Avaya Solution & Interoperability Test Lab

Application Notes for ION Networks Netgard Privileged Gateway with Avaya Aura® Suite, Avaya Session Border Controller for Enterprise, Avaya Messaging, Avaya Breeze, and Avaya IP Office - Issue 1.0

Abstract

These Application Notes describe the configuration steps required to enable ION Networks Netgard Privileged Gateway to provide secure access to Avaya Aura® Suite, Avaya Session Border Controller for Enterprise, Avaya Messaging, Avaya Breeze, and Avaya IP Office. The Avaya Aura® Suite included Avaya Aura® Communication Manager, Avaya Aura® Media Server, Avaya Aura® System Manager, Avaya Aura® Session Manager, and Avaya Aura® Application Enablement Services. ION Networks Netgard Privileged Gateway is a secure, remote access gateway that allows enterprises to manage privileged user access to critical voice and data services. In this compliance test, ION Networks Netgard Privileged Gateway provided secure access to the aforementioned Avaya endpoints using SSH, web access via HTTPS, Remote Desktop (RDP), and thick clients.

Readers should pay attention to **Section 2**, in particular the scope of testing as outlined in **Section 2.1** as well as the observations noted in **Section 2.2**, to ensure that their own use cases are adequately covered by this scope and results.

Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at the Avaya Solution and Interoperability Test Lab.

1. Introduction

These Application Notes describe the configuration steps required to configure ION Networks Netgard Privileged Gateway (NPG) to provide secure access to Avaya Aura® Suite, Avaya Session Border Controller for Enterprise, Avaya Messaging, Avaya Breeze, and Avaya IP Office. The Avaya Aura® Suite included Avaya Aura® Communication Manager, Avaya Aura® Media Server, Avaya Aura® System Manager, Avaya Aura® Session Manager, and Avaya Aura® Application Enablement Services (AES). ION Networks Netgard Privileged Gateway is a secure, remote access gateway that allows enterprises to manage privileged user access to critical voice and data services. In this compliance test, ION Networks Netgard Privileged Gateway provided secure access to the aforementioned Avaya endpoints using SSH, web access via HTTPS, SFTP, Remote Desktop (RDP), and thick clients.

Users log into NPG and establish a connection to one or more Avaya endpoints. The connection is "tunneled" through NPG from the user's PC to the Avaya endpoint(s). NPG assigns an IP address, from a pre-configured pool of IP addresses, to the Avaya endpoint to mask the actual IP address of the Avaya endpoint.

The connection is made using a specific protocol handler, such as SSH, SFTP, or HTTPS, or a "generic" protocol handler. In addition to the protocol handler, a port(s) must also be specified for the connection. When a specific protocol handler is used for the connection, NPG provides a hyperlink that could be clicked to open the appropriate access application. For example, for the HTTPS protocol handler, NPG could open a web browser, which would be set as the default application for HTTPS on the user's PC. A "generic" protocol handler is used when the application used to access an endpoint is proprietary or requires multiple ports; for example, a thick client such as IP Office Manager. In this case, the user would manually open the thick client, such as IP Office Manager. The user can then use the assigned IP address to open an application, such as a thick client, to access the Avaya endpoint. The user would then log in with their user credentials. Once the user no longer requires the connection, the user would close the NPG connection.

Additional features provided by NPG include administrator approval for connections and recording connection activity and playback.

2. General Test Approach and Test Results

The interoperability compliance test included feature and serviceability testing. The feature testing focused on establishing connections through NPG to provide access to Avaya endpoints using SSH, SFTP, HTTPS, RDP, and thick clients and closing connections.

The serviceability testing focused on verifying that the NPG server come back into service after a reboot or re-connecting the Ethernet cable.

DevConnect Compliance Testing is conducted jointly by Avaya and DevConnect members. The jointly defined test plan focuses on exercising APIs and/or standards-based interfaces pertinent to

the interoperability of the tested products and their functionalities. DevConnect Compliance Testing is not intended to substitute full product performance or feature testing performed by DevConnect members, nor is it to be construed as an endorsement by Avaya of the suitability or completeness of a DevConnect member's solution.

Avaya recommends our customers implement Avaya solutions using appropriate security and encryption capabilities enabled by our products. The testing referenced in this DevConnect Application Note included the enablement of supported encryption capabilities in the Avaya products. Readers should consult the appropriate Avaya product documentation for further information regarding security and encryption capabilities supported by those Avaya products.

Support for these security and encryption capabilities in any non-Avaya solution component is the responsibility of each individual vendor. Readers should consult the appropriate vendor-supplied product documentation for more information regarding those products.

For the testing associated with this Application Note, the interface between Avaya systems and Netgard Privileged Gateway used SFTP, SSH, and HTTPS to some Avaya systems.

2.1. Interoperability Compliance Testing

Interoperability compliance testing covered the following features and functionality:

- Establishing connections through NPG to Avaya endpoints.
- Closing connections to Avaya endpoints.
- Accessing Avaya endpoints using SSH, SFTP, HTTPS, RDP, and thick clients using connections established through NPG.
- Establishing multiple connections to the same and different Avaya endpoints via a single user.
- Establishing multiple connections to the same and different Avaya endpoints across different users.
- Administrator approval/rejection of connection requests.
- Recording a playing back connection activity. This requires the ION Networks Desktop Agent software.
- Proper system recovery after rebooting and re-establishing IP connectivity to NPG.

2.2. Test Results

All test cases passed with the following observations:

- When a connection is made, NPG assigns an IP address from a pool of IP addresses to Avaya endpoints to hide the actual IP address regardless how the "Use Real Addresses" toggle is configured. For the compliance test, the "Use Real Addresses" option was disabled as shown in **Section 6.7**.
- When the SFTP protocol handler is used for a connection, the user should manually open the SFTP application to avoid a problem opening the application using the hyperlink provided by NPG. Alternatively, the "generic" protocol handler may be used with the

SFTP port to prevent a hyperlink from being provided by NPG. This issue has been addressed in all builds subsequent to 1.0.6-11.

2.3. Support

For technical support of ION Networks Netgard Privileged Gateway, contact ION Networks Technical Support via phone, web, or email.

- Phone: +1 (800) 722-8986 (US)
- Web: https://www.apitech.com/brands/secure-systems-information-assurance/ion/
- Email: ion.networks.support@apitech.com

3. Reference Configuration

Figure 1 illustrates a sample configuration that supports connections established through NPG from a user PC to Avaya endpoints using SSH, SFTP, HTTPS, Remote Desktop (RDP), and thick clients, such as IP Office Manager, Monitor, and System Status. ION Networks Desktop Agent was also installed on the user PC to support the recording of connection activity.

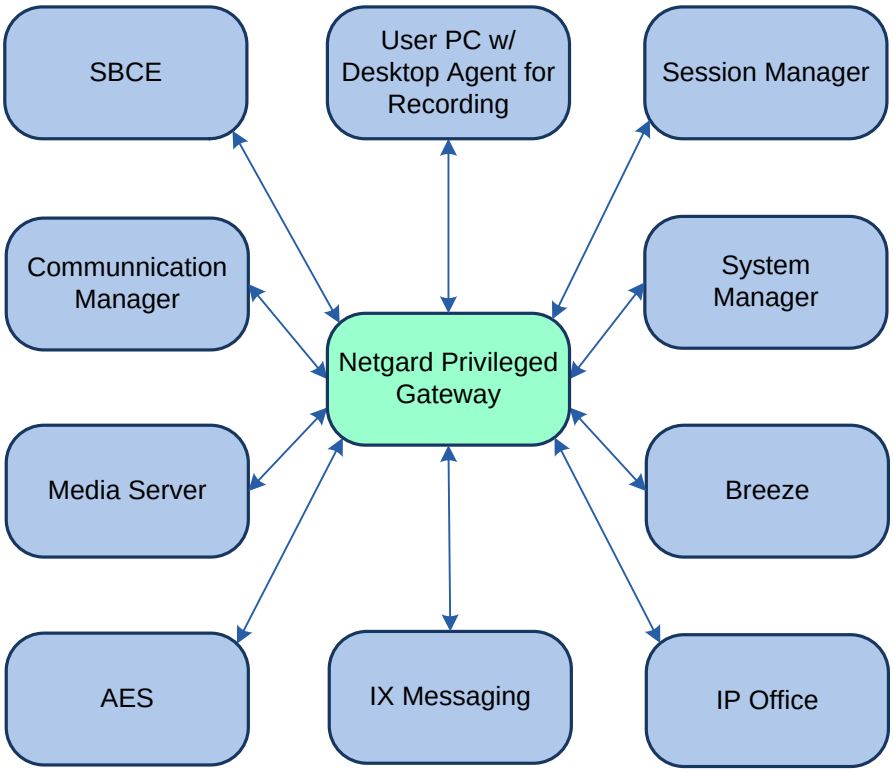


Figure 1: ION Networks Netgard Privileged Gateway with Avaya Endpoints

The table below lists the access methods used for each Avaya endpoint.

Avaya Endpoint	Access Method(s)
Aura® Communication Manager	HTTPS, SSH (including SAT)
Aura® System Manager	HTTPS, SSH
Aura® Session Manager	SSH, SFTP
Aura® Media Server	HTTPS, SSH
Aura® Application Enablement Services	HTTPS, SSH
Session Border Controller for Enterprise ▪ Element Management System (EMS) ▪ SBCE	 HTTPS SSH, SFTP
Messaging	HTTPS, RDP, Web
Breeze	HTTPS via System Manager, SSH
IP Office Server Edition	HTTPS, SSH, Manager, System Status, and Monitor Applications

4. Equipment and Software Validated

The following equipment and software were used for the sample configuration provided:

Equipment/Software	Release/Version
Avaya Aura® Communication Manager	8.1.3.2.0-FP3SP2
Avaya Aura® Media Server	v.8.0.2.138
Avaya Aura® System Manager	8.1.3.1 Build No. – 8.1.0.0.733078 Software Update Revision No: 8.1.3.1.1012493 Service Pack 1
Avaya Aura® Session Manager	8.1.3.1.813113
Avaya Aura® Application Enablement Services	8.1.3.0.0.25-0
Avaya Session Border Controller for Enterprise	8.1.2.0-31-19809
Avaya Messaging	10.8 SP1 SU3
Avaya Breeze	3.6.0.2.360201
IP Office*	11.1.1.0.0 build 209
ION Networks Netgard Privileged Gateway	1.0.4-20_enc
ION Networks Desktop Agent (required for connection recordings)	1.1.0.10529

** Compliance Testing is applicable when the tested solution is deployed with a standalone IP Office 500 v2 and also when deployed with IP Office Server Edition in all configurations.*

5. Configure Avaya Endpoints

The login credentials for the Avaya products were established during the software installation. However, additional user accounts may be added as necessary. The references in **Section 9** provide additional information about the ports that may be opened to each Avaya product. No additional configuration is required to allow access to the Avaya products.

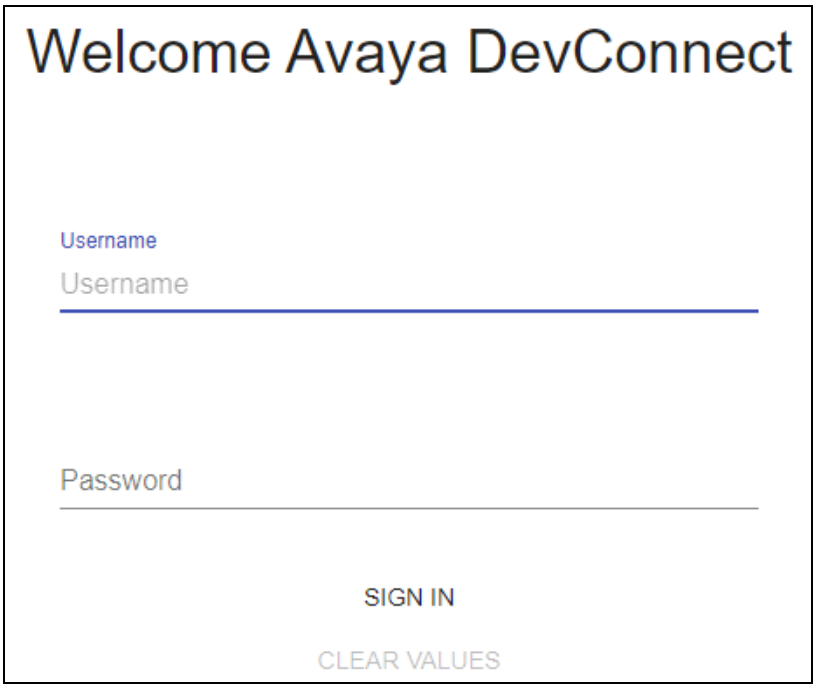
6. Configure ION Networks Netgard Privileged Gateway

This section provides the procedure for configuring Netgard Privileged Gateway (NPG), including IP address pool, users, endpoints, and access control. Configuration of NPG is performed via NPG Web Interface. This section covers the following areas:

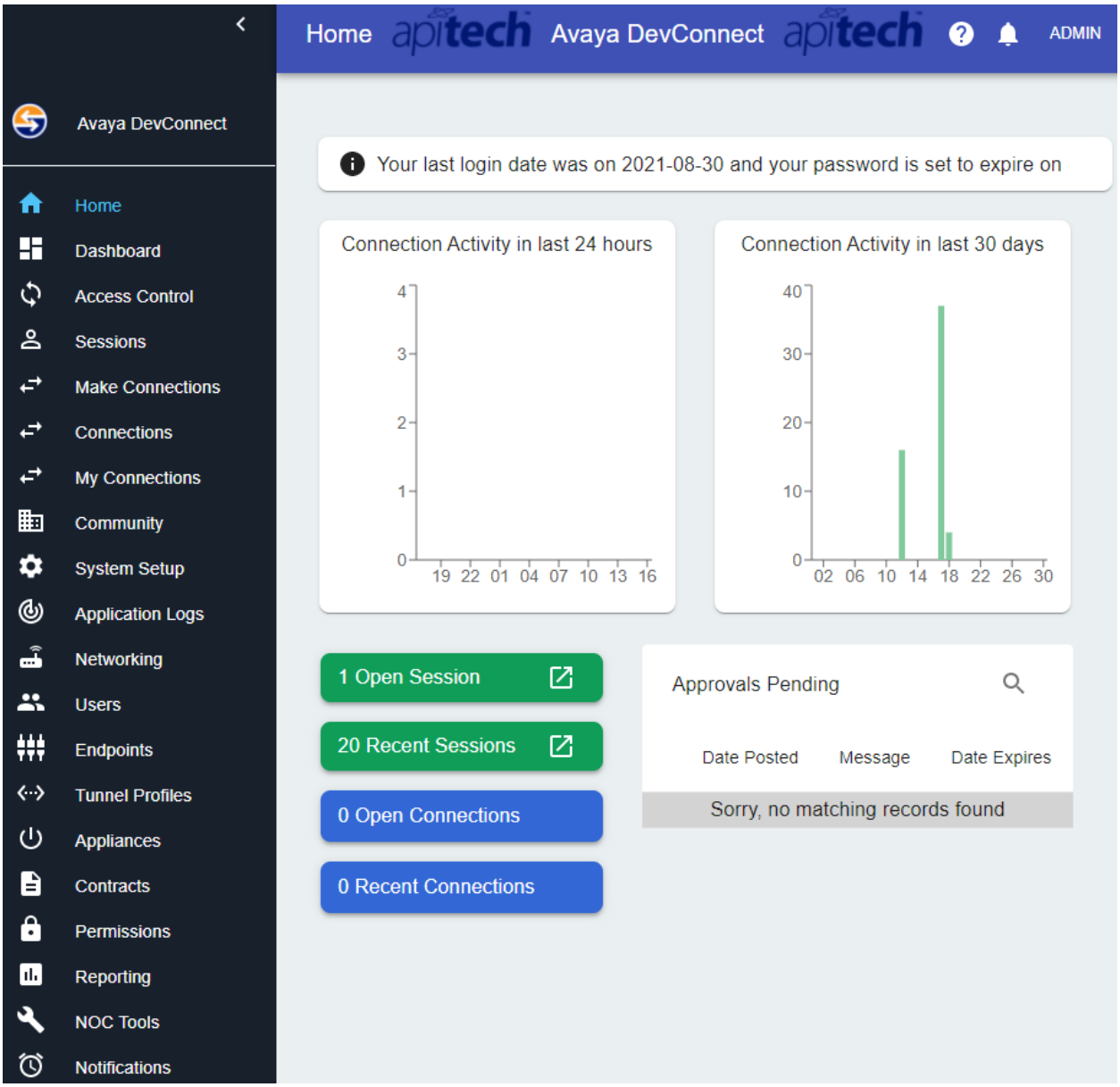
- Launch NPG Web Interface
- Administer Networking
- Administer System Setup
- Administer Access Control
- Administer Permissions
- Administer Users
- Administer Endpoints

6.1. Launch NPG Web Interface

Access the NPG Web Interface by using the URL **Error! Hyperlink reference not valid.** in an Internet browser, where <*ip-address*> is the NPG server IP address. Log in with the appropriate credentials.

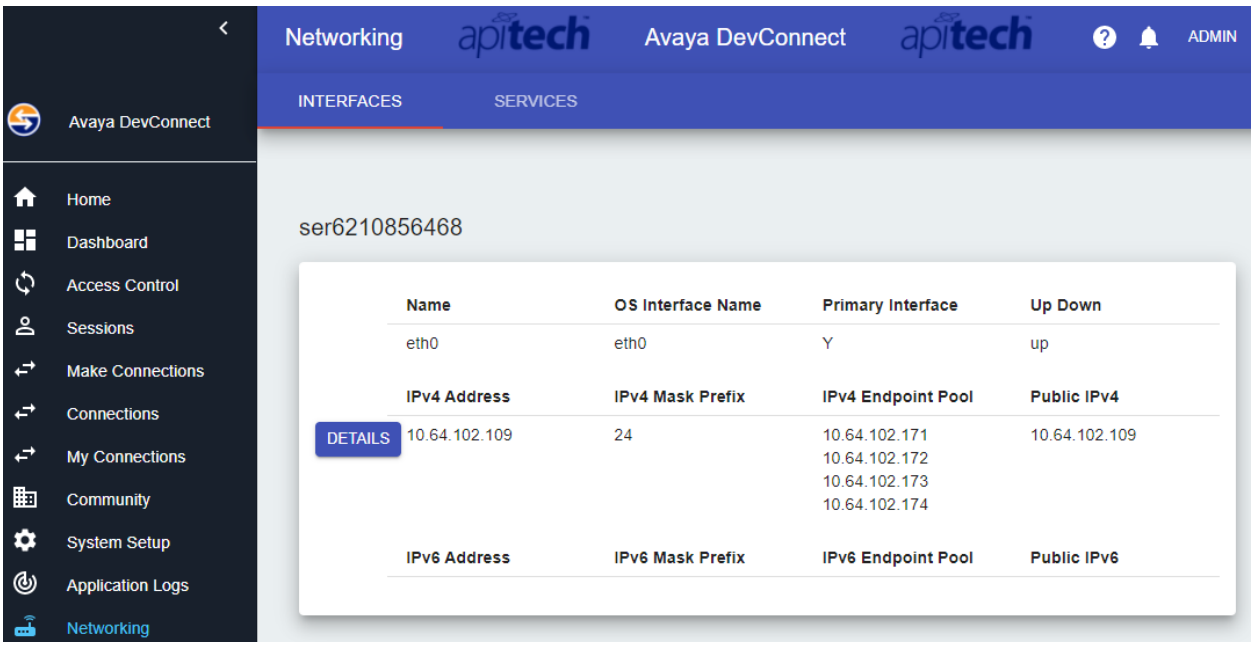


Once logged in, the following screen is displayed in the NPG Web Interface. The user interface includes administration options in the left pane as shown below.



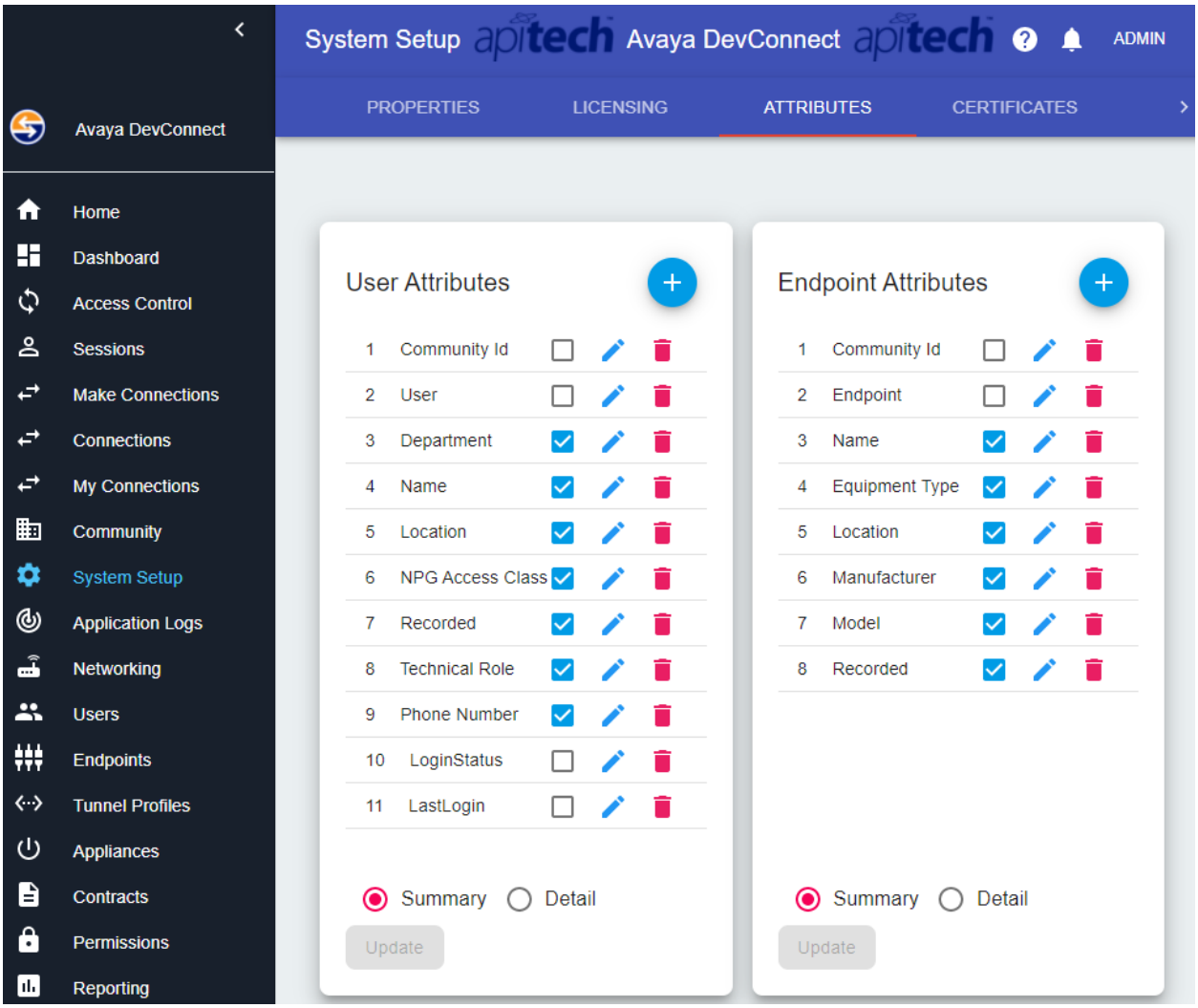
6.2. Administer Networking

Navigate to **Networking** and select the **Interfaces** tab to configure the **IPv4 Endpoint Pool**. When a connection is made to an Avaya endpoint, an IP address from the endpoint pool is assigned to the endpoint to hide the actual IP address. In the following example, four IP addresses were added to the endpoint pool. The assigned IP address can then be used to access the Avaya endpoint.

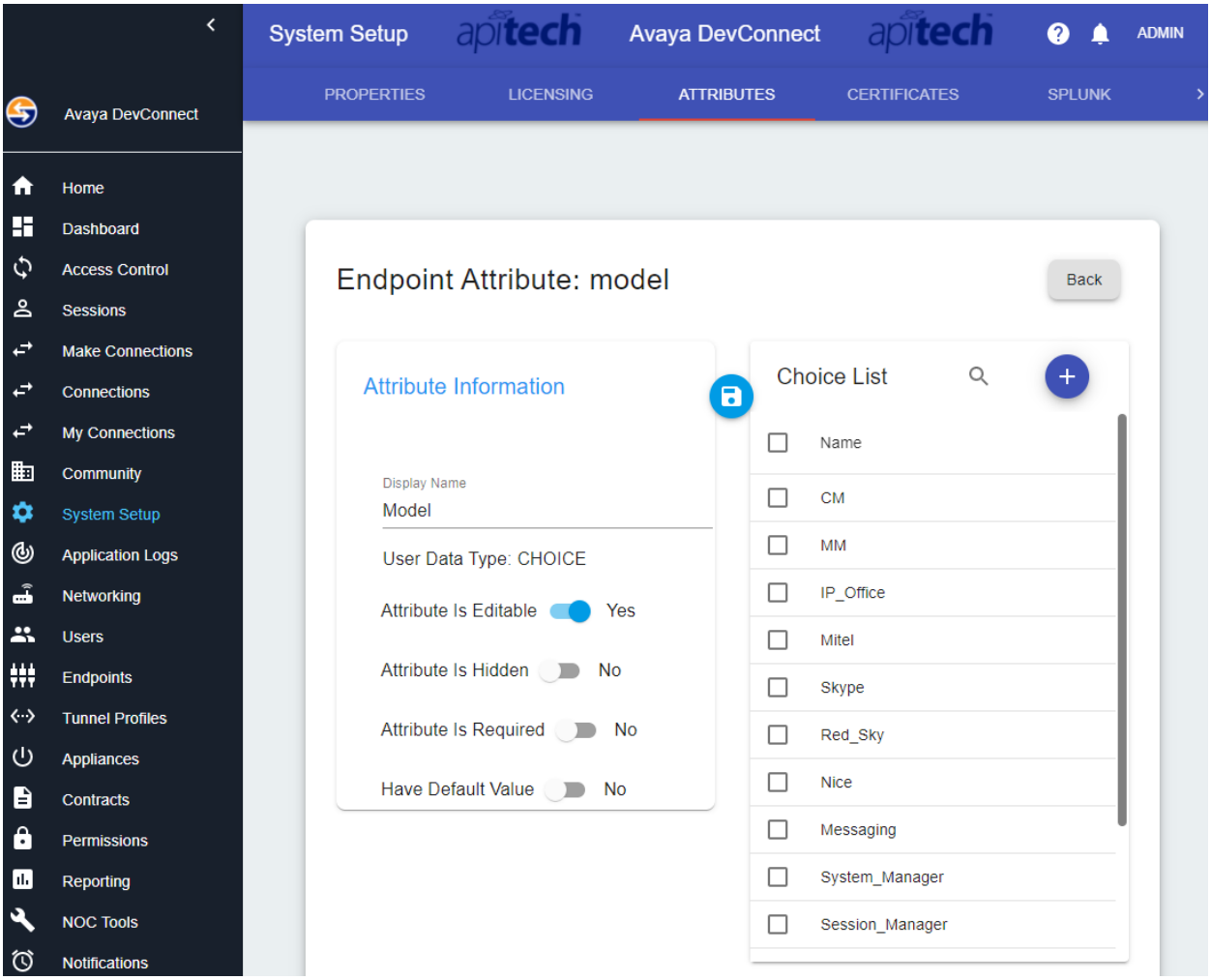


6.3. Administer System Setup

Navigate to **System Setup** and select the Attributes tab to add **Models** under **Endpoint Attributes**. In the **Endpoint Attributes** section, click on the **Model** edit icon.

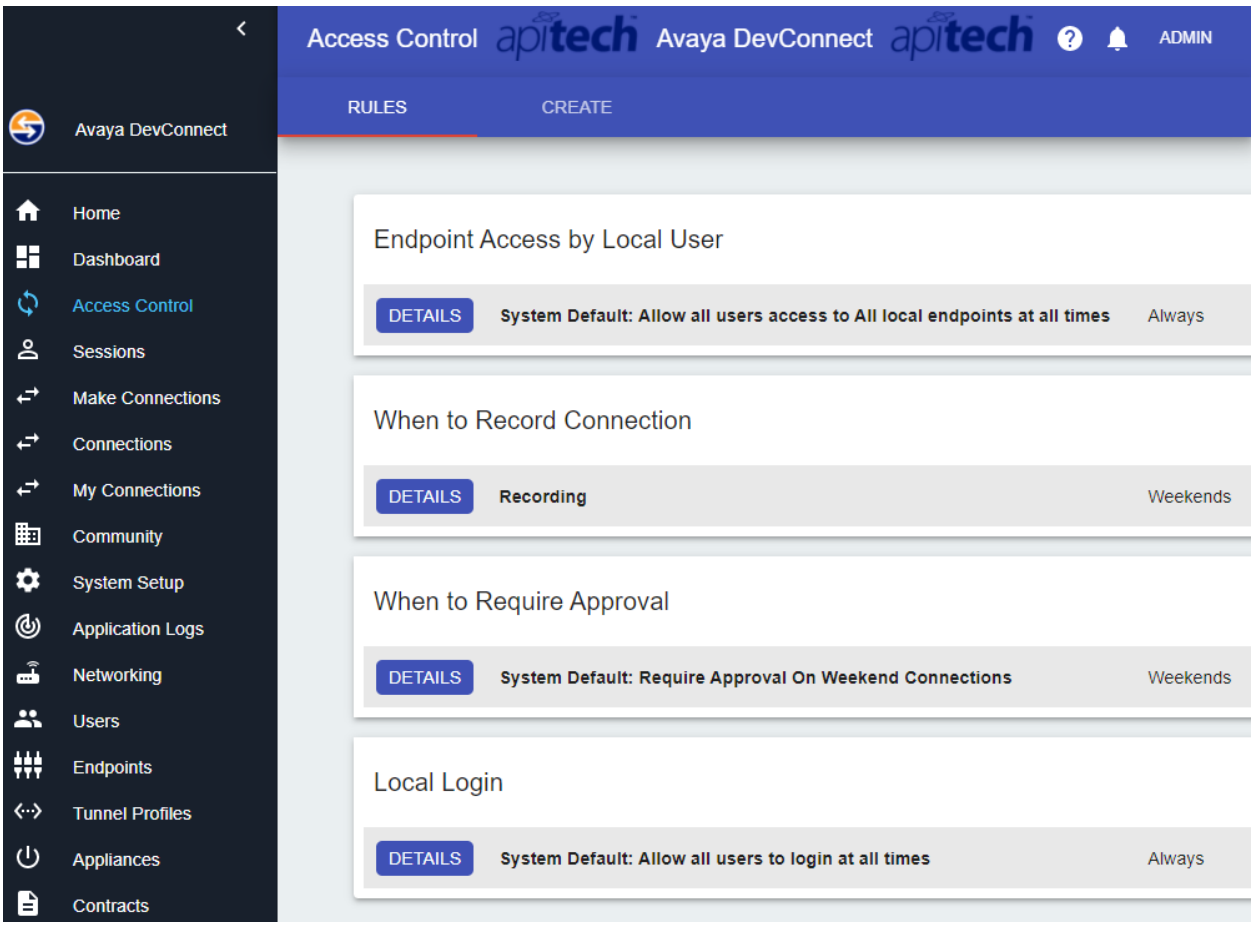


In the **Choice List** section, click on + to add a model name for an Avaya endpoint. In the example below, a model was added for *CM*, *Media_Server*, *System_Manager*, *Session_Manager*, *Application_Enablement_Services*, *Messaging*, *SBCE*, *Breeze*, and *IP_Office* (not all models are shown below). These model choices will be used in **Section 6.7** when administering **Endpoints**.



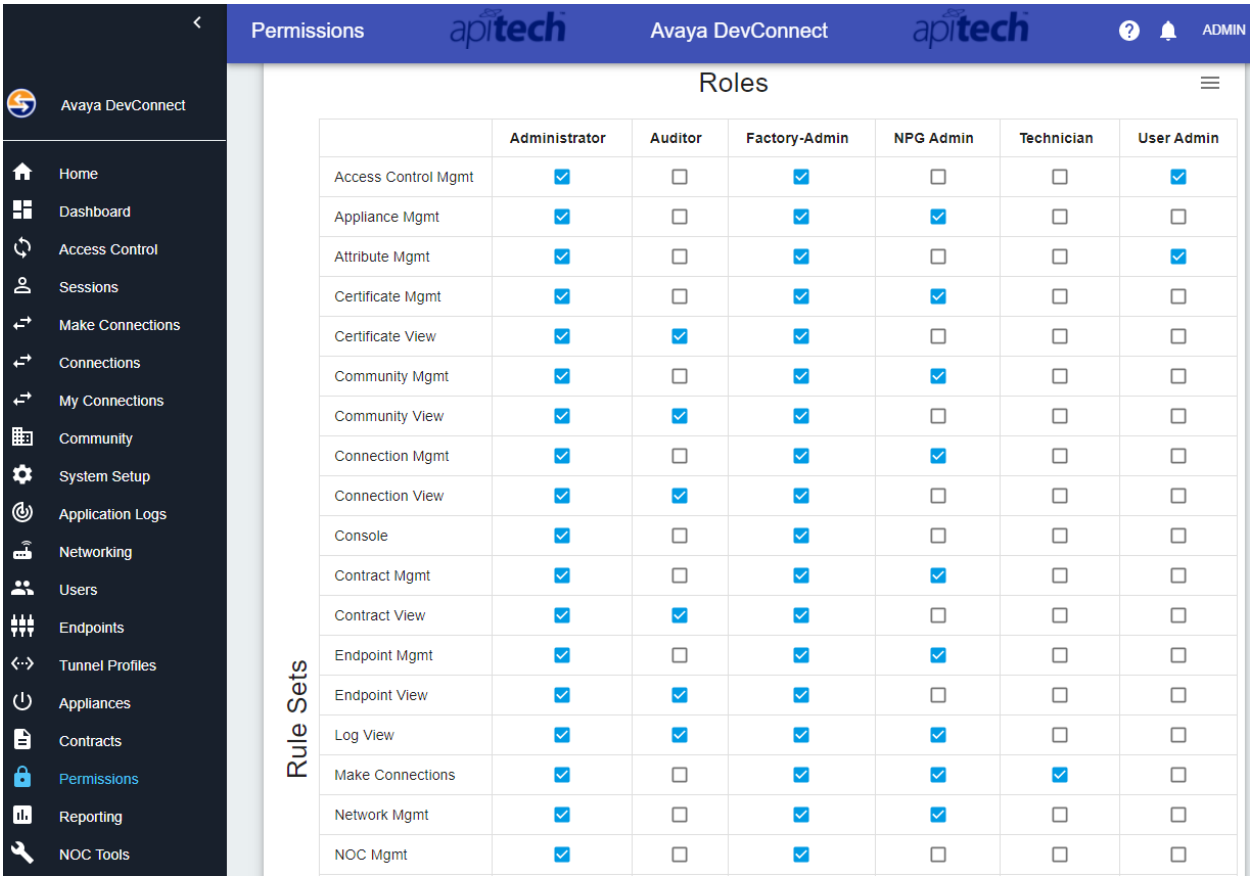
6.4. Administer Access Control

Navigate to **Access Control**, which provides four default Access Control rules to allow Local Login, Endpoint Access, When to Record, and When to Require Connection Approvals as shown below. Each Access Control rule was configured as shown below. Note that local login and endpoint access was always allowed and recording connections and connection approvals were only required on weekends per the configuration below.



6.5. Administer Permissions

Navigate to **Permissions** to specify the permissions allowed per role. For example, an **Administrator** has access to everything whereas a Technician is only allowed to **Make Connections**.

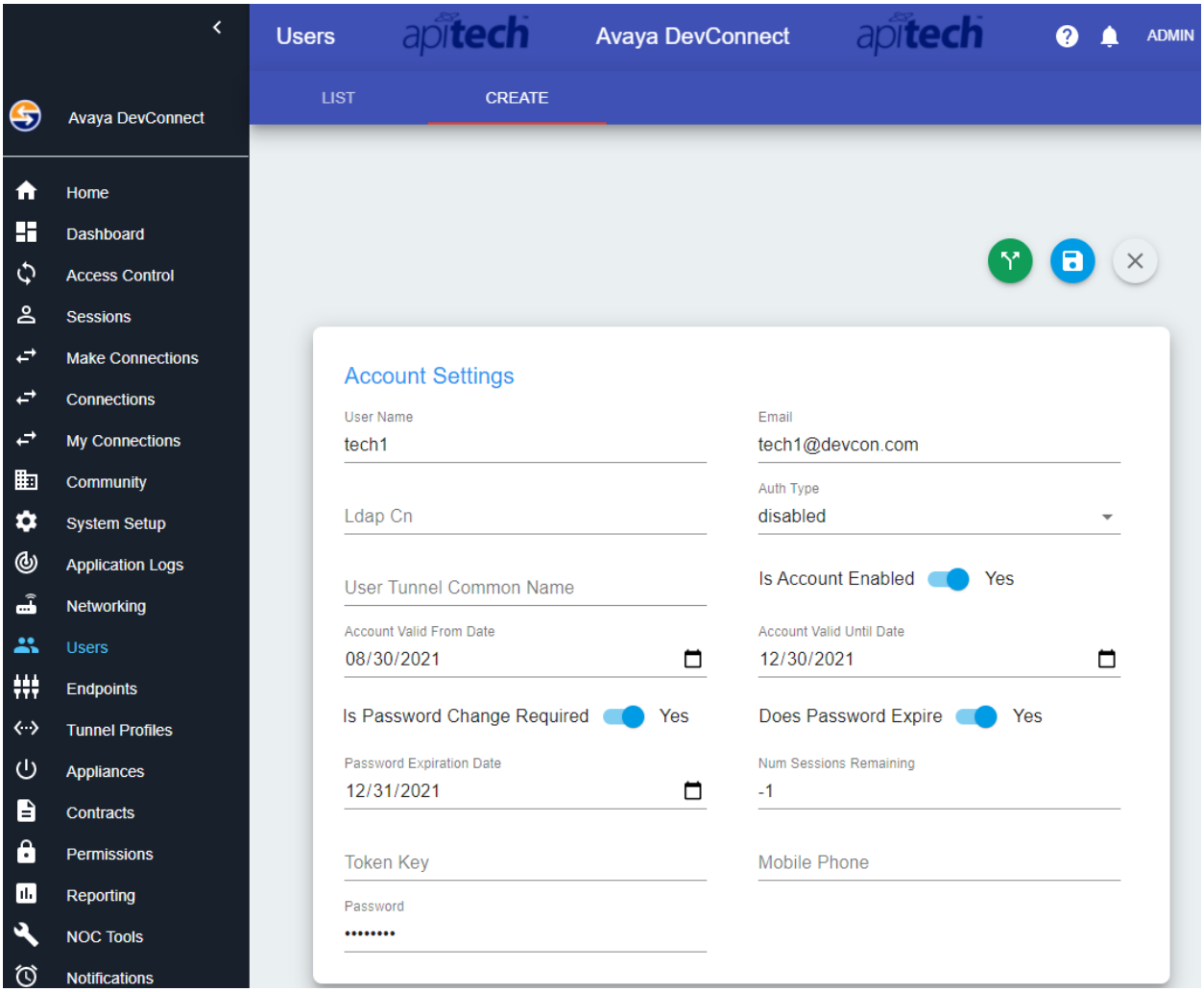


	Administrator	Auditor	Factory-Admin	NPG Admin	Technician	User Admin
Access Control Mgmt	☑	☐	☑	☐	☐	☑
Appliance Mgmt	☑	☐	☑	☑	☐	☐
Attribute Mgmt	☑	☐	☑	☐	☐	☑
Certificate Mgmt	☑	☐	☑	☑	☐	☐
Certificate View	☑	☑	☑	☐	☐	☐
Community Mgmt	☑	☐	☑	☑	☐	☐
Community View	☑	☑	☑	☐	☐	☐
Connection Mgmt	☑	☐	☑	☑	☐	☐
Connection View	☑	☑	☑	☐	☐	☐
Console	☑	☐	☑	☐	☐	☐
Contract Mgmt	☑	☐	☑	☑	☐	☐
Contract View	☑	☑	☑	☐	☐	☐
Endpoint Mgmt	☑	☐	☑	☑	☐	☐
Endpoint View	☑	☑	☑	☐	☐	☐
Log View	☑	☑	☑	☑	☐	☐
Make Connections	☑	☐	☑	☑	☑	☐
Network Mgmt	☑	☐	☑	☑	☐	☐
NOC Mgmt	☑	☐	☑	☐	☐	☐

6.6. Administer Users

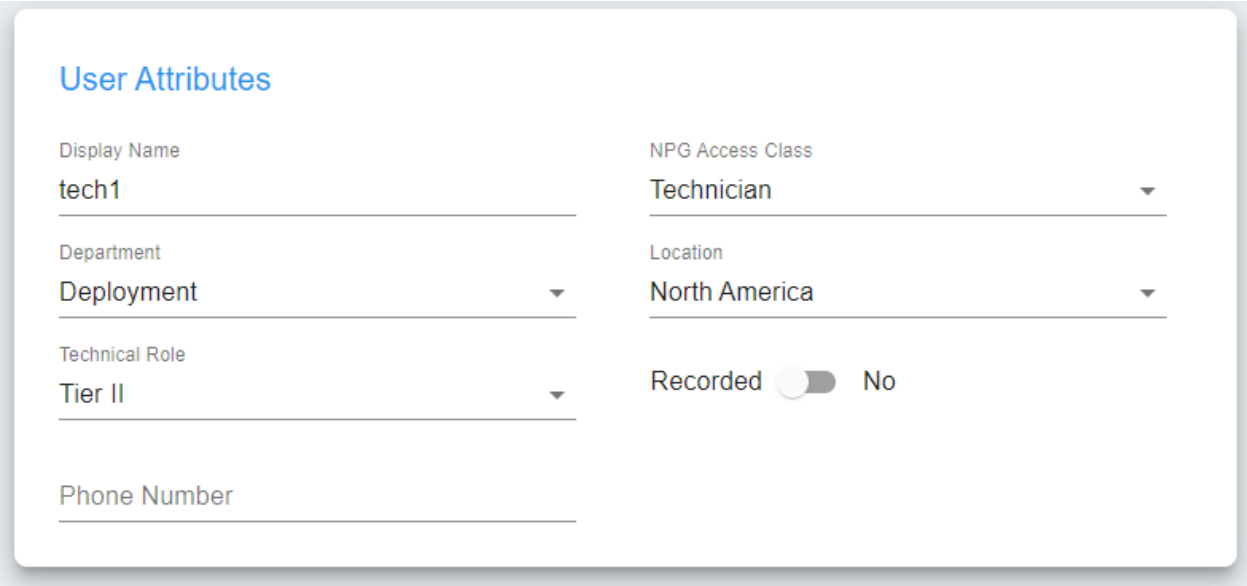
Navigate to **Users** and select the **Create** tab to add a user. In the following example, a Technician user account is created. Configure the following fields in the **Account Settings** section:

- **User Name:** Specify a user name (e.g., *tech1*).
- **Email:** Specify the user email (e.g., *tech1@devcon.com*).
- **Is Account Enabled:** Enable the account.
- **Account Valid From Date:** Specify a valid date.
- **Account Valid Until Date:** Specify an expiration date for the account.
- **Password Expiration Date:** Specify an expiration date for the password.
- **Password:** Specify a valid password that adheres to the password creation rules.

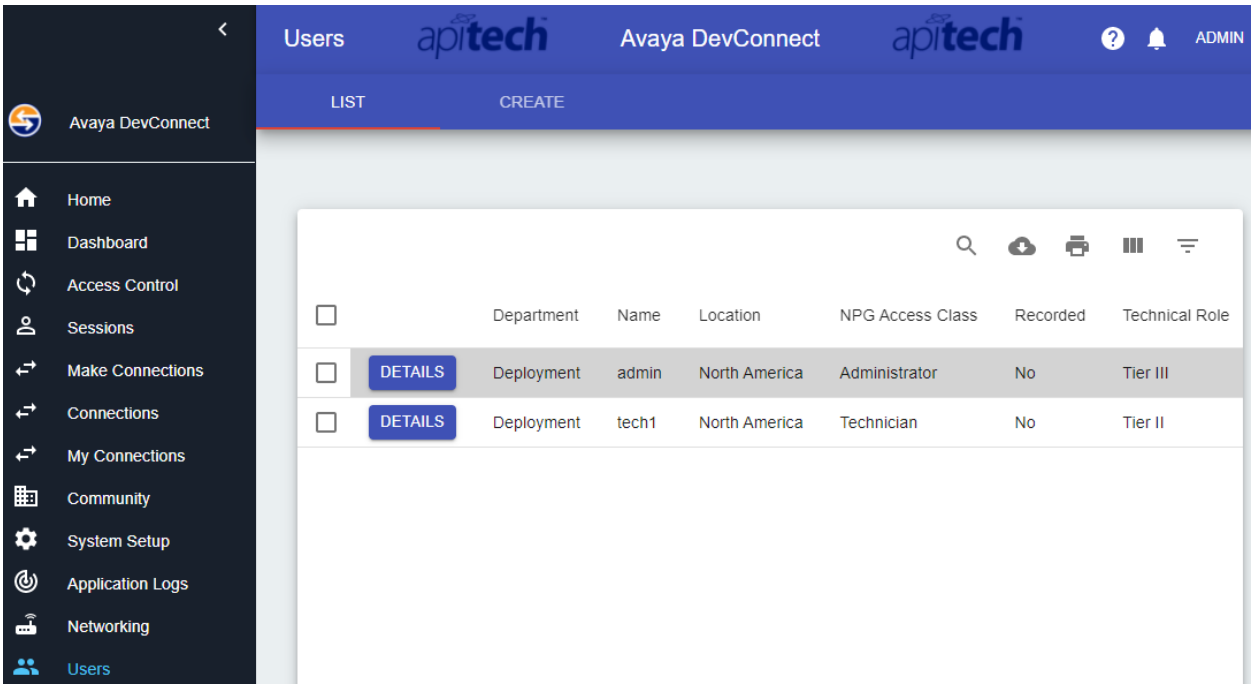


In the User Attributes section, configure the following fields:

- **Display Name:** Specify name displayed on the web interface for the user.
- **NPG Access Class:** Specify the role for the user described in **Section 6.5**.
- **Department:** Specify the user's department.
- **Location:** Specify the user's location.
- **Technical Role:** Specify the user's technical role.

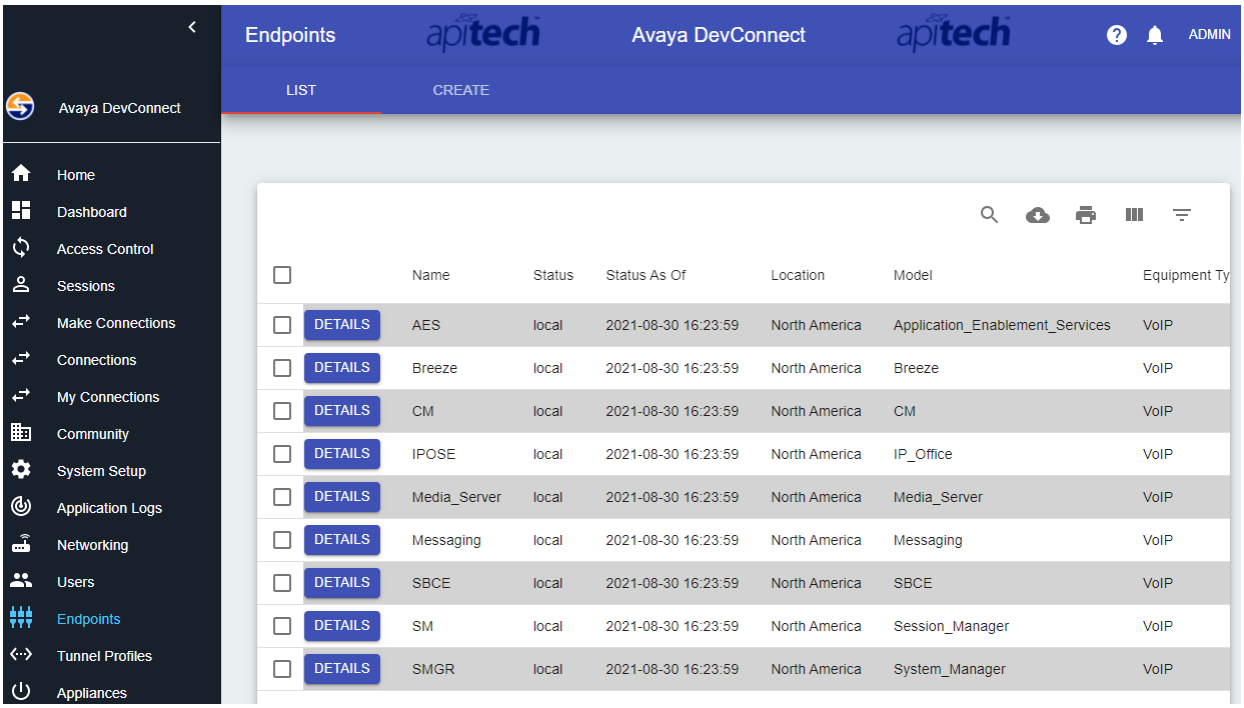


The **List** tab provides a list of configured users. In this example, an Administration and Technician account has been created.



6.7. Administer Endpoints

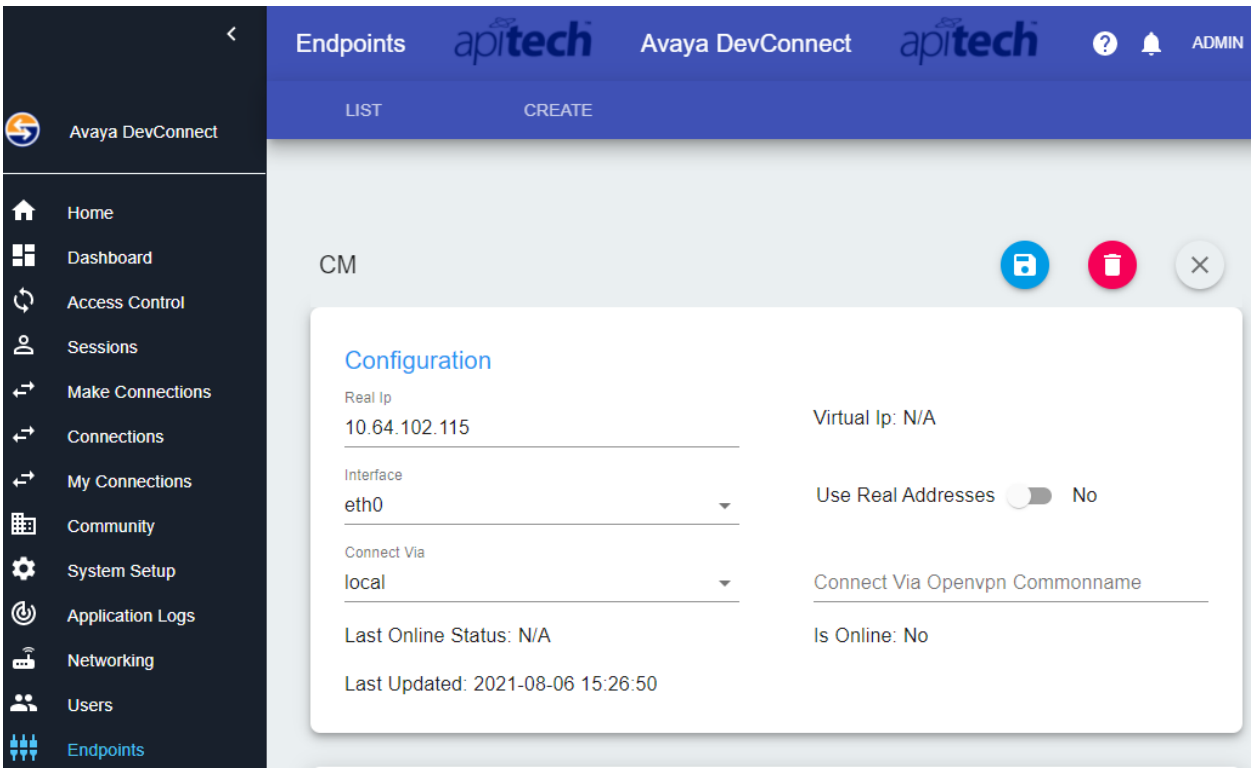
Navigate to **Endpoints** to view the list of available Avaya endpoints to which a user may connect. For the compliance test, the following Avaya endpoints were added as shown below and listed in **Section 3**. The following sections will provide the endpoint configuration for each Avaya endpoints, including the protocol handler and port. As mentioned in the **Introduction** in **Section 1**, a specific protocol handler, such as SSH or HTTPS, will allow the appropriate application to open using the specified port when the endpoint name link is clicked. For example, for HTTPS, an Internet browser will be opened. Alternatively, the user may open the Internet browser manually, or any other application, and access the Avaya endpoint using the endpoint pool address provided. A "generic" protocol handler doesn't provide an endpoint name link so the user would manually open the application to access the Avaya endpoint, such as IP Office Manager.



6.7.1. Avaya Aura® Communication Manager

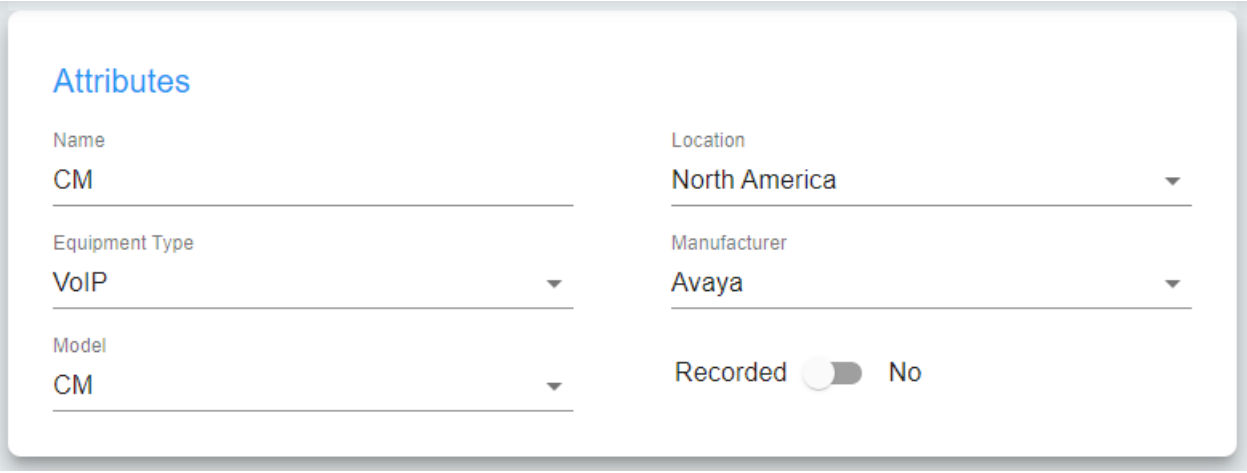
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for Communication Manager. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

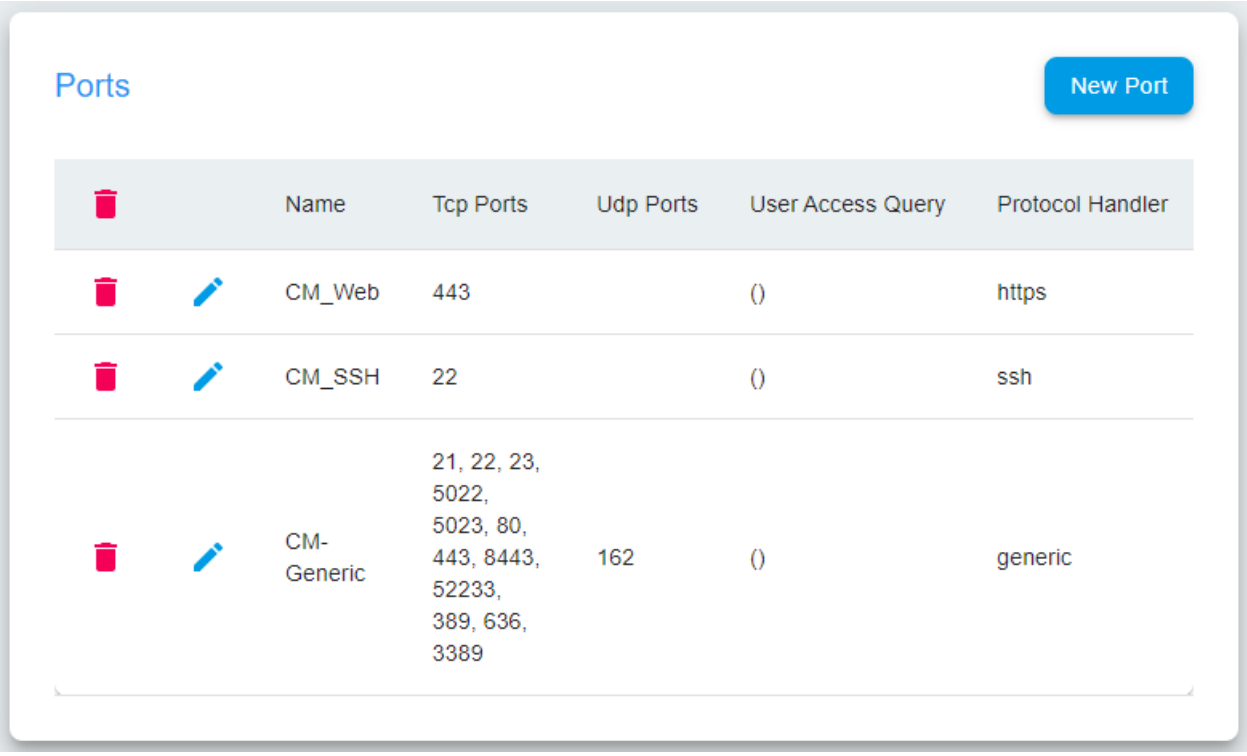


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *CM*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



In the **Ports** section, specify *HTTPS* protocol handler and port *443* for the Communication Manager System Management Interface and *SSH* protocol handler and port *22* for SSH. The SSH port allows access to the System Access Terminal (SAT). Additional ports may be opened using the "generic" protocol handler. Refer to **[1]** for a list of ports used by Communication Manager.



Ports

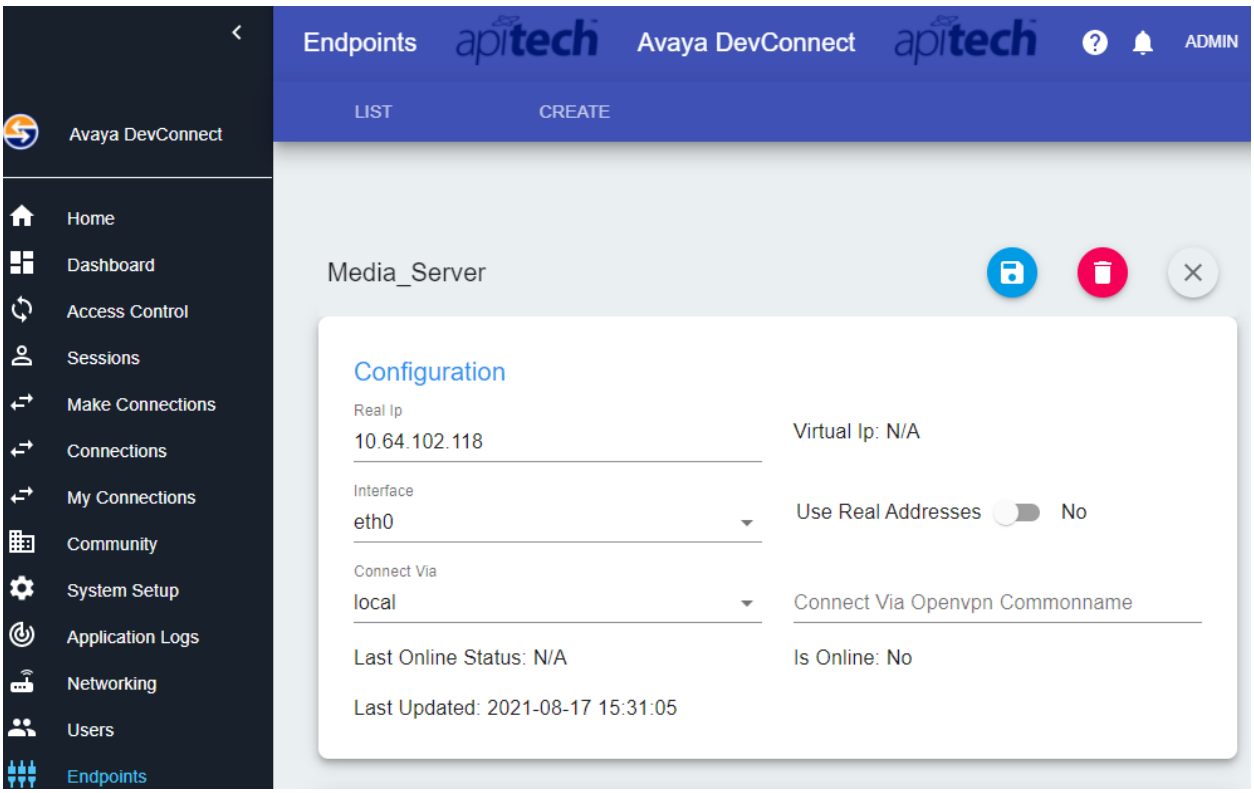
New Port

		Name	Tcp Ports	Udp Ports	User Access Query	Protocol Handler
		CM_Web	443		()	https
		CM_SSH	22		()	ssh
		CM-Generic	21, 22, 23, 5022, 5023, 80, 443, 8443, 52233, 389, 636, 3389	162	()	generic

6.7.2. Avaya Aura® Media Server

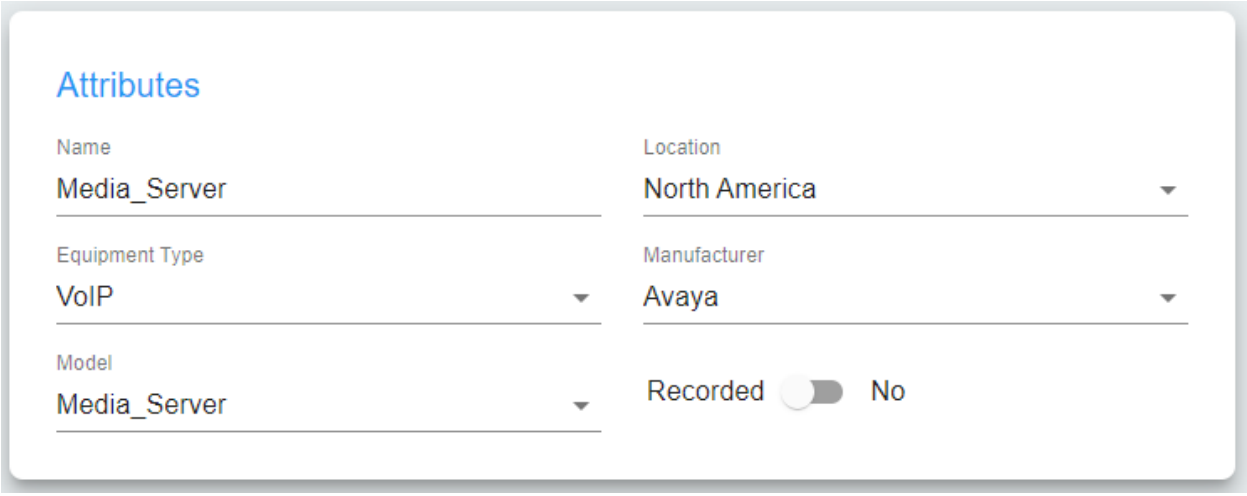
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for Media Server. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

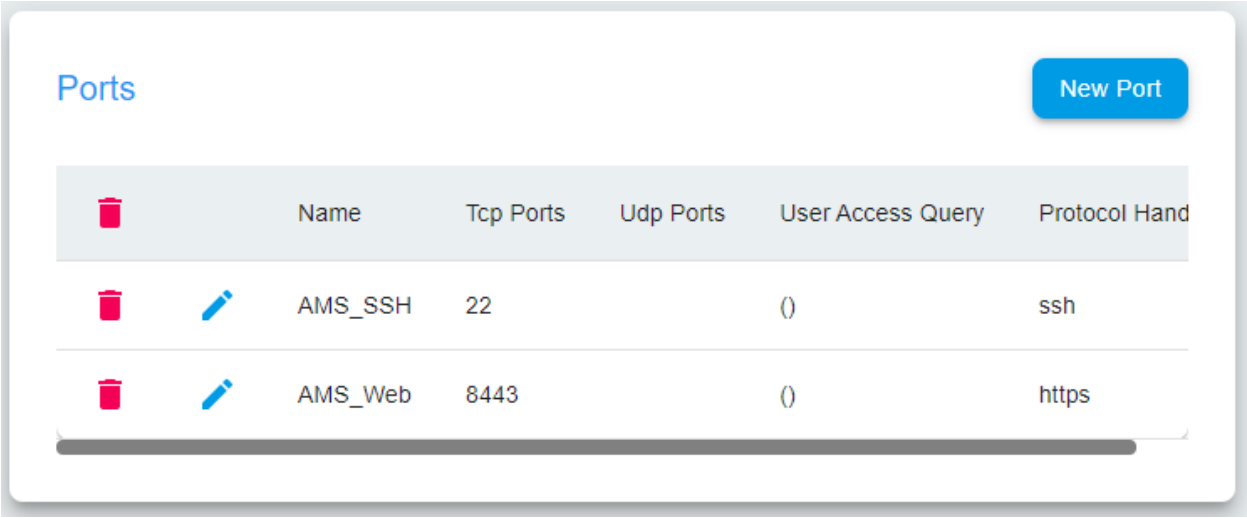


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *Media_Server*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



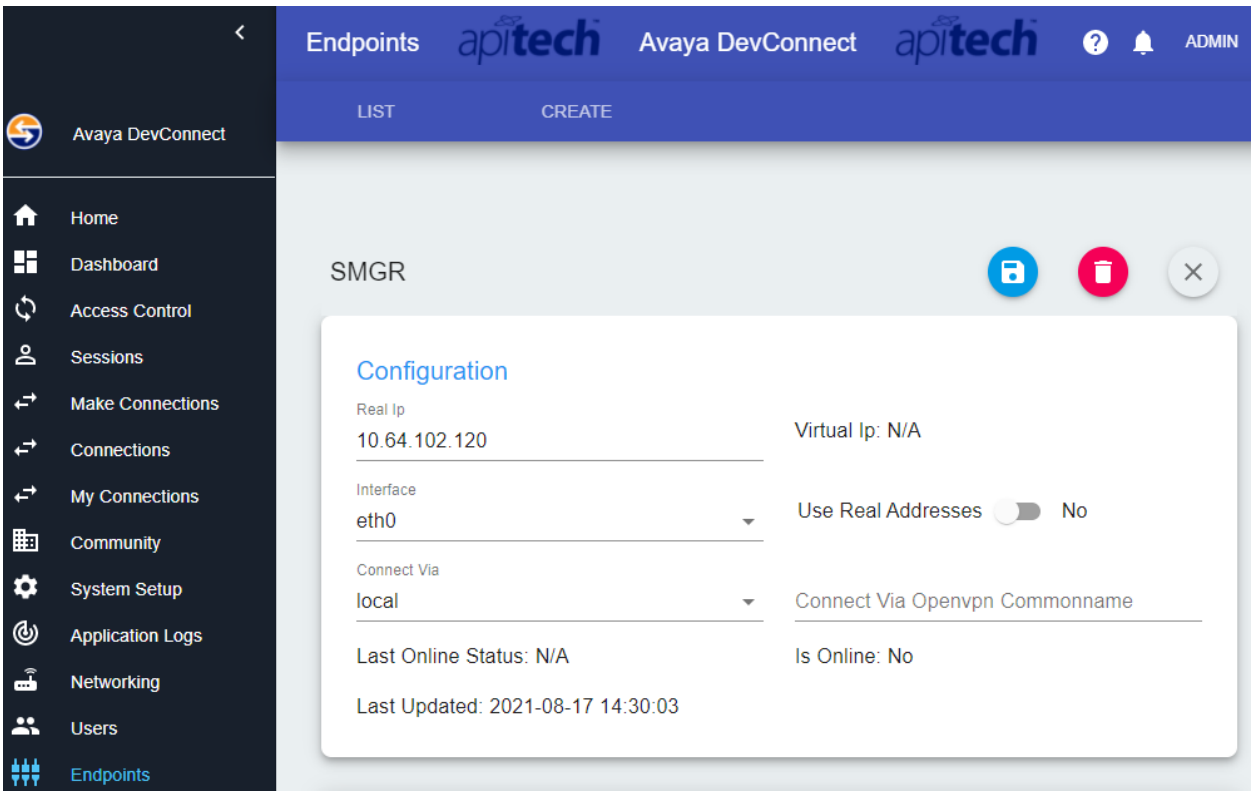
In the **Ports** section, specify *HTTPS* protocol handler and port *8443* for the EM Web-based Administration Tool and *SSH* protocol handler and port *22* for SSH.



6.7.3. Avaya Aura® System Manager

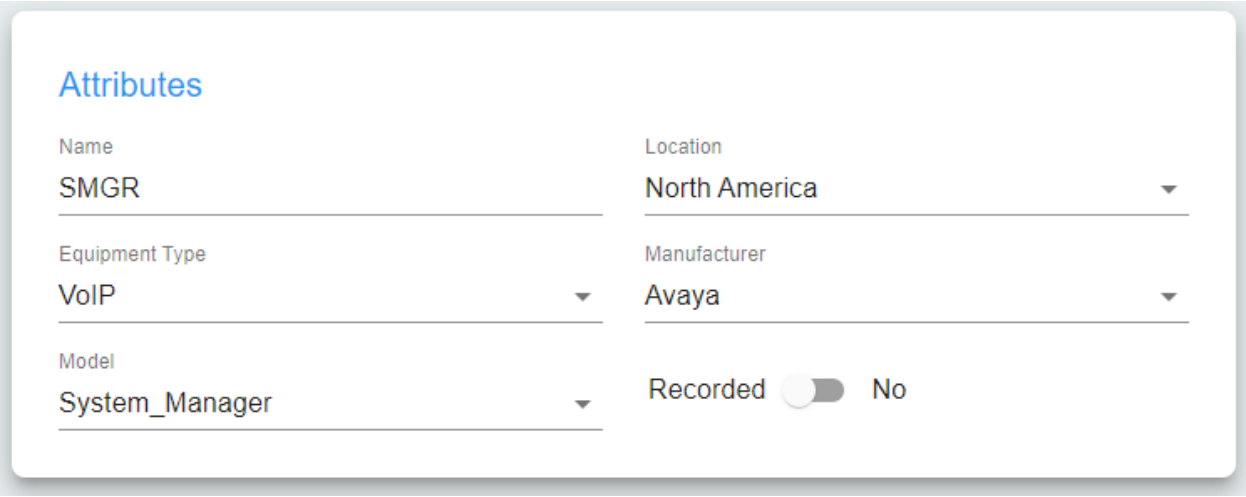
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for System Manager. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

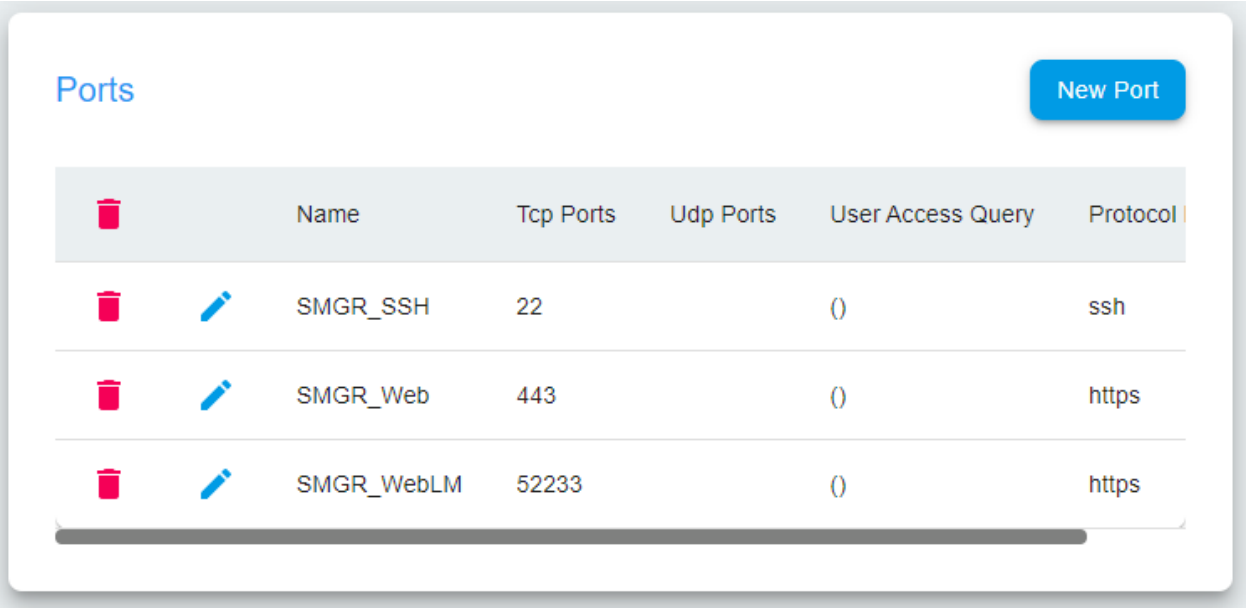


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *SMGR*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



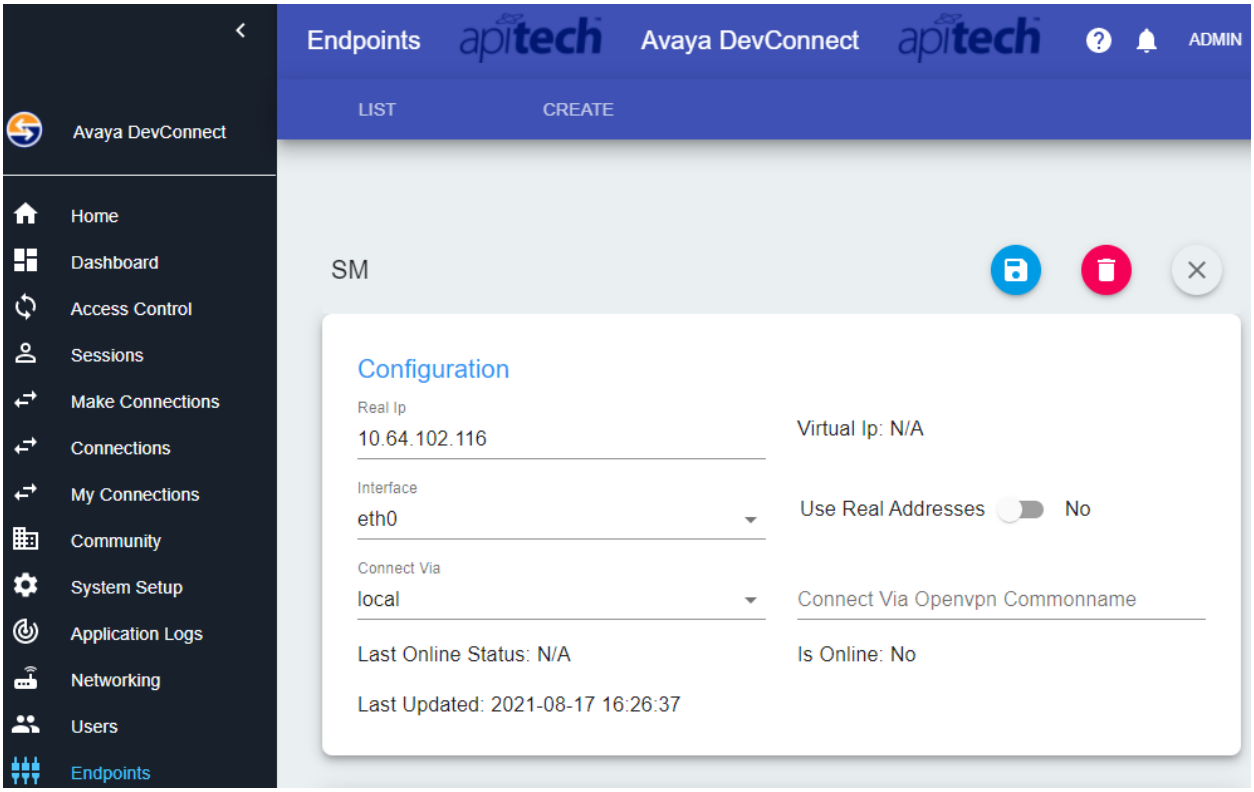
In the **Ports** section, specify *HTTPS* protocol handler and port *443* for the System Manager Web Interface, *SSH* protocol handler and port *22* for SSH, and *HTTPS* protocol handler and port *52233* for WebLM License Server.



6.7.4. Avaya Aura® Session Manager

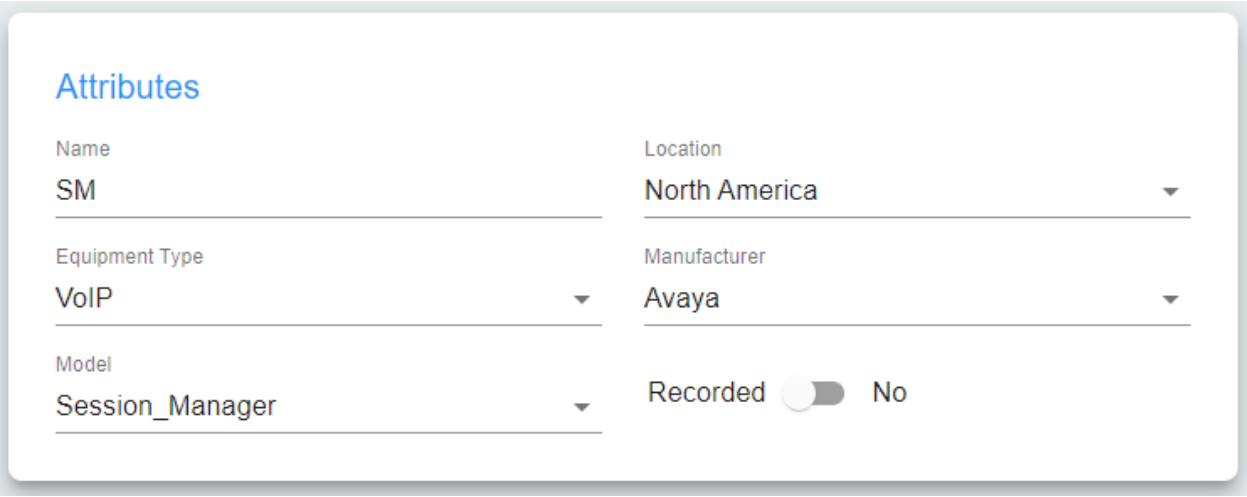
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for Session Manager. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the Session Manager management IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

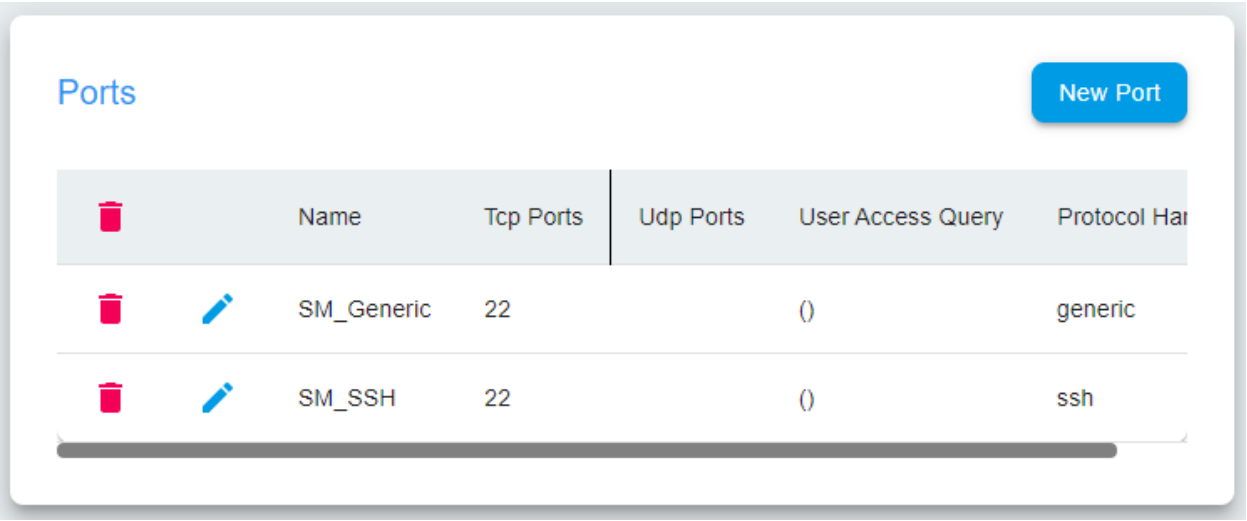


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *SM*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



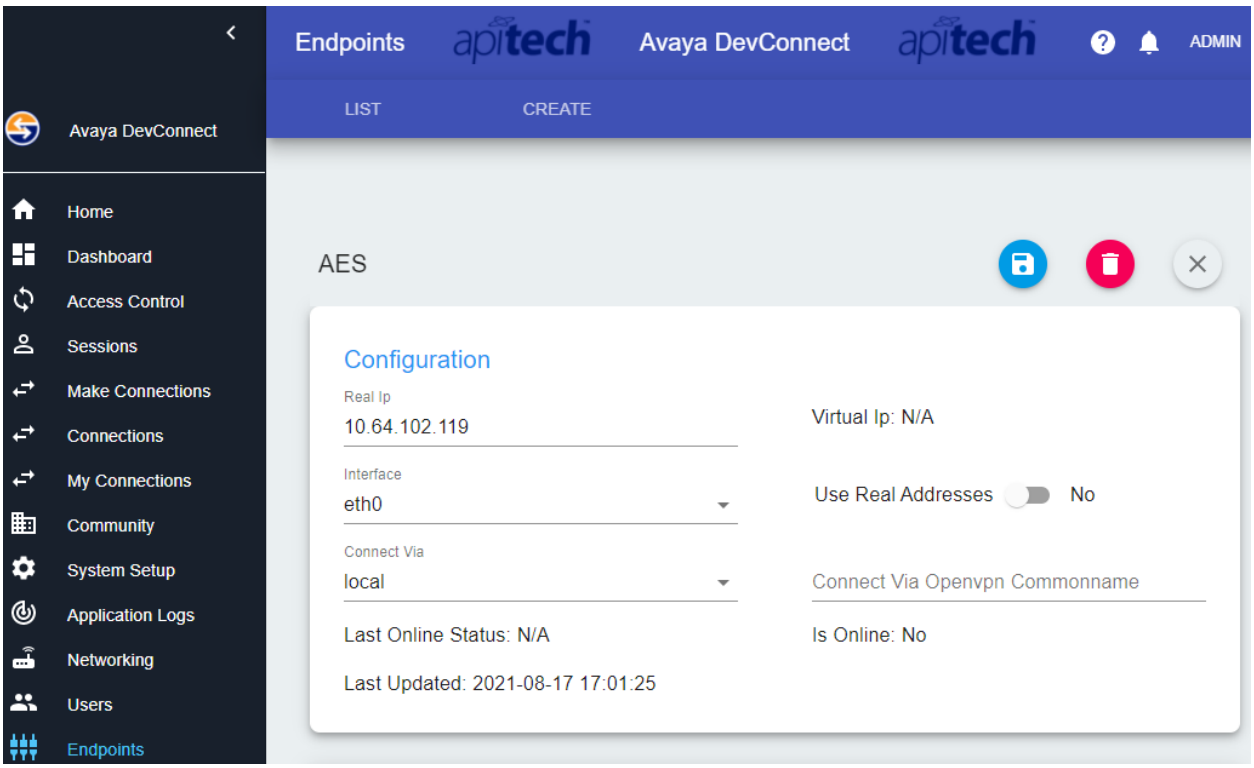
In the **Ports** section, specify *SSH* protocol handler and port *22* for SSH and *Generic* protocol handler and port *22* for SFTP. The SSH session may be used to access the *traceSM* utility tool.



6.7.5. Avaya Aura® Application Enablement Services

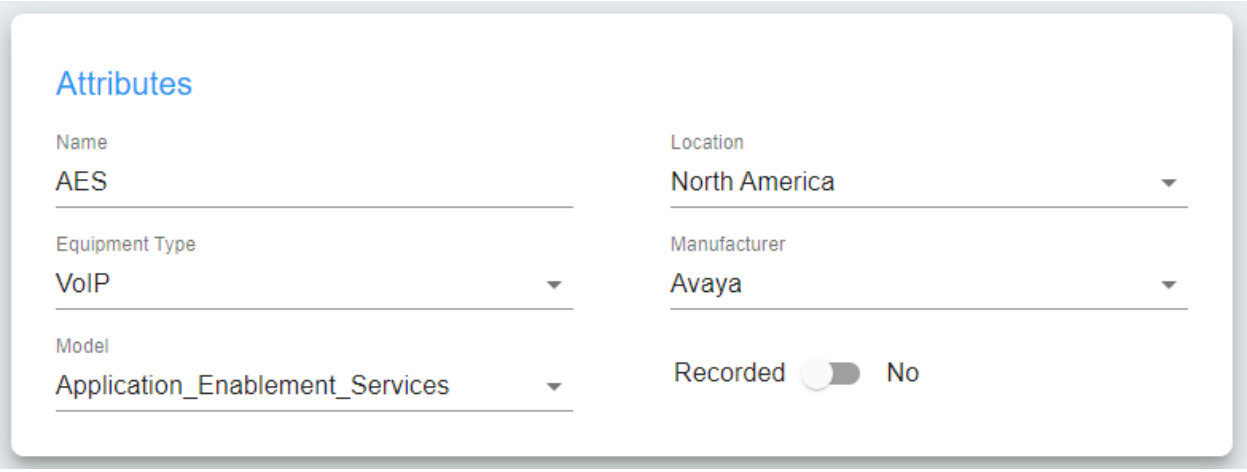
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for Application Enablement Services. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

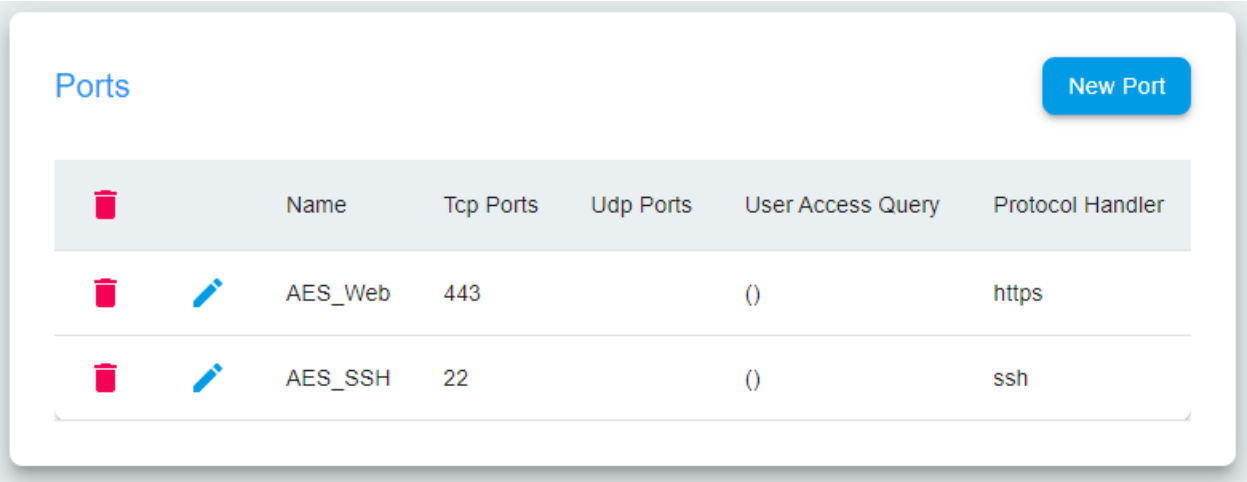


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *AES*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



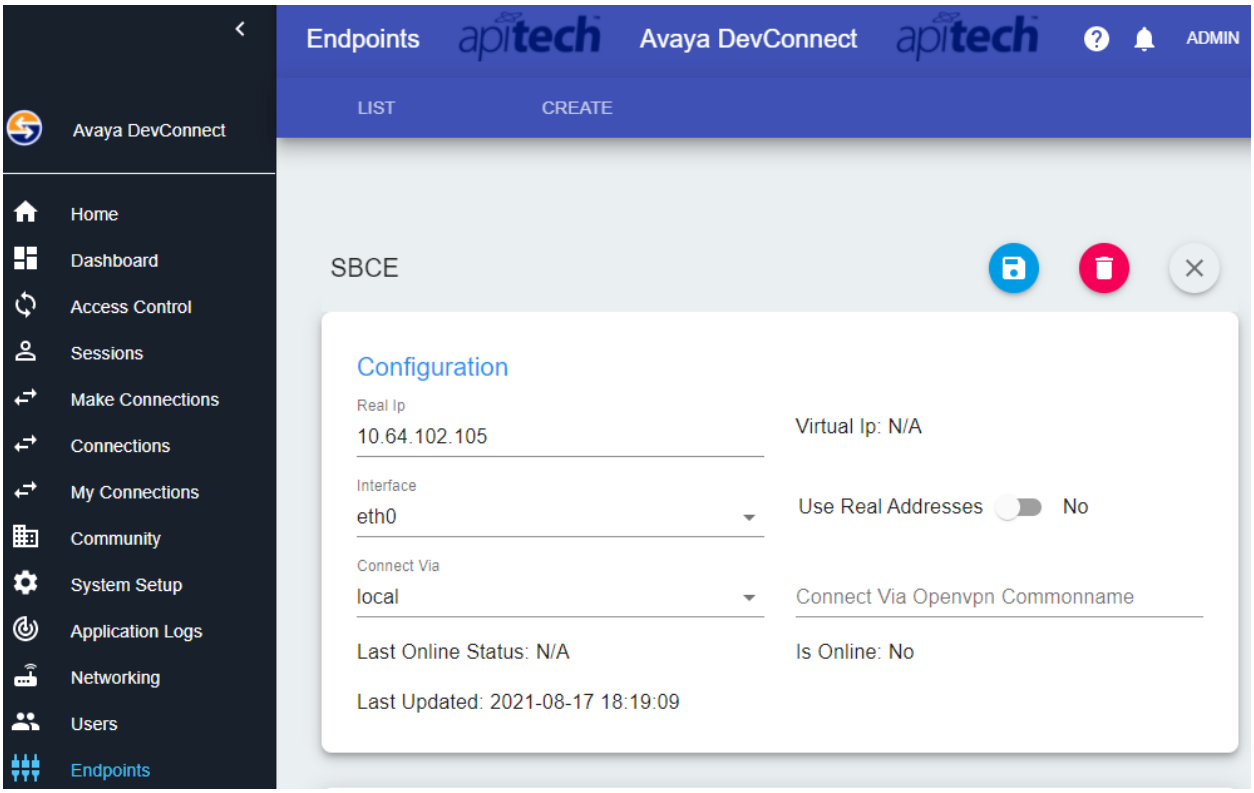
In the **Ports** section, specify *HTTPS* protocol handler and port *443* for the AES Management Console and *SSH* protocol handler and port *22* for SSH.



6.7.6. Avaya Session Border Controller for Enterprise

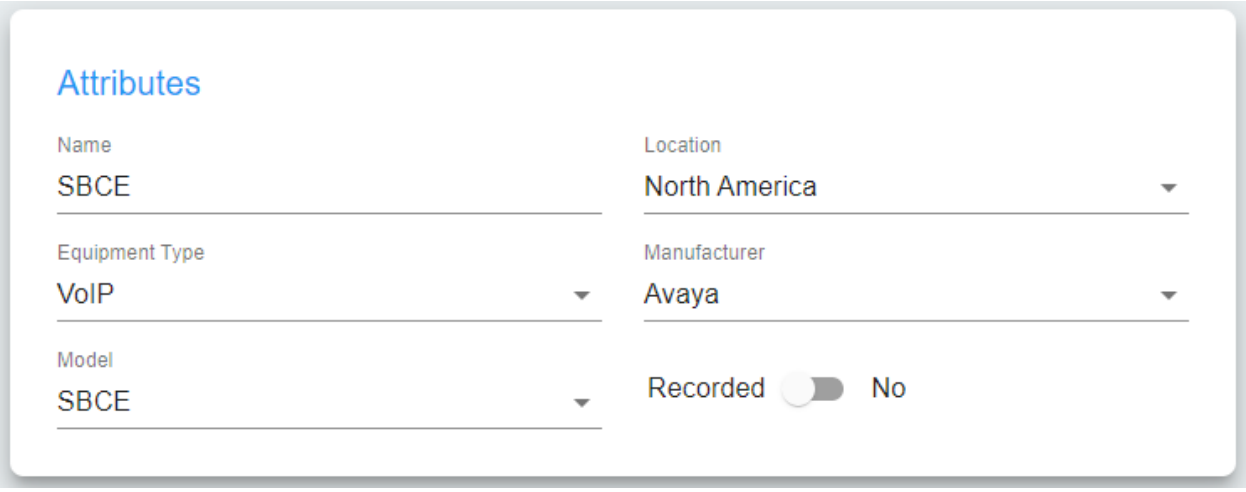
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for Session Border Controller for Enterprise (SBCE). For the compliance test, the EMS and SBCE were deployed on the same server. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

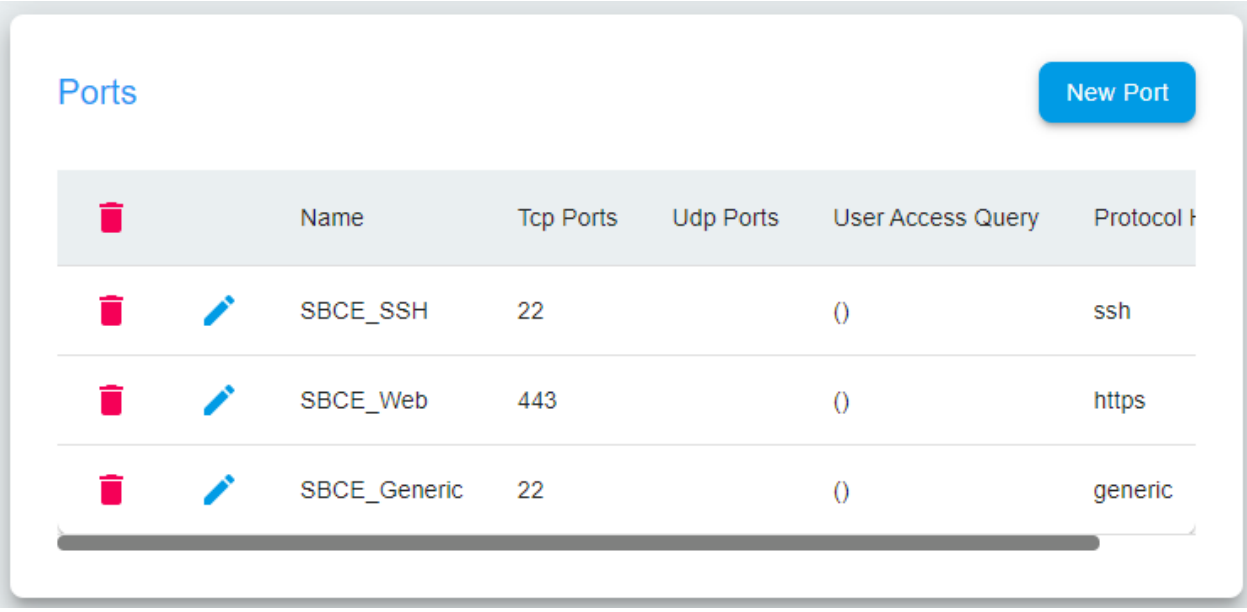


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *SBCE*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



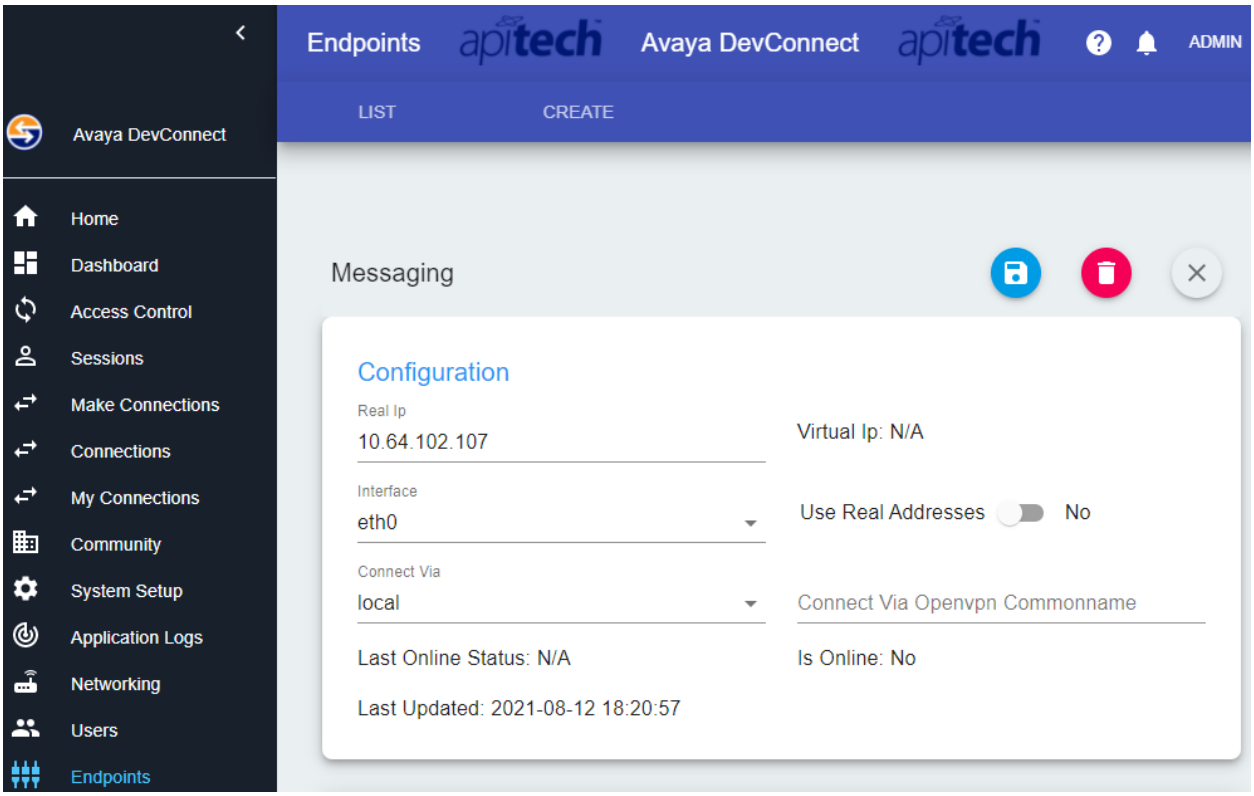
In the **Ports** section, specify *HTTPS* protocol handler and port *443* for the EMS Web Interface, *SSH* protocol handler and port *22* for SSH, and *Generic* protocol handler and port *22* for SFTP. The SSH session may be used to access the *tracesbc* utility tool.



6.7.7. Avaya Messaging

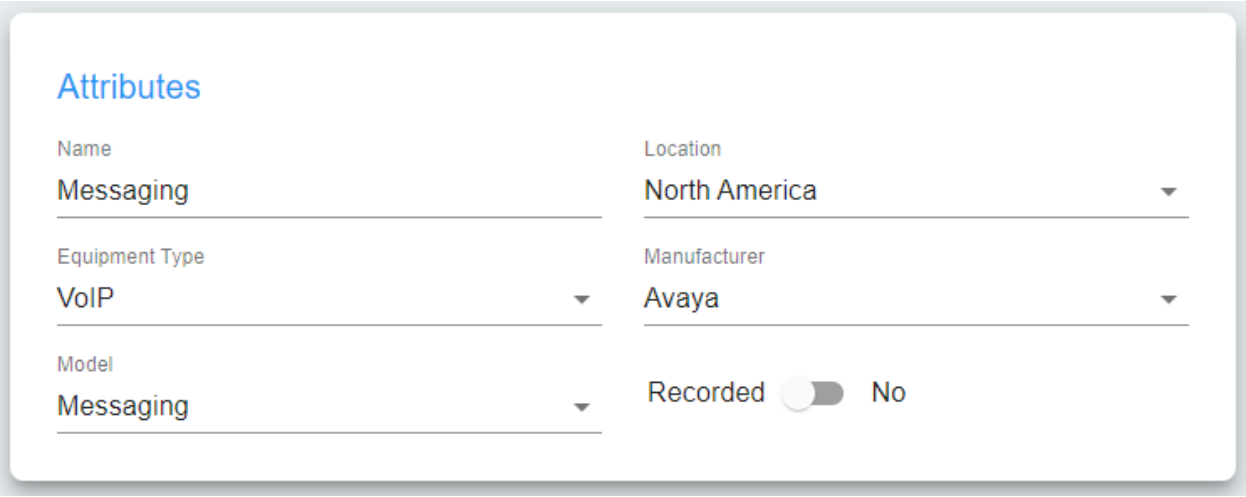
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for Messaging. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

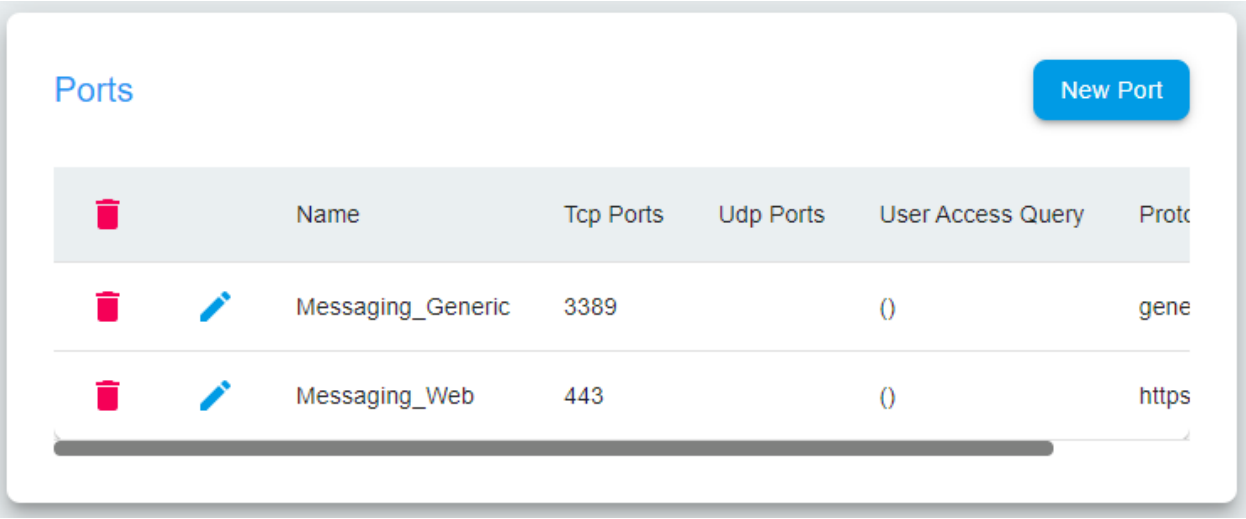


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *Messaging*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



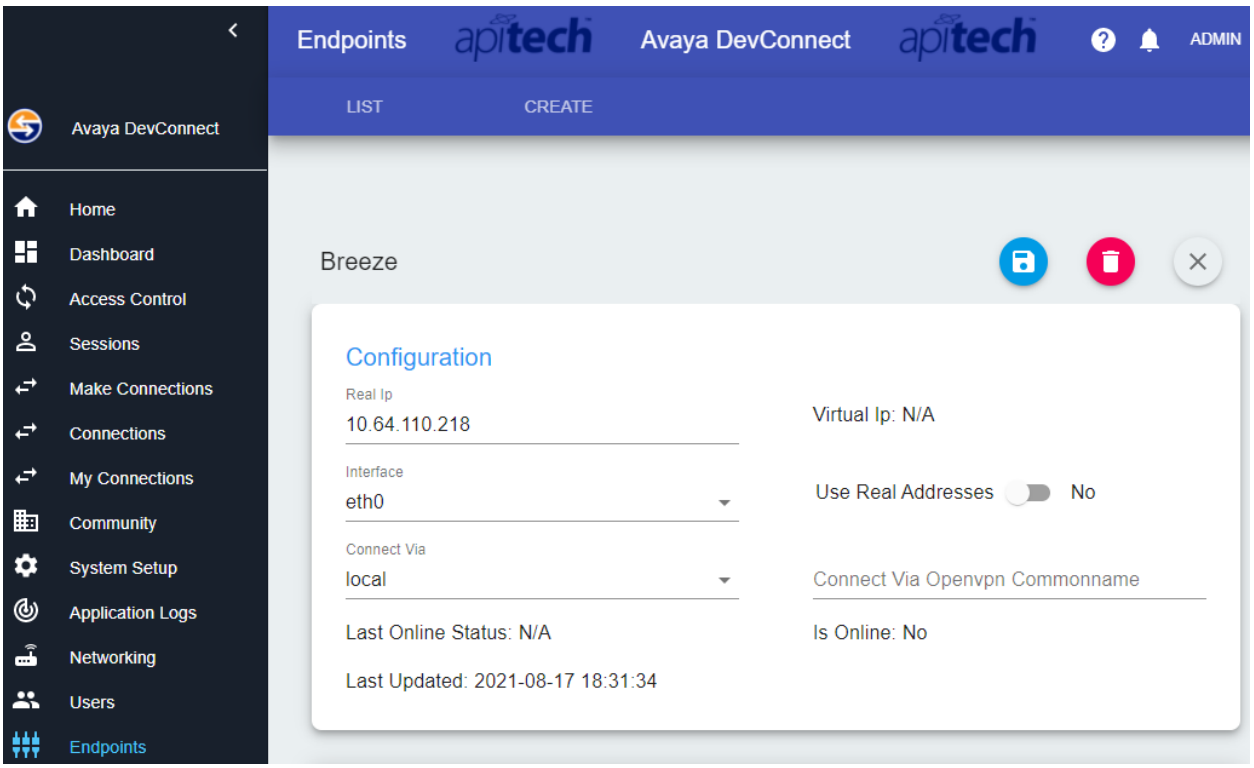
In the **Ports** section, specify *HTTPS* protocol handler and port *443* for Messaging Web Access and *Generic* protocol handler and port *3389* for Remote Desktop (RDP). The RDP session may be used to access the *Messaging Admin* and *SIP Configurator* applications.



6.7.8. Avaya Breeze

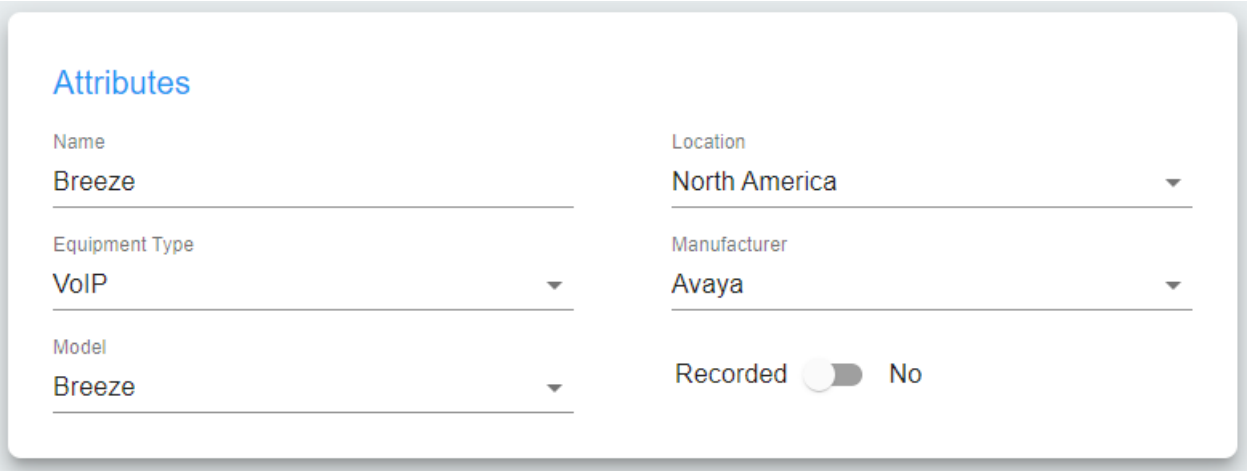
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for Breeze. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

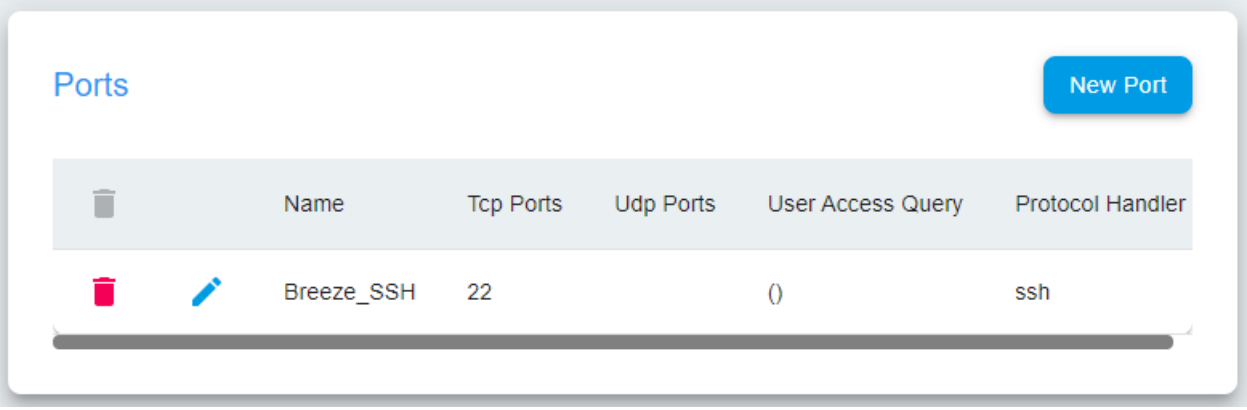


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *Breeze*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



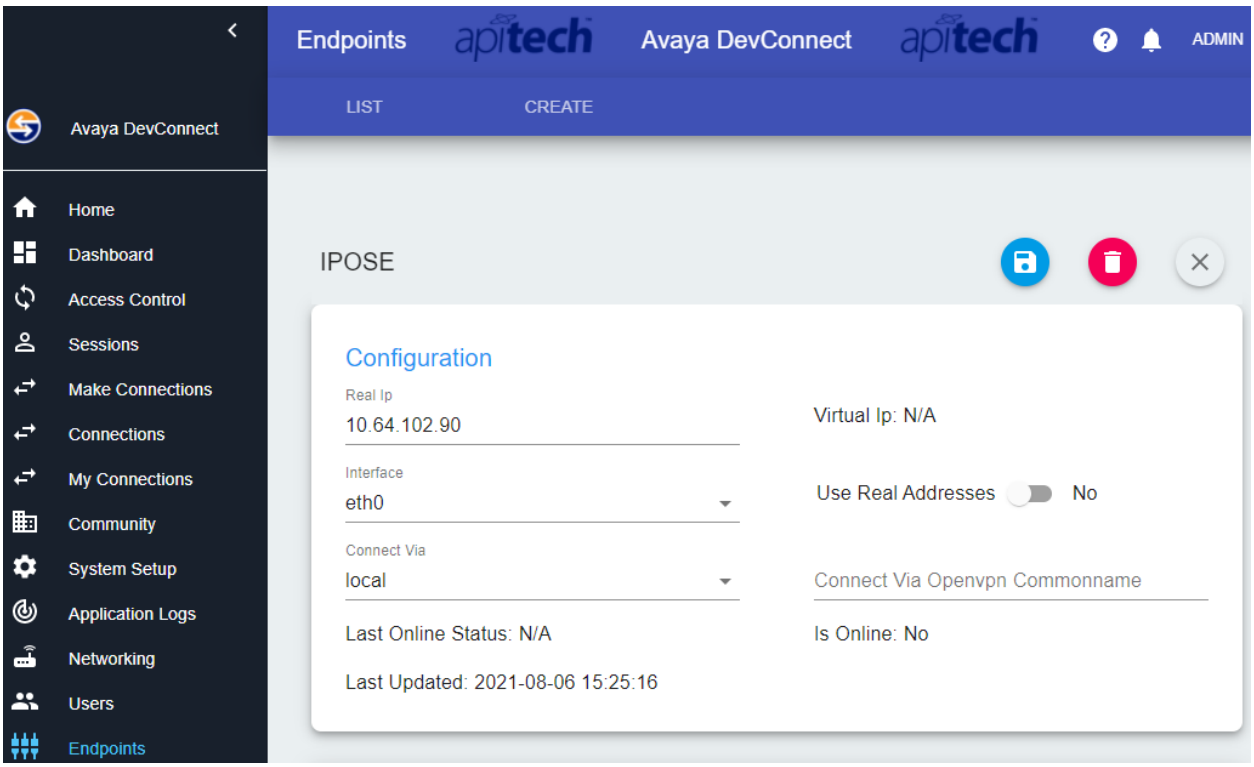
In the **Ports** section, specify *SSH* protocol handler and port *22* for SSH. Note that Breeze is configured through System Manager, which is an endpoint configured in **Section 6.7.3**.



6.7.9. Avaya IP Office Server Edition

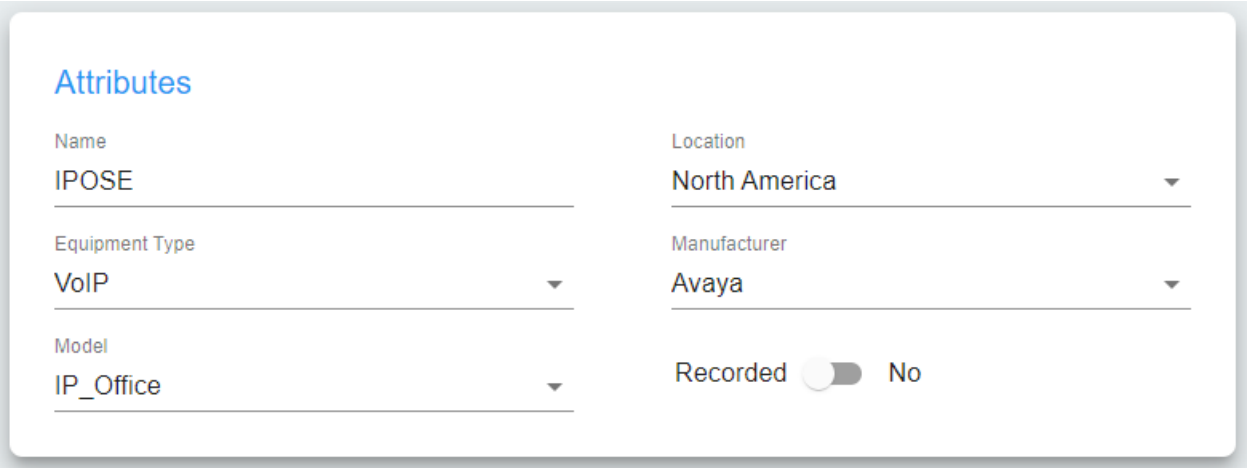
Navigate to **Endpoints** and select the **Create** tab to add an Endpoint for IP Office Server Edition. In the **Configuration** section, configure the following fields:

- **Real IP:** Specify the endpoint's IP address.
- **Use Real Addresses:** Disable this option.
- **Interface:** Specify the endpoint's network interface.

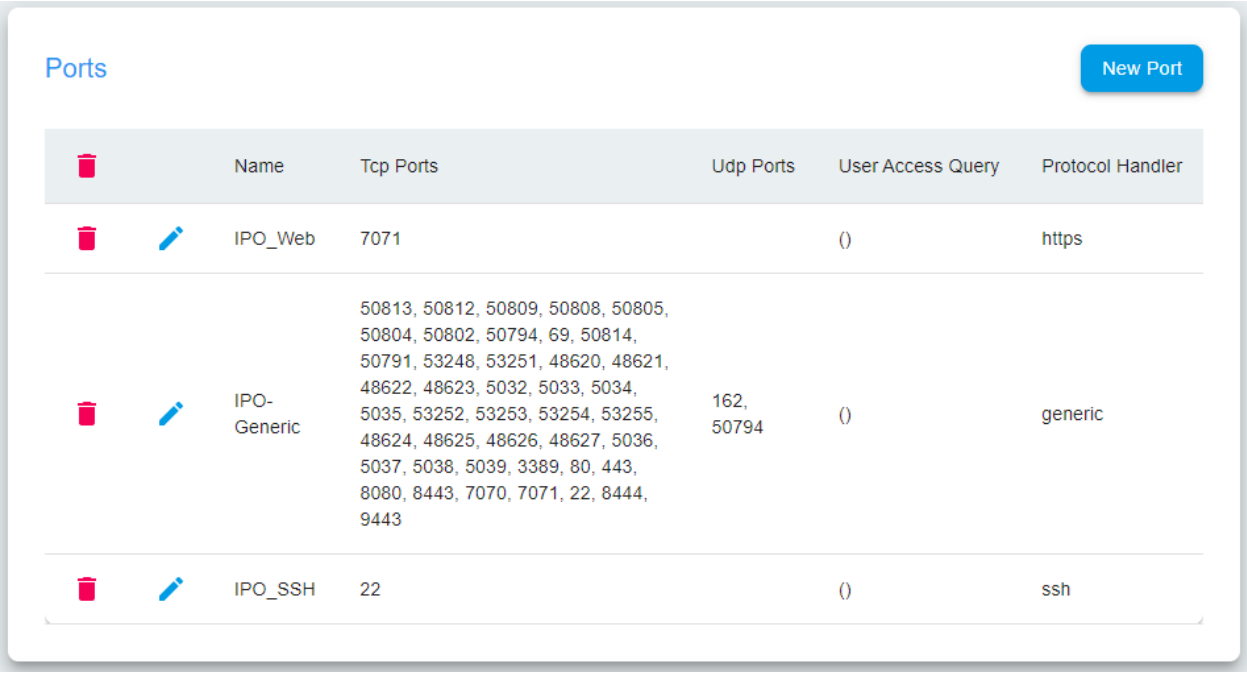


In the **Attributes** section, configure the following fields:

- **Name:** Specify the endpoint's name (e.g., *IPOSE*).
- **Location:** Specify the endpoint's location.
- **Equipment Type:** Set to *VoIP*.
- **Manufacturer:** Set to *Avaya*.
- **Model:** Select the model name from **Section 6.3**.



In the **Ports** section, specify *HTTPS* protocol handler and port *7071* or *7070* for the IP Office Web Manager, *SSH* protocol handler and port *22* for SSH, and *Generic* protocol handler and the ports shown below for access to IP Office Manager, Monitor, and System Status applications. Refer to **[7]** for the ports that should be opened for the IP Office applications.

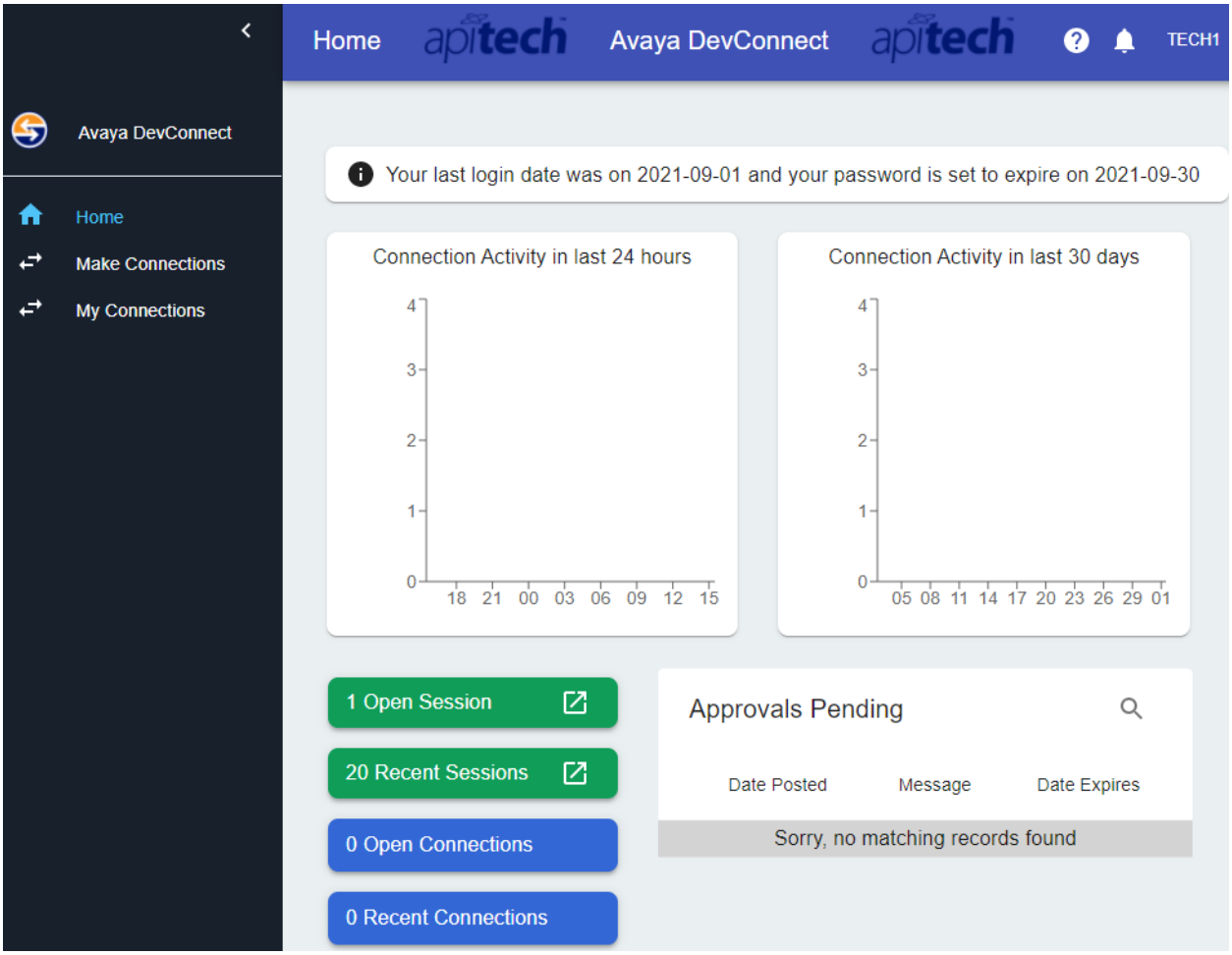


		Name	Tcp Ports	Udp Ports	User Access Query	Protocol Handler
		IPO_Web	7071		()	https
		IPO-Generic	50813, 50812, 50809, 50808, 50805, 50804, 50802, 50794, 69, 50814, 50791, 53248, 53251, 48620, 48621, 48622, 48623, 5032, 5033, 5034, 5035, 53252, 53253, 53254, 53255, 48624, 48625, 48626, 48627, 5036, 5037, 5038, 5039, 3389, 80, 443, 8080, 8443, 7070, 7071, 22, 8444, 9443	162, 50794	()	generic
		IPO_SSH	22		()	ssh

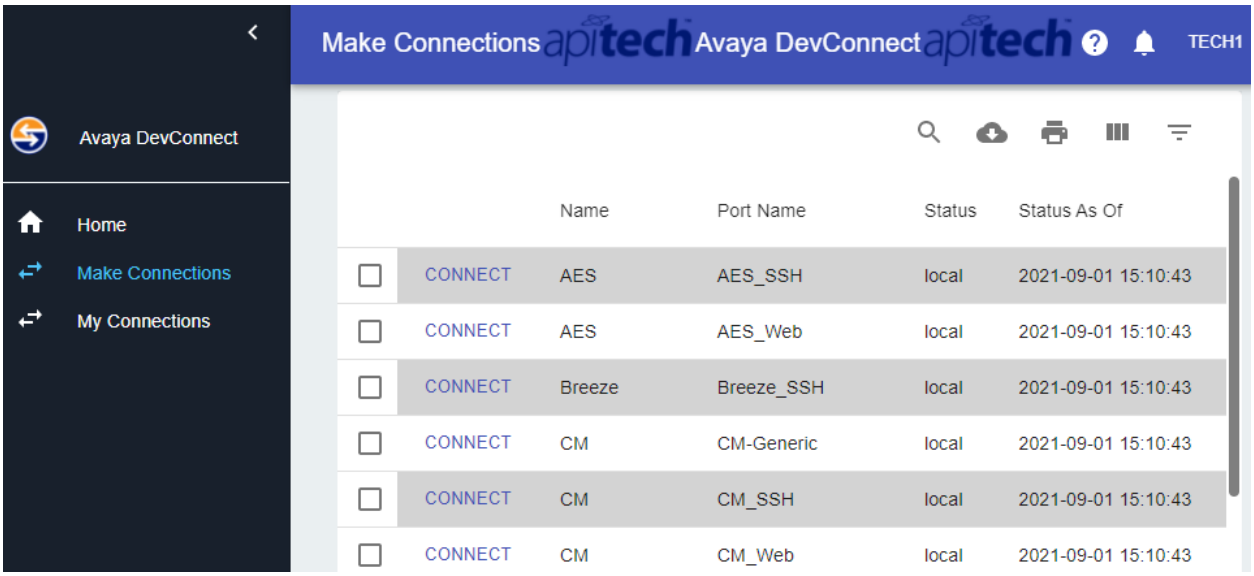
7. Verification Steps

This section provides the tests that can be performed to verify proper configuration of ION Networks Netgard Privileged Gateway with a few Avaya endpoints using SSH, Web/HTTPS, RDP, and IPO Manager.

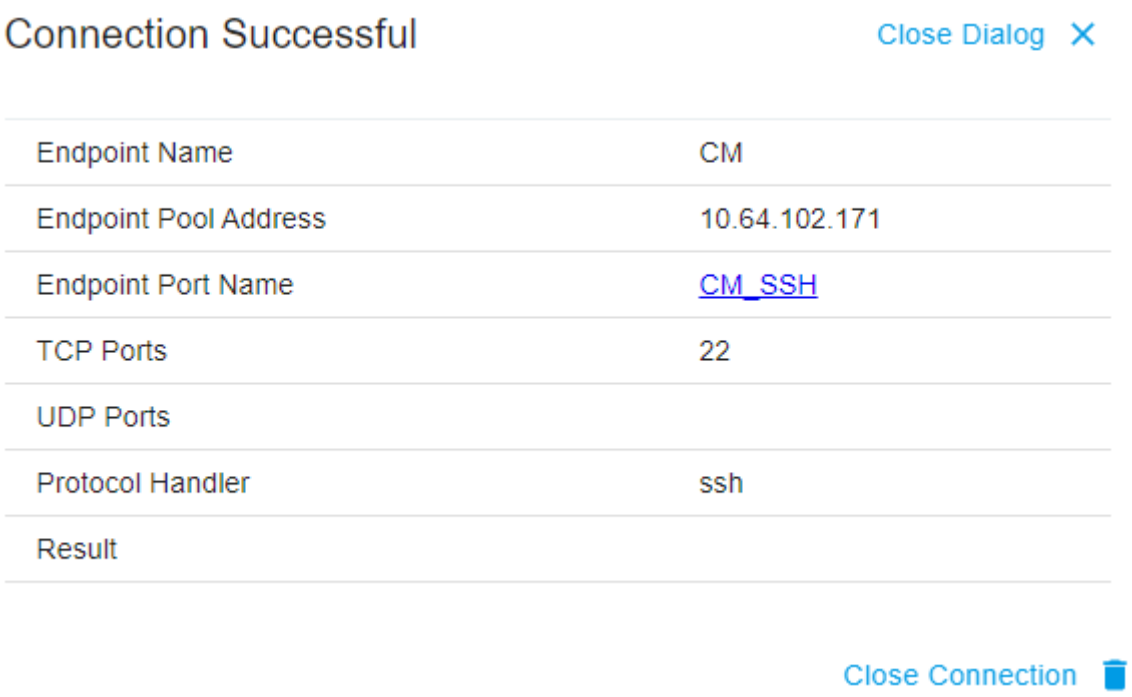
1. Log into the NPG Web Interface using a "technician" account. Verify the following screen is displayed with the **Make Connections** option in the left pane.



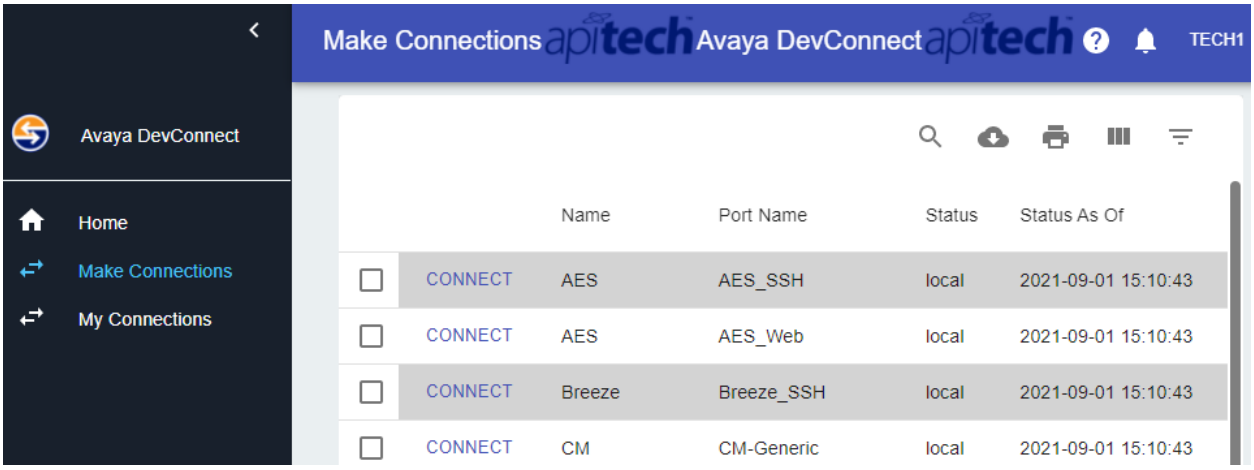
2. Click on the **Make Connections** option to display a list of endpoints available to the technician. Click on **CONNECT** associated with an SSH connection (e.g., *CM_SSH*).



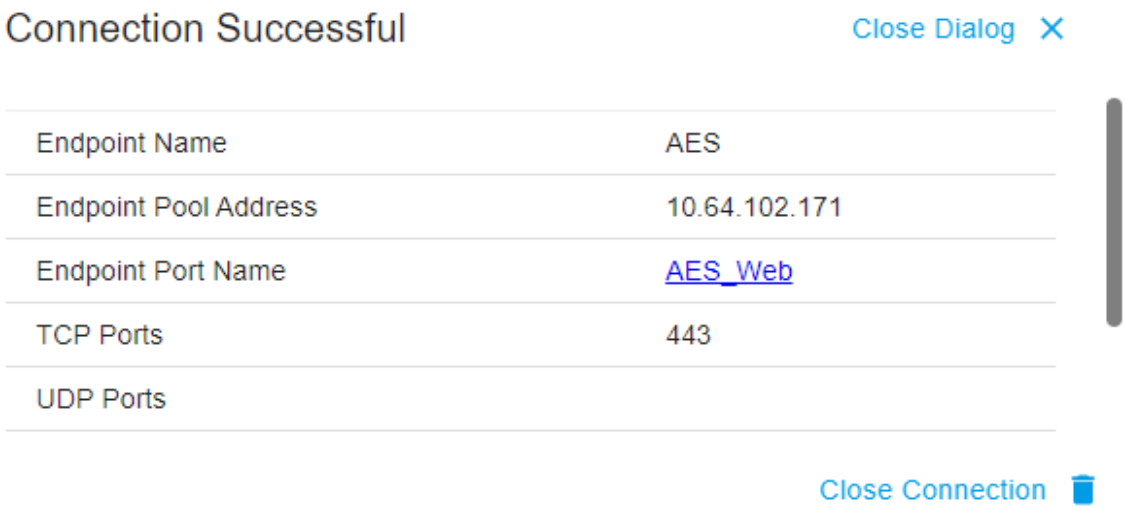
3. Verify the connection is established successfully as shown below. Click on the **Endpoint Port Name** (e.g., *CM_SSH*) to open the default SSH application and log into Communication Manager with the appropriate credentials. When done, click on **Close Connection** to terminate the connection.



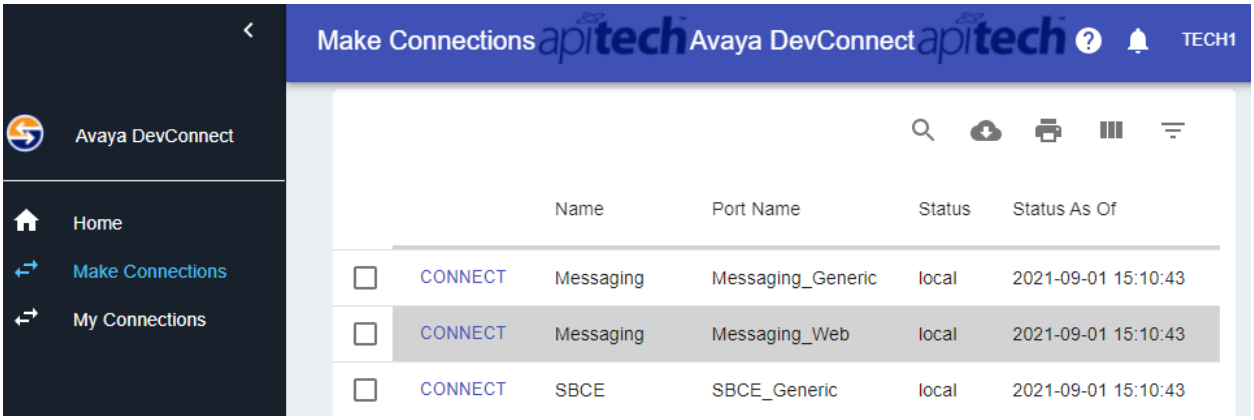
4. Click on the **Make Connections** option to display a list of endpoints available to the technician. Click on **CONNECT** associated with an Web/HTTPS connection (e.g., *AES_Web*).



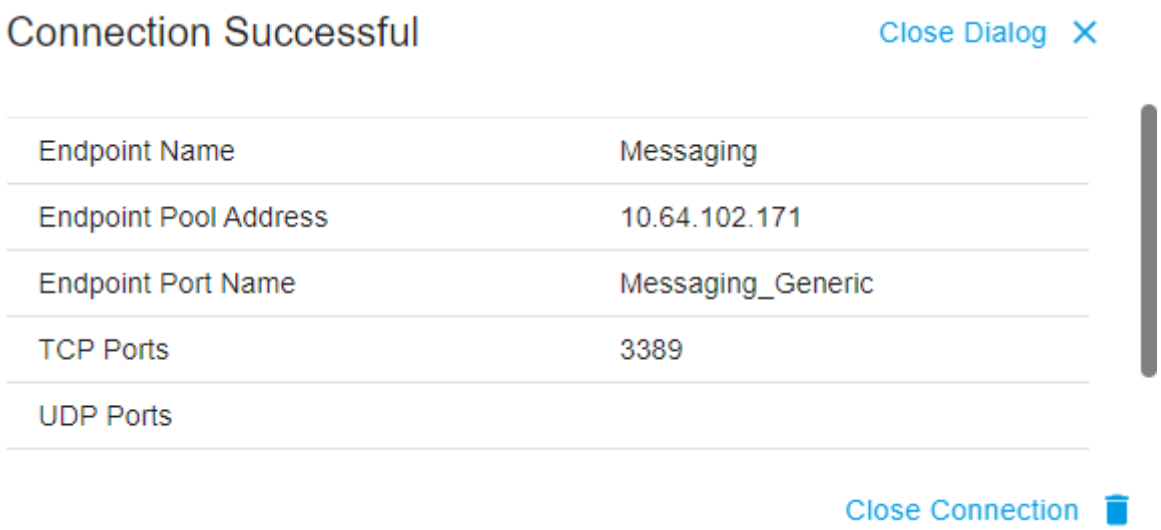
5. Verify the connection is established successfully as shown below. Click on the **Endpoint Port Name** (e.g., *AES_Web*) to open an Internet browser and log into AES with the appropriate credentials. When done, click on **Close Connection** to terminate the connection.



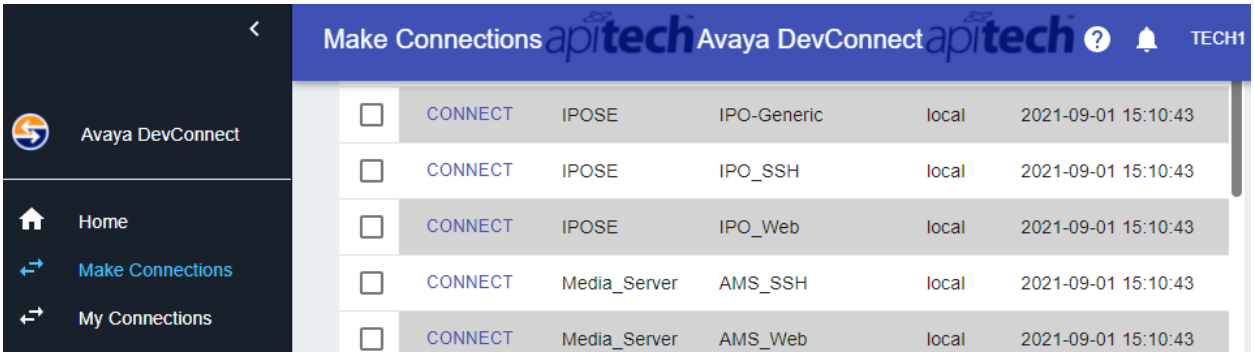
6. Click on the **Make Connections** option to display a list of endpoints available to the technician. Click on **CONNECT** associated with a Generic connection using port 3389 for Remote Desktop (e.g., *Messaging_Generic*).



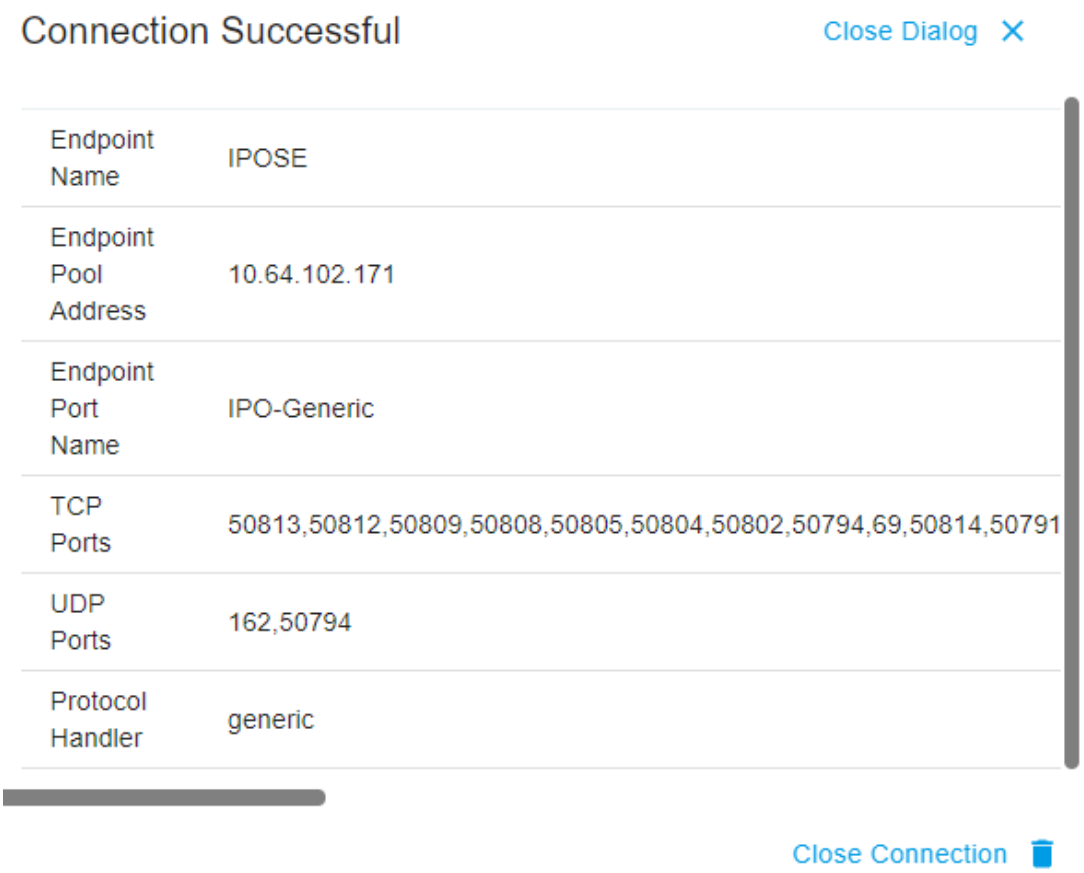
7. Verify the connection is established successfully as shown below. Note that when the "generic" protocol handler is used, no **Endpoint Port Name** is provided. The technician should use the **Endpoint Pool Address** (e.g., *10.64.102.171*) to enter in Remote Desktop. Log in with the appropriate credentials. When done, click on **Close Connection** to terminate the connection.



8. Click on the **Make Connections** option to display a list of endpoints available to the technician. Click on **CONNECT** associated with a Generic connection using IP Office Server Edition ports for IP Office Manager (e.g., *IPO_Generic*).



9. Verify the connection is established successfully as shown below. Note that when the "generic" protocol handler is used, no **Endpoint Port Name** is provided. The technician should use the **Endpoint Pool Name** (e.g., *10.64.102.171*) to open IP Office Manager, Monitor, or System Status. Log in with the appropriate credentials. When done, click on **Close Connection** to terminate the connection.



8. Conclusion

These Application Notes describe the configuration steps required to enable ION Networks Netgard Privileged Gateway to provide secure access to Avaya Aura® Suite, Avaya Session Border Controller for Enterprise, Avaya Messaging, Avaya Breeze, and Avaya IP Office. System access to the Avaya endpoints successfully used SSH, SFTP, HTTPS, RDP, and thick clients. All test cases passed with observations noted in **Section 2.2**.

9. References

This section references the Avaya documentation relevant to these Application Notes available at http://support.avaya.com.

[1] *Avaya Port Matrix: Avaya Aura® Communication Manager 8.1.3*, Issue 1.1, March 10, 2021.
[2] *Avaya Port Matrix: Avaya Aura® System Manager 8.1*, Issue 4.0, March 16, 2021.
[3] *Avaya Port Matrix: Avaya Aura® Session Manager 8.1.12*, Issue 1.0, June 12, 2021, DocID 193457.
[4] *Avaya Port Matrix: Avaya Aura® Application Enablement Services 8.1.11*, Issue 1.0, March 2021.
[5] *Avaya Port Matrix: Avaya Aura® Presence Services 8.1.4*, Issue 1.0, April 5, 2021.
[6] *Avaya Port Matrix: Avaya Session Border Controller for Enterprise (SBCE)*, Release 8.x, Issue 1, December 2020.
[7] *Avaya Port Matrix: Avaya IP Office 11.1.1.0*, Issue 12.4, January 28, 2021.

Please e-mail any questions or comments pertaining to these Application Notes along with the full title name and filename, located in the lower right corner, directly to the Avaya DevConnect Program at devconnect@avaya.com.