



# DoD Common Access Card Authentication

## Feature Description

UPDATED: 29 July 2023

**© 2022 Progress Software Corporation and/or one of its subsidiaries or affiliates. All rights reserved.**

These materials and all Progress® software products are copyrighted and all rights are reserved by Progress Software Corporation. The information in these materials is subject to change without notice, and Progress Software Corporation assumes no responsibility for any errors that may appear therein. The references in these materials to specific platforms supported are subject to change.

#1 Load Balancer in Price/Performance, 360 Central, 360 Vision, Chef, Chef (and design), Chef Habitat, Chef Infra, Code Can (and design), Compliance at Velocity, Corticon, Corticon.js, DataDirect (and design), DataDirect Cloud, DataDirect Connect, DataDirect Connect64, DataDirect XML Converters, DataDirect XQuery, DataRPM, Defrag This, Deliver More Than Expected, DevReach (and design), Driving Network Visibility, Flowmon, Inspec, Ipswitch, iMacros, K (stylized), Kemp, Kemp (and design), Kendo UI, Kinvey, LoadMaster, MessageWay, MOVEit, NativeChat, OpenEdge, Powered by Chef, Powered by Progress, Progress, Progress Software Developers Network, SequeLink, Sitefinity (and Design), Sitefinity, Sitefinity (and design), Sitefinity Insight, SpeedScript, Stylized Design (Arrow/3D Box logo), Stylized Design (C Chef logo), Stylized Design of Samurai, TeamPulse, Telerik, Telerik (and design), Test Studio, WebSpeed, WhatsConfigured, WhatsConnected, WhatsUp, and WS\_FTP are registered trademarks of Progress Software Corporation or one of its affiliates or subsidiaries in the U.S. and/or other countries.

Analytics360, AppServer, BusinessEdge, Chef Automate, Chef Compliance, Chef Desktop, Chef Workstation, Corticon Rules, Data Access, DataDirect Autonomous REST Connector, DataDirect Spy, DevCraft, Fiddler, Fiddler Classic, Fiddler Everywhere, Fiddler Jam, FiddlerCap, FiddlerCore, FiddlerScript, Hybrid Data Pipeline, iMail, InstaRelinker, JustAssembly, JustDecompile, JustMock, KendoReact, OpenAccess, PASOE, Pro2, ProDataSet, Progress Results, Progress Software, ProVision, PSE Pro, Push Jobs, SafeSpaceVR, Sitefinity Cloud, Sitefinity CMS, Sitefinity Digital Experience Cloud, Sitefinity Feather, Sitefinity Thunder, SmartBrowser, SmartComponent, SmartDataBrowser, SmartDataObjects, SmartDataView, SmartDialog, SmartFolder, SmartFrame, SmartObjects, SmartPanel, SmartQuery, SmartViewer, SmartWindow, Supermarket, SupportLink, Unite UX, and WebClient are trademarks or service marks of Progress Software Corporation and/or its subsidiaries or affiliates in the U.S. and other countries. Java is a registered trademark of Oracle and/or its affiliates. Any other marks contained herein may be trademarks of their respective owners.

Please refer to the NOTICE.txt or Release Notes – Third-Party Acknowledgements file applicable to a particular Progress product/hosted service offering release for any related required third-party acknowledgements.

# Table of Contents

---

<b>1 Introduction .....</b>	<b>5</b>
1.1 Document Purpose .....	5
1.2 Intended Audience .....	6
1.3 Prerequisites .....	6
<b>2 DoD CAC Authentication .....</b>	<b>7</b>
2.1 Web User Interface (WUI) Options .....	8
2.1.1 OCSP Configuration .....	8
2.1.2 Verify Client using OCSP .....	10
2.1.3 Flush the OCSPD Cache .....	11
2.2 Configure the LoadMaster .....	12
2.2.1 Connect to a Network Time Protocol (NTP) Host .....	12
2.2.2 Install the Root Certificate on the LoadMaster .....	12
2.2.3 Generate and Import a Client Certificate .....	13
2.2.4 Configure the OCSP Options .....	13
2.2.5 Configure the LDAP Endpoint .....	14
2.2.6 Configure the SSO Domains .....	15
2.2.6.1 Configure the Inbound SSO Domain in the LoadMaster .....	15
2.2.6.2 Configure the Outbound SSO Domain in the LoadMaster .....	20
2.2.7 Configure the Virtual Service(s) .....	21
<b>3 Using CAC Authentication for LoadMaster WUI Access .....</b>	<b>25</b>
3.1 Complete the CAC Infrastructure Configuration .....	25

---

3.2 Upload the Certificate to be Validated to the LoadMaster .....	25
3.3 Enable Session Management .....	25
3.4 Optionally Enable the OCSP Check .....	26
3.5 Enable CAC Authentication for LoadMaster WUI Access .....	26
3.6 Logging in to the LoadMaster WUI with CAC Authentication .....	28
<b>4 Appendix A: Configure the Active Directory Settings .....</b>	<b>29</b>
4.1 Add a Certificate to the Active Directory for TLS/LDAPS .....	30
4.2 Create a LoadMaster Trusted User .....	30
4.3 Associate an SPN with the User Entry .....	34
4.4 Configure Delegation for the User Entry .....	34
<b>5 PIV Smart Card Support .....</b>	<b>37</b>
<b>References .....</b>	<b>39</b>
<b>Last Updated Date .....</b>	<b>40</b>

# 1 Introduction

A Common Access Card (CAC) is a smart card used for identification of active-duty military personnel, selected reserve, US Department of Defence (DoD) civilian employees and eligible contractor personnel. In addition to providing physical access to buildings and protected areas, it also allows access to DoD computer networks and systems satisfying two-factor authentication, digital security and data encryption. It leverages a Public Key Infrastructure (PKI) Security Certificate to verify a cardholder's identity prior to allowing access to protected resources.

The Edge Security Pack (ESP) feature of the Kemp LoadMaster supports integration with DoD environments leveraging CAC authentication and Active Directory application infrastructures. The LoadMaster acts on behalf of clients presenting X.509 certificates using CAC and becomes the authenticated Kerberos client for services.

CAC authentication can also be used to authenticate access to the LoadMaster WUI. For more information on this, please refer to the **Using CAC Authentication for LoadMaster WUI Access** section.

The request for and presentation of the client certificate happens during initial SSL session establishment. There are two core elements to the process of a user gaining access to an application with CAC:

- Authentication – occurs during SSL session establishment and entails:
  - Verifying the certificate date
  - Verifying revocation status using Online Certificate Status Protocol (OCSP)
  - Verifying the full chain to the Certificate Authority (CA)
- Authorization – occurs after SSL session establishment and the matching of the certificate Subject Alternative Name (SAN) against the User Principal Name (UPN) of the appropriate principal in Active Directory.

## 1.1 Document Purpose

The purpose of this document is to provide step-by-step instructions on how to configure the LoadMaster to use DoD CAC authentication.

## 1.2 Intended Audience

This document is intended to be read by anyone interested in finding out how to configure the LoadMaster to use DoD CAC authentication.

## 1.3 Prerequisites

Before following the steps below to configure the LoadMaster, there are some prerequisites that need to be in place:

- The Active Directory settings must be configured correctly. If they are not configured correctly, constrained delegation will not work. For more information on what needs to be configured, please refer to the **Using CAC Authentication for LoadMaster WUI Access** section.
- A reverse DNS lookup zone needs to be set up which is able to resolve the IP address of the Real Server(s).

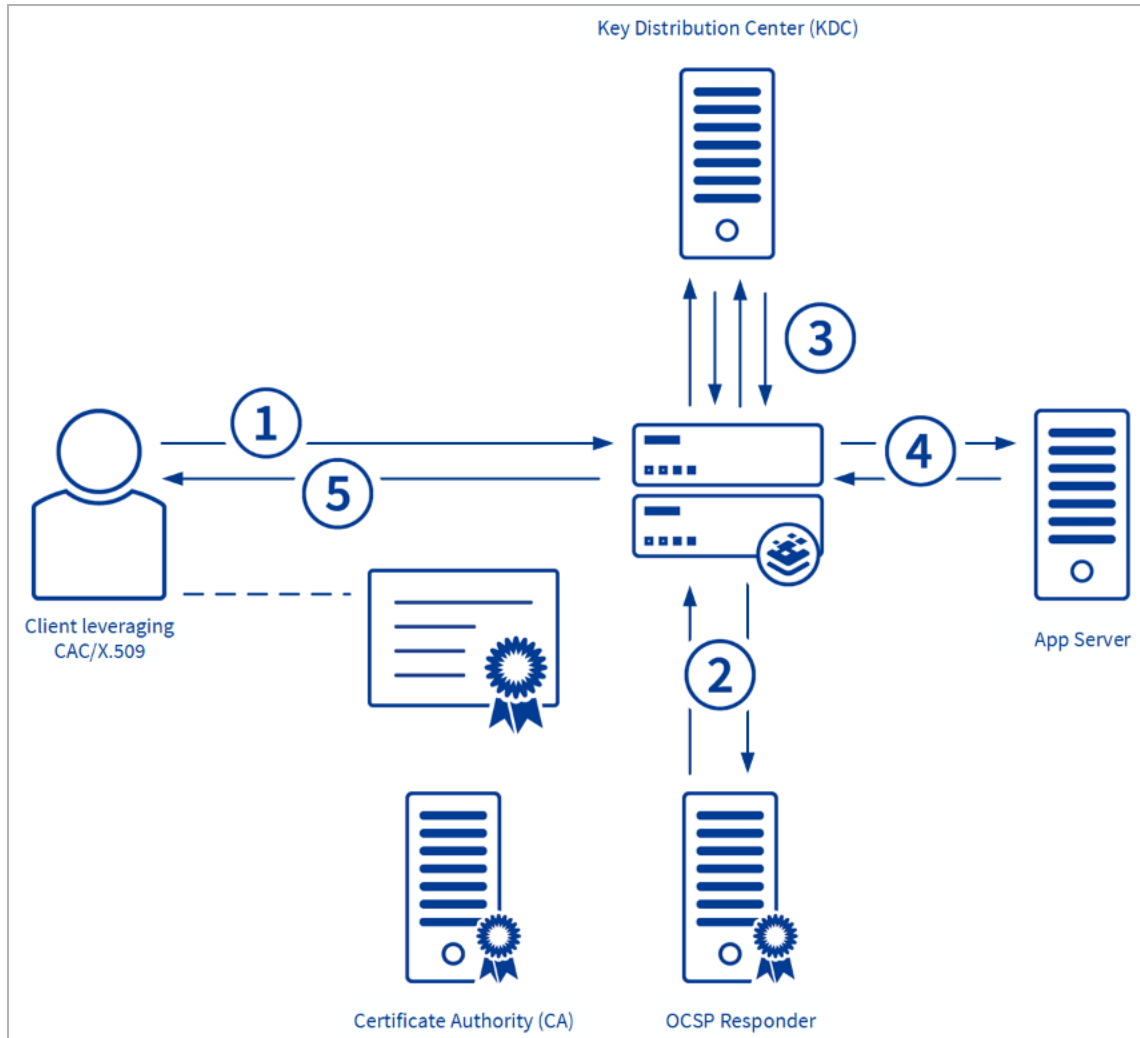
---

There can be multiple entries for Real Servers in the DNS server. As a result of this, when the LoadMaster does a reverse lookup in order to get the FQDN, the result may not match the Service Principal Name (SPN). This may result in a mismatch between the SPN the LoadMaster generates and the one configured under the trusted user in the Active Directory. To mitigate this issue, it is possible to override the DNS server entries by adding hosts for local resolution in the LoadMaster (**System Configuration > Host & DNS Configuration**).

---

- The LDAP server needs to support LDAP over a secure transport, for example LDAPS or StartTLS.
- The appropriate certificates must have been issued for the LoadMaster.

## 2 DoD CAC Authentication



The above diagram illustrates the CAC/KDC logical authorization process:

1. A client attempts to access an ESP-protected service using CAC credentials.
2. The LoadMaster verifies that the credentials are still valid with a trusted OCSP responder.
3. After mapping the SAN which contains the client User Principal Name (UPN) in Active Directory, the LoadMaster obtains a service ticket for the user and obtains a service ticket for the application.

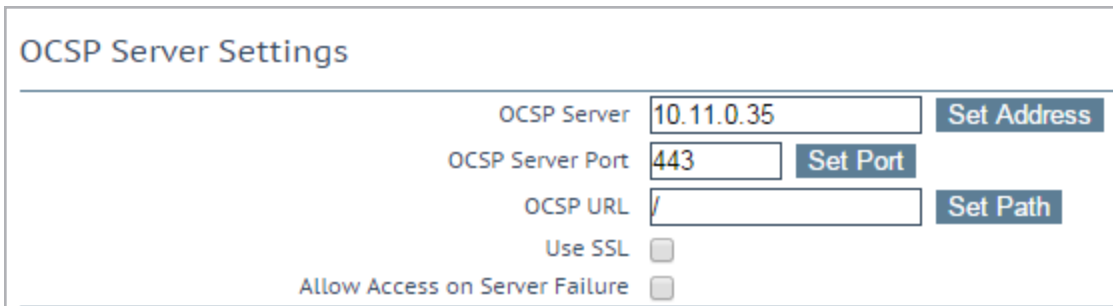
4. The LoadMaster forwards the user's service ticket to the desired service.
5. The LoadMaster passes the response to the client who gains access to the application/service.

## 2.1 Web User Interface (WUI) Options

There are a number of options in the LoadMaster WUI relating to DoD CAC authentication. These are described in the sections below.

### 2.1.1 OCSP Configuration

To get to the **OCSP Configuration** screen, in the main menu of the LoadMaster WUI, go to **Certificates & Security > OCSP Configuration**.



The screenshot shows the 'OCSP Server Settings' configuration page. It contains the following fields and controls:

OCSP Server Settings	
OCSP Server	<input type="text" value="10.11.0.35"/> <a href="#">Set Address</a>
OCSP Server Port	<input type="text" value="443"/> <a href="#">Set Port</a>
OCSP URL	<input type="text" value="/"/> <a href="#">Set Path</a>
Use SSL	<input type="checkbox"/>
Allow Access on Server Failure	<input type="checkbox"/>

#### OCSP Server

The address of the OCSP server. This can either be in IP address or Fully Qualified Domain Name (FQDN) format.

#### OCSP Server Port

The port of the OCSP server.

#### OCSP URL

The URL to access on the OCSP server.

#### Use SSL

Select this to use SSL to connect to the OCSP server.

#### Allow Access on Server Failure

Treat an OCSP server connection failure or timeout as if the OCSP server had returned a valid response, that is, treat the client certificate as valid.



### OCSP Checking

---

Enable OCSP Checking ☐

### OCSP Checking

Select the **Enable OCSP Checking** check box to enable the LoadMaster to perform OCSP checks on certain outbound connections. This is disabled by default.

### OCSP Stapling

---

Enable OCSP Stapling ☐

OCSP Refresh Interval 

1 Hour ▼

### Enable OCSP Stapling

Select this check box to enable the LoadMaster to respond to OCSP stapling requests. If a client connects using SSL and asks for an OCSP response, this is returned. Only Virtual Service certificates are validated. The system holds a cache of OCSP responses that are sent back to the client. This cache is maintained by the OCSP daemon. When the OCSP daemon sends a request to the server, it uses the name specified in the certificate (in the **Authority Information Access** field). If it cannot resolve this name, then it uses the default OCSP server specified in the **OCSP Server** text box.

### OCSP Refresh Interval

Specify how often the LoadMaster should refresh the OCSP stapling information. The OCSP daemon caches the entry for up to the amount of time specified here, after which it is refreshed. Valid values range from 1 hour (default) to 24 hours.

## 2.1.2 Verify Client using OCSP

SSL Properties	
SSL Acceleration	Enabled: <input checked="" type="checkbox"/> Reencrypt: <input type="checkbox"/>
Supported Protocols	<input type="checkbox"/> SSLv3 <input type="checkbox"/> TLS1.0 <input checked="" type="checkbox"/> TLS1.1 <input checked="" type="checkbox"/> TLS1.2 <input checked="" type="checkbox"/> TLS1.3
Add Received Cipher Name	<input type="checkbox"/>
Require SNI hostname	<input type="checkbox"/>
<p><b>Self Signed Certificate in use.</b></p> <div> <div> <div>Available Certificates</div> <div>None Available</div> </div> <div> <div>Assigned Certificates</div> <div>None Assigned</div> </div> <div> <div>&gt;</div> <div>&lt;</div> </div> <div> <div>Set Certificates</div> </div> </div> <div> <div>Manage Certificates</div> </div>	
Cipher Set	<div>Default</div> <div>Modify Cipher Set</div>
Ciphers	<div>Assigned Ciphers</div> <div> ECDHE-ECDSA-AES256-GCM-SHA384  ECDHE-RSA-AES256-GCM-SHA384  DHE-DSS-AES256-GCM-SHA384  DHE-RSA-AES256-GCM-SHA384  ECDHE-ECDSA-CHACHA20-POLY1305  ECDHE-RSA-CHACHA20-POLY1305 </div>
Client Certificates	Client Certificates and pass DER through as X-CLIENT-CERT
Verify Client using OCSP	<input checked="" type="checkbox"/>
Strict Transport Security Header	Don't add the Strict Transport Security Header

In the Virtual Service modify screen (**Virtual Services > View/Modify Services > Modify**) there is a check box in the **SSL Properties** section called **Verify Client using OCSP**. When this is enabled, the LoadMaster verifies that the client certificate is valid.

If **Verify Client using OCSP** is enabled and the OCSP server settings have not been configured in the **OCSP Configuration** screen, the client cannot be verified and the connection will fail. There will not be a warning or error message on the WUI which indicates this so please ensure to check this if troubleshooting any problems.

## 2 DoD CAC Authentication

## 2.1.3 Flush the OCSPD Cache

In the **Debug Options** screen (**System Configuration > Logging Options > System Log Files > Debug Options**) there is an option to flush the OCSPD cache. This option is intended to be used when troubleshooting or testing.

Debug Options

Disable All Transparency

Disable Transparency

Enable L7 Debug Traces

Enable Traces

Enable Extended L7 Debug

Enable Extended Debug

Enable IRQ Pinning

Enable IRQ Pinning

Perform an l7adm

l7adm

Enable WAF Debug Logging

Enable Logging

Enable IRQ Balance

Enable IRQ Balance

Enable TSO

Enable TSO

Enable TCP SACK

Enable TCP SACK

Enable Layer 4 IPv6 Forwarding

☒

Disable CLI VS Management

Disable CLI VS Management

Enable Bind Debug Traces

Enable Bind Traces

Perform a PS

ps

Perform Top

top

Iterations

10

Interval

1

sec

☐ Show Threads

☐ Sort by Memory usage

Include Top in Backups

☐

Display Meminfo

Meminfo

Display Slabinfo

Slabinfo

Perform an Ifconfig

Ifconfig

Perform a Netstat

Netstat

Include Netstat in Backups

☒

Reset Statistic Counters

Reset Statistics

Flush OCSPD Cache

Flush Cache

Enable SSOMGR Debug Traces

Enable Traces

Flush SSO Authentication Cache

Flush SSO Cache

Linear SSO Logfiles

☐

Start IPsec IKE Daemon

Start IPsec IKE Daemon

Perform an IPsec Status

IPsec Status

Enable IKE Debug Level Logs

Enable Logs

Netconsole Host

Interface

eth0

Set Netconsole Host

Ping Host

Interface

eth0

Ping

Ping6 Host

Interface

Automatic

Ping6

Traceroute Host

Traceroute

Kill LoadMaster (395722)

Kill LoadMaster

Enable DHCPv6 Client

☐

When using OCSP to verify client certificates, OCSPD caches the responses it gets from the OCSP server. The OCSPD log messages appear in the system messages log. This cache can be flushed by pressing the **Flush Cache** button. Flushing the OCSPD cache can be useful when testing, or when the Certificate Revocation List (CRL) has been updated.

## 2.2 Configure the LoadMaster

There are a number of areas that need to be configured for the LoadMaster to use DoD CAC authentication appropriately. Refer to the sections below for detailed configuration instructions.

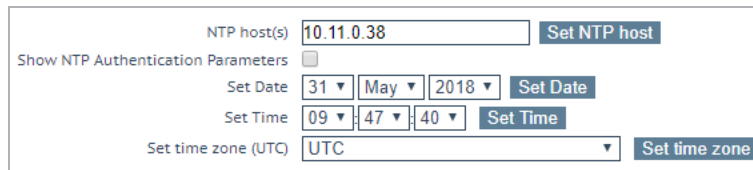
For information on what each of the WUI options mean, refer to the **Web User Interface (WUI) Options** section.

### 2.2.1 Connect to a Network Time Protocol (NTP) Host

If there is a time mismatch beyond a five-minute boundary between clients, intermediaries and servers, erroneous ticket invalidation will occur when KCD is in use. To avoid this problem, connect the LoadMaster to an NTP host server. The same host used by clients and servers in the infrastructure should be used by LoadMaster. An external NTP host server can be used if the LoadMaster can access it. However, if the LoadMaster is internal only – you will need to set up your own NTP server.

To configure the NTP settings on the LoadMaster, follow the steps below:

1. In the main menu, select **System Configuration > System Administration > Date/Time**.



The screenshot displays the NTP configuration section of the LoadMaster WUI. It includes the following elements:

- NTP host(s)**: A text input field containing '10.11.0.38' and a **Set NTP host** button.
- Show NTP Authentication Parameters**: A checkbox that is currently unchecked.
- Set Date**: Three dropdown menus for day (31), month (May), and year (2018), followed by a **Set Date** button.
- Set Time**: Three dropdown menus for hour (09), minute (47), and second (40), followed by a **Set Time** button.
- Set time zone (UTC)**: A dropdown menu currently set to 'UTC' and a **Set time zone** button.

2. Enter the IP address of the **NTP host(s)** and click **Set NTP host**.
3. Select a time zone in the **Set time zone (UTC)** drop-down menu. Click **Set time zone**.

---

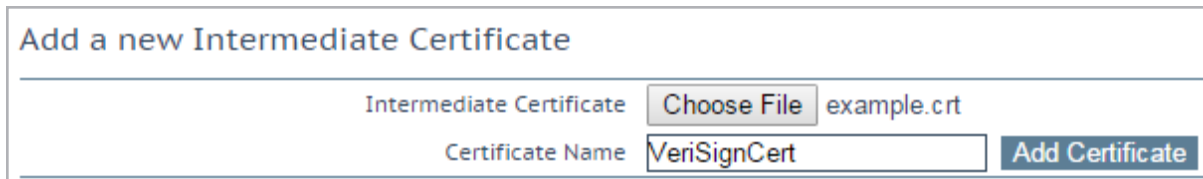
The time zone needs to be manually set even when an NTP server is used.

---

### 2.2.2 Install the Root Certificate on the LoadMaster

First, the root certificate (which is needed for chaining certificates presented by clients) needs to be installed on the LoadMaster. To do this, follow the steps below in the LoadMaster WUI:

1. In the main menu, select **Certificates & Security > Intermediate Certs**.



Add a new Intermediate Certificate

Intermediate Certificate  example.crt

Certificate Name

2. Click **Choose File**.
3. Browse to and select the relevant certificate file.
4. Enter the **desired filename**.
5. Click **Add Certificate**.
6. Click **OK**.

### 2.2.3 Generate and Import a Client Certificate

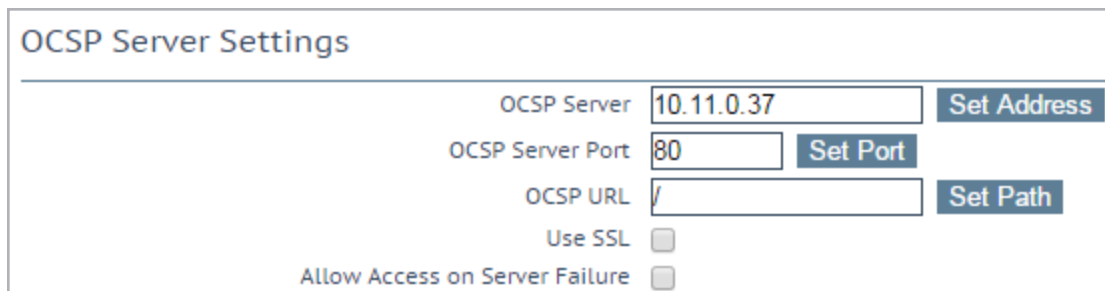
Generate a client certificate, for example with OpenSSL or Active Directory, which is signed by the root certificate. The client certificate must include a SubjectAltName (SAN) section with the email addresses of the clients. This is used to check if a particular user exists in the LDAP database. This client certificate must be imported in the clients' browser.

Please import the certificate in the **Personal** tab of the browser certificate settings.

### 2.2.4 Configure the OCSP Options

To configure the OCSP options, follow the steps below in the LoadMaster WUI:

1. In the main menu, select **Certificates & Security > OCSP Configuration**.



OCSP Server Settings

OCSP Server

OCSP Server Port

OCSP URL

Use SSL ☐

Allow Access on Server Failure ☐

2. Enter the IP address or FQDN of the **OCSP Server** and click **Set Address**.
3. Enter the **OCSP Server Port** and click **Set Port**.

4. Enter the URL to access on the OCSF server in the **OCSF URL** text box and click **Set Path**.
5. Enable or disable the **Use SSL** option.
6. Enable or disable the **Allow Access on Server Failure** option.

---

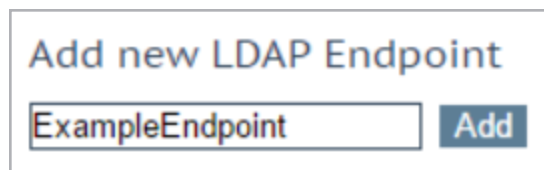
Kemp recommends leaving the **Use SSL** and **Allow Access on Server Failure** options disabled, but they can be enabled if needed.

---

### 2.2.5 Configure the LDAP Endpoint

To add a new LDAP endpoint, follow the steps below:

1. Expand **Certificates & Security** and click **LDAP Configuration**.

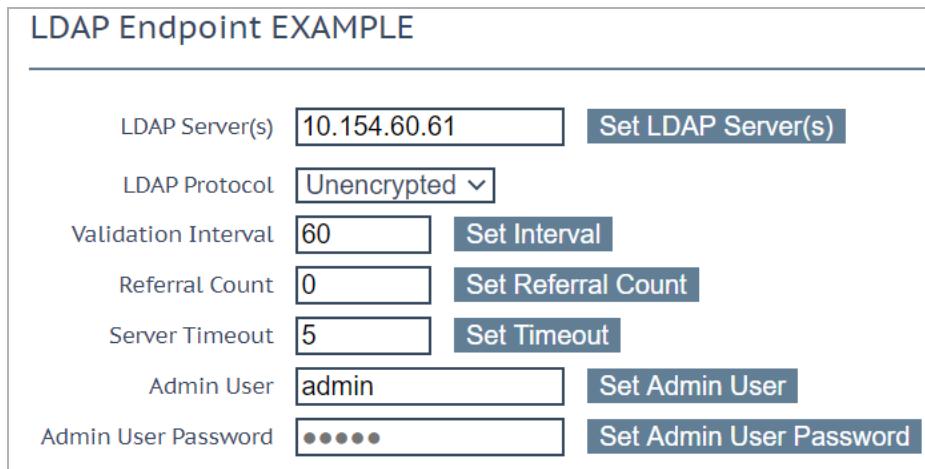


2. Type a name for the endpoint and click **Add**.

---

Spaces and special characters are not permitted in the LDAP endpoint name.

---



3. Type the IP address of the LDAP database or databases in the **LDAP Server(s)** text box and click **Set LDAP Server(s)**. Separate multiple entries by using a comma.

4. Select the relevant **LDAP Protocol** to communicate with the LDAP server.

---

If you create an SSO domain with the **Authentication Protocol** set to **Certificates**, ensure to set the **LDAP Protocol** to **LDAPS** in the LDAP endpoint.

---

5. Type the **Validation Interval** and click **Set Interval**. This specifies how often the user is revalidated with the LDAP server.
6. Type the relevant username in the **Admin User** text box and click **Set Admin User**.
7. Type the password for the admin user and click **Set Admin User Password**. These admin credentials are used to check the LDAP server or servers.

## 2.2.6 Configure the SSO Domains

### 2.2.6.1 Configure the Inbound SSO Domain in the LoadMaster

An inbound configuration SSO domain needs to be created in the LoadMaster. This should contain the IP address of the LDAP database as well as an administrator username and password. These login details are used to log in to the database and check if the user from the certificate does exist. If multiple domains are configured, sign-on can then be authenticated all at once. More information on this option can be found in the [ESP, Feature Description](#).

To create and configure this SSO domain, follow the steps below:

1. In the main menu of the LoadMaster WUI, select **Virtual Services > Manage SSO**.

Add new Client Side Configuration

ExampleInbound.com

Add

2. In the **Client Side Single Sign On Configurations** section, enter the **Name** of the SSO domain.
3. Click **Add**.

## 2 DoD CAC Authentication

Domain EXAMPLEINBOUND.COM

Authentication Protocol	<input type="text" value="Certificates"/>		
LDAP Endpoint	<input type="text" value="LDAP_EXAMPLE"/>		
Check Certificate to User Mapping	<input checked="" type="checkbox"/>		
Allow fallback to check Common Name	<input type="checkbox"/>		
Domain/Realm	<input type="text" value="ExampleInbound.com"/>	<input type="button" value="Set Domain/Realm Name"/>	
Logon Format	<input type="text" value="Principalname"/>		
Logon Transcode	<input type="text" value="Disabled"/>		
Failed Login Attempts	<input type="text" value="0"/>	<input type="button" value="Set Failed Login Attempts"/>	
	<b>Public - Untrusted Environment</b>		<b>Private - Trusted Environment</b>
	<input type="text" value="900"/>	<input type="button" value="Set Idle Time"/>	<input type="text" value="900"/> <input type="button" value="Set Idle Time"/>
Session Timeout	<input type="text" value="1800"/>	<input type="button" value="Set Max Duration"/>	<input type="text" value="28800"/> <input type="button" value="Set Max Duration"/>
	<input type="text" value="Use for Session Timeout: idle time"/>		
Use LDAP Endpoint for Healthcheck	<input checked="" type="checkbox"/>		

4. Select **Certificates** as the **Authentication Protocol**.
5. Select the relevant **LDAP Endpoint** to use (as created in the **Configure the LDAP Endpoint** section).
6. Select the relevant value for the **Select Certificate to User Mapping** drop-down list.

---

In LoadMaster firmware version 7.2.53, support for Personal Identity Verification (PIV) smart card authentication was added. For further details, refer to the following section: **PIV Smart Card Support**.

---

7. Enable or disable the **Allow fallback to check Common Name** option.

---

For more information regarding the **Check Certificate to User Mapping** option, refer to the **Select Certificate to User Mapping** section.

---

8. Enter the login domain to be used in the **Domain/Realm** text box.

---

This is also used with the logon format to construct the normalized username, for example;  
**Principalname:** <username>@<domain>  
**Username:** <domain>\<username>  
 If the **Domain/Realm** field is not set, the **Name** set when

---



---

initially adding an SSO domain is used as the **Domain/Realm** name.

---

### Select Certificate to User Mapping

This section provides further information about the **Select Certificate to User Mapping** option. The **Select Certificate to User Mapping** option is only available when the **Authentication Protocol** is set to **Certificates**.

---

In LoadMaster firmware version 7.2.53, support for Personal Identity Verification (PIV) smart card authentication was added. For further details, refer to the following section: **PIV Smart Card Support**.

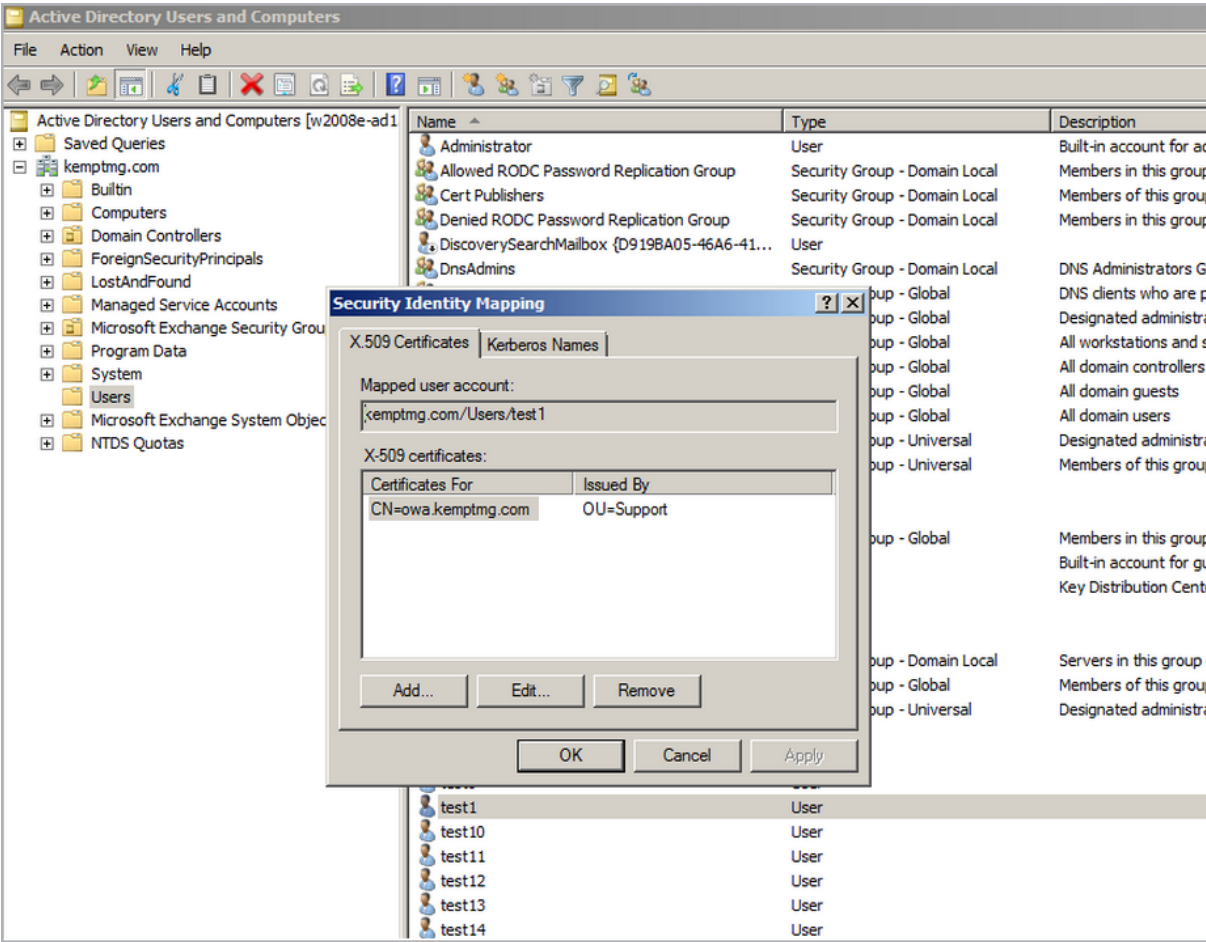
---

---

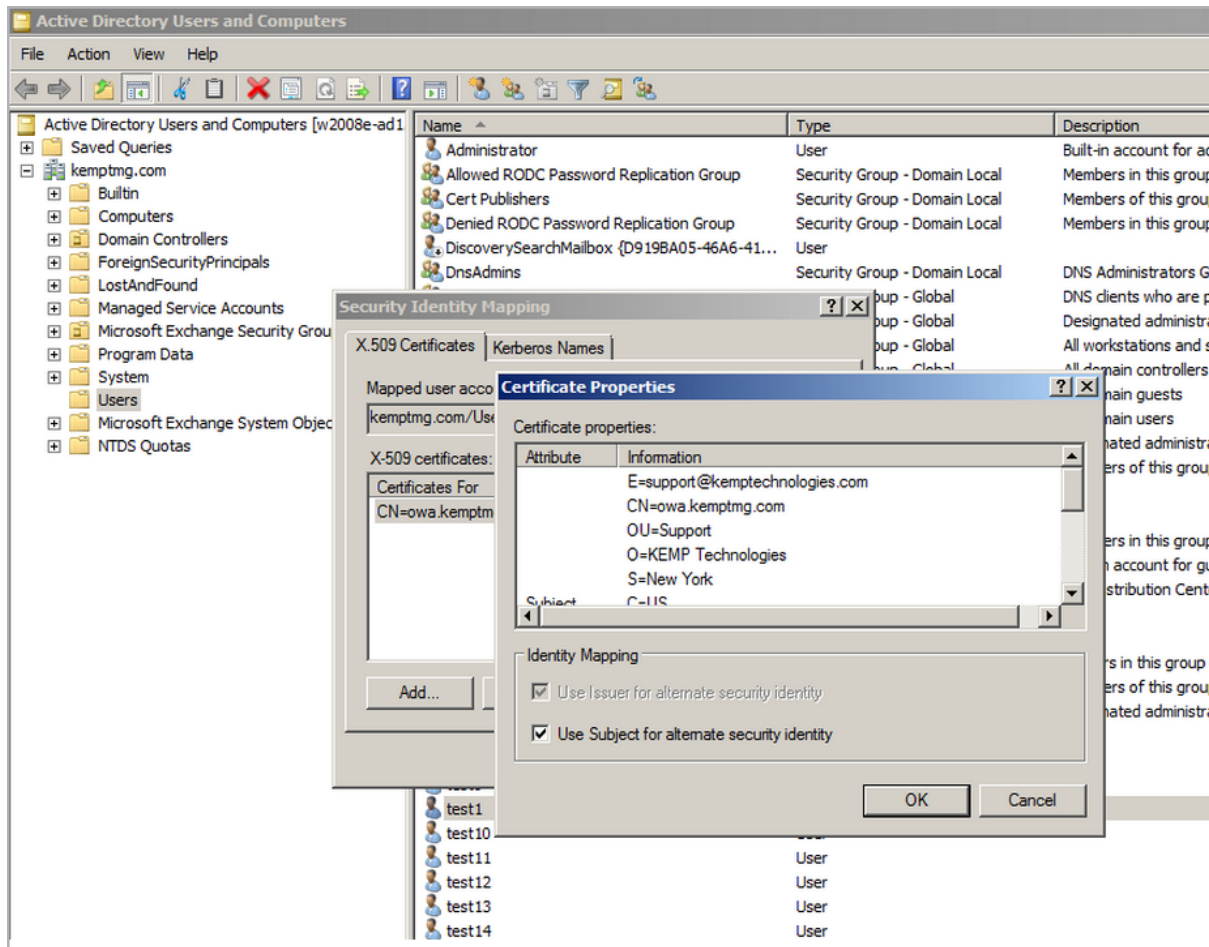
The screenshots in this section were taken in Windows Server 2012 R2. They were correct at time of writing but they may change without our knowledge. Refer to the Microsoft documentation for the latest screenshots and steps.

---

2 DoD CAC Authentication



## 2 DoD CAC Authentication



The altSecurityAttribute can be set in the **Active Directory Users and Computers** (data.msc) console by using the **Name Mappings** task (see screenshots above). Both the **Issuer** and **Subject** are used for alternate security identity. Using the **Name Mappings** method will create an altSecurityIdentities entry on the form:

**X509:<I>issuer data...<S>subject data...**

There are other formats (created by other methods) but this is currently the only one supported by the LoadMaster.

---

When changing the mapping in the Active Directory, the changes do not take effect immediately. To see the changes immediately, the LoadMaster SSO cache would need to be flushed or the user ticket would need to time out.

---

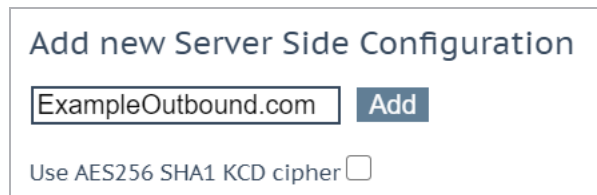
Flushing the SSO cache will flush all Single Sign-On (SSO) records, reset all authentication server statuses, reset the KCD domain (if relevant) and re-read the configuration. This has the effect of logging off all clients using Single Sign-On to connect to the LoadMaster.

### 2.2.6.2 Configure the Outbound SSO Domain in the LoadMaster

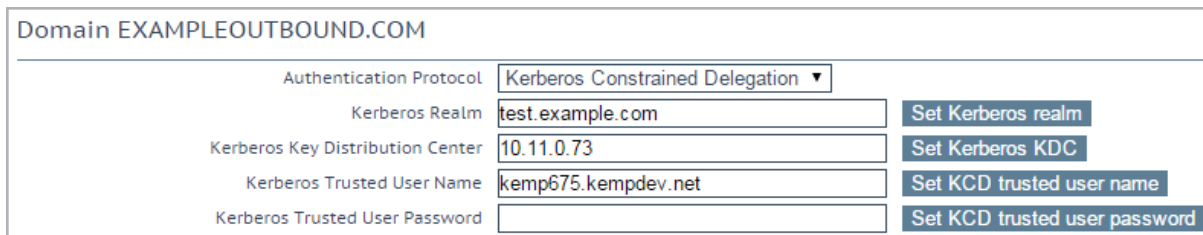
There are some guidelines to be aware of when creating a trusted user. For further details, refer to the **Create a LoadMaster Trusted User** section.

To configure the server (outbound) SSO domain, follow the steps below in the LoadMaster Web User Interface (WUI):

1. In the main menu, select **Virtual Services > Manage SSO**.



2. In the **Server Side Single Sign On Configurations** section, enter the name of the Single Sign On (SSO) domain in the **Name** text box and click **Add**.



3. Select **Kerberos Constrained Delegation** as the **Authentication Protocol**.
4. Enter the **Kerberos Realm** address and click **Set Kerberos realm**. Click **OK**.

The Kerberos realm should be a name (not an IP address), such as **kemptech.local**. If an IP address is specified, authentication will not work. This field only accepts one name. Double quotes are not allowed in this field.

5. Enter the address of the **Kerberos Key Distribution Center** and click **Set Kerberos KDC**. Click **OK**.

---

This field only accepts one **Key Distribution Center**.  
Double quotes are not allowed in this field.

---

6. Enter the **Kerberos Trusted User Name** and click **Set KCD** trusted user name. Click **OK**.

---

Refer to the **Create a LoadMaster Trusted User** section of this document for some key requirements relating to this trusted user account.

---

---

Double and single quotes are not allowed in the **Kerberos Trusted User Name** field.

---

7. Enter the **Kerberos Trusted User Password** and click **Set KCD** trusted user password. Click **OK**.

### 2.2.7 Configure the Virtual Service(s)

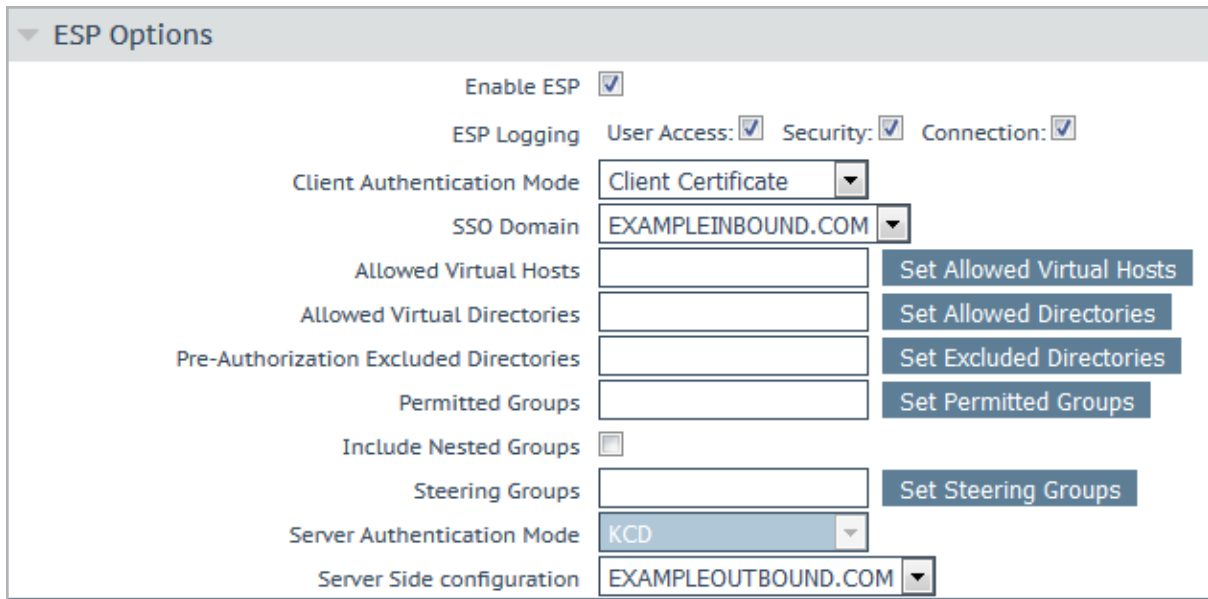
To configure the Virtual Service(s) to use DoD CAC authentication, follow the steps below:

1. In the main menu, select **Virtual Services > View/Modify Services**.
2. Expand the **SSL Properties** section.

## 2 DoD CAC Authentication

SSL Properties	
SSL Acceleration	Enabled: <input checked="" type="checkbox"/> Reencrypt: <input type="checkbox"/>
Supported Protocols	<input type="checkbox"/> SSLv3 <input type="checkbox"/> TLS1.0 <input checked="" type="checkbox"/> TLS1.1 <input checked="" type="checkbox"/> TLS1.2 <input checked="" type="checkbox"/> TLS1.3
Add Received Cipher Name	<input checked="" type="checkbox"/>
Require SNI hostname	<input type="checkbox"/>
Certificates	<p><b>Self Signed Certificate in use.</b></p> <div> <div>Available Certificates</div> <div>None Available</div> </div> <div> <div>Assigned Certificates</div> <div>None Assigned</div> </div> <div> <div>&gt;</div> <div>&lt;</div> </div> <div>Set Certificates</div> <div>Manage Certificates</div>
Ciphers	<div> <div>Cipher Set</div> <div>Default</div> <div>Modify Cipher Set</div> </div> <div>Assigned Ciphers</div> <div> ECDHE-ECDSA-AES256-GCM-SHA384  ECDHE-RSA-AES256-GCM-SHA384  DHE-DSS-AES256-GCM-SHA384  DHE-RSA-AES256-GCM-SHA384  ECDHE-ECDSA-CHACHA20-POLY1305  ECDHE-RSA-CHACHA20-POLY1305 </div>
Client Certificates	No Client Certificates required
Strict Transport Security Header	Don't add the Strict Transport Security Header
Intermediate Certificates	<p><b>Using all installed Intermediate certificates</b></p> <div>Show Intermediate Certificates</div>

3. Select **Enabled**.
4. Click **OK**.
5. Expand the **ESP Options** section.



6. Select **Enable ESP**.
7. Select **Client Certificate** as the **Client Authentication** mode.
8. Select the inbound SSO domain which was configured in the **Configure the Inbound SSO Domain in the LoadMaster** section in the **SSO Domain** drop-down list.

---

To allow the option to authenticate from multiple domains, alternative domains can be assigned at this point.

---

9. In the **Server Side configuration** drop-down list, select the outbound SSO domain which was created in the **Configure the Outbound SSO Domain in the LoadMaster** section.
10. Fill out any other details as needed. For more information on the general ESP options, refer to the [ESP, Feature Description](#).
11. Expand the **SSL Properties** section.

## 2 DoD CAC Authentication

SSL Properties	
SSL Acceleration	Enabled: <input checked="" type="checkbox"/> Reencrypt: <input type="checkbox"/>
Supported Protocols	<input type="checkbox"/> SSLv3 <input type="checkbox"/> TLS1.0 <input checked="" type="checkbox"/> TLS1.1 <input checked="" type="checkbox"/> TLS1.2 <input checked="" type="checkbox"/> TLS1.3
Add Received Cipher Name	<input type="checkbox"/>
Require SNI hostname	<input type="checkbox"/>
<p><b>Self Signed Certificate in use.</b></p> <div> <div> <div>Available Certificates</div> <div>None Available</div> </div> <div> <div>Assigned Certificates</div> <div>None Assigned</div> </div> <div> <div>&gt;</div> <div>&lt;</div> </div> <div> <div>Set Certificates</div> </div> </div> <div> <div>Manage Certificates</div> </div>	
<div> <div>Cipher Set</div> <div>Default</div> <div>Modify Cipher Set</div> </div> <div> <div>Assigned Ciphers</div> <div> ECDHE-ECDSA-AES256-GCM-SHA384  ECDHE-RSA-AES256-GCM-SHA384  DHE-DSS-AES256-GCM-SHA384  DHE-RSA-AES256-GCM-SHA384  ECDHE-ECDSA-CHACHA20-POLY1305  ECDHE-RSA-CHACHA20-POLY1305 </div> </div>	
Client Certificates	Client Certificates and pass DER through as X-CLIENT-CERT
Verify Client using OCSP	<input checked="" type="checkbox"/>
Strict Transport Security Header	Don't add the Strict Transport Security Header

12. Enable the **Verify Client using OCSP** option.

If **Verify Client using OCSP** is enabled and the OCSP server settings have not been configured in the **OCSP Configuration** screen, the client cannot be verified and the connection will fail.

13. Fill out any other details as needed.

14. Add any Real Servers as needed.

When using client certificates, you cannot have SubVSs when setting up an Exchange workload.



# 3 Using CAC Authentication for LoadMaster WUI Access

In addition to using CAC as the authentication protocol when using ESP, CAC authentication can also be used to authenticate user access to the LoadMaster administrative WUI. To configure this, follow the steps in the sections below.

---

Certificate-based authentication will be deprecated at some point in the future.

---

## 3.1 Complete the CAC Infrastructure Configuration

Before enabling CAC authentication for LoadMaster WUI access, please ensure that the CAC infrastructure configuration has been completed. If it has not been completed, you may not be able to gain access to the LoadMaster WUI after enabling CAC authentication for WUI access. For further information on completing the CAC infrastructure configuration, refer to the other sections in this document and also the third party CAC documentation.

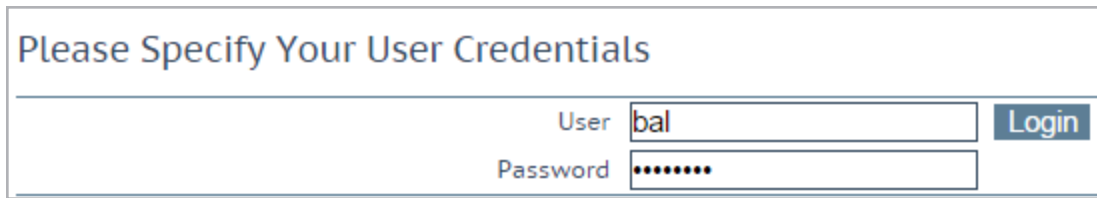
## 3.2 Upload the Certificate to be Validated to the LoadMaster

Ensure to upload the certificate to be validated to the **Intermediate Certs** section of the LoadMaster WUI. For step-by-step instructions, refer to the **Install the Root Certificate on the LoadMaster** section.

## 3.3 Enable Session Management

Session management needs to be enabled in the LoadMaster WUI in order to enable CAC authentication. To enable Session Management, follow the steps below:

1. In the main menu of the LoadMaster WUI, go to **System Configuration > Miscellaneous Options > WUI Settings**.
2. Tick the **Enable Session Management** check box.



Please Specify Your User Credentials

User	<input type="text" value="bal"/>	<input type="button" value="Login"/>
Password	<input type="password" value="....."/>	

3. Log in to the WUI.

4. If required, basic authentication can also be enabled.

For further information on WUI Session Management, refer to the [Web User Interface \(WUI\), Configuration Guide](#).

### 3.4 Optionally Enable the OCSP Check

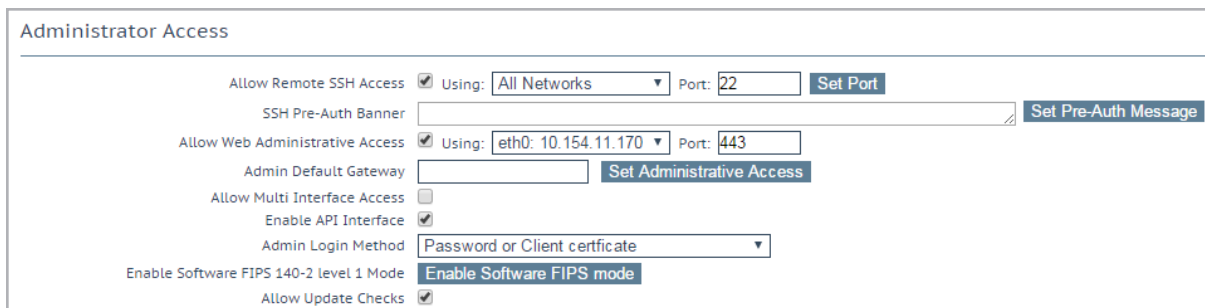
If desired, an OCSP check can also be enabled - but this is optional. For further information, refer to the OCSP sections in this document.

### 3.5 Enable CAC Authentication for LoadMaster WUI Access

Certificate authentication must be configured correctly before enabling WUI CAC support.

After session management has been enabled, CAC authentication can also be enabled for LoadMaster WUI access. To enable this, follow the steps below:

1. In the main menu of the LoadMaster WUI, go to **Certificates & Security > Remote Access**.



Administrator Access

Allow Remote SSH Access	<input checked="" type="checkbox"/>	Using: <input type="text" value="All Networks"/>	Port: <input type="text" value="22"/>	<input type="button" value="Set Port"/>
SSH Pre-Auth Banner	<input type="text"/>			<input type="button" value="Set Pre-Auth Message"/>
Allow Web Administrative Access	<input checked="" type="checkbox"/>	Using: <input type="text" value="eth0: 10.154.11.170"/>	Port: <input type="text" value="443"/>	
Admin Default Gateway	<input type="text"/>			<input type="button" value="Set Administrative Access"/>
Allow Multi Interface Access	<input type="checkbox"/>			
Enable API Interface	<input checked="" type="checkbox"/>			
Admin Login Method	<input type="text" value="Password or Client certificate"/>			
Enable Software FIPS 140-2 level 1 Mode	<input type="button" value="Enable Software FIPS mode"/>			
Allow Update Checks	<input checked="" type="checkbox"/>			

2. Select the relevant **Admin Login Method**.

The following login methods are available:

- **Password Only Access (default):** This option provides access using the username and password only – there is no access using client certificates.
- **Password or Client certificate:** The user can log in using either the username/password or using a valid client certificate. If a valid client certificate is in place, the username and password is not required.

The client is asked for a certificate. If a client certificate is supplied, the LoadMaster will check for a match. The LoadMaster checks if the certificate is a match with one of the local certificates, or checks if the Subject Alternative Name (SAN) or Common Name (CN) of the certificate is a match. The SAN is used in preference to the CN when performing a match. If there is a match, the user is allowed access to the LoadMaster. This works both using the API and user interface.

An invalid certificate will not allow access.

If no client certificate is supplied, the LoadMaster will expect that a username and password is supplied (for the API) or will ask the user to enter a password using the standard WUI login page.
- **Client certificate required:** Access is only allowed with the use of a client certificate. It is not possible to log in using the username and password. SSH access is not affected by this (only the **bal** user can log in using SSH).
- **Client certificate required (Verify via OCSP):** This is the same as the **Client certificate required** option, but the client certificate is verified using an OCSP service. The OCSP Server Settings must be configured in order for this to work. For further information on the OCSP Server Settings, refer to the **Configure the OCSP Options** section.

---

In LoadMaster firmware version 7.2.53 and above, the OCSP server settings do not need to be configured in the LoadMaster if the certificate has an Authority Information Access (AIA) extension that the LoadMaster will attempt to connect to it.

---

Some points to note regarding the client certificate methods are below:

- The **bal** user does not have a client certificate. Therefore, it is not possible to log into the LoadMaster as **bal** using the **Client certificate required** methods. However, a non-**bal** user can be created and granted **All Permissions**. This will allow the same functionality as the **bal** user.
- There is no log out option for users that are logged in to the WUI using client certificates, as it is not possible to log out (if the user did log out the next access would automatically log them back in again). The session is terminated when the page is closed, or when the browser is restarted.

## 3.6 Logging in to the LoadMaster WUI with CAC Authentication

After enabling CAC WUI authentication, you are logged out of the LoadMaster WUI. Please close the web browser and open it again. Then, attempt to log in with a valid certificate.

The WUI authentication login is based on CAC X.509 certificates. Authentication systems vary depending on the type of system, such as Active Directory or another access control list.

When logging into the LoadMaster WUI with CAC and LDAP, the username needs to be fully qualified, that is, it needs to be the UserPrincipalname or <Domain>\<Username>.

# 4 Appendix A: Configure the Active Directory Settings

There are certain Active Directory settings that need to be configured correctly for CAC authentication to work with the LoadMaster. Follow the steps below to configure these settings. If this account is not set up correctly, CAC authentication will not work.

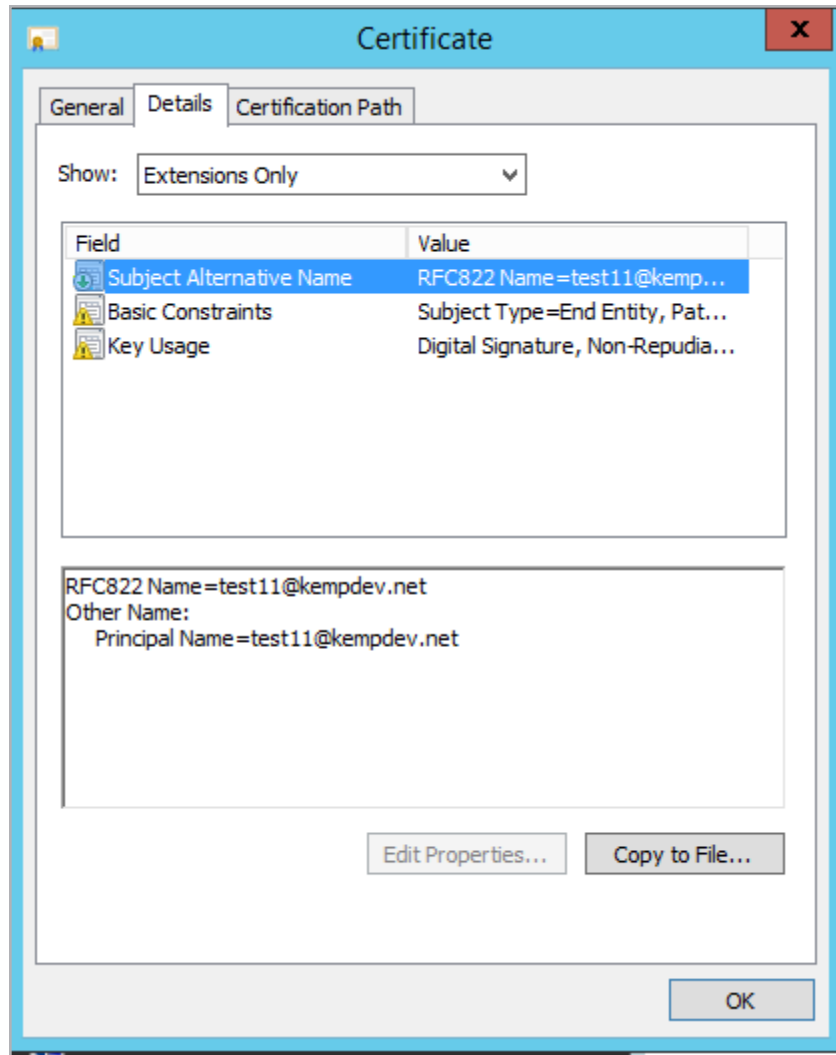
The steps below are functionally equivalent for Windows Server 2008 and Windows Server 2012 R2. For more information, please refer to the Microsoft documentation.

---

The screenshots in this section were taken in Windows Server 2012 R2. They were correct at time of writing but they may change without our knowledge. Please consult the Microsoft documentation for the latest screenshots and steps.

---

## 4.1 Add a Certificate to the Active Directory for TLS/LDAPS



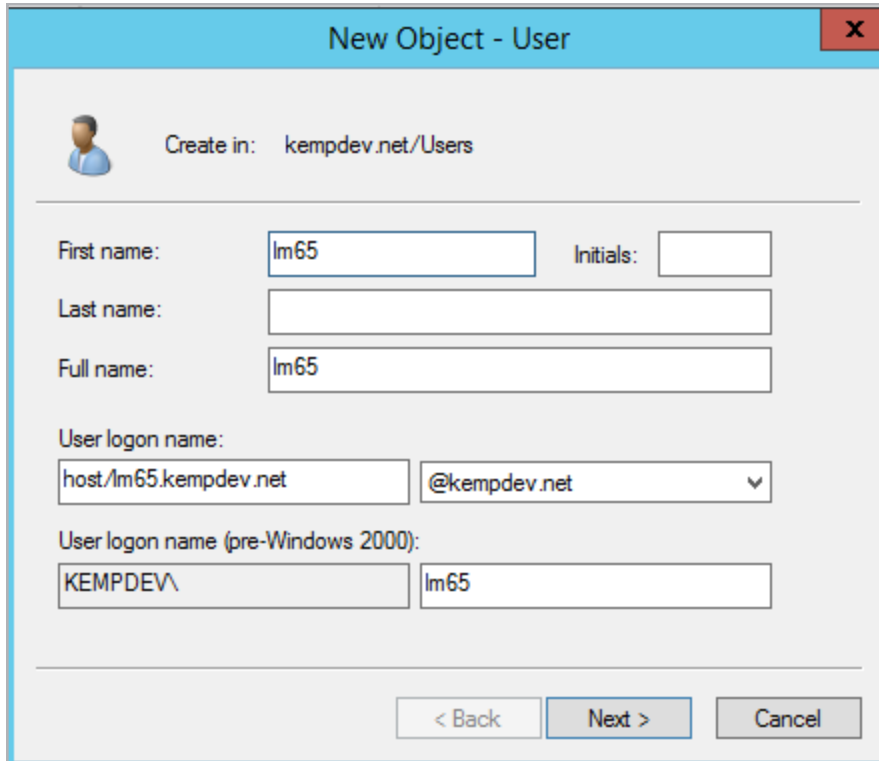
A certificate needs to be added to the Active Directory for Transport Layer Security (TLS)/Lightweight Directory Access Protocol over SSL (LDAPS).

## 4.2 Create a LoadMaster Trusted User

A LoadMaster trusted user must be created in the Windows domain (Active Directory). This trusted administrator user account is used to get tickets on behalf of users and services when a password is not provided. The Active Directory account for the trusted user is a user account, but it represents the LoadMaster.

Some guidelines regarding configuring the trusted user are listed below:

## 4 Appendix A: Configure the Active Directory Settings



The screenshot shows the 'New Object - User' dialog box. At the top, it says 'Create in: kempdev.net/Users'. Below this, there are several input fields: 'First name' with 'lm65', 'Initials' (empty), 'Last name' (empty), 'Full name' with 'lm65', 'User logon name' with 'host/lm65.kempdev.net' and a dropdown menu showing '@kempdev.net', and 'User logon name (pre-Windows 2000)' with 'KEMPDEV\' and 'lm65'. At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'.

- The User Principal Name (UPN) (**User logon name**) must be like a Service Principal Name (SPN), for example **host/<FQDN>.UPNSuffix**, like the example in the screenshot above; **host/lm65.kempdev.net**

---

The default UPN suffix must be used.

---

- The **pre-Windows 2000** user logon name has to be the name part of the FQDN that is part of the UPN above, for example **KempDEV\**

---

A DNS entry representing the FQDN must be created, ideally with a PTR record for reverse lookup.

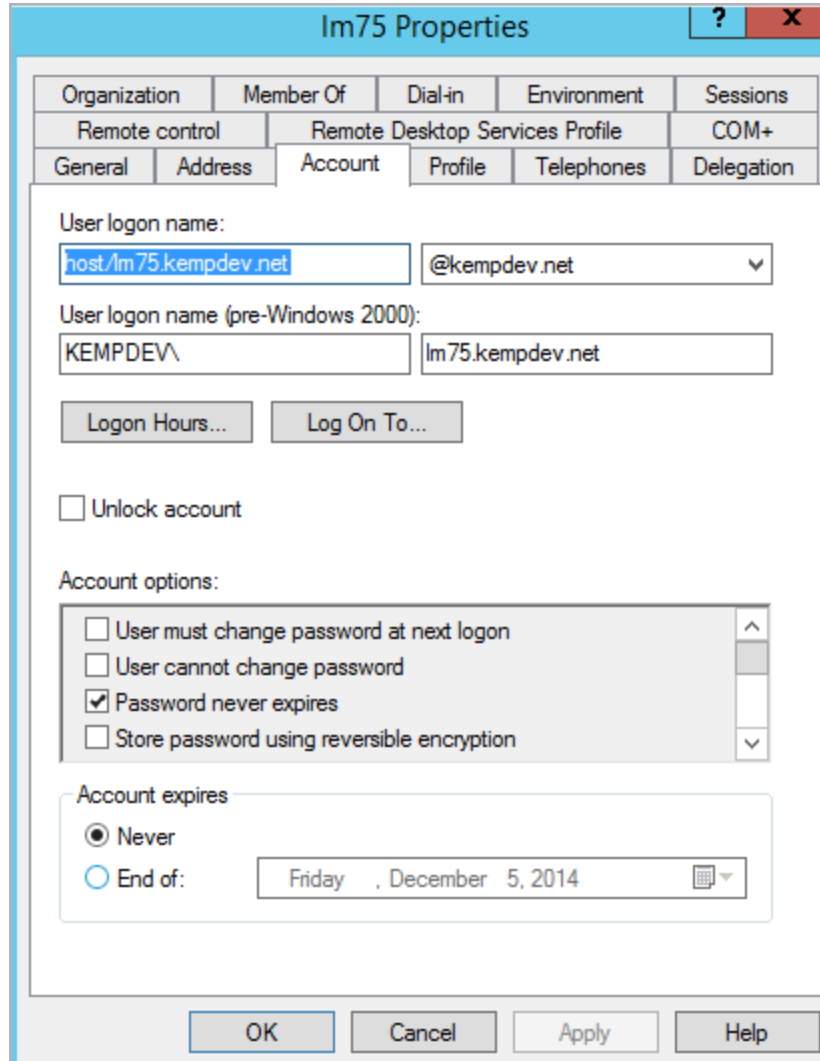
---

---

In the LoadMaster, the **Kerberos Trusted User Name** is set to the FQDN name above, which should be the host name of the LoadMaster.

---

## 4 Appendix A: Configure the Active Directory Settings



**Im75 Properties**

Organization	Member Of	Dial-in	Environment	Sessions
Remote control	Remote Desktop Services Profile			COM+
General	Address	Account	Profile	Telephones
		Delegation		

User logon name:

User logon name (pre-Windows 2000):

☐ Unlock account

Account options:

- ☐ User must change password at next logon
- ☐ User cannot change password
- ☒ Password never expires
- ☐ Store password using reversible encryption

Account expires:

☒ Never

☐ End of:

To open the user **Properties** screen, right-click the user and click **Properties**.

- The password should be set to never expire
- The user must have permissions to perform protocol transition. Refer to the **Configure Delegation for the User Entry** section for further information on this.



4 Appendix A: Configure the Active Directory Settings

Remote controlRemote Desktop Services ProfileCOM+

GeneralAddressAccountProfileTelephonesOrganization

Member OfDial-inEnvironmentSessions

Member of:

NameActive Directory Domain Services Folder

Domain Userskempdev.net/Users

Add...Remove

Primary group:Domain Users

Set Primary Group

There is no need to change Primary group unless you have Macintosh clients or POSIX-compliant applications.

OKCancelApplyHelp

- The user must be a member of the relevant domain

In the example, the items are mapped as follows:

Item	Mapping	Additional Information
Username	lm75	
Domain	kemptech.net	
Kerberos Realm	kemptech.net	
Default UPN-suffix	kemptech.net	
LoadMaster FQDN	lm75.kemptech.net	DNS entry
FQDN name/LoadMaster	lm75	

## 4 Appendix A: Configure the Active Directory Settings

Item	Mapping	Additional Information
hostname		
LoadMaster SPN	host/lm75.kemptech.net	
UPN of trusted user	host/lm75.kemptech.net	User logon name
Trusted user logon name	kempdev/lm75	User logon name (pre-Windows 2000)
Kerberos Trusted User Name	Lm75	

### 4.3 Associate an SPN with the User Entry

Execute the **ktpass.exe** file in the command prompt to associate a Service Principal Name (SPN) with the user entry, for example:

#### Example Syntax

```
ktpass.exe /princ host/<LoadMasterSPN>@<Domain> /ptype KRB5_NT_PRINCIPAL /mapuser
<Domain>\<TrustedUserLogonName> /mapop set /setupn /crypto all
```

#### Example Command

```
ktpass.exe /princ host/lm60.esptest.local@ESPTEST.local /ptype KRB5_NT_PRINCIPAL
/mapuser ESPTEST\lm60.esptest.local /mapop set /setupn /crypto all
```

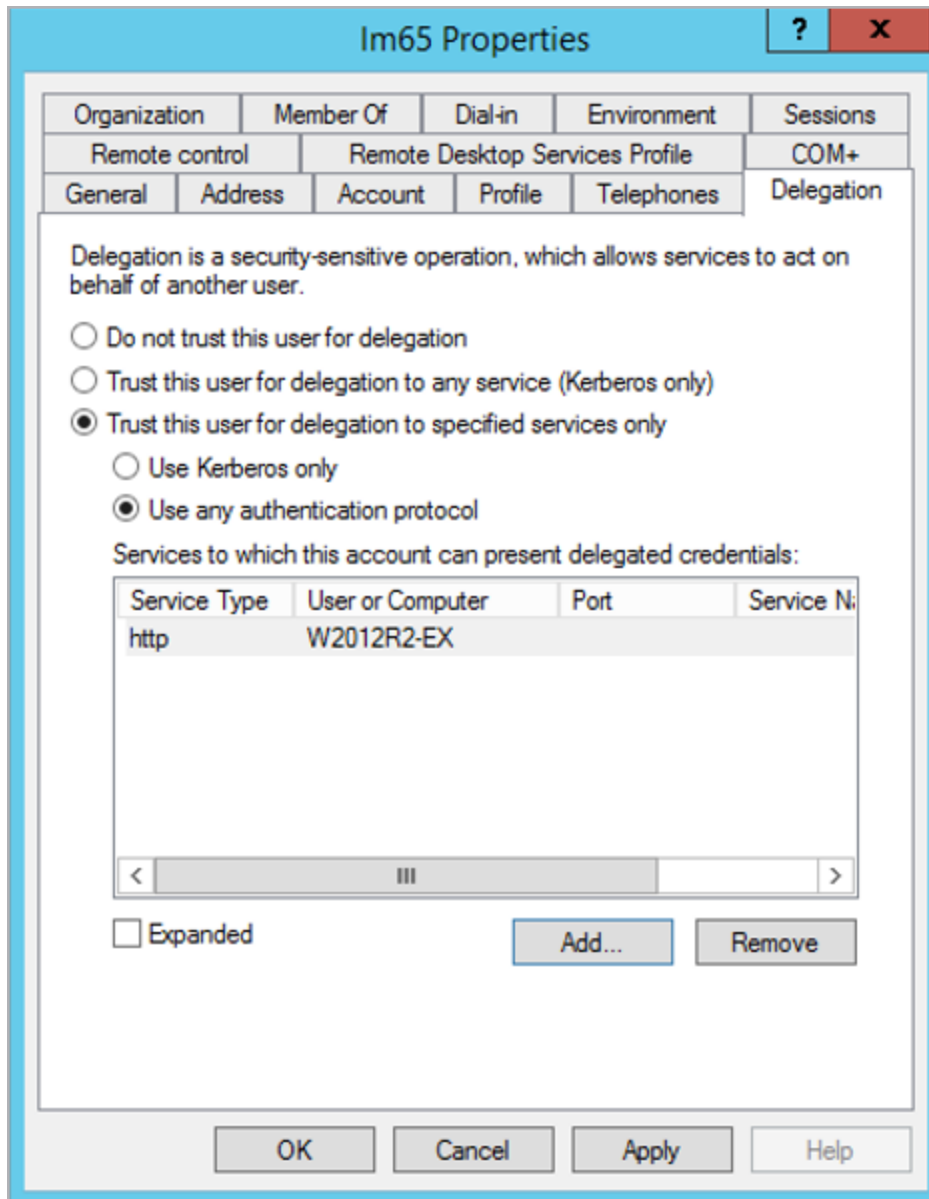
The **ktpass.exe** file is a Microsoft command-line utility and is present on any Windows Server installation.

When this has been completed, the user properties window will have the **Delegation** tab.

### 4.4 Configure Delegation for the User Entry

Some guidelines relating to the delegation settings for the trusted user are provided below:

## 4 Appendix A: Configure the Active Directory Settings



**Im65 Properties**

Organization	Member Of	Dial-in	Environment	Sessions
Remote control		Remote Desktop Services Profile		COM+
General	Address	Account	Profile	Telephones
				Delegation

Delegation is a security-sensitive operation, which allows services to act on behalf of another user.

☐ Do not trust this user for delegation  
☐ Trust this user for delegation to any service (Kerberos only)  
☒ Trust this user for delegation to specified services only

☐ Use Kerberos only  
☒ Use any authentication protocol

Services to which this account can present delegated credentials:

Service Type	User or Computer	Port	Service Name
http	W2012R2-EX		

< III >

☒ Expanded

Add... Remove

OK Cancel Apply Help

- The LoadMaster trusted user account must have delegation enabled (the ability to request a ticket on behalf of a user logging in) and be set to **Use any authentication protocol**

---

Delegation is not enabled by default when a user is created.

---

- In constrained delegation mode, the service(s) that need to be available must be selected. To do this, click the **Add** button.

---

Constrained delegation can be thought of as a white list type of security authenticating. Adding a service here is really adding it to the white list.

---

# 5 PIV Smart Card Support

In LoadMaster firmware version 7.2.53, support was added for Personal Identity Verification (PIV) smart card authentication. PIV guidance is to match certificate fields to "altsecurityidentities" in the Active Directory (AD). Support has been added for both SSO and WUI authentication.

## Select Certificate to User Mapping

The **Select Certificate to User Mapping** field appears in the drop-down list appears in **Virtual Services > Manage SSO > Modify** screen if the **Authentication Protocol** is set to **Certificates**.

The **Select Certificate to User Mapping** field appears in the **Certificates & Security > Remote Access > WUI Authorization Options** screen if the following settings are configured:

- **Session Management** must be enabled (**Certificates & Security > Admin WUI Access**) to see the **WUI Authorization Options** button.
- The **Admin Login Method** in **Certificates & Security > Remote Access** must be set to a **Client certificate** method.
- The **Pre-Auth Click Through Banner** must be set in **Certificates & Security > Admin WUI Access** before you can select a **Client certificate** method as the **Admin Login Method** in **Certificates & Security > Remote Access**.

The **Select Certificate to User Mapping** field has the following values:

- **User Principal Name (default value)**
- **Subject**
- **Issuer and Subject**
- **Issuer and Serial Number**

Some configuration caveats are below:

- After a certificate is revoked, the certificate fails authentication. However, sometimes it remains in the cache so to make it fail instantly ensure to use the **Flush OCSPD Cache** option in **System Configuration > System Administration > Logging Options > Debug Options**.
- If the LDAP query returns more than one match, the login fails.

- If the Authority Information Access (AIA) is present in the certificate, the LoadMaster attempts to connect with the provided AIA. If this does not work, it tries to connect with the local server.
- If the LoadMaster cannot get the status of the server configured in the certificate AIA, the LoadMaster does not fail back to the local server.
- If the certificate cannot be validated because the server is unavailable, there is an option in **Certificates & Security > OCSP Configuration** called **Allow Accession Server** Failure where you can decide if you want to pass the authentication or not. Enabling this check box treats an OCSP server connection failure or timeout as if the OCSP server has returned a valid response. That is, the client certificate is treated as valid.

# References

Unless otherwise specified, the following documents can be found at <http://kemptechnologies.com/documentation>.

**Kerberos Constrained Delegation, Feature Description**

**Web User Interface (WUI), Configuration Guide**

**ESP, Feature Description**

# Last Updated Date

This document was last updated on 29 July 2023.