

# gNMI Dial-Out Using the gRPC Tunnel Service

This module describes how to configure a tunnel service for gNMI dial-out connections. You can use the gRPC tunnel server to forward connections from external clients, such as a gRPC Network Management Interface (gNMI) or gRPC Network Operations interface (gNOI), to connect to a network device without establishing a direct connection.

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# gNMI Dial-Out Using gRPC Tunnel Service

In releases prior to Cisco IOS XE Dublin 17.11.1, gNMI supports a dial-in session, where the data collector sends RPCs directly to a network device. From Cisco IOS XE Dublin 17.11.1, gNMI uses a tunnel service for gNMI dial-out connections based on the recommendation from the OpenConfig forum.

With gNMI dial-out through gRPC tunnel service, you can use a router (tunnel client) to dial out to a collector (tunnel server). After establishing a session, the tunnel server acts as a client and requests gNMI services. The tunnel server then forwards requests from one or more gNMI or gNOI clients. Note that the gRPC tunnel server and the gNMI or gNOI client may be distinct entities.



**Note** The gRPC tunnel design is based on the feature specifications provided in the **tunnel.proto** file.

For more information about gNMI dial-out using gRPC tunnel, see the Github repository.



Note The tunnel service supports only Transport Layer Security (TLS) sessions.

# Information About gNMI Dial-Out Using gRPC Tunnel Service

The following sections provide detailed information about a traditional gRPC connection, a gRC tunnel, and connecting to GNMIB using a gRPC tunnel.

### Traditional gRPC Connection

The yellow arrow in the following image shows the traditional method of connecting to a network device to access gRPC or gNOI services. The gNMI client connects to the network device only when the gNMI client is allowed to establish a direct connection.





## gRPC Tunnel

The following are the main components of a gRPC tunnel:

- Target: Represents a single service on a network device. For example, gNMI or gNOI is one target type. A tunnel client can register one or more target types with a tunnel server.
- Tunnel: A bidirectional stream in which data can be forwarded between the tunnel client and the server.
- Tunnel Server: The gRPC server that manages the target subscriptions and registrations.
- Tunnel Client: GNMIB is the gRPC tunnel client.

## **Connecting to GNMIB Using the gRPC Tunnel**

In the gRPC tunnel design, the traditional flow is reversed. The network device dials out to the gRPC tunnel server. This leads to the gRPC tunnel server and any gNMI or gNOI clients to be unaware of the network device addresses and locations. Also, the network devices can access the gRPC tunnel server even if its outgoing connections are blocked.

#### Figure 2: A New Method of Connecting to GNMIB



# How to Configure gNMI Dial-Out Using gRPC Tunnel Service

The following sections provide detailed information about the configurations that comprise the larger gNMI dial-out using gRPC tunnel service configuration.

## **Configuring and Enabling a Target**

Run the following commands on a network device to configure and enable the target:

#### SUMMARY STEPS

- 1. enable
- **2**. configure terminal
- 3. gnxi grpctunnel target {GNMI\_GNOI | GNMI\_GNOI\_INSECURE}
- 4. enable
- 5. end

#### **DETAILED STEPS**

	Command or Action	Purpose	
Step 1	enable	Enables privileged EXEC mode.	
	Example:	• Enter your password if prompted.	
	Device> enable		
Step 2	configure terminal	Enters global configuration mode.	
	Example:		
	Device# configure terminal		
Step 3	gnxi grpctunnel target {GNMI_GNOI   GNMI_GNOI_INSECURE}	Configures a gRPC tunnel target, and enters target configuration mode.	
	<pre>Example: Device(config)# gnxi grpctunnel target GNMI_GNOI</pre>	Note Only GNMI_GNOI targets are supported. The GNMI_GNOI_INSECURE target is for testing purposes only and always connects to the GNMIB's insecure port.	
Step 4	enable	Enables the tunnel target.	
	Example:		
	<pre>Device(config-target)# enable</pre>		
Step 5	end	Exits target configuration mode and returns to privileged EXEC mode.	
	Example:		
	Device(config-target)# end		

# **Configuring a gRPC Tunnel**

Run the following commands to configure and enable a target in a network device that is part of a gRPC tunnel. Configure the IP address of the tunnel server, the port the tunnel server listens on, and the source or outgoing VRF. The following configuration task shows how the target sends data to the server:

#### **SUMMARY STEPS**

- 1. enable
- **2**. configure terminal
- 3. gnxi grpctunnel destination destination-name
- 4. enable
- 5. address IP-address
- 6. port port-number
- 7. identity-trustpoint trustpoint-name
- 8. source-address IP-address
- 9. source-vrf VRF-name
- 10. end

#### **DETAILED STEPS**

	Command or Action	Purpose	
Step 1	enable	Enables privileged EXEC mode.	
	Example:	• Enter your password if prompted.	
	Device> enable		
Step 2	configure terminal	Enters global configuration mode.	
	Example:		
	Device# configure terminal		
Step 3	gnxi grpctunnel destination destination-name	Configures a gRPC tunnel destination and enters	
	Example:	destination configuration mode.	
	Device(config)# gnxi grpctunnel destination foobar		
Step 4	enable	Enables the tunnel destination.	
	Example:		
	<pre>Device(config-destination)# enable</pre>		
	<pre>% node-1:dbm:gnmi:Destination address must be set when destination is enabled</pre>		
Step 5	address IP-address	Configures the destination IP address.	
	Example:		
	<pre>Device(config-destination)# address 209.165.200.225</pre>		
Step 6	port port-number	Configures the destination port.	
	Example:	• Valid values for the <i>port-number</i> argument are from	
	Device(config-destination) # port 1234	0 to 65535.	
Step 7	identity-trustpoint trustpoint-name	Configures the specified trustpoint certificate as the TLS	
	Example:	identity when connecting securely to a destination.	
	<pre>Device(config-destination)# identity-trustpoint trustpoint1</pre>		
Step 8	source-address IP-address	Configures the outgoing source address to use when connecting to the tunnel server or destination.	
	Example:		
	<pre>Device(config-destination)# source-address 209.165.201.30</pre>		
Step 9	source-vrf VRF-name	Configures a source Virtual Routing and Forwarding	
	Example:	(VRF) instance when connecting to the tunnel server or destination	
	Device(config-destination) # source-vrf Mgmt-vrf		
Step 10	end	Exits destination configuration mode and returns to privileged EXEC mode.	
	Example:		

Command or Action	Purpose
Device(config-destination)# end	

# Verifying the gNMI Dial-Out Using gRPC Tunnel Service Configuration

Use the following command to verify the state of the gRPC tunnel service interface:

```
Device# show gnxi state detail
Settings
_____
Server: Enabled
Server port: 50052
Secure server: Enabled
Secure server port: 9339
Secure client authentication: Disabled
Secure trustpoint: gnoi_pyats
Secure client trustpoint:
Secure password authentication: Disabled
GNMI
____
Admin state: Enabled
Oper status: Up
State: Provisioned
aRPC Server
_____
Admin state: Enabled
Oper status: Up
Configuration service
_____
Admin state: Enabled
Oper status: Up
Telemetry service
 _____
Admin state: Enabled
Oper status: Up
GNOI
====
Cert Management service
_____
Admin state: Enabled
Oper status: Up
OS Image service
_____
Admin state: Enabled
Oper status: Up
Supported: Supported
Factory Reset service
_____
Admin state: Enabled
Oper status: Up
Supported: Supported
GRPC Tunnel
_____
```

Admin state: Enabled Oper status: Up

Use the following command to display the statuses of all the currently configured gRPC tunnel servers:

Device# show gnxi grpctunnel destinations

```
All configured destinations
Destination Name: foobar
Target: GNMI_GNOI
Tag: 1
Registered: Yes
Session Started: Yes
Tunnel Active: Yes
Error:
Destination Name: example
Target: GNMI_GNOI
Tag: 1
Registered: Yes
Session Started: Yes
Tunnel Active: Yes
Error:
```

# Feature Information for gNMI Dial-Out Using gRPC Tunnel Service

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Feature Name	Release	Feature Information
gNMI Dial-Out Using gRPC Tunnel Service	Cisco IOS XE Dublin 17.11.1	This feature allows you to configure a network device (tunnel client) to register certain targets (preapproved services) with a gRPC tunnel server through the CLI.
		The following commands were introduced for this feature:
		• gnxi grpctunnel destination
		• gnxi grpctunnel target
		This feature was introduced on the following platforms:
		Cisco Catalyst 9200, 9200L, and 9200CX Series Switches
		• Cisco Catalyst 9300, 9300L, and 9300X Series Switches
		Cisco Catalyst 9400 and 9400X Series Switches
		Cisco Catalyst 9500 and 9500-High Performance Series Switches
		Cisco Catalyst 9600 and 9600X Series Switches
		<ul> <li>Cisco Network Convergence System 4200 Series</li> </ul>

#### Table 1: Feature Information for gNMI Dial-Out Using gRPC Tunnel Service