

IBM z/OS Connect

Customization - Security when accessing an IMS Transactions



**IBM Z
Wildfire Team –
Washington System Center**

Lab Version Date: April 23, 2022

Table of Contents

Overview	4
Enabling RACF Pass Tickets.....	5
<i>Define RACF resources required for IMS Pass Tickets.....</i>	<i>5</i>
<i>Test with a default identity using RACF Pass Tickets</i>	<i>6</i>
<i>Test with identity propagation being enabled while using RACF Pass Tickets</i>	<i>9</i>
<i>Summary</i>	<i>10</i>
Configuring TLS security to an IMS Subsystem	11
<i>Creating IMS SAF resources.....</i>	<i>11</i>
<i>Configure the AT-TLS policies</i>	<i>17</i>
Activating the AT-TLS configuration	49
<i>Test the TLS connection from the z/OS Connect Server to IMS.....</i>	<i>52</i>
<i>Optional</i>	<i>54</i>
Summary	55
Appendix – AT-TLS Policy Agent Configuration File	55

Important: On the desktop there is a file named *Security CopyPaste.txt*. This file contains commands and other text used in this workshop. Locate that file and open it. Use the copy-and-paste function (**Ctrl-C** and **Ctrl-V**) to enter commands or text. It will save time and help avoid typo errors. As a reminder text that appears in this file will be highlighted in yellow.

General Exercise Information and Guidelines

- ✓ This exercise requires the completion of the *IBM z/OS Connect Customization - Basic Configuration (1 of 2)* and *IBM z/OS Connect Configuration Basic Security (2 of 2)* exercises before it can be performed.
- ✓ This exercise requires using z/OS user identities *FRED* and *USER1*. The password for these users will be provided by the lab instructions.
- ✓ There are examples of *server.xml* scattered through this exercise. Your *server.xml* may differ depending on which exercises have been previously performed. Be sure the **red lines** in these examples are either added or already present.
- ✓ The acronyms RACF (resource access control facility) and SAF (system authorization facility) are used in this exercise. RACF is the IBM security manager product whereas SAF is a generic term for any security manager product, e.g. ACF2 or Top Secret or RACF. An attempt has been to use SAF when referring to information appropriate for any SAF product and to use RACF when referring to specific RACF commands or examples.
- ✓ Any time you have any questions about the use of IBM z/OS Explorer, 3270 screens, features or tools, do not hesitate to ask the instructor for assistance.
- ✓ Text in **bold** and highlighted in **yellow** in this document should be available for copying and pasting in a file named *Security CopyPaste* file on the desktop.
- ✓ Please note that there may be minor differences between the screen shots in this exercise versus what you see when performing this exercise. These differences should not impact the completion of this exercise.
- ✓ For information regarding the use of the Personal Communication 3270 emulator, see the *Personal Communications Tips* PDF in the exercise folder.

Overview

This exercise demonstrates the steps required to enable security between a z/OS Connect server and IMS.

In part one of the exercise the use of RACF pass tickets will be configured. RACF pass tickets can be used to pass the z/OS Connect authenticated RACF identity to IMS Connect and this identity will subsequently be used for IMS authorization checks.

In part two of the exercise, TLS support will be added by configuring AT-TLS policies. The presence of these policies will act as a surrogate for handing the server role on behalf of IMS Connect and a surrogate for the z/OS Connect server as client.

Enabling RACF Pass Tickets

When sending request from an z/OS Connect server to IMS, the identity used for IMS authorization checks will be by default, the identity configured in the basic authentication element of the IMS connection factory. This identity is associated with the server and not the z/OS Connect authenticated identity under which the request is running.

To provide identity assertion of the authenticated identity the use of RACF Pass Tickets is required. When RACF Pass Tickets are enabled, the z/OS Connect server will obtain a pass ticket from RACF and send this ticket (token) along with the request to IMS Connect. When the request arrives at the IMS Connect the pass ticket will be validated with RACF and the z/OS Connect authenticated identity will be extracted and use for subsequent IMS authorization checks.

Define RACF resources required for IMS Pass Tickets.

Begin by define the RACF resources required for IMS pass tickets.

- ___ 1. Begin by submit the job in member *IMSPTKT* in data set *USER1.ZC30.CNTL*.

```
ADDGROUP ZCEEIMS

CONNECT LIBSERV GROUP(ZCEEIMS)

SETROPTS CLASSACT(PTKTDATA) RACLIST(PTKTDATA)
SETROPTS GENERIC(PTKTDATA)

RDEFINE PTKTDATA IMSAPPL SSIGNON(KEYMASK(123456789ABCDEF0)) +
APPLDATA('NO REPLAY PROTECTION')

RDEFINE PTKTDATA IRRPTAUTH. IMSAPPL.* UACC(NONE)
PERMIT IRRPTAUTH. IMSAPPL.* ID(ZCEEIMS) CLASS(PTKTDATA) ACC(UPDATE)

SETROPTS RACLIST(PTKTDATA) REFRESH
```

These commands define the required *PTKTDATA* resource *IMSAPPL*.

Tech-Tip: The value *IMSAPPL* was derived from the IMS Connect *APPL* attribute for the DATASTORE configuration entry, see sample below:

```
HWS=(ID=IMS15HWS,XIBAREA=100,RACF=Y,RRS=Y)
TCPIP=(HOSTNAME=TCPIP,PORTID=(4000,LOCAL),RACFID=JOHNSON,TIMEOUT=5000)
DATASTORE=(GROUP=OTMAGRP,ID=IVP1,MEMBER=HWSMEM,DRU=HWSYDRU0,
TMEMBER=OTMAMEM,APPL=IMSAPPL)
ODACCESS=(ODBMAUTOCONN=Y,IMSPLEX=(MEMBER=IMS15HWS,TMEMBER=PLEX1),
DRDAPORT=(ID=5555,PORTTMOT=6000),ODBMTMOT=6000,APPL=IMSAPPL)
```

The value for the key mask was an arbitrary 16 hexadecimal string. If multiple RACF databases are involved this value must be the same for all.

Test with a default identity using RACF Pass Tickets

First let's explore invoking an IMS API and observing the security behavior when the connection factory default identity is used to generate a pass ticket.

1. First some server.xml housekeeping is required. Edit the *server.xml* configuration file for the *myServer* server, e.g. */var/zosconnect/servers/myServer/server.xml* and add an include for file *shared.xml* (if it is not already present) see below:

```
<include location="$${server.config.dir}/includes/shared.xml"/>
```

```
<include location="$${server.config.dir}/includes/safSecurity.xml"/>
<include location="$${server.config.dir}/includes/ipic.xml"/>
<include location="$${server.config.dir}/includes/keyringMutual.xml"/>
<include location="$${server.config.dir}/includes/groupAccess.xml"/>
<include location="$${server.config.dir}/includes/shared.xml"/>
```

This will install some predefined services and APIs in the server.

2. Before saving the *server.xml* file, add the *imsmobile* feature to the *featureManager* section of the *server.xml*.

```
<featureManager>
  <feature>zoscconnect:zosConnect-2.0</feature>
  <feature>zoscconnect:zosConnectCommands-1.0</feature>
  <feature>imsmobile:imsmobile-2.0</feature>
</featureManager>
```

3. Stop and restart the server with MVS commands ***P BAQSTRT*** and ***S BAQSTRT***.

Tech-Tip: MVS and JES2 commands can be entered from SDSF by enter a / (slash) on the command line followed by the command itself (e.g. /D T). The command results can be found in the system log. If a command is especially long, then simply entering a / (slash) to display a *SDSF – System Command Extension* panel where a command can span multiple lines. When an MVS command must be entered, the instructions in these exercises will indicate that the command is an MVS command and you may enter the command at the prompt by using the / (slash) prefix or using the *SDSF – System Command Extension* panel.

Restarting the server with the *imsmobile* feature enabled will create a new directory structure in the server's *resources* directory with the name *imsmobile-configuration*. The connection and interaction configuration elements in this directory structure now need to be configured.

4. Edit file *ims-connections.xml* in */var/zosconnect/servers/myServer/resources/imsmobile-config/connections* and ensure the attribute values shown below are modified to these values:

```
<server>
<imsmobile_imsConnection comment="" connectionFactoryRef="IVP1"
id="IMSCONN"/>
<connectionFactory id="IVP1">
<properties.gmoa hostName="wg31.washington.ibm.com" portNumber="4000"
applicationName="IMSAPPL" userName="FRED"/>
</connectionFactory>
</server>
```

With this configuration, a pass ticket will be generated for identity FRED for all request to IMS TM.

5. Next, edit file *ims-interactions.xml* in */var/zosconnect/servers/myServer/resources/imsmobile-config/interactions* and ensure the attributes red as shown below are modified to these values:

```
<server>
<imsmobile_interaction comment="" commitMode="1" id="IMSINTER"
imsConnectCodepage="Cp1047" imsConnectTimeout="30000"
imsDatastoreName="IVP1" interactionTimeout="-1" ltermOverrideName=""
syncLevel="0"/>
</server>
```

6. Refresh the configuration with MVS command ***F BAQSTRT,REFRESH,CONFIG***

7. Open a DOS command prompt and go to directory *c:/z/admin*.

8. Enter the cURL command below:

```
curl -X get --cacert certauth.pem --cert fred.pl2:secret --cert-type P12  
https://wg31.washington.ibm.com:9443/phonebook/contacts/LAST3
```

```
c:\z\admin>curl -X get --cacert certauth.pem --cert fred.pl2:secret --cert-type P12  
https://wg31.washington.ibm.com:9443/phonebook/contacts/LAST3  
{ "phonebookResponse": { "lastName": "LAST3", "firstName": "FIRST3", "zipCode": "D03\R03", "ex  
tension": "8-111-3333", "message": "ENTRY WAS DISPLAYED" } }
```

9. Enter the cURL command below specifying user1's personal certificate.

```
curl -X get --cacert certauth.pem --cert user1.pl2:secret --cert-type P12  
https://wg31.washington.ibm.com:9443/phonebook/contacts/LAST3
```

You should see the same results because the requests to IMS Connect are using the basic authentication as configured in the connection factory in *imsconnections.xml* (see below).

```
<properties.gmoa hostName="wg31.washington.ibm.com" portNumber="4000"  
  applicationName="IMSAPPL" userName="FRED"/>
```

10. To confirm that FRED is being used (not USER1), locate the outstanding reply for IMS Connect in the SDSF log and respond with *VIEWHWS*, as in *##VIEWHWS* (where *##* is the reply number). You should see a request for transaction *IVTNO* with the *USERID* of *FRED*

```
HWSC0001I      PORT=4000      STATUS=ACTIVE      KEEPAV=0  NUMSOC=2  
EDIT=          TIMEOUT=0  
HWSC0001I      CLIENTID  USERID    TRANCODE  DATASTORE  STATUS      SECOND  
CLNTPORT  IP-ADDRESS      APSB-TOKEN  
HWSC0001I      GMPGM7ZE  FRED      IVTNO      IVP1        RECV        30  
1146      192.168.017.201  
HWSC0001I      TOTAL CLIENTS=1  RECV=1  READ=0  CONN=0  XMIT=0  OTHER=0
```


Test with identity propagation being enabled while using RACF Pass Tickets

Next remove the *userName* attribute from the connection. Now request to IMS TM will use the authentication identity of the current user when generating a pass ticket.

1. Edit file *ims-connections.xml* in */var/zosconnect/servers/myServer/resources/imsmobile-config/connections* and remove the *userName* attribute:

```
<server>
<imsmobile_imsConnection comment="" connectionFactoryRef="IVP1"
id="IMSCONN"/>
<connectionFactory id="IVP1">
<properties.gmoa hostName="wg31.washington.ibm.com" portNumber="4000"
applicationName="IMSAPPL"/>
</connectionFactory>
</server>
```

2. Refresh the server's configuration using the MVS command **F BAQSTR,REFRESH,CONFIG**

Tech-Tip: A refresh should be sufficient, but a complete restart of the server might be better. The TCPIP connects linger for a while and restart of the server will break these connections and provide distinct results between tests.

3. Enter the cURL command below:

```
curl -X get --cacert certauth.pem --cert user1.p12:secret --cert-type P12
https://wg31.washington.ibm.com:9443/phonebook/contacts/LAST3
```

```
c:\z\admin>curl -X get --cacert certauth.pem --cert user1.p12:secret --cert-type P12
https://wg31.washington.ibm.com:9443/phonebook/contacts/LAST3
{"phonebookResponse":{"lastName":"LAST3","firstName":"FIRST3","zipCode":"D03\R03","ex
tension":"8-111-3333","message":"ENTRY WAS DISPLAYED"}}
```

:

You should see the same results.

4. To confirm the USER1 identity (user1.p12) is now being used for authorization, locate the outstanding reply for IMS Connect in the SDSF log again and respond with IMS Connect command *VIEWHWS*, as in **##VIEWHWS** (where ## is the outstanding reply number for IMS Connect). You should see a request for transaction *IVTNO* with the *USERID* of *USER1*

```

HWSC0001I      PORT=4000      STATUS=ACTIVE      KEEPAV=0  NUMSOC=2
EDIT=          TIMEOUT=0
HWSC0001I      CLIENTID USERID      TRANCOD DATASTORE STATUS      SECOND
CLNTPORT IP-ADDRESS      APSB-TOKEN
HWSC0001I      GMPGM7ZE USER1      IVTNO      IVP1      RECV      10
1146      192.168.017.201
HWSC0001I      TOTAL CLIENTS=1  RECV=1  READ=0  CONN=0  XMIT=0  OTHER=0

```

5. Repeat the curl command but this time use Fred's certificate. (fred.p12). Locate the outstanding reply for IMS Connect in the SDSF log again and respond with IMS Connect command *VIEWHWS*, as in **##VIEWHWS** (where ## is the outstanding reply number for IMS Connect). You should see a request for transaction *IVTNO* with the *USERID* of *FRED*

```

HWSC0001I      PORT=4000      STATUS=ACTIVE      KEEPAV=0  NUMSOC=2
EDIT=          TIMEOUT=0
HWSC0001I      CLIENTID USERID      TRANCOD DATASTORE STATUS      SECOND
CLNTPORT IP-ADDRESS      APSB-TOKEN
HWSC0001I      GMPGM7ZE FRED      IVTNO      IVP1      RECV      30
1146      192.168.017.201
HWSC0001I      TOTAL CLIENTS=1  RECV=1  READ=0  CONN=0  XMIT=0  OTHER=0

```

Summary

In this section a simple REST client (cURL) has been used to invoke an API which accesses IMS. Required RACF resources were defined and changes were made to the server.xml so RACF Pass Tickets would be used between the server and IMS Connect. Finally, the REST client was used to demonstrate that the identity associated with the client certificates (fred.p12 and user1.p12) were propagated to IMS Connect for authorization checks.

Configuring TLS security to an IMS Subsystem

Adding TLS support to the connection between the z/OS Connect server and IMS requires the creation of a key ring belonging to the identity under which the IMS Connect task is executing (look for message IEF695I in the IMS15HWS task's JES messages). This key ring contains the personal and the certificate authority certificates that will be used during TLS handshakes. The creation of the key ring and the connection of certificates to the key ring are done using the RACDCERT RACF commands.

Creating IMS SAF resources

First, we may have to do some housekeeping depending on which exercises have been previously performed.

- ___ 1. Browse data set *USER1.ZCEE30.CNTL*. You should see the members in that data set.
- ___ 2. Browse member **ZCEETLSC** (TLS client role). You should see the RACF commands below. Submit the job for execution if this job has not been previously submitted in another exercise.

```
/* Create personal certificate for zCEE outbound client request */
racdcert id(libserv) gencert subjectsdn(cn('zCEE Client Cert') +
ou('ATS') o('IBM')) withlabel('zCEE Client Cert') signwith(certauth +
label('zCEE CA')) notafter(date(2022/12/31))

/* Create zCEE outbound key ring and connect certificates */
racdcert id(libserv) addring(zCEE.KeyRing)

racdcert id(libserv) connect(ring(zCEE.KeyRing) +
label('zCEE CA') certauth usage(certauth))

racdcert id(libserv) connect(ring(zCEE.KeyRing) +
label('Liberty CA') certauth usage(certauth))

/* Connect CA certificate to Liberty inbound key ring */
racdcert id(libserv) connect(ring(Liberty.KeyRing) +
label('zCEE CA') certauth usage(certauth))

/* Connect default personal certificate */
racdcert id(libserv) connect(ring(zCEE.KeyRing) +
label('zCEE Client Cert') default)

racdcert id(libserv) listring(zCEE.KeyRing)
racdcert id(libserv) list

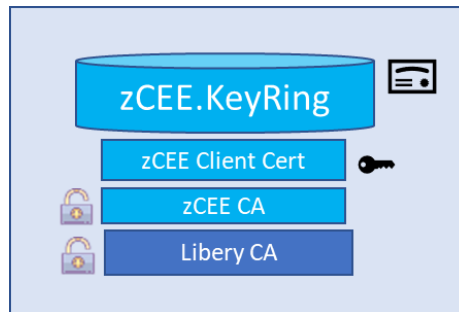
setr raclist(digtcert digtring) refresh

connect    libserv  group(zceeusrs)
connect    libserv  group(gminvoke)
```

These commands

- Define a personal certificate for the z/OS Connect server for use during outbound handshakes.
- Define a key ring to be used for outbound handshakes.
- Connect the z/OS Connect server personal certificate to this key ring.
- Connect the certificate authority (CA) public certificate used to sign the z/OS Connect server's outbound personal certificate to this key ring.
- Connect the certificate authority (CA) public certificate used to sign the API provider server's certificate to this key ring.
- Connects the certificate authority (CA) public certificate used to sign the z/OS Connect server's outbound personal certificate to the API provider's key ring.
- User LIBSERV is given the required authority to access their key ring and certificate.
- The in-storage profile for digital certificates resources are refreshed.
- User LIBSERV is connected to the groups that provide access to this z/OS Connect instance.

Below is visual representation of the key ring just created



___3. Next, browse member **IMSTLS**, you should see the RACF commands below. Submit the job for execution.

```
/* Create a CA certificate for IMS */
racdcert certauth gencert subjectsdn(cn('IMS CA') ou('ATS') +
ou('ATS') o('IBM')) withlabel('IMS CA') keyusage(certsign) +
notafter(date(2022/12/31))

/* Create a server certificate for IMS client request */
racdcert id(IMSSTC) gencert subjectsdn(cn('wg31.washington.ibm.com') +
ou('ATS') o('IBM')) withlabel('IMSSTC') signwith(certauth +
label('IMS CA')) notafter(date(2021/12/31))

setr raclist(digtcert,digtnmap) refresh

/* Create IMS key ring and connect CA and personal certificates */
racdcert id(IMSSTC) addring(IMS.KeyRing)

racdcert id(IMSSTC) connect(ring(IMS.KeyRing) +
label('IMS CA') certauth usage(certauth))

racdcert id(IMSSTC) connect(ring(IMS.KeyRing) +
label('zCEE CA') certauth usage(certauth))

racdcert id(libserv) connect(ring(zCEE.KeyRing) +
label('IMS CA') certauth usage(certauth))

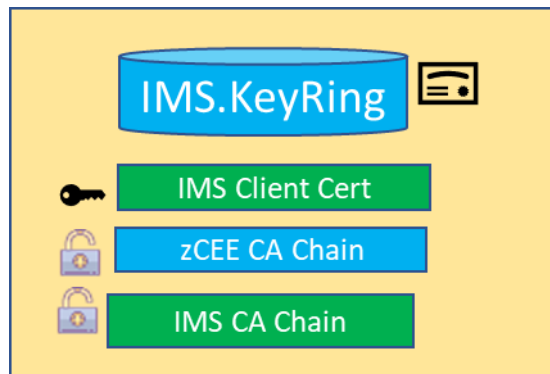
/* Connect default personal certificate */
racdcert id(IMSSTC) connect(ring(IMS.KeyRing) +
label('IMSSTC') default

setropts raclist(digtring,digtnmap) refresh
```

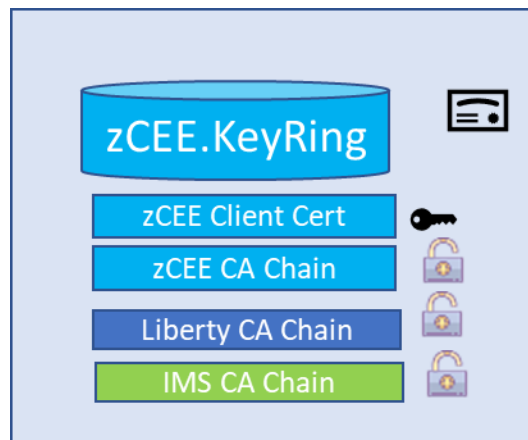
These commands

- Define a certificate authority certificate used to sign IMS certificates used during TLS handshakes.
- Define a personal certificate for the IMS server for use during TLS handshakes.
- Define a key ring to be used for TLS handshakes.
- Connect the IMS server personal certificate to this key ring.
- Connect the certificate authority (CA) public certificate used to sign the IMS server's certificate to this key ring.
- Connect the certificate authority (CA) public certificate used to sign the z/OS Connect server's outbound personal certificate to this key ring.
- The in-storage profile for digital certificates resources are refreshed.

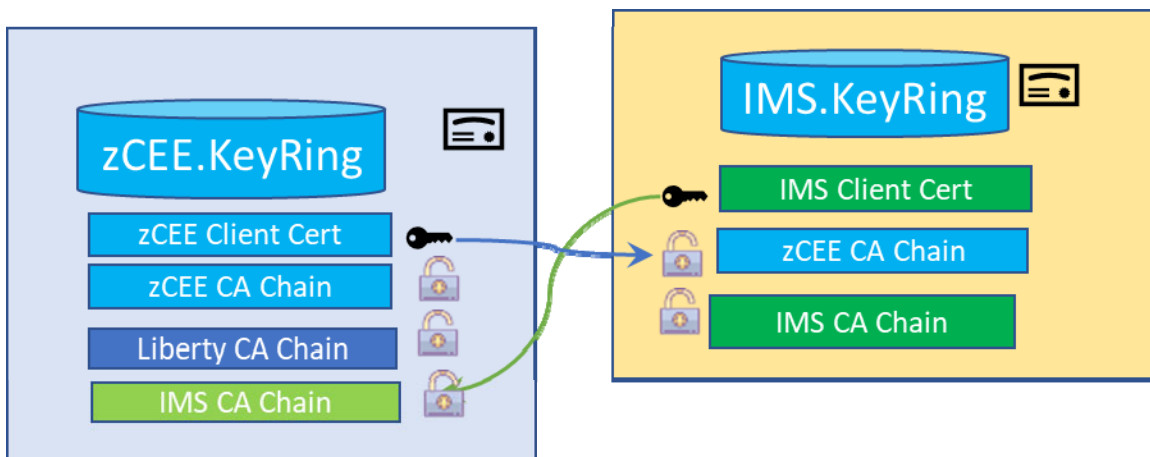
Below is visual representation of the key ring just created



The update made to the z/OS Connect server's outbound keyring



And the handshakes will flow as shown below



4. Edit the *server.xml* configuration file for the *myServer* server, found in directory */var/zosconnect/servers/myServer* and change the include for file *keyringMutual.xml* to an include of file *keyringOutBoundMutual.xml*, see below:

```
<include location="${server.config.dir}/includes/keyringOutboundMutual.xml"/>
```

```
<include location="${server.config.dir}/includes/safSecurity.xml"/>
<include location="${server.config.dir}/includes/ipicIDProp.xml"/>
<include location="${server.config.dir}/includes/keyringOutboundMutual.xml"/>
<include location="${server.config.dir}/includes/groupAccess.xml"/>
<include location="${server.config.dir}/includes/shared.xml"/>
```

The contents of *keyringOutboundMutual.xml* are shown below:

```
<!-- Enable features -->
<featureManager>
  <feature>transportSecurity-1.0</feature>
</featureManager>

<sslDefault sslRef="DefaultSSLSettings"
  outboundSSLRef="OutboundSSLSettings" />

<ssl id="DefaultSSLSettings"
  keyStoreRef="CellDefaultKeyStore"
  trustStoreRef="CellDefaultKeyStore"
  clientAuthenticationSupported="true"
  clientAuthentication="true"/>

<keyStore id="CellDefaultKeyStore"
  location="safkeyring:///Keyring.LIBERTY"
  password="password" type="JCERACFKS"
  fileBased="false" readOnly="true" />

<ssl id="OutboundSSLSettings"
  keyStoreRef="OutboundKeyStore"
  trustStoreRef="OutboundKeyStore"/>

<keyStore id="OutboundKeyStore"
  location="safkeyring:///zCEE.KeyRing"
  password="password" type="JCERACFKS"
  fileBased="false" readOnly="true" />
```

- ___ 5. Enter MVS commands *P BAQSRT and S BASSTRT* to refresh the z/OS Connect server's runtime configuration.

Tech-Tip: Updates to keyrings could have been refreshed in the server by using this command :

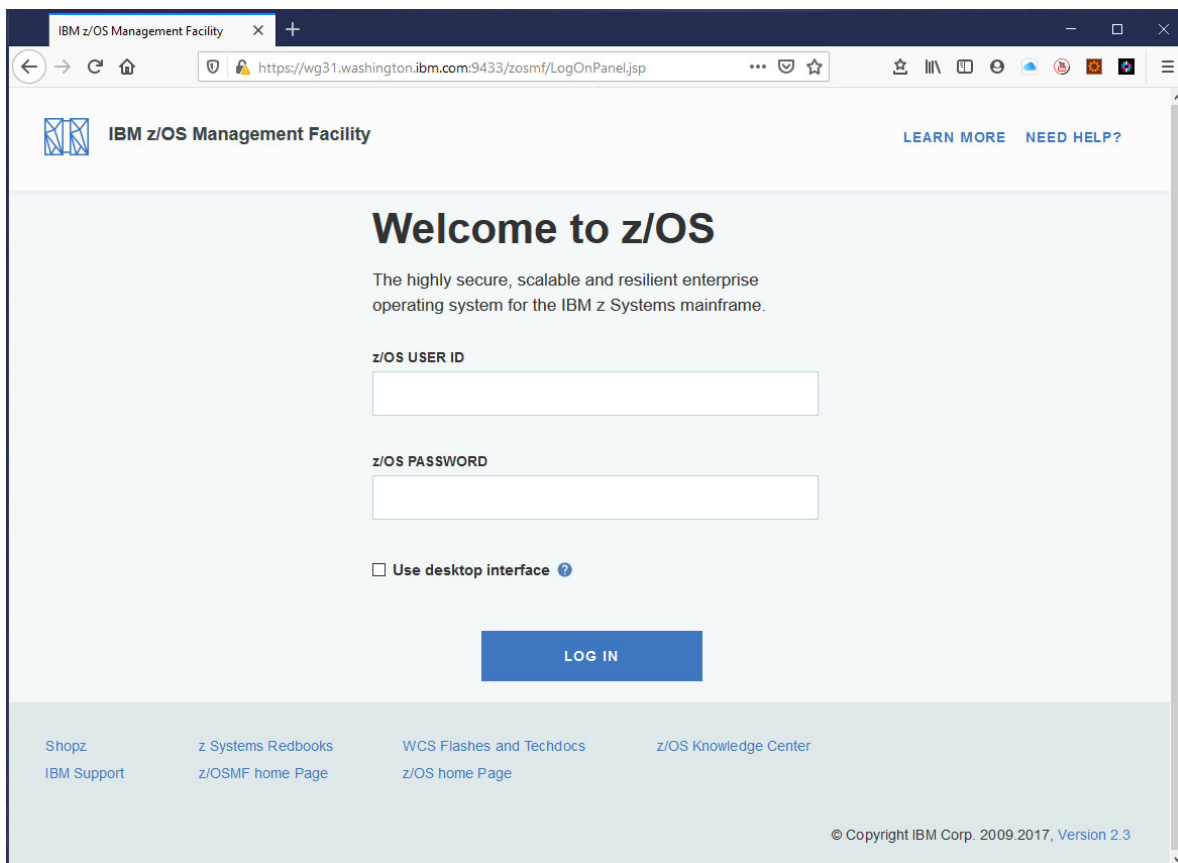
F BAQSTRT,REFRESH,KEYSTORE

This would have dynamically made the information about IMS CA certificate available in the z/OS Connect runtime

Configure the AT-TLS policies

z/OSMF will be used in this section to configure the AT-TLS configuration for the desired inbound and outbound policies.

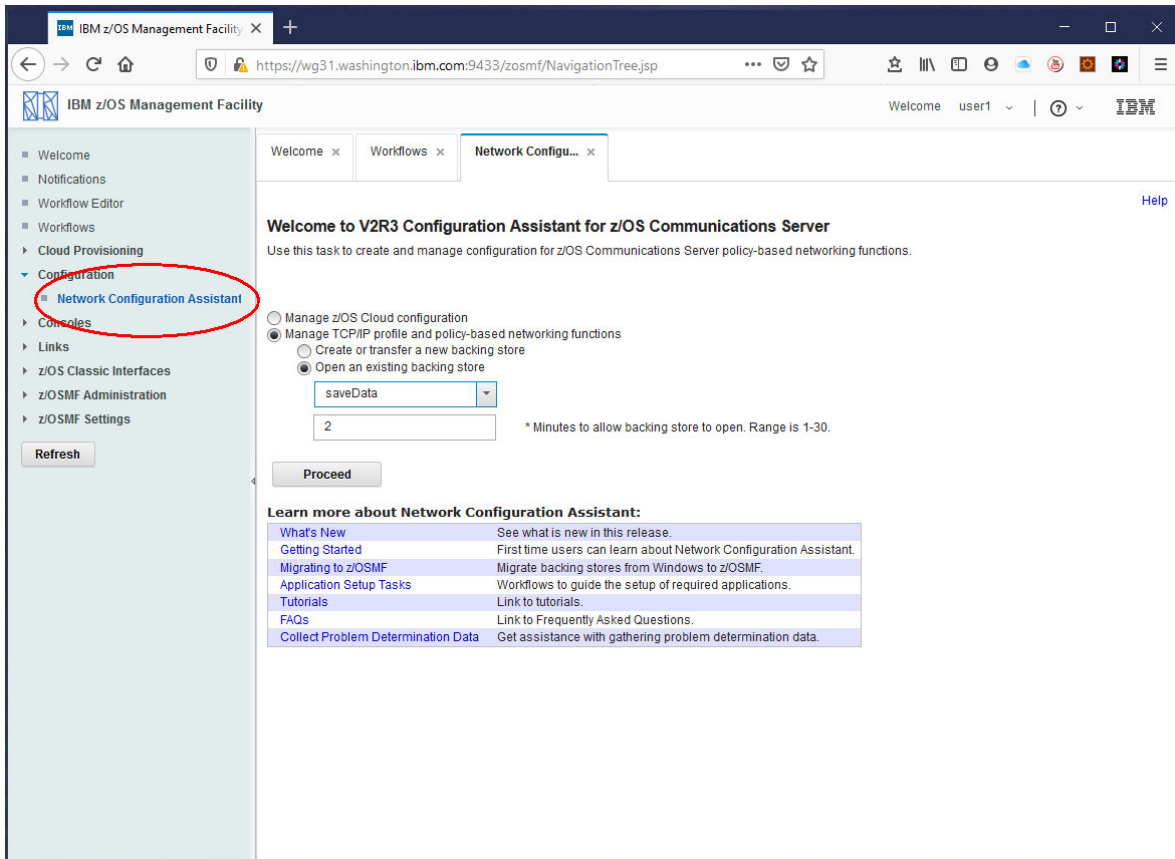
1. In a Firefox browser enter URL <https://wg31.washington.ibm.com:9433/zosmf> and you should see the *IBM z/OS Management Facility* window.



Note that some of the AT-TLS configuration steps described here may have been performed in another exercise.

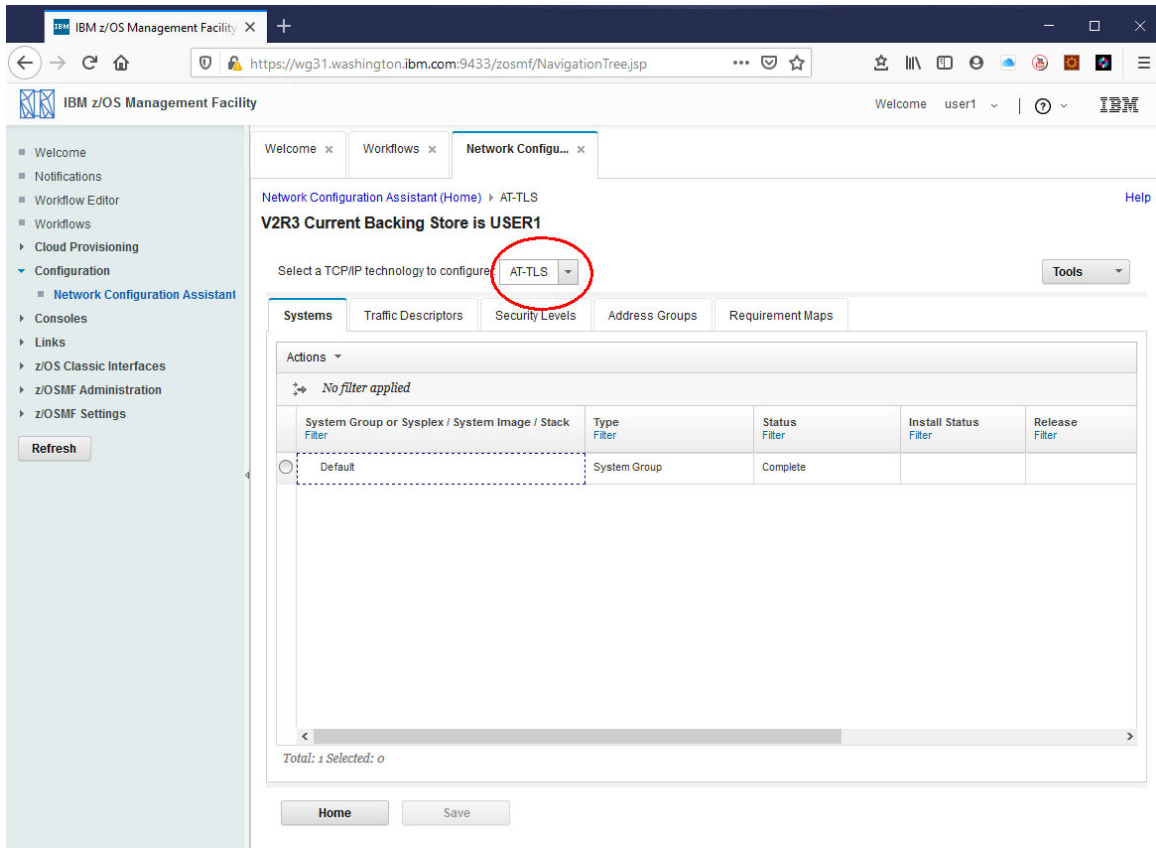
2. Enter *USER1* as the *z/OS USER ID* and *USER1*'s password and click the **LOG IN** button.

3. The *Welcome* screen should be displayed. On the left-hand side expand the *Configuration* tab to expose the *Network Configuration Assistance* option. Select this option to expose the *Network Configuration* tab.

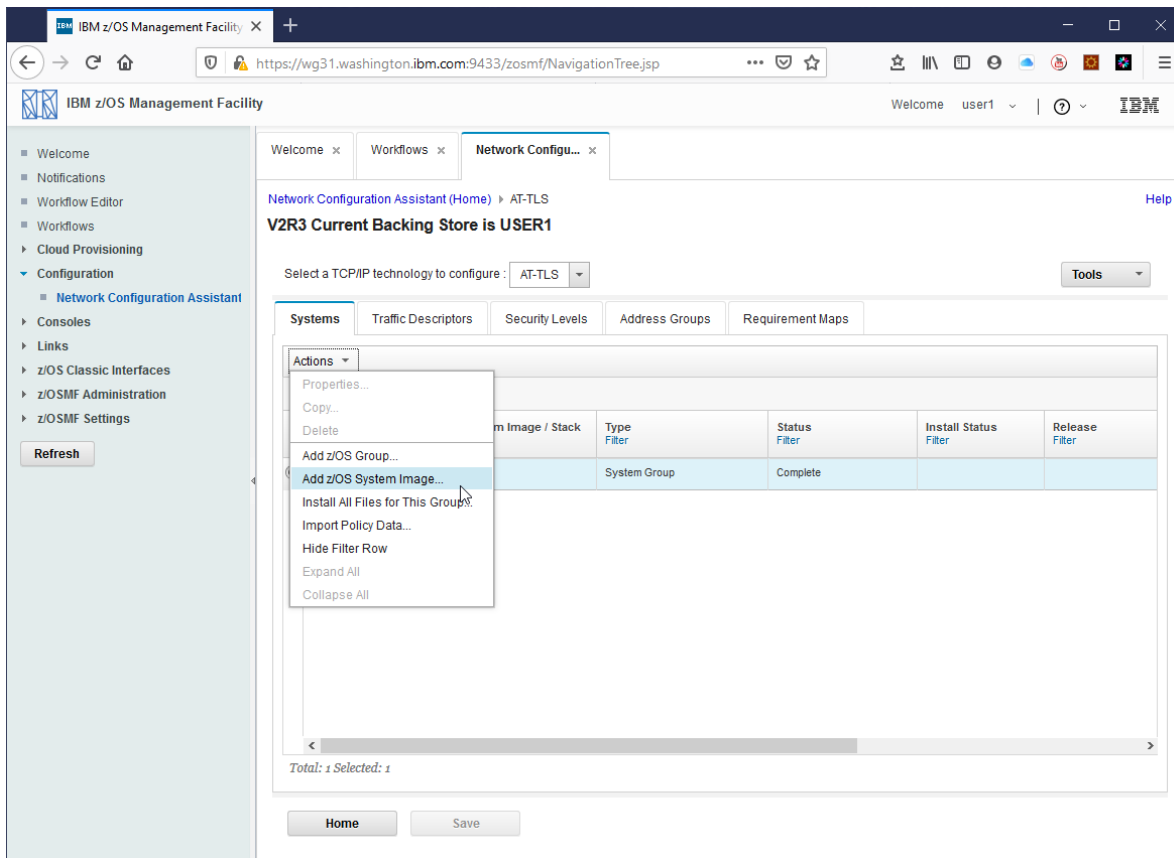


4. Select the radio button beside *Create or transfer a new backing store* option and click the **Proceed** button.
5. On the next screen select the radio button beside *Create a New Backing Store File* and enter **USER1** in the area beside *File Name*. Press the **OK** button and press the **OK** button on the Information pop-up.

6. On the *Network Configuration* tab use the pull-down arrow to select *AT-TLS* as the *TCP/IP technology* to configure.



7. Select the radio button beside the *Default - System Group* and use the *Action* pull-down button to select *Add z/OS System Image* option.



8. On the *Add z/OS System Image* window enter **WG31** for the image *Name* and check the radio button beside *Simple name (as in an SAF product...)* and enter **Liberty.KeyRing** as the default AT-TLS key ring name. Click **OK** to continue.

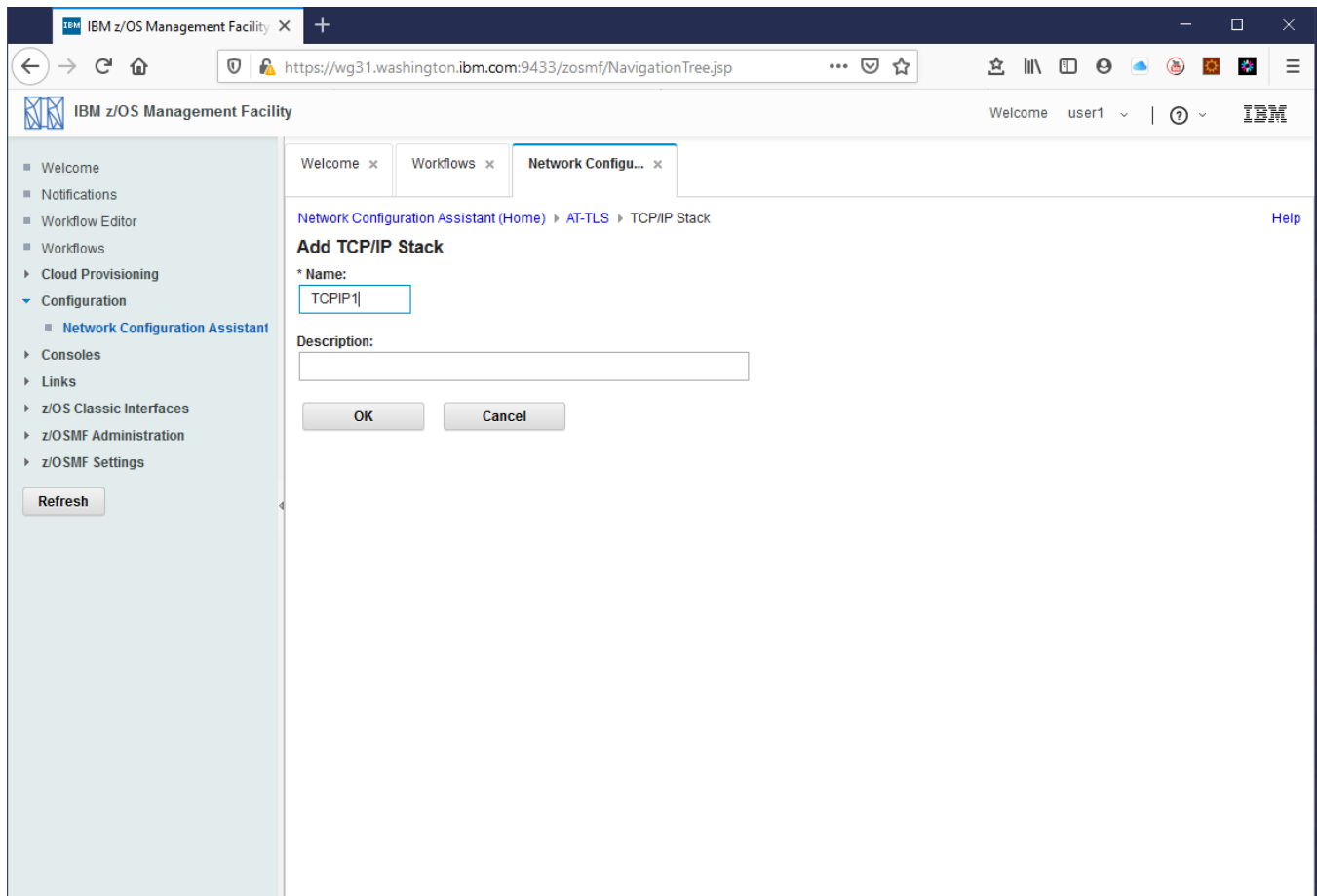
The screenshot shows the 'Add z/OS System Image' window in the IBM z/OS Management Facility. The 'Name' field is set to 'WG31'. The 'z/OS Release' is set to 'V2R3'. Under the 'Default AT-TLS key ring database' section, the 'Simple name (as in an SAF product or in PKCS #11 token format)' radio button is selected, and the 'Key ring' field is set to 'Liberty.KeyRing'. The 'OK' and 'Cancel' buttons are at the bottom.

Tech Tip: The value for the key ring will be used if an explicit key ring is not provided for a policy in a *Traffic Descriptor*.

We recommend establishing a naming convention for key rings with each SAF identity using the same key ring name in the same context. Using this name as an example you could create a unique key ring named *Liberty.KeyRing* for SAF identities USER1, USER2, FRED, etc. Each user's key ring would have the same name but a different set of connected certificates. One default key ring specified at the image level covers all users.

9. On the *Proceed to the Next Step?* pop-up click the **Proceed** button.

10. The *Add TCP/IP Stack* screen should be displayed. Select this option to expose the *Network Configuration* tab. Enter **TCPIP1** as the name of the stack. Click **OK** to continue.



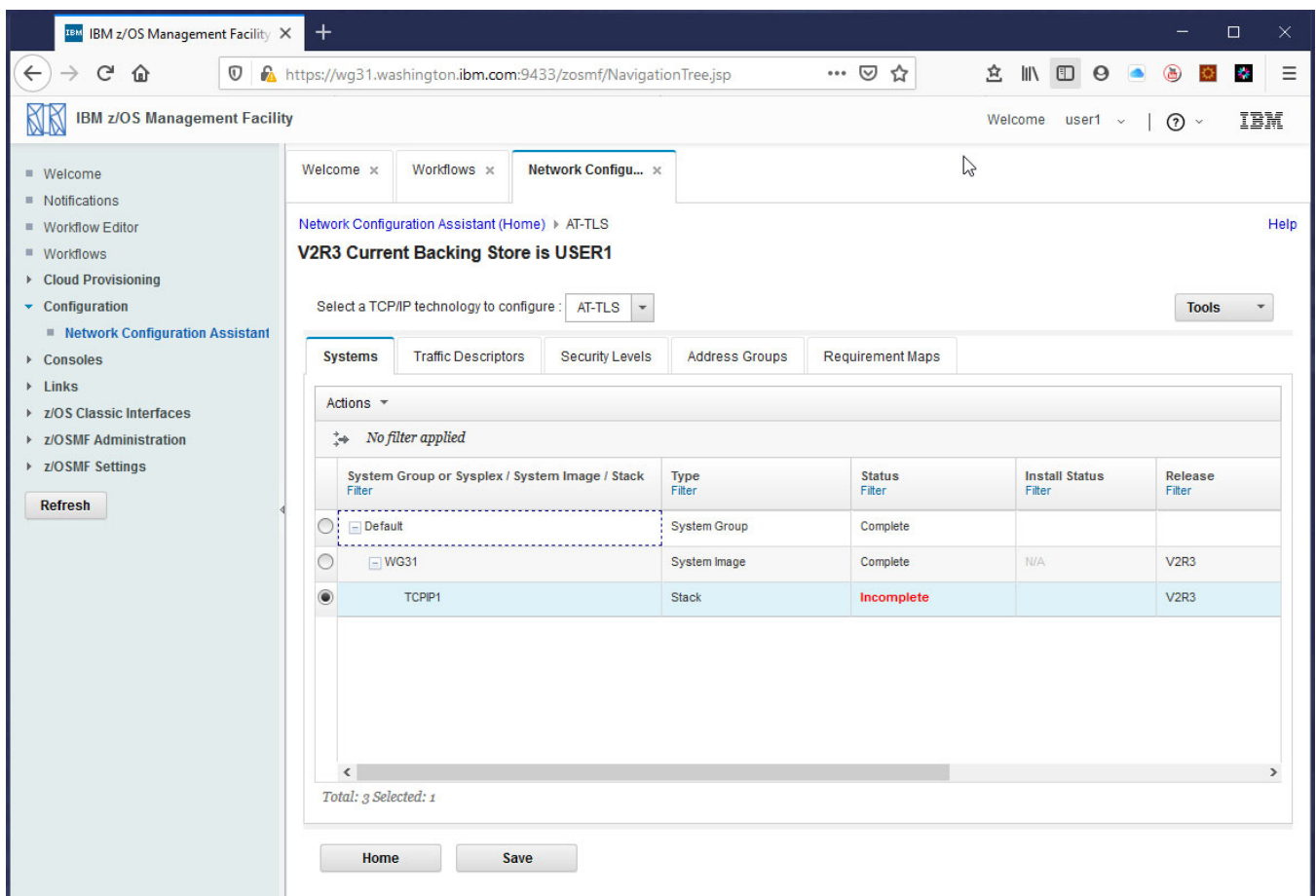
Tech-Tip: The value for the stack name was determined by the TCPIP Name display by entering the MVS command D TCPIP.

```
EZAOP50I TCPIP STATUS REPORT 007
COUNT   TCPIP NAME   VERSION   STATUS
-----
      1   TCPIP1      CS V2R3   ACTIVE
*** END TCPIP STATUS REPORT ***
EZAOP41I 'DISPLAY TCPIP' COMMAND COMPLETED SUCCESSFULLY
```

11. Before any TCP/IP stack rules can be added, *Traffic Descriptors*, *Address Groups* and *Requirement Maps* need to be defined. Click **Cancel** on the *Proceed to the Next Step?* displayed at this time.

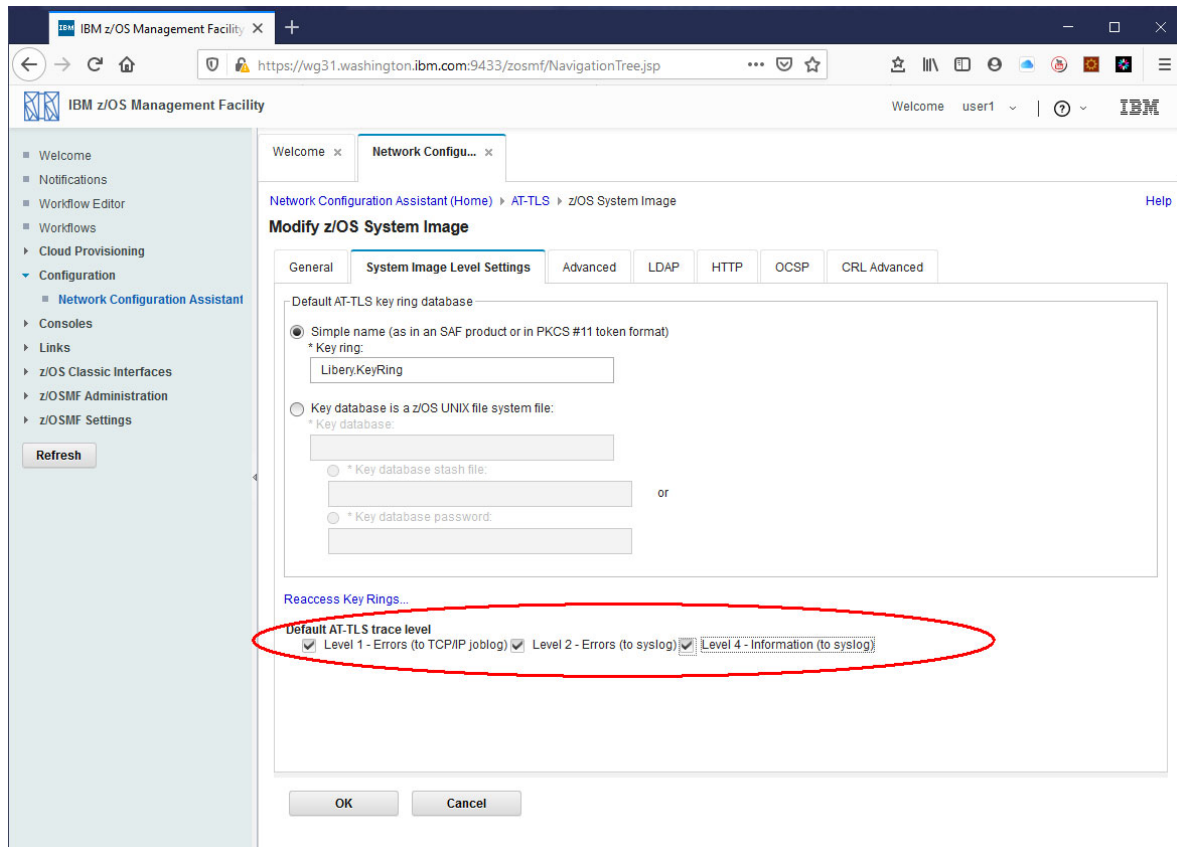


12. This will display the window below:

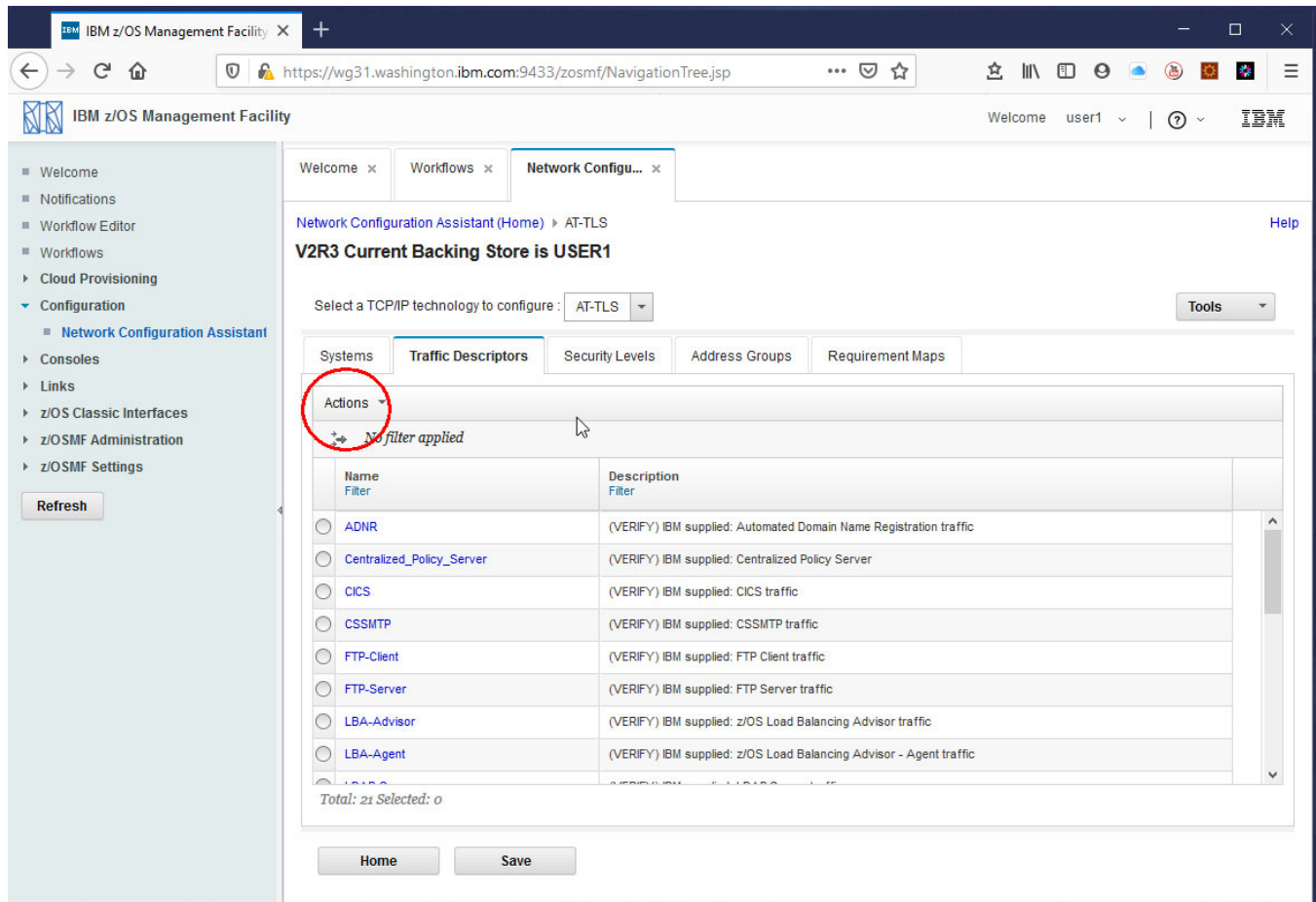


Tech Tip: The **Incomplete** warning will be addressed shortly.

13. Select the radio button beside *WG31* and use the *Actions* pull-down to select *Properties*. On the *Modify z/OS System Image* window select the *System Image Level Settings* tab and check all the trace level boxes as shown below. This is being done so we can confirm AT-TLS is being invoked and identify issues. Press **OK** to continue.



14. Select the *Traffic Descriptors* tab and use the *Actions* pull-down to select *New*.



The screenshot shows the IBM z/OS Management Facility interface. The left sidebar contains a navigation menu with options like Welcome, Notifications, Workflow Editor, Workflows, Cloud Provisioning, Configuration, Consoles, Links, z/OS Classic Interfaces, z/OSMF Administration, and z/OSMF Settings. The main content area is titled 'Network Configuration Assistant (Home) > AT-TLS' and displays 'V2R3 Current Backing Store is USER1'. Below this, there's a section for 'Select a TCP/IP technology to configure:' with a dropdown set to 'AT-TLS'. The 'Traffic Descriptors' tab is active, showing a table of traffic descriptors. The 'Actions' pull-down menu is open, and the 'New' option is highlighted. The table lists various traffic descriptors with their names and descriptions.

Name Filter	Description Filter
<input type="radio"/> ADNR	(VERIFY) IBM supplied: Automated Domain Name Registration traffic
<input type="radio"/> Centralized_Policy_Server	(VERIFY) IBM supplied: Centralized Policy Server
<input type="radio"/> CICS	(VERIFY) IBM supplied: CICS traffic
<input type="radio"/> CSSMTP	(VERIFY) IBM supplied: CSSMTP traffic
<input type="radio"/> FTP-Client	(VERIFY) IBM supplied: FTP Client traffic
<input type="radio"/> FTP-Server	(VERIFY) IBM supplied: FTP Server traffic
<input type="radio"/> LBA-Advisor	(VERIFY) IBM supplied: z/OS Load Balancing Advisor traffic
<input type="radio"/> LBA-Agent	(VERIFY) IBM supplied: z/OS Load Balancing Advisor - Agent traffic

Total: 21 Selected: 0

15. On the *New Traffic Descriptor* window enter **IMSCONNECT** as the name and use the *Actions* pull-down and select *New* to start the definition of a new traffic descriptor type.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

Welcome user1 | ? IBM

Welcome x Network Configu... x

Network Configuration Assistant (Home) > AT-TLS > Traffic Descriptor Help

New Traffic Descriptor

Traffic descriptors contain details of traffic types which are mapped to security levels within requirement maps. A traffic descriptor can contain a single type of traffic or multiple types of traffic.

* Name:

Description:

List of traffic types in this traffic descriptor

Actions | Move Up Move Down

Protocol	Local Port	Remote Port	Connect Direction	Job Name	User ID
There is no data to display.					

Total: 0 Selected: 0

OK Cancel

16. On the *New Traffic Type – TCP* window select the radio button beside *Single ports* under *Local port* and enter **4000** as the port number. Select the radio button *All ports* under *Remote port*. Select the radio button beside *Inbound only* under *Indicate the TCP connection direction*. Enter **IMS15HWS** in the area under *Jobname* and finally select the radio button beside *Server* under *AT-TLS Handshake Role*. Next click on the *KeyRing* tab to continue.

Tech-Tip: This traffic definition is triggered when a client attempts to connect to port 4000. Port 4000 was identified in the IMS Connect configuration.

```
HWS=(ID=IMS15HWS,XIBAREA=100,RACF=Y,RRS=Y)
TCPIP=(HOSTNAME=TCPIP,PORTID=(4000,LOCAL),RACFID=JOHNSON,TIMEOUT=5000)
DATASTORE=(GROUP=OTMAGRP,ID=IVP1,MEMBER=HWSMEM,DRU=HWSYDRU0,
TMEMBER=OTMAMEM,APPL=IMSAPPL)
ODACCESS=(ODBAUTOCONN=Y,IMSPLEX=(MEMBER=IMS15HWS,TMEMBER=PLEX1),
DRDAPORT=(ID=5555,PORTTMOT=6000),ODBMTMOT=6000,APPL=IMSAPPL)
```

If all the defined conditions are met, AT-TLS will act as a surrogate for the server during a TLS handshake. Note the *KeyRing* tab can be used to specify the name of the key ring to be used for this handshake, e.g. IMS.KeyRing. Otherwise the default is to use the same key ring name defined for the z/OS System image, e.g. Liberty.KeyRing.

17. On the *KeyRing* tab select the radio button beside *Use a Simple name* and enter *IMS.KeyRing* as the key ring name. Click **OK** twice to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

Network Configuration Assistant (Home) > AT-TLS > Traffic Descriptor > Traffic Type - TCP Help

New Traffic Type - TCP

Details KeyRing Advanced

Specify the key ring database to use for the traffic type specified on the Details tab.

☐ Use the key ring database defined for the z/OS system image.

☒ Use a Simple name (as in a SAF product or in PKCS #11 Token format):

* Key ring:

IMS.KeyRing

☐ Use this z/OS UNIX file system key database:

* Key database:

* Key database stash file:

* Key database password:

Certificate Label:

☐ Specified server certificate labels to be used by server to accommodate clients with different types of public keys. The certificates are in V2R3.

Actions

Certificate Label	Name	Cert Owner	USAGE	DEFAULT
IMS CA		CERTAUTH	CERTAUTH	NO
zCEE CA		CERTAUTH	CERTAUTH	NO
IMSSTC		ID (IMSSTC)	PERSONAL	YES

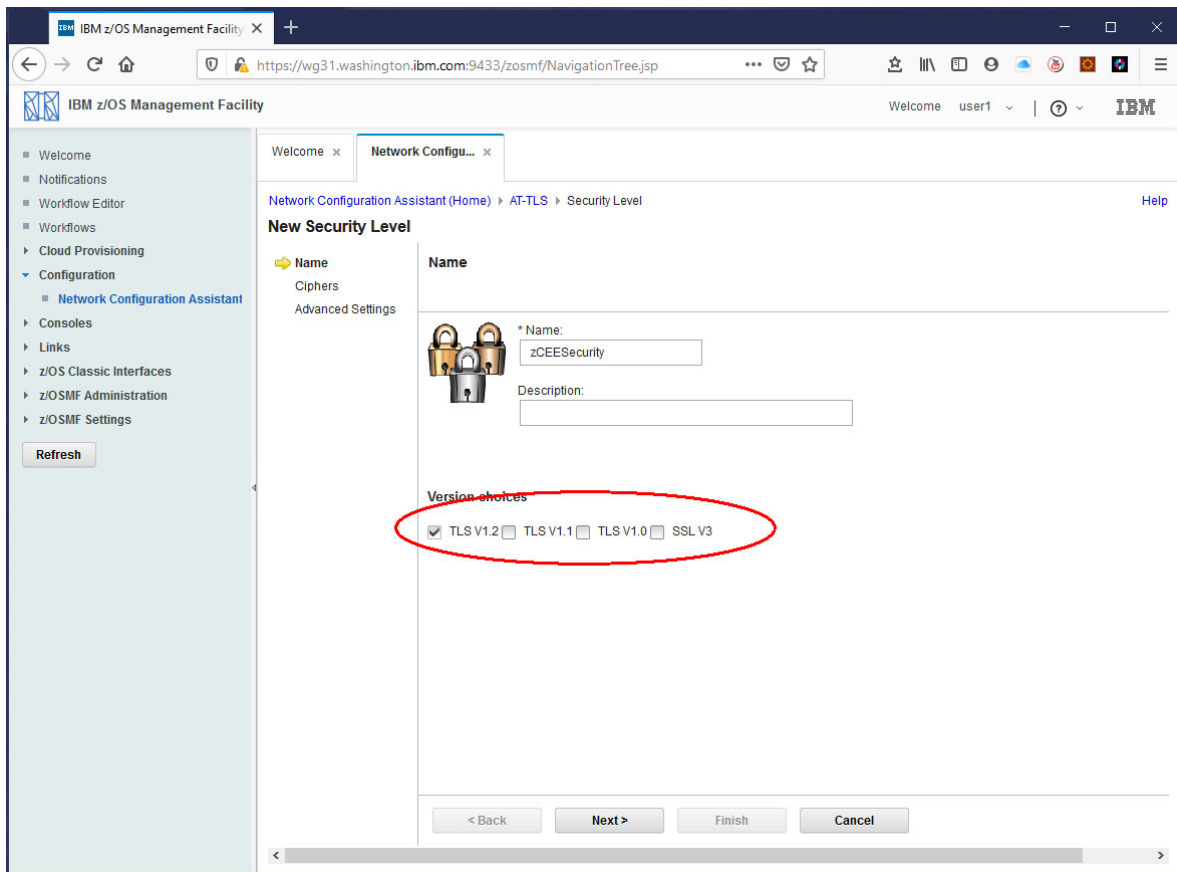
Tech Tip: The key ring specified here belongs to identity IMSSTC. This is the identity under which the IMS Connect task is running. This ring has these certificates connected.

Ring:

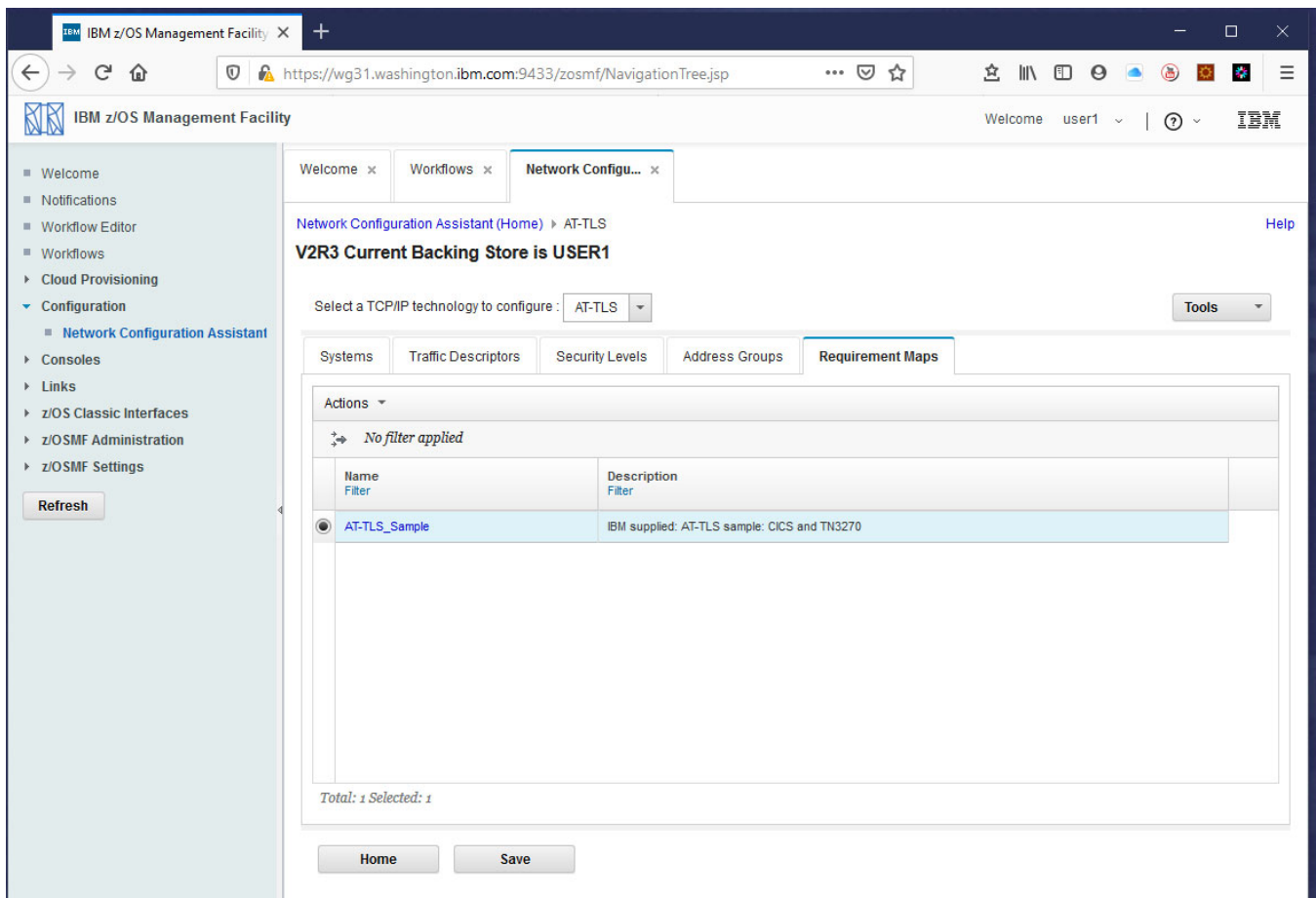
```
>IMS.KeyRing<
```

Certificate Label	Name	Cert Owner	USAGE	DEFAULT
IMS CA		CERTAUTH	CERTAUTH	NO
zCEE CA		CERTAUTH	CERTAUTH	NO
IMSSTC		ID (IMSSTC)	PERSONAL	YES

18. Next, click the *Security Levels* tab and use the *Actions* pull-down button and to select the *New* option. On the *New Security Level* windows, enter **zCEESecurity** for the *Name* and check the box beside *TLS V1.2* and uncheck the other boxes. Click **Next** to display the *Cipher selection* options. Click **Next** to display the *Advanced Settings* options exploring as you like but there is no need to make any changes. Click **Finish** to continue.



19. Next, click the *Requirement Maps* tab. Use the *Actions* pull-down button and to select the *New* option.



The screenshot shows the IBM z/OS Management Facility Network Configuration Assistant (Home) - AT-TLS page. The page has a navigation pane on the left with a 'Refresh' button. The main content area shows the 'Requirement Maps' tab selected. A dropdown menu 'Actions' is open, showing 'No filter applied'. Below the dropdown is a table with two columns: 'Name' and 'Description'. The table contains one row: 'AT-TLS_Sample' with the description 'IBM supplied: AT-TLS sample: CICS and TN3270'. At the bottom of the table, it says 'Total: 1 Selected: 1'. There are 'Home' and 'Save' buttons at the bottom of the page.

Name	Description
AT-TLS_Sample	IBM supplied: AT-TLS sample: CICS and TN3270

20. On the *New Requirement Map* window enter **IMSRequirementMap** as the *Name* and use the pull-down arrows to select **IMSConnect** as the *Traffic Descriptor* and **zCEESecurity** as the *Security Level* for this map. Click **OK** to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

- Welcome
- Notifications
- Workflow Editor
- Workflows
- Cloud Provisioning
- Configuration
 - Network Configuration Assistant**
- Consoles
- Links
- z/OS Classic Interfaces
- z/OSMF Administration
- z/OSMF Settings

Refresh

Welcome x Network Configu... x

Network Configuration Assistant (Home) > AT-TLS > Requirement Map Help

New Requirement Map

A requirement map is an object that maps each IP traffic type (traffic descriptor) to a specific level of security (security level).

To add a new mapping to the requirement map:

1. Click the "Add Row" action or use an existing row
2. Click a table cell to select a traffic descriptor from the list
3. Click a table cell to select a security level from the list

* Name:
IMSRequirementMap

Description:

Mappings table

Actions | Move Up Move Down

Traffic Descriptor	Security Level
IMSConnect	zCEESecurity
Select a traffic descriptor	Select a security level
Select a traffic descriptor	Select a security level

Total: 3 Selected: 0

OK Cancel

21. Select the radio button beside *IMSRequirementMap*. Use the *Actions* pull-down to select the *View Details* options to display the window below. Review the details and click the **Close** button to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

- Welcome
- Notifications
- Workflow Editor
- Workflows
- Cloud Provisioning
- Configuration
 - Network Configuration Assistant
- Consoles
- Links
- z/OS Classic Interfaces
- z/OSMF Administration
- z/OSMF Settings

Refresh

Welcome x Network Configu... x

Network Configuration Assistant (Home) > AT-TLS > View Details Help

View Details

Close Printable page

Application / Requirement Map: IMSRequirementMap

Requirement map summary

Traffic Descriptor	AT-TLS Security Level
IMSConnect	zCEESecurity

Requirement Map traffic - Shown in Configured Order

Traffic Descriptor					AT-TLS Security Level	
Name	Protocol	Local Port	Remote Port	Connect Direction	Name	Ciphers
IMSConnect	TCP	5555	All Ports	Inbound	zCEESecurity	---

Security Level Details

Security Level: zCEESecurity

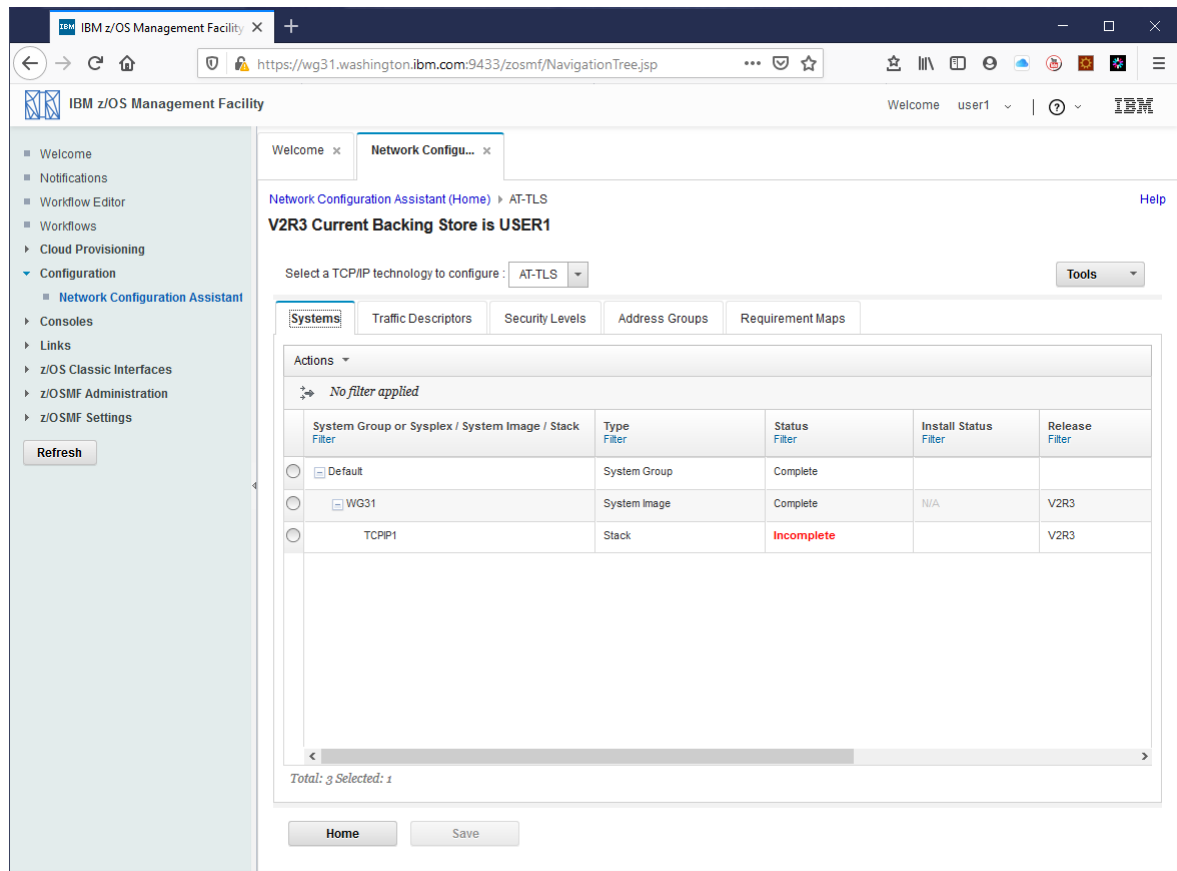
Type:
AT-TLS

Encryption:
System SSL V3 Defaults
Use TLS Version 1.0:
No
Use TLS Version 1.1:
No
Use TLS Version 1.2:
Yes
Use SSL Version 3:
No

Close Back to Top

22. Click the **Save** button to save the configuration.

23. When the save has complete click on the *Systems* tab to return to this window.



IBM z/OS Management Facility

Welcome user1

Network Configuration Assistant (Home) > AT-TLS

V2R3 Current Backing Store is USER1

Select a TCP/IP technology to configure: AT-TLS

Tools

Systems Traffic Descriptors Security Levels Address Groups Requirement Maps

Actions

No filter applied

System Group or Sysplex / System Image / Stack	Type	Status	Install Status	Release
Default	System Group	Complete		
WG31	System Image	Complete	N/A	V2R3
TCPIP1	Stack	Incomplete		V2R3

Total: 3 Selected: 1

Home Save

24. Select the radio button beside *TCPIPI*. Use the *Actions* pull-down to select *Rules*. This is where these definitions will be tied together. Use the *Actions* pull-down again and select *New* to create a new connectivity rule. Enter **IMSCoconnectRule** for the *Connectivity rule name* and press **Next** to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

Network Configuration Assistant (Home) > AT-TLS > TCP/IP Stack > Connectivity Rule Help

New Connectivity Rule

Data Endpoints

Requirement Map
Advanced Settings

* Connectivity rule name:
IMSCoconnectRule

Select the address groups of the host endpoints of the traffic you want to protect.

Local data endpoint

☒ Address group:
All_IPv4_Addresses

☐ * IPv4 or IPv6 address, subnet, or range:
Examples: xxx.x, xxx.x/yy, xxx.x-yy.y
xx.x, xx.x/yyy, xx.x-yy

Remote data endpoint

☒ Address group:
All_IPv4_Addresses

☐ * IPv4 or IPv6 address, subnet, or range:
Examples: xxx.x, xxx.x/yy, xxx.x-yy.y
xx.x, xx.x/yyy, xx.x-yy

< >

< Back Next > Finish Cancel

25. On the *New Connectivity Rule – Requirement Map* window select the radio button beside *Select an existing requirement map* and use the pull-down to select *IMSRequirementMap*. This should automatically populate the mapping table with *IMSConnect* as the traffic descriptor and *zCEESecurity* as the security level. Press **Next** and then **Finish** to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

Network Configuration Assistant (Home) > AT-TLS > TCP/IP Stack > Connectivity Rule Help

New Connectivity Rule

☒ Data Endpoints
☒ Requirement Map
 Advanced Settings

Requirement Map

Requirement maps are reusable objects that combine your traffic definitions (traffic descriptors) with your security definitions (security levels).

☐ Create a new requirement map
☒ Select an existing requirement map

IMSRequirementMap

IMSRequirementMap properties

* Name: IMSRequirementMap

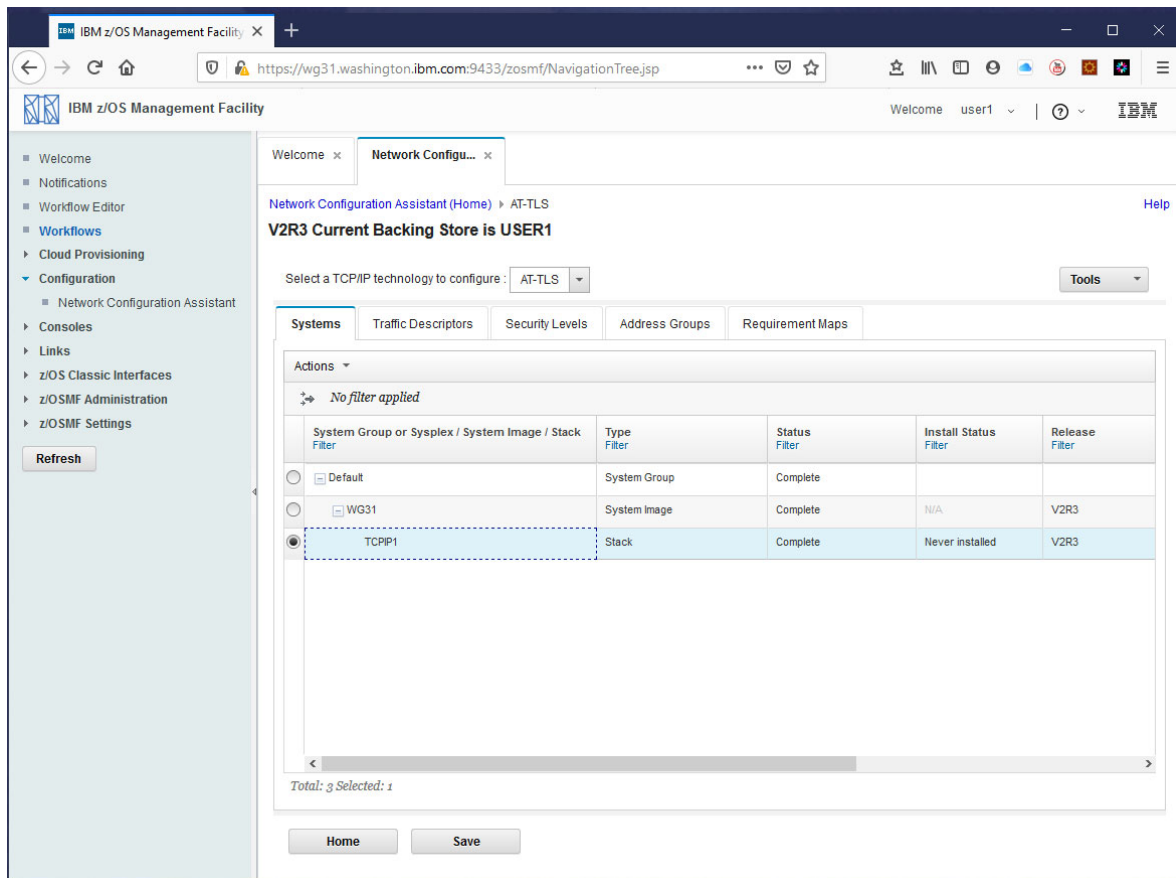
Description:

Traffic Descriptor	Security Level
IMSConnect	zCEESecurity

< >

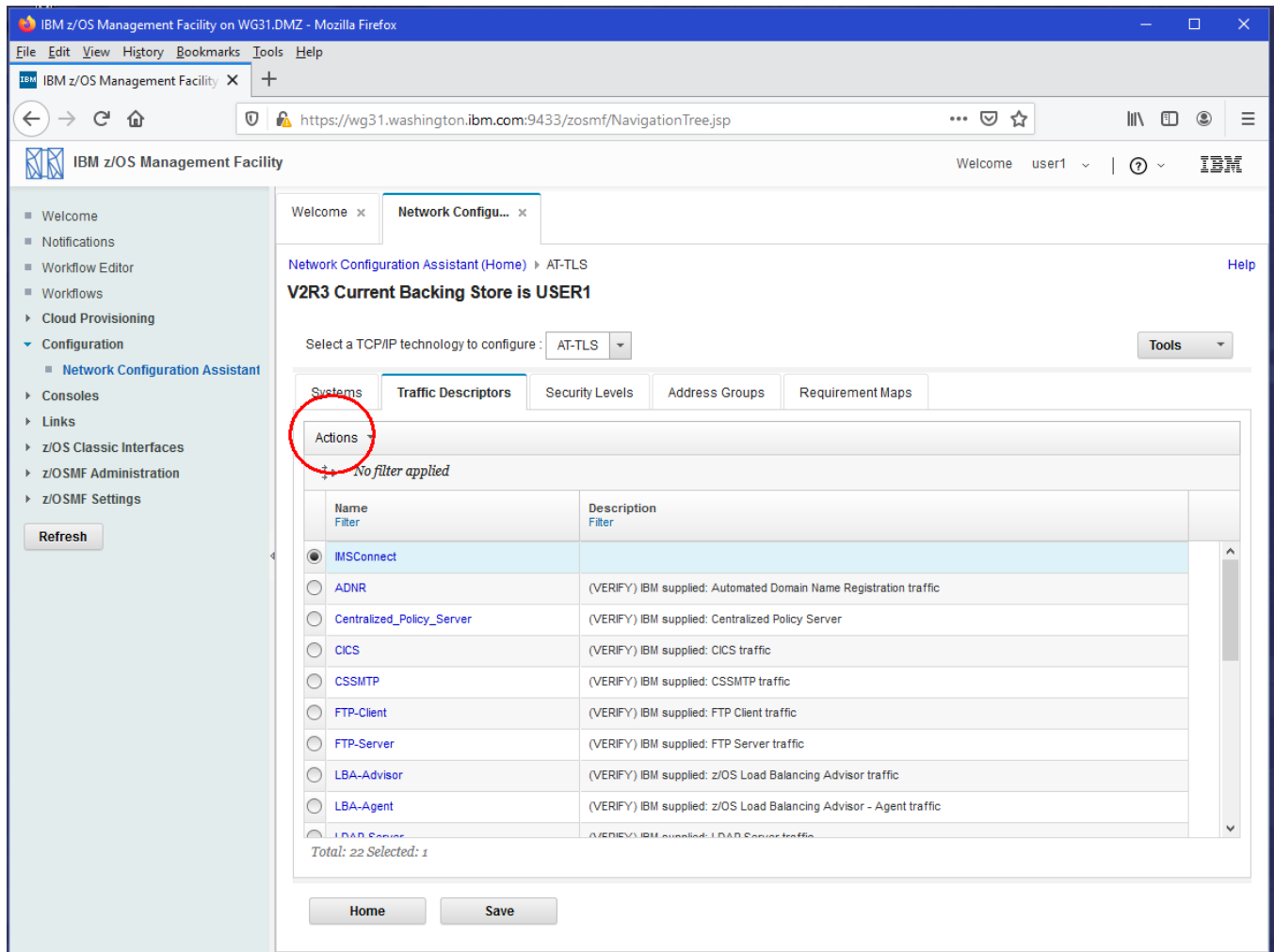
< Back Next > Finish Cancel

26. Press **Close** to return to this window. Note that the status of the configuration is now complete.



This completes the configuration of the inbound policy for the server side of the handshake. Now an outbound policy for the client side of the handshake needs to be configured

27. Select the *Traffic Descriptors* tab. Use the *Actions* pull-down to select *New*.



IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

Welcome user1 | IBM

IBM z/OS Management Facility

Welcome x Network Configu... x

Network Configuration Assistant (Home) > AT-TLS Help

V2R3 Current Backing Store is USER1

Select a TCP/IP technology to configure: AT-TLS Tools

Systems Traffic Descriptors Security Levels Address Groups Requirement Maps

Actions

No filter applied

Name Filter	Description Filter
<input checked="" type="radio"/> IMSCONNECT	
<input type="radio"/> ADNR	(VERIFY) IBM supplied: Automated Domain Name Registration traffic
<input type="radio"/> Centralized_Policy_Server	(VERIFY) IBM supplied: Centralized Policy Server
<input type="radio"/> CICS	(VERIFY) IBM supplied: CICS traffic
<input type="radio"/> CSSMTP	(VERIFY) IBM supplied: CSSMTP traffic
<input type="radio"/> FTP-Client	(VERIFY) IBM supplied: FTP Client traffic
<input type="radio"/> FTP-Server	(VERIFY) IBM supplied: FTP Server traffic
<input type="radio"/> LBA-Advisor	(VERIFY) IBM supplied: z/OS Load Balancing Advisor traffic
<input type="radio"/> LBA-Agent	(VERIFY) IBM supplied: z/OS Load Balancing Advisor - Agent traffic
<input type="radio"/> LBA-Server	(VERIFY) IBM supplied: LBA-Server traffic

Total: 22 Selected: 1

Home Save

28. On the *New Traffic Descriptor* window enter **IMSCient** as the name. Use the *Actions* pull-down and select *New* to start the definition of a new traffic descriptor type.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

Welcome user1 | ? IBM

Welcome x Network Configu... x

Network Configuration Assistant (Home) > AT-TLS > Traffic Descriptor Help

New Traffic Descriptor

Traffic descriptors contain details of traffic types which are mapped to security levels within requirement maps. A traffic descriptor can contain a single type of traffic or multiple types of traffic.

* Name:

Description:

List of traffic types in this traffic descriptor

Protocol	Local Port	Remote Port	Connect Direction	Job Name	User ID
There is no data to display.					

Total: 0 Selected: 0

OK Cancel

29. On the *New Traffic Type – TCP* window, select the radio button beside *Ephemeral ports* under *Local port*/. Select the radio button *Single ports* under *Remote port* and enter **4000**. Select the radio button beside *Outbound only* under *Indicate the TCP connection direction*. Finally select the radio button beside *Client* under *AT-TLS Handshake Role*. Next click on the *KeyRing* tab to continue.

IBM z/OS Management Facility

Welcome user1 | ? IBM

Network Configuration Assistant (Home) > AT-TLS > Traffic Descriptor > Traffic Type - TCP

Modify Traffic Type - TCP

Details KeyRing Advanced

Local port

☐ All ports

☐ Single port

100

☐ Port range

* Lower port: 100 * Upper port: 101

☒ Ephemeral ports

Remote port

☐ All ports

☒ Single port

4000

☐ Port range

* Lower port: 100 * Upper port: 101

☐ Ephemeral ports

Indicate the TCP connect direction

☐ Either ☐ Inbound only ☒ Outbound only

Jobname:

User ID:

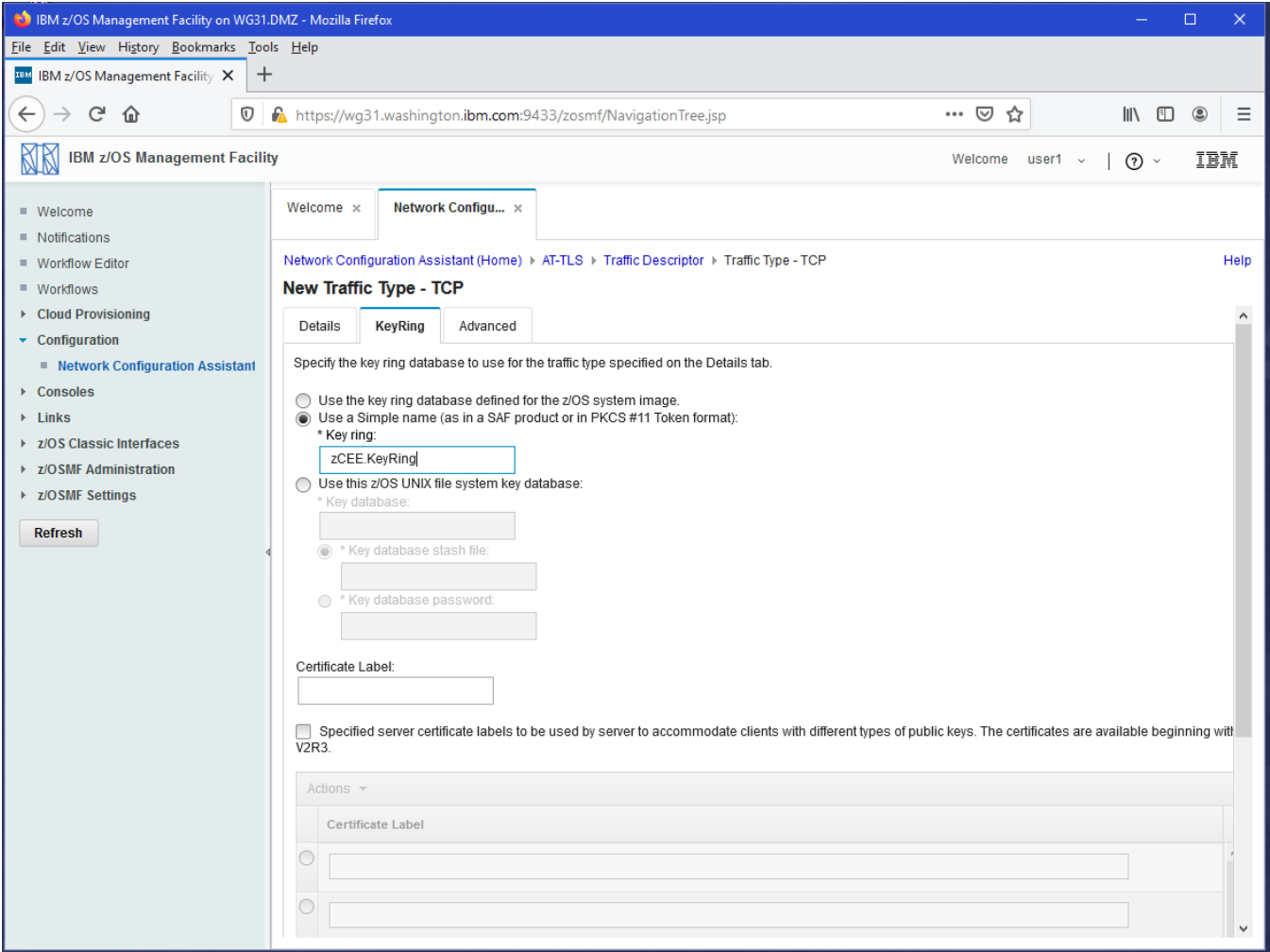
AT-TLS Handshake Role

☐ Server ☒ Client

Client authentication role is set in the security level.

OK Cancel

30. On the *KeyRing* tab select the radio button beside *Use a Simple name* and enter *zCEE.KeyRing* as the key ring name. Click **OK** twice to continue.



Tech Tip: The key ring specified here belongs to identity LIBSERV This is the identity under which the z/OS Connect server is running. This ring has these certificates connected.

```
Ring:
>zCEE.KeyRing<
Certificate Label Name          Cert Owner          USAGE          DEFAULT
-----
```

zCEE CA	CERTAUTH	CERTAUTH	NO
Liberty CA	CERTAUTH	CERTAUTH	NO
zCEE Client Cert	ID (LIBSERV)	PERSONAL	YES
zCEE-CertAuth	CERTAUTH	CERTAUTH	NO
IMS CA	CERTAUTH	CERTAUTH	NO

31. Next, click the *Requirement Maps* tab. Use the *Actions* pull-down button and to select the *New* option.

The screenshot shows the IBM z/OS Management Facility web interface in a Mozilla Firefox browser. The address bar shows the URL: `https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp`. The page title is "IBM z/OS Management Facility". The left sidebar contains a navigation menu with options: Welcome, Notifications, Workflow Editor, Workflows, Cloud Provisioning, Configuration (selected), Consoles, Links, z/OS Classic Interfaces, z/OSMF Administration, and z/OSMF Settings. The "Configuration" section is expanded, showing "Network Configuration Assistant". The main content area displays the "Network Configuration Assistant (Home)" page for "AT-TLS". A message states "V2R3 Current Backing Store is USER1". Below this, there is a dropdown menu for "Select a TCP/IP technology to configure:" set to "AT-TLS". The "Requirement Maps" tab is selected, showing a table with two rows: "IMSRequirementMap" and "AT-TLS_Sample". The "AT-TLS_Sample" row has a description: "IBM supplied: AT-TLS sample: CICS and TN3270". At the bottom, there are "Home" and "Save" buttons.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility

Welcome user1 | ? IBM

Welcome x Network Configu... x

Network Configuration Assistant (Home) > AT-TLS Help

V2R3 Current Backing Store is USER1

Select a TCP/IP technology to configure: AT-TLS Tools

Systems Traffic Descriptors Security Levels Address Groups Requirement Maps

Actions

No filter applied

Name Filter	Description Filter
<input type="radio"/> IMSRequirementMap	
<input type="radio"/> AT-TLS_Sample	IBM supplied: AT-TLS sample: CICS and TN3270

Total: 2 Selected: 0

Home Save

32. On the *New Requirement Map* window enter **IMSClntRequirementMap** as the *Name*. Use the pull-down arrows to select **IMSClnt** as the *Traffic Descriptor* and **zCEESecurity** as the *Security Level* for this map. Click **OK** to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility

Welcome user1

Network Configuration Assistant (Home) > AT-TLS > Requirement Map

New Requirement Map

A requirement map is an object that maps each IP traffic type (traffic descriptor) to a specific level of security (security level).

To add a new mapping to the requirement map:

1. Click the "Add Row" action or use an existing row
2. Click a table cell to select a traffic descriptor from the list
3. Click a table cell to select a security level from the list

* Name: IMSClntRequirementMap

Description:

Mappings table

Actions		Move Up	Move Down
Traffic Descriptor	Security Level		
<input type="radio"/> IMSClnt	<input type="text" value="zCEESecurity"/>		
<input type="radio"/> Select a traffic descriptor	<input type="text" value="Select a security level"/>		
<input type="radio"/> Select a traffic descriptor	<input type="text" value="Select a security level"/>		

Total: 3 Selected: 0

OK Cancel

33. Select the radio button beside *IMSCClientRequirementMap*, Use the *Actions* pull-down to select the *View Details* options to display the window below. Review the details and click the **Close** button to continue.

The screenshot shows the IBM z/OS Management Facility Network Configuration Assistant (NCA) interface. The left sidebar contains a navigation tree with options like Welcome, Notifications, Workflow Editor, Workflows, Cloud Provisioning, Configuration (selected), Consoles, Links, z/OS Classic Interfaces, z/OSMF Administration, and z/OSMF Settings. The main content area displays the 'View Details' for the 'IMSCClientRequirementMap'. It includes a 'Requirement map summary' table, a 'Requirement Map traffic - Shown in Configured Order' table, and 'Security Level Details' for 'zCEEESecurity'.

Requirement map summary

Traffic Descriptor	AT-TLS Security Level
IMSCClient	zCEEESecurity

Requirement Map traffic - Shown in Configured Order

Traffic Descriptor					AT-TLS Security Level	
Name	Protocol	Local Port	Remote Port	Connect Direction	Name	Ciphers
IMSCClient	TCP	1024-65535	6555	Outbound	zCEEESecurity	---

Security Level Details

Security Level: zCEEESecurity

Type:
AT-TLS

Encryption:
System SSL V3 Defaults

Use TLS Version 1.0:
No

Use TLS Version 1.1:
No

Use TLS Version 1.2:
Yes

Use SSL Version 3:
..

34. Click the **Save** button to save the configuration.

35. When the save has complete click on the *Systems* tab to return to this window.

A connectivity rule for the IMS Client now needs to be added.

36. Select the radio button beside *TCPIPI1*. Use the *Actions* pull-down to select *Rules*. This is where these client definitions will be tied together. Use the *Actions* pull-down again and select *New* to create a new connectivity rule. Enter ***IMSClietRule*** for the *Connectivity rule name* and press **Next** to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

Network Configuration Assistant (Home) > AT-TLS > TCP/IP Stack > Connectivity Rule Help

New Connectivity Rule

Data Endpoints

Requirement Map
Advanced Settings

* Connectivity rule name:
IMSClietRule

Select the address groups of the host endpoints of the traffic you want to protect.

Local data endpoint

☒ Address group:
All_IPv4_Addresses

☐ * IPv4 or IPv6 address, subnet, or range:
Examples: xxx.xxxx.yy, xxx-yyy
xx, xx/yyy, xx-y.y

Remote data endpoint

☒ Address group:
All_IPv4_Addresses

☐ * IPv4 or IPv6 address, subnet, or range:
Examples: xxx.xxxx.yy, xxx-yyy
xx, xx/yyy, xx-y.y

< Back Next > Finish Cancel

37. On the *New Connectivity Rule – Requirement Map* window select the radio button beside *Select an existing requirement map*. Use the pull-down to select *IMSCliantRequirementMap*. This should automatically populate the mapping table with *IMSCliant* as the traffic descriptor and *zCEESecurity* as the security level. Press **Next** and then **Finish** to continue.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

Network Configuration Assistant (Home) > AT-TLS > TCP/IP Stack > Connectivity Rule Help

New Connectivity Rule

☒ Data Endpoints
☒ Requirement Map
 Advanced Settings

Requirement Map

Requirement maps are reusable objects that combine your traffic definitions (traffic descriptors) with your security definitions (security levels).

☐ Create a new requirement map
☒ Select an existing requirement map

IMSCliantRequirementMap

IMSCliantRequirementMap properties

* Name: IMSCliantRequirementMap

Description:

Traffic Descriptor	Security Level
IMSCliant	zCEESecurity

< Back Next > Finish Cancel

38. Click **Close** to return the main screen. Select the radio button beside *TCPIP1* and use the *Actions* pull-down to select *Install All Files for This Group*.

IBM z/OS Management Facility on WG31.DMZ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

IBM z/OS Management Facility x +

https://wg31.washington.ibm.com:9433/zosmf/NavigationTree.jsp

IBM z/OS Management Facility Welcome user1 | ? IBM

Network Configuration Assistant (Home) AT-TLS Help

V2R3 Current Backing Store is USER1

Select a TCP/IP technology to configure : AT-TLS Tools

Systems Traffic Descriptors Security Levels Address Groups Requirement Maps

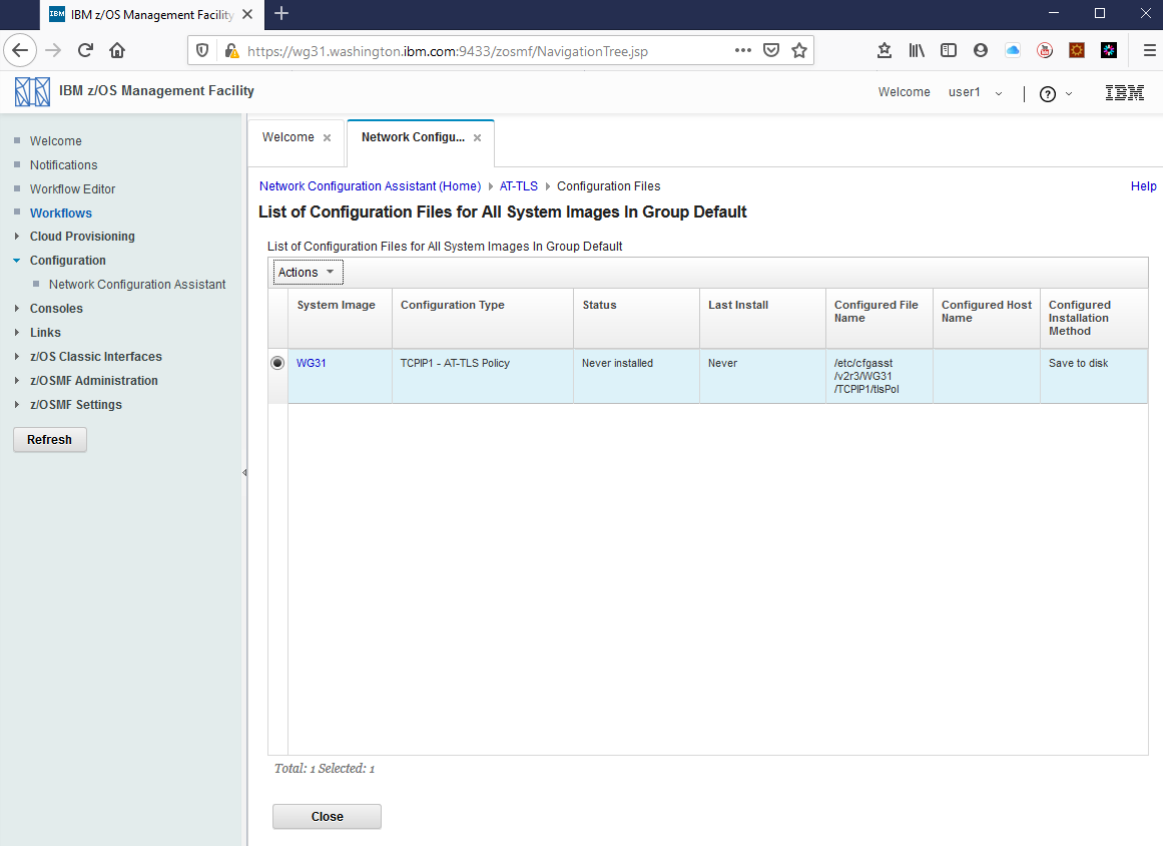
Actions No filter applied

System Group or Sysplex / System Image / Stack Filter	Type Filter	Status Filter	Install Status Filter	Release Filter
<input type="radio"/> Default	System Group	Complete		
<input type="radio"/> WG31	System Image	Complete	N/A	V2R3
<input checked="" type="radio"/> TCPIP1	Stack	Complete	Needs install	V2R3

Total: 3 Selected: 1

Home Save

39. On the *List of Configuration Files for All Systems Images in Group Default* window, select *WG31* and use the *Actions* pull-down to select *Install*.



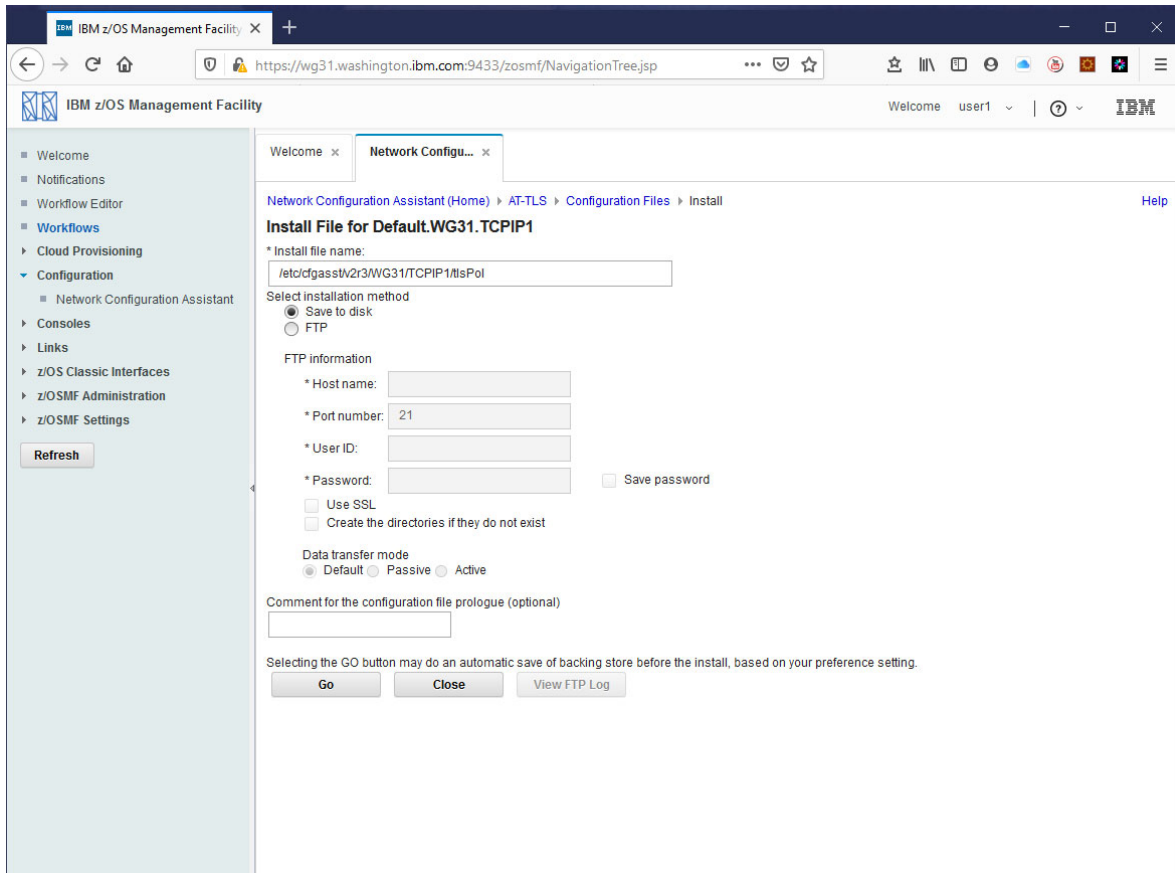
The screenshot shows the IBM z/OS Management Facility interface. The left sidebar contains a navigation menu with options like Welcome, Notifications, Workflow Editor, Workflows, Cloud Provisioning, Configuration (selected), Consoles, Links, z/OS Classic Interfaces, z/OSMF Administration, and z/OSMF Settings. The main content area is titled 'Network Configuration Assistant (Home) > AT-TLS > Configuration Files'. Below this, the window is titled 'List of Configuration Files for All System Images In Group Default'. A table lists configuration files, with 'WG31' selected. The table has columns for System Image, Configuration Type, Status, Last Install, Configured File Name, Configured Host Name, and Configured Installation Method.

System Image	Configuration Type	Status	Last Install	Configured File Name	Configured Host Name	Configured Installation Method
WG31	TCP/IP - AT-TLS Policy	Never installed	Never	/etc/cf/gasst /v2r3/WG31 /TCP/IP1/tlsPol		Save to disk

Total: 1 Selected: 1

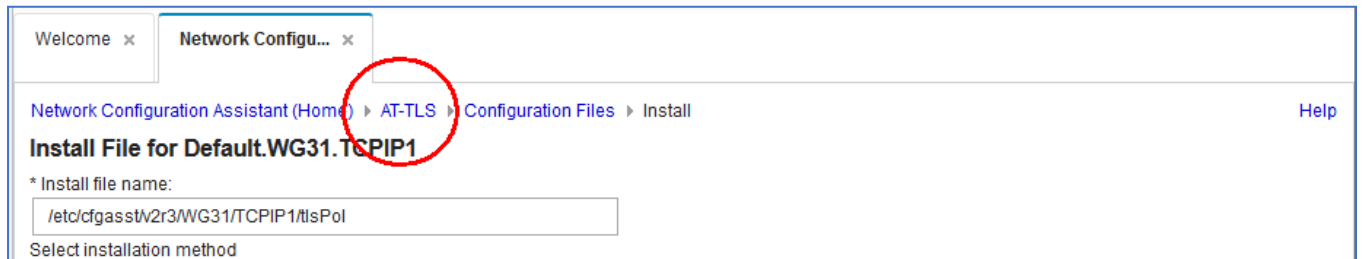
Close

40. On the *Install File for Default.WG31.TCPIP1* window click the **GO** button to continue.



41. Click **OK** twice to continue.

42. Next click on *AT-TLS* as shown below to return to the primary window.



43. The AT-TLS configuration has been completed and is installed. But it is not active yet.

Activating the AT-TLS configuration

The AT-TLS configuration has been saved in an OMVS file but has not been installed in an active policy agent task (e.g. PAGENT).

1. This instance of the policy agent has been configured to use the *SYSLOGD* daemon task to log messages

```
//PAGENT EXEC PGM=PAGENT,REGION=0K,TIME=NOLIMIT,
//  PARM='ENVAR("_CEE_ENVFILE_S=DD:STDENV")/-I SYSLOGD'
```

2. The *SYSLOGD* daemon has been configured to write all log messages to file */var/syslogd/syslogall.log* (see the *syslog.conf* file in the */etc* subdirectory).

```
#####
#
# Write all messages with priority err and higher to log file errors.
#
#*.err          /var/log/%Y/%m/%d/errors
*.*            /var/syslogd/syslogall.log
#
```

3. Use ISPF option 3.4 to access directory */var/syslogd* and the *v* line command to view *syslogall.log*. Go the bottom of the file and you will see something like what is shown below:

```
VIEW /SYSTEM/var/syslogd/syslogall.log Columns 00063 00134
Command ==> Scroll ==> 4
003388 YFT18I Using catalog '/usr/lib/nls/msg/C/ftpdmsg.cat' for FTP messages.
003389 Y2697I IBM FTP CS V2R3 19:44:07 on 03/23/20
003390 Y2640I Using dd:SYSFTPD=SYS1.TCPPARMS(FTPDATA) for local site configurat
003391 YFT147I dd:SYSFTPD=SYS1.TCPPARMS(FTPDATA) file, line 10: Ignoring keyword
003392 YFT147I dd:SYSFTPD=SYS1.TCPPARMS(FTPDATA) file, line 11: Ignoring keyword
003393 YFT147I dd:SYSFTPD=SYS1.TCPPARMS(FTPDATA) file, line 13: Ignoring keyword
003394 YFT147I dd:SYSFTPD=SYS1.TCPPARMS(FTPDATA) file, line 49: Ignoring keyword
003395 YFT147I dd:SYSFTPD=SYS1.TCPPARMS(FTPDATA) file, line 54: Ignoring keyword
003396 YFT21I Using catalog '/usr/lib/nls/msg/C/ftpdprly.cat' for FTP replies.
003397 YFT26I Using 7-bit conversion derived from 'ISO8859-1' and 'IBM-1047' fo
003398 YFT32I Using the same translate tables for the control and data connecti
003399 YFT09I system information for WG31: z/OS version 2 release 3 (3906)
003400 pFixLevel: Fix level: NONEFND Data: EZBOECPR
003401 pFixLevel: Fix level: HIP6230 Data: EZAFTPD1 EZAFTPD4 EZAFTPGA
003402 pFixLevel: Fix level: " Data: EZAFTPG1 EZAFTPXC EZAFTPB1 EZAFTPDF
003403 pFixLevel: Fix level: " Data: EZAFTPDH EZAFTPDM EZAFTPEA EZAFTPED
003404 pFixLevel: Fix level: " Data: EZAFTPEJ EZAFTPER EZAFTPET EZAFTPGU
003405 pFixLevel: Fix level: " Data: EZAFTPGV EZAFTPNX EZAFTPSD EZAITUTI
003406 pFixLevel: Fix level: UI53145 Data: EZAFTPNY
003407 pFixLevel: Fix level: UI56159 Data: EZAFTPEP
003408 pFixLevel: Fix level: UI57631 Data: EZAFTPF5
003409 pFixLevel: Fix level: 24/ 24 Data: OBJECTS PROCESSED. AV-BUFR: 0005087
003410 Y2700I Using port FTP control (21)
003411 Y2701I Inactivity time is 12000
003412 Y2702I Server-FTP: Initialization completed at 19:44:07 on 03/23/20.
003413 YFT141I Server-FTP: process id 83886182, server job name FTPSERVE
003414 nning on 0.0.0.0 port 22.
***** Bottom of Data *****
MA C 04/015
Connected to remote server/host wg31 using lu/pool TCP00109 and port 23
```

4. Start the policy agent task using MVS command *S PAGENT*
5. Exit the syslogall.log view session and reopen the file do a find for a subset of string *EZZ8431I PAGENT STARTING* and you should see these messages.

```
003414 0.0.0 port 22.
003415 main: EZZ8431I PAGENT STARTING
003416 main: Compiled on Sep 26 2016 at 18:37:59
003417 main: Use environment PAGENT_CONFIG_FILE = '/etc/pagent.conf'
003418 main: List all environment variables:
003419 main:   EXPORT '_CEE_ENVFILE_S=DD:STDENV'
003420 main:   EXPORT 'LIBPATH=/usr/lib:.'
003421 main:   EXPORT 'PAGENT_CONFIG_FILE=/etc/pagent.conf'
003422 main:   EXPORT 'PAGENT_LOG_FILE=SYSLOGD'
003423 main:   EXPORT 'TZ=EST5EDT'
003424 main:   EXPORT 'GSK_TRACE=0xFFFF'
003425 main: using code page 'IBM-1047'
003426 main: Using log level 511
```

6. Do a find for the character string *TTLSSRule*, e.g. *f TTLSSRule* and you see multiple occurrences where the AT-TLS configuration elements added earlier are being processed.

```
profile: Processing Image TLS config file: '/etc/cfgasst/v2r3/WG31/TCPI
Processing: 'TTLSSRule                               IMSConnectRule~1'
Processing: 'TTLSSRule                               IMSClientRule~2'
Processing: 'TTLSSGroupAction                         gAct1'
Processing: 'TTLSEnvironmentAction                   eAct1~IMSConnect'
Processing: 'TTLSEnvironmentAction                   eAct2~IMSClient'
Processing: 'TTLSSConnectionAction                   cAct1~IMSConnect'
Processing: 'TTLSSConnectionAction                   cAct2~IMSClient'
Processing: 'TTLSSConnectionAdvancedParms            cAdv1~IMSConnect'
Processing: 'TTLSSConnectionAdvancedParms            cAdv2~IMSClient'
Processing: 'TTLSSKeyringParms                       keyR1'
Processing: 'TTLSSKeyringParms                       keyR2'
Processing: 'IpAddrSet                               addr1'
Processing: 'PortRange                               portR1'
Processing: 'PortRange                               portR2'
profile: Finished processing Image TLS config file
rocessing TLS Group action 'gAct1'
rocessing TLS Connection action 'cAct1~IMSConnect'
rocessing TLS Connection action 'cAct2~IMSClient'
rocessing TLS Environment action 'eAct1~IMSConnect'
rocessing TLS Environment action 'eAct2~IMSClient'
rocessing TLS rule 'IMSClientRule~2'
rocessing TLS rule 'IMSConnectRule~1'
```

___ 7. Go the bottom of this file and you see these messages

```
EZD1579I PAGENT POLICIES ARE NOT ENABLED FOR TCPIP1 : TTLS
EZZ8771I PAGENT CONFIG POLICY PROCESSING COMPLETE FOR TCPIP1 : QOS
EZZ8771I PAGENT CONFIG POLICY PROCESSING COMPLETE FOR TCPIP1 : TTLS
EZD1586I PAGENT HAS INSTALLED ALL LOCAL POLICIES FOR TCPIP1
Finished main config file update
```

Tech-Tip: If a policy or otherwise changed the new or updated policy can be installed with an MVS modify command, ***F PAGENT,REFRESH.***

___ 8. The policy agent is active. The policies have been loaded but there is one remaining step. The TCPIP stack has not been modified to enable TTLS. On this image this has been configure this way so the AT-TLS is disabled by default and must be explicitly enabled. This is done by an MVS *VARY* command,

V TCPIP,,OBEY,SYS1.TCPPARMS(TTLS)

Where the contents of SYS1.TCPPARMS(TTLS) is simply *TCPCONFIG TTLS*.

Issue this command and you should see these messages in the console.

```
V TCPIP, ,OBEY,SYS1.TCPPARMS(TTLS)
EZZ0060I PROCESSING COMMAND: VARY TCPIP, ,OBEY,SYS1.TCPPARMS(TTLS)
EZZ0300I OPENED OBEYFILE FILE 'SYS1.TCPPARMS(TTLS) '
EZZ0309I PROFILE PROCESSING BEGINNING FOR 'SYS1.TCPPARMS(TTLS) '
EZZ0316I PROFILE PROCESSING COMPLETE FOR FILE 'SYS1.TCPPARMS(TTLS) '
EZZ0053I COMMAND VARY OBEY COMPLETED SUCCESSFULLY
```

Tech-Tip: AT-TLS can be also be disabled with a VARY command, ***V TCPIP,,OBEY,SYS1.TCPPARMS(NOTTLS)*** where the contents of SYS1.TCPPARMS(NOTTLS) are ***TCPCONFIG NOTTLS***

___ 9. Stop and restart the server with MVS commands ***PBAQSTRT*** and ***SBAQSTRT***.

Tech-Tip: The server must be stopped and restart because there is an active session between the z/OS Connect server and IMS Connect. The policies are not trigger until the socket session is restarted.

Test the TLS connection from the z/OS Connect Server to IMS

Now use the REST client to test the API with AT-TLS enabled.

- ___ 1. Open a DOS command prompt and change to directory *c:/z/admin*.
- ___ 2. Enter the cURL commands below:

```
c:\z\admin>curl -X get --cacert certauth.pem --cert user1.p12:secret --cert-type P12  
https://wg31.washington.ibm.com:9443/phonebook/contacts/LAST3
```

You should see the same results as before.

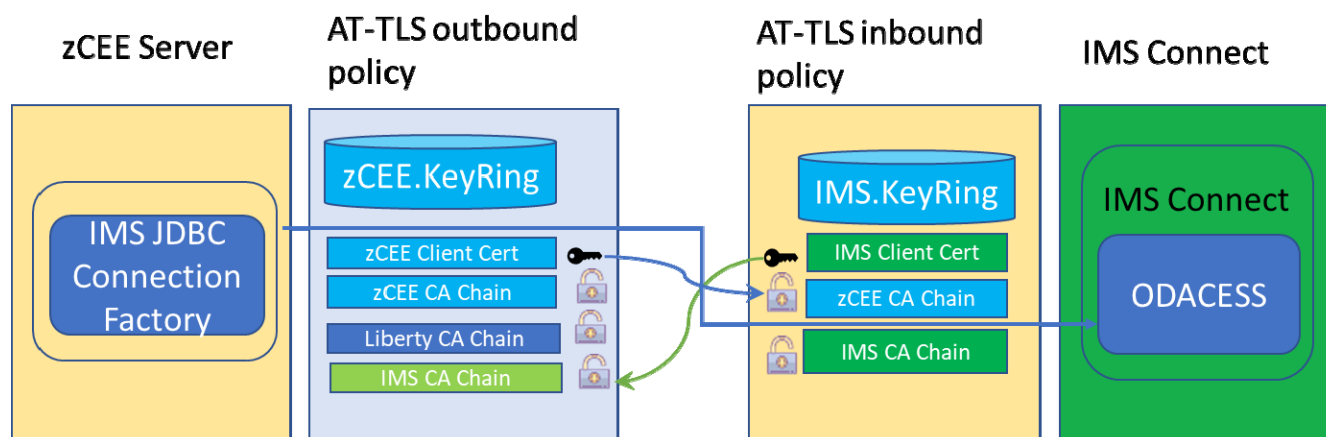
- ___ 3. View the *syslogd.log* file again and you should find the messages like the ones below. These messages are tracing the handshake between the outbound policy acting a client and the inbound policy acting as the server.

```
EZD1281I TTLS Map CONNID: 00000A35 LOCAL: 192.168.17.220..2693 REMOTE :  
192.168.17.220..5555 JOBNAME: BAQSTR USERID: LIBSERV TYPE: OutBound STATUS:  
Enabled RULE: IMSClientRule~2 ACTIONS: gAct1 eAct2~IMSClient cAc2~IMSClient  
  
EZD1281I TTLS Map CONNID: 00000A36 LOCAL: 192.168.17.220..5555 REMOTE :  
192.168.17.220..2693 JOBNAME: IMS15HWS USERID: IMSSTC TYPE: InBound STATUS:  
Enabled RULE: IMSConnectRule~1 ACTIONS: gAct1 eAct1~IMSConnect cAct1~IMSConnect  
  
EZD1283I TTLS Event GRPID: 000000009 ENVID: 000000009 CONNID: 00000A36 R C: 0  
Initial Handshake 000000501142EE90 0000005011429850 TLSV1.2 F0F0F3F5  
  
EZD1283I TTLS Event GRPID: 000000009 ENVID: 000000008 CONNID: 00000A35 R C: 0  
Initial Handshake 0000005011427EB0 0000005011422750 TLSV1.2 F0F0F3F5
```

- ___ 4. Entering IMS Connect *VIEWHWS* command should show FRED and/or USER1 as the USERIDs.

HWSC0001I	PORT=4000	STATUS=ACTIVE	KEEPAV=0	NUMSOC=2		
EDIT=	TIMEOUT=0					
HWSC0001I	CLIENTID	USERID	TRANCODE	DATASTORE	STATUS	SECOND
CLNTPORT	IP-ADDRESS	APSB-TOKEN				
HWSC0001I	GMP25URZ	FRED	IVTNO	IVP1	RECV	4

The diagram below shows the flow of the request from the z/OS Connect server to IMS Connect. The server and IMS Connect are unaware of the involvement of the AT-TLS the TLS handshake and the fact that the message is encrypted between the two endpoints.



5. There is information in the AT-TLS Knowledge Center for describing AT-TLS return codes (see URL https://www.ibm.com/support/knowledgecenter/SSLTBW_2.4.0/com.ibm.zos.v2r4.hald001/comtls.htm) For example, if the return code had been 202 it would be caused by the explanation below.

The key ring cannot be opened because the user does not have permission. Check the following items:

- Look at message EZD1281 to verify the user ID being used for this connection and the TTLSEnvironmentAction statement that is mapped to this connection. If you are configuring by using the IBM Configuration Assistant for z/OS® Communications Server, you can specify the key ring on either the AT-TLS: Image Level Settings panel or on each Traffic Descriptor.
- Ensure that the correct key ring is specified

This simply means the user does not have the required access to either of the RACF FACILITY resources IRR.DIGTCERT.LIST and IRR.DIGTCERT.LISTING

If the return code had been 414 and explanation can be found in the z/OS Cryptographic Services System SSL Programming (SC14-7495-40) manual or at URL https://www.ibm.com/support/knowledgecenter/SSLTBW_2.4.0/com.ibm.zos.v2r4.gska100/ssl2msg1000885.htm

414 Certificate is not valid.

Explanation: Either the local certificate or the peer certificate is not valid.

User response: Ensure that a valid certificate is being sent by the communication partner. Collect a System SSL trace containing a dump of the incorrect certificate and then contact your service representative if the error persists.

This is probably caused because the certificate authority certificate used to sign a server or personal certificate is not connect to the key ring. Or not properly connected to the key ring.

6. The JCL in member *PASEARCH* in data set *USER1.ZCEE30.CNTL* can be used to display AT-TLS policies. Submit this job and see a display of the contents of the policy agent's configuration file. Without the Configuration Assistant provided by z/OSMF this file would need to be maintained manually.

```
//BPXBATCH EXEC PGM=BPXBATCH,REGION=8M
//STDOUT DD PATH='/tmp/paStd.out',
//          PATHOPTS=(OWRONLY,OCREAT),PATHMODE=SIRWXU
//STDERR DD PATH='/tmp/paStd.err',
//          PATHOPTS=(OWRONLY,OCREAT),PATHMODE=SIRWXU
//STDPARM DD *
SH echo pasearch -t | su
//COPY EXEC PGM=IKJEFT01,DYNAMNBR=300
//SYSTSPRT DD SYSOUT=*
//PASTDOUT DD PATH='/tmp/paStd.out',PATHDISP=(DELETE,DELETE)
//PASTDERR DD PATH='/tmp/paStd.err',PATHDISP=(DELETE,DELETE)
//STDOUT DD SYSOUT=*,DCB=(LRECL=1000,RECFM=V)
//STDERR DD SYSOUT=*,DCB=(LRECL=1000,RECFM=V)
//SYSPRINT DD SYSOUT=*
//SYSTSIN DD *
OCOPY INDD(PASTDERR) OUTDD(STDERR)
OCOPY INDD(PASTDOUT) OUTDD(STDOUT)
```

Optional

Disable the use of RACF Passtickets and retest using only TLS and see what difference this makes.

Summary

In this step you have created AT-TLS inbound and outbound policies which protect the IMS Connect ODBA port of 4000. These policies respectively act as client and server surrogates for the z/OS Connect server and IMS Connect.

Appendix – AT-TLS Policy Agent Configuration File

```
##
## AT-TLS Policy Agent Configuration file for:
##   Image: WG31
##   Stack: TCPIP1
##
## Created by the IBM Configuration Assistant for z/OS Communications Server
## Version 2 Release 3
## Backing Store = USER1
## Install History:
## 2020-05-28 19:38:49 : Save To Disk
##
## End of Network Configuration Assistant information
TTLRule      IMSConnectRule~1
{
  LocalAddrSetRef      addr1
  RemoteAddrSetRef      addr1
  LocalPortRangeRef      portR1
  RemotePortRangeRef      portR2
  Jobname                IMS15HWS
  Direction              Inbound
  Priority                255
  TLSGroupActionRef      gAct1
  TLSEnvironmentActionRef eAct1~IMSConnect
  TLSConnectionActionRef cAct1~IMSConnect
}
TTLRule      IMSClientRule~2
{
  LocalAddrSetRef      addr1
  RemoteAddrSetRef      addr1
  LocalPortRangeRef      portR2
  RemotePortRangeRef      portR1
  Direction              Outbound
  Priority                254
  TLSGroupActionRef      gAct1
  TLSEnvironmentActionRef eAct2~IMSClient
  TLSConnectionActionRef cAct2~IMSClient
}
TLSGroupAction      gAct1
{
  TLSEnabled          On
  Trace                7
}
TLSEnvironmentAction eAct1~IMSConnect
{
  HandshakeRole        Server
  EnvironmentUserInstance 0
  TLSKeyringParmsRef   keyR1
}
```

```

TTLSEnvironmentAction      eAct2~IMSCClient
{
  HandshakeRole            Client
  EnvironmentUserInstance   0
  TLSKeyringParmsRef       keyR2
}
TLSConnectionAction        cAct1~IMSCConnect
{
  HandshakeRole            Server
  TLSConnectionAdvancedParmsRef cAdv1~IMSCConnect
  CtraceClearText          Off
  Trace                    7
}
TLSConnectionAction        cAct2~IMSCClient
{
  HandshakeRole            Client
  TLSConnectionAdvancedParmsRef cAdv2~IMSCClient
  CtraceClearText          Off
  Trace                    7
}
TLSConnectionAdvancedParms cAdv1~IMSCConnect
{
  SSLv3                    Off
  TLSv1                    Off
  TLSv1.1                  Off
  SecondaryMap              Off
  TLSv1.2                  On
}
TLSConnectionAdvancedParms cAdv2~IMSCClient
{
  SSLv3                    Off
  TLSv1                    Off
  TLSv1.1                  Off
  SecondaryMap              Off
  TLSv1.2                  On
}
TLSKeyringParms            keyR1
{
  Keyring                  IMS.KeyRing
}
TLSKeyringParms            keyR2
{
  Keyring                  zCEE.KeyRing
}
IpAddrSet                  addr1
{
  Prefix                   0.0.0.0/0
}
PortRange                  portR1
{
  Port                     4000
}
PortRange                  portR2
{
  Port                     1024-65535
}

```