. Click **Next**.

9 Ensure that **Open the Edit Claim Rules dialog for this relying party trust when the wizard closes** is selected.

10 Click **Close**.

The **Edit Claim Rules wizard** is displayed.

11 Click **Add Rule**.

12 Select **Transform an Incoming Claim** from **Claim rule template**.

13 Click **Next**.

14 Specify the **Claim rule name.**

15 Set **Incoming claim type** to **Windows account name**.

16 Set **Outgoing claim type** to **Name ID** and **Outgoing name ID format** to **Windows Qualified Domain Name**.

17 Ensure that **Pass through all claim values** is selected.

18 Click **Finish**.

19 Click **OK**.

20 In the ADFS Management console, click **Relying Party Trusts** and select the relying party trust you added.

21 Right-click on the relying party trust and select **Properties** from the menu.

22 In **Properties**, click the **Encryption** tab and remove the certificate by clicking **Remove**.

23 Click **OK**.

NOTE: Web authentication method does not support the encrypted tokens.

OpenID Connect for Advanced Authentication

To add the Open ID Connect Identity Provider, perform the following steps:

1 Specify the name of the provider in **Provider name**.

2 Select the **Available presets**.

The **Issuer, Scope**, and **Key field** are automatically populated.

3 Specify the **Client ID** and **Client secret**.

The **Client ID** and **Client secret** can be obtained by registering with the respective Identity Provider that you select, for more information see "Integrating Third Party Applications with Advanced Authentication Using OpenID Connect" on page 102.

NOTE: Set the Callback URL at the respective Identity Provider. For example, `https://<aahostname>/webauth/callback`.

---

4 Turn **Send Client secret as an URL parameter** to **ON** to send the Client secret as a URL. By default, the option is set to **OFF**.

5 Click the save icon.

6 Click **Save** to save the method configuration.

Integrating Third Party Applications with Advanced Authentication Using OpenID Connect

The following sample configurations explains how to configure third party applications with Advanced Authentication using OpenID Connect.

- "Integrating Advanced Authentication with Facebook" on page 102
- "Integrating Advanced Authentication with Google" on page 103
- "Integrating Advanced Authentication with Yahoo" on page 103
- "Integrating Advanced Authentication with Microsoft Azure" on page 104

Integrating Advanced Authentication with Facebook

Perform the following steps to integrate Advanced Authentication with Facebook using OpenID Connect:

1. Login to facebook for developers (https://developer.facebook.com).
2. Click **My Apps**.
3. In the left pane, click **Settings > Basic**.
4. Make a note of **App ID** and **App Secret**. These are the Client ID and Client Secret for Advanced Authentication.
5. In **Display Name**, specify `Advanced Authentication`. This is the name for this OpenID Connect configuration.
6. In **App Domains**, specify the domain name of the Advanced Authentication Server. For example `aafapp.demo.live`.
7. In **Privacy Policy URL**, specify the URL of the Advanced Authentication Server. For example `aafapp.demo.live`.
8. Scroll through the page until you find the **Website** section. If you cannot find the **Website** section, click **Add Platform > Website**.
9. In the **Website** section, specify the web address of the Advanced Authentication Server. For example `aafapp.demo.live`.
10. Click **Save Changes**.
11. In the left pane, click **Settings > Advanced**.
12. Scroll through the page until you find the **Domain Manager** tab.
13. Click **Add a Domain**.
14. In the Add a Domain window, specify the URL of the Advanced Authentication Server in **Site URL**. For example `aafapp.demo.live`.
15. Click **Apply**.
16. Click **Save Changes**.
17. In the left pane, click **App Review.**
18. Make your application public by clicking the toggle switch in the **Make Advanced Authentication public?** section.
19. In the left pane, below the **Products** tab, click Settings.
20. In **Valid OAuth Redirect URIs**, specify `https://<Advanced Authentication Server>/webauth/callback`.

21 Click **Save Changes**.

22 Specify the Client ID and Client Secret generated in Step 4 on page 102 in the **Client ID** and **Client Secret** fields of Advanced Authentication Administrative Portal.

Integrating Advanced Authentication with Google

Perform the following steps to integrate Advanced Authentication with Google using OpenID connect:

1 Login to Google APIs (https://console.developers.google.com/apis/credentials).

2 Click **Credentials > Create**.

3 Specify a **Project Name** and a **Location**.

4 Click **Create**.

5 Click **Create credentials > OAuth client ID**.

6 Click **Configure a consent screen**.

7 Specify a name in the **Application name** field. For example Advanced Authentication.

8 In **Authorised domains**, specify the domain name of the Advanced Authentication Server. For example `aafapp.demo.live`.

9 In **Application Homepage link**, specify the web address of the Advanced Authentication Server. For example `https://aafapp.demo.live`.

10 In **Application Privacy Policy link**, specify the web address of the Advanced Authentication Server. For example `https://aafapp.demo.live`.

11 In **Application type**, select **Web application**.

12 In **Application Terms of Service link**, specify the web address of the Advanced Authentication Server. For example `https://aafapp.demo.live`.

13 In **Name**, specify a name for the OpenID Connect configuration.

14 In **Authorized JavaScript origins**, specify the Advanced Authentication server address. Ensure that you specify the complete server address including `https`. For example `https://aafapp.demo.live`.

15 In **Authorized redirect URIs**, specify `https://<Advanced Authentication Server>/webauth/callback`. Ensure that you specify the valid Advanced Authentication server name inside <>.

16 Click **Save**.

17 Make a note of the client ID and client secret specified in the **OAuth client** window. Click **OK**.

18 Specify the Client ID and Client Secret generated in Step 17 on page 103 in the **Client ID** and **Client Secret** fields of Advanced Authentication Administrative Portal.

Integrating Advanced Authentication with Yahoo

Perform the following steps to integrate Advanced Authentication with Yahoo using OpenID connect:

1 Login to Yahoo Developer Network (https://developer.yahoo.com/apps/).

2 Click **Create an app**.

3 In **Application Name**, specify a name for the OpenID Connect configuration.

4 In **Application Type**, select **Web Application**.

5 In **Callback Domain**, specify the domain name of the Advanced Authentication Server. For example `aafapp.demo.live`.

6 Click **Create**.

7 Make a note of the client ID and client secret. Click **Update**.

8 Specify the Client ID and Client Secret generated in Step 7 on page 104 in the **Client ID** and **Client Secret** fields of Advanced Authentication Administrative Portal.

Integrating Advanced Authentication with Microsoft Azure

Perform the following steps to integrate Advanced Authentication with Microsoft Azure using OpenID connect:

1 Login to Microsoft Azure (https://portal.azure.com/).

2 In the left pane, click **Azure Active Directory**.

3 In the **Manage** section, click **App registrations**.

4 Click **New application registration**.

5 In **Name**, specify a name for the OpenID Connect configuration.

6 In **Application Type**, select **Web app / API**.

7 In **Sign-on URL**, specify `https://<Advanced Authentication Server>/webauth/callback`. Ensure that you specify the correct Advanced Authentication server address inside <>.

8 Click **Create**.

9 Make a note of **Application ID**. It is the Client ID for Advanced Authentication.

10 Click **Settings > Keys**.

11 In the **Passwords** section, specify key description and key duration.

12 Click **Save**.

13 Make a note of the text generated in the **VALUE** field. It is the Client Secret for Advanced Authentication.

14 In the left pane, click **Azure Active Directory**.

15 Click **Properties**.

16 Make a note of the text specified in the **Directory ID** field.

17 Specify the text generated in Step 16 on page 104 in the **Issuer field** of Advanced Authentication Administrative Portal.

18 Specify the Client ID generated in Step 9 on page 104 and Client Secret generated in Step 13 on page 104 in the **Client ID** and **Client Secret** fields of Advanced Authentication Administrative Portal.

OAuth 2.0 for Advanced Authentication

To add the OAuth 2.0 Identity Provider, perform the following steps:

1 Specify the name of the provider in **Provider name**.

2 Select the **Available presets**.

The **Authorization endpoint**, **Token endpoint**, **Attributes endpoint**, **Scope**, and **Key field** are automatically populated.

3 Specify the **Client ID** and **Client secret**.

The **Client ID** and **Client secret** can be obtained by registering with the respective Identity Provider that you select.

NOTE: Set the Callback URL at the respective Identity Provider. For example, `https://<aahostname>/webauth/callback`.

---

4 Turn **Send Client secret as an URL parameter** to **ON** to send the Client secret as a URL. By default, the option is set to **OFF**.

5 Select the format of the access token from **Access token is returned in body encoded as**.

6 Set **Send access token in "Authorization: Bearer" header** to **ON** to send the access token as a header. By default, the option is set to **OFF**.

7 Click the save icon.

8 Click **Save** to save the method configuration.

Windows Hello

Windows Hello authentication allows the users to use the Windows Hello Fingerprint and Facial Recognition authentication to log in to Windows 10. Advanced Authentication supports the Windows Hello fingerprint and facial recognition authentication.

To configure Windows Hello method in Advanced Authentication, perform the following steps:

1 Click **Methods > Windows Hello**.

2 (Optional) Set **Allow to specify Username (for AD Users only)** to **ON** if you want the Active Directory users to specify their account name while enrolling. By default, the option is disabled.

This is applicable for Active Directory users only. This option does not affect local and other repository users and they must specify their account name while enrolling.

3 Click **Save**.

Creating a Chain

A chain is a combination of authentication methods. A user must pass all methods in the chain to be successfully authenticated. For example, if you create a chain with LDAP Password and SMS OTP, a user must first specify the LDAP Password. If the LDAP password is correct, the system sends an SMS with a One-Time-Password (OTP) to the user's mobile. The user must specify the correct OTP to be authenticated.

Advanced Authentication contains the following chains that are created by default:

1. **LDAP Password Only**: Any user from a repository can use this chain to get authenticated with the LDAP Password (single-factor) method.
2. **Password Only**: Any user who has a Password method enrolled can use this chain to get authenticated with the Password (single-factor) method.

You can create any number of chains with multiple authentication methods. To achieve better security, you can include multiple methods in a chain.

Authentication comprises of the following three factors:

- **Something that you know** such as password, PIN, and security questions.
- **Something that you have** such as smartcard, token, and mobile phone.
- **Something that you are** such as biometrics (fingerprint or iris).

You can achieve multi-factor or strong authentication by using any two factors out of this list. For example, multi-factor authentication can include a combination of password and a token or a smartcard and a fingerprint.

After you create a chain, you can use the chain on specific user groups in your repository. The chain is then mapped to an event.

To create a new chain or edit an existing chain, perform the following steps:

1. Click **Chains**.
2. Click **Add** to create a chain. You can also click the edit icon against the chain that you want to edit.
3. Specify a name of the chain in **Name**.
4. Specify a **Short name**. The short name is used by a user to move to a chain. For example, if you name a chain containing the LDAP Password and SMS methods as **SMS,** then a user can specify <username> sms and the user is forced to use **SMS** as the chain. This is helpful in scenarios when the primary chain is not available.

   NOTE: This is applicable only for the RADIUS Server event.

5. Set **Is enabled** to **ON** to enable the chain.
6. Select the methods that you want to add to the chain from the **Methods** section. You can prioritize the methods in the list. For example, if you create a chain with LDAP Password and HOTP methods, then the user will be prompted for the LDAP Password method first and then the OTP.
7. Specify the groups that will use the authentication chain in **Roles and Groups**.

   You can specify the following roles and groups based on your requirement:

   - **ALL USERS**: To use all the users and groups of all the added repositories.
   - **<REPO\Group>**: To use a specific group from the repository. For example to specify users of an **IT staff** group, specify **FOCUS\IT staff**.
   - **<REPO Users>**: To use all the users of a specific repository. For example to use all users in the repository **FOCUS**, specify **FOCUS Users**.

   IMPORTANT: It is recommended not to use those groups from which you will not be able to exclude users because you will not be able to free up a user's license. For example, you use a **Repo Users** group or **ALL USERS** group. If an employee from these groups leaves the company and you do not delete the user’s domain account but just disable it, the license will not be freed.

8. Expand **Advanced Settings** by clicking **+**.

9 Set **Apply if used by endpoint owner** to **ON** if an Endpoint owner must use the chain.

NOTE: The Endpoint owner feature is supported for Windows Client, Mac OS Client, and Linux PAM Client only.

---

10 Specify the **MFA tags**. When a user logs in to Windows on a workstation with Advanced Authentication Windows Client installed, the user's account is moved to the group specified in **MFA tags**.

NOTE: This functionality is available when you set the **Enable filter** to **ON** in the **Logon Filter for AD** policy and have configured the Logon Filter.

For example if you specify a **Card users** group from Active Directory in **MFA tags**, then the user will be moved from the legacy group (specified in the **Advanced Settings** of Active Directory repository) to the **Card users** group.

NOTE: If the user credentials are saved with **Remember my credentials,** the MFA tag does not work while connecting to the Remote Desktop.

---

11 Set **Required chain** to **Nothing**, if this is a required (high-security) chain. To configure a linked chain within a specific time period after successful authentication with a required chain, choose an appropriate required chain. You also need to specify a **Grace period (mins).** Within this time period, the linked chain can be used instead of the required chain. The maximum value for grace period is 44640 minutes (31 days).

NOTE: You must assign both a required and a linked chain to an Event. The linked chain must be of higher order than the corresponding required chain. The option is available when the Linked Chains policy is set to **ON**.

For example, LDAP `Password+Card` is a required chain and `Card` is a linked chain. The users must use LDAP `Password+Card` chain once in every 8 hours and within this period, they can provide only card without the LDAP Password to authenticate.

12 A top administrator can enforce the configurations of a chain on secondary tenants. After the administrator configures the settings for a chain, the administrator can freeze those configurations for that specific tenant. The tenant will not be able to edit the settings in the tenant administrator console that have been enforced by the top administrator for that chain.

To enforce the configurations for a specific tenant, perform the following steps:

12a In the **Tenancy settings**, click **+** to expand the settings.

12b Select the tenant to whom you want to enforce the configurations in **Force the configuration for the tenants.**

12c After you add a tenant, the **Hide forced settings** option is displayed. You can turn this option to **ON** if you want to hide the configurations that you have enforced on the tenant. This will be hidden on the tenant administrator console.

13 (Conditional) In **Custom names**, you can specify the chain name in a specific language. To do this click **+** to expand the settings and specify the chain name.

14 Click **Save**.

IMPORTANT: If you have configured more than one chain using one method (for example, **LDAP Password**, **LDAP Password+Smartphone**) and assigned it to the same group of users and the same event, then the top chain is always used if the user has enrolled all the methods in the chain. An exception is the use of a high-security chain and its appropriate simple chain, where the simple chain must be higher than its high-security chain.

Configuring Events

Advanced Authentication provides authentication events for the supported applications or devices. You can configure an event to leverage the Advanced Authentication functionalities for the respective application or device. The application or device triggers the respective authentication event when a user tries to access it.

You can create customized events for the following:

- Third-party integrations.
- To use Windows Client, Linux PAM Client or Mac OS X Client on both the domain joined and non-domain workstations and it requires to have a separate event to use the non-domain mode.
- Integrations using SAML 2.0 and OAUTH 2.0.
- To create more than one RADIUS Server event.

This section contains the following:

- "Configuring an Existing Event" on page 108
- "Creating a Customized Event" on page 114

Configuring an Existing Event

1 Click **Events**.

2 Click the edit icon against the event that you want to edit.

3 Ensure that **Is enabled** is set to **ON** if you want to use the event.

4 Select the **Event type**.

For most of the predefined events, you cannot change the **Event type**. For events such as **Windows logon**, **Linux logon,** and **Mac OS logon**, you can change the **Event type** from **OS Logon (domain)** to **OS Logon (local)** if the workstations are not joined to the domain.

- Select OS Logon (domain) to allow only the domain joined users to login to the event.
- Select OS Logon (local) to allow any Advanced Authentication user from any repository to access the event. However, users must map themselves to a local user account during their first login by providing the credentials.

5 Enable the **reCAPTCHA** option to **ON** if you want the Google reCAPTCHA option to be displayed in the login page for the particular event.

The reCAPTCHA option is displayed only when you enable the Google reCAPTCHA Options policy.

NOTE: The reCAPTCHA option is supported only for the **Admin UI** event, **Authenticators Management** event, **Helpdesk** event, **Helpdesk user** event, **Report logon** event, **Tokens Management** event, and the **Search Card** event.

6 Select the **Authenticator category.** The **Authenticator category** option is displayed only if you have added categories in the "Event Categories" policy.

7 Select the chains that you want to assign to the current event.

In an event, you can configure a prioritized list of chains that can be used to get access to that specific event.

8 If you want to restrict access of some endpoints to the event, add all the endpoints that must have access to the **Endpoint whitelist**. The remaining endpoints are blacklisted automatically. If you leave the **Endpoints whitelist** blank, all the endpoints will be considered for authentication.

9 Set **Geo-fencing** to **ON** to enable geo-fencing. Move the permitted zones from **Available** to **Used**. For more information about configuring geo-fencing, see the Smartphone method.

IMPORTANT: You must enable the Geo Fencing Options policy to use the geo fencing functionality.

10 Select **Allow Kerberos SSO** if you want to enable single sign-on (SSO) to the Advanced Authentication portals. Kerberos SSO is supported for AdminUI, Authenticators Management, Helpdesk, and Report logon events.

IMPORTANT: To use the Kerberos SSO feature, you must configure the Kerberos SSO Options policy and upload a keytab file.

11 Set **Bypass user lockout in repository** to **ON**, if you want to allow users who are locked on repository to authenticate on the Advanced Authentication. By default, **Bypass user lockout in repository** is set to **OFF** and users who are locked on repository are not allowed to authenticate.

12 You as a top administrator can enforce the configuration of events (except the **RADIUS Server** event) on secondary tenants. After configuring the settings for the event, you can freeze those settings for a specific tenant. The tenant cannot edit the settings in the tenant administrator console that have been enforced by the top administrator for that event.

To enforce the configurations for a specific tenant, perform the following steps:

12a In the **Tenancy settings**, click **+**.

12b Select the tenant to in **Force the configuration for the tenants** to whom you want to enforce the configurations.

12c After you select a tenant, the **Hide forced settings** option is displayed. You can set **Hide forced settings** to **ON** if you want to hide the configurations that you have enforced on the tenant. When this option is set to **ON**, the tenant administrator console does not show setting changes.

13 Select the **Allow to logon to this event by shared template** option to allow users to login using shared authenticators. By default this option is disabled for the `Authenticators Management`, `Helpdesk`, `Helpdesk User`, `AdminUI`, `Search Card`, `Token Management`, and `Report Logon` events and enabled for all the other events.

14 Click **Save**.

15 If you want to revert the changes to the default configuration, click **Initialize default chains**.

NOTE: If you have configured more than one chain using one method (for example, **LDAP Password**, **LDAP Password+Smartphone**) and assigned it to the same group of users and to the same event, the top chain is always used if the user has enrolled all the methods in the chain. An exception is the use of a high-security chain and its appropriate simple chain, where the simple chain must be higher than its high-security chain.

TIP: It is recommended to have a single chain with the **Emergency Password** method at the top of the chains list in the **Authenticators Management** event and other events, which are used by users. The chain will be ignored if the user does not have the **Emergency Password** enrolled. The user can use the Emergency Password immediately after the helpdesk administrator enrolls the user with the Emergency Password authenticator.

By default, Advanced Authentication contains the following events.

- ADFS Event
- AdminUI Event
- Authentication Agent Event
- Authenticators Management Event
- Helpdesk Event
- Helpdesk User Event
- Linux Logon Event
- Mac OS Logon Event
- Mainframe Logon Event
- NAM Event
- NCA Event
- RADIUS Server Event
- Report Logon Event
- Search Card Event
- Tokens Management Event
- Windows Logon Event

ADFS Event

This event is used to integrate Advanced Authentication with ADFS using the previous ADFS plug-in for Advanced Authentication 5.x.

For 6.0, you can use the new ADFS MFA plug-in. For more information see the *Configuring the Advanced Authentication Server for ADFS Plug-in* guide.

AdminUI Event

Use this event to access the Administration portal. You can configure the chains that can be used to get access to the `/admin` URL.

IMPORTANT: You must be careful when changing the default chains that are assigned to this event. You may block the access to the Administration portal.

NOTE: You can promote users or group of users from a repository to the **FULL ADMINS** role in Repositories > Local. After this, you must assign chains in which the methods are enrolled for users with the **AdminUI** event (at a minimum with an LDAP Password).

WARNING: If you have enabled the Google reCAPTCHA policy for the Admin UI event, you must consider the following guidelines. Otherwise, a deadlock scenario can happen and you will not be able to access the Administration portal without the cluster re-installation:

- If the site key or secret key gets deleted at the Google server, you will not be able to get the same site key or secret key. The site key and secret key used on the Administration portal are no more valid and there is no way to bypass the reCaptcha on the Administration portal.
- If you have registered the reCAPTCHA for one domain name and you change the domain name or migrate the Advanced Authentication server to another domain name, the site key or secret key used on the Administration portal are no more valid.

Authentication Agent Event

Configure the settings of this event to enable a login to the Authentication Agent on Windows Client.

Authenticators Management Event

Use this event to access the Self-Service portal. In the Self-Service portal, users can enroll to any of the methods that are configured for any chain and they are a member of the group assigned to the chain.

Add an **LDAP Password** chain as the last chain in the list of chains to ensure secure access to the portal for users who have methods enrolled.

IMPORTANT: If the Administration portal uses a repository that does not have any user, you must enable a chain with **Password** only (Authenticators Management - Password) for this event. This action enables you accessing the Self-Service portal or changing the password in the Self-Service portal.

You can also perform basic authentication with Advanced Authentication. To achieve basic authentication, set the **Allow basic authentication** option to **ON** in the **Event Edit** screen for Authenticators Management.

NOTE: The basic authentication is supported only for the **Authentication Management** event and for the Password, LDAP Password, and HOTP methods.

You must specify `/basic` with the URL to login to the enrollment page. The Login page appears and the format of the Username you must provide is:
`username:PASSWORD|LDAP_PASSWORD|HOTP:1.` For example: `admin:PASSWORD:1`.

When you log in to the Self Service portal, by default the chain with the highest priority is displayed. To display the other chains with the enrolled methods, set **Show chain selection** to **ON**.

NOTE: If you enable to show the chain selection, but a chain is not displayed in the list of available chains in the Self-Service portal, ensure that all the methods of the chain are enrolled by the user.

For more information, see "Managing Authenticators" in the *Advanced Authentication- User* guide.

Helpdesk Event

Configure the settings of this event to enable the Helpdesk administrator to access the Helpdesk portal. One of the roles of a Helpdesk administrator is to set an emergency password for users. An emergency password is a temporary password for users when they lose their smart card or smart phone. Some companies restrict self-enrollment and have the Helpdesk administrator who does the enrollment after hiring. You can promote the repository administrators or users as Helpdesk administrators in the **Repositories > LOCAL > Edit > Global Roles > ENROLL ADMINS** section.

You can manage the enrollment and re-enrollment of the authenticators in one of the following ways:

- Restrict the self-enrollment and force users to enroll through the Helpdesk.

  Or

- Restrict only the re-enrollment or deletion of authenticator from the Self-Service portal using the Disable re-enrollment option.

For more information, see "Managing the Authenticators of Users" in the *Advanced Authentication- Helpdesk Administrator* guide.

Helpdesk User Event

Configure the settings of this event to enable the Helpdesk administrator to authenticate users in the Helpdesk portal. This event is applicable for the **User to manage** screen that appears on the Helpdesk portal.

You must enable the **Ask credentials of management user** option in the Helpdesk Options policy before using this event.

Linux Logon Event

Configure the settings of this event to enable login to the Linux Client. If you want to use Linux Client on non-domain joined workstations, change the **Event type** from **OS Logon (domain)** to **OS Logon (local)**.

Mac OS Logon Event

Configure the settings of this event to enable login to the Mac OS Client. If you want to use Mac OS Client on non-domain joined workstations, change the **Event type** from **OS Logon (domain)** to **OS Logon (local)**.

Mainframe Logon Event

Configure the settings of this event to enable login to the Mainframe system.

NAM Event

Configure the settings of this event to facilitate the integration of Advanced Authentication with NetIQ Access Manager (https://www.netiq.com/products/access-manager/).

NCA Event

Configure the settings of this event to facilitate the integration of Advanced Authentication with NetIQ CloudAccess (https://www.netiq.com/products/cloudaccess/). CloudAccess must be configured to use Advanced Authentication as an authentication card and user stores must be added for the repositories for the integration to work. For more information, see the Advanced Authentication CloudAccess documentation.

RADIUS Server Event

The Advanced Authentication server contains a built-in RADIUS server to authenticate any RADIUS client using one of the chains configured for the event. For more information about configuring the RADIUS Server event, see Chapter 10, “RADIUS Server,” on page 215.

Report Logon Event

Configure the settings of this event to log in to the Advanced Authentication Reporting portal. For more information about the Reporting portal, see Chapter 15, “Reporting,” on page 285.

Search Card Event

Configure the settings of this event to log in to the Advanced Authentication Search Card portal. The Search Card functionality helps you to get the card holder’s contact information by inserting the card in the card reader. For more information about searching a card holder’s information, see Chapter 17, “Searching a Card Holder’s Information,” on page 289.

Tokens Management Event

Configure the settings of this event to log in to the Advanced Authentication Tokens Management portal. The Tokens Management functionality allows you to assign each token to specific user. For more information about assigning a token to user, see Chapter 16, “Managing Tokens,” on page 287.

Windows Logon Event

Configure the settings of this event to log in to the Windows Client.

Creating a Customized Event

You can create customized events for the following.

- Third-party integrations.
- When you must use Windows Client or Linux PAM Client, or Mac OS X Client on both the domain joined and non-domain workstations and you must have a separate event to use the non-domain mode.
- For integrations using SAML 2.0 and OAUTH 2.0.
- To create more than one RADIUS Server event.

You can create the following types of customized events:

- Generic
- OS Logon (domain)
- OAuth2
- SAML2
- RADIUS

Creating a Generic Event

You can create a generic event for Windows Client, Mac OS X Client, and Linux PAM Client workstation when these clients are not joined or bound to a domain.

Perform the following steps to create a generic event:

1. Click **Events** > **Add**.
2. Specify a name for the event.
3. Set **Is enabled** to **ON**.
4. Select **Generic** in the **Event type**.
5. Select the **Authenticator category.** The **Authenticator category** option is displayed only if you have added categories in the "Event Categories" policy.
6. Select the chains that you want to assign to the current event.
7. If you want to restrict access of some endpoints to the event, add all the endpoints that must have access to the **Endpoint whitelist**. The remaining endpoints are blacklisted automatically. If you leave the **Endpoints whitelist** blank, all the endpoints will be considered for authentication.
8. Set **Geo-fencing** to **ON** to enable geo-fencing. Move the permitted zones from **Available** to **Used**. For more information about configuring geo-fencing, see the Smartphone method.

   IMPORTANT: You must enable the Geo Fencing Options policy to use the geo fencing functionality.

9. Set **Bypass user lockout in repository** to **ON**, if you want to allow users who are locked on repository to authenticate on the Advanced Authentication. By default, **Bypass user lockout in repository** is set to **OFF** and users who are locked on repository are not allowed to authenticate.

10 A top administrator can enforce the configuration of events (except the **RADIUS Server** event) on secondary tenants. For more information, see Step 12 on page 109.

11 Click **Save.**

NOTE: When you create a custom event, you must specify the custom event in the configuration file of the related endpoints. For more information, see the *Advanced Authentication- Linux PAM Client*, *Advanced Authentication - Mac OS X Client*, or *Advanced Authentication - Windows Client* guides related to the specific endpoint.

Creating an OS Logon (Domain) Event

You can create this event when the third-party application needs to read password of a user after authentication. For example, when Windows Client, Mac OS X Client, or Linux PAM Client workstation is joined or bound to a domain, the third-party application must read the password of the user.

The steps to create an **OS Logon (domain)** event are similar to the Generic event.

Creating an OAuth 2.0 Event

You can create this event for third-party integrations with OAuth 2.0.

To create an **OAuth 2** event, perform the following steps:

1 Click **Events** > **Add**.

2 Specify a name for the event.

3 Set **Is enabled** to **ON**.

4 Select **OAuth2** in the **Event type**.

5 Select the **Authenticator category.** The **Authenticator category** option is displayed only if you have added categories in the "Event Categories" policy.

6 Select the chains that you want to assign to the current event.

7 Specify the **Redirect URIs**. The **Client ID** and **Client secret** are generated automatically. The **Client ID, Client secret**, and **Redirect URI** are consumed by the consumer web application. After successful authentication, the redirect URI web page specified in the event is displayed.

8 In **Advanced Settings**, perform the following actions:

- Set the **Use for Owner Password Credentials** option to **ON**, if the consumer web application provides authorization in the form of Resource Owner Password Credentials Grant.
- Set the option to **OFF**, if the consumer web application provides authorization in the form of Authorization Code Grant or Implicit Grant.

NOTE: If option is set to **ON**, you can use only the **LDAP Password only** chain for this event. It is recommended to use separate events for Resource Owner Password Credentials Grant (**Use for Owner Password Credentials** > **ON**) and Authorization Code Grant / Implicit Grant (**Use for Owner Password Credentials** > **OFF**).

---

9 Set **Bypass user lockout in repository** to **ON**, if you want to allow users who are locked on repository to authenticate on the Advanced Authentication. By default, **Bypass user lockout in repository** is set to **OFF** and users who are locked on repository are not allowed to authenticate.

10 A top administrator can enforce the configuration of events (except the **RADIUS Server** event) on secondary tenants. For more information, see Step 12 on page 109.

11 Click **Save.**

After you have created an **OAuth 2** event, perform the following steps to access the consumer web application:

1 Specify the **Client ID**, **Client secret**, and **redirect URIs** in the consumer web application.

2 Specify the appliance end point (authorization end point) in the web application. For example, `https://<Appliance IP>/osp/a/TOP/auth/oauth2/grant`.

3 Authenticate with the required authentication method(s) to access the consumer web application.

NOTE: Authorization is provided in the form of Authorization Code Grant or Implicit Grant or Resource Owner Password Credentials Grant.

Creating a SAML 2.0 Event

You can create this event for third-party integrations with SAML 2.0.

1 Click **Events** > **Add**.

2 Specify a name for the event.

3 Set **Is enabled** to **ON**.

4 Select **SAML 2** in the **Event type**.

5 Select the **Authenticator category.** The **Authenticator category** option is displayed only if you have added categories in the "Event Categories" policy.

6 Select the chains that you want to assign to the current event.

7 In **SAML 2.0 settings,** perform the following:

NOTE: You must configure the Web Authentication policy for the SAML 2.0 event to work appropriately.

7a You can either insert your Service Provider's SAML 2.0 metadata in **SP SAML 2.0 metadata** or click **Browse** and select a Service Provider's SAML 2.0 metadata XML file to upload it.

7b Set the **Send E-Mail as NameID (suitable for G-Suite)** option to **ON** for integrating with the G-suite.

7c Set the **Send SAMAccount as NameID** option to **ON** to send **SAMAccountName** in the **NameID** attribute as a SAML response from the Advanced Authentication server.

This option must be enabled for the integration with CyberArk.

WARNING: You can set **Send SAMAccount as NameID** to **ON** only when the **Send E-Mail as NameID (suitable for G-Suite)** option is turned **OFF**.

7d Set the **Send ImmutableId (User objectId) as NameID (required for Microsoft Office 365)** option to **ON** for integrating with Microsoft Office 365 without ADFS.

7e Set **Bypass user lockout in repository** to **ON**, if you want to allow users who are locked on repository to authenticate on the Advanced Authentication. By default, **Bypass user lockout in repository** is set to **OFF** and users who are locked on repository are not allowed to authenticate.

7f A top administrator can enforce the configuration of events (except the **RADIUS Server** event) on secondary tenants. For more information, see Step 12 on page 109.

8 Click **Save.**

Creating a RADIUS Event

When you want to add multiple RADIUS clients, you can add them to the predefined RADIUS Server event. But all the RADIUS clients will use the same authentication chain(s). If you want to configure specific authentication chain(s) for different RADIUS clients, then you must create a custom RADIUS event. To add a custom RADIUS event, perform the following steps:

1 Click **Events** > **Add**.

2 Specify a name for the event.

3 Ensure that **Is enabled** is set to **ON**.

4 Select **RADIUS** from **Event Type**.

5 Select the chains that you want to assign to the event.

6 Select **RADIUS** from **Endpoint whitelist**.

7 Click **Add** to add and assign a RADIUS Client to the event:

7a Specify the IP address of the RADIUS Client in **IP Address**.

7b Specify the RADIUS Client name in **Name**.

7c Specify the RADIUS Client secret and confirm the secret.

7d Ensure that the RADIUS Client is set to **ON**.

7e Click to save the RADIUS Client.

7f Add more RADIUS Clients if required.

8 Specify **NAS ID** for the RADIUS event and use the same NAS ID on the configured RADIUS clients to associate them with the custom RADIUS event.

NAS ID is a unique identifier to map RADIUS clients to the custom RADIUS event.

NOTE: While configuring the predefined RADIUS Server event, NAS ID is optional. But while adding a custom RADIUS event, it is required to specify NAS ID that is used to map RADIUS clients with the custom RADIUS event.

---

9 Set **Bypass user lockout in repository** to **ON**, if you want to allow users who are locked on repository to authenticate on the Advanced Authentication. By default, **Bypass user lockout in repository** is set to **OFF** and users who are locked on repository are not allowed to authenticate.

10 Click **Save**.

Managing Endpoints

Endpoints are devices where the Advanced Authentication server authenticates. An endpoint can be a Windows workstation for Windows Client endpoint, or Advanced Authentication Access Manager appliance for the NAM endpoint and so on.

The endpoints are automatically added when you install a plug-in such as NAM or install Windows Client. The RADIUS endpoint, an OSP endpoint that is used for WebAuth authentication, and Endpoint41 and Endpoint42 are the predefined endpoints.

NOTE: Endpoint41 and Endpoint42 are created for the integration with legacy NAM and NCA plug-ins, which are used in NAM 4.2 and earlier versions with Advanced Authentication 5.1.

The NAM and NCA plug-ins work with the hard coded endpoint ID and secret. In Advanced Authentication 5.2 and later, you must register the endpoints. This breaks the backward compatibility with old plug-ins. These two legacy endpoints allow to keep the old plug-ins working.

To configure an endpoint for Advanced Authentication, perform the following steps:

1. In the **Endpoints** section, click **Edit** against the endpoint you want to edit.
2. You can rename the endpoint, change its description or endpoint type.
3. Set **Is enabled** to **ON** to enable the endpoint.
4. Set **Is trusted** to **ON** if the endpoint is trusted. In some integrations such as Migration Tool, Password Filter, NAM, and NCA you must enable the **Is trusted** option for their endpoints.
5. Specify an **Endpoint Owner** if you have configured a specific chain to be used by the Endpoint owner only. This is a user account that must be able to use a different chain than the other users for authentication.

   The Endpoint Owner feature is supported for Windows Client, Mac OS Client, and Linux PAM Client only.

   NOTE: Additional information such as **Operating System**, **Software** version, **Last session** time and **Device** information are displayed. Also in **Advanced properties,** RAM information is displayed.

   Advanced Authentication Windows Client 5.6 or newer, Advanced Authentication Linux PAM Client 6.0 or newer, Advanced Authentication Mac OS X Client 6.0 or newer must be installed on the endpoint.

   ---
6. Click **Save**.

You can create an endpoint manually. This endpoint can be used for the third-party applications that do not create endpoints.

To create an endpoint manually, perform the following steps:

1. In the **Endpoints** section, click **Add**.
2. On the **Add endpoint** page, specify a **Name** of the endpoint and its **Description**.
3. Set the **Type** to **Other**.
4. Set **Is enabled** to **ON**.
5. Set **Is trusted** to **ON** if the endpoint is trusted.
6. Leave **Endpoint Owner** blank.

7 Click **Save**. The **New Endpoint secret** window is displayed.

8 Take down the values specified in **Endpoint ID** and **Endpoint Secret** and place them in a secure place in your application.

NOTE: You will not be able to get the **Endpoint ID** and **Endpoint Secret** later on the appliance.

9 Click **OK**.

NOTE: **Tenancy settings** are not supported for Endpoints.

IMPORTANT: You must ensure not to remove an endpoint that has at least one component running on it such as Windows Client, Logon Filter, RD Gateway plug-in, or ADFS plug-in. Endpoint is removed automatically when you uninstall Windows Client. However you must remove the endpoint manually when you uninstall Logon Filter, RD Gateway plug-in or ADFS plug-in.

If you remove an endpoint accidentally, ensure to remove the records with prefix **endpoint*** from the `%ProgramData%\NetIQ\Windows Client\config.properties` file and re-start the machine. This recreates the endpoint.

Configuring Policies

Policies contain configuration settings for the Advanced Authentication methods, events, and so on. For example, to use the **Email OTP** method, you must configure the server and port settings in the **Mail sender** policy and to use the Multitenancy mode, you must enable the **Multitenancy options** policy.

Advanced Authentication provides the following policies:

- Authentication Agent
- Authenticator management options
- Cache options
- CEF log forwarding
- Custom Messages
- Custom CSS
- Delete me options
- Endpoint management options
- Event categories
- Geo fencing options
- Google reCAPTCHA options
- HTTPS Options
- Helpdesk Options
- Kerberos SSO Options
- Linked Chains
- Lockout Options

- Login Options
- Logo
- Logon Filter for AD
- Mail sender
- Multitenancy Options
- Password Filter for AD
- Public external URLs (load balancers)
- Replica options
- Reporting Options
- SMS sender
- Services Director Options
- Users Synchronization Options
- Voice sender
- Web Authentication

To configure a policy, perform the following steps:

1 Click **Policies** in the Administration portal.

2 Click the **Edit** icon against the policy you want to configure.

   You can also double-click on the policy to edit the configuration.

3 Make the required changes for a specific policy.

   A top administrator can enforce the configurations of a policy on secondary tenants. After configuring a policy, you can lock the settings for that specific tenant. The tenant cannot edit the locked settings in the tenant administrator console.

   To enforce the configurations for a specific tenant, perform the following steps:

   3a In **Tenancy settings**, click **+**.

   3b Move the tenant to whom you want to enforce the configurations from the **Available** to the **Used** list in the **Force the configuration for the tenants** section.

   3c After you add a tenant, the **Hide forced settings** option is displayed. You can turn this option to **ON** if you want to hide the configurations that you have enforced on the tenant.

   NOTE: The **Tenancy settings** are not supported for the following policies: CEF log forwarding, Event categories, HTTPS Options, Logo, and Multitenancy options.

   A tenant administrator cannot access the **CEF log forwarding** and **Multitenancy options** policies.

4 Click **Save**.

IMPORTANT: The configured policies are applied for all the Advanced Authentication servers.

Authentication Agent

In this policy, you can configure the Daemon host. The Daemon host is address of the server that contains a background service to manage connections and incoming requests from the Authentication Agents. The Daemon host is secured by default.

NOTE: To initiate an authentication process using the Authentication Agent installed on a Windows machine, you must configure the **Authentication Agent** chain in the configuration file of the respective Clients. For more information about how to configure the Authentication Agent in different Clients, see Linux Client, Mac Client and Windows Client.

To configure the Authentication Agent policy, perform the following steps:

1. Specify the IP address of the Advanced Authentication server that manages requests from Authentication Agents in **Daemon host**. The loop-back address (127.0.0.1) is set by default. The Loop-back address is self-address of a particular computer. With the loop-back address, a computer can transmit signals to itself to communicate and check network connectivity.

   For more information about how to configure DNS in the Authentication Agent to discover the daemon host, see Setting DNS for Server Discovery.

   NOTE: In a cluster, if there are multiple Advanced Authentication servers, you must specify the address of one server in **Daemon host** that can accept connections and manage requests from the Authentication Agents. The server stores these connection details in the memory and are not replicated. Therefore, in a cluster do not retain the default address (127.0.0.1) in **Daemon host**.

   ---

2. By default, **Verify SSL** is set to **ON** to secure the daemon host. Ensure that a valid SSL certificate is uploaded in Server Options tab of the Advanced Authentication server which is configured as daemon host.
3. Click **Save**.

Authenticator Management Options Policy

This policy allows you to configure the following two settings:

- "Enabling Sharing of Authenticators for the Helpdesk Administrators" on page 121
- "Disabling Re-Enrollment of the Authenticators in the Self-Service Portal" on page 122

Enabling Sharing of Authenticators for the Helpdesk Administrators

This setting allows a user to authenticate with his or her authenticator to another user's account. The helpdesk administrator can share an authenticator of one user with another user.

To enable sharing authenticators, set **Enable sharing of authenticators** to **ON**.

The account of an helpdesk administrator must be added to the **SHAREAUTH ADMINS** group to grant privilege to share the authenticators. For more information about how to allow the helpdesk administrators to share authenticators, see "Local Repository".

NOTE: Shared authenticators work only in the online mode. Cached login does not work for the shared authenticators. The supported methods for sharing authenticators are TOTP, HOTP, Password, Fingerprint, Card, and FIDO U2F.

For more information, see "Sharing Authenticators" in the *Advanced Authentication- Helpdesk Administrator* guide.

Disabling Re-Enrollment of the Authenticators in the Self-Service Portal

This setting allows you to restrict users from re-enrolling, editing, and deleting the enrolled authenticators in the Self-Service portal.

NOTE: This setting disables re-enrollment and removal of the authenticators only in the Self-Service portal. The setting has no effect on the Helpdesk portal.

To disable re-enrollment or removal of authenticators, set **Disable re-enrollment** to **ON**.

WARNING: If you access the Administration portal with a local user credentials such as **local\admin**, you might get into a lockout situation. This can happen when the administrator's password expires and it is not possible to change the password through the Self-Service portal. Therefore, to use the **Disable re-enrollment** option, you must configure the access of a repository account to the Administration portal. To do this:

- Add authorized users or a group of users from a repository to the **FULL ADMINS** role.
- Assign chains, which contain methods that are enrolled for users, to the **AdminUI** event (at a minimum with an LDAP Password method).

Cache Options Policy

In this policy, you can disable the local caching of authenticators. The policy is supported for Windows Client, Mac OS X Client, and Linux PAM Client for chains that use the methods: LDAP Password, Password, HOTP, TOTP, Smartphone (offline mode), Card, FIDO U2F, Fingerprint, and PKI.

This policy allows you to configure the following settings:

- By default, the **Enable local caching** option is enabled. To disable the caching, set the option to **OFF** and click **Save**.

  The caching functionality enables the storing of credentials on the Client for offline authentication, when the Advanced Authentication server is not available. Therefore, a user who has successfully logged in once to the server with the authentication, can now login with the offline authentication.
- By default, the **Cache expire time** is set to 0, to indicate that the cache never expires. Use the **Cache expire time** option to set the duration (in hours) to store user authenticators in Client cache. The maximum expiry time that you can set is 24 * 366 (8784 hours). This setting is applicable for the Advanced Authentication Clients.

  When a user logs in with cached authenticators, Advanced Authentication compares the last online login time with the current offline authentication time. If the time duration is less than or equal to the specified duration in **Cache expire time**, the user is authenticated to Clients.

For example, consider the **Cache expire time** is set to 2 hours. The last online log in time of the user to Client is 1:00 PM. When the user tries to log in to Windows Client using cached authenticator credentials at 2:30 PM, the authentication is successful and the user is logged in to Windows Client. But, if the user tries to log in with cached authenticator credentials at 4:00 PM, the offline authentication fails and displays the following message as the cache has expired.

```
Authenticators of <user name> were not cached. Press OK and try again to
log in as local user or cached user
```

NOTE: You can use the enforced cached logon instead of the default online logon, to improve the logon and unlock speed on Clients. For more information, refer to the following topics:

- For Linux, see "Configuring the Enforced Cached Login" in the "*Advanced Authentication- Linux PAM Client*" guide.
- For mac OS, see "Configuring the Enforced Cached Logon" in the "*Advanced Authentication - Mac OS X Client*" guide.
- For Windows, see "Configuring the Enforced Cached Login" in the "*Advanced Authentication - Windows Client*" guide.

CEF Log Forward Policy

In this policy, you can configure settings to forward the logs to an external Syslog server. The central logging server can be used for log forwarding. To configure the policy, perform the following steps:

1. Set **Enable** to **ON**.
2. Specify the IP address of the remote logging server in **Syslog server**.
3. Specify the port of the remote logging server in **Port**.
4. Select an applicable transfer protocol from **Transport**.
5. Click **Save**.

NOTE: The same Syslog configuration is used for each server type. Each server type in the appliance records its own log file.

Only logs from the **Syslog** section are forwarded to the external Syslog server. For more information about Syslog, see Chapter 13, "Logging," on page 257.

For more information about how to integrate Advanced Authentication with external log management server, see an example Configuring Integration with Sentinel.

Custom Messages

In this policy, you can customize the error messages, method message and prompt message of a specific language.

For example, you can customize the default logon error message in English to `Your login failed.` In the Self-Service portal, when the user specifies wrong user name, the customized error message is displayed.

To customize the messages, perform the following tasks:

- Customizing Messages in the Custom Localization File
- Customizing a Specific Message on the Portal

NOTE: The customized messages are cached in the Advanced Authentication server. The refresh interval for custom messages is one hour. Therefore, when you customize a message or upload a custom localization file, the respective message is displayed on the corresponding Advanced Authentication portals after an hour.

You can also perform the following tasks in the **Custom Messages** section:

- Customize the authentication request message displayed on the app. For more information, see Customizing Authentication Request Message For Smartphone Method.
- Customize the prompt messages of authentication methods for RADIUS event. For more information, see Customizing Prompt Messages of the Authentication Methods for RADIUS Event.
- Customize message on the clients. For more information, see Customizing the Message for Clients.

Customizing Messages in the Custom Localization File

To customize preferred messages using the **Custom localization** file, perform the following steps:

1. Click **Custom Messages**.
2. Perform one of the following action to download the custom localization file on your local drive:
   - Click **Download original** to save the `custom_messages.tar.gz` file that contains the default messages.
   - If you have customized the messages, click **Download current messages** to save the `current_custom_messages.tar.gz` file that contains the latest messages.
3. Extract the files from the `custom_messages.tar.gz` file.
4. Navigate to the preferred language folder.

   To customize English messages, use the `custom_messages.pot` file and for other languages use the `custom_messages.po` file.
5. Open the `custom_messages.pot` file in the text format.
6. Specify the message in the `msgstr ""`.

```
msgctxt "errors.user_not_found"
msgid "User not found"
msgstr ""

msgctxt "method.swisscom.user_should_accept_request"
msgid "The user should accept your request with his/her mobile phone"
msgstr ""

msgctxt "method.messaging.cannot_determine_recipient_address"
msgid "Cannot determine OTP recipient address"
msgstr ""

msgctxt "method.virtual_password.password_will_expire"
msgid "Password will expire after ${days} days"
msgstr "Password will expire in ${days} days"

msgctxt "method.emergency_password.password_is_not_effective"
msgid "Emergency password is not effective yet. Wait ${wait_days} day(s)"
msgstr ""

```

7 Save the changes.

8 Compress the `custom_messages` folder to `.tar.gz` or `.zip` format.

9 Click **Browse** and select the compressed `custom_messages` file from the local drive.

10 Click **Upload**.

Customizing a Specific Message on the Portal

To customize a specific message on the portal, perform the following steps:

1 Click **Custom Messages**.

2 Use the **Message filter** to search for a specific message or you can find the preferred message manually.

3 Use the **Message Group** to search a specific message by group. Options available are **All**, **Method messages**, **Error messages**, and **Other messages**.

4 Click the **Edit** icon next to the preferred message. You can also double-click on the message to edit the content.

5 Specify the message in the preferred language.

6 Click **Save**.

Customizing Authentication Request Message For Smartphone Method

You can customize the authentication request message that is displayed on the NetIQ Auth app when user initiates Smartphone authentication. The authentication can be either to the endpoint or to the Advanced Authentication portals.

To customize the message for smartphone method, perform the following steps:

1. Click **Custom Messages**.
2. Search for one of the following keys:
   - `method.smartphone.authentication_hint` to edit the request message specific to endpoint authentication.
   - `method.smartphone.authentication_hint_no_endpoint` to edit the request message for any authentication that does not use endpoint such as Advanced Authentication portals login.
3. Click for the preferred key.
4. Specify any of the following parameters in the preferred language message as per your requirement:
   - `{user}` to fetch the user name.
   - `{client_ip}` to fetch the client IP address.
   - `{event}` to fetch the event name.
   - `{tenant}` to fetch the tenant name.
   - `{endpoint}` to fetch the endpoint name.
5. Click **Save**.

NOTE: The customized authentication request message reflects on the NetIQ smartphone app after an approximate delay of one hour.

For example, to customize the endpoint specific authentication message for the smartphone method you must search the key `method.smartphone.authentication_hint` and specify the message `{user} requested for authentication request from the client {client_ip} for the {event} to access the {endpoint}` in the field corresponding to English language. When the user tries to authenticate to Windows Client using the smartphone method then the customized message is displayed on the NetIQ smartphone app as:

```
Bob requested for authentication request from the client 10.3.10.5 for the
Windows logon to access the Windows-machine-589.
```

Customizing Prompt Messages of the Authentication Methods for RADIUS Event

You can customize prompt messages of the authentication methods that are configured for the RADIUS event. The customized prompt messages are displayed when a user initiates authentication to the RADIUS event using the configured methods.

To customize prompt message, perform the following steps:

1. Click **Custom Messages**.
2. Use the **Message filter** to search for a specific prompt message or you can find the preferred message manually.

   For example, specify `radius.totp.prompt` to search the prompt message displayed on RADIUS client for the TOTP method.
3. Click the Edit icon or double-click on the preferred message to edit the content.
4. Specify the message in the preferred language on the **Edit Customer Message** page.
5. Click **Save**.

For example, consider Thomas, an administrator, wants to customize the default prompt message of the Voice OTP method that is configured for the RADIUS event. Thomas must first search the key `radius.voice_otp.prompt` and modify the message to `Specify the OTP that you heard from the voice call` in the text box corresponding to English.

When Mark, an end user tries to authenticate to RADIUS event using the Voice OTP method, the customized prompt message is displayed.

Customizing the Message for Clients

You can customize the error messages, method message and prompt message specific to any authentication method that is displayed on endpoints such as Windows, Linux PAM, and Mac OS Clients.

To customize the message for clients, perform the following steps:

1. Copy the `aucore_custom.zip` custom localization file from one of the following path based on the Client:
   - **Windows**: `C:\Program Files\NetIQ\Windows Client\locale\`
   - **Linux PAM**: `/opt/pam_aucore/locale/`
   - **Mac OS X**: `Library/Security/SecurityAgentPlugins/aucore_login.bundle/Contents/Resources/aucore/locale`
2. Navigate to **Policies > Custom Messages** in the Administration portal.
3. Click **Choose file** and select the custom localization file.
4. Click **Upload**.

   NOTE: You can find the messages specific to the Clients with the prefix `client.` in the **Key**.
5. Search a specific message using the **Message filter** or find the preferred message manually.

For example, specify `client.method.smartcard.waiting_for_card` to search the message displayed for the Card method on all clients.

6 Click **Edit** next to the preferred message. You can also double-click on the message to edit the same.

7 Specify the message in the preferred language.

8 Click **Save**.

NOTE: The customized messages reflect on the respective Clients after an approximate delay of one hour. However, after the first online log in to the Client, users can view the customized messages.

For example, consider Thomas, an administrator wants to customize the default method message (`Enter one-time password`) of the TOTP method that is displayed for all clients. In the key `client.method.totp.password`, Thomas can modify the default message to `Specify the OTP that is displayed on Token or` App in the text box corresponding to English language.

When Mark, an end user tries to authenticate to any client using the TOTP method, the customized method message is displayed.

Custom CSS

This policy allows you to use a customized css for all the Advanced Authentication portals.

To use a customized css, perform the following steps:

1 Place the css file in **Content**.

For example, you can place the following sample css file.

```
body {
   color: #000000;
   background-image: url("http://cgcreative.com/videos/poster/
MicroFocus_2017_Brand_Cutdown_AMC_01.jpg") !important;
}

.skin-ias .main-header {
    background: linear-gradient(90deg,#0ecce4,#5c1bd7);
    color: #ffffff;
}

table.table-hover tr:hover td {
   background-color: #808080;
}

.skin-ias .sidebar-menu li a:hover  {
   background-color: #808080;
}

.skin-ias .sidebar-menu li.active.open {
   background-color: #D3D3D3;
}

.content-wrapper {
   color: #000000;
```

```
   background: transparent !important;
}

.well {
   background: transparent !important;
   border: 0px;
   border-radius: 0px;
   box-shadow: none;
}

.box  {
   color: #000000;
   background: transparent !important;
}

.main-footer {
   color: #000000;
   background: transparent !important;
}

.auth .content .login {
   background: transparent !important;
}

.auth .content .login .header-row {
   background: #ffffff;
}
```

2 Click **Save**.

To revert the changes, remove the custom code from **Content** and click **Save**.

Delete Me Options

In this policy, you can configure settings that enable deleting all the user data from the server, including the enrolled methods.

When you set **Enable the Delete me policy** to **ON,** the users can view the **Delete me** option in a drop-down by clicking on the user name on the top-right corner of the Self-Service portal.

NOTE: To comply with General Data Protection Regulation (GDPR), you must set the **Enable the Delete me policy** option to **ON**.

Endpoint Management Options

In this policy, you can configure the following settings for managing an endpoint:

- **Require the administrator password to register an endpoint or workstation**: Set this option to **ON** for registering an untrusted endpoint from any IP address. Typically, this option is configured along with **Whitelist IP address**.

You must disable the option when installing any components from the Advanced Authentication distributives package that uses endpoints (Advanced Authentication Windows Client, Mac OS X Client, Linux PAM Client, Logon Filter, and RDG plug-in). Otherwise, the endpoints are not created. You must use the option for third-party integrations only.

- **Whitelist IP Address**: Add the preferred IP addresses to the **Whitelist IP Address** to register either a trusted or an untrusted endpoint from these IP addresses. You can add a single IP address, multiple IP addresses, or a range of IP addresses to the whitelist. The IP address must be in IPv4 or IPv6 format.

  The following conditions summarizes the use of endpoint management options:

  - **Whitelist IP Address** is empty and **Require the administrator password to register an endpoint or workstation** is **OFF**: Untrusted endpoints can be registered from any IP address without the administrator's credentials.

    Regardless of the status of **Require the administrator password to register an endpoint or workstation** and **Whitelist IP Address** options, the administrator's credentials are required to perform the following actions:

    - To delete and update any endpoint.
    - To register a trusted endpoint.

    Endpoint registration is restricted only from those IPs that are specified in **Whitelist IP Address**.

  - **Whitelist IP Address** is empty and **Require the administrator password to register an endpoint or workstation** is **ON**: The administrator's credentials are required to register an untrusted endpoint from any IP address.
  - IP addresses are specified in **Whitelist IP Address** and **Require the administrator password to register an endpoint or workstation** is **ON**: The administrator's credentials are required to register untrusted endpoints only from the IP addresses specified in the whitelist.

    The endpoint registration request from any other IP address that is not specified in the whitelist is blocked automatically.

Event Categories

In this policy you can add categories, which can be used in an event to support multiple enrollments for a method. For each event, you can specify one category.

To add a category, perform the following steps:

1. Click **Event categories**.
2. Click **Add**.
3. Specify a name and description for the category.
4. Click **Save**.
5. Click **Events** and edit the required event to specify the category.

   Ensure that users or helpdesk administrators enroll authenticators for the new category.

NOTE:

- You can enroll only one authenticator of one type for each category.

- The **Authenticator category** option in **Events** is not displayed when no category is created.
- The LDAP Password method is an exception. There is one LDAP password authenticator always, it can be used with any category.

Geo Fencing Options

In this policy, you can create authentication zones by drawing boundaries for a geographical location. When you enable the geo-fencing policy, users can authenticate with their Smartphones only from the allowed geographical locations.

To enable geo-fencing, set **Enable Geo-fencing** to **ON**. For more information about how to configure the geo-zones, see the "Smartphone" method.

NOTE: When you enable the **Geo-fencing options** policy, the functioning of the TOTP mode of the Smartphone method, which is used in the offline mode, is affected. An error message `TOTP login is disabled` is displayed to the users when they try to authenticate with this method.

Google reCAPTCHA Options

The **Google reCAPTCHA Options** policy helps to prevent the Advanced Authentication web portals login page from bots and to confirm that the user is a human and not a robot. This policy adds an additional layer of security before users go through multi-factor authentication. A series of images are displayed and the users must select the images for the specified condition to login.

To configure the Google reCAPTCHA for Advanced Authentication, you must perform the following configuration tasks:

- "Registering the Google reCAPTCHA Account" on page 131
- "Configuring Google reCAPTCHA for Advanced Authentication" on page 132
- "Enabling the Google reCAPTCHA Options Policy for Events" on page 132

Registering the Google reCAPTCHA Account

Before you configure Google reCAPTCHA in Advanced Authentication, you must have a Google reCAPTCHA account.

To register for the Google reCAPTCHA account, perform the following steps:

1. Log in to the Google reCAPTCHA website with your Google account.
2. Click **Get reCAPTCHA**.
3. Specify a **Label**, select **reCAPTCHA V2** from **reCAPTCHA type.**
4. Select one of the following options:
   - **"I\'m not a robot\" Checkbox**: Select this option to validate with the "I'm not a robot" checkbox.
   - **Invisible reCAPTCHA badge**: Select this option to validate requests in the background.
   - **reCAPTCHA Android**: Select this option to validate requests in your android app.

5 Specify the `IP address` or the domain name of the Advanced Authentication server in **Domain**.

6 Accept the terms of Google reCAPTCHA.

7 Click **Submit**.

8 Copy the **Site key** and **Secret key** to configure reCAPTCHA in Advanced Authentication. For more information, see Configuring Google reCAPTCHA for Advanced Authentication.

NOTE: If you forget the generated secret key, you can retrieve it from your Google account.

WARNING: If you have enabled the Google reCAPTCHA policy for the Admin UI event, you must consider the following guidelines. Otherwise, a deadlock scenario can happen and you will not be able to access the Administration portal without the cluster re-installation:

- If the site key or secret key gets deleted at the Google server, you will not be able to get the same site key or secret key. The site key and secret key used on the Administration portal are no more valid and there is no way to bypass the reCaptcha on the Administration portal.
- If you have registered the reCAPTCHA for one domain name and you change the domain name or migrate the Advanced Authentication server to another domain name, the site key or secret key used on the Administration portal are no more valid.

Configuring Google reCAPTCHA for Advanced Authentication

To configure Google reCAPTCHA for Advanced Authentication, perform the following steps:

1 Log in to the Administration portal.

2 Click **Policies > Google reCAPTCHA Options**.

3 Specify the **Site Key** and **Secret Key** that you received when you registered for a Google reCAPTCHA account.

For more information about how to register the Google reCAPTCHA account, see "Registering the Google reCAPTCHA Account".

4 Click **Test** to test the policy after the configuration.

5 Click **Save**.

Enabling the Google reCAPTCHA Options Policy for Events

After you configure the Google reCAPTCHA policy, you must enable the policy for the respective events.

To enable the policy for events, perform the following steps:

1 Click **Events**.

NOTE: You can enable the Google reCAPTCHA policy only for the Admin UI event, Authenticators Management event, Helpdesk event, Helpdesk User event, Report logon event, Search Card event, Tokens Management event, and Web authentication events such as OAuth and SAML 2.0 events.

---

2 Set **Enable Google reCAPTCHA** to **ON**.

3 Click **Save**.

Helpdesk Options

In this policy, you can configure the following settings for the Helpdesk portal:

- **Ask for the credentials of the managed user**: Set this to **ON** to prompt the helpdesk administrator to provide the credentials of the managed user in the Helpdesk portal. This enhances security, however reduces convenience of the operations.

  When this setting is enabled, the helpdesk administrator must know the users' credentials to manage their authenticators. Ensure that you have specified a chain (with all the methods of the chain enrolled for the users) for the Helpdesk User event. When you set the option to **OFF**, the user management becomes faster, but less secure.
- **Allow to unlock user accounts**: Set to **ON** to allow a helpdesk administrator to unlock users who are locked in the Advanced Authentication server local repository. Users are locked when the **Lockout options** policy is enabled. The helpdesk administrator can view and unlock the users in the Helpdesk portal under the **Locked Users** tab.
- **Allow to manage endpoints**: Set **Allow to manage endpoints** to **ON** to allow a helpdesk administrator to manage the endpoints of the Advanced Authentication server. When the helpdesk administrator logs in to the Helpdesk portal, an **Endpoints** tab is displayed where all the endpoints are listed. The helpdesk administrator can remove the endpoints. This option is disabled by default. For more information, see Managing Endpoints.

HTTPS Options

In this policy, you can configure settings to ensure that the appliance is safe from security vulnerabilities.

This policy allows you to configure the following settings:

- **Enable TLS 1.0**: This option is disabled by default to ensure security vulnerabilities are prevented because TLS 1.0 is considered as an unsafe protocol. In some scenarios, you can enable the option to support the older versions of browsers. For more information on browser support for TLS, see TLS support for web browsers.
- **Enable TLS 1.1**: This option is disabled by default to prevent security vulnerabilities and have secure connection between the server and web portals such as Helpdesk, Self-Service and so on. It is recommended to keep default setting because TLS 1.1 is considered as an unsafe protocol. In some scenarios, you can enable the option to support the older versions of browsers.
- **Enable HTTP compression**: This setting allows you to enable the HTTP compression to accelerate performance in the scenarios of low bandwidth or when the network connectivity is slow.
- **Enable Client SSL for Webauth Service**: This option allows you to enable the Client SSL to authenticate to any web environment using the details available in the client SSL certificate. This option is used for virtual smartcard support of the PKI method. The Client SSL also ensures privacy of transmitted data to the server.

  When this option is set to **OFF** (default value), users must use the PKI device to authenticate to any device or web service.

When this option is set to **ON**, the following settings are displayed:

- **Client SSL CA Certificate Store**: This setting allows you to upload the CA certificate that is essential to validate the Client SSL certificate for OAuth 2.0 event authentication.
- **Enable Auto Enrollment based on certificates**: This option allows you to enable the auto enrollment of PKI method using the client SSL certificate on the user's browser.

  When this option is set to **ON**, the PKI method gets auto-enrolled if the following conditions are true:

  - The PKI method and another authentication method are added to the chain that is associated to the **OAuth 2.0** event and user has enrolled other method that is available in the chain.
  - A valid client SSL certificate is available in the user's browser.

  When this option is set to **OFF**, the PKI method does not auto-enroll even though the browser has valid client SSL certificate.
- **SSL Client Certificate Verify Depth**: This setting allows you to define a value that indicates the levels to validate a client certificate during authentication. The verification of the client certificate is to ensure whether the certificate is valid and signed by the trustworthy authority.

  For example, if you set the **SSL Client Certificate Verify Depth** as 2, then the client certificate must pass through two levels of validation by the two different certificate authorities.

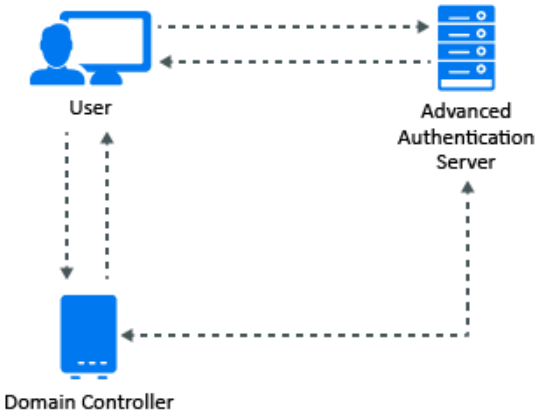
- **Frame Ancestor URLs One URL per line**: This setting allows some of the domains to load the Advanced Authentication pages in an iFrame. Previously, none of the domains were allowed to load the pages in iFrame. You can specify any number of domain names.

Kerberos SSO Options

In this policy, you can select an Active Directory repository that points to a domain for which you want to configure the single sign-on (SSO). Kerberos SSO is supported for the **AdminUI**, **Authenticators Management**, **Helpdesk**, and **Report logon** events.

The Figure 5-1 displays the architecture of Kerberos SSO.

Figure 5-1 *Kerberos SSO Architecture*



By default, the basic authentication window is displayed in your browser while accessing an Advanced Authentication portal. Advanced Authentication servers' sites must be added to the local intranet in the browser on the domain-joined workstations to avoid it. Perform the following steps to do it for Internet Explorer:

1. From the **Start** menu, navigate to **Control Panel** > **Network and Internet** > **Internet Options.**
2. In the **Internet Properties** window, click the **Security** tab and select **Local intranet.**
3. Click **Sites.**
4. In the **Local intranet** window, click **Advanced.**
5. Add the Advanced Authentication Servers' sites to the zone. For example: `https://v5.netiq.loc` or `v5.netiq.loc`.
6. Click **Close**.

Perform the following steps to configure Advanced Authentication to perform an SSO authentication:

1. Ensure that the Multitenancy options policy is disabled.
2. Go to **Policies > Kerberos SSO options.**
3. Select Active Directory as repository in **Repository**.

   NOTE: This feature works only for a single Active Directory repository at a time.

4. Click **Save**.
5. Log in to a Domain Controller.
6. Generate the keytab files for the Kerberos authentication for each Advanced Authentication server.

   A Sample command to create the keytab file is:

   ```
   ktpass /princ HTTP/aas1.netiq.loc@NETIQ.LOC /mapuser
   aas1srv@authasas.local /crypto ALL /ptype KRB5_NT_PRINCIPAL /mapop set
   /pass Q1w2e3r4 /out C:\Temp\keytab_aas1srv
   ```

   where

   - `aas1` is a server name (according to the record in DNS), the domain name is **netiq.loc**.
   - `aas1srv` is a service account created in the Active Directory for the Advanced Authentication server. The password of this account is `Q1w2e3r4`.

     The keytab file `keytab_aas1srv` is created in the `C:\Temp` folder.
7. Go to the Advanced Authentication Administration portal.
8. Click **Server Options**.
9. Scroll down to the **Keytab file** section.
10. Click **Browse** and select a keytab file for the Advanced Authentication server.
11. Click **Upload**.
12. Repeat Step 8 to Step 11 for the other Advanced Authentication servers.
13. Click **Events** on the Global Master server.

14 Open the properties of any supported event: **AdminUI**, **Authenticators Management**, **Helpdesk,** or **Report logon**.

15 Scroll down and set **Allow Kerberos SSO** to **ON**.

IMPORTANT: You must add the Advanced Authentication server sites to the local intranet in the browser of the domain-joined workstations. To know how to do this for the Internet Explorer, see the above procedure.

By default, Firefox browser does not support SSO. If you use the Firefox browser, you can enable SSO by performing the steps defined on the Single Sign-On in Firefox page.

NOTE: The basic authentication window is displayed while accessing a configured Advanced Authentication portal, if the **Kerberos SSO** option is enabled for **Authenticators Management** event and security is set to High for **Local intranet** in the Internet Explorer.

Linked Chains

This policy allows users to use a simple chain within a few hours of authentication done with a high-security chain. You must enable this policy for the Require chain option while creating a chain.

NOTE: This policy has replaced the **Last Logon Tracking Options** policy.

For example, if a user authenticates with the LDAP `Password+Card` chain once in a day, the user can further use a linked chain with only the `Card` method without the LDAP `Password` method, or if a user authenticates with the `Fingerprint+Smartphone` chain once in every four hours, the user can authenticate once with this chain and next authentication he can use only the linked `Smartphone` chain. The duration for which he can use the linked chain depends on the grace period that you specify in the Require chain option.

Perform the following steps to configure this policy:

1 **Enable linked chains**: Turn this option to **ON** to enable the linked chain policy.

2 **Hide required chain**: After using the required chain within the grace period, a user will see both the required and linked chain on Windows Client, Mac Client, and Linux PAM Client.

   Use this option to hide the required (high-security) chain after you authenticate once. Therefore after authenticating with the required chain, instead of displaying both the chains, only the linked chain is displayed. By default, this option is disabled.

3 **Limit by same endpoint**: Use this option to restrict a user to authenticate with the alternate linked chain only on the endpoint on which the user has successfully authenticated with a required chain, during the grace period. This option increases security by preventing a user to get authenticated on another endpoint after authenticating with the required (main) chain on an endpoint. By default, the option is **ON**.

   For example, Bob authenticates on a Windows Client endpoint named `System1` with a required chain **Card+LDAP password**. Now, Bob wants to get authenticated to another Windows Client endpoint named `System2`, with a linked chain **Card**. When the **Limit by same endpoint** option is enabled, Bob will not be able to authenticate on System2 with the linked chain Card. He must first authenticate with the required chain **Card+LDAP password** on System2.

Lockout Options

In this policy, you can configure settings to lock a user's account when the user reaches the maximum failure attempts of login. This enhances security by preventing the guessing of passwords and one-time passwords (OTPs).

You can configure the following options in this policy:

- **Enable**: An option to enable the lockout settings.
- **Attempts** failed: The limit of failure attempts of authentication, after which the user's account is locked. The default value is 3.
- **Lockout period**: The period within which the user's account is locked and the user cannot authenticate. The default value is 300 seconds.
- **Lock in repository**: The option to lock the user account in repository. You cannot use **Lockout period** if you enable this option. Only the system administrator must unlock the user in the repository.

IMPORTANT: You must configure the appropriate settings in your repository for the options to function appropriately. For Active Directory Domain Services, you must enable the Account lockout threshold policy on Domain Controllers.

For NetIQ eDirectory, you must configure the Intruder Detection properly.

After a user's account is locked (not in the repository), you can unlock the user account. To do this, click **Repositories > Edit > Locked Users** and click **Remove** against the user's account name.

The Helpdesk administrator can also unlock the locked users, if the **Allow to unlock user accounts** is enabled in the Helpdesk Options policy.

Login Options

In this policy, you can configure the settings to add default repository and ensure not to disclose valid username for malicious attack.

This policy allows you to configure the following settings:

- **Default repository**: You can add repositories that are used as default repositories. Therefore while logging in, you need not prefix the repository name before the username for authentication.

  For example, if pjones is a member of the company repository, then while logging in, instead of specifying `company\pjones`, you can specify only `pjones`.

  To add a repository as default, move the repository from **Available** to **Default** and click **Save**.
- **Username disclosure**: This option is set to **OFF** by default. It is recommended to keep default setting to prevent security vulnerabilities and to make it difficult for hackers to predict the valid username.

  If you set **Username disclosure** to **ON** and a user specifies an invalid username on the Advanced Authentication login page, an error message `User not found` is displayed. When the user specifies a valid username, the associated chain details are prompted to confirm the specified username and disclosing valid username. This can cause security vulnerability making it easy for attackers to guess the valid username.

When this option is set to **OFF**, chain details are displayed instead of error message even though a user specifies an invalid username on the login page. A user can select a preferred authentication method. If the input data specific to the selected method is incorrect, a generic message `Invalid credentials` is displayed. This does not disclose whether username or first-factor authentication is incorrect.

For example, a user specifies an invalid username, selects the SMS OTP method from the authentication chain. In this case, the SMS with OTP is not sent to the user. If the user specifies some random 6 digit as OTP, the server prompts an error message `Incorrect OTP password`. This helps the user to determine that specified username is valid though it is invalid.

- **LDAP caching**: This option allows you to enable or disable the caching of a user's information on the Advanced Authentication server. This information can be the lockout status of users, whether users have been disabled, or about the expiry of a user's password.

  By default, the option is set to **OFF**. This indicates that the Advanced Authentication server communicates with the LDAP server each time to check a user's information. You can enable the option to allow the caching of a user's information. Enabling the option increases the performance and cache the user's information for 5 minutes. However, it may also lead to security vulnerabilities. Therefore, it is recommended to set the option to **OFF**.

Logo

This policy allows you to set and customize an image as a logo for the Administration and Self-Service portal. You can also set an alternate text instead of an image as logo.

To set a logo for the Administration and Self-Service portal, perform the following steps:

1. In the **Logo** page, set **Use image** to **ON**.
2. Specify an alternate text for the image in **Text as an alternate for image**.
3. Specify the **URL** that is redirected when you click on the logo.
4. Select an image for the logo. The image resolution must be `230x50` pixels. The supported formats are `.jpg` and .png.
5. You can also set a mini logo with an image. This mini logo is displayed when the navigation pane on the left is collapsed. The image resolution for the mini logo must be `50x50` pixels.
6. Click **Save**.

NOTE: The logo is applied for all the tenants. A tenant administrator cannot customize the logo.

Logon Filter for Active Directory

In this policy you can configure settings to enable the use of Logon Filter that you must install on all the Domain Controllers in the domain and configure it. Logon Filter allows you to automatically update group membership if you login with the Advanced Authentication Windows Client.

To enable the policy, set **Enable filter** to **ON** and click **Save**.

NOTE: Before enabling the policy, you must ensure the Advanced Authentication Logon Filter is installed on all the Domain Controllers in the domain. Else, you might face problems with password validation during password synchronization on workstations that have the Windows Client installed.

For information about how to configure Logon Filter, see Configuring Logon Filter.

Mail Sender

In the **Mail sender** policy, you can configure settings for the Email OTP method to facilitate sending email messages with one-time passwords to users.

To configure the **Mail sender** settings, perform the following steps:

1 Specify the following details:

1. **Host**: The outgoing mail server name. For example, `smtp.company.com`.
2. **Port**: The port number. For example, 465.
3. **Username**: The username of an account that is used to send the authentication email messages. For example, noreply or `noreply@company.com`.
4. **Password**: The password for the specified account.
5. **Sender email**: The email address of the sender.
6. **Recipient Mask:** Specify the masked value that you want to display for the email.

   The email address of the users value is masked when users authenticate with the email method.

   NOTE: The default value is set and if you do not change the **Recipient Mask** value, the default value is considered for masking of the email address.

   ---

7. **TLS** and **SSL**: The cryptographic protocol used by the mail server.

2 You can test the configurations for the Mail sender policy in the **Test** section.

2a Specify the email address in **E-mail** to which you want to send the Email OTP.

2b Specify a message to be sent to the phone in **Message**.

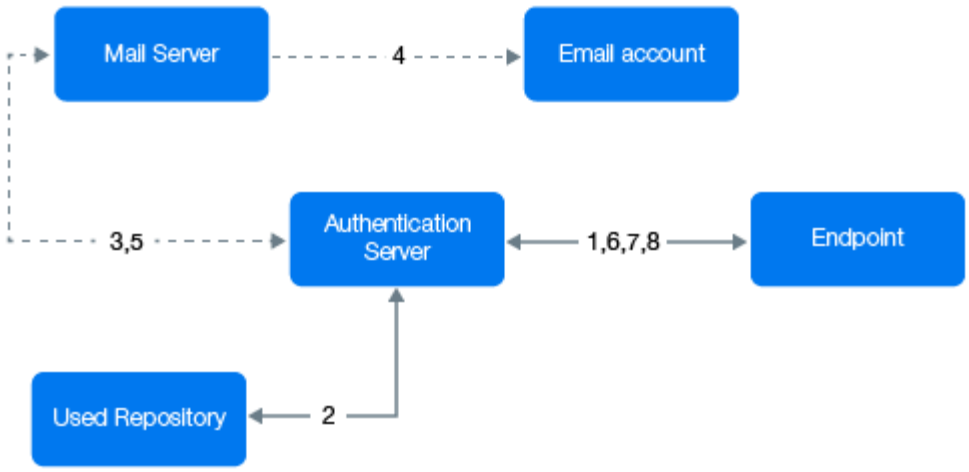
2c Click **Send test message!**.

3 Click **Save**.

Real messaging uses async sender. Ensure that you have configured a chain with the **Email OTP** method and assigned it to an event. Login to the Self-Service portal and test the Email authenticator. If it does not work, click **async log**.

Authentication Flow

The authentication flow for the Mail sender is described in the following image.



A user wants to authenticate on an endpoint such as a laptop or a website with the **Email OTP** method. The following steps describe the authentication flow:

1. When the authentication request is initiated, the endpoint contacts the Advanced Authentication server.
2. The Advanced Authentication server validates the user’s credentials and gets an email address of the user from a repository.
3. Advanced Authentication server sends the request to a configured mail server to send an email message with the content that includes a one-time password (OTP) for authentication.
4. Mail server sends the message to the user's email address.
5. Mail server sends the sent signal to the Advanced Authentication server.
6. Advanced Authentication server sends a request to the user to specify an OTP on the endpoint.
7. The user specifies the OTP from the email message. The Advanced Authentication server gets the OTP.
8. Advanced Authentication server validates the authentication. The authentication is done or denied.

HTTPS protocol is used for the internal communication.

Access configuration

Advanced Authentication server - Mail Server (SMTP, outbound).

Multitenancy Options

In this policy, you can enable the Multitenancy mode.

A tenant is a company with a group of users sharing common access with specific privileges. The **Multitenancy options** policy helps you to create a single instance of Advanced Authentication solution that supports multiple tenants.

Enable **Multitenancy mode** to support more than one tenant on a single appliance.

For workstations with Windows Client, Mac OS X Client, or Linux PAM Client installed, you must perform the following steps before you enable Multitenancy options:

1. Ensure that you have installed Advanced Authentication 5.4 or later Client components.
2. Configure the Clients to point to a tenant.
   - For information about how to configure Multitenancy in Windows Client, see Configuration Settings for Multitenancy.
   - For information about how to configure Multitenancy in Mac OS X Client, see Configuration Settings for Multitenancy.
   - For information about how to configure Multitenancy in Linux PAM Client, see Configuration Settings for Multitenancy.

These steps are critical and if not performed, the users on the workstations cannot login.

IMPORTANT: The **Multitenancy options** policy is hidden when your license does not have the Multitenancy feature. To have the policy, you must apply for a license that contains the Multitenancy feature.

Password Filter for Active Directory

In this policy, you can configure settings to synchronize the password update between the appliance and Active Directory through the Password Filter. The Password Filter automatically updates the LDAP Password stored in Advanced Authentication, whenever the password is changed or reset in the Active Directory. This helps you to authenticate without getting any prompt to synchronize the password after it is changed or reset.

You can perform the following settings in this policy:

- Set **Update password on change** to **ON** to update the LDAP password automatically in Advanced Authentication when it is changed in the Active Directory. This helps you to authenticate without getting a prompt to synchronize the password after it is changed.

  Set **Update password on change** to **OFF** to prompt the user to synchronize the LDAP password while logging in to Windows when the password is changed in the Active Directory.
- Set **Update password on reset** to **ON** to update the LDAP password automatically in Advanced Authentication when it is it is reset in the Active Directory.This helps users to authenticate without getting a prompt to synchronize the password if it is reset.

  Set **Update password on reset** to **OFF** to prompt the user to synchronize the LDAP password while logging in to Windows when the user's password has been reset in the Active Directory.

  NOTE: If **Enable local caching** is set to **ON** in the Cache Options policy and when the password is changed or reset in the Active Directory. Then, a user is prompted to synchronize the password while logging in to Windows irrespective of the status of the following **Password Filter for AD** settings:

  - **Update password on change**
  - **Update password on reset**

  If **Enable local caching** is set to **OFF**, the Password Filter works according to the settings configured in this policy.

NOTE: Endpoint for the Password Filter must be trusted. To do this, perform the following steps:

1. Click **Endpoints** in the Advanced Authentication Administration portal.
2. Edit an endpoint of the Password Filter.
3. Set **Is trusted** to **ON** and add a description.
4. Save the changes.

Public External URLs (Load Balancers)

In this policy, you can set the external URLs used for the OOB authentication and methods such as **Smartphone**, and **Voice**. You can specify multiple server URLs for the different sites, which are callback URLs, for the authentication to happen between the sites.

NOTE: You must specify different public external URLs for the different Advanced Authentication sites. It is not possible to specify a public external URL of a common load balancer for all the sites.

The following work flow describes the working of this policy in a multi-site environment for the Smartphone authentication.

1. Smartphone app receives and updates the list of callback URLs during enrollment and in the background when the Smartphone app starts.
2. When a user opens the Smartphone app, the app sends the request `get salt` to all callback URLs.
3. Only one callback URL returns the salt to the Smartphone and this is an Advanced Authentication server, which initiated the authentication.
4. The Smartphone app sends the user's answer (Accept/Reject) only to this Advanced Authentication server.

NOTE: A tenant administrator cannot access the **Public external URLs** policy.

Replica options

In this policy, you can configure the setting for monitoring the replication process of all the servers in a cluster. Advanced Authentication performs the following actions in the replication process:

1. Generates and sends the replication report on daily basis to the configured email address.
2. Sends notification email to the configured email address when a conflict is detected.
3. Tracks and provides the specific time from when the replication has not happened between the conflicting servers.

NOTE: You can configure the Replica Monitor policy only in the DB Master server.

To configure the replication monitor settings, perform the following steps:

1. Specify the **Email address** of the recipient who wants to receive the replication report and conflict notification.
2. Set **Everyday report** to **ON** to send the data replication status report daily to the configured email address.
3. Set **Notify if Problem** to **ON** to send an email notification to the configured email address whenever a replication conflict is detected.
4. Set **Delete old endpoint device and update endpoint last session** to **OFF** to allow the Advanced Authentication server to perform the following thus prevents any new conflicts related to the endpoints:
   - Do not delete the existing endpoint device specific record though there are two devices with the same **Endpoint ID** and **Endpoint Secret**.
   - Do not update the last login session time of each device.

   When **Delete old endpoint device and update endpoint last session** option is set to **ON** (default behavior), the server performs the following:
   - Deletes the old device specific record if there are two devices that contain the same **Endpoint ID** and **Endpoint Secret**.
   - Updates the last login session time of each device that logs in.
5. Click **Save**.

NOTE: Ensure that you configure the Mail Sender policy with sender details to send the replication status report and notification on a replication conflict to the configured email address.

Reporting Options

In this policy, you can configure settings to delete the history about the login information of users that is recorded in the reports.

Specify a value in **History max age(days)**. The default value is 30 (days). This indicates that the history about the login information of users will be recorded from the current date to the previous 30 days. Any data before that will be deleted.

SMS Sender

In this policy, you can configure the settings for the SMS OTP method. The **SMS OTP** method sends SMS messages with one-time passwords to the users. Advanced Authentication contains predefined settings for Twilio and MessageBird services.

The **Sender Service** consists of the following three options:

- Generic
- Twilio
- MessageBird

To configure SMS sender manually perform the following steps:

1 Select **Generic** in **Sender service**.

2 **Recipient Mask:** Specify the masked value that you want to display for the SMS.

The SMS OTP of the users is masked when users authenticate with the SMS OTP method.

NOTE: The default value is set and if you do not change the **Recipient Mask** value, the default value is considered for masking of the SMS OTP.

---

3 Specify a **Service URL** value. For example, Clickatell `http://api.clickatell.com/http/sendmsg?`.

4 Leave **HTTP Basic Authentication Username** and **HTTP Basic Authentication Password** blank.

5 Select **POST** from **HTTP request method**.

6 Click **Add** and create the following parameters in **HTTP request body**.

- name: **user**

  value: name of your account

- name: **to**

  value: {phone}

- name: **text**

  value: {message}

- name: **api_id**, this is a parameter that is issued after addition of an HTTP sub-product to your Clickatell account. A single account may have multiple API IDs associated with it.

- name: **from**

  value: sender's phone number

7 Click **Add secure** and create the following parameter in **HTTP request body**.

- Name: **password**

  Value: current password that is set on the account

For more information about the additional parameters for Clickatell, see the Clickatell documentation.

NOTE: The parameters may differ for different SMS service providers. But the `{phone}` and `{message}` variables are mandatory.

To configure SMS sender settings for **Twilio** service, perform the following steps:

1 Select **Twilio** in **Sender service**.

2 **Recipient Mask:** Specify the masked value that you want to display for the SMS.

The SMS OTP of the users is masked when users authenticate with the SMS OTP method.

NOTE: The default value is set and if you do not change the **Recipient Mask** value, the default value is considered for masking of the SMS OTP.

---

3 Specify the following details:

- **Account sid** and **Authentication token**: In Twilio, the Account SID acts as a username and the Authentication Token acts as a password.

- **Use Copilot**: The copilot option is used to send SMS from a Twilio's phone number of your location. This is helpful when SMS messages have to be sent across the geographical locations. For example, with copilot, SMS will be sent from Indian phone number to the Indian users. Without copilot, SMS will be sent from US phone number to the Indian users.

  For more information on Copilot option and its features, see https://www.twilio.com/copilot#phone-number-intelligence and https://www.twilio.com/docs/api/rest/sending-messages-copilot#features.

  - **Messaging Service SID**: Service SID.
- **Sender phone**: Sender's phone number.

For more information, see the Twilio website.

To configure SMS sender settings for **MessageBird** service, perform the following steps:

1. Select **MessageBird** in **Sender service**.
2. **Recipient Mask:** Specify the masked value that you want to display for the SMS.

   The SMS OTP of the users is masked when users authenticate with the SMS OTP method.

   NOTE: The default value is set and if you do not change the **Recipient Mask** value, the default value is considered for masking of the SMS OTP.
3. Specify the **Username**, **Password**, and **Sender name**.

For more information, see the MessageBird website.

IMPORTANT: MessageBird API v2 is not supported. To activate MessageBird API v1, perform the following steps:

1. Go to the MessageBird account.
2. Click **Developers** in the left navigation bar and open the API access tab.
3. Click **Do you want to use one of our old API's (MessageBird V1, Mollie or Lumata)? Click here**.

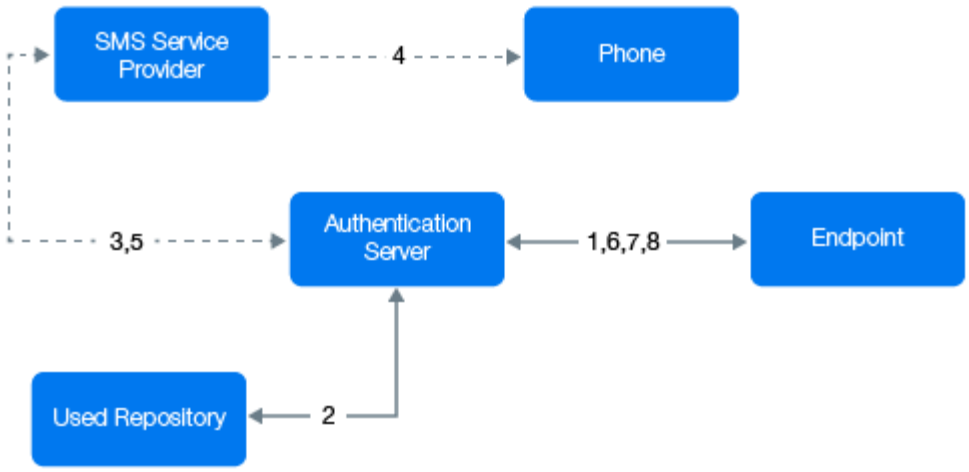
You can test the configurations for the SMS sender policy in the **Test** section.

1. Specify the phone number in **Phone** to which you want to send the SMS OTP.
2. Specify a message to be sent to the phone in **Message**.
3. Click **Send test message!**.
4. Click **Save**.

   Real messaging uses async sender. Ensure that you have configured a chain with the **SMS** method and assigned it to an event. Then sign-in to the Self-Service portal and test the SMS authenticator. If it does not work, see the **async** logs.

Authentication Flow

The authentication flow for the SMS sender in Advanced Authentication is described in the following image.



A user wants to authenticate on an endpoint such as a laptop or a website with the SMS method. The following steps describe the authentication flow:

1. When the authentication request is initiated, the endpoint contacts the Advanced Authentication server.
2. The Advanced Authentication server validates the user’s credentials and gets a phone number of the user from a Repository.
3. Advanced Authentication server sends the request to a configured SMS Service Provider to send an SMS message with the content that includes a one-time password (OTP) for authentication.
4. SMS Service Provider sends the SMS message to the user's phone.
5. SMS Service Provider sends the 'sent' signal to the Advanced Authentication server.
6. Advanced Authentication server sends a request to the user to specify an OTP on the endpoint.
7. The user specifies the OTP from the SMS message. The Advanced Authentication server gets the OTP.
8. Advanced Authentication server then validates the authentication. The authentication is done or denied.

HTTP/HTTPS protocol is used for the communication.

Access configuration

Advanced Authentication server - SMS Service Provider (HTTP/HTTPS, outbound).

Services Director Options

In this policy, you can configure settings required to integrate with the Services Director.

Perform the following steps to configure this policy:

1. Set **Enable integration** to **ON** to enable the integration of Advanced Authentication with Services Director.
2. Specify the **Public DNS name** of Advanced Authentication, **Services Director DNS Name, Tenant administrator name,** and **Tenant administrator password** of Services Director to integrate it with Advanced Authentication.

NOTE: You cannot integrate Services Director with Advanced Authentication when the Multitenancy Options policy is enabled.

Users Synchronization Options

In this policy, you can configure the settings to retain the users or groups for the required number of days, who are deleted from an LDAP or SQL repository. The authenticators of these users are retained in the Advanced Authentication server based on the period specified. Users need not re-enroll the authenticators, if the user accounts are restored in the repository.

The authenticators are restored automatically, if the users are restored in their repository. Administrators or Helpdesk need not manage the deleted users or the authenticators.

NOTE

- The authenticators are not retained for the users who are not deleted from the repository, but just removed from a group assigned in the used chains.
- The user deleted from a repository after full synchronization is not counted in the used licenses, though the user is retained in the Advanced Authentication database.

Specify the number of days till when you want to retain the users or groups who have been deleted from the repository in **Retain the deleted users or groups (days)**. The default value is 60.

For example, if you specify 30 in Retain the deleted users or groups (days), then the authenticators of the deleted users or groups are retained for a period of 30 days in the Advanced Authentication server and after 30 days, the authenticators are deleted.

Voice Sender

In this policy, you can configure the settings for the Voice and Voice OTP methods. Advanced Authentication supports the Twilio service for the Voice methods.

To configure Voice Sender settings for **Twilio** service, perform the following steps.

1. **Recipient Mask:** Specify the masked value that you want to display for the Voice OTP.

   The Voice OTP of the users is masked when users authenticate with the Voice OTP method.

   NOTE: The default value is set and if you do not change the **Recipient Mask** value, the default value is considered for masking of the Voice OTP.

2. Specify the following details in the **Voice sender** policy:
   - **Account sid** and **Authentication token**: In Twilio, the Account SID acts as a username, and the Authentication Token acts as a password.
   - **Sender phone**: The phone number of the sender.
   - **Server url**: The public URL to which the Twilio service connects for authentication. This URL points to the Public External URLs (Load Balancers) policy. You can use http protocol for testing purpose, but for production environment you must use https protocol. You must have a valid certificate when you use https.

3 You can test the configurations for the Voice sender policy in the **Test** section.

   3a Specify the phone number in **Phone** to which you want to send the Voice OTP.

   3b Specify a message to be sent to the phone in **Message**.

   3c Click **Send test message!**.

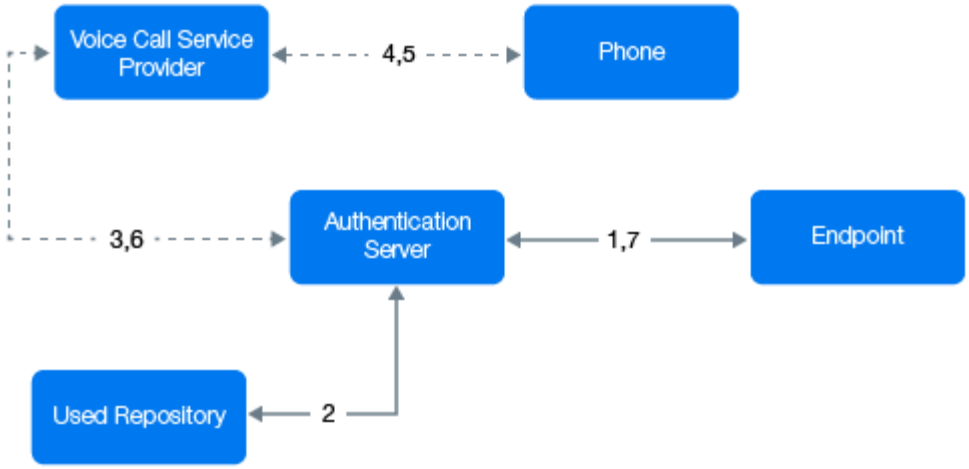
4 Click **Save**.

   Real messaging uses async sender. Ensure that you have configured a chain with the **Voice OTP** method and assigned it to an event. Then sign-in to the Self-Service portal and test the Voice authenticator. If it does not work, see the **async** logs.

IMPORTANT: The users may receive calls with the voice `Application error`. This happens because of incorrect settings or invalid certificates. Ensure that the certificate is valid and is not expired. Invalid certificates cannot be applied by Twilio.

Authentication Flow

The authentication flow for the Voice sender in Advanced Authentication is described in the following image.



A user wants to authenticate on an endpoint such as a laptop or a website with the Voice Call method. The following steps describe the authentication flow:

1 When the authentication request is initiated, the endpoint contacts the Advanced Authentication server.

2 The Advanced Authentication server validates the user's credentials and gets a phone number of the user from a repository.

3 Advanced Authentication server sends the request to a configured voice call service provider (Twilio) to call the user.

4 The voice call service provider calls the user.

5 The user picks up the phone, listens to the call, and specifies the PIN followed by the hash (#) sign.

6 Voice call provider sends the specified PIN to the Advanced Authentication server.

7 Advanced Authentication server then validates the authentication. The authentication is done or denied.

HTTP/HTTPS protocol is used for the communication.

Access configuration

Advanced Authentication server - Voice Call Service Provider (HTTP/HTTPS, inbound/ outbound).

Web Authentication

This policy replaces the **SAML 2.0 options** policy. The Web Authentication policy allows you to configure the following settings:

- Configuring Settings for the SAML 2.0 Events
- Customizing the Login Page of Web Authentication Events
- Customizing Messages and Authentication Method Names for the Web Authentication Events

Configuring Settings for the SAML 2.0 Events

You can configure the settings to specify the Identity Provider's URL to download the SAML 2.0 metadata file. The downloaded SAML 2.0 metadata file is used to configure the service provider.

For more information about configuring this policy, see "SAML 2.0".

Customizing the Login Page of Web Authentication Events

You can customize the login page of the OAuth 2.0 or SAML 2.0 events. To do this, perform the following steps:

1. Set **Custom Branding** to **ON**.
2. Click **Download Template**.
3. Save the `osp-custom-resources.jar` file.
4. Unzip the `osp-custom-resources.jar` file and in the **resources** folder open the file that you want to customize.

   For example, to edit the custom branding in the English language, customize the `oidp_enduser_custom_resources_en_US.properties` file.

   NOTE: Ensure that you edit the attributes in the **Login page properties** section of the `oidp_enduser_custom_resources_en_US.properties` file for the custom branding of the login pages in the English language.

5. After you edit the specific file in the **resources** folder, zip the file `osp-custom-resources.jar`.
6. Click **Browse** to upload the `osp-custom-resources.jar` file in the Web Authentication policy.
7. Click **Save**.

NOTE: When you upload the custom branding changes for the first time, you must restart the Advanced Authentication server to reflect the changes on the login pages of the web authentication events. This is applicable per tenant.

You can also add your customized .css file in the **css** folder of the `osp-custom-resources.jar` file.

The following section describes an example of the customization that you can achieve for the Web authentication.

Example of Customizing a Login Page

To achieve the customized login page in the Figure 5-2 for Acme Group of company, you can perform the following:

- "Adding a Customized CSS for the Login Page" on page 151
- "Customizing the Logo of an Enterprise" on page 154
- "Customizing the Copyrights" on page 154
- "Customizing the Branding Text" on page 155
- "Adding Links on the Login Page" on page 155

Figure 5-2 *Customized Page for Acme Group*

Adding a Customized CSS for the Login Page

You can add a customized css file to reflect changes for the login pages.

The following sample.css file has been customized for achieving the customized login page in Figure 5-2 for the Acme Group of company.

```
/* general styles
------------------------------- */
body {
  margin:0;
  padding:0;
  background:#fff url("/osp/TOP/images/login_bg.jpg") no-repeat center
center fixed;
  -webkit-background-size: cover;
  -moz-background-size: cover;
  -o-background-size: cover;
  background-size: cover;
  font-family:Arial, Helvetica, sans-serif;
}
img {
  border:none;
  max-width: 100%;
}
/* login box
------------------------------- */
div.page-container {
  position:absolute;
  top: 50%;
  left: 0px;
  width:100%;
  margin:-265px auto 0 auto;
}
div.dialog {
  border: 12px solid rgba(255, 255, 255, 0.3);
  border-radius: 2px;
  width: 318px;
  max-width:100%;
  margin:0 auto;
  background-color: transparent;
}
div.dialog-content {
  height:525px;
  padding:0 15px;
  background:url(/osp/TOP/images/acme.png);
  background-color:#414749 ;
  background-position:180px 20px;
  background-repeat:no-repeat;
  font-family: Arial, Helvetica, sans-serif;
  text-align: left;
  }
.dialog-header {
  margin:0;
  padding: 150px 0 40px 0;
  color:#48c6e7;
  font-size:22px;
```

```
  font-weight:100;
  background: none;
}
div.dialog-header-content {
  display:block;
  color:#fff;
  font-weight: 200;
}
p { margin:0; padding:0; }
div.dialog-body {
  padding: 0;
}
.product-name {
  margin: 0;
}
#password, #Ecom_User_ID {
  color: #000 !important;
  background-color: #999;
  font-size: 13px;
  line-height: 20px;
  margin: 0 0 3px 0;
  padding: 11px 10px 12px;
  width: 100%;
  box-sizing: border-box;
  border: none;
  border-radius: 0;
}
.dialog-footer-content {
  display: none;
}
.button-container button, .btn {
  display: block;
  text-align: center;
  color: #fff;
  font-size: 13px;
  background-color: #48c6e7;
  border: none;
  margin: 30px 0 0 0;
  padding: 11px 10px 12px;
  box-sizing: border-box;
  width: 100%;
  cursor: pointer;
  -webkit-appearance: none;
  text-decoration: none;
}
.button-container button:hover {
  background-color:#00B4DF;
  border: none;
}
.input-box input {
  box-sizing: border-box;
  background-color: #999;
}
p.error {
    color: #cccccc;
```

```
    font-size: 13px;
    margin: 0;
    padding: 0 0 18px;
}
#logoutmsg, #logoutmsgsub { color:#fff; }
.error h1 { padding-bottom:20px; }
.help p { margin:0; padding:20px 0 0 0; font-size:11px; }
.help a { color:#cccccc; text-decoration:none; }
.help a:hover { color:#fff; }
.title {
  display: none;
}
.image-custom-link, .login-custom-link {
  display: inline;
}
.image-custom-link a {
  padding: 0;
}
.image-custom-link a:hover {
  color: #fff;
  background-color: transparent;
  display: inline;
  padding: 0;
}
.image-custom-link img {
  height: 0;
  width: 0;
}
#loginCustomLink1 {
  float: right;
}
/*-------------------------------------*\
    RESPONSIVE
\*-------------------------------------*/
@media only screen and (max-width:480px) {
  div.page-container {
    position: static;
    top: 0;
    margin: 0;
  }
  div.dialog {
    width: auto;
    margin: 0;
  }
}
```

Perform the following steps to add the sample.css file to the `osp-custom-resources.jar` file.

1. Open the `osp-custom-resources.jar` file.
2. Upload your .css file to the `css` folder.
3. Open the `resources` folder.
4. Open the `oidp_enduser_custom_resources_en_US.properties` file to edit the custom branding of the login pages in the English language.

5 Uncomment the line `OIDPENDUSER.LoginCss=reset.css,uistyles.css,uistyles_loginselect.css` by removing the # sign.

   You can add your .css file here. For example, `OIDPENDUSER.LoginCss=sample.css`.

Customizing the Logo of an Enterprise

You can edit the logo displayed on the login page of web authentication event using the parameter `OIDPENDUSER.LoginProductImage` available in the Login page properties.

For example, to edit the logo of the login page of an OAuth 2.0 event in the English language, perform the following:

1 Open the `oidp_enduser_custom_resources_en_US.properties` file and edit the following attribute:

   `OIDPENDUSER.LoginProductImage=company_img.png`.

   You can also edit the .css file. The following code has been added to the sample.css file to display the logo in the Figure 5-2:

```
div.dialog-content {
  height:525px;
  padding:0 15px;
  background:url(/osp/TOP/images/company_img.png);
  background-color:#414749 ;
  background-position:180px 20px;
  background-repeat:no-repeat;
  font-family: Arial, Helvetica, sans-serif;
  text-align: left;
  }
```

2 Ensure that you add the image that you want as a logo to the `images` folder with the name that matches with the attribute value in `OIDPENDUSER.LoginProductImage`.

   By default the images folder contains the image `company_img`.

Customizing the Copyrights

You can edit the copyright text displayed on the login page of web authentication event using the parameter `OIDPENDUSER.50004` available under the **JSP Strings**.

For example, to remove the copyright note that is displayed on the login page of an OAuth 2.0 event in the English language:

1 Open the `oidp_enduser_custom_resources_en_US.properties` file and search the following parameter:

```
#OIDPENDUSER.50004=Copyright [copy] [year] NetIQ[nbsp]Corporation, a
Micro[nbsp]Focus company. All rights reserved
```

2 Uncomment the following parameter as follows:

   `OIDPENDUSER.50004=`

   This removes the copyright note from the web authentication event - login page.

Customizing the Branding Text

You can edit the branding text displayed on the login page of web authentication event using the parameter `OIDPENDUSER.LoginProductName` available in the **Login page properties** section of the `oidp_enduser_custom_resources_en_US.properties` file.

For example, to edit the branding of the company to **Acme Group**, perform the following:

1. Open the `oidp_enduser_custom_resources_en_US.properties` file and search the following parameter:

   ```
   #OIDPENDUSER.LoginProductName=Company[nbsp]Name[reg]
   ```

2. Edit the following parameter as follows:

   ```
   OIDPENDUSER.LoginProductName=Acme[nbsp]Group[reg]
   ```

If you want to remove the branding text **Acme Group, perform the following:**

1. Open the `oidp_enduser_custom_resources_en_US.properties` file and search the following parameter:

   ```
   #OIDPENDUSER.LoginProductName=Company[nbsp]Name[reg]
   ```

2. Uncomment the following parameter as follows:

   ```
   OIDPENDUSER.LoginProductName=
   ```

This removes the branding text, Acme Group, from the web authentication event - login page.

Adding Links on the Login Page

You can add links for the login page of the web authentication event.

For example, if you want to add the link **Forgotten Password** that is displayed on the login page in the English language, add the following:

1. Open the `oidp_enduser_custom_resources_en_US.properties` file.
2. Add the following:

   ```
   #OIDPENDUSER.70000=null
   OIDPENDUSER.70001=https://intra.sample.net/ForgottenPassword <link
   where the users gets redirected to>
   OIDPENDUSER.70002=Forgotten Password? <label of the link>
   OIDPENDUSER.70004=_top <name of the tenant>
   OIDPENDUSER.70005=LOGIN_PAGE <attribute>
   ```

Customizing Messages and Authentication Method Names for the Web Authentication Events

You can customize the messages and authentication methods name for the Web Authentication events in the Custom Messages policy. Set **Use Custom Messages** to **ON** to enable using the custom messages for the OAuth or SAML 2.0 events. You must customize the messages in the "Custom Messages" policy.

Configuring the Server Options

Perform the following configurations to configure the Advanced Authentication server settings:

- "Uploading the SSL Certificate" on page 156
- "Customizing the Login Page Background" on page 157
- "Uploading a Keytab File" on page 157

Uploading the SSL Certificate

Advanced Authentication server uses the HTTPS protocol. You must create a certificate file that is in the .pem or .crt, or .pfx format. You must apply the existing SSL certificate on the server.

IMPORTANT: Smartphone and Voice Call authentication providers work only with a valid SSL certificate. Self-signed certificate does not work.

To upload an SSL certificate perform the following steps:

1. Log in to the Advanced Authentication Administration portal directly and not through a load balancer or Access Manager.
2. Click **Server Options**.
3. Click **Browse** in Web server SSL certificate for HTTPS and select a new SSL certificate. The file must contain both the certificate and the private key.

   NOTE: The certificate must not contain any of the encrypted private keys.

   Intermediate certificates must also be placed in the certificate file in the .pem or .crt or .pfx format if they are present.

   IMPORTANT: The certificate file must be in the following order:

   ```
   -----BEGIN PRIVATE KEY-----
   (Your Private Key: your_domain_name.key)
   -----END PRIVATE KEY-----
   -----BEGIN CERTIFICATE-----
   (Your Primary SSL certificate: your_domain_name.crt)
   -----END CERTIFICATE-----
   -----BEGIN CERTIFICATE-----
   (Your Intermediate certificate: intermediate.crt)
   -----END CERTIFICATE-----
   -----BEGIN CERTIFICATE-----
   (Your Root certificate: TrustedRoot.crt)
   -----END CERTIFICATE-----
   ```

   ---

4. Click **Upload**.

IMPORTANT: The certificate is not replicated among the Advanced Authentication servers. Therefore, it is recommended to upload the certificate to each Advanced Authentication server or add it on a load balancer.

Customizing the Login Page Background

You can set a custom login page background. It must be a JPEG or PNG image and the recommended resolution is 1920x774 px, 72 dpi. You must not use backgrounds whose size exceeds 100KB. To apply a custom login page background, perform the following steps:

1. Click **Browse** in **Login page background**.
2. Select the background file.
3. Click **Upload** to upload and apply the custom background.
4. Click **Revert to original** to revert the settings to original.

Uploading a Keytab File

The **Keytab file** option located in **Server Options** of Advanced Authentication Administration portal helps you to upload a keytab file. The keytab file contains the encrypted files required for the Advanced Authentication server to authenticate to the selected Active Directory using Kerberos.

1 Generate a keytab file for Kerberos authentication to the Advanced Authentication server on a Domain Controller. For information on generating a keytab file, see the website.

   Sample command to create the keytab file:

   ```
   ktpass /princ HTTP/aas1.netiq.loc@NETIQ.LOC /mapuser
   aas1srv@authasas.local /crypto ALL /ptype KRB5_NT_PRINCIPAL /mapop set
   /pass Q1w2e3r4 /out C:\Temp\keytab_aas1srv
   ```

   Information about the sample command is as follows:

   - HTTP in upper-case is mandatory in the parameter for keytab file. For more information, see the website.
   - `aas1` is a server name (according to record in DNS), the domain name is `netiq.loc`.
   - `aas1srv` is a service account specially created in Active Directory for the Advanced Authentication server, `Q1w2e3r4` is the password.
   - The keytab file `keytab_aas1srv` is created in the folder `C:\Temp`.

   IMPORTANT: If there are multiple Advanced Authentication servers in the cluster, generate a keytab file for each Advanced Authentication server. Different users must be used for the keytab file generation for each server.

2 Click **Upload** to select and upload the keytab file.

NOTE: Keytab file can be removed only when an Active Directory repository is selected in the Kerberos SSO Options policy.

Adding a License

To add a license for Advanced Authentication, perform the following steps:

1 Click **Licenses**.

2 Click **Add**.

3. Click **Browse** and select the valid license.
4. Click **Upload** to upload the license.

A user license is consumed when a user enrolls at least one authenticator through an automatic enrollment, enrollment by a Helpdesk administrator, or self-enrollment. This is an exception for the LDAP password, as a license is not consumed for it. An automatic enrollment is done only when a user performs a first authentication.

After you add the license, following details of the license are displayed:

- License ID
- Expiry date
- Restrictions: License type and applicable restrictions.
- Usage: List of applicable authentication methods with the total and usage count of each method.

Your license might be limited to some specific authentication methods. Other methods will be unavailable in the **Methods** section.

IMPORTANT: If the multi-tenancy mode is enabled, you must add licenses for each tenant.

TIP: To free up a user's license, perform the following steps:

1. Exclude the user from a group that is assigned to chains.
2. Click **Repositories** and edit a repository.
3. Click **Full sync** to perform a full synchronization of the repository.

   The existing user's authenticators are removed.

Exporting and Importing the Database

IMPORTANT: The Advanced Authentication upgrade with the database is not supported post Advanced Authentication 5.6. Therefore, it is recommended to export the database and upgrade an appliance from version 5 to the 6.0 version.

Advanced Authentication facilitates you to export the entire database to `.cpt` format. In this way, you can create backup of the database or migrate the database to Advanced Authentication 6.0 version. The exported database includes configuration of the following sections:

- Dashboard
- Repositories
- Methods
- Chains
- Events
- Endpoints
- Policies

- Logs
- Licenses
- Tenant database
- Server Options
  - Login page background
  - Web server SSL certificate for HTTPS
- Enrollment
  - Enrolled Authenticators
  - Shared Authenticators
  - Emergency Passwords

NOTE: The exported database does not include configuration of the following sections:

- Web Authentication
- Debug logs
- Cluster configuration in Global Master server
- Updates.

Exporting the Database

To export the database, perform the following steps:

1. Click **Export** in the Administration console on the Global Master server.
2. Click **Export Database**.

   The exported database file is saved in the `.cpt` format on your local drive.

Exporting the Database Through Console

You can use the following procedure along with some third-party modules to automate the backup process:

1. Run the following command to launch the bash terminal:

   ```
   docker exec -it aaf_aucore_1 /bin/bash
   ```

2. Run the following command to navigate to the directory `version 2`:

   ```
   cd /opt/AuCore/aucore/scripts/db_tools/version2/
   ```

3. Run the following command to export the database:

   ```
   ./au_export_encrypt.sh
   ```

   NOTE: You can also run the following command to initiate the database export process instead of performing Step 1 to Step 3:

   ```
   docker exec aaf_aucore_1 /opt/AuCore/aucore/scripts/db_tools/version2/
   au_export_encrypt.sh
   ```

The exported database file is saved in the following locations in `.cpt` format:

- Within the container: `/opt/AuCore/data/export/`
- Out of the container: `/var/lib/docker/volumes/aaf_aucore-data/_data/export/`

IMPORTANT: When you are exporting the database for the first time, ensure to export using the Administration portal. If you try to Exporting the Database Through Console for the first time instead of exporting through the administration portal, you might get an error message as follows:

```
+ pidfile=/etc/nginx/html/static/proc/export.pid
+ '[' -f /etc/nginx/html/static/proc/export.pid ']'
+ echo 17985
./export.sh: line 12: /etc/nginx/html/static/proc/export.pid: No such file or directory
```

Importing the Database

To import the database, perform the following steps:

1. Click **Export**.
2. Click **For import Click Here** to upload the database.
3. In **Step 1. Upload backup** section, specify the following details:
   - **3a** **From**: The database download URL (FTP or HTTP server).

     Ensure the database file is in the `.cpt` format.
   - **3b** **Decrypt Password**: The password to decrypt the database file.
4. Click **Upload**.

   The upload logs are displayed. The uploaded file is displayed in the **Step 2. Import backup** section.
5. Click **Import** next to the uploaded file.

   The import logs are displayed.

   IMPORTANT: For recovering from a disaster in production environments with multiple sites and services, see "Disaster Recovery".

   NOTE: You may get the following errors while you are importing the database:

   - If the provided download path or decrypt password is incorrect, a message `Error Download or decrypt. Wrong back up password or URL` is displayed.
   - When you export the configurations from Advanced Authentication 5.6 Patch Update 5 to 6.0 appliance, an error message `oob: ERROR (spawn error)` is displayed in the `Importlogs.txt`. You can ignore this error and the Authentication Agent service will start immediately after the server reboot.

   ---
6. After you export and import the database, you must restart the server.

NOTE: The Tenant administrators cannot export and import the database.

Adding a Report

Report provides you pictorial representation of collected data. You can examine data in different combinations, display report in easy-to-understand graphs, track data at different time intervals and export the report in JSON and CSV formats to share the result with others. With reports, you can track all logins (failed or successful), users' enrollment status, authentication methods used for specific event, license information, number of active users and so on.

You can add a report with specific report type as described in Table 3-1.

Table 5-2 *Report Types*

Report Type	Description	Available Attributes
Pie chart	This report displays the information collected on a specific parameter and represents information in the Pie chart format. You can sort the parameter in ascending and descending order.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**. ◆ **Event Type**: Types of events to display in the report. Options available are **All logon events**, **Failed logon events** and **Successful logon events**. ◆ **Size**: Number of records to filter in the report. ◆ **Order**: Sorting order of selected parameter in the **Field**. Options available are **Ascending** and **Descending**. ◆ **Field**: The parameter on which the data is collected to display in the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on. ◆ **Users**: To filter records of specific user from directory. ◆ **Events**: To filter records of specific event. ◆ **Chains**: To filter records of specific chain.

Report Type	Description	Available Attributes
Stacked chart	This report displays a stacked bar chart that classifies and compares different categories of Field 1 and 2 parameters to track the maximum and minimum number of logons. X-axis represents categories of the Field 2 parameter. Y-axis represents logon count. Segments in each vertical bar represents categories of Field 1 parameter. Different colors are used to depict different categories and label for each category is displayed in upper-right corner of the report.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**. ◆ **Event Type**: Types of events to display in the report. Options available are **All logon events**, **Failed logon events** and **Successful logon events**. ◆ **Field 1**: The parameter to represent on X-axis of the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on. ◆ **Size 1**: Number of records to display on the X-axis. ◆ **Order 1**: To sort the parameter selected in the **Field 1**. Options available are **Ascending** and **Descending**. ◆ **Field 2**: The parameter to represent on Y-axis of the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on. ◆ **Size 2**: Number of records to display on the Y-axis. ◆ **Order 2**: To sort the parameter selected in the **Field 2**. Options available are **Ascending** and **Descending**. ◆ **Users**: To filter records of specific user from directory. ◆ **Events**: To filter records of specific event. ◆ **Chains**: To filter records of specific chain.
Activity stream	This report displays information about user, tenant, chain, method used for authentication, and the result.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON**, select a specific time interval from the **Relative Interval**. Set this option to **OFF**, select preferred From and To dates from the **Date range**. ◆ **Event Type**: Types of events to display in the report. Options available are **All logon events**, **Failed logon events** and **Successful logon events**. ◆ **Users**: To filter records of specific user from directory. ◆ **Events**: To filter records of specific event. ◆ **Chains**: To filter records of specific chain.

Report Type	Description	Available Attributes
Enroll activity stream	This report displays information about enrolled users: last log on time, tenant, user, method used for authentication, and event type.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**. ◆ **Users**: To filter records of specific user from directory.
Users	This report displays information about the enrolled users: tenant name, user name, enrollment status and last log on time.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**.
Authenticators	This report displays information about the enrolled authenticators: tenant name, user name, event category, method, comment and owner of the account.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**.
Licenses	This report displays information about the license id, license validity dates (such as From and To dates), license expiry status and license warnings (regarding license expiry, exceed in user count)	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**.
Event count line chart	This report tracks and displays logon count of all events in the appliance. X-axis represents time and Y-axis represents logon count. Each data point on the chart represents numbers of user logged on at a specific time. All the data points are plotted and connected with a line to track the maximum and minimum number of logons.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**. ◆ **Event Type**: Types of events to display in the report. Options available are **All logon events**, **Failed logon events** and **Successful logon events**. ◆ **Interval**: Regular interval to track the data point on the chart. ◆ **Users**: To filter records of specific user from directory. ◆ **Events**: To filter records of specific event. ◆ **Chains**: To filter records of specific chain.

Report Type	Description	Available Attributes
Event count line chart group by field	This report tracks and displays logon count of specific parameter. X-axis represents time and Y-axis represents logon count. Data points of different colors represent specific category of the selected parameter. The label for each category is displayed in upper-right corner of the widget. All the data points are plotted and connected with a line to track the maximum and minimum number of logons.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON** to select a specific time interval from the **Relative Interval**. Set this option to **OFF** to select preferred From and To dates from the **Date range**. ◆ **Event Type**: Types of events to display in the report. Options available are **All logon events**, **Failed logon events** and **Successful logon events**. ◆ **Interval**: Regular interval to track the data point on the chart. ◆ **Size**: Number of records to filter in the report. ◆ **Order**: Sorting order of the parameter selected in the **Field**. Options available are **Ascending** and **Descending**. ◆ **Field**: The parameter on which the data is collected to display in the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on. ◆ **Users**: To filter records of specific user from directory. ◆ **Events**: To filter records of specific event. ◆ **Chains**: To filter records of specific chain.

Report Type	Description	Available Attributes
Distinct events count line chart	This report tracks and displays distinct count of all categories in the selected parameter (**Distinct values by field**). X-axis represents time and Y-axis represents distinct logon count. Each data point on the chart represents unique logon count at a specific time. All the data points are plotted and connected with a line to track the maximum and minimum number of distinct logons.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON**, select a specific time interval from the **Relative Interval**. Set this option to **OFF**, select preferred From and To dates from the **Date range**. ◆ **Event Type**: Events to display in the report. Options available are **All logon events**, **Failed logon events** and **Successful logon events**. ◆ **Interval**: Regular interval to track the data point on the chart. ◆ **Distinct values by field**: The parameter on which the data is collected to display in the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on. ◆ **Size**: Number of records to filter in the report. ◆ **Order**: Sorting order of the parameter selected in the **Field**. Options available are **Ascending** and **Descending**. ◆ **Users**: To filter records of specific user from directory. ◆ **Events**: To filter records of specific event. ◆ **Chains**: To filter records of specific chain.

Report Type	Description	Available Attributes
Distinct events count line chart group by field	This report displays and classifies distinct logon count of each event. X-axis represents time and Y-axis represents distinct logon count. Each data point on the chart represents unique logon count of particular event at a specific time. All the data points are plotted and connected with a line to track the maximum and minimum number of distinct logons to particular event.	◆ **Name**: Title of the report. ◆ **Relative Time Interval**: Set this option to **ON**, select a specific time interval from the **Relative Interval**. Set this option to **OFF**, select preferred From and To dates from the **Date range**. ◆ **Event Type**: Events to display in the report. Options available are **All logon events**, **Failed logon events** and **Successful logon events**. ◆ **Interval**: Regular interval to track the data point on the chart. ◆ **Size**: Number of records to filter in the report. ◆ **Order**: Sorting order of the parameter selected in the **Field**. Options available are **Ascending** and **Descending**. ◆ **Field**: The parameter on which the data is collected to display in the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on. ◆ **Distinct values by field**: The parameter on which the data is collected to display in the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on. ◆ **Users**: To filter records of specific user from directory. ◆ **Events**: To filter records of specific event. ◆ **Chains**: To filter records of specific chain.

Following are the generic steps to add a custom report:

1. Click **Reports** in the Administration portal.
2. Click **Add**.
3. Specify the report title in the **Name**.
4. Select the preferred **Report type**. Options available are:
   - Pie chart
   - Stacked chart
   - Activity stream
   - Enroll activity stream
   - Users
   - Authenticators
   - Licenses

- Servers
- Events count line chart
- Events count line chart grouped by field
- Distinct events count line chart
- Distinct events count line chart grouped by field

5 When the **Relative time interval** is set to **ON**, the **Relative Interval** is displayed to select a specific time interval. When set to **OFF**, the date range is displayed to select preferred From and To dates.

6 Select the preferred **Event type**. Options available are **All logon events**, **Failed logon events**, and **Successful logon events**.

7 Select number of records from the **Size** to display in the report.

8 Select sorting order from the **Order**. Options available are **Ascending** or **Descending**.

9 Select the preferred parameter from the **Field**. Based on the selected parameter, the data is collected to display on the report. Options available are **Event Name**, **Chain Name**, **Method Name**, **Endpoint Name** and so on.

10 Specify and select the preferred domain joined user from the **Users** to filter records in the report.

11 Specify and select the preferred event from the **Events** to filter records in the report.

12 Specify and select the preferred chain from the **Chains** to filter records in the report.

13 Click **Save**.

14 Click **Reload** to generate and display the report based on the selected values.

6 Sample Configurations

This section describes how to configure Advanced Authentication with the following example scenarios:

- "Implementing Multi-Factor Authentication to VPN" on page 169
- "Securing Windows Workstation with Multi-Factor Authentication" on page 175

Implementing Multi-Factor Authentication to VPN

Let us assume Reltic Data, Inc. wants to implement multi-factor authentication for its VPN (Virtual Private Network) connection to secure the Corporate network that is accessed from their employees who are in a remote location.

This section explains the prerequisites, flow of actions, and step-by-step configuration details to achieve this.

This example refers to the following user profiles:

- Thomas: An administrator of Reltic Data, Inc.
- Mark Jones: An employee of Reltic Data, Inc.

Thomas, an administrator wants to enforce Multi-factor authentication with the LDAP Password and Smartphone methods for OpenVPN to secure the corporate network. After multi-factor authentication is implemented, employees need to authenticate to both methods successfully to access the network through VPN.

Thomas must perform the following tasks to implement multi-factor authentication for OpenVPN:

1. Add a Repository
2. Configure Methods
3. Create a Chain
4. Configure Public External URLs Policy
5. Assign Chain to RADIUS Server Event
6. Configure the OpenVPN Server

To understand the sequential flow of configuration in the Advanced Authentication Administration portal, see Configuration Flow in Advanced Authentication for RADIUS Server Event.

For information about how an end user enrolls the configured methods and authenticates to VPN client using Advanced Authentication, see End User Tasks.

Prerequisites

Ensure that you meet the following prerequisites:

- An LDAP repository for Reltic Data, Inc is configured and the repository contains the information of all users.

  This example uses **Active Directory Domain Services** as an **LDAP repository**.
- A group named **Employees** is created in Active Directory Domain Services.
- The Advanced Authentication server is installed. For more information, see Installing Advanced Authentication.
- A VPN client is installed on all employees' system.

  This example uses **OpenVPN** as the VPN client.

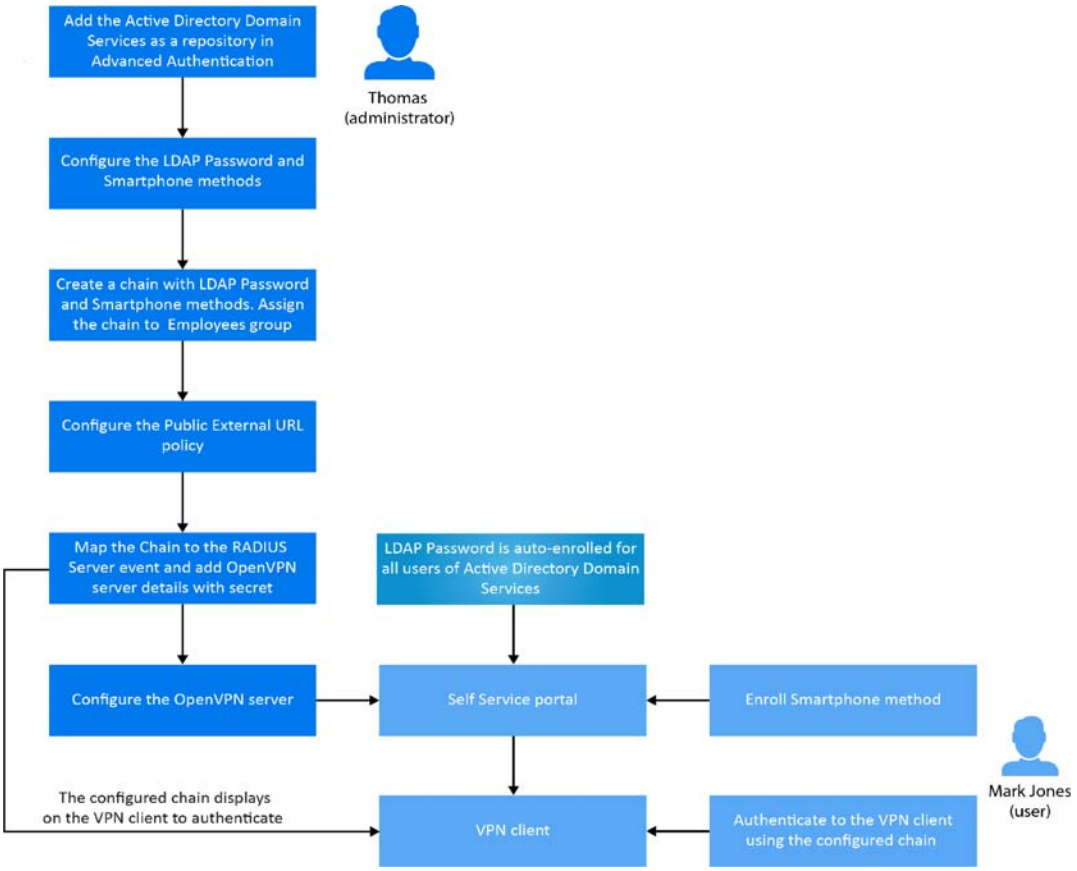
Considerations Before Configuration

Follow these guidelines to begin implementing multi-factor authentication for any event:

1. Identify the authentication methods that you want to configure.
2. Determine the order of methods in the chain. The methods are displayed to the end user in the order that you have configured.
3. Determine the policy that must be configured for the identified method.
4. Identify the user group for which you want to enforce this authentication chain.

Configuration Flow in Advanced Authentication for RADIUS Server Event

The following diagram illustrates the sequential flow of actions required for securing the Open VPN client with multi-factor authentication:



Add a Repository

In Advanced Authentication, add Active Directory of Reltic Data, Inc. as a repository from where the user details are fetched for validation.

Perform the following steps to add Active Directory of Reltic Data, Inc. to Advanced Authentication:

1. Click **Repositories** on the Advanced Authentication Administration portal.
2. Click **Add LDAP repo**.
3. Select **AD** (Active Directory Domain Services) from the **LDAP type list**.
4. Specify a container for the users in **Base DN**. When you select the **Subtree** option, Advanced Authentication performs a search for the users in each child node. You can change the search scope by selecting the **Search one level only** option.
5. Specify a user account in **User** and specify the password of the user in **Password**.

   Ensure that the user's password has no expiry.
6. You can specify a container for the groups in **Group DN (optional)**. When you select the **Subtree** option, Advanced Authentication performs a search for the groups in each child node. You can change the search scope by selecting the **Search one level only** option.
7. Select **DNS discovery** to find LDAP servers automatically. Specify **DNS zone** and **Site name** (optional) and click **Perform DNS Discovery**.

   When the DNS discovery is done, the DNS servers list is updated every three hours.
8. Click **Save**.

NOTE: If an LDAP server is unavailable for 2.5 seconds, Advanced Authentication excludes it from the LDAP requests for a period of 3 minutes.

9 Continue with Configure Methods.

Configure Methods

The LDAP Password and Smartphone methods are configured with pre-defined values. These methods work as expected with the pre-defined values.

For more information, see LDAP Password and Smartphone.

Create a Chain

Perform the following steps to create a chain with LDAP Password and Smartphone methods:

1 Click **Chains > Add** in the Advanced Authentication Administration portal.

2 Specify the following details:

Field	Description
Name	A name for the chain. **NOTE:** Ensure to remember the name of the chain for further use.
Short name	A name that is provided to end user for selecting a chain. For example, you configure a chain named SMS containing LDAP Password and SMS methods. A user can specify <username> sms and the user is required to use SMS as the chain. This is helpful in scenarios when the primary chain is not available.
Is enabled	Set to ON to enable the chain.
Methods	Select the LDAP Password and Smartphone methods to add to the chain.
Roles and Groups	Specify Employees. This enforces all users of this group to use this authentication chain for accessing the corporate network through VPN.

3 Click **Save**.

4 Continue with Configure Public External URLs Policy.

Configure Public External URLs Policy

The external URL manages the following activities for the Smartphone method:

- A push notification that is sent to the NetIQ Advanced Authentication app.
- User responses from the NetIQ Advanced Authentication app.

Perform the following steps to configure the external URL:

1 Click **Policies > Public External URLs** on the Advanced Authentication Administration portal.

2 Click **Edit** and specify the URL in **Public URL**.

Ensure that the Public URL is accessible from users' smartphone.

3 Click **OK**.

4 Continue with Assign Chain to RADIUS Server Event.

Assign Chain to RADIUS Server Event

Perform the following steps to assign the chain to RADIUS Server event and configure details of the Open VPN server with a secret:

1 Click **Events**.

2 Click **Edit** next to the **RADIUS Server** event.

3 Ensure that **Is enabled** is set to **ON**.

4 Select the chains that you have created in Create a Chain.

5 Click **Add** to add and assign a RADIUS Client to the event:

   5a Specify the IP address of the OpenVPN server in **IP Address**.

   5b Specify the OpenVPN server name in **Name**.

   5c Specify the OpenVPN server secret and confirm the secret.

   NOTE: Ensure to make a note of this secret for future reference.

   5d Ensure that the **RADIUS Client** is set to **ON**.

6 Click **Save**.

7 Continue with Configure the OpenVPN Server.

Configure the OpenVPN Server

Perform the following steps to configure the OpenVPN server and enable the server to connect with Advanced Authentication server:

1 Open the OpenVPN Access server site.

2 Click **Authentication > RADIUS**.

3 Enable the **RADIUS authentication**.

4 Select **PAP**.

5 Add an IP address of the Advanced Authentication server and specify the secret that is set while configuring the RADIUS Server event in the Advanced Authentication Administration portal.

You must specify the `<repository name>\<username>` or only *<username>* if you have set the following configurations:

- You have selected a chain from the Used section in the RADIUS Server settings for connecting to OpenVPN.
- You have set the default repository name in **Policies > Login** options of the Advanced Authentication appliance.

End User Tasks

Mark, as an employee, must perform the following actions to access the corporate network of Reltic Data network through OpenVPN:

- "Enroll the Smartphone Method" on page 174
- "Authenticate to OpenVPN Using Advanced Authentication" on page 175

NOTE: The LDAP Password method enrolls automatically and users cannot remove it.

For more information, see LDAP Password.

Enroll the Smartphone Method

Mark must ensure to install the NetIQ Advanced Authentication application on his smartphone to enroll the Smartphone method.

For more information about downloading and installing the NetIQ Advanced Authentication application, see Installing NetIQ Advanced Authentication App.

During the enrollment, Mark must scan a QR code that creates an authenticator on his mobile app. When Mark initiates the authentication, a push notification is sent to the app. Accept the request and get authenticated.

To enroll the Smartphone method with a QR code, perform the following steps:

1. Click the Smartphone icon under the **Add Authenticator** section of the Self-Service portal.
2. (Optional) Specify a comment related to the Smartphone authenticator.
3. (Optional) Select the required category from **Category**.
4. Click **Save**.

   A QR code is displayed.
5. Scan the QR code with the NetIQ Auth app. To do this, perform the following steps:
   - **5a** Open the NetIQ Advanced Authentication app.
   - **5b** Specify a PIN if applicable.
   - **5c** Click the **+** (plus) icon in the **Enrolled Authenticators** screen.

     The camera of your smartphone is launched.
   - **5d** Scan the QR code with the camera.

     A message `Authenticator "Smartphone" added` is displayed.
6. Specify the user name and an optional comment in the app.
7. Tap **Save**.

   The smartphone authenticator is created.

If Mark does not enroll the Smartphone method within few minutes, an error message `Enroll failed: Enroll timeout` is displayed. He can refresh the browser and try enrolling again.

TIP: If you users are unable to scan the QR code with the NetIQ Auth app, they can do the following:

- Zoom the page to 125-150% and scan the zoomed QR code.
- Ensure that nothing overlaps the QR code (mouse cursor, text).

For more information, see Smartphone.

Authenticate to OpenVPN Using Advanced Authentication

1. Launch the OpenVPN client.

   The Login dialog is displayed.
2. Specify **Username** and **LDAP Password**.
3. Open the NetIQ Advanced Authentication app in the mobile phone.

   Specify PIN or touch the enrolled finger that you registered for the app.
4. Tap **Accept** in the **Authentication Requests** screen to accept the authentication request.

   A message `Accepted` is displayed and Mark authenticates to OpenVPN successfully.

Securing Windows Workstation with Multi-Factor Authentication

Let us assume Reltic Data, Inc. wants to implement multi-factor authentication for all Windows workstations to secure the data and provide authorized access to their employees.

This section explains the prerequisites, flow of actions, and step-by-step configuration details to achieve this.

This example refers to the following user profiles:

- Clarie Lee: An administrator of Reltic Data, Inc.
- Sussane Ross: An employee of Reltic Data, Inc.

Clarie, an administrator wants to enforce multi-factor authentication with the U2F and SMS OTP methods for the Windows login. After multi-factor authentication is implemented, employees must authenticate to both methods successfully to access the Windows workstation.

Clarie must perform the following tasks to implement multi-factor authentication for the Windows logon:

1. Add a Repository
2. Configure Methods
3. Create a Chain
4. Configure SMS Sender Policy
5. Assign Chain to Windows Logon Event

To understand the sequential flow of configuration in the Advanced Authentication Administration portal, see Configuration Flow in Advanced Authentication for Windows Logon Event.

For information about how an end user enrolls the configured methods and authenticates to the Windows workstation using Advanced Authentication, see End User Tasks.

Prerequisites

Ensure that you meet the following prerequisites:

- An LDAP repository for Reltic Data, Inc is configured and the repository contains the information of all users.

  This example uses **Active Directory Domain Services** as an **LDAP repository**.
- A group named **Windows OS** is created in Active Directory Domain Services.
- The Advanced Authentication server is installed. For more information, see Installing Advanced Authentication.
- The Advanced Authentication Windows Client is installed on Windows workstation. For more information, see Installing Windows Client.
- A DNS is configured to allow the Windows Client to discover and connect with the Advanced Authentication server. For more information, see Setting a DNS for Advanced Authentication Server Discovery
- The Advanced Authentication Device Service is installed on the Windows workstation. For more information, see Installing Device Service on Windows.
- An account for Reltic Data, Inc is registered with a SMS service provider that can deliver SMS OTP to users during authentication.

  This example uses **Twilio** as the SMS service provider.

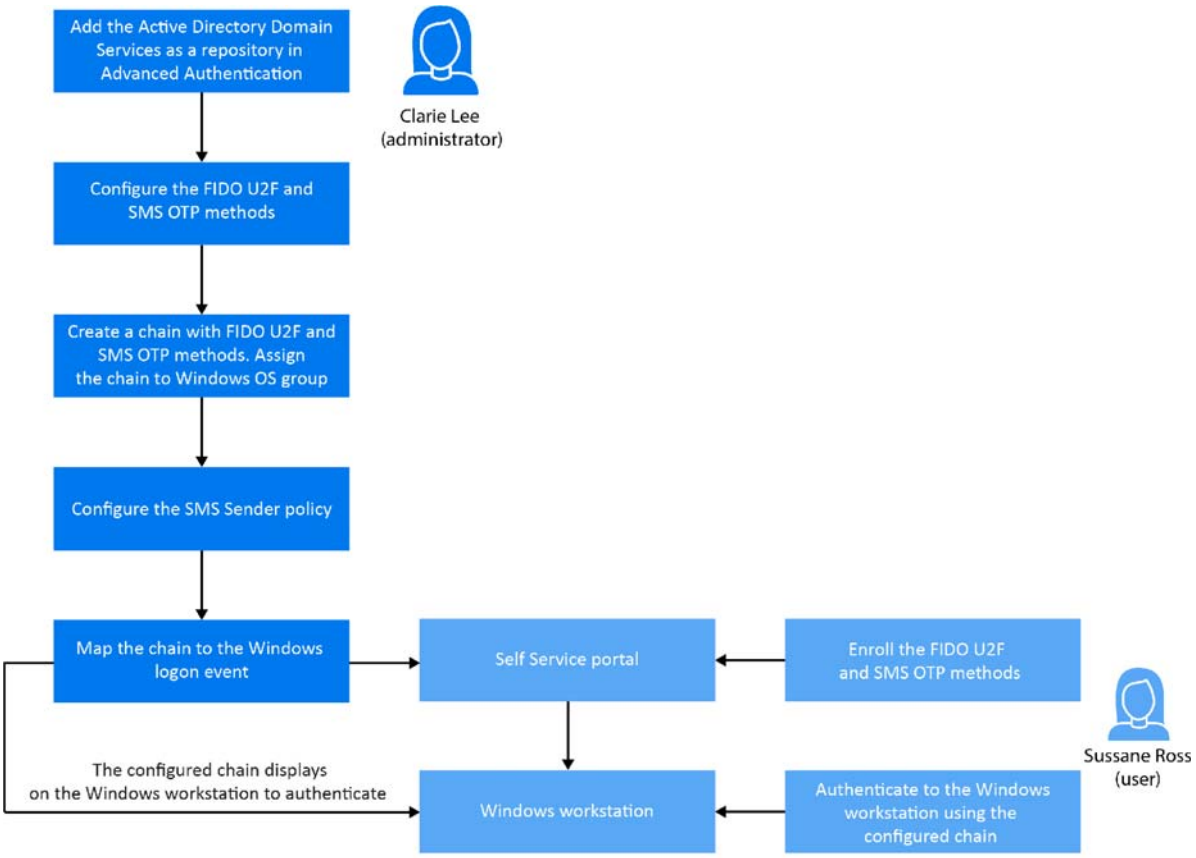
Points to Consider Before Configuration

Consider the following guidelines before you begin implementing multi-factor authentication for the **Windows logon**:

1. Identify the authentication methods that you want to configure.
2. Determine the order of methods in the chain. The methods are displayed to the end user in the order that you have configured.
3. Determine the policy that must be configured for the identified methods.
4. Identify the user group for which you want to enforce this authentication chain.

Configuration Flow in Advanced Authentication for Windows Logon Event

The following diagram illustrates the sequential flow of actions required for securing the Windows workstation with multi-factor authentication:



Add a Repository

In Advanced Authentication, add Active Directory of Reltic Data, Inc. as a repository from where the user details are fetched for validation.

Perform the following steps to add Active Directory of Reltic Data , Inc. to Advanced Authentication:

1. Click **Repositories** on the Advanced Authentication Administration portal.
2. Click **Add LDAP repo**.
3. Select **AD** (Active Directory Domain Services) from the **LDAP type** list.
4. Specify a container for the users in **Base DN**. When you select the **Subtree** option, Advanced Authentication performs a search for the users in all the child nodes. You can change the search scope by selecting the **Search one level only** option.
5. Specify a user account in User and specify the password of the user in **Password**.

   Ensure that the user's password has no expiry.
6. You can specify a container for the groups in **Group DN (optional)**. When you select the **Subtree** option, Advanced Authentication performs a search for the groups in all the child nodes. You can change the search scope by selecting the **Search one level only** option.
7. Select **DNS discovery** to find LDAP servers automatically. Specify the **DNS zone** and **Site name** (optional) and click **Perform DNS Discovery**.

When the DNS discovery is done, the DNS servers list is updated every three hours.

8 Click **Save**.

NOTE: If an LDAP server is unavailable for 2.5 seconds, Advanced Authentication excludes it from the LDAP requests for a duration of 3 minutes.

---

9 Continue with Configure Methods.

Configure Methods

Perform the following steps to configure the U2F and SMS OTP methods:

1 Click **Methods** on the Advanced Authentication Administration portal.

2 Click the **Edit** icon corresponding to the U2F method.

3 Perform the following steps to configure the U2F method:

- **3a** Set **Require attestation certificate** to **ON** to enable validation of the attestation certificate.
- **3b** Select the attestation certificate:
  - **3b1** To use a default certificate, click **Add Default**.
  - **3b2** To use a custom certificate instead of predefined device manufacturer certificate, perform the following steps:
    - **3b2a** Click next to the default attestation certificate to remove the certificate.
    - **3b2b** Click **Add** to add a custom certificate.
    - **3b2c** Click **Browse** and select the custom certificate and click **Upload**.

      The certificate must be in the PEM format.
- **3c** Click **Save**.

4 Configure the SMS OTP method.

- **4a** Click the Edit icon corresponding to SMS OTP method.
- **4b** Specify the following details to configure SMS OTP method:

Parameter	Description
OTP Period	The lifetime of an OTP in seconds. The default value is 120 seconds.
OTP format	The number of digits in the OTP. The default value is 6.
Body	The text in the SMS that is sent to the user. The following structure describes the text in the OTP: ◆ {user}: Name of the user. {endpoint}: Device the user is authenticating to. {event}: Name of the event where the user is trying to authenticate to. ◆ {otp}: One-Time Password.
Allow overriding phone number	Set this option to **OFF** to prevent users to specify a different phone number during the enrollment. The option is set to ON by default.
Allow user enrollment without a phone	Set this option to **OFF** to ensure that a user does not enroll the SMS OTP authenticator without a phone. The user is prompted with an error message that you can specify in Error message. Set this option to **ON** to allow the user to enroll the SMS OTP authenticator without a phone.

4c Click **Save**.

5 Continue with Create a Chain.

Create a Chain

Perform the following steps to create a chain with the U2F and SMS OTP methods:

1 Click **Chains > Add** in the Advanced Authentication Administration portal.

2 Specify the following details:

Field	Description
Name	A name for the chain. **NOTE:** Ensure to remember the name of the chain for further use.
Short name	This is not applicable for the Windows Client event. This is applicable only for the RADIUS Server event.
Is enabled	Set to **ON** to enable the chain.
Methods	Select the U2F and SMS OTP methods to add to the chain.
Roles and Groups	Specify Windows OS users. This enforces all users of this group to use this authentication chain for logging in to the Windows workstation.

3 Click **Save**.

4 Continue with Configure SMS Sender Policy.

Configure SMS Sender Policy

In Advanced Authentication, add Twilio details of Reltic Data, Inc. as a service provider that sends SMS OTP to the end users during authentication.

Perform the following steps to configure the details of Twilio in Advanced Authentication:

1. Click **Policies > SMS Sender** in the Advanced Authentication Administration portal.
2. Select **Twilio** in Sender service.
3. Specify the masked value that you want to display for the SMS in **Recipient Mask**.

   The SMS OTP of the users is masked when users authenticate with the SMS OTP method.

   NOTE: The **Recipient Mask** value is predefined and if you do not change the value, the default value is considered for masking of the SMS OTP.

   ---

4. Specify the following details:
   - **Account sid** and **Authentication token**: In Twilio, the Account SID acts as a username and the Authentication Token acts as a password.
   - **Sender phone**: Sender's phone number.
5. You can test the configurations for the SMS sender policy in the **Test** section.
   1. Specify the phone number in **Phone** to which you want to send the SMS OTP.
   2. Specify a message to be sent to the phone in **Message**.
   3. Click **Send test message!**.
6. Click **Save**.
7. Continue with Assign Chain to Windows Logon Event.

Assign Chain to Windows Logon Event

Perform the following steps to assign the chain to Windows logon event:

1. Click **Events**.
2. Click **Edit** next to the **Windows Logon** event.
3. Ensure that **Is enabled** is set to **ON**.
4. Select the chains that you have created in Create a Chain.
5. Click **Save**.

End User Tasks

Sussane must perform the following tasks to authenticate to the Windows workstation with the configured methods:

- "Enroll the FIDO U2F Method" on page 181
- "Enroll the SMS OTP Methods" on page 181
- "Authenticate to the Windows Workstation Using Advanced Authentication" on page 181

Enroll the FIDO U2F Method

1 Log in to the Advanced Authentication Self-Service portal.

2 Click the U2F icon in **Add Authenticator**.

A message `Press button "Save" to begin enrolling.` is displayed.

3 (Optional) Specify a comment related to U2F in **Comment**.

4 (Optional) Select the preferred category from **Category**.

5 Click **Save**.

A message `Please touch the flashing U2F device now` is displayed. You may be prompted to allow the site permissions to access your security keys.

6 Touch the FIDO U2F button when there is a flash on the device.

A message `Authenticator "U2F" enrolled` is displayed. If there is no flash for more than 10 seconds, reconnect your token and repeat the steps.

Enroll the SMS OTP Methods

NOTE: The SMS OTP method enrolls automatically if a phone number is specified in the user profile in Active Directory.

---

1 Click the SMS OTP icon in **Add Authenticator**.

2 (Optional) Specify a comment related to SMS OTP authenticator in **Comment**.

3 (Optional) Select the preferred category from **Category**.

4 Specify the mobile number in **Phone number**.

5 Click **Save**.

A message `Authenticator "SMS OTP" has been added` is displayed.

Authenticate to the Windows Workstation Using Advanced Authentication

1 Switch ON the Windows workstation.

The Sign in screen is displayed.

2 Specify **Username**.

Ensure the FIDO U2F device is plugged to the workstation.

3 Touch the FIDO U2F button when there is a flash on the device.

4 Specify the OTP that is sent to the phone.

Sussane gets authenticated to the Windows workstation successfully.

7 Configuring a Cluster

In a production environment, you must use more than one Advanced Authentication server for fault tolerance and redundancy. For load balancing, see "Installing a Load Balancer for Advanced Authentication Cluster".

In Advanced Authentication, a cluster consists of sites. Each site is installed in a specific geographical location and contains the following:

- A DB Master server
- One or two DB servers that are used for only backup and fail-over
- Maximum of 6 Web servers without a database that are used in combination with a third-party load balancer for load balancing.

All these servers handle the authentication requests from clients of the same location. The Advanced Authentication server that you deploy first gets the Global Master and Server Registrar roles.

This chapter contains the following sections:

- "Registering a New Site" on page 185
- "Registering a New Server" on page 186
- "Monitoring Outgoing Replication Batches" on page 188
- "Resolving Conflicts" on page 189
- "Installing a Load Balancer for Advanced Authentication Cluster" on page 189
- "Restoring Operations When a Global Master Server is Broken" on page 194
- "Restoring Operations When a Database Master of the Secondary Site is Broken" on page 195

To configure an Advanced Authentication cluster, perform the following steps:

1. Click **Cluster** in the Administration portal.
2. You must create a Global Master. Click **Set up Global Master** to create a Global Master.
3. Specify the Global site name in **Enter name of the site. Renaming not supported**. The Global site name must be in lower case and can contain latin characters, digits, and underscores.
4. Click **OK**.

   In **DB servers**, the following information about each server in the list is displayed:

   - **Site**: Name of the site.
   - **Mode**: Mode of the server. The options are:
     - Global Master
     - DB Master
     - DB Server-1
     - DB Server-2
   - **Host**: IP address of the host.

- **Desc**: Status of the server. Click the edit icon to add or edit the description.
- **Heartbeat**: Time of the last ping. Each server is pinged every 5 minutes.

IMPORTANT: Ensure to take regular snapshots of all the DB servers at the same time or to clone them to protect the environment from any hardware issues or accidental failures. It is recommended to do this for the following scenarios:

- Each time you change the configuration of repositories, methods, chains, events, and policies.
- After performing the enrollment.

  In large companies, the enrollment can be used on a daily basis as a massive enrollment. In such scenarios, it is good to create snapshots regularly (it can be fortnightly or monthly).
- When you are adding or removing servers in the cluster.
- Before you upgrade Advanced Authentication servers in the environment.

You can convert a DB server of the primary site to a Global Master server or a DB server of a site to a DB Master server of the same site. You must update the DNS settings after the conversion. If the Global Master and the DB servers from the primary site are lost, you cannot replace them.

NOTE: All the servers in a cluster must have the same version.

---

5 Click **Register new site** if your company is geographically distributed and to deploy a DB Master server in another site. For information about creating a new site, see Registering a New Site.

6 Click **Register new server** to register a new server in one of the existing sites. For information about creating a new site, see Registering a New Server.

IMPORTANT: For the replication to work, it is important to have the same time on the Advanced Authentication servers. Ensure that the NTP port 123 (UDP) is open on your corporate firewalls to allow the Advanced Authentication servers to sync time on the predefined NTP servers or specify your internal NTP servers.

If you have configured a cluster and you receive a replication conflict, click Resolving Conflicts.

NOTE: If you delete DB Master server of a site from the **Cluster** page of the Global Master, there is no provision to add it back. The deleted DB Master server of that site loses connection to other servers and this is replicated across the sites. You must deploy the DB Master server of that site again.

For example, a cluster consists of three sites: Site1, Site2, and Site3. The Global Master server is in Site1. Site2 and Site3 have DBM1 and DBM2. If you delete DBM1 from the Site2, you will not be able to add DBM1 back to the cluster.

Performing a Health Check of the Advanced Authentication Servers

You can use API to configure third-party tools to perform a health check of the Advanced Authentication servers.

Registering a New Site

You must register a new site to deploy Advanced Authentication in a new geographical location. For example, a cluster has a single **site A.** To deploy an Advanced Authentication server at **site B**, you must register a new Advanced Authentication site. With the registration of the new site, you must configure a DB Master in the site.

Before registering a new site, ensure that the following requirements are met:

- You have an administrator's privilege to access the Advanced Authentication Server Registrar.
- You have installed the Advanced Authentication server appliance that has the same version as the Global Master server. Ensure that you have not configured for a DB server in the new site.

To register a new site and to deploy a DB Master server in the site, perform the following steps:

1. Open the database port `<Registrar_host_name>:5432` on your NAT/Firewall.
2. Open the Advanced Authentication Configuration Wizard for a new installed server: `https://<New_Server_host_name>`.
3. Select **Existing cluster** in the first **Server Mode**.
4. Click **Next.**
5. Specify the server DNS hostname in **My DNS hostname**.

   WARNING: You must specify a DNS hostname instead of an IP address because appliance does not support the changing of IP address.

6. Click **Next**.
7. Specify a password for the **LOCAL\admin** account.

   You may get the error `Remote host returned error: Wrong password of key file (AuError)` when you are trying to deploy a DB server on the previous versions of Advanced Authentication server. You must have Advanced Authentication 5.5-326 or later installed.

8. Click **Next**.

   In **Import database information**, a message `Waiting for Global Master....` is displayed.

9. Goto the Advanced Authentication Administration portal of the Advanced Authentication Server Registrar.
10. Click **Register new site** in **Cluster**.
11. Specify a host name for the new DB server of the new site in **Master server host**.

    TIP: If the new server is behind NAT, you can forward its port 443 on a temporary basis and specify an external `hostname:port`. You must close the port after installation.

12. Specify a name of the new site in **Site name**.
13. Click **Register**.

    After successful registration, a message `Success! Continue server install` is displayed.

    DB Master server is displayed in **DB servers**, for the newly created site. The record is marked in red.

14. Go to the new server and click **Next**.

15 Click **Copy**.

The server is automatically restarted within 60 seconds after the database completes copying from a Global Master server.

16 Go to the Advanced Authentication Server Registrar. The newly deployed server is displayed in **DB servers**.

NOTE: Each of the DB servers in the list is pinged every 5 minutes. If an issue occurs, the server is marked in red. To view the details of connectivity issues click **View log.** To view the replication issues, click **Conflicts**.

---

17 Close the database port `<Registrar_host_name>:5432` on your NAT/Firewall.

18 To add LDAP servers for the new site, perform the following steps:

18a Log in to the Administration portal on the DB Master of the new site.

18b Click **Repositories**.

18c Edit the existing repository.

18d Add the LDAP Servers.

18e Save the changes.

NOTE: These changes are replicated only within a site.

NOTE

- You must install the new servers one at a time. Simultaneous installations may cause replication issues.
- The inter-site replication interval is 10 seconds.

Registering a New Server

You must register a new server to an existing Advanced Authentication site.

After you create a Global Master (in the primary site) or a DB Master (in the secondary site), you must deploy DB servers for database backup. For this, you must register a new server or a Web server.

Before registering a new site, ensure that the following requirements are met:

- You have an administrator's privilege to access the Advanced Authentication Server Registrar.
- You have installed the Advanced Authentication server appliance that has the same version as the Global Master server. Ensure that you have not configured for a new server.

To deploy a new DB server or a Web server in an existing site, perform the following steps:

1 Open the database port `<Registrar_host_name>:5432` on your NAT/Firewall if you are deploying a DB server.

2 Open the Advanced Authentication Configuration Wizard for a new installed server: `https://<New_Server_host_name>`.

3 Select **Existing cluster** in the first **Server Mode**.

4 Click **Next.**

5 Specify the server DNS hostname in **My DNS hostname**.

WARNING: You must specify a DNS hostname instead of an IP address because appliance does not support the changing of IP address.

---

6 Click **Next**.

7 Specify a password for the **LOCAL\admin** account.

You may get the error `Remote host returned error: Wrong password of key file (AuError)` when you are trying to deploy a DB server on previous versions of Advanced Authentication server. You must have Advanced Authentication 5.5-326 or later installed.

8 Click **Next**.

In **Import database information**, a message `Waiting for Global Master....` is displayed.

9 Goto the Advanced Authentication Administration portal of the Advanced Authentication Server Registrar.

10 Click **Register new server** in **Cluster**.

11 Specify the new server's host name in **Server host**.

TIP: If the new server is behind NAT, you can forward its port 443 on a temporary basis and enter external hostname:port. You must close the port after installation.

---

12 Select one of the following servers:

- **Web Server:** This server does not contain a database. Web server responds to authentication requests and connects to the DB Master database. You need more Web servers to serve more workload. You must not deploy more than 5-6 web servers per site.
- **DB Server**: The database is used for backup and fail-over. Two DB servers can be created within a site. When the DB Master is down, a DB server responds to the database requests. When the DB Master is available again, the DB server synchronizes with the Master and the DB Master becomes the primary point of contact for database requests again. The DB server is inactive under normal circumstances.

  During the installation process, the DB server copies the database from its DB Master. Ensure to close the Global Master port 5432.

NOTE: The DB server also handles the authentication request in the same way as the Web server. When handling the authentication requests, the DB or Web servers connect to the Master server for database related operations.

NOTE: If you select **DB Server**, you must copy the database from Global Master. Open database port `<Registrar_host_name>:5432` on your NAT/Firewall. You must close the port after installation.

---

13 Select the site in **Add server to the site**.

14 Click **Register**.

15 Go to the new server and click **Next**.

WARNING: While you are registering a secondary DB server for the secondary site, ensure to wait till the secondary DB server is displayed under the Master DB server of secondary site. Then, click **Copy** in **Copy database**.

16 If you select **DB Server,** click **Copy** in **Copy database**.

WARNING: Ensure not to click **Next** or **Back** button while the database copy is in progress.

The server is automatically restarted within 60 seconds after the database completes copying from a Global Master server.

17 If you select **DB Server**, goto the Advanced Authentication Server Registrar. The newly deployed server is displayed in **DB servers.**

NOTE: Each of the DB servers in the list are pinged for every 5 minutes. If an issue occurs, the server is marked in red. To view the details of connectivity issues click **View log.** To view the replication issues, click **Conflicts**.

18 Close the database port `<Registrar_host_name>:5432` on your NAT/Firewall if you have opened it.

NOTE: You must install the new servers one at a time. Simultaneous installations may cause replication issues.

Monitoring Outgoing Replication Batches

You can monitor the last 200 outgoing batches from the Master server to the peer DB servers on the same site and to the Master server on other sites in the cluster. This includes batches which have already been replicated and the batches in error. The batches are transmitted to replicate information about the changes that are made to the database. The changes include new entry, update, and delete actions to all DB servers in the cluster.

When a Master server sends the batch to the target server, the status displays **NE** indicating that the new batch of data is transmitted. After receiving the response from the target server, the **Status** of that particular batch will set one of the following values:

- **OK**: Indicates that the batch is successfully received by the target server.
- **ER**: Indicates that there is conflict on the target server. An error while sending the batch may also result in the status ER.

To monitor outgoing batches, click **Cluster** in administration portal, and then click **Batches**. You can view the following information about each transmitted batch:

- **Server**: IP address of the target server to which the batches are sent.
- **Status**: Status of the transmitted batch. Possible statuses are NE, OK, and ER.
- **BatchID**: Unique ID of a batch that is sent to the target server.
- **What**: Details of information that the corresponding batch includes.
- **When**: Time when the batch is transmitted.

Resolving Conflicts

In Advanced Authentication, conflicts can occur if two servers try to configure the same object. For example, MasterX and MasterY create a same login chain **Visitor**. This can lead to a conflict because both try to send **Visitor** to each other. If a conflict occurs, the replication between the conflicting servers stops. Replication uses **last-write-wins** policy. Conflicts can occur for one of the following reasons:

- During upgrade when a new server communicates with the old server.
- When two unique objects have been added.

Outgoing conflict indicates an incoming conflict on the destination server. Unique object collision causes two corresponding conflicts: incoming and outgoing conflicts on both the source and target servers.

You can resolve the conflict in one of the following ways:

- **Simplest way**: Click **Fix** on both the servers.
- **Smarter way**: Click **Fix** on a server in one site and click **Forget** on a server in the other site.
- **Possible way**: Click **Forget outgoing** on the servers in both the sites. You can use this method for UPDATE conflicts. Object changes are lost but will sync on next object change.
- **Zero way**: Source server automatically re-sends the changes until you forget the outgoing conflict.
- **Purge working tables**: This method is used as a last resort. If you see low-level errors in the replication log, if conflict resolution does not work for you, you may force the replication system to forget all pending replicas and re-initialize.

Advanced Authentication scans for the replication conflicts, automatically. To resolve the existing conflicts, in the **Cluster** section of the Advanced Authentication Server Registrar, click **Conflicts**. If no conflicts are detected, only the information is displayed. If there are any conflicts, the details and controls to resolve the conflicts are displayed. You will get a confirmation request with each action. The confirmation contain notes that help you to resolve the conflicts.

Installing a Load Balancer for Advanced Authentication Cluster

You can install a Load balancer and configure it through a third-party software. The following example guides you on how to install and configure nginx as a load balancer on Ubuntu 16.04.

NOTE: Advanced Authentication supports DNS round-robin and third-party VIP, but only with Sticky sessions. The DNS Discovery mechanism is excluded from the workflow. Advanced Authentication clients are pointed to a load balancer that manages all traffic.

Target configuration:

	Hostname	IP address	Role	Operation System
Domain controller	win-dc.utopia.locl	192.168.1.56	AD DS, DNS	Windows Server 2012 R2
Advanced Authentication	aaf-clu-gm.utopia.locl	192.168.1.70	Global Master	Advanced Authentication
Advanced Authentication	aaf-clu-gs.utopia.locl	192.168.1.71	Slave	Advanced Authentication
Load balancer	llb.utopia.locl	192.168.1.138	Nginx load balancer	Ubuntu 16.04
Client	windows7v5.utopia.locl	192.168.1.61	AA Client	Windows 7 x64

Before you start the configuration, ensure that the following requirements are met:

- Repository is configured in Advanced Authentication appliance.
- Both Advanced Authentication servers are installed and configured as Master and DB server.
- Appropriate entries are added to DNS.
- Ubuntu 16.04 is installed.

Installing nginx on Ubuntu 16.04

1 Update repository and install nginx:.

   1a `apt-get update`

   1b `apt-get install nginx`

2 Start nginx and ensure that web server is working.

   2a `sudo service nginx restart`

3 Open your browser and go to the web server `http://192.168.1.138`.

Configuring nginx

The following load balancing methods are supported in nginx.

- **round-robin**: The requests to the application servers that are distributed in a round-robin fashion.
- **least-connected**: Next request assigned to the server with the least number of active connections.
- **ip-hash**: A hash-function that is used to determine which server must be selected for the next request (based on the client's IP address).

This document describes the ip-hash configuration because the REST queries that are balancing require sticky-session enabled and ip-hash is a similar mechanism.

In this document, the ip-hash configuration has been described because for the REST queries that are balancing, the sticky-session must be enabled. The ip-hash has a similar mechanism.

To configure nginx, perform the following steps:

1. Create a backup of the original configuration file by running the following command:

   `sudo cp /etc/nginx/nginx.conf /etc/nginx/nginx.conf_original`.

   NOTE: This configuration file allows to balance REST, Administration, and Self-Service portal requests.

2. Copy the certificate from any Advanced Authentication server in a cluster from the directory `/etc/nginx/cert.pem` to the same directory on a load balancer.
3. Open the `nginx.conf` file and replace with the following:

```
user www-data;
worker_processes auto;
pid /run/nginx.pid;

events {
  worker_connections 768;
  # multi_accept on;
}

http {

  ##
  # Basic Settings
  ##

  sendfile on;
  #tcp_nopush on;
  #tcp_nodelay on;
  keepalive_timeout 65;
  types_hash_max_size 2048;
  # server_tokens off;

  # server_names_hash_bucket_size 64;
  # server_name_in_redirect off;

  #include /etc/nginx/mime.types;
  #default_type application/octet-stream;

  ##
  # SSL Settings
  ##

  ssl_protocols TLSv1 TLSv1.1 TLSv1.2; # Dropping SSLv3, ref: POODLE
  ssl_prefer_server_ciphers on;
  ssl_certificate /etc/nginx/cert.pem;
  ssl_certificate_key /etc/nginx/cert.pem;

  ##
  # Logging Settings
  ##

  access_log /var/log/nginx/access.log;
```

```
  error_log /var/log/nginx/error.log;

  ##
  # Gzip Settings
  ##

  gzip on;
  gzip_disable "msie6";
  gzip_vary on;
  gzip_proxied any;
  gzip_comp_level 6;
  gzip_buffers 16 8k;
  gzip_http_version 1.1;
  gzip_types text/plain text/css application/json application/
javascript text/xml application/xml application/xml+rss text/
javascript;

  ##
  # Virtual Host Configs
  ##

  include /etc/nginx/conf.d/*.conf;
  include /etc/nginx/sites-enabled/*;
  resolver 192.168.1.56 valid=300s ipv6=off; # ip address of DNS
  resolver_timeout 10s;
  upstream aaf-clu {
      ip_hash; # Type of load balancing mechanism
      server aaf-clu-gm.utopia.locl:443; #192.168.1.70:443;
      server aaf-clu-gs.utopia.locl:443; #192.168.1.71:443;
    }

  server {
          listen 443 ssl;
          # Rule for REST
          location ~ ^/rest/user/api/ {
            proxy_set_header X-Real-IP $remote_addr;
                  proxy_set_header X-Forwarded-Server $host;
                  proxy_set_header X-Forwarded-For
$proxy_add_x_forwarded_for;
                  proxy_set_header Host $host;
                  proxy_pass https://aaf-clu$uri?$args;
              }
      location ~ ^/admin {
            proxy_set_header X-Real-IP $remote_addr;
                  proxy_set_header X-Forwarded-Server $host;
                  proxy_set_header X-Forwarded-For
$proxy_add_x_forwarded_for;
                  proxy_set_header Host $host;
                  proxy_pass https://aaf-clu$uri?$args;
              }
            location ~ ^/static {
          proxy_set_header X-Real-IP $remote_addr;
          proxy_set_header X-Forwarded-Server $host;
          proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
          proxy_set_header Host $host;
```

```
            proxy_pass https://aaf-clu$uri?$args;
          }
        location ~ ^/helpdesk {
            proxy_set_header X-Real-IP $remote_addr;
            proxy_set_header X-Forwarded-Server $host;
            proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
            proxy_set_header Host $host;
            proxy_pass https://aaf-clu$uri?$args;
          }
        location ~ ^/account {
            proxy_set_header X-Real-IP $remote_addr;
            proxy_set_header X-Forwarded-Server $host;
            proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
            proxy_set_header Host $host;
            proxy_pass https://aaf-clu$uri?$args;
          }
    location ~ ^/osp/ {
                        proxy_set_header X-Real-IP $remote_addr;
    proxy_set_header X-Forwarded-Server $host;
                        proxy_set_header X-Forwarded-For
    $proxy_add_x_forwarded_for;
    proxy_set_header Host $host;
                        proxy_pass https://aaf-clu$uri?$args;
    }
          }
    }
```

Performing a Health Check of the Advanced Authentication Servers

You can use API to configure third-party tools to perform a health check of the Advanced Authentication servers.

Configuring Advanced Authentication Client

To point the Advanced Authentication client to a load balancer, you must make some changes after installing the client on a workstation.

1. Install Windows Client. To install Windows Client, see "Installing Windows Client" in the *Advanced Authentication - Windows Client* guide.
2. Open the configuration file: `C:\ProgramData\NetIQ\Windows Client\config.properties`.
3. Set the parameter `discovery.host = <IP_address/hostname_loadbalancer>`.

   This configuration points Advanced Authentication Client to a load balancer that manages the traffic between the Advanced Authentication server and Advanced Authentication Client (REST API).

Restoring Operations When a Global Master Server is Broken

When a GMS (Global Master server) breaks, restore it from backup or a snapshot. If this does not work, perform the following steps to convert an existing DB server from the same site as GMS to a new GMS and deploy a new DB server.

WARNING: It is recommended that you prepare a snapshot of the DB server which you are going to convert, to ensure that you have a backup in a scenario where the conversion fails. Conversion is a risky operation and can be performed only if you do not have the snapshots to which you can revert the broken server to.

As a pre-requisite, ensure that the GMS is turned off.

1. Open the Advanced Authentication Administration portal on the DB server.
2. Click **Cluster**.

   Wait until you see the **Cluster** section updated.
3. Click **Failover**.
4. Open database port 5432 (TCP/UDP) on your NAT/Firewall for a time of conversion.
5. Click **Convert to Global Master**.
6. Click **OK**.
7. When you see **Cluster** again, close the database port.
8. If you have been using the RADIUS server, you must reconfigure the settings.
   - **8a** In the Administration portal, click **Events** and edit the **RADIUS Server** event.
   - **8b** Check the configuration including the **Clients** section.
   - **8c** Click **Save** to reconfigure the RADIUS server.
9. Update the DNS so that the DNS name of the lost GMS resolves the IP address of the server being converted.

   IMPORTANT: Do not change the IP addresses of working servers.

   ---
10. Update the load balancer configuration if required.
11. Install a new server with an `ISO` file of the same version as on the new GMS and configure a new DB server instead of the converted one.

    NOTE: If you have two DB servers in the site, you must reinstall the second DB server to get the latest database.

    WARNING: Do not use the previously used IP address and DNS name for the new Advanced Authentication server.

    ---
12. Log in to the Administration portal on Web servers. If you are not able to log in, reboot the Web servers. If you are still unable to log in, redeploy the Web servers.

NOTE: The new Global Master Server is displayed with the name of the old Global Master server on the **Cluster** tab. You cannot change the name of the new Global Master server, because a conversion to Global Master is just a replacement of physical server.

Restoring Operations When a Database Master of the Secondary Site is Broken

When a DB Master of the secondary site fails, you can restore it from backup or a snapshot. If this does not work, perform the following steps to promote a DB server from the same site to a new DB Master.

WARNING: It is recommended to prepare a snapshot of the DB server before conversion to ensure that you have a backup if the conversion fails. Conversion is a risky operation and can be performed only if you do not have the snapshots of the broken server to restore.

Ensure that the DB Master is turned off as a pre-requisite.

1. Open the Advanced Authentication Administration portal on the GMS.
2. Click **Cluster**.
3. Click Edit for any DB server which must be converted to DB Master in the same site.
4. Click **Convert**.

   Wait until the conversion is complete.
5. Open the Advanced Authentication Administration portal of the DB server (DB server that is converted to DB Master in step 3).
6. Click **Cluster**.
7. Click **Failover**.
8. Click **Convert to DB Master**.

   Wait till the conversion is complete.
9. Reboot all the servers.

8 Enrolling the Authentication Methods

Advanced Authentication server supports the following ways to enroll the authentication methods:

- **Automatic enrollment**: This type of enrollment is used for the **SMS**, **Email**, **RADIUS**, **LDAP Password**, and **Swisscom Mobile ID** methods.

  The methods are enrolled automatically if the chains containing them are assigned to any event.

- **Enrollment by Administrator**: This type of enrollment is used for the **OATH Tokens**.

  An administrator can import tokens from the PSKC or CSV files in the **Administration portal** > **Methods** > **OATH OTP** > **OATH Tokens** tab. You can assign tokens to the specific users.

- **Enrollment by Helpdesk administrator**: This type of enrollment is used by the Helpdesk administrator.

  A Helpdesk administrator can access the Helpdesk portal with the address: `https://<NetIQ Server>/helpdesk`. In the Helpdesk portal, the Helpdesk administrator can enroll the authentication methods for users. A Helpdesk administrator must be a member of the **Enroll Admins** group **(Repositories > Local > Edit > Global Roles**) to manage users' authenticators.

- **Enrollment by User**: This method is applicable for the users. A user can access the Self-Service portal with the address: `https://<NetIQ Server>/account`, where the users can enroll any of the authentication methods.

11 Configuring Integrations

Advanced Authentication facilitates clients to integrate with the third-party solutions using the following interface.

- OAuth 2.0
- RADIUS Server
- SAML 2.0
- REST API

The information about configuring Advanced Authentication with some of the third party solutions is as follows:

- Configuring Integration with Barracuda
- Configuring Integration with Citrix NetScaler
- Configuring Integration with Dell SonicWall SRA EX-Virtual Appliance
- Configuring Integration with FortiGate
- Configuring Integration with OpenVPN
- Configuring Integration with Salesforce
- Configuring Integration with ADFS

9 OAuth 2.0

In OAuth 2.0 authorization, the third-party client requests access to the resources that are controlled by the resource owner. Instead of using the resource owner's credentials to access the protected resources, the third-party client obtains an access token. The third-party clients can be web applications, mobile phones, handheld devices, and desktop applications.

This section contains the following topics:

- "Building Blocks of OAuth 2.0" on page 201
- "Sample OAuth 2.0 Application Integrated with Advanced Authentication" on page 204
- "OAuth 2.0 Attributes" on page 210
- "Non Standard Endpoints" on page 211

Building Blocks of OAuth 2.0

The following are the building blocks of OAuth 2.0.

- OAuth 2.0 Roles
- OAuth 2.0 Grants

OAuth 2.0 Roles

OAuth 2.0 consists of the following four roles:

- **Resource Owner:** Entity that grants access to a protected resource. It can be a system or a person (end-user) owning the resources.
- **Resource Server:** Server that hosts the protected resources. It accepts and responds to the protected resource requests using the access tokens.
- **Client:** Application that requests and get authorization on behalf of the resource owner to access a protected resource.
- **Authorization Server:** Server that issues access tokens to the client after the successful authentication of the resource owner and obtaining authorization.

OAuth 2.0 Grants

By default, Advanced Authentication supports the following OAuth 2.0 grant types. However, if you require to use the **Resource owner password credential** grant, you have to enable it using Advanced Authentication settings. For more information on OAuth 2.0 grant types, see the link (https://tools.ietf.org/html/rfc6749).

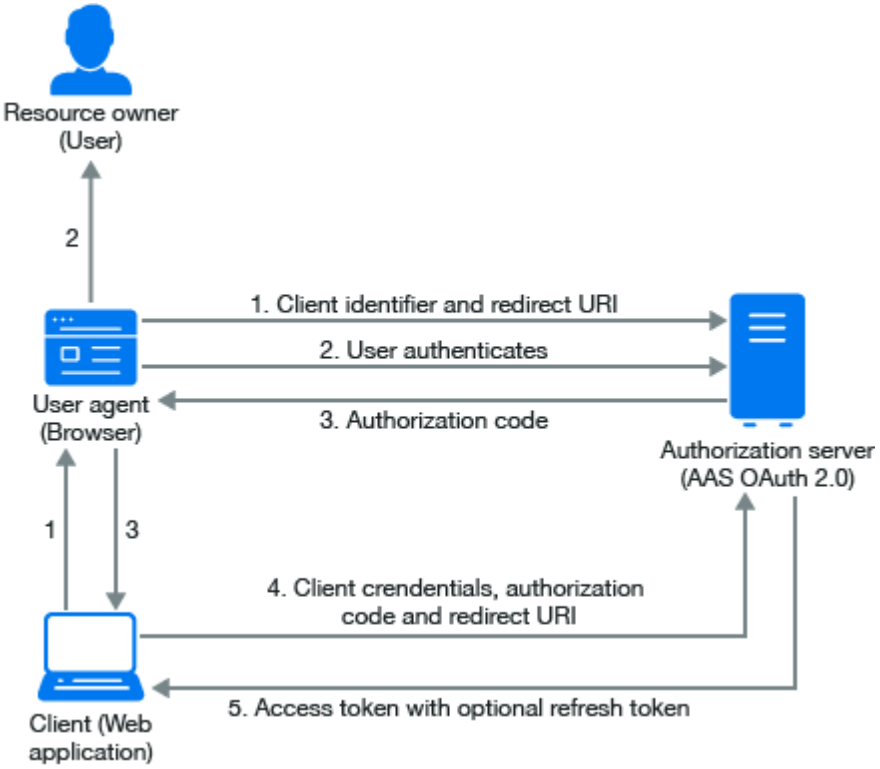
- "Authorization Code" on page 202
- "Implicit Grant" on page 203

Authorization Code

In authorization code, an authorization server acts as an intermediary between the client and the resource owner. Instead of requesting authorization directly from the resource owner, the client directs the resource owner to an authorization server, which in turn directs the resource owner back to the client with the authorization code.

The authorization grant type depends on the method used by the application to request authorization, and the grant types supported by the API.

The following diagram describes the workflow of authorization code grant.



The workflow for authorization code includes the following steps:

1. The OAuth client initiates the flow when it directs the user agent of the resource owner to the authorization endpoint. The OAuth client includes its client identifier, requested scope, local state, and a redirection URI.
2. The authorization server authenticates the resource owner through the user agent and recognizes whether the resource owner grants or denies the access request.
3. If the resource owner grants access, the OAuth client uses the redirection URI provided earlier to redirect the user agent back to the OAuth client. The redirection URI includes an authorization code and any local state previously provided by the OAuth client.

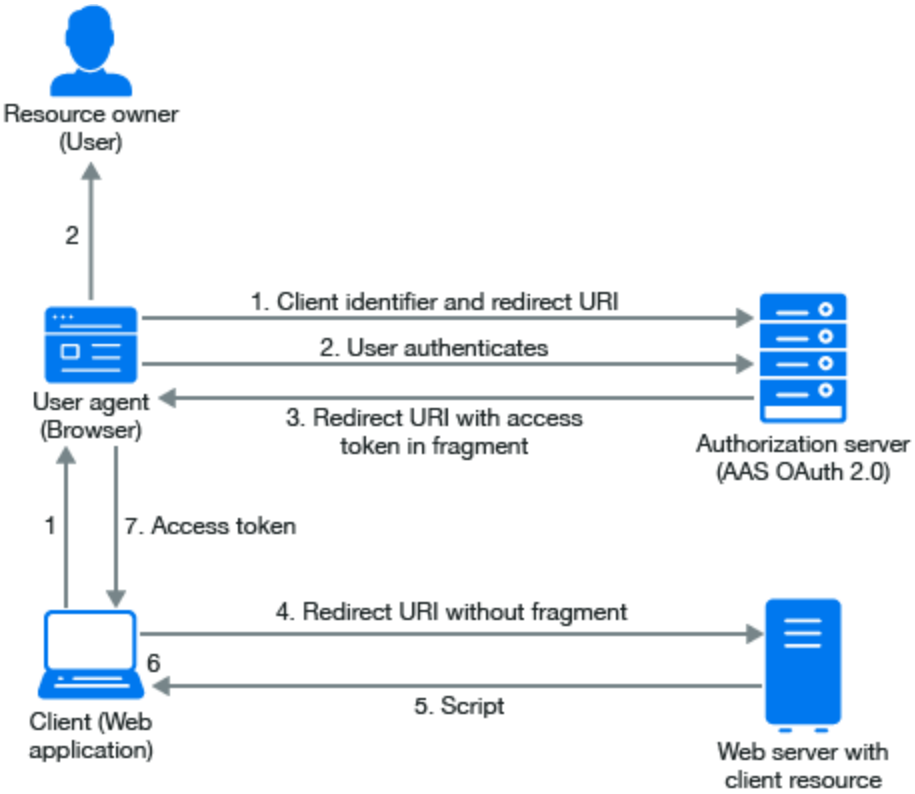
4. The OAuth client requests an access token from the authorization server through the token endpoint. The OAuth client authenticates with its client credentials and includes the authorization code received in the previous step. The OAuth client also includes the redirection URI used to obtain the authorization code for verification.
5. The authorization server validates the client credentials and the authorization code. The server also ensures that the redirection URI received matches the URI used to redirect the client in Step 3. If valid, the authorization server responds back with an access token.

Implicit Grant

The implicit grant is similar to the authorization code grant with two distinct differences.

- It is used for user-agent-based clients. For example, single page web apps that cannot keep a client secret because all the application code and storage is easily accessible.
- Secondly, instead of the authorization server returning an authorization code which is exchanged for an access token, the authorization server returns an access token.

The following diagram describes the workflow of Impicit grant.



The workflow for implicit grant includes the following steps:

1. The OAuth client initiates the flow by directing the user agent of the resource owner to the authorization endpoint. The OAuth client includes its client identifier, requested scope, local state, and a redirection URI. The authorization server sends the user agent back to the redirection URI after access is granted or denied.
2. The authorization server authenticates the resource owner through the user agent and verifies whether the resource owner grants or denies the access request.

3. If the resource owner grants access, the authorization server redirects the user agent back to the client using the redirection URI provided earlier. The redirection URI includes the access token in the URI fragment.
4. The user agent follows the redirection instructions by making a request to the web server without the fragment. The user agent retains the fragment information locally.
5. The web server returns a web page, which is typically an HTML document with an embedded script. The web page accesses the full redirection URI including the fragment retained by the user agent. It can also extract the access token and other parameters contained in the fragment.
6. The user agent runs the script provided by the web server locally, which extracts the access token and passes it to the client.

Sample OAuth 2.0 Application Integrated with Advanced Authentication

To create a sample web application, you need Python v3 (the sample script prepared on v3.4.3).

The following web application describes the functionalities supported when Advanced Authentication is integrated with OAuth 2.0. OAuth 2.0 server is an authorization and resource server. As an Authorization Server, the OAuth server can prompt the users to go through authentication chains and as a resource server, the OAuth server can prompt the users to provide user details.

You must create the following five files:

1. **Sample script (oauth2_test.py)**

```
from bottle import Bottle, request, run, redirect, SimpleTemplate,
template
from urllib.parse import urlparse, urlunparse, urlencode,quote
import urllib.request
import base64
import ssl
import json

app = Bottle()

client_id = 'id-rSCzuBLQgXCATfkXZ4fsedAo8sPsWxSs'
client_secret = 'secret-91DpzWFD26RriURR7KJ1pryFx7V9QeDm'
redirect_uri = 'http://localhost:8088/'  # this app callback URI
authorization_endpoint = 'https://192.168.0.151/osp/a/TOP/auth/oauth2/
grant'
attributes_endpoint = 'https://192.168.0.151/osp/a/TOP/auth/oauth2/
getattributes'
state = {}

@app.get('/getattr')
def get_attributes():
    params = urlencode({
        'attributes': 'client username userRepository user_dn user_cn
mail sid upn netbiosName',
        'access_token': state['access_token']
    })
```

```
    url = attributes_endpoint + '?' + params
    print('getattr url: {}\n'.format(url))
    req = urllib.request.Request(url)
    gcontext = ssl.SSLContext(ssl.PROTOCOL_TLSv1_2)  # avoid cert
checking
    with urllib.request.urlopen(req, context=gcontext) as response:  #
perform GET request and read response
        rsp = response.read()
    attributes = json.loads(rsp.decode('utf-8'))
    return template('attributes.html', items=attributes.items(),
refresh_token=urllib.parse.quote(state['refresh_token']))


@app.get('/')
def do_get():
    code = request.query.get('code')
    if code:
        # got code from OAuth 2 authentication server
        token = get_token_code(code)
        state.update(token)
        return template('token.html', items=token.items(),
refresh_token=urllib.parse.quote(token['refresh_token']))
    else:
        return template('main.html')


@app.get('/logon')
def do_logon():
    pr=list(urlparse(authorization_endpoint))
    # set query
    pr[4]=urlencode({
        'response_type': 'code',
        'client_id': client_id,
        'redirect_uri': redirect_uri
    })
    # perform redirection to OAuth 2 authentication server
    redirect(urlunparse(pr))

@app.get('/logon-implicit')
def do_logon_implicit():
    # parse authorization_endpoint URL
    pr = list(urlparse(authorization_endpoint))
    # set query
    pr[4] = urlencode({
        'response_type': 'token',
        'client_id': client_id,
    })
    # perform redirection to OAuth 2 authentication server
    redirect(urlunparse(pr))

@app.get('/logon-creds')
def do_logon_creds():
    return template('logonform.html')

@app.post('/logon-creds')
```

```
def do_logon_creds_post():
    username = request.forms.get('username')
    password = request.forms.get('password')
    token = get_token_password(username, password)
    state.update(token)
    return template('token.html', items=token.items(),
refresh_token=urllib.parse.quote(token['refresh_token']))

def get_token_password(username, password):
    # prepare POST parameters - encode them to urlencoded
    data = urlencode({
        'grant_type': 'password',
        'username': username,
        'password': password
    })
    data = data.encode('ascii')  # data should be bytes
    resp_text = post_data(data, prepare_headers())
    print(resp_text)
    return json.loads(resp_text)

@app.get('/refresh')
def do_refresh():
    token = refresh_access_token(request.query.get('refresh_token'))
    state.update(token)
    return template('token.html', items=token.items(),
refresh_token=state.get('refresh_token', ''))

def get_token_code(code):
    # prepare POST parameters - encode them to urlencoded
    data = urlencode({
        'grant_type': 'authorization_code',
        'code': code,
        'redirect_uri': redirect_uri
    })
    data = data.encode('ascii')  # data should be bytes
    resp_text = post_data(data, prepare_headers())
    print(resp_text)
    return json.loads(resp_text)

def refresh_access_token(refresh_token):
    print('refresh_token: {}'.format(refresh_token))
    # prepare POST parameters - encode them to urlencoded
    data = urlencode({
        'grant_type': 'refresh_token',
        'refresh_token': refresh_token,
    })
    data = data.encode('ascii')  # data should be bytes
    resp_text = post_data(data, prepare_headers())
    print(resp_text)
    return json.loads(resp_text)

def prepare_headers(use_content_type_hdr = True):
    hdrs = {
        'Authorization': 'Basic {}'.format(base64.b64encode(
            '{}:{}'.format(quote(client_id, safe=''),
```

```
quote(client_secret, safe='')).encode('ascii')).decode(
            'ascii')),
    }
    if use_content_type_hdr:
        hdrs.update({'Content-type': 'application/x-www-form-
urlencoded'})
    return hdrs

def post_data(data, headers):
    print('post_data\nheaders:\n{}\ndata:\n{}'.format(headers, data))
    req = urllib.request.Request(authorization_endpoint, data, headers)
    gcontext = ssl.SSLContext(ssl.PROTOCOL_TLSv1_2)  # avoid cert
checking
    with urllib.request.urlopen(req, context=gcontext) as response:  #
perform POST request and read response
        rsp = response.read()
    return rsp.decode('utf-8')


run(app, host='0.0.0.0', port=8088)
```

NOTE: In the script, you must change the values for `client_id`, `client_secret`, and Advanced Authentication server address in `authorization_endpoint` and `attributes_endpoint` (lines 10-14).

---

2. **Main menu (main.html)**

```
<!DOCTYPE html>
<html>
<head lang="en">
    <meta charset="UTF-8">
    <title></title>
    <script type="text/javascript">
         //<![CDATA[
            function getHashParam(name) {
                var hash = window.location.hash;
                if (hash) {
                    if (name = (new RegExp('[#&]' +
encodeURIComponent(name) + '=([^&]*)')).exec(hash))
                    return decodeURIComponent(name[1]);
                }
            }
            function showResult() {
                if (window.location.hash) {
                 document.getElementById('result').innerHTML = '<table
border="1">'+
                        '<tr><td>access_token</
td><td>'+getHashParam('access_token')+'</td></tr>'+
                        '<tr><td>token_type</
td><td>'+getHashParam('token_type')+'</td></tr>'+
                        '<tr><td>expires_in</
td><td>'+getHashParam('expires_in')+'</td></tr>'+
                        '</table>';
                } else {
```

```
                    document.getElementById('result').innerHTML =
'Implicit granted token is not found';
                }
            }
          // ]>
        </script>
</head>
<body onload="showResult();">
<div id="result">result</div><br/>
<br/>
Click <a href="/logon">here</a> to obtain an authentication token
through Authorization Code Grant<br/>
Click <a href="/logon-implicit">here</a> to obtain an authentication
token through Implicit Grant (the token will be received in hash part of
THIS page)<br/>
Click <a href="/logon-creds">here</a> to obtain an authentication token
through Resource Owner Password Credentials Grant<br/>
</body>
</html>
```

3. **Token information (token.html)**

```
<!DOCTYPE html>
<html>
<head lang="en">
    <meta charset="UTF-8">
    <title></title>
</head>
<body>
Token<br/>
<table border="1">
    % for k, v in items:
    <tr>
        <td>{{k}}</td>
        <td>{{v}}</td>
    </tr>
    % end
</table>
<br/>
<a href="/getattr">Get attributes</a><br/>
<a href="/refresh?refresh_token={{refresh_token}}">Refresh token</a>
</body>
</html>
```

4. **Attributes information (attributes.html)**

```
<!DOCTYPE html>
<html>
<head lang="en">
    <meta charset="UTF-8">
    <title></title>
</head>
<body>
Attributes<br/>
<table border="1">
    % for k, v in items:
    <tr>
        <td>{{k}}</td>
        <td>{{v}}</td>
    </tr>
    % end
</table>
<br/>
<a href="/refresh?refresh_token={{refresh_token}}">Refresh token</a>
</body>
</html>
```

5. **Logon form for Resource Owner Password Credentials Grant mode (logonform.html)**

```
<!DOCTYPE html>
<html>
<head lang="en">
    <meta charset="UTF-8">
    <title></title>
</head>
<body>
<form method="post" action="/logon-creds">
    User name: <input type="text" name="username"><br/>
    Password: <input type="password" name="password"><br/>
    <input type="submit">
</form>
</body>
</html>
```

Running the Sample Web Application

Perform the following steps to run the sample web application.

1. Run the script `python oauth2_test.py`.
2. Open the URL `http://localhost:8088`.

   A message is displayed with the following modes:

```
Authorization Code Grant
Implicit Grant (the token will be received in hash part of THIS page)
Resource Owner Password Credentials Grant (is not supported by default
but it can be activated in AAF)
```

3 Select the grant based on your requirement.

- **Authorization Code Grant**
  1. Ensure that **Use for Owner Password Credentials** is set to **OFF** in the **Advanced settings** section for the OAuth 2.0 event.
  2. Click the first link.

     The NetIQ Access page is displayed with the user name request.
  3. Specify the **Username**.
  4. Click **Next**.
  5. Authenticate using all required methods of the chain.

     The result page shows the `access_token`, `token_type` and `expires_in`.
     - Click **Get attributes** to look at the attributes.
     - Click **Refresh token** to refresh token. The `access_token` value is updated.
- **Implicit Grant**
  1. Ensure that **Use for Owner Password Credentials** is set to **OFF** in the **Advanced settings** section for the OAUTH 2.0 event.
  2. Click the first link.

     The NetIQ Access page is displayed with the user name request.
  3. Specify the **Username**.
  4. Click **Next**.
  5. Authenticate using all the required methods of the chain.

     The result page shows the `access_token`, `token_type` and `expires_in`.
- **Resource Owner Password Credentials Grant**
  1. Open **Advanced settings** for the OAUTH 2.0 event.
  2. Set **Use for Owner Password Credentials** to **ON**.
  3. Click the third link.

     A request for Username and Password is displayed.
  4. Specify the username and password, then click **Submit**.

     The result page displays the `access_token`, `token_type`, and `expires_in`.

OAuth 2.0 Attributes

The following table displays the OAuth 2.0 attributes for a test user from the Active Directory.

Attribute	Value
`user_name`	pjones
`repository_name`	TESTCOMPANY
`naafUserSID`	S-1-5-21-3320677580-2179873152-1514081409-1103

Attribute	Value
`naafUserDN`	CN=Paul Jones,CN=Users,DC=testcompany,DC=local
`naafUserCN`	Paul Jones
`naafUserUPN`	pjones@testcompany.local
`naafUsernameNetBIOS`	TESTCOMPANY\pjones
`client`	id-0TRljvJEe3qKwJiXvy3IbjvcixfiiY1Q
`naafUserEmail`	pjones@testcompany.com

The following table displays the OAuth 2.0 attributes for a local user.

Attribute	Value
`user_name`	ADMIN
`repository_name`	LOCAL
`client`	id-0TRljvJEe3qKwJiXvy3IbjvcixfiiY1Q

The `client` attribute is a **Client ID** specified in the OAuth 2.0 settings.

Non Standard Endpoints

OSP provides a non-standard OAuth 2.0 endpoint for signing additional data that can be passed during the grant request. The URL of the sign endpoint is: `https://<serverip>/osp/a/TOP/auth/oauth2/sign`.

The sign endpoint helps to create a signed and encrypted data packet that can be used to supply data to other endpoints. For more information, see the Sign class documentation.

The only endpoint with which the signed data is currently used is the grant endpoint when it is used with the authorization code grant and implicit grant types.

The signed data can be used to supply one or both of the following:

- **Username**: Supplying the username for a client application is useful when you already know the username. For example, Advanced Authentication uses OSP for authentication after Advanced Authentication has obtained the username.
- **Advanced Authentication chain**: An Advanced Authentication server (5.6 or later) can be used to supply one or more additional authentication factors by authenticating with Advanced Authentication OAuth 2.0 for a user who is already authenticated. The username and name of the desired authentication chain containing the factor(s) is supplied.

You must be able to resolve username in an Advanced Authentication repository and you must configure the chain in the Advanced Authentication event for the OAuth 2.0 client used.

Submitting the Data

The sign endpoint is used by submitting a string value to the endpoint. The output is returned in a JSON structure.The output can be used with the grant endpoint with the **parameters** attribute.

You can accomplish OAuth 2.0 client authentication with HTTP **Basic** or **Bearer** authorization header value.

Request parameters

- **data** (required): The data to be signed and encrypted.

  The following JSON request object code is an example to sign an endpoint.

  ```
  {
     "username" : "< username >"
     "LoginParameters" :  {  "internal.osp.oidp.aa.chain-name" : "<chain name>" }
    }
  ```

  where username is name of the user trying to authenticate and chain name is name of the chain configured in the Advanced Authentication server.
- **ttl** (optional): The time-to-live period of the result data in milliseconds. If no value is supplied, then the default value of 30 seconds is used.

HTTP status codes

The following table describes the HTTP status codes.

HTTP Status Code	Description
200	The operation was successful.
400	The operation was unsuccessful. Additional error information may be found in the response content.
401	Client authentication missing or invalid.
500	A server error occurred.

The cause of the error can be determined from the additional error information found in the response content.

Response content

The response to a successful request is a serialized JSON object (XML is not currently supported).

The **data** field is the signed and encrypted data to be used with another endpoint. The **exp** field is the expiration time of the data as defined by RFC 7519. For more information, see An example (https://tools.ietf.org/html/rfc7519#section-4.1.4).

The following sample code in javascript is an example of the response content.

```
{
   "data":"_TXNCmy8ocXUg3Hg7u1TmRRJ3-2JQHcv3XggLbzhX2l6TcM-
11sfYlVatE6KIhP1.e1lJXX3Gj5UlFPoo03ig-4vczT2UtrAzbV4poyN592s~",
   "exp":1488210079
}
```

NOTE: The web authentication does not query the LDAP directly for users. Web authentication routes the request to the Advanced Authentication server internally. Therefore, if the Advanced Authentication server can match the inbound username with an appropriate attribute in the LDAP server, it would be same as what Advanced Authentication provides.

10 RADIUS Server

The Advanced Authentication server provides a built-in RADIUS server that can authenticate any RADIUS client using one of the chains configured for the event.

IMPORTANT

- The built-in RADIUS server supports only the PAP method.
- The RADIUS server supports the following authentication methods: **Email OTP**, **Emergency Password**, **LDAP Password**, **OATH OTP**, **Password**, **RADIUS Client**, **Security Questions**, **Smartphone**, **SMS OTP**, **Voice OTP**, and **Voice** methods.
- By design, Advanced Authentication does not support the single-factor authentication with a **Smartphone**, **Email OTP**, **SMS OTP**, **Security Questions**, **Voice OTP**, and **Voice** method for RADIUS. These methods cannot be the first or single method in a chain. It is recommended to use it in a two-factor chain with the **LDAP Password** method.

To configure pre-defined RADIUS Server event, perform the following steps:

1. Click **Events**.
2. Click **Edit** next to the **RADIUS Server** event.
3. Ensure that **Is enabled** is set to **ON**.
4. Select the chains that you want to assign to the event.
5. Select **RADIUS** from **Endpoint whitelist**.
6. Click **Add** to add and assign a RADIUS Client to the event:
   - **6a** Specify the IP address of the RADIUS Client in **IP Address**.
   - **6b** Specify the RADIUS Client name in **Name**.
   - **6c** Specify the RADIUS Client secret and confirm the secret.
   - **6d** Ensure that the RADIUS Client is set to **ON**.
   - **6e** Click next to the RADIUS Client.
   - **6f** Add more RADIUS Clients if required.
7. Set **Return user groups** to **ON** to enable the RADIUS server to return all the groups of a user in the `filter-id` attribute in an authentication response to the RADIUS Client.

   By default the option is set to **OFF** and the RADIUS server does not return the `filter-id` attribute in the authentication response.

   - **7a** Specify the preferred user groups in **User groups white list** to allow the RADIUS server to return only the specified groups of a user in the `filter-id` attribute to the RADIUS Client.

If you set the **Return user groups** to **ON** and the **User groups white list** is empty, all the groups of a user are returned in the `filter-id` attribute.

7b You can specify any attribute you want to return instead of the `Filter-ID` attribute in **Groups attribute**. For example, you can specify the `class` attribute in **Groups attribute** and the `class` attribute will be returned instead of the `Filter-Id` attribute. By default, the `Filter-Id` attribute is returned in an authentication response to the RADIUS Client.

NOTE: It is recommended to enable the **Return user groups** option and specify the preferred user groups because in large environments a user can be part of many groups and as a result, the list of all groups that are returned by the RADIUS server can be large. The size of RADIUS response exceeds the maximum size of RADIUS packet.

---

8 (Optional) Specify **NAS ID** while adding custom RADIUS server event. You must use the same NAS ID on the configured RADIUS clients to associate them with the custom RADIUS server event.

9 Set **Bypass user lockout in repository** to **ON**, if you want to allow repository locked-out users to be authenticated on the Advanced Authentication. By default, **Bypass user lockout in repository** is set to **OFF** and users locked on repository is not allowed to authenticate.

10 Click **Save**.

IMPORTANT: If you use more than one chain with the RADIUS server, follow one of the following ways:

1. Each chain assigned to the RADIUS event may be assigned to a different LDAP group. For example, **LDAP Password+Smartphone** chain is assigned to a **Smartphone** users group, **LDAP Password+HOTP** chain is assigned to a HOTP users group. If a RADIUS user is a member of both groups, the top group is used.
2. By default, the top chain specified in the **RADIUS Server** event in which all the methods are enrolled is used. But, you can authenticate with the RADIUS authentication using another chain from the list when specifying `<username>&<chain shortname>` in **username**. For example, `pjones&sms`. Ensure that you have specified the short names for chains. Some RADIUS clients such as FortiGate do not support this option.

NOTE: If you use the `LDAP Password+Smartphone` chain, you can use an offline authentication by specifying the password in the format `<LDAP Password>&<Smartphone OTP>`. For example, `Q1w2e3r4&512385`. This option is supported for `LDAP Password+OATH TOTP`, `Password+Smartphone`, `Password+OATH TOTP`, `Password+OATH HOTP`.

When you want to add multiple RADIUS clients, you can add them to the predefined RADIUS Server event. But all the RADIUS clients will use the same authentication chain(s). If you want to configure specific authentication chain(s) for different RADIUS clients, then you must create a custom RADIUS event. While adding the custom RADIUS event ensure to specify NAS ID that is essential to associate clients with the custom RADIUS event.

For more information about the custom RADIUS event, see Creating a RADIUS Event.

NOTE: If the RADIUS log files are overflown of records with the error `Discarding duplicate request from client`, you can increase the timeout on the RADIUS Client. The optimal timeout value needs to be determined by experimenting. It must not exceed 60 seconds.

Customizing Prompt Messages For RADIUS Event

You can customize prompt messages of the authentication methods that are configured for the RADIUS event. The customized prompt messages are displayed when a user initiates authentication to RADIUS event using the configured methods.

For more information about customizing prompt message for RADIUS event, see Customizing Prompt Messages of the Authentication Methods for RADIUS Event.

Challenge-Response Authentication

If you have configured a multi-factor chain such as LDAP `Password&SMS OTP` or any other combination chain, some users (during the authentication) might not be able to specify the `<Password>&<OTP>` in a single line (because of the Password length limit in RADIUS). In this case, you can configure the existing RADIUS Client by performing the following steps:

NOTE: Advanced Authentication supports 128 character length passwords for RADIUS.

---

1. Specify an LDAP password in **Password** and send the authentication request.

   Advanced Authentication server returns the access-challenge response with `State=<some value>` `(example: State=WWKNNLTTBxP6QYfiZIpvscyt7RYrYsGag4h8s0Rh8R)` and `Reply-Message=SMS OTP.` You will receive an SMS with a one-time password on the registered mobile.
2. Specify the OTP in **Password** and add an additional RADIUS attribute with `State=<value>` where, value is the value that is obtained in step 1.
3. Send the authentication request.

Using RADIUS in Multitenancy Mode

When you enable Multitenancy, you can use one of the following formats to represent the user name:

- `<repository_name>\<username>`
- `<tenant_name>\<repository_name>\<username>`
- `<username>@<tenant_name>`
- `<repository_name>\<username>@<tenant_name>`

The following are the examples of integration with a RADIUS Server:

- Configuring Integration with Barracuda
- Configuring Integration with Citrix NetScaler
- Configuring Integration with Dell SonicWall SRA EX-Virtual Appliance
- Configuring Integration with FortiGate
- Configuring Integration with OpenVPN

11 SAML 2.0

SAML 2.0 is an XML-based protocol that uses security tokens containing assertions. The assertions are used for sending the information about a subject (an entity that is often a human user) from a SAML authority (Identity Provider) to a SAML consumer (Service Provider).

This chapter contains the following section:

- "Integrating Advanced Authentication with SAML 2.0" on page 219

Integrating Advanced Authentication with SAML 2.0

To integrate Advanced Authentication with the third-party solutions using SAML 2.0, perform the following steps

1. Click **Events > Add**.
2. Specify a name for the new event.
3. Change the **Event type** to **SAML2.**
4. Select the required chains for the event.
5. Copy and paste your Service Provider's SAML 2.0 metadata to **SP SAML 2.0 metadata**.

   OR

   Click **Browse** and select a Service Provider's SAML 2.0 metadata XML file to upload it.
6. Click **Policies > Web Authentication**.
7. (Conditional) Specify the Identity Provider's URL in **Identity provider URL**.

   NOTE: To use multiple Advanced Authentication servers with SAML 2.0, you must do the following:

   1. Configure an external load balancer.
   2. Specify the address in **Identity provider URL** instead of specifying an address of a single Advanced Authentication server.

   ---
8. Click **Download IdP SAML 2.0 Metadata** to open a metadata.The metadata opens in a new browser page.
9. Save the metadata (XML text) from the browser.
10. (Conditional) Use the downloaded metadata file in your Service Provider.
11. (Conditional) Use the Identity Provider certificate in your Service Provider.

```
-----BEGIN CERTIFICATE-----

MIIDczCCAlugAwIBAgIEHfhpIDANBgkqhkiG9w0BAQsFADBqMQswCQYDVQQGEwJ1czENMA
sGA1UE

CBMEdXRhaDEOMAwGA1UEBxMFcHJvdm8xFzAVBgNVBAoTDk1pY3JvZm9jdXMgSW5jMREwDw
YDVQQL

EwhzZWN1cml0eTEQMA4GA1UEAxMHd2ViYXV0aDAeFw0xOTAyMDUxMzQzNDhaFw0yOTAyMD
IxMzQz

NDhaMGoxCzAJBgNVBAYTAnVzMQ0wCwYDVQQIEwR1dGFoMQ4wDAYDVQQHEwVwcm92bzEXMB
UGA1UE

ChMOTWljcm9mb2N1cyBJbmMxETAPBgNVBAsTCHNlY3VyaXR5MRAwDgYDVQQDEwd3ZWJhdX
RoMIIB
 IjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAmQ89L/
qZAvdSxvVERU9O6g54nRkFVJaZ5sxd
 rNsckAkqy7k1hzCnEOejWxFepmj0ul6cAHxcMWX1TfnljRNy/
OpP4+TJnMhSbKBHY6Png4S7UEfN

r1Djqvq9XDCa6OZrxZXpdDpZAA42tX3sb565I33MsmTKeryiFN0GD4KxyqxiRIahjFtAMT
9osHrg
 3RcxmyOSCev2gCjuiT3Bk2GvCtsNcgFlV7bqQmtV5ERW16dqRdR9/i/L1MSrWB+QkatE/
gczWHGz
 M+drT01cQkwauEo1yK3S/DFHNSYgtV4uc3yKZwzn/1dHKYuX8BDRg04bCCKse2hqd/
m4CP0G695a

aQIDAQABoyEwHzAdBgNVHQ4EFgQUQJNrW+25YWx6oIG+p9xsREpEYWcwDQYJKoZIhvcNAQ
ELBQAD
 ggEBAGQ8/
KA7XSxfjK4WdU1HZMn8w7kYLtjMTYEY9D1vpSEmsw8si+uH3ZEfIcxkkpnvq7GKLtmE

rXPJ6j6a9esJjHc0I3LMMRK0xg5tjdh2sXbJm2MForiQvzoonHK2Uf72ODgbCdhqPN3kkg
wPBxXJ
 xhdncALOT/h1IVTp/aop/UZmvJQkcbgRvSZaptz2r/
waOLaOCeladPvdQKsMTZMmPdfjW1xWVMa6
 CX7ERCcxeKFWWcCcceepoZd+BPHB9Vuzr+59o2cydCU0x/
OlnHrcsvUx4Wl1GmB3r6NdpvEJszdb
 sNkV+rczAz0rlhcKTJq3mQzKSMRZXeB9SQ1GorEoEy0=
-----END CERTIFICATE-----
```


12 Change used hash to SHA-1 in your Service Provider, if the option is presented.

13 Set the **Send E-Mail as NameID (suitable for G-Suite)** option to **ON** for integrating with the G-suite.

14 Set the **Send SAMAccount as NameID** option to **ON** to send **SAMAccountName** in the **NameID** attribute as a SAML response from the Advanced Authentication server.

WARNING: You can set **Send SAMAccount as NameID** to **ON** only when the **Send E-Mail as NameID (suitable for G-Suite)** option is turned **OFF**.

---

15 Set **Bypass user lockout in repository** to **ON**, if you want to allow users who are locked on repository to authenticate on the Advanced Authentication. By default, **Bypass user lockout in repository** is set to **OFF** and users who are locked on repository are not allowed to authenticate.

The following are the examples of integration with SAML 2.0.

- Configuring Integration with Salesforce
- Configuring Integration with ADFS
- Configuring Integration with Office 365 without Using ADFS

Requesting Advanced Authentication Methods and Chains Through a SAML AuthnRequest

SAML 2.0 provides a mechanism to request an **authentication class reference**. For more information, see the SAML 2.0 Core specification (https://docs.oasis-open.org/security/saml/v2.0/saml-core-2.0-os.pdf) in **section 3.3.2.2.1**.

The Service Provider sends the following code in the `<AuthnRequest>`:

```
<samlp:RequestedAuthnContext>
<saml:AuthnContextClassRef>urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOn
eFactorContract</saml:AuthnContextClassRef>
</samlp:RequestedAuthnContext>
```

SAML 2.0 defines a bunch of URNs that corresponds to authentication **classes**. For more information, see SAML 2.0 Authentication Context (http://docs.oasis-open.org/security/saml/v2.0/saml-authn-context-2.0-os.pdf).

Some of the authentication class types of Advanced Authentication match the SAML 2.0 references. The Advanced Authentication auth class types are defined in an enum named `AuthClassType`.

In this XML example, the SAML class reference URN maps to the Advanced Authentication's `AuthClassType.MOBILE_ONE_FACTOR_CONTRACT`. The Advanced Authentication value is mapped to `NaafAuthMethod.SMARTPHONE (or NaafAuthMethod.SWISSCOM)`.

The code in `NaafEventContractExecutable.filterChains` selects from the available chains any chain that contains one of its methods (in this example) SMARTPHONE or SWISSCOM. (The map from Advanced Authentication methods to OSP auth class type is `NaafContractExecutable.METHOD_TO_TYPE_MAP.`)

In this example, after the user is identified, if there is a chain available with the Smartphone or Swisscom methods, then the authentication proceeds. If not, the authentication fails and Advanced Authentication returns a `no requested authentication context` status to the Service Provider.

An optional `Comparison` attribute can be set on the `<RequestedAuthnContext>`. This attribute is defined in the SAML 2.0 Core specification (https://docs.oasis-open.org/security/saml/v2.0/saml-core-2.0-os.pdf) in **section 3.3.2.2.1**.

In addition to requesting the Advanced Authentication methods using the SAML 2.0-defined URNs, Advanced Authentication also has a special **contract parameters** class reference URN. The URN is: `urn:uuid:519a6c73-f092-43d3-ab11-8d789ebc2f79`.

The **contract parameters** are added through the URN **q-component**. The URN syntax is defined at RFC 8141 (https://tools.ietf.org/html/rfc8141).

The `<NaafEvent>` contract executable contains attributes named `allowClientChainSelection` and `allowClientEventSelection`. These attributes allow the authentication chain and the authentication event to be selected through a **contract parameter** from the client, which in this example, is the SAML Service Provider. In the Advanced Authentication `authcfg.xml`, the default value of `allowClientEventSelection` is `false` and `allowClientChainSelection` is `true`.

For example, **ISM** is an event name with the following chains: LDAP+Smartphone, LDAP+SMS_OTP, LDAP+TOTP, LDAP+SecQuest, LDAP+U2F, and LDAP+Voice.

If the `<NaafEvent>` contract executable is configured with the **ISM** event, then the following code will request the LDAP+SMS_OTP chain.

```
<samlp:RequestedAuthnContext>
<saml:AuthnContextClassRef>urn:uuid:519a6c73-f092-43d3-ab11-
8d789ebc2f79?=internal.osp.oidp.aa.chain-name=LDAP%2BSMS_OTP</
saml:AuthnContextClassRef>
</samlp:RequestedAuthnContext>
```

The plus sign `'+'` is encoded as `'%2B'`. Advanced Authentication considers that the **q-component,** which starts with ?=, is in the `x-www-form-urlencoded` format and '+' is a reserved character for this syntax.

The two contract parameters that are defined in the Advanced Authentication class `CFGNaafEvent` are:

- `internal.osp.oidp.aa.chain-name`
- `internal.osp.oidp.aa.event-name`

12 Examples of Integrations

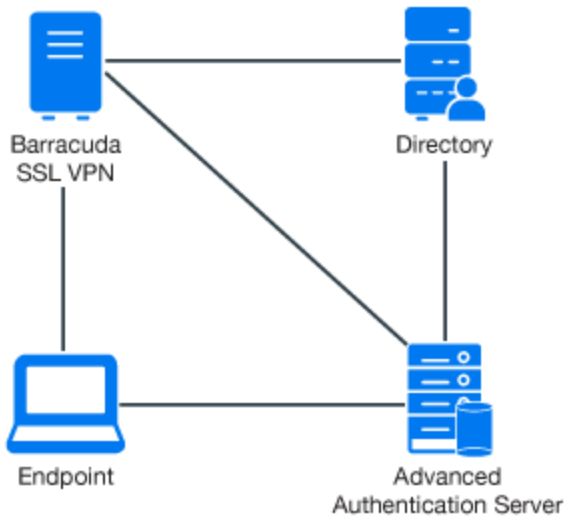
This chapter contains the following examples of third- party integrations.

- "Configuring Integration with Barracuda" on page 223
- "Configuring Integration with Citrix NetScaler" on page 225
- "Configuring Integration with Dell SonicWall SRA EX-Virtual Appliance" on page 227
- "Configuring Integration with FortiGate" on page 228
- "Configuring Integration with OpenVPN" on page 230
- "Configuring Integration with Palo Alto GlobalProtect Gateway" on page 232
- "Configuring Integration with Salesforce" on page 233
- "Configuring Integration with ADFS" on page 236
- "Configuring Integration with Google G Suite" on page 239
- "Configuring Integration with Citrix StoreFront" on page 242
- "Configuring Integration with Office 365" on page 247
- "Configuring Integration with Sentinel" on page 249
- "Configuring Integration with Office 365 without Using ADFS" on page 250

Configuring Integration with Barracuda

This section provides the configuration information on integrating Advanced Authentication with Barracuda SSL VPN virtual appliance. This integration secures the Barracuda SSL VPN connection.

The following diagram represents integration of Advanced Authentication with Barracuda SSL VPN.



To configure the Advanced Authentication integration with Barracuda SSL VPN, perform the following configuration tasks:

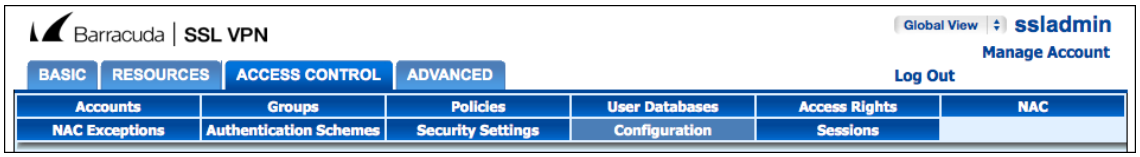
- "Configuring the Advanced Authentication RADIUS server:" on page 224
- "Configuring the Barracuda SSL VPN Appliance:" on page 224
- "Authenticating on Barracuda SSL VPN Using Advanced Authentication" on page 225

Configuring the Advanced Authentication RADIUS server:

1. Open the Advanced Authentication Administration portal.
2. Click **Events > RADIUS Server**.
3. Set **Is enabled** to **ON**.
4. Move one or more chains from **Available** to **Used** list. Ensure that the chains are assigned to the appropriate group of users in **Roles & Groups** of the **Chains** section.
5. Click **Client > Add**.
6. Specify an **IP address** of the Barracuda SSL VPN appliance.
7. Specify a secret and confirm it.
8. Set **Enabled** to **ON**.
9. Click **Save** in **Client**.
10. Click **Save** in **Events**.

Configuring the Barracuda SSL VPN Appliance:

1. Sign-in to the Barracuda SSL VPN Configuration portal as **ssladmin**.
2. Click **Access Control > Configuration**.



3. Scroll down to **RADIUS**.
4. Specify an Advanced Authentication appliance IP address in **RADIUS Server**.
5. Specify a shared secret in **Shared Secret.**
6. Set **Authentication Method** to **PAP**.
7. Set **Reject Challenge** to **No** to allow challenge response.
8. Click **Save Changes**.
9. Click **Access Control > User Databases**.
10. Create a user database using the same storage as you are using for Advanced Authentication.
11. Click **Access Control > Authentication Schemes**.
12. Click **Edit** for the **Password** scheme for the user database.
13. Move **RADIUS** from **Available modules** to **Selected modules**.

14 Remove the **Password** module from the **Selected modules**.

15 Apply the changes.

Authenticating on Barracuda SSL VPN Using Advanced Authentication

1 Specify the user's credentials.

2 Click **More** and select the configured user database (if the database is not selected by default).

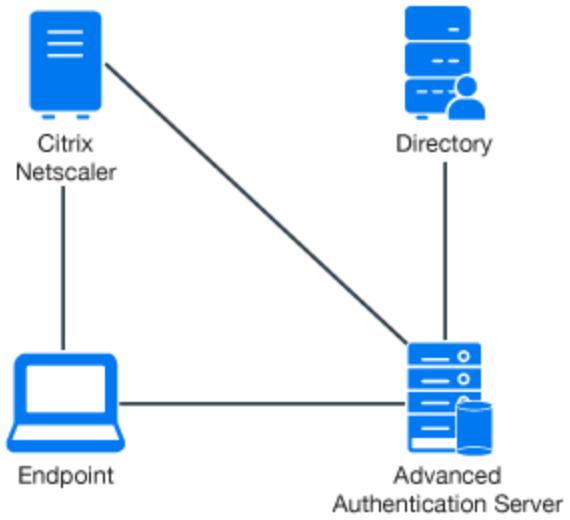
3 Click **Log In** and approve the authentication on the user's smartphone.

NOTE: Advanced Authentication can be configured with the other authentication chains.

Configuring Integration with Citrix NetScaler

This section provides the configuration information on integrating Advanced Authentication with Citrix NetScaler VPX. This integration secures the Citrix NetScaler VPX connection.

The following diagram represents Advanced Authentication in Citrix NetScaler.



To configure the Advanced Authentication integration with Citrix NetScaler VPX, perform the following configuration tasks:

- "Configuring the Advanced Authentication RADIUS Server" on page 226
- "Configuring the Citrix NetScaler Appliance" on page 226
- "Authenticating on the Citrix NetScaler Using Advanced Authentication" on page 227

Ensure that the following requirements are met:

- Citrix NetScaler VPX (version NS11.0 has been used to prepare these instructions) is installed.
- Advanced Authentication 5 appliance is installed.

Configuring the Advanced Authentication RADIUS Server

1. Open the Advanced Authentication Administration portal.
2. Click **Events > RADIUS Server**.
3. Set **Is enabled** to **ON**.
4. Move one or more chains from **Available** to **Used** list. Ensure that the chains are assigned to the appropriate group of users in **Roles & Groups** of the **Chains** section.
5. Click **Client > Add**.
6. Specify an **IP address** of the Citrix NetScaler appliance.
7. Specify a secret and confirm it.
8. Set **Enabled** to **ON**.
9. Click **Save** in **Client**.
10. Click **Save** in **Events**.

Configuring the Citrix NetScaler Appliance

1. Sign-in to the Citrix NetScaler configuration portal as **nsroot**.
2. Click **Configuration > Authentication > Dashboard**.
3. Click **Add**.
4. Select **RADIUS** for **Choose Server Type**.
5. Specify **Name** of the Advanced Authentication server, **IP Address**, **Secret Key**, and **Confirm Secret Key.**
6. Change **Time-out (seconds)** to 120-180 seconds if you are using the Smartphone, SMS, Email or Voice methods.
7. Click **More** and ensure that **PAP** is selected in **Password Encoding**.
8. Click **Create**.

   If the connection to the RADIUS server is valid, the **Up** status is displayed.
9. Click **Configuration > System > Authentication > RADIUS > Policy**.
10. Click **Add**.
11. Specify **Name** of the Authentication RADIUS Policy.
12. Select the created RADIUS server from **Server** and select **ns_true** from the **Saved Policy Expressions** list.
13. Click **Create**.
14. Select the created policy and click **Global Bindings**.
15. Click **Select Policy**.
16. Select the created policy.
17. Click **Bind**.
18. Click **Done**.

    A check mark is displayed in the **Globally Bound** column.

Authenticating on the Citrix NetScaler Using Advanced Authentication

1 Specify the user's credentials then click **Login**.

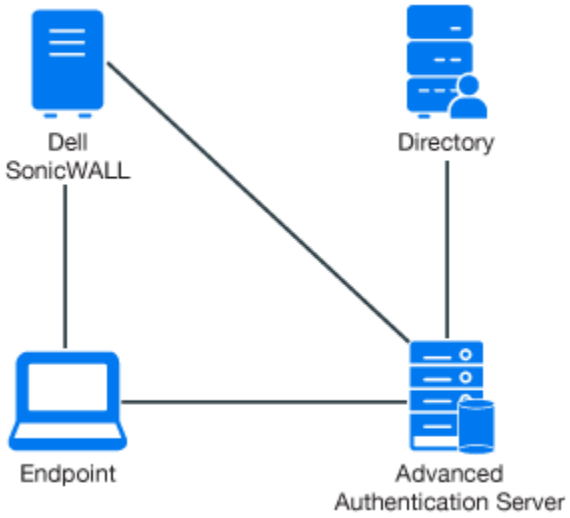
2 Accept the authentication on your smartphone.

NOTE: Advanced Authentication can be configured with other authentication chains.

Configuring Integration with Dell SonicWall SRA EX-Virtual Appliance

This section provides the configuration information on integrating Advanced Authentication with Dell SonicWall SRA EX-virtual appliance. This integration secures the Dell SonicWall SRA connection.

The following diagram represents Advanced Authentication in Dell SonicWall.



To configure the Advanced Authentication integration with Dell SonicWall SRA, perform the following configuration tasks:

- "Configuring the Advanced Authentication RADIUS Server" on page 228
- "Configuring the Dell SonicWall SRA Appliance" on page 228
- "Authenticating on Dell SonicWall Workspace Using Advanced Authentication" on page 228

Ensure that the following requirements are met:

- Dell SonicWall SRA EX-Virtual appliance v11.2.0-258 is installed.
- Advanced Authentication v5 appliance is installed.

Configuring the Advanced Authentication RADIUS Server

1. Open the Advanced Authentication Administration portal.
2. Click **Events > RADIUS Server**.
3. Set **Is enabled** to **ON**.
4. Move one or more chains from **Available** to **Used** list. Ensure that the chains are assigned to the appropriate group of users in **Roles & Groups** of the **Chains** section.
5. Click **Client > Add**.
6. Specify an **IP address** of the Dell SonicWall appliance.
7. Specify the secret and confirm it.
8. Set **Enabled** to **ON**.
9. Click **Save** in **Client**.
10. Click **Save** in **Events**.

Configuring the Dell SonicWall SRA Appliance

1. Sign-in to the Dell SonicWall SRA Management console as **admin**.
2. Click **User Access > Realms**.
3. Click **New realm**.
4. Create a **New Authentication Server** and set the **RADIUS** authentication directory.
5. Set **RADIUS Server** and **Shared key**.
6. Save and apply the configuration.
7. Click **User Access > Realms**.

   Review the realm diagram.

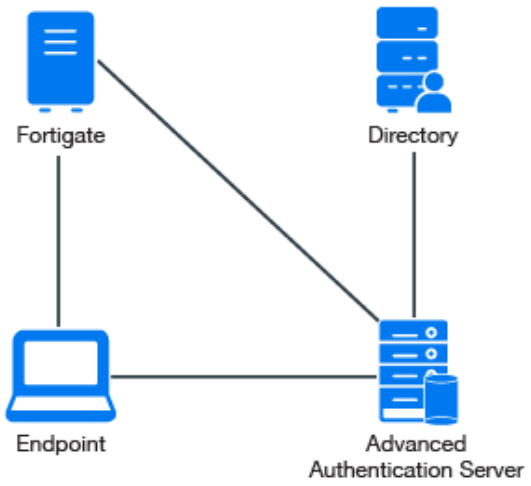
Authenticating on Dell SonicWall Workspace Using Advanced Authentication

1. Open a browser and navigate to the workplace.
2. Specify your username and LDAP password.
3. Specify the **SMS OTP** and click **OK**.

Configuring Integration with FortiGate

This section provides the configuration information on integrating Advanced Authentication with FortiGate. This integration secures the FortiGate connection.

The following diagram represents Advanced Authentication in FortiGate.



To configure the Advanced Authentication integration with FortiGate perform the following configuration tasks:

- "Configuring the Advanced Authentication RADIUS Server" on page 229
- "Configuring the FortiGate Appliance" on page 229
- "Authenticating on FortiGate Using Advanced Authentication" on page 230

Ensure that the following requirements are met:

- Fortinet virtual appliance v5 (Firmware version 5.2.5, build 8542 has been used to prepare these instructions) is installed.
- Advanced Authentication v5 appliance is installed.

Configuring the Advanced Authentication RADIUS Server

1. Open the Advanced Authentication Administration portal.
2. Click **Events > RADIUS Server.**
3. Set **Is enabled** to **ON**.
4. Move one or more chains from **Available** to **Used** list. Ensure that the chains are assigned to the appropriate group of users in **Roles & Groups** of the **Chains** section.
5. Click **Client > Add**.
6. Specify an **IP address** of the FortiGate appliance.
7. Specify the RADIUS shared secret and confirm it.
8. Set **Enabled** to **ON**.
9. Click **Save** in **Client**.
10. Click **Save** in **Events**.

Configuring the FortiGate Appliance

1. Sign-in to FortiGate configuration portal as **admin**.
2. Check which **Virtual Domain** is bound to the network interface.

3. Open the RADIUS Server configuration for an appropriate **Virtual Domain** and setup the required settings.
4. Click **Test Connectivity** and specify the credentials of Advanced Authentication administrator to test the connection.
5. Create a user group and bind it to a remote authentication server.
6. Create user and place in the created group.

Authenticating on FortiGate Using Advanced Authentication

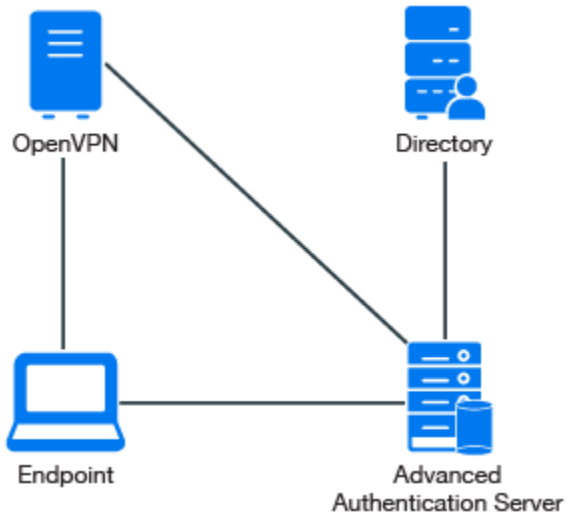
1. Specify the user's credentials and click **Login**.
2. Specify the OTP and click **Login**.

NOTE: The **Token Code** field has a limitation of 16 digits. Therefore, you may face issues when using the YubiKey tokens with 18-20 digits code.

Configuring Integration with OpenVPN

This section provides the configuration information on integrating Advanced Authentication with OpenVPN virtual appliance. This integration secures the OpenVPN connection.

The following diagram represents Advanced Authentication in OpenVPN.



To configure the Advanced Authentication integration with OpenVPN perform the following configuration tasks:

- "Configuring the Advanced Authentication RADIUS Server" on page 231
- "Configuring the OpenVPN Appliance" on page 231

Ensure that the following requirements are met:

- OpenVPN v2 appliance (version 2.0.10 was used to prepare these instructions) is installed.
- Advanced Authentication v5 appliance with a configured repository is installed.

Configuring the Advanced Authentication RADIUS Server

1. Open the Advanced Authentication Administration portal.
2. Click **Events > RADIUS Server**.
3. Set **Is enabled** to **ON**.
4. Move one or more chains from **Available** to **Used** list. Ensure that the chains are assigned to the appropriate group of users in **Roles & Groups** of the **Chains** section.
5. Click **Client > Add**.
6. Specify an **IP address** of the OpenVPN appliance.
7. Specify a secret and confirm it.
8. Set **Enabled** to **ON**.
9. Click **Save** in **Client**.
10. Click **Save** in **Events**.

Configuring the OpenVPN Appliance

1. Open the **OpenVPN Access Server** site.
2. Click **Authentication > RADIUS**.
3. Enable the **RADIUS** authentication.
4. Select **PAP** authentication method.
5. Add an IP address of the Advanced Authentication v5 appliance and specify the secret.

You must specify the `<repository name>\<username>` or only `<username>`, if you have set the following configurations:

- You have selected a chain from the **Used** section in the **RADIUS Server** settings for connecting to OpenVPN.
- You have set the default repository name in **Policies > Login options** of the Advanced Authentication v5 appliance.

If you have assigned multiple chains in the **Used** section of the RADIUS event for connecting to OpenVPN, then you must specify `<username>&<chain shortname>` in the **username**.

NOTE: For some authentication methods, the correct time must be configured on the OpenVPN appliance. You can sync the time of the OpenVPN appliance using the following commands:

```
/etc/init.d/ntp stop
/usr/sbin/ntpdate pool.ntp.org
```

User Account Locks After Three Successful Authentications with SMS AP to OpenVPN

Issue: While authenticating with the SMS method to connect to OpenVPN, after three successful authentications the user account is locked by OpenVPN.

Workaround: OpenVPN assumes each attempt of the challenge response (request of additional data in chain) as an error.

To resolve the issue, you must change the number of failures that can be accepted. For more information, see Authentication failure lockout policy.

Configuring Integration with Palo Alto GlobalProtect Gateway

This section provides the configuration information on integrating Advanced Authentication with Palo Alto GlobalProtect Gateway. This integration secures the Palo Alto GlobalProtect Gateway connection.

NOTE: This configuration has been tested with PAN-OS 6.1.5 to 7.1.x and GlobalProtect 2.1x.

To configure the Advanced Authentication integration with Palo Alto GlobalProtect Gateway, perform the following configuration tasks:

- "Adding the RADIUS Server" on page 232
- "Adding an Authentication Profile" on page 233
- "Configuring GlobalProtect Gateway" on page 233

Adding the RADIUS Server

1. Log in to the Palo Alto administrative interface.
2. Click **Device > Server Profiles > RADIUS**.
3. Click **Add** to add a new RADIUS server profile.
4. Specify **NetIQ RADIUS** in **Name**.
5. Specify 30 in **Timeout**.
6. In the **Servers** section, click **Add** to add a RADIUS server and specify the following information:
   - **Profile Name**
   - Set **Timeout and Retries** in **Server Settings**
   - Details in the **Servers** section
7. Click **Add** and configure a connection to the RADIUS server built-in to the Advanced Authentication server.
8. Click **OK**.

Adding an Authentication Profile

1 Click **Device > Authentication Profile.**
2 Click **New** to add a new authentication profile.
3 Specify the Authentication Profile details such as the server type and user domain.

Configuring GlobalProtect Gateway

1 Click **Network > GlobalProtect > Gateways**.
2 Click on your configured GlobalProtect Gateway to open the properties window.
3 In the **Authentication** section of the **GlobalProtect Gateway General properties** tab, select the **NetIQ authentication profile** created in Add an Authentication Profile from the list.
4 Click **OK** to save the GlobalProtect Gateway settings.

Configuring Integration with Salesforce

This section provides the configuration information on integrating Advanced Authentication with Salesforce. This integration secures the Salesforce connection.

The following diagram represents Advanced Authentication in Salesforce.

To configure the Advanced Authentication integration with Salesforce, perform the following configuration tasks:

- "Configuring the Salesforce Domain Name" on page 233
- "Configuring the SAML Provider" on page 234
- "Configuring the Advanced Authentication SAML 2.0 Event" on page 235
- "Configuring to Authenticate on Salesforce with SAML 2.0" on page 236

Configuring the Salesforce Domain Name

1 Login to your Salesforce account.
2 Create a domain. If the domain is not created, then perform the following tasks:
   2a Click **Gear** and select **Setup Home** in the **Lightning Experience** interface.
   2b Scroll down the setup toolbar and navigate to **Company Settings**.
   2c Click **My Domain**.

2d Specify your domain name and click **Save**.

The domain is activated. Use your domain name to open Salesforce. For example, `https://CompanyName.my.salesforce.com/.` SAML provider requires the domain name.

Configuring the SAML Provider

1. Click **Settings > Identity > Single Sign-On Settings**.
2. Create a text file and add the following Identity Provider certificate to the file.


```
-----BEGIN CERTIFICATE-----

MIIDczCCAlugAwIBAgIEHfhpIDANBgkqhkiG9w0BAQsFADBqMQswCQYDVQQGEwJ1czENMA
sGA1UE

CBMEdXRhaDEOMAwGA1UEBxMFcHJvdm8xFzAVBgNVBAoTDk1pY3JvZm9jdXMgSW5jMREwDw
YDVQQL

EwhzZWN1cml0eTEQMA4GA1UEAxMHd2ViYXV0aDAeFw0xOTAyMDUxMzQzNDhaFw0yOTAyMD
IxMzQz

NDhaMGoxCzAJBgNVBAYTAnVzMQ0wCwYDVQQIEwR1dGFoMQ4wDAYDVQQHEwVwcm92bzEXMB
UGA1UE

ChMOTWljcm9mb2N1cyBJbmMxETAPBgNVBAsTCHNlY3VyaXR5MRAwDgYDVQQDEwd3ZWJhdX
RoMIIB
 IjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAmQ89L/
qZAvdSxvVERU9O6g54nRkFVJaZ5sxd
 rNsckAkqy7k1hzCnEOejWxFepmj0ul6cAHxcMWX1TfnljRNy/
OpP4+TJnMhSbKBHY6Png4S7UEfN

r1Djqvq9XDCa6OZrxZXpdDpZAA42tX3sb565I33MsmTKeryiFN0GD4KxyqxiRIahjFtAMT
9osHrg
 3RcxmyOSCev2gCjuiT3Bk2GvCtsNcgFlV7bqQmtV5ERW16dqRdR9/i/L1MSrWB+QkatE/
gczWHGz
 M+drT01cQkwauEo1yK3S/DFHNSYgtV4uc3yKZwzn/1dHKYuX8BDRg04bCCKse2hqd/
m4CP0G695a

aQIDAQABoyEwHzAdBgNVHQ4EFgQUQJNrW+25YWx6oIG+p9xsREpEYWcwDQYJKoZIhvcNAQ
ELBQAD
 ggEBAGQ8/
KA7XSxfjK4WdU1HZMn8w7kYLtjMTYEY9D1vpSEmsw8si+uH3ZEfIcxkkpnvq7GKLtmE

rXPJ6j6a9esJjHc0I3LMMRK0xg5tjdh2sXbJm2MForiQvzoonHK2Uf72ODgbCdhqPN3kkg
wPBxXJ
 xhdncALOT/h1IVTp/aop/UZmvJQkcbgRvSZaptz2r/
waOLaOCeladPvdQKsMTZMmPdfjW1xWVMa6
 CX7ERCcxeKFWWcCcceepoZd+BPHB9Vuzr+59o2cydCU0x/
OlnHrcsvUx4Wl1GmB3r6NdpvEJszdb
 sNkV+rczAz0rlhcKTJq3mQzKSMRZXeB9SQ1GorEoEy0=
-----END CERTIFICATE-----
```

3 In **Single Sign-On Settings,** click **New** and specify the following details:

   1. **Name**: Advanced Authentication.
   2. **API Name**: AAF.
   3. **Issuer**: `https://AdvancedAuthenticationServerAddress/osp/a/TOP/auth/saml2/metadata`, where you must replace `AdvancedAuthenticationServerAddress` with the domain name or IP address of your Advanced Authentication server.
   4. **Entity ID**: `https://CompanyName.my.salesforce.com/`.
   5. Click **Browse** to open the Identity Provider certificate.
   6. **SAML Identity Type**: Select **Assertion contains the Federation ID from the User object**.
   7. **SAML Identity Location**: Select **Identity is in an Attribute element**.
   8. **Attribute Name**: upn.
   9. **Service Provider Initiated Request Binding**: Select **HTTP Redirect**.
   10. **Identity Provider Login URL**: `https://AdvancedAuthenticationServerAddress/osp/a/TOP/auth/saml2/sso`.
   11. Select **User Provisioning Enabled**.
   12. Click **Save**.

4 Click **Edit** for Federated Single Sign-On Using SAML.

5 Select **SAML Enabled**.

6 Click **Save**.

7 Click **Settings > Users.**

8 Click **Edit** for the required Salesforce users by adding **Federation ID** for the user accounts. The Federation ID corresponds to `userPrincipalName` attribute in Active Directory. For example, pjones@company.com.

NOTE: The name that you specify in **Federation ID** is case sensitive. The following error may occur, if you ignore the case:

```
We can't log you in. Check for an invalid assertion in the SAML
Assertion Validator (available in Single-Sign On Settings) or check the
login history for failed logins.
```

---

9 Click your profile icon and click **Switch to Salesforce Classic**.

   This mode is required to tune the domain options.

10 Click **Setup Administrator > Domain Management > My Domain > Edit** to access the **Authentication Configuration** screen.

11 Select **Login Page** and **osp options**.

12 Click **Save**.

Configuring the Advanced Authentication SAML 2.0 Event

1 Click **username > Switch to Lightning Experience**.

2 Click **Gear** and select **Setup Home**.

3 Navigate to **Identity > Single Sign-On Settings**.

4 Click the created configuration (not for Edit).

5 Click **Download Metadata.**

6 Open the Advanced Authentication Administration portal.

7 Click **Events > Add** to add a new event.

8 Create an event with the following parameters.

- Name: Salesforce
- Chains: select the required chains.
- Click **Browse** to Upload SP SAML 2.0 metadata file. Open the Salesforce metadata file and click **Save**.

Configuring to Authenticate on Salesforce with SAML 2.0

1 Click **Policies > Web Authentication.**

2 Set **Identity provider URL** to `https://AdvancedAuthenticationServerAddress/` and replace `AdvancedAuthenticationServerAddress` with domain name or IP address of your Advanced Authentication server.

NOTE: To use multiple Advanced Authentication servers with SAML 2.0, you must do the following:

1. Configure an external load balancer.
2. Specify the address with port number in **Identity provider URL** instead of specifying an address of a single Advanced Authentication server.

IMPORTANT: You must use the server name or IP address specified in the **Issuer** field of Salesforce.

---

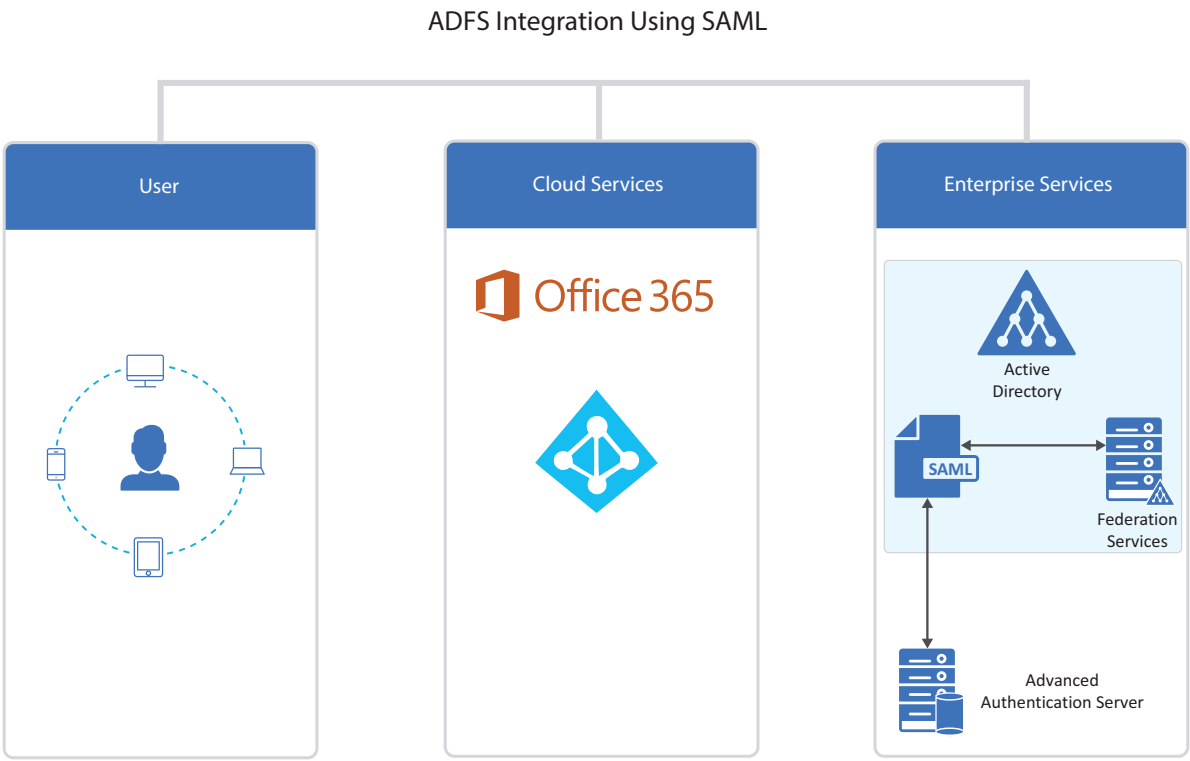
3 Open the URL `https://CompanyName.my.salesforce.com/` and click **Advanced Authentication** to check the SAML 2.0 authentication.

Configuring Integration with ADFS

This section provides the configuration information on integrating Advanced Authentication with ADFS (Active Directory Federation Services). This integration secures the ADFS connection.

The following diagram represents Advanced Authentication and ADFS integration using SAML.

Figure 12-1



To configure the Advanced Authentication integration with ADFS using SAML 2.0 perform the following configuration tasks:

NOTE: These instructions are valid only for ADFS 3 and 4.

- "Configuring the Advanced Authentication SAML 2.0 Event" on page 237
- "Making the Corresponding Changes in ADFS" on page 238

Configuring the Advanced Authentication SAML 2.0 Event

1 Open the Advanced Authentication Administration portal.

2 Click **Events > Add** to add a new event.

3 Create an event with the following parameters:

- Name: ADFS_SAML.
- Event Type: **SAML 2**.
- Chains: Select the required chains.
- Paste the content of the file `https://<adfs_hostname>/FederationMetadata/2007-06/FederationMetadata.xml` to **SP SAML 2.0 meta data**.

  Or

  - Click **Browse** and upload the saved XML file.
- Click **Save**.

NOTE: Verify that you can access the file in your browser. If the file is not displayed, you have an issue on ADFS that you must resolve.

4 Click **Policies > Web Authentication.**

5 Set **Identity provider URL** to `https://AdvancedAuthenticationServerAddress/` and replace `AdvancedAuthenticationServerAddress` with domain name or IP address of your Advanced Authentication server.

NOTE: To use multiple Advanced Authentication servers with SAML 2.0, you must do the following:

1. Configure an external load balancer.
2. Specify the address in **Identity provider URL** instead of specifying an address of a single Advanced Authentication server.

6 Click **Download IdP SAML 2.0 Metadata**.

You must open the file as an XML file.

NOTE: If `{"Fault":{... ` is displayed, you must verify the configuration.

Making the Corresponding Changes in ADFS

1 Open the ADFS management console.

2 Expand **Trust Relationships**.

3 Click **Add Claims Provider trust**.

4 Paste OSP metadata URL `https://<AAF_server_hostname>/osp/a/TOP/auth/saml2/metadata`.

It may not work for self-signed certificate. You can copy metadata from OSP URL to an XML file and provide the file name.

5 Specify the **Display name**.

6 Select **Open the Edit Claim Rules dialog for this claims provider when the wizard closes**.

7 In **Edit Claims Rules**, click **Add Rule**.

8 Select **Send Claims Using a Custom Rule**.

9 Click **Next**.

10 Specify **Claim rule name**.

11 Paste Custom rule and click **Finish**.

```
 c:[Type == "upn"]
=> issue(Type = "http://schemas.xmlsoap.org/ws/2005/05/identity/claims/upn", Issuer = c.Issuer, OriginalIssuer = c.OriginalIssuer, Value = c.Value, ValueType = c.ValueType);
```

12 In **ADFS snap-in**, double click on the provider name.

13 Click **Advanced**.

14 Move the hash algorithm from SHA-256 to SHA1.

15 Click **OK**.

Configuring Integration with Google G Suite

This section provides the configuration information on integrating Advanced Authentication with Google G Suite. This integration secures the connection.

The following diagram represents Advanced Authentication in Google G Suite.

To configure the Advanced Authentication integration with Google G Suite using SAML 2.0, perform the following configuration tasks:

- "Configuring Google G Suite" on page 239
- "Configuring the Advanced Authentication Event" on page 241
- "Configuring to Authenticate on Google G-Suite with SAML 2.0" on page 241

NOTE: As a prerequisite, ensure that you finalize the setup of G Suite by accepting the agreement and clicking **Finalize setup**.

Configuring Google G Suite

1. Login to the Google's Administration console.
2. Open the **Security** section.
3. Expand **Set up single sign-on (SSO)**.
4. Enable **Setup SSO with third party identity provider**.
5. Specify the following parameters:
   - **5a** **Sign-in page URL**: `https://<AdvancedAuthenticationServerAddress>/osp/a/TOP/auth/saml2/sso`. Replace `AdvancedAuthenticationServerAddress` with the domain name or IP address of your Advanced Authentication server.
   - **5b** **Sign-out page URL**: `https://<AdvancedAuthenticationServerAddress>/osp/a/TOP/auth/app/logout`.
   - **5c** **Change password URL**: `https://<AdvancedAuthenticationServerAddress>` or Self-Service Password Reset URL.
   - **5d** Create a text file and add the Identity Provider Certificate to it.

```
-----BEGIN CERTIFICATE-----
MIIDkzCCAnugAwIBAgIESsmdMzANBgkqhkiG9w0BAQsFADB6MRAwDgYDVQQGEwdVbmt
ub3duMRAw
DgYDVQQIEwdVbmtub3duMRAwDgYDVQQHEwdVbmtub3duMREwDwYDVQQKEwhBdXRoYXN
hczESMBAG
A1UECxMJQXV0aGFzYXNhMRswGQYDVQQDExJvc3AuYXV0aGFzYXMubG9jYWwwHhcNMTY
wNTI2MDUz
NjI0WhcNMjYwNDA0MDUzNjI0WjB6MRAwDgYDVQQGEwdVbmtub3duMRAwDgYDVQQIEwd
Vbmtub3du
MRAwDgYDVQQHEwdVbmtub3duMREwDwYDVQQKEwhBdXRoYXNhczESMBAGA1UECxMJQXV
0aGFzYXNh
MRswGQYDVQQDExJvc3AuYXV0aGFzYXMubG9jYWwwggEiMA0GCSqGSIb3DQEBAQUAA4I
BDwAwggEK
AoIBAQCw3YLz03qhSZPXjBc/Ws+cZ2/
E5oogqKeJ3p4RR6USOoarjnmvQPq+maRfvexriwQjRDgS
OFRb58cert/
misqzsHBVmQDnfMwicFVzuuKjDEbWFp9vL1gRkDzIlpCyl3eNmBWuWXM49Z6mm8XS
fIwlAoydNp5DK0o0Yrk6FNOi0nOrnI5kHGVD0bd5SpDtvXSF1WLfc5YT9UBUpfZneKs
VPWSkbeBX
F84hYJWBtdzcTEyjdso9Ra7UtxLIUW0UH3LWTgn9zS97nLkmhetmD1I3mEAeAE9SAmq
TRyH1FNXZ
ZOfi/
BJF4+sz86f6pBbwYM2KTvXaABgzSpZpJ1pQrZKPAgMBAAGjITAfMB0GA1UdDgQWBBTL
8PbA
+e6YkBIk4yELTZ+AbfdA6DANBgkqhkiG9w0BAQsFAAOCAQEAm87lNyAO8CtN5jlLe3C
upLAAbUWR
NY6av7LpPail1JRIw+uvddMyOz1vOS1IwpDDNtcPtxGXsaZI1CKgNPBpLvSxePVUXNf
FgUCtu+bT
cuUtiQbkiDWwFLmAS6KeA+EBFOeqBiudEfkAZZT87DF9gKvM6VWdzJ7BvWi2YPbH/
FRM82fLoyAd
RbphF215we3rvsfeWbwXw70UGNyBUTb3zUcAmB3sHbcZiXJZj3pJYgDaN9Ss60sz/
yG1ZLEYluvL
R1T2PPEfEcA1Eij0R1A31Z5hJ3zDlXoCeNYLoMg4522QYekTwvQeWkeYejBXEcxdL7V
P6F91zmfZ
bm1A4PY5jw==
-----END CERTIFICATE-----
```


5e Upload the Identity Provider Certificate.

6 Clear **Use a domain specific issuer** if you have one domain in G Suite or select the option if you have more than one domain in G Suite.

Ensure that you have a user account in a repository that corresponds to a user account in Google. An email address specified in the **Contact information** for the Google account must be the same as an address from email attribute for the corresponding account of your repository.

NOTE: You cannot use the Google administrator account with SAML.

---

7 Create a new text file and add the Service Provider metadata to it:

```
<EntityDescriptor entityID="google.com"
xmlns="urn:oasis:names:tc:SAML:2.0:metadata">
    <SPSSODescriptor
protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol">
        <NameIDFormat>urn:oasis:names:tc:SAML:1.1:nameid-
format:emailAddress</NameIDFormat>
        <AssertionConsumerService index="1"
Binding="urn:oasis:names:tc:SAML:2.0:bindings:HTTP-POST"
            Location="https://www.google.com/a/mycompany.com" />
    </SPSSODescriptor>
</EntityDescriptor>
```

Replace `mycompany.com` in the Location URL to your primary domain from the **Domains** settings in Google.

NOTE: You must use the Service Provider metadata when one domain exists in the G Suite. If you have more than one domain in G Suite, then every Service Provider metadata for each domain must have `google.com` as an entityID replaced with `google.com/mycompany.com`, where `mycompany.com` is your domain name.

---

8 Save the text file with a `.xml` extension.

Configuring the Advanced Authentication Event

1 Open the Advanced Authentication Administration portal.

2 Click **Events > Add** to add a new event with the following options:

   2a Name: Google

   2b Chains: select the required chains.

   2c Click **Browse** to upload the XML file.

   2d Set **Send E-Mail as NameID (suitable for G-Suite)** to **ON**. This is applicable for the G-Suite.

   2e Click **Save**.

Configuring to Authenticate on Google G-Suite with SAML 2.0

1 In **Policies > Web Authentication**, set **Identity provider URL** to `https://AdvancedAuthenticationServerAddress/` and replace `AdvancedAuthenticationServerAddress` with domain name or IP address of your Advanced Authentication server.

NOTE: To use multiple Advanced Authentication servers with SAML 2.0, you must do the following:

1. Configure an external load balancer.
2. Specify the address in **Identity provider URL** instead of specifying an address of a single Advanced Authentication server.

2 Open the Google Sign in page and specify an email address of the user from **Basic information** of the Google account (email address of Google account).

Google redirects to the Advanced Authentication server, where the user must authenticate. After successful authentication, the Advanced Authentication server redirects the user back to Google.

Configuring Integration with Citrix StoreFront

This section provides the configuration information on integrating Advanced Authentication with Citrix StoreFront. This integration secures the Citrix StoreFront connection.

To configure the integration of Advanced Authentication appliance with StoreFront using SAML 2.0 perform following tasks:

- "Exporting the Token Signing Certificate from ADFS" on page 242
- "Configuring the Authentication Methods on Citrix StoreFront" on page 243
- "Creating the Relying Party Trust on ADFS" on page 243
- "Configuring the SAML 2.0 Event on Advanced Authentication" on page 244
- "Creating the Claims Party Trust on ADFS" on page 245

Ensure that the following requirements are met:

- Advanced Authentication is configured with repository (Active Directory).
- StoreFront is installed on the Citrix Server.

NOTE: The Citrix StoreFront is supported for Active Directory only.

Exporting the Token Signing Certificate from ADFS

1 Open the ADFS Management console.

2 Click **Service > Certificates > Token Signing Certificate**.

Token Signing dialog box is displayed.

3 Navigate to the **Details** tab and click **Copy to a file**.

The Certificate Export wizard is displayed. Export the certificate on your local drive.

Configuring the Authentication Methods on Citrix StoreFront

1 Open the Citrix StoreFront console.

2 Click **Stores > Manage Authentication Methods**.

3 Select **User name** and **Password**.

4 Click Settings icon against **User name** and **Password**.

5 Click **Configure Password Validation**.

6 Ensure **Validate Password** is set to **Active Directory**.

7 Select **SAML Authentication**.

8 Click Settings icon against **SAML Authentication** and click **Identity Provider**.

9 Select **Post** from **SAML Binding**.

10 Specify **ADFS Address** in `https://<adfs_server>/adfs/ls` format.

11 Click **Import**.

12 Select the Token Signing certificate (exported from ADFS) and click **Open**.

13 Click **OK** to close the **Identity Provider** dialog box.

14 Click Settings icon against **SAML Authentication** and click **Service Provider**.

15 Specify **Export Signing Certificate Name** and click **Browse** to save the StoreFront signing certificate on your local drive.

16 Specify **Export Encryption Certificate Name** and click **Browse** to save the StoreFront encryption certificate on your local drive.

17 Specify the **Service Provider Identifier** in `https://<StoreFront_URL>/Citrix/StoreAuth` format.

18 Click **OK**.

Creating the Relying Party Trust on ADFS

1 On the ADFS Management console, click **Relying Party Trusts > Add Relying Party Trust**.

2 Select **Claims aware** and click **Start**.

3 To import StoreFront metadata, perform the following:

   3a Select **Import data about the relying party from a file**.

   3b Specify **StoreFront metadata URL** in `https://<storefront_server>/Citrix/<StoreAuth>/SamlForms/ServiceProvider/Metadata` format.

   3c Click **Next**.

4 Specify **Display Name** and **Notes** for StoreFront and click **Next**.

5 Select **Permit everyone** from **Choose an access control policy list** to configure access control policy for ADFS and click **Next**.

6 Verify the values imported from the StoreFront metadata and Click **Next**.

7 Select **Configure claims issuance policy for this application** and click **Close**.

8 Select the trust created for StoreFront on the Relying Party Trusts and click **Edit Claim Rules**.

9 In the **Issuance Transform Rule** tab, add three rules:

- To add the first rule, perform the following steps:
  1. Click **Add Rule**.
  2. Select **Send LDAP Attributes as Claims** from **Claim Rule Template**.
  3. Specify **Claim rule name**.
  4. Select **Active Directory** from **Attribute Store**.
  5. Select **User-Principal-Name** from **LDAP Attribute**.
  6. Select **Name ID** from **Outgoing Claim Type**.
  7. Click **Save**.
- To add the second rule, perform the following steps:
  1. Click **Add Rule**.
  2. Select **Pass Through or Filter an Incoming Claim** from **Claim Rule Template** and click **Next**.
  3. Specify **Claim rule name**.
  4. Select **Name ID** from **Incoming Claim Type**.
  5. Select **Unspecified** from **Incoming name ID format**.
  6. Select **Pass through all claim values**.
  7. Click **OK**.
- To add the third rule, perform the following steps:
  1. Click **Add Rule**.
  2. Select **Send LDAP Attributes as Claims** from **Claim Rule Template**.
  3. Specify **Claim rule name**.
  4. Select **Active Directory** from **Attribute Store**.
  5. Map the LDAP attributes as follows:
     - LDAP attribute 1:
       1. Select **Surname** from **LDAP Attribute**.
       2. Select **Surname** from **Outgoing Claim Type**.
     - LDAP attribute 2:
       1. Select **Given Name** from **LDAP Attribute**.
       2. Select **Given Name** from **Outgoing Claim Type**.

Configuring the SAML 2.0 Event on Advanced Authentication

1 Open the Advanced Authentication Administration portal.

2 Click **Events > Add.**

3 Create an event with the following parameters:

- Name: Citrix StoreFront

- Chains: select the required chains.
- Paste the content of the file `https://<adfs_hostname>/FederationMetadata/2007-06/FederationMetadata.xml` to the **SP SAML 2.0 meta data**.

  or

  - Click **Choose File** and upload the saved XML file.
- Click **Save**.

NOTE: Verify that you can access the file in your browser. If the file is not displayed, then you have an issue on ADFS that you need to resolve.

---

4 Click **Policies > Web Authentication.**

5 Set **External URL** to `https://AdvancedAuthenticationServerAddress/` and replace `AdvancedAuthenticationServerAddress` with domain name or IP address of your Advanced Authentication server.

NOTE: To use multiple Advanced Authentication servers with SAML 2.0, you must do the following:

1. Configure an external load balancer.
2. Specify the address in **External URL** instead of specifying an address of a single Advanced Authentication server.

---

6 Click **Download IdP SAML 2.0 Metadata**.

You must open the file as an XML file.

NOTE: If `{"Fault":{...` is displayed, you must verify the configuration.

Creating the Claims Party Trust on ADFS

1 Open the ADFS management console.

2 Expand the **Trust Relationships** menu.

3 Click **Add Claims Provider trust**.

4 Select **Import data about the claims provider**.

5 Paste **OSP metadata URL** in `https://<AAF_server_hostname>/osp/a/TOP/auth/saml2/metadata` format or import the file manually.

It may not work for the self-signed certificate. You can copy metadata from OSP URL to an XML file and provide the file name.

6 Specify the **Display name**.

7 **Edit Claim Rules** for the created claims provider trust.

8 In **Edit Claims Rules**, add three rules:

- To add the first rule, perform the following steps:
  1. Click **Add Rule**.
  2. Select **Send Claims Using a Custom Rule** from **Claim Rule Template** and click **Next**.
  3. Specify **Claim rule name**.

4. Paste **Custom rule** and click **Finish**.

```
c:[Type == "upn"]=> issue(Type = "http://schemas.xmlsoap.org/ws/
2005/05/identity/claims/upn", Issuer = c.Issuer, OriginalIssuer
= c.OriginalIssuer, Value = c.Value, ValueType = c.ValueType);
```

- To add the second rule, perform the following steps:
  1. Click **Add Rule**.
  2. Select **Pass Through or Filter an Incoming Claim template** from **Claim Rule Template** and click **Next**.
  3. Specify **Claim rule name**.
  4. Select **UPN** from **Incoming Claim Type**.
  5. Select **Pass through all claim values** and click **Finish**.
- To add the third rule, perform the following steps:
  1. Click **Add Rule**.
  2. Select **Transform an Incoming Claim template** from **Claim Rule Template** and click **Next**.
  3. Specify **Claim rule name**.
  4. Select **UPN** from **Incoming Claim Type**.
  5. Select **Name ID** from **Outgoing claim type**.
  6. Select **Unspecified** from **Outgoing name ID to** and click **Finish**.

9 Open **Properties** for the created claims provider trust and navigate to the **Advanced** tab.

10 Set **Secure hash algorithm** from **SHA-256** to **SHA-1**.

11 Navigate to **Endpoints** tab and ensure that the **Binding** of all endpoints is set to POST.

WARNING: While removing the existing endpoints from the **Endpoints** tab, make a note of configuration to re-create an endpoint and set the **Binding** to POST.

---

12 Click **OK**.

IMPORTANT: Citrix StoreFront does not support SAML Single Logout that causes to authenticate the next login automatically without prompting the users for multi-factor authentication. For more information, see SAML Single Logout (https://support.citrix.com/article/CTX230620).

When users log out from Citrix StoreFront, they must close the browser to protect their account.

NOTE: When you log off from Citrix StoreFront and try to login again through the same browser, an error message `You cannot log on at this time` is displayed. To resolve this issue you must configure the following command in the `script.js` file:

```
CTXS.allowReloginWithoutBrowserClose = true
```

For more information, see Error While Re-login To Citrix StoreFront.

Configuring Integration with Office 365

This section provides the configuration information on integrating Advanced Authentication with Office 365. This integration secures the connection.

The following diagram represents integration of Advanced Authentication with Office 365.

To configure the integration of Advanced Authentication with Office 365, perform the following tasks:

- "Configuring Advanced Authentication SAML 2.0 Event" on page 247
- "Making the Corresponding Changes in ADFS" on page 248
- "Authenticating on Office 365" on page 249

Ensure that the following requirements are met:

- ADFS v4.0, Domain Controller, and other components must be configured to work with Microsoft Office 365.

Configuring Advanced Authentication SAML 2.0 Event

1. Open the Advanced Authentication Administration portal.
2. Click **Events > Add** to add a new event.
3. Create an event with the following parameters:
   - Name: **Office 365**
   - Event Type: **SAML 2**.
   - Chains: Select the required chains.
   - Paste the content of the file `https://<adfs_hostname>/FederationMetadata/2007-06/FederationMetadata.xml` to **SP SAML 2.0 meta data**.

     Or

     - Click **Browse** and upload the saved XML file.
   - Click **Save**.

   NOTE: Verify that you can access the file in your browser. If the file is not displayed, you have an issue on ADFS that you must resolve.
4. Click **Policies > Web Authentication**.
5. Set the **External URL** to `https://AdvancedAuthenticationServerAddress/` and replace `AdvancedAuthenticationServerAddress` with domain name or IP address of your Advanced Authentication server.

NOTE: To use multiple Advanced Authentication servers with SAML 2.0, you must do the following:

1. Configure an external load balancer.
2. Specify the address in **External URL** instead of specifying an address of a single Advanced Authentication server.

6 Click **Download IdP SAML 2.0 Metadata**.

You must open the file as an XML file.

NOTE: If `{"Fault":{...` is displayed, you must verify the configuration.

7 Click **Save**.

Making the Corresponding Changes in ADFS

1 Open the ADFS management console.

2 Click **Claims Provider Trusts > Add Claims Provider trust**.

3 Click **Start** in the **Add Claims Provider Trust Wizard**.

4 Click **Import data about the claims provider from a file** in the **Select Data Source** tab.

5 Browse the **Federation metadata file**.

You can download the Federation metadata from the Advanced Authentication metadata URL: `https://<aaf-server>/osp/a/TOP/auth/saml2/metadata`.

6 Click **Next**.

7 Specify the **Display name**.

8 Click **Next**.

9 Select **Open the Edit Claim Rules dialog for this claims provider when the wizard closes**.

10 Click **Close**.

11 Right-click the **Display name** and click **Edit Claim Rules**.

12 Click **Add Rule**.

13 Select **Send Claims Using a Custom Rule from Claim rule template** in the **Add Transform Claim Rule Wizard**.

14 Click **Next**.

15 Specify the **Claim rule name**.

16 Paste the following in **Custom rule**:

```
c:[Type == "netbiosName"]
 => issue(Type = "http://schemas.microsoft.com/ws/2008/06/identity/
claims/windowsaccountname", Issuer = c.Issuer, OriginalIssuer =
c.OriginalIssuer, Value = c.Value, ValueType = c.ValueType);
```

17 Click **OK**.

Authenticating on Office 365

1 Launch `http://office.com/`.
2 Login with your credentials.
3 Select **Advanced Authentication** to go through the multi-factor authentication.
4 You will be redirected to the OAuth or SAML Login page.
5 You must go through the specified chains for authentication.

Configuring Integration with Sentinel

This section provides the configuration information about integrating Advanced Authentication with Sentinel for managing logs. With this integration the syslog files are gathered and transmitted from Advanced Authentication to Sentinel sever, where an administrator can search the events to analyze, monitor, and generate a report.

To configure the integration of Advanced Authentication with Sentinel, perform the following tasks:

- "Configuring the CEF Log Forward Policy on Advanced Authentication" on page 249
- "Searching the Events on Sentinel" on page 249

Configuring the CEF Log Forward Policy on Advanced Authentication

To forward the syslog details to Sentinel, you must configure the **CEF log Forward** policy by performing the following steps:

1 Open the Advanced Authentication Administration portal.
2 Click **Policy > CEF Log Forward**.
3 Specify the Sentinel server IP address in **Syslog server**.
4 Specify the port number in **Port**.

   For example, you can specify 1443.
5 Select the transport layer details in **Transport**.

   For example, you can select **TCP with TLS.**
6 Click **Save**.
7 Restart the Advanced Authentication server to apply the changes.

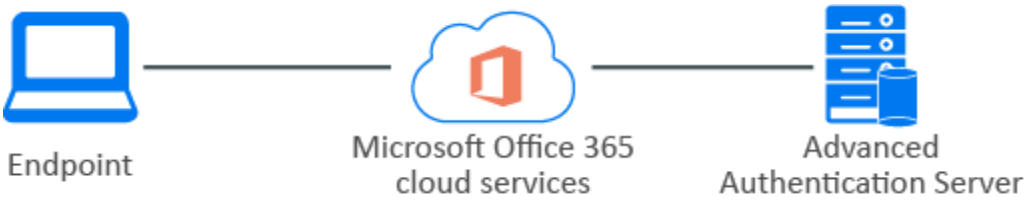
Searching the Events on Sentinel

1 Open the Sentinel console.
2 Specify the query `((sev:[0 TO 5])) AND (sp:"CEF")` in the Search bar, then click **Search**.

   The events with severity 0 to 5 are displayed. You can download the events in the `csv` format.

Configuring Integration with Office 365 without Using ADFS

This section provides the configuration information about integrating Advanced Authentication with Microsoft Office 365. This integration allows users to log in to Office 365 by using their corporate password. During authentication, the specified password is validated by using the federated on-premises Active Directory.



To configure the Advanced Authentication integration with Office 365 using SAML 2.0 perform the following tasks:

- "Configuring the Advanced Authentication SAML 2.0 Event" on page 250
- "Obtaining the Metadata of Advanced Authentication" on page 251
- "Enabling Single Sign-On to Office 365" on page 251
- "Verifying Single Sign-On to Office 365" on page 253

Before integration ensure to download the Office 365 SAML Metadata from Microsoft Online Service (https://nexus.microsoftonline-p.com/federationmetadata/saml20/federationmetadata.xml).

Configuring the Advanced Authentication SAML 2.0 Event

1. Log in to the Advanced Authentication Administration portal.
2. Click **Events > Add**.
3. Create an event with the following parameters:
   - **Name**: Office365
   - **Event Type**: SAML 2
   - **Chains**: Select the preferred chains
   - Perform one of the following to import the metadata:
     - Paste the content of the file `https://nexus.microsoftonline-p.com/federationmetadata/saml20/federationmetadata.xml` to **SP SAML 2.0 meta data**.

       Or
     - Click **Browse** and upload the saved XML file.
   - Set **Send ImmutableId (User objectId) as NameID (required for Microsoft Office 365)** to **ON**. This is required for integration with Microsoft Office 365 without ADFS.
4. Click **Save**.

Obtaining the Metadata of Advanced Authentication

1 Click **Policies > Web Authentication** in the Advanced Authentication Administration portal.

2 Set the **Identity Provider URL** to `https://AdvancedAuthenticationServerAddress/` and replace `AdvancedAuthenticationServerAddress` with domain name or IP address of your Advanced Authentication server.

3 Click **Download IdP SAML 2.0 Metadata**.

You must open the file as an XML file.

NOTE: If `{"Fault":{...` is displayed, you must verify the configuration.

---

4 Click **Save**.

Enabling Single Sign-On to Office 365

It is required to add a custom domain to Office 365 to federate your Office 365 tenant with Advanced Authentication as the external identity provider. You cannot federate your `onmicrosoft.com` domain and cannot set the custom domain that you have added to Office 365 as the default domain.

To enable single sign-on to Office 365 perform the following tasks:

- "Enabling Directory Synchronization in Office 365" on page 251
- "Enabling Active Directory Federation to Office 365 using Advanced Authentication" on page 252

Enabling Directory Synchronization in Office 365

1 Log in to the Office 365 Identity Federation Setup page (https://portal.office.com/IdentityFederation/IdentityFederation.aspx) as the tenant administrator. We recommend you to follow and complete the described ten steps to achieve SSO.

2 Review and prepare for SSO as described in the step 1 (https://docs.microsoft.com/en-us/previous-versions/azure/azure-services/jj151786(v=azure.100)) of Identity Federation Setup page.

3 Skip step 2 to integrate without AD FS.

NOTE: In this integration, it is not required to deploy AD FS. Here, Advanced Authentication replaces AD FS and acts as Security Token Service (STS) for SSO. Ensure to make note of the UPN requirements for SSO.

---

4 Do not install the Windows Azure Active Directory Federation Services 2.0 as described in step 3. Instead, install the Microsoft Online Services Sign-in Assistant on a computer joined to your AD domain then open PowerShell and run the following command to install the Microsoft Azure Active Directory Module for Windows PowerShell:

```
Install-Module MSOnline
```

For more information about Office 365 PowerShell, see Connect to Office 365 PowerShell (https://docs.microsoft.com/en-us/office365/enterprise/powershell/connect-to-office-365-powershell).

5 Review the prerequisites for Active Directory synchronization and activate the Active Directory synchronization for your domain as described in step 5 and 6.

6 Install and configure the Directory Sync tool on the same server where you have installed the Microsoft Azure Active Directory Module for Windows PowerShell.

7 Launch Azure Active Directory Connect.

8 In the **Express settings** page, click **Custom Settings**.

9 In the **User sign-in** page, select **Do not configure** as **Sign On method**.

10 In the **Identifying Users** page, select **objectGUID** from **Source Anchor**.

11 Verify the Active Directory Synchronization and activate the Office 365 licensing for unlicensed but synchronized users.

Enabling Active Directory Federation to Office 365 using Advanced Authentication

1 Log in to the domain-joined computer where you have installed the following components:

- Microsoft Online Services Sign-in Assistant
- Microsoft Azure Active Directory Module for Windows PowerShell
- Azure AD Connect tool

2 Launch Windows Powershell and then run the following command to connect to your Office 365 tenant:

```
Connect-MsolService
```

3 Run the following command to verify whether your Office 365 domain is federated:

```
get-msoldomain -domain samplecompany.365domain.com
```

In case the authentication type of your Office 365 domain is set to Federated, you must convert the authentication type to Managed using the following command:

```
Set-MsolDomainAuthentication –DomainName samplecompany.365domain.com -
Authentication Managed
```

4 Set the identity provider details in the PowerShell variables as follows:

- `$domainname="fully_qualified_domain_name"`

  For example, `$domainname="samplecompany.365domain.com"`
- `$IssuerUri="https://AdvancedAuthenticationServerAddress/osp/a/TOP/auth/saml2/metadata"`
- `$PassiveLogOnUri="https://AdvancedAuthenticationServerAddress/osp/a/TOP/auth/saml2/sso"`
- `$LogOffUri="https://AdvancedAuthenticationServerAddress/osp/a/TOP/auth/saml2/slo"`
- `$protocol="SAMLP"`

- $cert="<place the below certificate here>"


  ```
  MIIDczCCAlugAwIBAgIEHfhpIDANBgkqhkiG9w0BAQsFADBqMQswCQYDVQQGEwJ1czE
  NMAsGA1UE

  CBMEdXRhaDEOMAwGA1UEBxMFcHJvdm8xFzAVBgNVBAoTDk1pY3JvZm9jdXMgSW5jMRE
  wDwYDVQQL

  EwhzZWN1cml0eTEQMA4GA1UEAxMHd2ViYXV0aDAeFw0xOTAyMDUxMzQzNDhaFw0yOTA
  yMDIxMzQz

  NDhaMGoxCzAJBgNVBAYTAnVzMQ0wCwYDVQQIEwR1dGFoMQ4wDAYDVQQHEwVwcm92bzE
  XMBUGA1UE

  ChMOTWljcm9mb2N1cyBJbmMxETAPBgNVBAsTCHNlY3VyaXR5MRAwDgYDVQQDEwd3ZWJ
  hdXRoMIIB
   IjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAmQ89L/
  qZAvdSxvVERU9O6g54nRkFVJaZ5sxd
   rNsckAkqy7k1hzCnEOejWxFepmj0ul6cAHxcMWX1TfnljRNy/
  OpP4+TJnMhSbKBHY6Png4S7UEfN

  r1Djqvq9XDCa6OZrxZXpdDpZAA42tX3sb565I33MsmTKeryiFN0GD4KxyqxiRIahjFt
  AMT9osHrg
   3RcxmyOSCev2gCjuiT3Bk2GvCtsNcgFlV7bqQmtV5ERW16dqRdR9/i/
  L1MSrWB+QkatE/gczWHGz
   M+drT01cQkwauEo1yK3S/DFHNSYgtV4uc3yKZwzn/1dHKYuX8BDRg04bCCKse2hqd/
  m4CP0G695a

  aQIDAQABoyEwHzAdBgNVHQ4EFgQUQJNrW+25YWx6oIG+p9xsREpEYWcwDQYJKoZIhvc
  NAQELBQAD
   ggEBAGQ8/
  KA7XSxfjK4WdU1HZMn8w7kYLtjMTYEY9D1vpSEmsw8si+uH3ZEfIcxkkpnvq7GKLtmE

  rXPJ6j6a9esJjHc0I3LMMRK0xg5tjdh2sXbJm2MForiQvzoonHK2Uf72ODgbCdhqPN3
  kkgwPBxXJ
   xhdncALOT/h1IVTp/aop/UZmvJQkcbgRvSZaptz2r/
  waOLaOCeladPvdQKsMTZMmPdfjW1xWVMa6
   CX7ERCcxeKFWWcCcceepoZd+BPHB9Vuzr+59o2cydCU0x/
  OlnHrcsvUx4Wl1GmB3r6NdpvEJszdb
   sNkV+rczAz0rlhcKTJq3mQzKSMRZXeB9SQ1GorEoEy0=
  ```


5 Run the following command to convert your Office 365 domain to Federated authentication:

  ```
  Set-MsolDomainAuthentication –DomainName $dom -Authentication Federated
  -PassiveLogOnUri $url -IssuerUri $uri -LogOffUri $logoutUrl -
  PreferredAuthenticationProtocol SAMLP -SigningCertificate $certData
  ```

6 Run the following command to verify the federation settings of your Office 365 domain:

  ```
  Get-MsolDomainFederationSettings -domain samplecompany.365domain.com
  ```

Verifying Single Sign-On to Office 365

1 On the Microsoft Office page (http://office.com/), log in with your credentials.

  The page redirects to the Advanced Authentication SAML Login page.

2 Select the preferred chain for authentication.

You must pass all methods in the chain to authenticate successfully.

III Maintaining Advanced Authentication

This chapter contains the following sections:

- Chapter 13, “Logging,” on page 257
- Chapter 14, “Disaster Recovery,” on page 277
- Chapter 15, “Reporting,” on page 285
- Chapter 16, “Managing Tokens,” on page 287
- Chapter 17, “Searching a Card Holder’s Information,” on page 289
- Chapter 18, “Troubleshooting,” on page 291

13 Logging

Advanced Authentication provides the logging functionality. All the administrative and user actions and events are logged in this section.

Logs help to debug a problem based on the event or action performed.

There is a hard coded log rotation based on the file size. The maximum size of a log file is 20 MB and for WebAuth logs it is 10 MB. Advanced Authentication stores the last ten log files of each type.

Advanced Authentication supports the following types of logs:

- "Syslog" on page 258
- "RADIUS Logs" on page 273
- "Async Logs" on page 273
- "Web Server Logs" on page 274
- "Replication Logs" on page 274
- "Superuser Logs" on page 274
- "Background Tasks Logs" on page 274
- "NGINX Errors Logs" on page 275
- "WebAuth Logs" on page 275
- "Fingerprint Logs" on page 275

NOTE: A tenant administrator cannot access the Web server logs, Replication logs, Superuser logs, and Background tasks logs.

You can change a time zone in the upper-right section that displays your local time zone. The changes are applied for only the logs displayed and are not applied for the exported logs. Advanced Authentication resets the time zone when you switch from the **Logs** section or close the Administration portal.

Exporting the Logs

You can export the logs to a compressed file in the `tar.gz` format.

To export logs, perform the following steps:

1. Click **Logs**.
2. Select the log you want to export.
3. Click **Export**.
4. Specify a **Start date** and **End date** to determine the required logging period.
5. Click **Export**.

   The exported log files are displayed in the **File Name** section.

6. Click the exported log file package that is exported in the format `aucore-logs_<logging_period>.tar.gz` to download it.

   NOTE: A tenant administrator cannot export the logs.

Clearing the Logs

You can clear all the logs on the server that you are currently logged on. To clear the logs, perform the following steps:

1. In the **Logs** page, click **Clear**.

   A message appears to confirm that you want to continue clearing the logs.

   NOTE: It is a good practice to export logs to save as a backup before you delete them.

2. Click **OK** to clear the logs.

Syslog

These logs contain information about the system events and actions. The log message is displayed in the format `<date> <host> CEF:0|AAA|Core|<version>|<code>|<message>|<severity>|<endpoint>|<event>|<authentication method name>|<template owner>|<tenant name>|<user name>|<uwsgi process id>`.

The Syslogs are classified as follows:

- 0 - 99: Maintenance
- 100 - 199: Access
- 200 - 299: App data
- 300 - 399: Endpoints
- 400 - 499: Repositories
- 500 - 599: Local users
- 600 - 699: Repository users
- 700 - 799: User templates
- 800 - 999: Policies
- 900 - 1099: Licenses
- 1000 - 1100: Settings
- 1100 - 1200: Password filter
- 1201 - 1300: Background logon
- 1301 - 1400: Events
- 1401 - 1500: Chains

Code	Name	Class	Severity	Optional Parameters	Example
1	New Request	Operational	1	None	June 10 20:10:11 host CEF:0|AAA|Core|5.0|1|New Request|1|
2	Request failed	Operational	1	None	June 10 20:10:11 host CEF:0|AAA|Core|5.0|2|Request failed|1|p=3531
10	Server started	Operational	4	None	June 10 20:10:11 host CEF:0|AAA|Core|5.0|1|Server started|4|
12	Server stopped	Operational	7	None	June 10 20:10:11 host CEF:0|AAA|Core|5.0|2|Server stopped|7|
13	Server unexpectedly stopped	Operational	10	None	June 10 20:10:11 host CEF:0|AAA|Core|5.0|3|Server unexpectedly stopped|10
50	Server Message	Operational	5	Message	June 10 20:10:11 host CEF:0|AAA|Core|5.0|4|Server Message|4|This is my message
100	User logon started	Security	4	Username Ep Ep_addr Sid Unit_id Session_id Event Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|4|User logon started|4|username=Mycompany\\demo sid=S-1-5-XXX session_id=123 event=Windows Logon ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 tenant_name=Mycompany
101	User was successfully logged on	Security	7	Username Ep Ep_addr Sid Session_id method_name method_comment method_infoEvent Tenant_name Template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|101|User was successfully logged on|7|username=Mycompany\\demo sid=S-1-5-XXX session_id=123 method_name=card method_comment=white card method_info=YYY password ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 event=Windows Logon template_owner=Mycompany\\demo tenant_name=Mycompany\\AbbooPI p=9721

Code	Name	Class	Severity	Optional Parameters	Example
102	User was failed to authenticate	Security	9	Username Ep Ep_addr Sid Session_id Method_name Tenant_name Template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|6|User was failed to authenticate|9|Username=Mycompany\\demo sid=S-1-5-XXX session_id=123 method_name=card ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 template_owner=Mycompany\\demo tenant_name=Mycompany
103	User was switched to different method	Security	2	Username Ep Ep_addr Sid Session_id New_method_name Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|7|User was switched to different method|2|username=Mycompany\\demo sid=S-1-5-XXX new_method_name=fingerprint session_id=123 ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 tenant_name=Mycompany
104	User logon session was ended	Security	2	Username Ep Ep_addr Sid Session_id Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|8|User logon session was ended|2|username=Mycompany\\demo sid=S-1-5-XXX session_id=123 ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 tenant_name=Mycompany
105	User logon unwanted	Security	9	Username Ep Ep_addr Method_name Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|8|User logon session was ended|9|username=Mycompany\\demo sid=S-1-5-XXX session_id=123 ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 method_name=voice tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
106	User was failed to authenticate method in the middle of a chain	Security	2	Username Ep Ep_addr Method_name Tenant_name	June 10 20:10:11 (UTC+0530) host CEF:0|AAA|Core|5.0|106|User was failed to authenticate method in the middle of a chain|2|ep_addr=164.99.137.193 method_name=PASSWORD:1 tenant_name=TOP user_name=MFA\\topvisu p=3147
200	User read app data	Security	3	Username Ep Ep_addr Sid Session_id Data_id Record_id Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|9|User read app data|3|username=Mycompany\\demo sid=S-1-5-XXX session_id=123 data_id=Windows Logon record_id=password ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 tenant_name=Mycompany
201	User write app data	Security	4	Username Ep Ep_addr Sid Session_id Data_id Record_id Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|10|User write app data|4|username=Mycompany\\demo sid=S-1-5-XXX session_id=123 data_id=Windows Logon record_id=password ep=aaadev1.Mycompany.local ep_addr=192.168.91.1 tenant_name=Mycompany
300	Endpoint joined	Security	4	Ep_name Ep_addr Ep_id Username Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|11|Endpoint joined|4|ep_name=xp_client ep_id=123 username=Mycompany\Admin ep_addr=192.168.91.1 tenant_name=Mycompany
301	No rights to join endpoint	Security	7	Ep_name Ep_addr Ep_id Username Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|12|No rights to join endpoint|7|ep_name=xp_client ep_id=123 username=Mycompany\Admin ep_addr=192.168.91.1 tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
302	Failed to join endpoint	Operational	7	Ep_name Ep_addr Ep_id Username Reason Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|13|Failed to join endpoint |7|ep_name=xp_client ep_id=123 username=Mycompany\Admin ep_addr=192.168.91.1 reason=Duplicated tenant_name=Mycompany
303	Endpoint remove	Security	4	Ep_name Ep_addr Ep_id Username Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|14|Endpoint remove|4|ep_name=xp_client ep_id=123 username=Mycompany\Admin ep_addr=192.168.91.1
	Endpoint changed	Security	4	Ep_name Ep_addr Ep_id Username Tenant_name	
	Failed to change endpoint	Operational	7	Ep_name Ep_addr Ep_id Username Tenant_name reason	
304	No rights to remove endpoint	Security	7	Ep_name Ep_addr Ep_id Username Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|15|No rights to remove endpoint|7|ep_name=xp_client ep_id=123 username=Mycompany\Admin ep_addr=192.168.91.1 tenant_name=Mycompany
305	Failed to remove endpoint	Operational	7	Ep_name Ep_addr Ep_id Username Reason Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|16|Failed to remove endpoint |7|ep_name=xp_client ep_id=123 username=Mycompany\Admin ep_addr=192.168.91.1 reason=Duplicated tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
306	Endpoint session started	Operational	2	Ep_name Ep_addr Ep_id Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|306|End point session started|2|ep_name=xp_client ep_id=123 ep_addr=192.168.91.1 tenant_name=Mycompany p=5428
307	Endpoint session ended	Operational	2	Ep_name Ep_addr Ep_id Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|18|Endp oint session ended|2|ep_name=xp_client ep_id=123 ep_addr=192.168.91.1 tenant_name=Mycompany
308	Invalid endpoint secret	Security	7	Ep_name Ep_addr Ep_id Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|17|Inval id endpoint secret|2|ep_name=xp_client ep_id=123 ep_addr=192.168.91.1 tenant_name=Mycompany
309	Failed to create endpoint session	Operational	7	Ep_name Ep_addr Ep_id Reason Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|18| Failed to create endpoint session |7|ep_name=xp_client ep_id=123 ep_addr=192.168.91.1 reason=No memory tenant_name=Mycompany
310	Failed to end endpoint session	Operational	7	Ep_name Ep_addr Ep_id Reason Tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|18| Failed to create endpoint session |7|ep_name=xp_client ep_id=123 ep_addr=192.168.91.1 reason=No memory tenant_name=Mycompany
401	New repository was added	Operational	4	repo_name repo_type session_id tenant_name user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|19|New repository was added |4|repo_name=Mycompany repo_type=LDAP session_id=123 tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
402	Failed to add repository	Operational	7	repo_name repo_type session_id reason tenant_name user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|20| Failed to add repository|7|repo_name=Mycompany repo_type=LDAP session_id=123 reason=repo already exists tenant_name=Mycompany
403	Repository was removed	Operational	4	repo_name repo_type session_id tenant_name user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|21|Repository was removed|4|repo_name=Mycompany repo_type=LDAP session_id=123 tenant_name=Mycompany
404	Failed to remove repository	Operational	7	repo_name repo_type session_id reason tenant_name user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|22|Failed to remove repository|7| repo_name=Mycompany repo_type=LDAP session_id=123 reason=not empty tenant_name=Mycompany
405	Repository configuration was changed	Operational	4	repo_name repo_type session_id reason tenant_name user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|23|Repository configuration was changed|4| repo_name=Mycompany repo_type=LDAP session_id=123 tenant_name=Mycompany
501	Local user was created	Operational	4	user_name session_id tenant_name target_user_name	2018-08-29T12:46:21.485790 (UTC+0530)+00:00 linux CEF:0|AAA|Core|5.0|501|Local user was created|4|target_user_name=syslog_1 tenant_name=TOP user_name=LOCAL\\ADMIN p=8103
502	Local user was removed	Operational	5	user_name session_id tenant_name target_user_name	2018-08-29T12:45:46.701541 (UTC+0530)+00:00 linux CEF:0|AAA|Core|5.0|502|Local user was removed|5|target_user_name=SAMPLE tenant_name=TOP user_name=LOCAL\\ADMIN p=8105

Code	Name	Class	Severity	Optional Parameters	Example
503	Failed to create local user	Operational	4	user_name session_id tenant_name target_user_name	2018-08-29T12:45:25.343315 (UTC+0530)+00:00 linux CEF:0|AAA|Core|5.0|503|Failed to create local user|4|reason=transaction<space>aborted target_user_name=Sample tenant_name=TOP user_name=LOCAL\\ADMIN p=8107
504	No rights to remove local user	Security	7	user_name session_id tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|26|ailed to create local user|4|user_name=admin session_id=123 reason=already exists tenant_name=Mycompany
505	Failed to remove local user	Operational	5	user_name session_id reason tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|28|Failed to remove local user|5|user_name=admin session_id=123 reason=can't remove currently logged on user tenant_name=Mycompany
506	No rights to create local user	Security	7	user_name session_id tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|29|Failed to create local user|7|user_name=admin session_id=123 tenant_name=Mycompany
601	User was created	Operational	4	user_name session_id repo_name tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|30|User was created|4|username=Someone session_id=123 repo_name=Mycompany tenant_name=Mycompany
602	No rights to create user	Security	7	user_name session_id repo_name tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|31|No rights to create user|7|username=Someone session_id=123 repo_name=Mycompany tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
603	Failed to create user	Operational	4	user_name session_id repo_name reason tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|32|Failed to create user|4|user_name=someone session_id=123 repo_name=123 reason=already exists tenant_name=Mycompany
605	No rights to remove user	Security	7	user_name session_id repo_name tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|34No rights to remove user|7|username=Someone session_id=123 repo_name=Mycompany tenant_name=Mycompany
606	Failed to remove user	Operational	5	user_name session_id repo_name reason tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|35|Failed to remove user|5|user_name=someone session_id=123 repo_name=123 reason=not found tenant_name=Mycompany
607	Role was granted to user	Operational	7	user_name session_id tenant_name target_user_name role_name	2018-08-29T12:46:31.839284 (UTC+0530)+00:00 linux CEF:0|AAA|Core|5.0|607|Role has been granted to user|7|role_name=FULL<space>ADMINS target_user_name=SYSLOG_1 tenant_name=TOP user_name=LOCAL\\ADMIN p=8105
608	Failed to grant role to user	Operational	8	user_name session_id tenant_name target_user_name role_name	2018-08-29T12:46:31.839284 (UTC+0530)+00:00 linux CEF:0|AAA|Core|5.0|608|Failed to grant role to user|8|role_name=FULL<space>ADMINS target_user_name=SYSLOG_1 tenant_name=TOP user_name=LOCAL\\ADMIN p=8105

Code	Name	Class	Severity	Optional Parameters	Example
609	Role was revoked from user	Operational	7	user_name session_id tenant_name target_user_name role_name	2018-08-29T12:46:35.776761 (UTC+0530)+00:00 linux CEF:0|AAA|Core|5.0|609|Role has been revoked from user|7|role_name=FULL<space>ADMINS target_user_name=SYSLOG_1 tenant_name=TOP user_name=LOCAL\\ADMIN p=8103
610	Failed to revoke role from user	Operational	8	user_name session_id tenant_name target_user_name role_name	2018-08-29T12:46:35.776761 (UTC+0530)+00:00 linux CEF:0|AAA|Core|5.0|610|Failed to revoke role from user|8|role_name=FULL<space>ADMINS target_user_name=SYSLOG_1 tenant_name=TOP user_name=LOCAL\\ADMIN p=8103
611	User was unlocked	Operational	7	target_user_name, tenant_name, user_name	
701	Template was assigned to the user	Security	7	user_name session_id ap_name comment tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|36|Template was assigned to the user|7|user_name=Mycompany\some session_id=123 ap_name=Card comment=white card tenant_name=Mycompany
702	Template was enrolled for the user	Security	7	user_name session_id ap_name comment tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|37|Template was enrolled for the user|7|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand tenant_name=Mycompany
703	User enroll the assigned template	Security	7	user_name session_id ap_name comment tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|38|User enroll the assigned template|7|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
704	Template is linked	Security	8	user_name target_user_name session_id ap_name comment tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|39|Template is linked|8|user_name=Mycompany\some target_user_name=Mycompany\boss session_id=123 ap_name=hand 3D comment=left hand tenant_name=Mycompany
705	Failed to assign template to the user	Security	7	user_name session_id ap_name comment reason tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|40|Failed to assign template to the user|7|user_name=Mycompany\some session_id=123 ap_name=Card comment=white card reason=no license tenant_name=Mycompany
706	Failed to enroll template for the user	Security	7	user_name session_id ap_name comment reason tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|41|Failed to enroll template for the user|7|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand reason=ap error tenant_name=Mycompany
707	User can't enroll the assigned template	Security	7	user_name session_id ap_name comment reason tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|41|User can't enroll the assigned template|7|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand reason=AP not installed on client side tenant_name=Mycompany
709	Failed to link template	Security	8	user_name target_user_name session_id ap_name comment reason tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|42|Failed to link template|8|user_name=Mycompany\some target_user_name=Mycompany\boss session_id=123 ap_name=hand 3D comment=left hand reason=target user can't be found tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
709	Template link was removed	Security	6	user_name target_user_name session_id ap_name comment tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|43|Template link was removed|6|user_name=Mycompany\some target_user_name=Mycompany\boss session_id=123 ap_name=hand 3D comment=left hand tenant_name=Mycompany
710	Failed to remove template link	Security	6	user_name target_user_name session_id ap_name comment reason tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|44|Failed to remove template link|6|user_name=Mycompany\some target_user_name=Mycompany\boss session_id=123 ap_name=hand 3D comment=left hand reason=too small carma tenant_name=Mycompany
711	Template was removed	Security	6	user_name ap_name comment session_id tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|45|Template was removed|6|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand tenant_name=Mycompany
712	Failed to remove template	Security	6	user_name ap_name comment session_id reason tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|46|Failed to remove template|6|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand reason=only owner can remove template tenant_name=Mycompany
713	Template was changed	Security	7	user_name ap_name comment session_id tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|47|Template was changed|7|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
714	Failed to change template	Security	6	user_name ap_name comment session_id reason tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|48|Failed to change template|6|user_name=Mycompany\some session_id=123 ap_name=hand 3D comment=left hand reason=only owner can change template tenant_name=Mycompany
715	Template was changed during logon	Security	5	user_name ap_name comment session_id tenant_name template_owner	June 10 20:10:11 host CEF:0|AAA|Core|5.0|49|Template was changed during logon|7|user_name=Mycompany\some session_id=123 ap_name=TOTP comment=ASA (iPhone) tenant_name=Mycompany
801	Policy was changed	Security	7	session_id scope component_id policy_name user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|50|Policy was changed|7|session_id=123 scope=global comp_name=password poliices policy_name=minimal password length old_value=4 new_value=8
802	No rights to change policy	Security	8	session_id scope component_id policy_name user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|51|No rights to change policy|8|session_id=123 scope=global comp_name=password poliices policy_name=minimal password
803	Failed to change policy	Operational	7	session_id scope component_id policy_name reason user_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|52|Failed to change policy|7|session_id=123 scope=global comp_name=password poliices policy_name=minimal password reason=policy not found

Code	Name	Class	Severity	Optional Parameters	Example
901	New license was added	Operational	3	session_id license_id users_count enabled_features expire_date	June 10 20:10:11 host CEF:0|AAA|Core|5.0|53|New license was added|3|session_id=123 license_id=111 users_count=101 enabled_features=client,rte,nps expire_date=31/12/2014
902	Failed to add license	Operational	8	session_id license_id users_count enabled_features expire_date reason	June 10 20:10:11 host CEF:0|AAA|Core|5.0|54|Failed to add license|8|session_id=123 license_id=111 users_count=101 enabled_features=client,rte,nps expire_date=31/12/2013 reason=already expired
1001	Global setting was changed	Security	9	session_id setting_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|55|Global setting was changed|9|session_id=123 setting_name=syslog_server
1002	No rights to change global setting	Security	9	session_id setting_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|56|No rights to change global setting|9|session_id=123 setting_name=syslog_server
1003	Failed to change global setting	Operational	9	session_id setting_name reason	June 10 20:10:11 host CEF:0|AAA|Core|5.0|57|Failed to change global setting|9|session_id=123 setting_name=syslog_server reason=server is unavailable
1101	Password was changed	Security	5	user_name ep ep_addr tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|15|Password was changed|5|ep=xp_client user_name=Mycompany\Admin ep_addr=192.168.91.1 tenant_name=Mycompany
1102	Password was reset	Security	8	user_name ep ep_addr tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|15|Password was reset|8|ep=xp_client user_name=Mycompany\Admin ep_addr=192.168.91.1 tenant_name=Mycompany

Code	Name	Class	Severity	Optional Parameters	Example
1201	User successfully logged on using local cache	Security	8	user_name ep_addr event chain_name logon_time tenant_name	June 10 20:10:11 host CEF:0|AAA|Core|5.0|1201|User successfully logged on using local cache|8|ep=xp_client user_name=Mycompany\Admin ep_addr=192.168.91.1 event=windows logon chain_name=LDAP+SMS logon_time=2017-11-05 08:10:03 tenant_name=Mycompany
1301	Event was created successfully	Security	4	event tenant_name session_id user_name	Jan 03 17:04:10 host CEF:0|AAA|Core|5.0|1301|Event was created sucessfully|4|event=Windows logon tenant_name=TOP p=9171
1302	Failed to create event	Operational	7	event tenant_name reason session_id user_name	
1303	Event was changed successfully	Security	4	event tenant_name session_id user_name	Jan 03 17:05:21 host CEF:0|AAA|Core|5.0|1303|Event was changed sucessfully|4|event=Linux logon tenant_name=TOP p=9163
1304	Failed to change event	Operational	7	event tenant_name reason session_id user_name	
1305	Event was removed successfully	Security	4	event tenant_name session_id user_name	Jan 03 17:06:40 host CEF:0|AAA|Core|5.0|1305|Event was removed sucessfully|4|event=linux logon tenant_name=TOP p=9171
1306	Failed to remove event	Operational	7	event tenant_name reason session_id user_name	
1401	Chain was created sucessfully	Security	4	chain_name tenant_name session_id user_name	Jan 03 16:54:09 host CEF:0|AAA|Core|5.0|1401|Chain was created sucessfully|4|chain_name=password tenant_name=TOP p=9171

Code	Name	Class	Severity	Optional Parameters	Example
1402	Failed to create chain	Operational	7	chain_name tenant_name reason session_id user_name	
1403	Chain was changed sucessfully	Security	4	chain_name tenant_name session_id user_name	Jan 03 16:59:45 host CEF:0|AAA|Core|5.0|1403|Chain was changed sucessfully|4|chain_name=SMS tenant_name=TOP p=9171
1404	Failed to change chain	Operational	7	chain_name tenant_name reason session_id user_name	
1405	Chain was removed sucessfully	Security	4	chain_name tenant_name session_id user_name	Jan 03 16:56:16 host CEF:0|AAA|Core|5.0|1405|Chain was removed sucessfully|4|chain_name=email OTP tenant_name=TOP p=9163
1406	Failed to remove chain	Operational	7	chain_name tenant_name reason session_id user_name	

To configure logs forwarding to a third-party syslog server, see CEF Log Forward Policy.

RADIUS Logs

These logs contain information about the logs that are recorded for the RADIUS server.

On the server, the `radius.log` file is stored in the `/var/lib/docker/volumes/aaf_radiusd-logs/_data/` directory.

After you export the RADIUS logs, you can find the `radius.log` file in the `/var/log/freeradius/` directory.

Async Logs

These logs contain information about the asynchronized delivery of OTP messages for the SMS, Email, and Voice methods.

On the server, the `async_commander.log` and `async_commander.*.log` files are stored in the `/var/lib/docker/volumes/aaf_aucore-logs/_data/` directory.

After you export the Async logs, you can find the `async_commander.log` and `async_commander.*.log` files in the `/opt/AuCore/logs/` directory.

Web Server Logs

These logs contain information about requests to REST API, Administration portal, and so on.

On the server, the `uwsgi.log` file is stored in the `/var/lib/docker/volumes/aaf_aucore-logs/_data/` directory

After you export the Web Server logs, you can find the `uwsgi.log` file in the `/opt/AuCore/logs/` directory.

Replication Logs

These logs contain information about the replication events for a cluster.

On the server, the `symdb.log` file is stored in the `/var/lib/docker/volumes/aaf_aucore-logs/_data/` directory.

After you export the Replication logs, you can find the `symdb.log` file in the `/opt/AuCore/logs/` directory.

Superuser Logs

These logs contain information about the process that is used to execute shell commands under the root account (used by updates).

On the server, the `root_commander.log` file is stored in the `/var/lib/docker/volumes/aaf_aucore-logs/_data/` directory.

After you export the Superuser logs, you can find the `root_commander.log` file in the `/opt/AuCore/logs/` directory.

Background Tasks Logs

These logs contain information about the queue tasks and about periodically running tasks (such as LDAP sync).

On the server, the `celery.log` file is stored in the `/var/lib/docker/volumes/aaf_aucore-logs/_data/` directory.

After you export the Background Tasks logs, you can find the `celery.log` file in the `/opt/AuCore/logs/` directory.

NGINX Errors Logs

These logs contain information about the errors of the nginx web server.

On the server, the `error.log` file is stored in the `/var/lib/docker/volumes/aaf_webd-logs/_data/` directory.

After you export the NGINX Errors logs, you can find the `error.log` file in the `/var/log/nginx/` directory.

WebAuth Logs

These logs contain information about the SAML 2.0 and OAuth 2.0 integrations.

When you enable **Debug logging**, logs in the FINEST mode are generated and when you disable **Debug logging**, logs in the FINER mode are generated.

On the server, the `osp-aa.*` file is stored in the `/var/lib/docker/volumes/aaf_webauth-logs/_data/` directory.

After you export the WebAuth logs, you can find the `osp-aa.*` in the `/opt/osp/tomcat/logs` directory.

NOTE: The FINEST mode resets to FINER mode after a change in SAML 2.0 events, OAuth 2.0 events or Web Authentication policy. This mode reset is not shown on UI. Disable the Debug logging and then enable it to reset logging to the FINEST mode again.

Fingerprint Logs

These logs contain all information from a Fingerprint service.

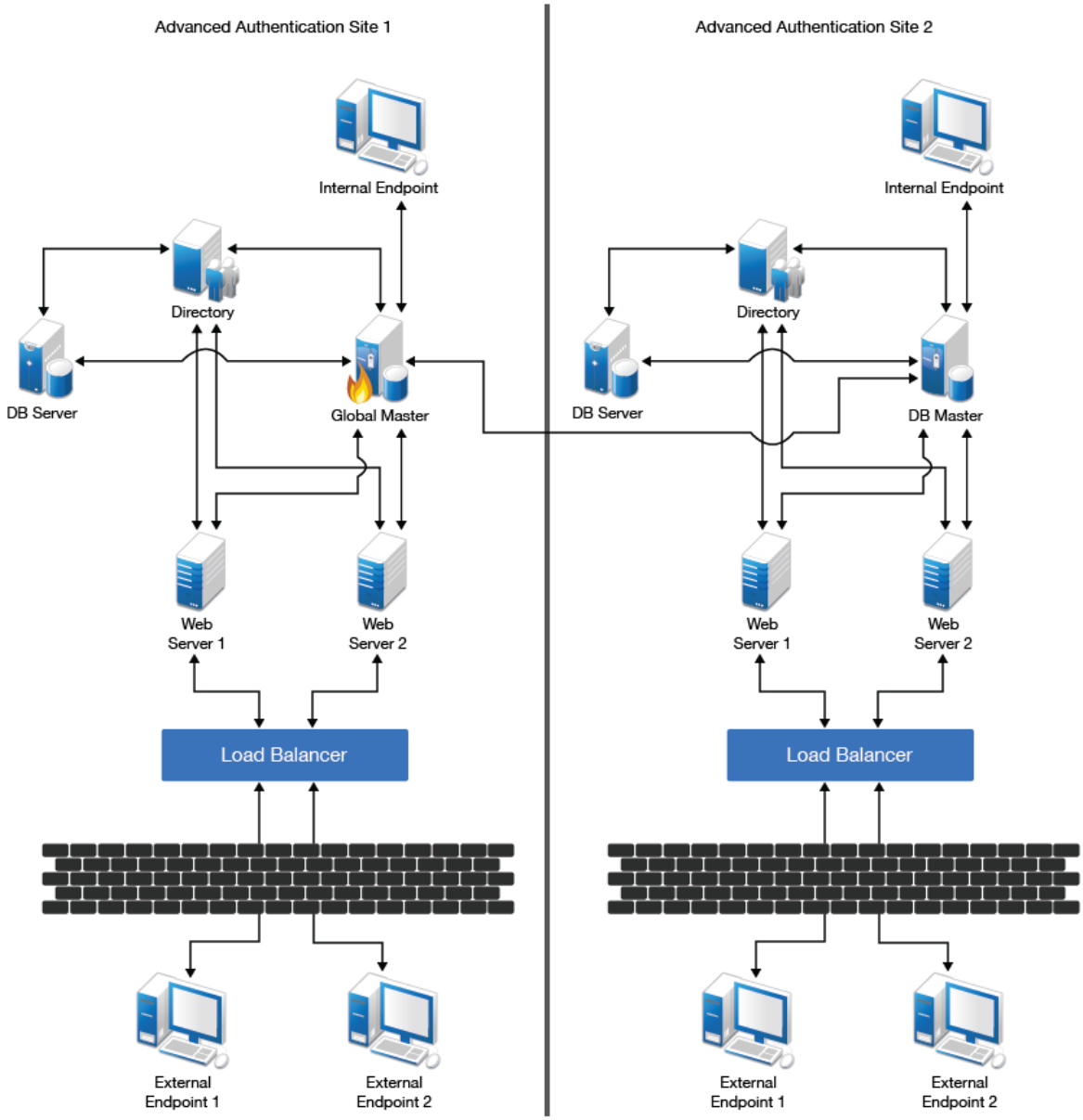
On the server, the `nbisd.log` file is stored in the `/var/lib/docker/volumes/aaf_afisd-logs/_data/` directory.

14 Disaster Recovery

Disaster recovery lets you restore the system after a crash or when other catastrophic failure occurs. Disaster recovery helps you to restore as much data as possible and limit the resources needed during the backup.

A Disaster Recovery scenario in Advanced Authentication can be when the Global Master database (GMS) is corrupt or the configuration has been deleted. The Figure 14-1 illustrates the Disaster Recovery scenario.

Figure 14-1 *Disaster Recovery scenario*



This chapter describes the steps for creating a backup of Advanced Authentication and restoring the environment in case of a disaster.

You can recover from a disaster based on the following two use-cases:

- Restoring: When a disastrous damage has occurred in the cluster from which it is impossible to recover, you must restore the cluster.
- Rejoining: When any of the servers are down (web server, DB server), you can rejoin to recover the cluster.

Restoring a Cluster

You must perform the following to restore the cluster:

- "Creating a Backup" on page 278
- "Recovering by Restoring the Backup" on page 279

Creating a Backup

Advanced Authentication provides support for database back up through the Administration portal. Backup can be used to restore a setup in case of a disaster.

Exporting the Database

1. Log in to the Administration portal with the **FULL ADMIN** role privilege where the Global Master is set up.
2. Click **Export** in the Administration console.
3. Click **Export Database**.

   A message `Are you sure? Backup file will be encrypted with LOCAL\admin` PASSWORD is displayed.
4. Click OK.

The exported database file is saved in the `.cpt` format on your local drive. This backup file will be encrypted with the LOCAL\admin PASSWORD.

You can automate the creation of the `.cpt` file. To do this, create a cronjob on the server that does the following:

1. Create a `proc` folder in the docker container:

   ```
   docker exec -ti aaf_aucore_1 mkdir /etc/nginx/html/static/proc/
   ```
2. Create `/opt/AuCore/data/export/aubak-YYYY_MM_DD_HH_MM.cpt`.

   ```
   docker exec -it aaf_aucore_1 "/opt/AuCore/aucore/scripts/db_tools/
   version2/au_export_encrypt.sh"
   ```
3. Copy the `.cpt` file to a secure location.

   ```
   cp /var/lib/docker/volumes/aaf_aucore-data/_data/export/*.cpt <your
   location>
   ```

4 Remove the `.cpt` file from the container.

```
rm /var/lib/docker/volumes/aaf_aucore-data/_data/export/*.cpt
```

Recovering by Restoring the Backup

You can perform the following to restore the backup:

- "Prerequisite for Restoring" on page 279
- "Importing the Database" on page 279
- "Re Adding the LDAP Servers on All the DB Master(s)" on page 280

Prerequisite for Restoring

It is recommended to stop the Advanced Authentication services on the DB Masters and DB servers for a smooth recovery.

To stop the process, perform the following steps:

1 Log in to the Database Masters and DB server machines (NOT the Global Master).

1a Log in to the Aucore container:

```
docker exec -it aaf_aucore_1 bash
```

1b Stop the Advanced Authentication processes:

```
/opt/superctl stop all
```

1c Stop the replication from this server to the other cluster members:

```
/opt/penv/bin/au-replica stop
```

1d Exit the container:

```
exit
```

or

Run the following single command to stop all the services:

```
docker exec aaf_aucore_1 bash -c "/opt/penv/bin/au-replica stop && /
opt/superctl stop all"
```

2 Repeat the Step 1 on all the Database Master and DB server machines.

NOTE: After you import the database to the Global Master and copy the database to all the DB Masters and DB servers, you must start the Advanced Authentication process. There will be a short duration of downtime.

Importing the Database

1 Log in to the Administration portal with the FULL ADMIN role privilege where the Global Master is set up.

2 Click **Export**.

3 Click **For import Click Here** to upload the database.

4 In **Upload backup** section, specify the following details:

   4a **From**: The database download URL (FTP or HTTP server). Ensure the database file is in the `.cpt` format.

   4b **Decrypt Password**: The password to decrypt the database file.

5 Click **Upload**.

6 The upload logs are displayed. The uploaded file is displayed in the **Import backup** section.

7 Click **Import** next to the uploaded file.

8 Click **OK**.

   The import logs are displayed. Import of the database to the Global Master is complete.

9 Copy the Global Master DB to all the Database Masters and database server machines.

   9a Log in as a root user to the Database Master machine.

   Run the following commands to copy from the Global Master database to a local DB.

   9a1 Log in to the Aucore container:

   ```
   docker exec -it aaf_aucore_1 bash
   ```

   9a2 Copy the database from Global Master server to a local DB:

   ```
   /opt/penv/bin/au-replica copy-db
   ```

   9a3 Start all the Advanced Authentication processes:

   ```
   /opt/superctl start all
   ```

   9a4 Start the replication to the other cluster members:

   ```
   /opt/penv/bin/au-replica start
   ```

   9a5 Exit the container:

   ```
   exit
   ```

   or

   Run the following single command to start all the services:

   ```
   docker exec aaf_aucore_1 bash -c "/opt/penv/bin/au-replica copy-db
   && /opt/superctl start all && /opt/penv/bin/au-replica start"
   ```

10 Repeat Step 1 to Step 9 on all the Database Master and DB server machines.

11 Log in to all the server members and check the cluster page.

NOTE: After importing the database, information about the **Last 200 outgoing batches for every server** listed in **Cluster > Batches** of the Administration portal will be lost.

Re Adding the LDAP Servers on All the DB Master(s)

1 Log in to the Administration portal with the **FULL ADMIN** role privilege where the Global Master is set up.

2 Click **Repositories**.

3 Click on any repository.

4 Under **LDAP Servers**, click **Add Server.**

5 Click on the icon to add the LDAP Server of the same site as the DB Master server.

NOTE: You can perform the Step 4 to Step 5 with the DNS discovery as well.

6 Provide the repository administrator user password and save the configuration.

7 Repeat the Step 1 to Step 6 on all the Database Master.

Rejoining the Cluster

When errors occur within the database and replicas, you must re-create the Global Master database (GMS).

You must re-install all the other servers in the cluster. You can do this by performing a fresh install of all the servers in the cluster.

It is recommended to rebuild the cluster by performing the following steps:

1. In the primary site:
   a. Rejoin the database servers
   b. Rejoin the Webserver servers
2. In other sites:
   a. Rejoin the Master server
   b. Rejoin the database servers
   c. Rejoin the Webserver servers

To enable the First Install wizard, perform the following steps.

1 Log in as root to the server.

2 Perform the following:

2a `Run the command: cd /opt/aauth`

2b Stop the Advanced Authentication server:

```
/opt/aauth/stop
```

2c Remove the containers, network, and volumes which Advanced Authentication has created on the server:

```
docker-compose -p aaf -f docker-compose.yml -f docker-
compose.sles.yml down -v
```

2d Start the Advanced Authentication server:

```
/opt/aauth/start
```

3 Browse the URL: `https://<servername>` in a web browser and rejoin the server.

You can rejoin the cluster in any of the following scenarios:

- "Database Server is Down" on page 282
- "Web Server is Down" on page 282
- "Database Master is Down" on page 283
- "Site is Down" on page 284

Database Server is Down

Ensure to enable the SSH daemon on the appliance. To do this, browse `https://<aafwebservername>:9443` and log in as a `vaadmin`. Click the **System Services** tab and start the SSH service.

NOTE: If you want to recover the database server because of a failure, you must delete the server from the **Cluster** tab of the Administration portal, before re-joining the web server. To delete the server in the **Cluster** tab, see "Configuring a Cluster".

Perform the following steps to restore the database server:

1. Log in as root to the server.
2. Run the following commands:
   - **2a** `cd /opt/aauth`
   - **2b** Stop the Advanced Authentication server:

     ```
     /opt/aauth/stop
     ```
   - **2c** Remove the containers, network, and volumes that the Advanced Authentication has created on the server:

     ```
     docker-compose -p aaf -f docker-compose.yml -f docker-compose.sles.yml down -v
     ```
   - **2d** Start the Advanced Authentication server:

     ```
     /opt/aauth/start
     ```
3. Browse the URL `https://<servername>` in a web browser and rejoin the server.

   After joining the database server to the existing cluster, the database replication takes place.

   If issues occur while joining the cluster configuration, ensure that the ports are accessible by the Global Master and the database server. For more information, see "Configuring the Firewall".

Web Server is Down

You can perform the following steps to restore a web server.

1. Log in as root to the server.
2. Run the following commands:
   - **2a** `cd /opt/aauth`
   - **2b** Stop the Advanced Authentication server:

     ```
     /opt/aauth/stop
     ```
   - **2c** Remove the containers, network, and volumes which Advanced Authentication has created on the server:

     ```
     docker-compose -p aaf -f docker-compose.yml -f docker-compose.sles.yml down -v
     ```
   - **2d** Start the Advanced Authentication server:

     ```
     /opt/aauth/start
     ```

3 Browse the URL `https://<servername>` in a web browser and rejoin the server.

After joining the database server to the existing cluster, the database replication takes place.

If issues occur while joining the cluster configuration, ensure that the ports are accessible towards the Global Master and the database server. For more information, see Configuring the Firewall.

NOTE

- If you can access the Web server through the console, ensure to enable the SSH daemon on the appliance. To do this, browse `https://<aafwebservername>:9443` and log in as a `vaadmin`. Click the **System Services** tab and start the SSH service.
- If you want to recover the database server because of a failure, you must delete the server from the **Cluster** tab of the Administration portal, before re-joining the web server. To delete the server in the **Cluster** tab, see "Configuring a Cluster".

Database Master is Down

A database master server exists for a multi-site implementation.

NOTE: Ensure to enable the SSH daemon on the appliance. To do this, browse `https://<aafwebservername>:9443` and log in as a `vaadmin`. Click the **System Services** tab and start the SSH service.

You can perform the following steps to restore the database master:

NOTE: If you want to recover the Database Master server because of a failure, you must delete the server from the **Cluster** tab of the Administration portal, before re-joining the web server. To delete the server in the **Cluster** tab, see "Configuring a Cluster". Delete the web server before re-joining.

---

1 Log in as root to the server.

2 Perform the following commands:

2a `cd /opt/aauth`

2b Stop the Advanced Authentication server:

```
/opt/aauth/stop
```

2c Remove the containers, network, and volumes which Advanced Authentication has created on the server:

```
docker-compose -p aaf -f docker-compose.yml -f docker-
compose.sles.yml down -v
```

2d Start the Advanced Authentication server:

```
/opt/aauth/start
```

3 Browse the URL `https://<servername>` in a web browser and rejoin the server.

After joining the database server to the existing cluster, the database replication happens.

If issues occur while joining the cluster configuration, ensure that the ports are accessible towards the Global Master and the database server. For more information, see "Configuring the Firewall".

Site is Down

When a site goes down due to a configuration problem or a database issue, all the site infrastructure needs to be rebuild again.

Perform the following to restore the site:

- "Register a New Site on the Global Master Server" on page 284
- "Database Master Server Restore" on page 284

Register a New Site on the Global Master Server

1. Open the Administration portal.
2. Click **Cluster > Register new site**.
3. Specify the details.

Database Master Server Restore

A database master server exists for a multi-site implementation.

For the procedure to restore the database master, see "Database Master is Down".

15 Reporting

Advanced Authentication facilitates you to add and view reports according to your requirement. You can view information about the memory utilization, tenant information, successful or failed logins, licenses, and so forth in a graphical representation. You can also export these reports to JSON and CSV formats.

To log in to the Advanced Authentication Reporting portal, launch the URL: `https://<NetIQServer>/report` and log in with your credentials.

NOTE: You must assign chains to the **Report logon** event in the **Events** section.

The Reporting portal does not work behind a load balancer. You need to open it directly.

FULL ADMINS can view the reports from all the tenants. To view the reports of a specific tenant, you must login to the Reporting portal as the tenant administrator.

For more information, see "Adding a Report" section.

16 Managing Tokens

Managing Tokens functionality helps you to import a file that contains information about multiple tokens and you can assign the tokens to specific users such that the user can pass through the OATH authentication method.

To access Tokens Management portal, you must assign chains to the **Tokens Management** event in the **Events** section.

To import token files, perform the following steps:

1. Log in to the Advanced Authentication Tokens Management portal (`https://<AdvancedAuthenticationServer>/tokens`).
2. Click **Add**.
3. Click **Browse** and add a PSKC or CSV file.
4. Select the **File type**. The options available are:
   - **OATH compliant PSKC**: This file type must be compliant with OATH. For example, HID OATH TOTP compliant tokens.
   - **OATH csv**: This file type must contain the format as described in CSV File Format To Import OATH Compliant Tokens. You cannot use the YubiKey CSV files.
   - **Yubico csv**: In this file type, you must use one of the supported **Log configuration output** (see **YubiKey Personalization Tool > Settings tab > Logging Settings**) formats with comma as a delimiter.
     - Traditional format: In this file type, **OATH Token Identifier** must be enabled.
     - Yubico format: This file type is supported only for **HOTP Length** set to **6 Digits** and **OATH Token Identifier** set to **All numeric**.

     IMPORTANT: **Moving Factor Seed** must not exceed 100000.
5. Add the encrypted PSKC files. Select **Password** or **Pre-shared key** in **PSKC file encryption type** and provide the information.
6. Click **Upload** to import tokens from the file.

NOTE: Advanced Authentication receives an **OTP format** from the imported tokens file and stores the information in the enrolled authenticator. Therefore, Advanced Authentication administrator need not change the default value of **OTP format** on the **Method Settings Edit** tab. For more information on the OTP format, see OATH OTP.

When the tokens are imported, you can see the list of tokens on the Tokens Management Portal. You must assign these tokens to the users. The tokens can be assigned either by an administrator or by user in the following ways:

- As an administrator, you can do the following:
  1. Click **Edit** next to the token.

2. Select **Owner**.
3. Click **Save**.

- A user can self-enroll a token in the Self-Service portal. Administrator must let the user know an appropriate value from the **Serial** column for the self-enrollment.

CSV File Format To Import OATH Compliant Tokens

A CSV file, which is imported as OATH `csv` file in the **Administration portal** > **Methods** > **OATH OTP** > **OATH Tokens** tab, must contain fields with the following parameters:

- Token's serial number
- Token's seed
- (Optional) Type of the token: TOTP or HOTP (by default HOTP)
- (Optional) OTP length (default value is 6 digits)
- (Optional) Time step (default value is 30 seconds)

Comma is a delimiter.

The following is an example of a CSV file:

```
Token001, 15d2fa517d3c6b791bd4cc2044c241429307001f
Token002, 8c557fc050721037fd31e1d3345b5d3263263e0f, totp, 8
Token003, 658208efea5ac49d5331ba781e66f2c808cccc8e, hotp, 6
Token004, 89f0dfe1c90379da6a11aaca2fc1070f606efe36, totp, 6, 60
```

IMPORTANT: For the YubiKey tokens, you must use the traditional format of the CSV (check **YubiKey Personalization Tool > Settings tab > Logging Settings**) with comma as a delimiter. Use Yubico csv file type (**Advanced Authentication Administration portal > Methods > OATH OTP > OATH Tokens**).

---

17 Searching a Card Holder's Information

With the Search Card portal, you can get a card holder's contact information by tapping the card on the card reader. Information such as name of the card holder, repository information, email address, and mobile number of the user can be obtained.

You must assign chains to the **Search card** event in the **Events** section.

IMPORTANT: To use this feature, you must have the Device Service installed on the computer.

To get the user information from the card, perform the following steps:

1. Log in to the Advanced Authentication Search Card portal (`https://<AdvancedAuthenticationServer>/search-card`).
2. Tap a card on the card reader. The card holder's user name, repository information, email address, and mobile number are displayed.

   NOTE: If the card was not enrolled before, a message `No user was found for this card` is displayed.

   ---

18 Troubleshooting

NOTE: This chapter contains solutions for known issues. If you encounter any problems that are not mentioned here, contact the support service.

This chapter contains the following topics:

- "Administration Portal Is Accessible Without Any Authentication" on page 291
- "Error During the Deployment of ISO File and Installation in the Graphic Mode" on page 291
- "Partition Disks to Avoid Removal of Data" on page 292
- "Networking Is Not Configured" on page 292
- "The ON/OFF Switch Is Broken If the Screen Resolution Is 110%" on page 292
- "Error When Requesting For Update" on page 292
- "Error While Re-login To Citrix StoreFront" on page 293
- "Users Can Login Using the Old Password" on page 293
- "Command Line Scripts to Reinitiate Replication and Resolve Conflicts" on page 293
- "Error is Displayed in the User Report Section of the Helpdesk Portal" on page 296

Administration Portal Is Accessible Without Any Authentication

Issue: After authenticating to the enrollment portal, if a user switches to the Administration portal, access is granted without any authentication prompt.

Workaround: You must disable the Kerberos SSO option for the **Report logon** and **Admin UI** events.

Error During the Deployment of ISO File and Installation in the Graphic Mode

While trying to install Advanced Authentication server appliance, the following error is displayed:

```
Server is already active for display 0. If this server is no longer
running, remove /tmp/ .X0-lock and start again.
```

This issue can occur if you click **Continue** without selecting **I agree** in **End User License Agreement**. As a result **I don't agree** is automatically selected and **Yes** is selected on the next screen.

To resolve the issue, perform the following steps:

1. Run the installer.
2. Select **I agree** and continue installation.

Partition Disks to Avoid Removal of Data

It is recommended to perform disk partitioning while installing the Advanced Authentication server. Otherwise, the installation will destroy all data on any partitions you have removed as well as on the partitions that are going to be formatted.

To perform disk partitioning, select **Yes** and click **Continue**.

Networking Is Not Configured

After the installation of Advanced Authentication Server appliance, an error occurs. This can be because your network does not use the DHCP protocol.

As a solution to this issue, perform the following:

Select **OK** and configure networking manually using the **Configuration Console**. For more information, see "Installing Advanced Authentication" in the *Advanced Authentication- Server Installation and Upgrade*guide.

The ON/OFF Switch Is Broken If the Screen Resolution Is 110%

While trying to edit the **Lockout options** policy, the **ON/OFF** switch is broken when the screen resolution is 110%.

As a solution, change the screen resolution to 100%.

Error When Requesting For Update

When requested for the update, the following error is displayed:

```
E: Could not get lock /var/lib/apt/lists/lock - open (11: Resource
temporarily unavailable)
```

```
E: Unable to lock directory /var/lib/apt/lists/ (AuCore)
```

After rebooting, the following error is displayed and the problem repeats:

```
Command '('sudo','apt-get','update')' timed out after 28 seconds (AuError)
```

As a solution, perform the following.

- Check the networking configuration and HTTP Proxy configuration in the Configuration Console.
- Ensure that the DNS servers you have specified are able to resolve the address `repo.authasas.com`.
- Ensure your company's firewall does not lock Internet connection to the address on the appliance.

Error While Re-login To Citrix StoreFront

When you log off from the Citrix StoreFront and try to re-login through the same browser, an error message `You cannot log on at this time` is displayed. This occurs when you log on to Citrix StoreFront on the same browser where the application has been logged off earlier.

As a solution, perform the following steps:

1. Navigate to `C:\inetpub\wwwroot\Citrix\<StoreWeb>\custom\script.js`.
2. Add a command `CTXS.allowReloginWithoutBrowserClose = true` to enable StoreFront Allow re-login without browser close.

   This allows you to re-login to the Citrix StoreFront without closing the browser.

Users Can Login Using the Old Password

Issue: When users use the **LDAP Password only** chain for authentication and change their LDAP password, they are still able to log in with their old LDAP password.

Workaround: You must disable the cache logon on Domain Controllers. To disable the cache logon, you must make the following registry changes:

1. Open the registry key: `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Lsa\.`
2. Create a `DWORD` parameter `OldPasswordAllowedPeriod` and set the parameter's value to `0`.

Command Line Scripts to Reinitiate Replication and Resolve Conflicts

You can use the following command line scripts to examine and resolve replication conflicts between the servers in a cluster:

- rereplicate
- drop-triggers
- purge
- copy-db
- dump-outgoing-batches
- dump-outgoing-conflicts
- forget

NOTE: To view all the applicable command line parameters, perform the following steps:

1. Run the following command to connect to the container:

   ```
   docker exec -ti aaf_aucore_1 bash
   ```

2. Run the following command to view list of command line parameters:

   ```
   /opt/penv/bin/au-replica --help
   ```

For more information, see the `README.txt` file located in the `/opt/AuCore/aucore/scripts/db-sync/` path of container.

Rereplicate

You can enforce the replication of all tables from one server to the peer servers in the cluster. To rereplicate, perform the following steps:

1. Run the following command to connect to the container:

   ```
   docker exec -ti aaf_aucore_1 bash
   ```

2. Run the following command on the server from where you want to enforce the replication:

   ```
   /opt/penv/bin/au-replica rereplicate
   ```

To enforce the replication process for a specific table in a server, run the following commands in the respective server:

1. `docker exec -ti aaf_aucore_1 bash`
2. `/opt/penv/bin/au-replica rereplicate [–table <table_name>]`

   For example, `/opt/penv/bin/au-replica rereplicate [–table <1087>]`

Drop Triggers

You can remove the trigger, stop recording any change to the database, and stop replicating all tables to the peer servers in the cluster.

To stop recording changes to the database and drop the triggers run the following commands:

1. `docker exec -ti aaf_aucore_1 bash`
2. `/opt/penv/bin/au-replica stop`
3. `au-replica drop-triggers`

Run the following commands to enable the trigger, initiate storing changes to the database, and start the replication with the peer servers:

1. `docker exec -ti aaf_aucore_1 bash`
2. `au-replica start`

Purge

To forget all pending replicas and re-initialize the replication of tables with peer servers, run the following commands:

1. `docker exec -ti aaf_aucore_1 bash`
2. `/opt/penv/bin/au-replica purge`

Copy DB

To copy the database from Global Master Server to the current server, run the following commands:

1. `docker exec -ti aaf_aucore_1 bash`
2. `/opt/penv/bin/au-replica copy-db`

To copy the database from specific server to the current server, run the following commands:

1. `docker exec -ti aaf_aucore_1 bash`
2. `SRC_PASSWORD=XXX au-replica copy-db [--host SRC_HOST]`

where:

- SRC_HOST is registrator by default.
- SRC_PASSWORD is environment variable and by default reads the password from server table (where `host=SRC_HOST`).

You can fetch the local DB password using the following command:

```
docker exec aaf_aucore_1 cat /opt/AuCore/data/production.ini | grep
replica.url
```

This command returns the following output:

```
replica.url = postgresql+psycopg2://root:Password1@127.0.0.1/aucore_prod
```

The text between colon (:) and at symbol (@) is the actual password.

Troubleshooting the Outgoing Batches

To view the list of the outgoing batches, run the following commands:

1. `docker exec -ti aaf_aucore_1 bash`
2. `/opt/penv/bin/au-replica dump-outgoing-batches`

To view the list of outgoing conflicts that are detected by the server, run the following commands:

1. `docker exec -ti aaf_aucore_1 bash`
2. `/opt/penv/bin/au-replica dump-outgoing-conflicts`

To forget a particular outgoing batch, run the following commands:

1. `docker exec -ti aaf_aucore_1 bash`
2. `/opt/penv/bin/au-replica forget-outgoing-batch <batch_id>`

   For example, `/opt/penv/bin/au-replica forget-outgoing-batch 24`

   This script is similar to Forget option available in the administration console.

Error is Displayed in the User Report Section of the Helpdesk Portal

Issue: The following error is displayed when navigating to the **User Report** tab of the Helpdesk portal on a web server:

```
ConnectionError

HTPPSConnectionPool(host='<hostname>, port=443):Max retries exceeded with
url:

/admin/api/reports/multisite/table Caused by ProxyError('Cannot connect to
proxy.', OSError('Tunnel connection failed: 503 Service Unavailable',)))
(Unknown Error)
```

Solution: Perform the following steps:

1. Use yast to set the **NO_PROXY** settings:

   ```
   sudo yast proxy
   ```

2. Add the internal company's domain (for example, .sample.com) that exists under **No Proxy Domains**.

3. Restart the configuration:

   ```
   sudo systemctl restart proxyenv aauth
   ```