Reference Guide

AudioCodes Multi-Service Business Routers (MSBR)

TR-069

CPE WAN Management Protocol (CWMP) for Remote Device Management

Version 6.8

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Table of Contents

List of Figures

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Abbreviations and Terminology

Each abbreviation, unless widely used, is spelled out in full when first used.

Document Revision Record

LTRT	Description
52340	Initial document release for Version 6.8.
52341	TR-098 added.
52342	InternetGatewayDevice.UploadDiagnostics. parameters; InternetGatewayDevice.DownloadDiagnostics.parameters; InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.IEEE11iAuthenticationMode; InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.IEEE11iEncryptionMode

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1 Introduction

This document describes the CPE WAN Management Protocol (TR-069), intended for communication between a CPE—**AudioCodes Mediant MSBR series**—and an Auto-Configuration Server (ACS). The CPE WAN Management Protocol defines a mechanism that encompasses secure auto-configuration of a CPE, and also incorporates other CPE management functions into a common framework.

The CPE WAN Management Protocol is intended to support a variety of functionalities to manage a collection of CPE, including the following primary capabilities:

■ Auto-configuration and dynamic service provisioning

■ Software/firmware image management

■ Software module management

■ Status and performance monitoring

■ Diagnostics

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2 TR-069 Data Model

TR-069 is a specification published by Broadband Forum (www.broadband-forum.org) entitled CPE WAN management protocol (CWMP). It defines an application layer protocol for remote management of end-user devices.

TR-069 uses a bi-directional SOAP/HTTP protocol for communication between the customer premises equipment (CPE) and the Auto Configuration Servers (ACS). For MSBR devices, the TR-069 connection to the ACS can be done on the LAN or WAN interface.

The protocol stack looks as follows:

Figure 2-1: TR-069 Protocol Stack

CPE/ACS Management Application
RPC Methods
SOAP
HTTP
SSL/TLS
TCP/IP

Communication is typically established by the CPE; hence, messages from CPE to ACS are typically carried in HTTP requests, and messages from ACS to CPE in HTTP responses.

Figure 2-2: TR-069 Session Example
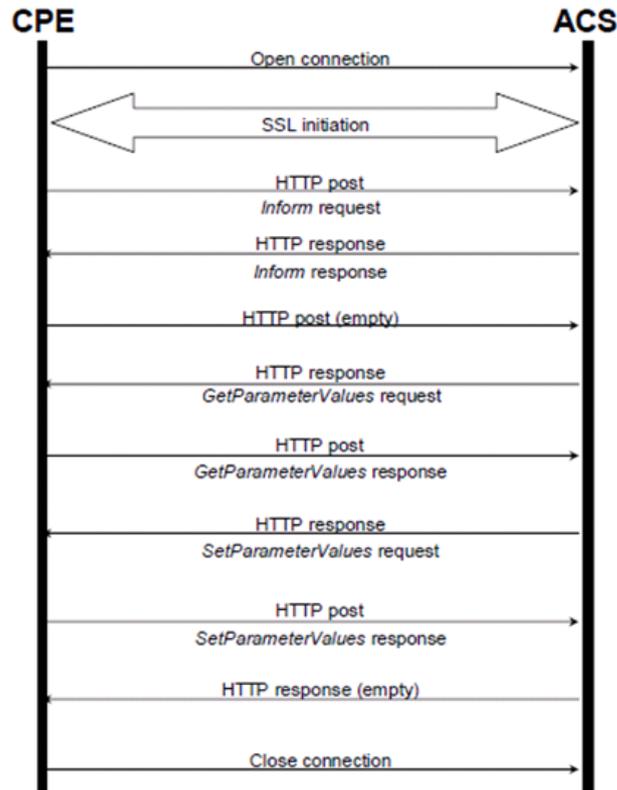
Communication between ACS and CPE is defined via Remote Procedure Call (RPC) methods. TR-069 defines a generic mechanism by which an ACS can read or write

parameters to configure a CPE and monitor CPE status and statistics. It also defines the mechanism for file transfer and firmware/software management. However, it does not define individual parameters; these are defined in separate documents, as described below.

Some of the RPC methods are Configuration File Download, Firmware upgrade, Get Parameter Value, Set Parameter Value, Reboot, and the upload and download files.

3   Configuring TR-069 through CLI

This section describes how to enable and configure TR-069 through the device's CLI.

➢ **To configure TR-069 using CLI:**

1. Establish serial communication with the device.
2. Log in to the CLI.
3. Access the System configuration mode:

```
# configure system
(config-system)#
```

4. At the prompt, access the CWMP command set by entering the following:

```
(config-system)# cwmp
(cwmp-tr069)#
```

The TR-069 parameters are described in the table below.

Table 3-1: TR-069 Parameters

Parameter	Description
`acs-password [STRING]` `acs-password [STRING] obscured`	Defines the password to access the ACS.
`acs-url-provisioning-mode` `[automatic | manual]`	Determines whether the ACS URL is acquired using DHCP Option 43 (automatic) or user-defined (manual). When using the automatic option, you also need to add parameters under the WAN interface.
`acs-url`	Defines the ACS URL. **Note:** This command is applicable only if **acs-url-provisioning-mode manual**.
`activate`	Applies changes.
`connection-request-password`	Defines the CPE connection request password.
`connection-request-user-name`	Defines the CPE connection request username.
`cwmp-debug-online`	Enables CWMP debugging online and print TR additional debugging information to the Syslog.
`default-inform-interval`	Defines the TR-069 default periodic inform interval (in seconds).
`defaults`	Defines all CWMP parameters to their default value.
`exit`	Exits from the current mode.
`port`	Defines the TR-069 port of the device.
`protocol`	Defines the TR-069 protocol (HTTP or HTTPS).
`send-connection-request`	The CPE issues a connection request event toward an ACS.
`service [on | off]`	Determines whether to enable the TR-069 service.
`tls-context`	Defines the TR-069 TLS Context index.
`tr069-cwmp-wait-interval`	Defines the TR-069 CWMP interval timeout (in seconds). This overwrites the TR's state-machine interval (Backoff algorithm).
`verify-certificate`	Enables certificate verifaction during TR-069 connection.
`verify-common-name`	Enables common name verification during TR-069 connection

Parameter	Description
`vrf-name`	TR-069 application's VRF name is set to 'main_vrf' for default vrf (main routing table).
WAN Configuration for acs-url- provisioning-mode command	
`ip address dhcp`	Defines the DHCP client for the interface.
`ip dhcp-client class-id [name of class id]`	Defines the Class-ID (Option 60).
`ip dhcp-client default-route`	Defines the received DHCP gateway address as the default route.
`ip dhcp-client acs-provisioning-sub-option 1`	TR-069 ACS provisioning sub-option.

The following are CWMP configuration examples:

■ **For Static ACS URL:**

```
configure system
   cwmp
    set acs-password $1$BHB3NjEx obscured
    set connection-request-password $1$kPbl8/Dn obscured
    set acs-url "https://friendly2:8443/dps-basic/TR069"
    set acs-user-name "tr069"
    set connection-request-user-name "ftacs"
    port 3050
    default-inform-interval 3600
    service on
    activate
   exit
```

■ **For acs-url- provisioning-mode automatic:**

```
configure system
   cwmp
    set acs-password $1$BHB3NjEx obscured
    set connection-request-password $1$kPbl8/Dn obscured
    acs-url-provisioning-mode automatic
    set acs-user-name "tr069"
    set connection-request-user-name "ftacs"
    port 3050
    service on
    activate
   exit

interface GigabitEthernet 0/0
    ip address dhcp
    ip dhcp-client class-id "xdslforum.org"
    ip dhcp-client default-route
    ip dhcp-client acs-provisioning-sub-option 1
    no shutdown
   exit
```

4   TR-098 Data Model

TR-098 specifies the InternetGatewayDevice (IGD) data model for TR-069 enabled devices. This data model is a set of parameters, modelled in a tree structure, which can be managed using CWMP.

4.1   InternetGatewayDevice - Proprietary Parmeters

The name of AudioCodes-specific parameters and objects has the following form:

X_00908F_<vendor specific parameter or object name>

Table 4-1: Proprietary InternetGatewayDevice Table

Name	Type	Write	Description
InternetGatewayDevice.X_00908F_AccessList.{i}.	object	W	Access to the Access List table.
X_00908F_AccessList_Action	string	W	Defines the Access List action: ▪ permit ▪ deny ▪ permit stateless
X_00908F_AccessList_Dest	IP address (x.x.x.x)	W	Defines the Access List destination (IP address).
X_00908F_AccessList_DestMask	IP address (x.x.x.x)	W	Defines the Access List destination mask.
X_00908F_AccessList_DestPort	unsignedInt	W	Defines the start destination port (0-65535).
X_00908F_AccessList_DestPortEnd	unsignedInt	W	Defines the end destination port (0-65535). For one port, define the same as the source port start. For any port, define start and end to 0.
X_00908F_AccessList_DSCPMask	IP address (x.x.x.x)	W	Defines the Access List DiffServ codepoint mask.
X_00908F_AccessList_DSCPValue	unsignedInt	W	Defines the Access List DiffServ codepoint (0-63; default is 0).
X_00908F_AccessList_Log	boolean	W	Logs the Access List actions.
X_00908F_AccessList_Name	string	W	Defines the Access List name (up to 25 characters).
X_00908F_AccessList_Protocol	unsignedInt	W	Defines the Access List protocol (0-255).
X_00908F_AccessList_Source	IP address (x.x.x.x)	W	Defines the Access List source address.
X_00908F_AccessList_SourceMask	IP address (x.x.x.x)	W	Defines the Access List source mask.
X_00908F_AccessList_SourcePort	unsignedInt	W	Defines the start source port (0-65535).
X_00908F_AccessList_SourcePortEnd	unsignedInt	W	Defines the end source port (0-65535). For one port, define the same as the source port start. For any port, define the start and end to 0.
InternetGatewayDevice.DeviceConfig.	object	W	This object contains general configuration parameters.
X_00908F_Trusted_IP_1_IP_Address	string	W	Defines a Trusted IP address for remote management of the device.
X_00908F_Trusted_IP_1_IP_Mask	string	W	Defines a Trusted IP mask for remote management of the device.
X_00908F_UserRestrictionEnable	unsignedInt	W	Defines administrative lease limit.
X_00908F_CellularMode	string	W	Defines the Cellular mode: ▪ cdc_ether ▪ ppp

Name	Type	Write	Description
X_00908F_RemoteManagementHTTPEnable	boolean	W	Allows acces to HTTP from the WAN.
X_00908F_RemoteManagementHTTPSEnable	boolean	W	Allows acces to HTTPS from the WAN.
X_00908F_RemoteManagementSNMPEnable	boolean	W	Allows acces to SNMP from the WAN.
X_00908F_RemoteManagementSNMPEnable	boolean	W	Allows acces to SNMP from the WAN.
X_00908F_RemoteManagementSSHEnable	boolean	W	Allows acces to SSH from the WAN.
X_00908F_RemoteManagementTelnetEnable	boolean	W	Allows acces to Telnet from the WAN.
InternetGatewayDevice.DeviceInfo.	object	-	This object contains information about the INI file.
X_00908F_ConfigurationVersion	unsignedInt	W	Contains the INI file version number that is reported in the acEV_BOARD_STARTED event.
InternetGatewayDevice.DownloadDiagnostics.	object	-	This object defines the diagnostics configuration for a HTTP and FTP DownloadDiagnostics Test. Files received in the DownloadDiagnostics do not require file storage on the CPE device.
X_00908F_Speed	string	-	Textual result of download speed test. Example: 8.1 Mbps.
X_00908F_TestDuration	Unsigned Integer	-	Time took to run the download Speed Test.
InternetGatewayDevice.UploadDiagnostics.	object	-	This object defines the diagnostics configuration for a HTTP or FTP UploadDiagnostics test. Files sent by the UploadDiagnostics do not require file storage on the CPE device, and MAY be an arbitrary stream of bytes.
X_00908F_Speed	string	-	Textual result of upload speed test. Example: 8.1 Mbps.
X_00908F_TestDuration	Unsigned Integer	-	Time took to run the upload Speed Test.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANPPPConnection.{i}.	object	W	This object enables configuration of PPP connections on the WAN interface of a CPE. This object is required for all WANConnectionDevices that employ PPP addressing, and must not be active for WANConnectionDevices that do not employ PPP addressing.
X_0090F8_CellularPincode	char[5]	W	Defines the cellular pincode.
X_0090F8_CellularModemError	string	-	Displays the last cellular modem status error: ▪ SIM PIN required ▪ SIM PUK required ▪ SIM failure ▪ SIM busy ▪ SIM wrong ▪ incorrect password ▪ SIM PIN2 required ▪ SIM PUK2 required
X_0090F8_CellularOperator	string	-	Displays the cellular operator.
X_0090F8_CellularSignalStrength	string	-	Displays the cellular signal strength (RSSI) in dBm.
X_0090F8_CellularRoamStatus	string	-	Displays whether the cellular modem is at home or in roaming.
X_0090F8_AccessList_Name_In	string	W	Defines the AccessList name to filter the incomming traffic on this interface.
X_0090F8_FirewallEnable	boolean	W	Activates the firewall on this interface.
X_0090F8_MaxMTUSize	unsignedInt	W	Defines the maximum MTU in bytes on this interface. For automatic, set it to 0.
X_0090F8_WANPPP_AccessList_Name_Out	string	W	Defines the AccessList name to filter the outgoing traffic on

Name	Type	Write	Description
			this interface.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANIPConnection.{i}.	object	W	This object representing the WAN IP connection device.
X_00908F_AccessList_Name_In	string	W	Defines the AccessList name to filter the incomming traffic on this interface.
X_00908F_AccessList_Name_Out	string	W	Defines the AccessList name to filter the outgoing traffic on this interface.
X_00908F_DHCP_DefaultRoute	boolean	W	Sets the received DHCP gateway address as the default route.
X_0090F8_FirewallEnable	boolean	W	Activates the firewall on this interface.
InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.	object	-	This object contains information about the WLAN channel.
X_00908F_WLANConfiguration_ChannelRescan	boolean	W	Defines the WLAN Channel Auto-rescan. Applied only if channel was chosen automatically. When there is no traffic, periodic rescan occurs to locate the better channel.
InternetGatewayDevice.LANDevice.{i}.	object	-	
X_0090F8_Name	string	-	Defines the LAN interface name.
InternetGatewayDevice.UserInterface.	object	-	This object contains information about user accounts.
X_00908F_AdminUser_Password	string	W	Defines the password for the "Admin" user account (Web and CLI).
X_00908F_AdminUser_UserName	string	W	Defines the username for the "Admin" user account (Web and CLI).
X_00908F_User_Password	string	W	Defines the password for the "User" account (Web and CLI)
X_00908F_User_UserName	string	W	Defines the username for the "User" account (Web and CLI).
InternetGatewayDevice.Services.X_00908F_Firewall.{i}.	object	W	Network access list (internal firewall).
X_00908F_ByteBurst	integer	W	Defines the allowed traffic burst in bytes (0 is unused).
X_00908F_ByteRate	integer	W	Defines the allowed traffic in bytes per second (0 is unused)
X_00908F_EndPort	unsignedInt	W	Defines the port range end.
X_00908F_InterfaceID	string	W	Defines the interface name (none for all).
X_00908F_PacketSize	integer	W	Defines the maximum packet size (0 is unused).
X_00908F_PrefixLen	unsignedInt	W	Defines the prefix length of the source IP address (defining a subnet).
X_00908F_Protocol	string	W	Defines the IP user-level protocol (TCP, UDP, ICMP, ESP, SIP, MGCP, TPNCP, ANY or numeric value)
X_00908F_SourceIP	unsignedInt	W	Defines the source IP address for the Access rule.
X_00908F_SourcePort	unsignedInt	W	Defines the source port (0 for ALL).
X_00908F_StartPort	unsignedInt	W	Defines the port range start.
X_00908F_UseSpecificInterface	boolean	W	Defines the specific interface or for all the interfaces on which the rule is applied.
X_00908FI_AllowType	string	W	Allows or blocks traffic matching the rule.

4.2 InternetGatewayDevice - Standard Parameters

The following table lists the standard InternetGatewayDevice objects and parameters.

Table 4-2: Standard InternetGatewayDevice Table

Name	Type	Write	Description
InternetGatewayDevice.	object	-	
LANDeviceNumberOfEntries	unsignedInt	-	Number of instances of LANDevice.
WANDeviceNumberOfEntries	unsignedInt	-	Number of instances of WANDevice.
InternetGatewayDevice.CaptivePortal.	object	-	This object contains parameters relating to the captive portal configuration on the CPE. The captive portal configuration defines the CPE's WAN-destined HTTP (port 80) traffic redirect behavior. When the captive portal is disabled, WAN-destined HTTP (port 80) traffic MUST be permitted to all destinations. When the captive portal is enabled, WAN-destined HTTP (port 80) traffic MUST be permitted only to destinations listed in the AllowedList; traffic to all other destinations MUST be redirected to the CaptivePortalURL.
Enable	string	W	Enables or disables the captive portal.
InternetGatewayDevice.DeviceConfig.	object	-	This object contains general configuration parameters.
InternetGatewayDevice.DeviceInfo.	object	-	This object contains general device information.
AdditionalHardwareVersion	string	-	Any additional hardware version information the vendor might wish to supply.
AdditionalSoftwareVersion	string	-	Any additional software version information the vendor might wish to supply.
Description	string	-	A full description of the CPE device (human readable string).
DeviceLog	string	-	Vendor-specific log(s).
EnabledOptions	string	-	This parameter is DEPRECATED because the "voucher mechanism", as defined in [Annex C/TR-069a3] is deprecated in favor of the "Software Module Management mechanism" as described in [Appendix II/TR-157a3]. Comma-separated list (maximum list length 1024) of strings. The OptionName of each Option that is currently enabled in the CPE. The OptionName of each is identical to the OptionName element of the OptionStruct described in [TR-069a3]. Only those options are listed whose State indicates the option is enabled.
FirstUseDate	dateTime	-	Date and time in UTC that the CPE first both successfully established an IP-layer network connection and acquired an absolute time reference using NTP or equivalent over that network connection. The CPE MAY reset this date after a factory reset. If NTP or equivalent is not available, this parameter, if present, SHOULD be set to the Unknown Time value.
HardwareVersion	string	-	A string identifying the particular CPE model and version.
Manufacturer	string	-	The manufacturer of the CPE (human readable string).
ManufacturerOUI	string	-	Organizationally unique identifier of the device manufacturer. Represented as a six hexadecimal-digit value using all upper-case letters and including any leading zeros. Possible patterns: ▪ [0-9A-F]{6} ▪ The value MUST be a valid OUI as defined in [OUI]. ▪ This value MUST remain fixed over the lifetime of the device, including across firmware updates. Any

Name	Type	Write	Description
			change would indicate that it's a new device and would therefore require a BOOTSTRAP Inform.
ModelName	string	-	Model name of the CPE (human readable string).
ModemFirmwareVersion	string	-	A string identifying the version of the modem firmware currently installed in the CPE. This is applicable only when the modem firmware is separable from the overall CPE software.
ProductClass	string	-	Identifier of the class of product for which the serial number applies. That is, for a given manufacturer, this parameter is used to identify the product or class of product over which the SerialNumber parameter is unique.
			This value MUST remain fixed over the lifetime of the device, including across firmware updates. Any change would indicate that it's a new device and would therefore require a BOOTSTRAP Inform.
ProvisioningCode	string	W	Identifier of the primary service provider and other provisioning information, which MAY be used by the ACS to determine service provider-specific customization and provisioning parameters.
			If not empty, this argument SHOULD be in the form of a hierarchical descriptor with one or more nodes specified. Each node in the hierarchy is represented as a 4-character sub-string, containing only numerals or upper-case letters. If there is more than one node indicated, each node is separated by a "." (dot). Examples: "TLCO" or "TLCO.GRP2".
SerialNumber	string	-	Identifier of the particular device that is unique for the indicated class of product and manufacturer.
			This value MUST remain fixed over the lifetime of the device, including across firmware updates. Any change would indicate that it's a new device and would therefore require a BOOTSTRAP Inform.
SoftwareVersion	string	-	A string identifying the software version currently installed in the CPE.
			To allow version comparisons, this element SHOULD be in the form of dot-delimited integers, where each successive integer represents a more minor category of variation. For example, "3.0.21" where the components mean: "Major.Minor.Build".
SpecVersion	string	-	Represents the version of the specification implemented by the device. Currently 1.0 is the only available version. The value of this parameter MUST equal "1.0".
			This parameter is DEPRECATED because its value is fixed and it therefore serves no purpose. However, it is a Forced Inform parameter and therefore cannot be OBSOLETED.
UpTime	string	-	Time in seconds since the CPE was last restarted.
InternetGatewayDevice.DeviceSummary	string	-	As defined in [TR-106a1].
			This parameter is DEPRECATED because DeviceInfo.SupportedDataModel and associated Device Type XML documents (DT Instances) provide a more granular and scalable way of describing the device's data model.
			Therefore its value MAY be an empty string if (and only if) DeviceInfo.SupportedDataModel is supported.
InternetGatewayDevice.DownloadDiagnostics .	object	-	This object defines the diagnostics configuration for a HTTP and FTP DownloadDiagnostics Test.
			Files received in the DownloadDiagnostics do not require file storage on the CPE device.
DiagnosticsState	string	W	Indicate the availability of diagnostic data:

Name	Type	Write	Description
			▪ None (READONLY) ▪ Requested ▪ Completed (READONLY) ▪ Error_InitConnectionFailed (READONLY) ▪ Error_NoResponse (READONLY) ▪ Error_TransferFailed (READONLY) ▪ Error_PasswordRequestFailed (READONLY) ▪ Error_LoginFailed (READONLY) ▪ Error_NoTransferMode (READONLY) ▪ Error_NoPASV (READONLY) ▪ Error_IncorrectSize (READONLY) ▪ Error_Timeout (READONLY) If the ACS sets the value of this parameter to Requested, the CPE MUST initiate the corresponding diagnostic test. When writing, the only allowed value is Requested. To ensure the use of the proper test parameters (the writable parameters in this object), the test parameters MUST be set either prior to or at the same time as (in the same SetParameterValues) setting the DiagnosticsState to Requested. When requested, the CPE SHOULD wait until after completion of the communication session with the ACS before starting the diagnostic. When the test is completed, the value of this parameter MUST be either Completed (if the test completed successfully), or one of the Error values listed above. If the value of this parameter is anything other than Completed, the values of the results parameters for this test are indeterminate. When the diagnostic initiated by the ACS is completed (successfully or not), the CPE MUST establish a new connection to the ACS to allow the ACS to view the results, indicating the Event code 8 DIAGNOSTICS COMPLETE in the Inform message. After the diagnostic is complete, the value of all result parameters (all read-only parameters in this object) MUST be retained by the CPE until either this diagnostic is run again, or the CPE reboots. After a reboot, if the CPE has not retained the result parameters from the most recent test, it MUST set the value of this parameter to None. Modifying any of the writable parameters in this object except for this one MUST result in the value of this parameter being set to None. While the test is in progress, modifying any of the writable parameters in this object except for this one MUST result in the test being terminated and the value of this parameter being set to None. While the test is in progress, setting this parameter to Requested (and possibly modifying other writable parameters in this object) MUST result in the test being terminated and then restarted using the current values of the test parameters.
Interface	string	-	The value MUST be the path name of the IP-layer interface over which the test is to be performed. The value of this parameter MUST be either a valid interface or an empty string. An attempt to set this parameter to a different value MUST be rejected as an invalid parameter value. If an empty string is specified, the CPE MUST use the default routing interface.
DownloadURL	string	W	The URL, as defined in [RFC3986], for the CPE to perform the download on. This parameter MUST be in the form of a valid HTTP [RFC2616] or FTP [RFC862] URL.

Name	Type	Write	Description
			When using FTP transport, FTP binary transfer MUST be used.
			When using HTTP transport, persistent connections MUST be used and pipelining MUST NOT be used.
			When using HTTP transport the HTTP Authentication MUST NOT be used.
DSCP	Unsigned Integer	-	The DiffServ code point for marking packets transmitted in the test.
			The default value SHOULD be zero.
EthernetPriority	Unsigned Integer	-	Ethernet priority code for marking packets transmitted in the test (if applicable).
			The default value SHOULD be zero.
ROMTime	dateTime	-	Request time in UTC, which MUST be specified to microsecond precision.
			For example: 2008-04-09T15:01:05.123456
			For HTTP this is the time at which the client sends the GET command.
			For FTP this is the time at which the client sends the RTRV command.
BOMTime	dateTime	-	Begin of transmission time in UTC, which MUST be specified to microsecond precision.
			For example: 2008-04-09T15:01:05.123456
			For HTTP this is the time at which the first data packet is received.
			For FTP this is the time at which the client receives the first data packet on the data connection.
EOMTime	dateTime	-	End of transmission in UTC, which MUST be specified to microsecond precision.
			For example: 2008-04-09T15:01:05.123456
			For HTTP this is the time at which the last data packet is received.For FTP this is the time at which the client receives the last packet on the data connection.
TestBytesReceived	Unsigned Integer	-	The test traffic received in bytes during the FTP/HTTP transaction including FTP/HTTP headers, between BOMTime and EOMTime.
TCPOpenRequestTime	dateTime	-	Request time in UTC, which MUST be specified to microsecond precision.
			For example: 2008-04-09T15:01:05.123456
			For HTTP this is the time at which the TCP socket open (SYN) was sent for the HTTP connection.
			For FTP this is the time at which the TCP socket open (SYN) was sent for the data connection.
			Note: Interval of 1 microsecond SHOULD be supported.
InternetGatewayDevice.UploadDiagnostics	object	-	This object defines the diagnostics configuration for a HTTP or FTP UploadDiagnostics test.
			Files sent by the UploadDiagnostics do not require file storage on the CPE device, and MAY be an arbitrary stream of bytes.
DiagnosticsState	String	-	Indicate the availability of diagnostic data:
			▪ None (READONLY)
			▪ Requested
			▪ Completed (READONLY)
			▪ Error_InitConnectionFailed (READONLY)
			▪ Error_NoResponse (READONLY)
			▪ Error_PasswordRequestFailed (READONLY)
			▪ Error_LoginFailed (READONLY)

Name	Type	Write	Description
			▪ Error_NoTransferMode (READONLY) ▪ Error_NoPASV (READONLY) ▪ Error_NoCWD (READONLY) ▪ Error_NoSTOR (READONLY) ▪ Error_NoTransferComplete (READONLY)
			If the ACS sets the value of this parameter to Requested, the CPE MUST initiate the corresponding diagnostic test. When writing, the only allowed value is Requested. To ensure the use of the proper test parameters (the writable parameters in this object), the test parameters MUST be set either prior to or at the same time as (in the same SetParameterValues) setting the DiagnosticsState to Requested.
			When requested, the CPE SHOULD wait until after completion of the communication session with the ACS before starting the diagnostic.
			When the test is completed, the value of this parameter MUST be either Completed (if the test completed successfully), or one of the Error values listed above.
			If the value of this parameter is anything other than Completed, the values of the results parameters for this test are indeterminate.
			When the diagnostic initiated by the ACS is completed (successfully or not), the CPE MUST establish a new connection to the ACS to allow the ACS to view the results, indicating the Event code 8 DIAGNOSTICS COMPLETE in the Inform message.
			After the diagnostic is complete, the value of all result parameters (all read-only parameters in this object) MUST be retained by the CPE until either this diagnostic is run again, or the CPE reboots. After a reboot, if the CPE has not retained the result parameters from the most recent test, it MUST set the value of this parameter to None.
			Modifying any of the writable parameters in this object except for this one MUST result in the value of this parameter being set to None.
			While the test is in progress, modifying any of the writable parameters in this object except for this one MUST result in the test being terminated and the value of this parameter being set to None.
			While the test is in progress, setting this parameter to Requested (and possibly modifying other writable parameters in this object) MUST result in the test being terminated and then restarted using the current values of the test parameters.
Interface	String	-	The value MUST be the path name of the IP-layer interface over which the test is to be performed. The value of this parameter MUST be either a valid interface or an empty string. An attempt to set this parameter to a different value MUST be rejected as an invalid parameter value. If an empty string is specified, the CPE MUST use the default routing interface.
UploadURL	String	W	The URL, as defined in [RFC3986], for the CPE to Upload to. This parameter MUST be in the form of a valid HTTP [RFC2616] or FTP [RFC862] URL. When using FTP transport, FTP binary transfer MUST be used. When using HTTP transport, persistent connections MUST be used and pipelining MUST NOT be used. When using HTTP transport the HTTP Authentication MUST NOT be used.
DSCP	String	-	DiffServ code point for marking packets transmitted in the test.

Name	Type	Write	Description
			The default value SHOULD be zero.
EthernetPriority	Unsigned Integer	-	Ethernet priority code for marking packets transmitted in the test (if applicable). The default value SHOULD be zero.
TestFileLength	String	W	The size of the file (in bytes) to be uploaded to the server. The CPE MUST insure the appropriate number of bytes are sent.
ROMTime	dateTime	-	Request time in UTC, which MUST be specified to microsecond precision. For example: 2008-04-09T15:01:05.123456 For HTTP this is the time at which the client sends the PUT command. For FTP this is the time at which the STOR command is sent.
BOMTime	dateTime	-	Begin of transmission time in UTC, which MUST be specified to microsecond precision. For example: 2008-04-09T15:01:05.123456 For HTTP this is the time at which the first data packet is sent. For FTP this is the time at which the client receives the ready for transfer notification.
EOMTime	dateTime	-	End of transmission in UTC, which MUST be specified to microsecond precision. For example: 2008-04-09T15:01:05.123456 For HTTP this is the time when the HTTP successful response code is received. For FTP this is the time when the client receives a transfer complete.
TCPOpenRequestTime	dateTime	-	Request time in UTC, which MUST be specified to microsecond precision. For example: 2008-04-09T15:01:05.123456 For HTTP this is the time at which the TCP socket open (SYN) was sent for the HTTP connection. For FTP this is the time at which the TCP socket open (SYN) was sent for the data connection Note: Interval of 1 microsecond SHOULD be supported.
TCPOpenResponseTime	dateTime	-	Response time in UTC, which MUST be specified to microsecond precision. For example: 2008-04-09T15:01:05.123456 For HTTP this is the Time at which the TCP ACK to the socket opening the HTTP connection was received. For FTP this is the Time at which the TCP ACK to the socket opening the Data connection was received. Note: Interval of 1 microsecond SHOULD be supported.
InternetGatewayDevice.ManagementServer.	object	-	This object contains parameters relating to the CPE's association with an ACS.
ConnectionRequestPassword	string	W	Password used to authenticate an ACS making a Connection Request to the CPE.
ConnectionRequestURL	string(256)	-	HTTP URL, as defined in {{bibref|RFC3986}}, for an ACS to make a Connection Request notification to the CPE. In the form: **http://host:port/path** The "host" portion of the URL MAY be the IP address for the management interface of the CPE in lieu of a host name.
ConnectionRequestUsername	string	W	Username used to authenticate an ACS making a

Name	Type	Write	Description
			Connection Request to the CPE.
ParameterKey	string(32)	W	ParameterKey provides the ACS a reliable and extensible means to track changes made by the ACS. The value of ParameterKey MUST be equal to the value of the ParameterKey argument from the most recent successful SetParameterValues, Addobject, or Deleteobject method call from the ACS.
			The CPE MUST set ParameterKey to the value specified in the corresponding method arguments if and only if the method completes successfully and no fault response is generated. If a method call does not complete successfully (implying that the changes requested in the method did not take effect), the value of ParameterKey MUST NOT be modified.
			The CPE MUST only modify the value of ParameterKey as a result of SetParameterValues, Addobject, Deleteobject, or due to a factory reset. On factory reset, the value of ParameterKey MUST be set to an empty string.
Password	string(256)	W	Password used to authenticate the CPE when making a connection to the ACS using the CPE WAN Management Protocol.
			his password is used only for HTTP-based authentication of the CPE.
			Note that on a factory reset of the CPE, the value of this parameter might be reset to its factory value. If an ACS modifies the value of this parameter, it SHOULD be prepared to accommodate the situation that the original value is restored as the result of a factory reset.
PeriodicInformEnable	boolean	W	Whether or not the CPE MUST periodically send CPE information to the ACS using the Inform method call.
PeriodicInformInterval	unsignedInt	W	The duration in seconds of the interval for which the CPE MUST attempt to connect with the ACS and call the Inform method ifPeriodicInformEnable is true.
PeriodicInformTime	dateTime	W	An absolute time reference in UTC to determine when the CPE will initiate the periodic Inform method calls. Each Inform call MUST occur at this reference time plus or minus an integer multiple of the PeriodicInformInterval.
			PeriodicInformTime is used only to set the "phase" of the periodic Informs. The actual value of PeriodicInformTime can be arbitrarily far into the past or future.
			For example, if PeriodicInformInterval is 86400 (a day) and if PeriodicInformTime is set to UTC midnight on some day (in the past, present, or future) then periodic Informs will occur every day at UTC midnight. These MUST begin on the very next midnight, even if PeriodicInformTime refers to a day in the future.
			The Unknown Time value defined in [Section 2.2/TR-098a2] indicates that no particular time reference is specified. That is, the CPE MAY locally choose the time reference, and needs only to adhere to the specified PeriodicInformInterval.
			If absolute time is not available to the CPE, its periodic Inform behavior MUST be the same as if the PeriodicInformTime parameter was set to the Unknown Time value.
RetryIntervalMultiplier	integer	W	Configures the retry interval multiplier as specified in [Section 3.2.1.1/TR-069a2].
			This value is expressed in units of 0.001. Hence the values of the multiplier range between 1.000 and 65.535.
			A value of 2000 corresponds to the default behavior that is described in [TR-069a2].
			The device MUST use a random value between CWMPRetryMinimumWaitInterval and

Name	Type	Write	Description
			(CWMPRetryMinimumWaitInterval * CWMPRetryIntervalMultiplier / 1000) as the first retry wait interval. Other values in the retry pattern MUST be calculated using this value as a starting point.
RetryMinimumWaitInterval	integer	W	Configures the first session retry wait interval, in seconds, as specified in [Section 3.2.1.1/TR-069a2].
			A value of 5 corresponds to the default behavior that is described in [TR-069a2].
			The device MUST use a random value between CWMPRetryMinimumWaitInterval and (CWMPRetryMinimumWaitInterval * CWMPRetryIntervalMultiplier / 1000) as the first retry wait interval. Other values in the retry pattern MUST be calculated using this value as a starting point.
UpgradesManaged	boolean	W	Indicates whether or not the ACS will manage upgrades for the CPE. If true, the CPE SHOULD NOT use other means other than the ACS to seek out available upgrades. If false, the CPE MAY use other means for this purpose.
			Note that an autonomous upgrade (reported via an "10 AUTONOMOUS TRANSFER COMPLETE" Inform Event code) SHOULD be regarded as a managed upgade if it is performed according to ACS-specified policy.
URL	string(256)	W	URL, as defined in RFC3986, for the CPE to connect to the ACS using the CPE WAN Management Protocol.
			This parameter MUST be in the form of a valid HTTP or HTTPS URL RFC2616.
			The "host" portion of this URL is used by the CPE for validating the ACS certificate when using SSL or TLS.
			Note that on a factory reset of the CPE, the value of this parameter might be reset to its factory value. If an ACS modifies the value of this parameter, it SHOULD be prepared to accommodate the situation that the original value is restored as the result of a factory reset.
Username	string(256)	W	Username used to authenticate the CPE when making a connection to the ACS using the CPE WAN Management Protocol.
			This username is used only for HTTP-based authentication of the CPE.
			Note that on a factory reset of the CPE, the value of this parameter might be reset to its factory value. If an ACS modifies the value of this parameter, it SHOULD be prepared to accommodate the situation that the original value is restored as the result of a factory reset.
InternetGatewayDevice.Services.	object	-	This object contains general services information.
InternetGatewayDevice.UserInterface.	object	-	This object contains parameters relating to the user interface of the CPE.
InternetGatewayDevice.Layer3Forwarding.Forwarding.{i}.	object	-	Layer 3 forwarding table.
			In addition to statically configured routes, this table MUST include dynamic routes learned through layer 3 routing protocols, including RIP, OSPF, DHCP, and IPCP. The CPE MAY reject attempts to delete or modify a dynamic route entry.
			For each incoming packet, the layer 3 forwarding decision is conceptually made as follows:
			Only table entries with a matching ForwardingPolicy are considered, i.e. those that either do not specify a ForwardingPolicy, or else specify a ForwardingPolicy that matches that of the incoming packet.
			For the remaining table entries, those for which the source address/mask matches are sorted by longest prefix, i.e. with the most specific networks first (an

Name	Type	Write	Description
			unspecified source address is a wild-card and always matches, with a prefix length of zero). For the remaining table entries, those for which the destination address/mask matches are sorted by longest prefix, i.e. with the most specific networks first (an unspecified destination address is a wild-card and always matches, with a prefix length of zero). The first of the remaining table entries is applied to the packet. At most one entry in this table (regardless of whether or not it is enabled) can exist with a given value for Alias. On creation of a new table entry, the CPE MUST choose an initial value for Alias such that the new entry does not conflict with any existing entries. At most one enabled entry in this table can exist with all the same values for DestIPAddress, DestSubnetMask, SourceIPAddress and SourceSubnetMask.
DestIPAddress	string	W	[IPAddress] Destination address. An empty string or a value of "0.0.0.0" indicates no destination address is specified. A Forwarding table entry for which DestIPAddress and DestSubnetMask are both an empty string or "0.0.0.0" is a default route.
DestSubnetMask	string	W	IPAddress Destination subnet mask. An empty string or a value of "0.0.0.0" indicates no destination subnet mask is specified. If a destination subnet mask is specified, the DestSubnetMask is ANDed with the destination address before comparing with the DestIPAddress. Otherwise, the full destination address is used as is. A Forwarding table entry for which DestIPAddress and DestSubnetMask are both an empty string or "0.0.0.0" is a default route
ForwardingMetric	unsignedInt	W	Forwarding metric. A value of -1 indicates this metric is not used.
GatewayIPAddress	string	W	IP address of the gateway. Only one of GatewayIPAddress and Interface SHOULD be configured for a route. If both are configured, GatewayIPAddress and Interface MUST be consistent with each other.
Interface	string	W	Specifies the egress interface associated with this entry. the layer 3 connection object Example: ''InternetGatewayDevice.WANDevice.1.WANConnectionDevice.2.WANPPPConnection.1''. Only one of GatewayIPAddress and Interface SHOULD be configured for a route. If both are configured, GatewayIPAddress and Interface MUST be consistent with each other. For a route that was configured by setting GatewayIPAddress but not Interface, read access to Interface MUST return the full hierarchical parameter name for the route's egress interface.
SourceIPAddress	string	W	Source address. empty or a value of "0.0.0.0" indicates no source address is specified.
SourceSubnetMask	string	W	[IPAddress] Source subnet mask. An empty string or a value of "0.0.0.0" indicates no source subnet mask is specified. If a source subnet mask is specified, the SourceSubnetMask is ANDed with the source address before comparing with the SourceIPAddress. Otherwise, the full source address is used as is.

Name	Type	Write	Description
StaticRoute	boolean	-	If true, this route is a Static route.
Status	string	-	Indicates the status of the forwarding entry. Enumeration of: ▪ Disabled ▪ Enabled ▪ Error (OPTIONAL) The Error value MAY be used by the CPE to indicate a locally defined error condition.
InternetGatewayDevice.Layer3Forwarding.	object	-	This object allows the handling of the routing and forwarding configuration of the device.
ForwardNumberOfEntries	unsignedInt	-	Number of forwarding instances.
InternetGatewayDevice.LANDevice.{i}.	object	-	Each instance models a LAN side layer 3 IP interface. Each instance has children that correspond to the layer 2 interfaces that are connected to the Gateway's IP router via the modeled IP interface. If a LANDevice instance is deleted, the objects modeling those layer 2 interfaces that are as a result no longer connected to the Gateway's IP router will move to the InternetGatewayDevice.LANInterfaces object. If the "Layer2Bridging" object is implemented, the view that it provides of the CPE's underlying bridging configuration MUST be consistent with the view provided by any "LANDevice" and "WAN**Connection" objects. The implications of this are explained in Annex A.6.
LANEthernetInterfaceNumberOfEntries	unsignedInt	-	Number of instances of LANEthernetInterfaceConfig in this "LANDevice".
LANUSBInterfaceNumberOfEntries	unsignedInt	-	Number of instances of LANUSBInterfaceConfig in this "LANDevice".
LANWLANConfigurationNumberOfEntries	unsignedInt	-	Number of instances of WLANConfiguration in this "LANDevice".
InternetGatewayDevice.LANDevice.{i}.Hosts.	object	-	This object provides information about each of the hosts on the LAN, including those whose IP address was allocated by the CPE using DHCP as well as hosts with statically allocated IP addresses.
HostNumberOfEntries	unsignedInt	-	Number of entries in the Host table.
InternetGatewayDevice.LANDevice.{i}.Hosts. Host.{i}.	object	-	Host table.
Active	boolean	-	Whether or not the host is currently present on the LAN. The method of presence detection is a local matter to the CPE. The ability to list inactive hosts is OPTIONAL. If the CPE includes inactive hosts in this table, this variable MUST be set to false for each inactive host. The length of time an inactive host remains listed in this table is a local matter to the CPE.
AddressSource	string	-	Indicates whether the IP address of the host was allocated by the CPE using DHCP, was assigned to the host statically, or was assigned using automatic IP address allocation.
HostName	string(64)	-	The device's host name or empty if unknown.
InterfaceType	string	-	Type of physical interface through which this host is connected to the CPE.
IPAddress	string	-	Current IP Address of the host.
LeaseTimeRemaining	int	-	DHCP lease time remaining in seconds. A value of -1 indicates an infinite lease. The value MUST be 0 (zero) if the AddressSource is not DHCP.

Name	Type	Write	Description
MACAddress	string	-	MAC address of the host.
InternetGatewayDevice.LANDevice.{i}.LANEthernetInterfaceConfig.{i}.	object	-	This object models an Ethernet LAN connection on a CPE device. This object MUST be implemented for CPE that contain an Ethernet interface on the LAN side.
DuplexMode	string	W	The duplex mode available to this connection.
Enable	boolean	W	Enables or disables this interface.
MACAddress	string	-	The physical address of the interface.
MACAddressControlEnabled	boolean	W	Indicates whether MAC Address Control is enabled or not on this interface. MAC Address Control limits the clients that connect to those that match a list of allowed MAC addresses specified in InternetGatewayDevice.LANDevice.{i}.LANHostConfigManagement.AllowedMACAddresses.
MaxBitRate	string	W	The maximum upstream and downstream bit rate available to this connection.
Name	string(16)	-	The name of this layer 2 interface, chosen by the vendor, e.g. "eth0" or "eth0:1".
Status	string	-	Indicates the status of this interface. Enumeration of: ▪ Up ▪ NoLink ▪ Error (OPTIONAL) ▪ Disabled The Error value MAY be used by the CPE to indicate a locally defined error condition.
InternetGatewayDevice.LANDevice.{i}.LANEthernetInterfaceConfig.{i}.Stats.	object	-	This object contains statistics for an Ethernet LAN interface on a CPE device. Note that these statistics refer to the link layer, not to the physical layer.
BroadcastPacketsReceived	unsignedInt	-	The total number of received packets which were addressed to a broadcast address. The value of this counter MAY be reset to zero when the CPE is rebooted.
BroadcastPacketsSent	unsignedInt	-	The total number of packets requested for transmission which were addressed to a broadcast address, including those that were discarded or not sent. The value of this counter MAY be reset to zero when the CPE is rebooted.
BytesReceived	unsignedInt	-	The total number of bytes received on the interface, including framing characters. The value of this counter MAY be reset to zero when the CPE is rebooted.
BytesSent	unsignedInt	-	The total number of bytes transmitted out of the interface, including framing characters. The value of this counter MAY be reset to zero when the CPE is rebooted.
DiscardPacketsReceived	unsignedInt	-	The total number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable. One possible reason for discarding such a packet could be to free up buffer space. The value of this counter MAY be reset to zero when the CPE is rebooted.
DiscardPacketsSent	unsignedInt	-	The total number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.

Name	Type	Write	Description
			The value of this counter MAY be reset to zero when the CPE is rebooted.
ErrorsReceived	unsignedInt	-	The total number of inbound packets that contained errors preventing them from being deliverable. The value of this counter MAY be reset to zero when the CPE is rebooted.
ErrorsSent	unsignedInt	-	The total number of outbound packets that could not be transmitted because of errors. The value of this counter MAY be reset to zero when the CPE is rebooted.
MulticastPacketsReceived	unsignedInt	-	The total number of received packets which were addressed to a multicast address. The value of this counter MAY be reset to zero when the CPE is rebooted.
MulticastPacketsSent	unsignedInt	-	The total number of packets requested for transmission which were addressed to a multicast address, including those that were discarded or not sent. The value of this counter MAY be reset to zero when the CPE is rebooted.
PacketsReceived	unsignedInt	-	The total number of packets which were received on this interface. The value of this counter MAY be reset to zero when the CPE is rebooted.
PacketsSent	unsignedInt	-	The total number of packets transmitted out of the interface. The value of this counter MAY be reset to zero when the CPE is rebooted.
UnicastPacketsReceived	unsignedInt	-	The total number of received packets which were not addressed to a multicast or broadcast address. The value of this counter MAY be reset to zero when the CPE is rebooted.
UnicastPacketsSent	unsignedInt	-	The total number of packets requested for transmission which were not addressed to a multicast or broadcast address, including those that were discarded or not sent. The value of this counter MAY be reset to zero when the CPE is rebooted.
InternetGatewayDevice.LANDevice.{i}.LANHostConfigManagement.	object	-	This object enables reporting of LAN-related device information and setting and configuring LAN IP addressing. The DHCP parameters in this object define the behavior of the default DHCP server, i.e. the behavior for DHCP requests that do not match any of the DHCP conditional serving pool entries.
DHCPLeaseTime	int	W	Specifies the lease time in seconds of client assigned addresses. A value of -1 indicates an infinite lease.
DHCPRelay	string	-	Indicates if the DHCP server performs the role of a server (false) or a relay (true) on the LAN interface. This parameter is DEPRECATED because the functionality that it describes is not well-defined. The CPE MAY set it to the value that it thinks most appropriate, based on its configuration.
DHCPServerConfigurable	boolean	W	Enables the configuration of the DHCP server on the LAN interface. If this variable is set to false, the CPE SHOULD restore its default DHCP server settings.
DHCPServerEnable	boolean	W	Enables or disables the DHCP server on the LAN interface.
DNSServers	string	W	DNS servers offered to DHCP clients. Support for more

Name	Type	Write	Description
			than three DNS Servers is OPTIONAL.
DomainName	string	W	Sets the domain name to provide to clients on the LAN interface.
IPInterfaceNumberOfEntries	unsignedInt	-	The number of entries in the IPInterface table.
IPRouters	string	W	IP addresses of routers on this subnet. Also known as default gateway. Support for more than one Router address is OPTIONAL.
MaxAddress	string	W	Specifies last address in the pool to be assigned by the DHCP server on the LAN interface. This parameter MUST have a valid value before the DHCP server can be enabled.
MinAddress	string	W	Specifies first address in the pool to be assigned by the DHCP server on the LAN interface. This parameter MUST have a valid value before the DHCP server can be enabled.
SubnetMask	string	W	Specifies the client's network subnet mask. This parameter MUST have a valid value before the DHCP server can be enabled.
InternetGatewayDevice.LANDevice.{i}.LANHostConfigManagement.IPInterface.{i}.	object	-	IP address table with each object representing an IP address on the LANDevice IP interface. Support for more than one interface instance is OPTIONAL.
Enable	boolean	W	Enables or disables this entry. On creation, an entry is disabled by default.
IPInterfaceAddressingType	string	W	Represents the addressing method used to assign the LAN-side IP address of the CPE on this interface.
IPInterfaceIPAddress	string	W	IP address of the LAN-side interface of the CPE.
IPInterfaceSubnetMask	string	W	Subnet mask of the LAN-side interface of the IGD.
InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.	object	-	This object models an 802.11 LAN connection on a CPE device. This object MUST be implemented for CPE that contain an 802.11 interface on the LAN side.
AutoChannelEnable	boolean	W	Enable or disable automatic channel selection. Set to false to disable the automatic channel selection procedure, in which case the currently selected channel remains selected. Set to true to enable the automatic channel selection procedure. This procedure MUST automatically select the channel, and MAY also change it subsequently. AutoChannelEnable MUST automatically change to false whenever the channel is manually selected, i.e. whenever the Channel parameter is written. Whenever AutoChannelEnable is true, the value of the Channel parameter MUST be the channel selected by the automatic channel selection procedure.
AutoRateFallBackEnabled	boolean	-	Indicates whether the access point can automatically reduce the data rate in the event of undue noise or contention.
BasicAuthenticationMode	string	W	Authentication modes that are available when basic 802.11 is enabled. Enumeration of: ▪ None (Open authentication) ▪ EAPAuthentication (OPTIONAL) ▪ SharedAuthentication (OPTIONAL) If this WLANConfiguration instance does not support basic 802.11 then this parameter MUST NOT be present in this instance of the WLANConfiguration object.
BasicEncryptionModes	string	W	Encryption modes that are available when basic 802.11 is

Name	Type	Write	Description
			enabled. WEPEncryption implies that all wireless clients can use WEP for data encryption. Enumeration of: ▪ None ▪ WEPEncryption If this WLANConfiguration instance does not support basic 802.11 then this parameter MUST NOT be present in this instance of the WLANConfiguration object
BeaconType	string	W	The capabilities that are currently enabled on the access point (and that are announced via beacons if BeaconAdvertisementEnabled is true). Write access to this parameter enables and disables such capabilities. An attempt to set this parameter to one of the REQUIRED (mandatory) values MAY be rejected if (and only if) the requested capability is not available on this WLANConfiguration instance but is available on another WLANConfiguration instance within this Internet Gateway Device. For example, only basic 802.11 might be supported by one virtual AP, and only WPA might be supported by another virtual AP. A value of None means that no capabilities are currently enabled on the access point and that no stations will be able to associate with it. Enumeration of: ▪ None ▪ Basic ▪ WPA ▪ 11i (OPTIONAL) ▪ BasicandWPA (OBSOLETED) ▪ Basicand11i (OBSOLETED) ▪ WPAand11i (OPTIONAL) ▪ BasicandWPAand11i (OBSOLETED) 11i SHOULD be taken to refer to both the 802.11i specification and to the WPA2 specification (any WPA2-certified device will implement all mandatory parts of the 802.11i standard). The OBSOLETED values are those for Basic + WPA/WPA2 mixed modes, which are not permitted by the WPA specifications.
BSSID	string	-	The MAC address of the interface.
Channel	unsignedInt	W	The current radio channel used by the connection. To request automatic channel selection, set AutoChannelEnable to true. Whenever AutoChannelEnable is true, the value of the Channel parameter MUST be the channel selected by the automatic channel selection procedure.
Enable	boolean	W	Enables or disables this interface. When there are multiple "WLANConfiguration" instances, e.g. each instance supports a different 802.11 standard or has a different security configuration, this parameter can be used to control which of the instances are currently enabled.
KeyPassphrase	string	-	A passphrase from which the WEP keys are to be generated. This parameter is the same as the parameter "InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.PreSharedKey.1.KeyPassphrase" for the same instance of "WLANConfiguration". When either parameter is changed, the value of the other is changed as well. IfKeyPassphrase is written, all four WEP keys are immediately generated. The ACS SHOULD NOT set the passphrase and also set the WEP keys directly (the result

Name	Type	Write	Description
			of doing this is undefined). This MUST either be a valid key length divided by 8, in which case each byte contributes 8 bits to the key, or else MUST consist of Hex digits and be a valid key length divided by 4, in which case each byte contributes 4 bits to the key. Note: If a passphrase is used, all four WEP keys will be the same.
MaxBitRate	string	-	The maximum upstream and downstream bit rate available to this connection in Mbps. Either "Auto", or the largest of the param|OperationalDataTransmitRates values.
Name	string	-	The name of this layer 2 interface, chosen by the vendor, e.g. "wlan0".
RadioEnabled	boolean	W	Indicates whether or not the access point radio is enabled.
SSID	string(32)	W	The current service set identifier in use by the connection. The SSID is an identifier that is attached to packets sent over the wireless LAN that functions as a "password" for joining a particular radio network (BSS). Note: If an access point wishes to be known by more than one SSID, it MUST provide a "WLANConfiguration" instance for each SSID.
SSIDAdvertisementEnabled	boolean	W	Indicates whether or not beacons include the SSID name. This parameter has an effect only if BeaconAdvertisementEnabled is true.
Standard	string	W	Indicates which IEEE 802.11 standard this WLANConfiguration instance is configured for. Enumeration of: ▪ a ▪ b ▪ g (b and g clients supported) ▪ g-only (only g clients supported) ▪ n Where each value indicates support for only the indicated standard. If the device is configured simultaneously for more than one standard, a separate WLANConfiguration instance MUST be used for each supported standard.
Status	string	-	Indicates the status of this interface. Enumeration of: ▪ Up ▪ Error (OPTIONAL) ▪ Disabled The Error value MAY be used by the CPE to indicate a locally defined error condition.
TotalAssociations	unsignedInt	-	The number of devices currently associated with the access point. This corresponds to the number of entries in the AssociatedDevice table.
TotalBytesReceived	unsignedInt	-	The total number of bytes received on the interface, including framing characters. The value of this counter MAY be reset to zero when the CPE is rebooted.
TotalBytesSent	unsignedInt	-	The total number of bytes transmitted out of the interface, including framing characters. The value of this counter MAY be reset to zero when the CPE is rebooted.
TotalPacketsReceived	unsignedInt	-	The total number of packets which were received on this interface.

Name	Type	Write	Description
			The value of this counter MAY be reset to zero when the CPE is rebooted.
TotalPacketsSent	unsignedInt	-	The total number of packets transmitted out of the interface. The value of this counter MAY be reset to zero when the CPE is rebooted.
TransmitPower	unsignedInt	W	Indicates the current transmit power level as a percentage of full power. The value MUST be one of the values reported by the param|TransmitPowerSupported parameter.
TransmitPowerSupported	string	-	Supported transmit power levels as percentages of full power. For example, "0,25,50,75,100".
WEPEncryptionLevel	string	W	A passphrase from which the WEP keys are to be generated. This parameter is the same as the parameter InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.PreSharedKey.1.KeyPassphrase for the same instance of WLANConfiguration. When either parameter is changed, the value of the other is changed as well. If KeyPassphrase is written, all four WEP keys are immediately generated. The ACS SHOULD NOT set the passphrase and also set the WEP keys directly (the result of doing this is undefined). This MUST either be a valid key length divided by 8, in which case each byte contributes 8 bits to the key, or else MUST consist of Hex digits and be a valid key length divided by 4, in which case each byte contributes 4 bits to the key. Note: If a passphrase is used, all four WEP keys will be the same. When read, this parameter returns an empty string, regardless of the actual value.
WEPKeyIndex	unsignedInt	W	The index of the default WEP key.
WPAAuthenticationMode	string	W	Authentication modes that are available when WPA is enabled. Enumeration of: ▪ PSKAuthentication ▪ EAPAuthentication (OPTIONAL) If this WLANConfiguration instance does not support WPA then this parameter MUST NOT be present in this instance of the WLANConfiguration object.
WPAEncryptionModes	string	W	Encryption modes that are available when WPA is enabled. Enumeration of: ▪ WEPEncryption (DEPRECATED) ▪ TKIPEncryption ▪ WEPandTKIPEncryption (DEPRECATED) ▪ AESEncryption (OPTIONAL) ▪ WEPandAESEncryption (DEPRECATED) ▪ TKIPandAESEncryption (OPTIONAL) ▪ WEPandTKIPandAESEncryption (DEPRECATED) If this WLANConfiguration instance does not support WPA then this parameter MUST NOT be present in this instance of the WLANConfiguration object. The DEPRECATED values are those that combine WEP with TKIP and/or AES, which is not permitted by the WPA specifications.
InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.AssociatedDevice.{i}.	object	-	A table of the devices currently associated with the access point. The size of this table is given by InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.TotalAssociations. This object MUST be

Name	Type	Write	Description
			implemented for CPE that contain an 802.11 interface on the LAN side.
AssociatedDeviceAuthenticationState	boolean	-	Whether an associated device has authenticated (true) or not (false).
AssociatedDeviceIPAddress	string(64)	-	The IP address or DNS name of an associated device.
AssociatedDeviceMACAddress	string	-	The MAC address of an associated device.
InternetGatewayDevice.LANDevice.{i}.WLAN Configuration.{i}.PreSharedKey.{i}.	object	-	This is a table of preshared keys. The size of this table is fixed with exactly 10 entries (with instance numbers 1 through 10). This object MUST be implemented for CPE that contain an 802.11 interface on the LAN side.
AssociatedDeviceMACAddress	string	W	The MAC address associated with a preshared key, or empty if no MAC address is associated with the key.
KeyPassphrase	string	W	A passphrase from which the PSK is to be generated. The first table entry is the same as the parameter InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.KeyPassphrase for the same instance of WLANConfiguration. When either parameter is changed, the value of the other is changed as well. If KeyPassphrase is written, the PSK is immediately generated. The ACS SHOULD NOT set the passphrase and also set the PSK directly (the result of doing this is undefined). The key is generated as specified by WPA, which uses PBKDF2 from PKCS #5: Password-based Cryptography Specification Version 2.0 (RFC 2898 RFC2898).
PreSharedKey	string	W	A literal WPA PSK expressed as a hexadecimal string. The first table entry contains the defaultPreSharedKey} ("InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.PreSharedKey.1.PreSharedKey"). If param|KeyPassphrase is written, the PSK is immediately generated. The ACS SHOULD NOT set the passphrase and also set the PSK directly (the result of doing this is undefined).
InternetGatewayDevice.LANDevice.{i}.WLAN Configuration.{i}.WEPKey.{i}.	object	-	This is a table of WEP keys. The size of this table is fixed with exactly 4 entries (with instance numbers 1 through 4). This object MUST be implemented for CPE that contain an 802.11 interface on the LAN side.
WEPKey	string(128)	W	A WEP key expressed as a hexadecimal string. The WEP encryption level for a given key is inferred from the key length, e.g. 10 characters for 40-bit encryption, or 26 characters for 104-bit encryption (keys do not all have to be of the same length, although they will be if the CPE uses InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.KeyPassphrase to generate them). If InternetGatewayDevice.LANDevice.{i}.WLANConfiguration.{i}.KeyPassphrase is written, all four WEP keys are immediately generated. The ACS SHOULD NOT set the passphrase and also set the WEP keys directly (the result of doing this is undefined).
InternetGatewayDevice.LANDevice.{i}.WLAN Configuration.{i}.	object	-	This is a table of Authentication modes.
IEEE11iAuthenticationMode	string	W	Authentication modes that are available when 802.11i is enabled: - PSKAuthentication - EAPAuthentication (OPTIONAL) - EAPandPSKAuthentication (OPTIONAL) If this WLANConfiguration instance does not support 802.11i, this parameter MUST NOT be present in this

Name	Type	Write	Description
			instance of the WLANConfiguration object.
			IEEE11i SHOULD be taken to refer to both the 802.11i specification and to the WPA2 specification (any WPA2-certified device will implement all mandatory parts of the 802.11i standard).
IEEE11iEncryptionMode	string	W	Encryption modes that are available when 802.11i is enabled:
			▪ WEPEncryption (DEPRECATED)
			▪ TKIPEncryption (OPTIONAL)
			▪ WEPandTKIPEncryption (DEPRECATED)
			▪ AESEncryption
			▪ WEPandAESEncryption (DEPRECATED)
			▪ TKIPandAESEncryption (OPTIONAL)
			▪ WEPandTKIPandAESEncryption (DEPRECATED)
			If this WLANConfiguration instance does not support 802.11i then this parameter MUST NOT be present in this instance of the WLANConfiguration object.
			IEEE11i SHOULD be taken to refer to both the 802.11i specification and to the WPA2 specification (any WPA2-certified device will implement all mandatory parts of the 802.11i standard).
			The DEPRECATED values are those that combine WEP with TKIP and/or AES, which is not permitted by the WPA2 specifications.
InternetGatewayDevice.WANDevice.{i}.WANCommonInterfaceConfig.	object	-	This object models WAN interface properties common across all connection instances.
EnabledForInternet	boolean	W	Used to enable or disable access to and from the Internet across all connection instances.
Layer1DownstreamMaxBitRate	unsignedInt	-	Specifies the maximum downstream theoretical bit rate for the WAN device in bits per second. This describes the maximum possible rate given the type of interface assuming the best-case operating environment, regardless of the current operating rate.
			For example, if the physical interface is 100BaseT, this value would be 100000000, regardless of the current operating rate.
Layer1UpstreamMaxBitRate	unsignedInt	-	Specifies the maximum upstream theoretical bit rate for the WAN device in bits per second. This describes the maximum possible rate given the type of interface assuming the best-case operating environment, regardless of the current operating rate.
			For example, if the physical interface is 100BaseT, this value would be 100000000, regardless of the current operating rate.
MaximumActiveConnections	unsignedInt	-	Indicates the maximum number of active connections the CPE can simultaneously support.
NumberOfActiveConnections	unsignedInt	-	Number of WAN connection service instances currently active on this WAN interface.
PhysicalLinkStatus	string	-	Indicates the state of the physical connection (link) from WANDevice to a connected entity.
TotalBytesReceived	unsignedInt	-	The cumulative counter for total number of bytes received downstream across all connection service instances on the WAN device.
TotalBytesSent	unsignedInt	-	The cumulative counter for total number of bytes sent upstream across all connection service instances on the WAN device.
TotalPacketsReceived	unsignedInt	-	The cumulative counter for total number of packets (IP or PPP) received downstream across all connection service

Name	Type	Write	Description
			instances on the WAN device.
TotalPacketsSent	unsignedInt	-	The cumulative counter for total number of packets (IP or PPP) sent upstream across all connection service instances on the WAN device.
WANAccessProvider	string(256)	-	Name of the Service Provider providing link connectivity on the WAN.
WANAccessType	string	-	Specifies the WAN access (modem) type.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANDSLLinkConfig.	object	-	This object models the ATM layer properties specific to a single physical connection of a DSL modem used for Internet access on a CPE. This object is intended for a CPE with a DSL modem WAN interface, and is exclusive of any other "WAN*LinkConfig" object within a given "WANConnectionDevice" instance.
DestinationAddress	string(256)	W	Destination address of this link. One of: ■ * "PVC: VPI/VCI" ■ * "SVC: ATM connection name" ■ * "SVC: ATM address" The "PVC:" or "SVC:" prefix is part of the parameter value and MUST be followed by 0 or 1 space characters. For example, possible values for this parameter are "PVC:8/23" or "PVC: 0/35".
Enable	boolean	W	Enables or disables the link. On creation of a "WANConnectionDevice", this object is disabled by default.
LinkStatus	string	W	Status of the link.
LinkType	string	-	Indicates the type of DSL connection and refers to the complete stack of protocol used for this connection. Enumeration of: ■ EoA (RFC 2684 [RFC2684] bridged Ethernet over ATM) ■ IPoA (RFC 2684 [RFC2684] routed IP over ATM) ■ PPPoA (RFC 2364 [RFC2634] PPP over ATM) ■ PPPoE (RFC 2516 [RFC2516] PPP over Ethernet on RFC 2684 [RFC2684] bridged Ethernet over ATM, DEPRECATED) ■ CIP (RFC 2225 [RFC2225] Classical IP over ATM) ■ Unconfigured The value PPPoE has always been DEPRECATED and EoA SHOULD be used instead (see [Annex B/TR-098a2]). The ACS MUST NOT set this parameter to PPPoE and the CPE MUST reject attempts to do so.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANEthernetLinkConfig.	object	-	This object models the Ethernet link layer properties specific to a single physical connection used for Internet access on a CPE. This object is intended for a CPE with an Ethernet WAN interface, and is exclusive of any other "WAN*LinkConfig" object within a given "WANConnectionDevice" instance. Note that this object is not related to the Ethernet protocol layer sometimes used in associated with a DSL connection.
EthernetLinkStatus	string	-	Status of the Ethernet link.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANIPConnection.{i}.	object	-	This object enables configuration of IP connections on the WAN interface of a CPE. If the "Layer2Bridging" object is implemented, the view that it provides of the CPE's underlying bridging configuration MUST be consistent with the view provided by any "LANDevice" and "WAN**Connection" objects. The implications of this are explained in TR-098a2-Annex A.6.
AddressingType	string	-	The method used to assign an address to the WAN side

Name	Type	Write	Description
			interface of the CPE for this connection.
AutoDisconnectTime	unsignedInt	-	The time in seconds since the establishment of the connection after which connection termination is automatically initiated by the CPE. This occurs irrespective of whether the connection is being used or not. A value of 0 (zero) indicates that the connection is not to be shut down automatically.
ConnectionStatus	boolean	-	Current status of the connection. Enumeration of: ▪ Unconfigured ▪ Connecting ▪ Connected ▪ PendingDisconnect ▪ Disconneting (DEPRECATED) ▪ Disconnecting ▪ Disconnected The value Disconneting is DEPRECATED because it is a typo. The ACS MUST treat Disconneting and Disconnecting the same.
ConnectionTrigger	string	W	Trigger used to establish the IP connection. Enumeration of: ▪ OnDemand ▪ AlwaysOn ▪ Manual The above values are defined as follows: ▪ OnDemand: If this IP connection is disconnected for any reason, it is to remain disconnected until the CPE has one or more packets to communicate over this connection, at which time the CPE automatically attempts to reestablish the connection. ▪ AlwaysOn: If this IP connection is disconnected for any reason, the CPE automatically attempts to reestablish the connection (and continues to attempt to reestablish the connection as long it remains disconnected). ▪ Manual: If this IP connection is disconnected for any reason, it is to remain disconnected until the user of the CPE explicitly instructs the CPE to reestablish the connection. Note that the reason for an IP connection becoming disconnected to begin with might be either external to the CPE, such as non-renewal of a DHCP lease or momentary disconnection of the physical interface, or internal to the CPE, such as use of the IdleDisconnectTime and/or AutoDisconnectTime parameters in this object. Note also that the means by which a CPE would keep an IP connection disconnected (while waiting for the designated trigger) if it is otherwise physically connected and has an IP address is a local matter specific to the implementation of the CPE.
DefaultGateway	string	-	The IP address of the default gateway for this connection. This parameter is configurable only if the AddressingType is Static.
DNSEnabled	boolean	-	Whether or not the device SHOULD attempt to query a DNS server across this connection.
DNSServers	string(64)	-	DNS server IP addresses for this connection. Support for more than three DNS Servers is OPTIONAL.
Enable	boolean	W	Enables or disables the connection instance. On creation of a "WANIPConnection" instance, it is initially disabled.

Name	Type	Write	Description
ExternalIPAddress	string	-	This is the external IP address used by NAT for this connection. This parameter is configurable only if the AddressingType is Static. If Active Notification is enabled, the CPE MUST initiate an Inform whenever either the value of this parameter changes or the default WAN connection changes to a different connection.
IdleDisconnectTime	unsignedInt	-	The time in seconds that if the connection remains idle, the CPE automatically terminates the connection. A value of 0 (zero) indicates that the connection is not to be shut down automatically.
MACAddress	string	-	The physical address of the "WANIPConnection" if applicable. Configurable only if MACAddressOverride is present and true.
MaxMTUSize	unsignedInt	W	The maximum allowed size of an Ethernet frame from LAN-side devices.
Name	string(256)	W	User-readable name of this connection.
NATEnabled	boolean	W	Indicates if Network Address Translation (NAT) is enabled for this connection.
PortMappingNumberOfEntries	unsignedInt	-	Total number of port mapping entries.
PossibleConnectionTypes	string	-	Types of connections possible for this connection instance.
SubnetMask	string	-	Subnet mask of the WAN interface. This parameter is configurable only if the AddressingType isStatic.
Uptime	unsignedInt	-	The time in seconds that this connection has been up.
WarnDisconnectDelay	unsignedInt	-	Time in seconds the Status remains in the pending disconnect state before transitioning to disconnecting state to drop the connection.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANIPConnection.{i}.PortMapping.{i}.	object	-	Port mapping table. This table MUST contain all NAT port mappings associated with this connection, including static and dynamic port mappings programmatically created via local control protocol, such as UPnP. This table MUST NOT contain dynamic NAT binding entries associated with the normal operation of NAT. At most one entry in an instance of this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol. If the ACS attempts to set the parameters of an existing entry such that this requirement would be violated, the CPE MUST reject the request. In this case, the SetParameterValues response MUST include a SetParameterValuesFault element for each parameter in the corresponding request whose modification would have resulted in such a violation. On creation of a new table entry, the CPE MUST choose default values for ExternalPort and PortMappingProtocol such that the new entry does not conflict with any existing entry. At most one entry in this table (regardless of whether or not it is enabled) can exist with a given value for Alias. On creation of a new table entry, the CPE MUST choose an initial value for Alias such that the new entry does not conflict with any existing entries. At most one enabled entry in this table can exist with all the same values for RemoteHost, ExternalPort and PortMappingProtocol.
ExternalPort	integer	W	The external port (or the first port of a range of external ports) that the NAT gateway would listen on for connection requests to a corresponding InternalPort. Inbound packets to this external port on the WAN interface SHOULD be forwarded to InternalClient on the

Name	Type	Write	Description
			InternalPort.
			A value of zero (0) represents a "wildcard". If this value is a wildcard, connection requests on all external ports (that are not otherwise mapped) will be forwarded to InternalClient. In the wildcard case, the value(s) of InternalPort on InternalClient are ignored.
			When wildcard values are used for RemoteHost and/or ExternalPort, the following precedence order applies (with the highest precedence listed first):
			▪ Explicit RemoteHost, explicit ExternalPort
			▪ Explicit RemoteHost, wildcard ExternalPort
			▪ Wildcard RemoteHost, explicit ExternalPort
			▪ Wildcard RemoteHost, wildcard ExternalPort
			If an incoming packet matches the criteria associated with more than one entry in this table, the CPE MUST apply the port mapping associated with the highest precedence entry.
			At most one entry in this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol.
ExternalPortEndRange	integer	W	Indicates the last port of the external port range that starts with ExternalPort.
			If an external port range is specified, then the behavior described for ExternalPort applies to all ports within the range.
			A value of zero (0) indicates that no external port range is specified, i.e. that the range consists only of ExternalPort.
			If ExternalPort is zero (wildcard), the value of this parameter MUST be ignored.
			If specified, the value of this parameter MUST be greater than or equal to the value of ExternalPort.
InternalClient	string	W	The IP address or DNS host name of an internal client (on the LAN).
			Support for an IP address is mandatory. If InternalClient is specified as an IP address and the LAN device's IP address subsequently changes, the port mapping MUST remain associated with the original IP address.
			Support for DNS host names is OPTIONAL. If InternalClient is specified as a DNS host name and the LAN device's IP address subsequently changes, the port mapping MUST remain associated with this LAN device. In this case, it is the responsibility of the CPE to maintain the name-to-address mapping in the event of IP address changes. This can be accomplished, for example, by assigning the DNS host name via use of DHCP option 12 (Host Name) or option 81 (FQDN). Note that the ACS can learn the host name associated with a given LAN device via the Hosts table (InternetGatewayDevice.LANDevice.{i}.Hosts).
			Read access to this parameter MUST always return the exact value that was last set by the ACS. For example, if the internal client is set to a DNS host name, it MUST read back as a DNS host name and not as an IP address.
			An empty string indicates an unconfigured InternalClient. If this parameter is unconfigured, this port mapping MUST NOT be operational.
			It MUST be possible to set the InternalClient to the broadcast IP address 255.255.255.255 for UDP mappings. This is to enable multiple NAT clients to use the same well-known port simultaneously.
InternalPort	integer	W	The port on InternalClient that the gateway SHOULD forward connection requests to. A value of zero (0) is not allowed.

Name	Type	Write	Description
PortMappingDescription	string	W	User-readable description of this port mapping.
PortMappingEnabled	boolean	W	Enables or disables the port mapping instance. On creation, an entry is disabled by default.
PortMappingLeaseDuration	integer	W	Determines the time to live, in seconds, of a port-mapping lease, where "time to live" means the number of seconds before the port mapping expires. A value of 0 means the port mapping is static. Support for dynamic (non-static) port mappings is OPTIONAL. That is, the only value for PortMappingLeaseDuration that MUST be supported is 0. For a dynamic (non-static) port mapping, when this parameter is read, the value represents the time remaining on the port-mapping lease. That is, for a dynamic port mapping, the value counts down toward 0. When a dynamic port-mapping lease expires, the CPE MUST automatically terminate that port mapping, and MUST automatically delete the corresponding PortMapping table entry.
PortMappingProtocol	string	W	The protocol of the port mapping. Enumeration of: ▪ TCP ▪ UDP At most one entry in this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol.
RemoteHost	string	W	This parameter is the IP address of the source of inbound packets. An empty string indicates a "wildcard" (this will be a wildcard in most cases). CPE are REQUIRED only to support wildcards. When RemoteHost is a wildcard, all traffic sent to the ExternalPort on the WAN interface of the gateway is forwarded to the InternalClient on the InternalPort. When RemoteHost is specified as one external IP address, the NAT will only forward inbound packets from this RemoteHost to the InternalClient, all other packets will be dropped. If a CPE supports non-wildcard values for RemoteHost, it MAY additionally support the ability to have more than one port mapping with the same ExternalPort and PortMappingProtocol, but with differing values of RemoteHost. When wildcard values are used for RemoteHost and/or ExternalPort, the following precedence order applies (with the highest precedence listed first): ▪ Explicit RemoteHost, explicit ExternalPort ▪ Explicit RemoteHost, wildcard ExternalPort ▪ Wildcard RemoteHost, explicit ExternalPort ▪ Wildcard RemoteHost, wildcard ExternalPort If an incoming packet matches the criteria associated with more than one entry in this table, the CPE MUST apply the port mapping associated with the highest precedence entry. At most one entry in this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANIPConnection.{i}.Stats.	object	-	This object contains statistics for all connections within the same "WANConnectionDevice" that share a common MAC address. The contents of this object SHOULD be identical for each such connection. This object is intended only for "WANConnectionDevice"s that can support an Ethernet-layer on this interface (e.g., "PPPoE", "IPoE").
EthernetBytesReceived	unsignedInt	-	The total number of bytes received, including framing

Name	Type	Write	Description
			characters, over all connections within the same "WANConnectionDevice" that share a common MAC address. The value of this counter MAY be reset to zero when the CPE is rebooted.
EthernetBytesSent	unsignedInt	-	The total number of bytes transmitted, including framing characters, over all connections within the same "WANConnectionDevice" that share a common MAC address. The value of this counter MAY be reset to zero when the CPE is rebooted.
EthernetDiscardPacketsReceived	unsignedInt	-	The total number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable, over all connections within the same "WANConnectionDevice" that share a common MAC address. One possible reason for discarding such a packet could be to free up buffer space. The value of this counter MAY be reset to zero when the CPE is rebooted.
EthernetDiscardPacketsSent	unsignedInt	-	The total number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted, over all connections within the same "WANConnectionDevice" that share a common MAC address. One possible reason for discarding such a packet could be to free up buffer space. The value of this counter MAY be reset to zero when the CPE is rebooted.
EthernetErrorsReceived	unsignedInt	-	The total number of inbound packets that contained errors preventing them from being deliverable, over all connections within the same "WANConnectionDevice" that share a common MAC address. The value of this counter MAY be reset to zero when the CPE is rebooted.
EthernetErrorsSent	unsignedInt	-	The total number of outbound packets that could not be transmitted because of errors, over all connections within the same "WANConnectionDevice" that share a common MAC address. The value of this counter MAY be reset to zero when the CPE is rebooted.
EthernetPacketsReceived	unsignedInt	-	The total number of packets which were received over all connections within the same "WANConnectionDevice" that share a common MAC address. The value of this counter MAY be reset to zero when the CPE is rebooted.
EthernetPacketsSent	unsignedInt	-	The total number of packets transmitted over all connections within the same "WANConnectionDevice" that share a common MAC address. The value of this counter MAY be reset to zero when the CPE is rebooted.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.	object	-	Each instance contains objects associated with a given WAN link. In the case of DSL, each instance corresponds to either a single ATM VC or a PTM Ethernet link. On creation of a "WANConnectionDevice" instance, there are initially no connection objects contained within. In the case of Ethernet (interface or link), only one "WANConnectionDevice" instance is supported.
WANIPConnectionNumberOfEntries	unsignedInt	-	Number of instances of WANIPConnection in this "WANConnectionDevice".
WANPPPConnectionNumberOfEntries	unsignedInt	-	Number of instances of WANPPPConnection in this "WANConnectionDevice".

Name	Type	Write	Description
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANPPPConnection.{i}.	object	-	This object enables configuration of PPP connections on the WAN interface of a CPE. If the "Layer2Bridging" object is implemented, the view that it provides of the CPE's underlying bridging configuration MUST be consistent with the view provided by any "LANDevice" and "WAN**Connection" objects. The implications of this are explained in TR-098a2-Annex A.
ConnectionStatus	string	-	Current status of the connection.
ConnectionTrigger	string	W	Trigger used to establish the PPP connection. Enumeration of: • OnDemand • AlwaysOn • Manual The above values are defined as follows: • OnDemand: If this PPP connection is disconnected for any reason, it is to remain disconnected until the CPE has one or more packets to communicate over this connection, at which time the CPE automatically attempts to reestablish the connection. • AlwaysOn: If this PPP connection is disconnected for any reason, the CPE automatically attempts to reestablish the connection (and continues to attempt to reestablish the connection as long it remains disconnected). • Manual: If this PPP connection is disconnected for any reason, it is to remain disconnected until the user of the CPE explicitly instructs the CPE to reestablish the connection. Note that the reason for a PPP connection becoming disconnected to begin with might be either external to the CPE, such as termination by the BRAS or momentary disconnection of the physical interface, or internal to the CPE, such as use of the IdleDisconnectTime and/or AutoDisconnectTime parameters in this object.
ConnectionType	string	-	Specifies the connection type of the connection instance.
DNSEnabled	boolean	-	Whether or not the device SHOULD attempt to query a DNS server across this connection.
DNSServers	string(64)	-	DNS server IP addresses for this connection. Support for more than three DNS Servers is OPTIONAL.
Enable	boolean	W	Enables or disables the connection instance. On creation of a "WANPPPConnection" instance, it is initially disabled.
ExternalIPAddress	string	-	This is the external IP address used by NAT for this connection. If Active Notification is enabled, the CPE MUST initiate an Inform whenever either the value of this parameter changes or the default WAN connection changes to a different connection.
MACAddress	string	-	The physical address of the "WANPPPConnection" if applicable. Configurable only if MACAddressOverride is present and true. If TransportType is PPPoA-TransportType, the value of this parameter is irrelevant and MUST be empty.
Name	string(256)	W	User-readable name of this connection.
NATEnabled	boolean	W	Indicates if Network Address Translation (NAT) is enabled for this connection.
Password	string(64)	W	Password to be usef for authentication.
PortMappingNumberOfEntries	unsignedInt	-	Total number of port mapping entries.

Name	Type	Write	Description
PossibleConnectionTypes	string	-	Types of connections possible for this connection instance.
PPPLCPEcho	unsignedInt	W	PPP LCP Echo period in seconds.
PPPLCPEchoRetry	unsignedInt	W	Number of PPP LCP Echo retries within an echo period.
PPPoEACName	string(256)	W	PPPoE Access Concentrator.
PPPoEServiceName	string(256)	W	PPPoE Service Name.
TransportType	string	-	PPP transport type of the connection.
Uptime	unsignedInt	-	The time in seconds that this connection has been up.
Username	string(64)	W	Username to be used for authentication.
InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANPPPConnection.{i}.PortMapping.{i}.	object	-	Port mapping table. This table MUST contain all NAT port mappings associated with this connection, including static and dynamic port mappings programmatically created via local control protocol, such as UPnP. This table MUST NOT contain dynamic NAT binding entries associated with the normal operation of NAT. At most one entry in an instance of this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol. If the ACS attempts to set the parameters of an existing entry such that this requirement would be violated, the CPE MUST reject the request. In this case, the SetParameterValues response MUST include a SetParameterValuesFault element for each parameter in the corresponding request whose modification would have resulted in such a violation. On creation of a new table entry, the CPE MUST choose default values for param and PortMappingProtocol such that the new entry does not conflict with any existing entry.
ExternalPort	Unsigned integer	W	The external port (or the first port of a range of external ports) that the NAT gateway would listen on for connection requests to a corresponding InternalPort. Inbound packets to this external port on the WAN interface SHOULD be forwarded to InternalClient on the InternalPort. A value of zero (0) represents a "wildcard". If this value is a wildcard, connection request on all external ports (that are not otherwise mapped) will be forwarded to InternalClient. In the wildcard case, the value(s) of InternalPort on InternalClient are ignored. When wildcard values are used for RemoteHost and/or ExternalPort, the following precedence order applies (with the highest precedence listed first): ▪ Explicit RemoteHost, explicit ExternalPort ▪ Explicit RemoteHost, wildcard ExternalPort ▪ Wildcard RemoteHost, explicit ExternalPort ▪ Wildcard RemoteHost, wildcard ExternalPort If an incoming packet matches the criteria associated with more than one entry in this table, the CPE MUST apply the port mapping associated with the highest precedence entry. At most one entry in this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol.
ExternalPortEndRange	Unsigned integer	W	Indicates the last port of the external port range that starts with ExternalPort. If an external port range is specified, then the behavior described for ExternalPort applies to all ports within the range.

Name	Type	Write	Description
			A value of zero (0) indicates that no external port range is specified, i.e. that the range consists only of ExternalPort.
			If ExternalPort is zero (wildcard), the value of this parameter MUST be ignored.
			If specified, the value of this parameter MUST be greater than or equal to the value of ExternalPort.
InternalClient	string	W	The IP address or DNS host name of an internal client (on the LAN).
			Support for an IP address is mandatory. If InternalClient is specified as an IP address and the LAN device's IP address subsequently changes, the port mapping MUST remain associated with the original IP address.
			Support for DNS host names is OPTIONAL. If InternalClient is specified as a DNS host name and the LAN device's IP address subsequently changes, the port mapping MUST remain associated with this LAN device. In this case, it is the responsibility of the CPE to maintain the name-to-address mapping in the event of IP address changes. This can be accomplished, for example, by assigning the DNS host name via use of DHCP option 12 (Host Name) or option 81 (FQDN). Note that the ACS can learn the host name associated with a given LAN device via the Hosts table (InternetGatewayDevice.LANDevice.{i}.Hosts).
			Read access to this parameter MUST always return the exact value that was last set by the ACS. For example, if the internal client is set to a DNS host name, it MUST read back as a DNS host name and not as an IP address.
			An empty string indicates an unconfigured InternalClient. If this parameter is unconfigured, this port mapping MUST NOT be operational.
			It MUST be possible to set the InternalClient to the broadcast IP address 255.255.255.255 for UDP mappings. This is to enable multiple NAT clients to use the same well-known port simultaneously.
InternalPort	Unsigned integer	W	The port on InternalClient that the gateway SHOULD forward connection requests to. A value of zero (0) is not allowed.
PortMappingDescription	string	W	User-readable description of this port mapping.
PortMappingEnabled	boolean	W	Enables or disables the port mapping instance. On creation, an entry is disabled by default.
PortMappingLeaseDuration	integer	W	Determines the time to live, in seconds, of a port-mapping lease, where "time to live" means the number of seconds before the port mapping expires.
			A value of 0 means the port mapping is static. Support for dynamic (non-static) port mappings is OPTIONAL. That is, the only value for PortMappingLeaseDuration that MUST be supported is 0.
			For a dynamic (non-static) port mapping, when this parameter is read, the value represents the time remaining on the port-mapping lease. That is, for a dynamic port mapping, the value counts down toward 0. When a dynamic port-mapping lease expires, the CPE MUST automatically terminate that port mapping, and MUST automatically delete the corresponding PortMapping table entry.
PortMappingProtocol	string	W	The protocol of the port mapping. Enumeration of:
			▪ TCP
			▪ UDP
			At most one entry in this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol.

Name	Type	Write	Description
RemoteHost	string	W	This parameter is the IP address of the source of inbound packets. empty indicates a "wildcard" (this will be a wildcard in most cases). CPE are REQUIRED only to support wildcards.
			WhenRemoteHost is a wildcard, all traffic sent to the ExternalPort on the WAN interface of the gateway is forwarded to the InternalClient on the InternalPort.
			When RemoteHost is specified as one external IP address, the NAT will only forward inbound packets from this RemoteHost to the InternalClient, all other packets will be dropped.
			If a CPE supports non-wildcard values for RemoteHost, it MAY additionally support the ability to have more than one port mapping with the same ExternalPort and PortMappingProtocol, but with differing values of RemoteHost.
			When wildcard values are used forRemoteHost and/or ExternalPort, the following precedence order applies (with the highest precedence listed first):
			▪ # Explicit RemoteHost, explicit ExternalPort
			▪ # Explicit RemoteHost, wildcard ExternalPort
			▪ # Wildcard RemoteHost, explicit ExternalPort
			▪ # Wildcard RemoteHost, wildcard ExternalPort
			If an incoming packet matches the criteria associated with more than one entry in this table, the CPE MUST apply the port mapping associated with the highest precedence entry.
			At most one entry in this table can exist with all of the same values for RemoteHost, ExternalPort, and PortMappingProtocol.
InternetGatewayDevice.WANDevice.{i}.WANDSLInterfaceConfig.	object	-	This object models physical layer properties specific to a single physical connection of a DSL modem used for Internet access on a CPE. This object is required for a CPE with a DSL modem WAN interface, and is exclusive of any other "WAN*InterfaceConfig" object within a given "WANDevice" instance.
AllowedProfiles	string	-	Comma-separated list of strings. Indicates which VDSL2 profiles are allowed on the line. Each list item is an enumeration of:
			▪ 8a
			▪ 8b
			▪ 8c
			▪ 8d
			▪ 12a
			▪ 12b
			▪ 17a
			▪ 17b
			▪ 30a
			Note: In G.997.1, this parameter is called PROFILES. See ITU-T Recommendation G.997.1.
			Note: This parameter is OPTIONAL at the G and S/T interfaces in G.997.1 Amendment 1. If the parameter is implemented but no value is available, its value MUST be an empty string.
CurrentProfile	string	-	Indicates which VDSL2 profile is currently in use on the line.
			Note: This parameter is OPTIONAL at the G and S/T interfaces in G.997.1 Amendment 1. If the parameter is implemented but no value is available, its value MUST be empty.

Name	Type	Write	Description
DownstreamAttenuation	int	-	The current downstream signal loss (expressed in 0.1 dB).
DownstreamCurrRate	unsignedInt	-	The current physical layer aggregate data rate (expressed in Kbps) of the downstream DSL connection. Note: This parameter is OPTIONAL at the G and S/T interfaces in G.997.1 Amendment 1. If the parameter is implemented but no value is available, it MUST have the value 4294967295 (the maximum for its data type).
DownstreamMaxRate	unsignedInt	-	The current attainable rate (expressed in Kbps) of the downstream DSL channel. Note: This parameter is related to the G.997.1 parameter ATTNDRds, which is measured in bits/s. See ITU-T Recommendation G.997.1.
DownstreamNoiseMargin	int	-	The current signal-to-noise ratio margin (expressed in 0.1 dB) in the downstream direction. Note: In G.997.1, this parameter is called SNRMds. See ITU-T Recommendation G.997.1.
DownstreamPower	int	-	The current received power at the CPE's DSL interface (expressed in 0.1 dBmV).
Enable	boolean	W	Enables or disables the link.
LinkEncapsulationSupported	string	-	Indicates which link encapsulation standards and recommendations are supported by the B-NT.
LinkEncapsulationUsed	string	-	Indicates the link encapsulation standard that the B-NT is using for the connection. Enumeration of: • G.992.3_Annex_K_ATM • G.992.3_Annex_K_PTM • G.993.2_Annex_K_ATM • G.993.2_Annex_K_PTM When the standard identifies ATM encapsulation then the InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANDSLLinkConfig object MUST be used. When the standard identifies PTM encapsulation then the InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANPTMLinkConfig object MUST be used.
ShowtimeStart	unsignedInt	-	Number of seconds since the most recent DSL Showtime - the beginning of the period used for collection of "Showtime" statistics. Showtime is defined as successful completion of the DSL link establishment process. The "Showtime" statistics are those collected since the most recent establishment of the DSL link.
StandardsSupported	string	-	Indicates which DSL standards and recommendations are supported by the B-NT.
StandardUsed	string	-	Indicates the standard that the B-NT is using for the connection.
Status	string	-	Status of the DSL physical link. Enumeration of: • Up • Initializing • EstablishingLink • NoSignal • Error (OPTIONAL) • Disabled The Error value MAY be used by the CPE to indicate a locally defined error condition.
TotalStart	unsignedInt	-	Number of seconds since the beginning of the period used for collection of "Total" statistics. Statistics SHOULD continue to be accumulated across

Name	Type	Write	Description
			CPE reboots, though this might not always be possible.
UpstreamAttenuation	int	-	The current upstream signal loss (expressed in 0.1 dB).
UpstreamCurrRate	unsignedInt	-	The current physical layer aggregate data rate (expressed in Kbps) of the upstream DSL connection. Note: This parameter is OPTIONAL at the G and S/T interfaces in G.997.1 Amendment 1. If the parameter is implemented but no value is available, it MUST have the value 4294967295 (the maximum for its data type).
UpstreamMaxRate	unsignedInt	-	The current attainable rate (expressed in Kbps) of the upstream DSL channel. Note: This parameter is related to the G.997.1 parameter ATTNDRus, which is measured in bits/s. See ITU-T Recommendation G.997.1.
UpstreamNoiseMargin	int	-	The current signal-to-noise ratio margin (expressed in 0.1 dB) in the upstream direction. Note: In G.997.1, this parameter is called SNRMus. See ITU-T Recommendation G.997.1.
UpstreamPower	int	-	The current output power at the CPE's DSL interface (expressed in 0.1 dBmV).
InternetGatewayDevice.WANDevice.{i}.WANDSLInterfaceConfig.Stats.	object	-	This object contains statistics for a WAN DSL physical interface.
InternetGatewayDevice.WANDevice.{i}.WANDSLInterfaceConfig.Stats.Showtime.	object	-	This object contains DSL statistics accumulated since the most recent DSL Showtime.
CRCErrors	unsignedInt	-	Number of CRC errors detected since the most recent DSL Showtime (CV-C as defined in ITU-T Rec. G.997.1). Note: This parameter is OPTIONAL at the G and S/T interfaces in G.997.1 Amendment 1. If the parameter is implemented but no value is available, its value MUST be 4294967295 (the maximum for its data type).
InternetGatewayDevice.WANDevice.{i}.WANDSLInterfaceConfig.Stats.Total.	object	-	This object contains DSL total statistics.
CRCErrors	unsignedInt	-	Total number of CRC errors detected (CV-C as defined in ITU-T Rec. G.997.1). Note: This parameter is OPTIONAL at the G and S/T interfaces in G.997.1 Amendment 1. If the parameter is implemented but no value is available, its value MUST be 4294967295 (the maximum for its data type).
InternetGatewayDevice.WANDevice.{i}.WANEthernetInterfaceConfig.	object	-	This object models physical layer properties specific to a single Ethernet physical connection used for Internet access on a CPE. This object is required for a CPE with an Ethernet WAN interface, and is exclusive of any other "WAN*InterfaceConfig" object within a given "WANDevice" instance. Note that this object is not related to the Ethernet protocol layer sometimes used in associated with a DSL connection.
DuplexMode	string	-	The duplex mode available to this connection.
Enable	boolean	W	Enables or disables this interface.
MACAddress	string	-	The physical address of the interface.
MaxBitRate	string	-	The maximum upstream and downstream bit rate available to this connection.
InternetGatewayDevice.WANDevice.{i}.WANEthernetInterfaceConfig.Stats.	object	-	This object contains statistics for an Ethernet WAN interface on a CPE device.
BytesReceived	unsignedInt	-	Total number of bytes received over the interface since the CPE was last reset.
BytesSent	unsignedInt	-	Total number of bytes sent over the interface since the

Name	Type	Write	Description
			CPE was last reset.
PacketsReceived	unsignedInt	-	Total number of packets received over the interface since the CPE was last reset.
PacketsSent	unsignedInt	-	Total number of packets sent over the interface since the CPE was last reset.
Status	string	-	Indicates the status of this interface. Enumeration of: ▪ Up ▪ NoLink ▪ Error (OPTIONAL) ▪ Disabled The Error value MAY be used by the CPE to indicate a locally defined error condition.

5 TR-104 Data Model

TR-104 defines the data model for the provisioning of a voice-over-IP (VoIP) CPE device by an Auto-Configuration Server (ACS) using the mechanism defined in TR-069.

The following profiles are implemented by MSBR products:
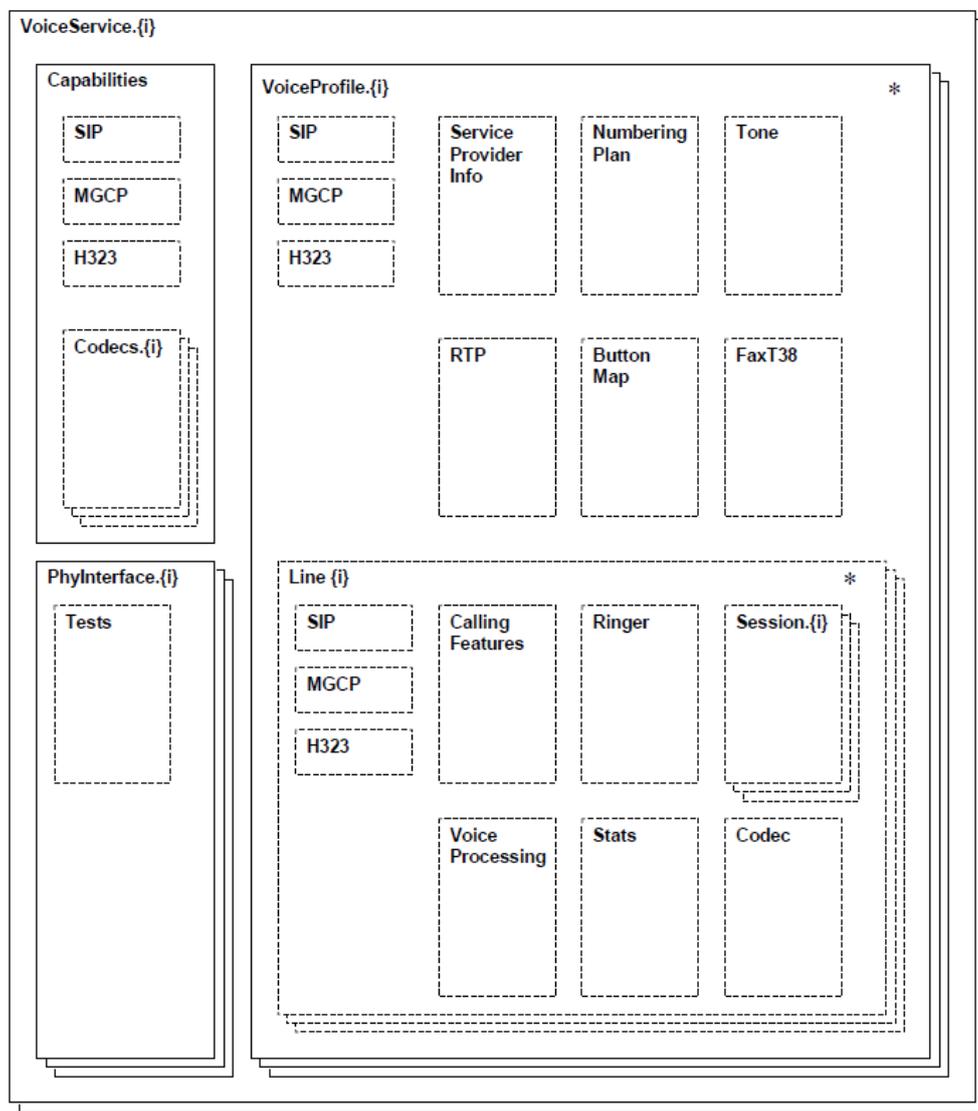
- Endpoint Profile
- SIP Endpoint Profile

> **Note:** TR-104 is supported only for FXS interfaces.

5.1 Major Elements

The following diagram provides an overview of all objects defined in TR-104:

Figure 5-1: Objects Defined in TR-104

TR-104 describes functionality of a VoIP device that has one or more FXS lines.

The MSBR configuration model differs considerably from the model described in TR-104. For example, instead of the *VoiceProfile* object that corresponds to a group of phone lines, a separate *TelProfile* and/or IP Profile objects are used. TR-104 uses an implicit routing model while MSBR supports explicit routing tables that may be used to implement much more complicated call routings.

To "bridge" between these two very different configuration models, the following is assumed regarding the way MSBR is configured:

■ Default Tel Profile (0) is used for all Hunt Groups (FXS Lines).

■ "IP to Tel" Routing for phone lines (FXS ports) is implemented via the *PSTNPrefix* table. For each phone line (FXS port), a separate and unique entry in this table is created.

■ "Tel to IP" routing is performed by the default *ProxySet (0)* and when the *IsProxySet* parameter is set to "1" (enabled). The first IP address entry in the Proxy Set configuration is used.

■ Default IP Profile (0) is used for all routing rules.

■ Outbound Proxy (if needed) is implemented via a single line in the *PSTNPrefix* table with '*' wildcard for source and destination prefix.

5.2   VoiceService

VoiceService is a container "service" object as defined in TR-106.

MSBR implements a single instance of this object – VoiceService.1 only if it is equipped with the FXS ports.

5.2.1   VoiceService.{i}.Capabilities.Codecs

Codecs table describes the set of supported codecs. The table is read-only. Line.{i}.Codec.List table is used instead to customize list and parameters of coders assigned to the specific phone line.

MSBR will populate this table with *all supported* coders (as per CoderName_Type and CoderName_Rate ENUMs, taking into account the current DSP template). Each entry will contain "default" parameters (e.g. p-time) that correspond to the specific coder.

5.2.2   VoiceService.{i}.VoiceProfile

VoiceProfile corresponds to one or more phone lines (FXS ports) that share the same basic configuration.

MSBR implements a single instance of the VoiceProfile.1 object.

5.2.3   VoiceService.{i}.VoiceProfile.{i}.Line

The Line object corresponds to a single phone line (FXS port).

MSBR implements an instance of this object for each phone line (FXS port) configured in Hunt Group (TrunkGroup) table. Add/remove operations will be supported to allow configuration/removal of specific FXS port (See details in the table below).

5.2.4   VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Codec

The Codec object describes voice coder currently used by the specific phone line. In addition to that it provides a list of coders (Codec.List.{i}) enabled on the specific line and the ability to modify this configuration.

MSBR implements a global Coder table that is shared by all phone lines (FXS ports). It allows "per-line" customization of coders via Coder Group table. However, use of this

functionality requires use of different Tel Profiles for different Hunt Groups (FXS port) and number of coder groups that may be configured is limited to 4.

Map Codec.List.{i} table directly to Coders (CoderName) table. This essentially means that all lines share the same configuration and configuration change for one line immediately affects all other lines.

5.2.5 VoiceService.{i}.VoiceProfile.{i}.Line.{i}.SIP

The Line.{i}.SIP object contains username/password assigned to a specific phone line (FXS port).

MSBR will map this object to corresponding entry in Authentication Table.

5.2.6 VoiceService.{i}. X_0090F8_SwitchOverToProxy

The X_0090F8_SwitchOverToProxy parameter is an AudioCodes proprietary parameter, which disables automatic dialing between FXS and FXO endpoints.

5.3 Endpoint Profile

MSBR complies with Version 1 of Endpoint profile (Endpoint:1) as defined in TR-104 Section 4.2.

Table 5-1: Endpoint Profile Table

Name	Type	Write	Description	Comment
InternetGatewayDevice. Services.VoiceService.{i}.	object	–	The top-level object.	A single instance of VoiceService object will be created.
VoiceProfileNumberOfEntries	unsignedInt	–	Defines the number of instances of VoiceProfile.	1
.VoiceService.{i}.Capabilities.	object	–	Defines the overall capabilities of the VoIP CPE.	
MaxProfileCount	unsignedInt	–	Defines the maximum total number of distinct voice profiles supported.	1
MaxLineCount	unsignedInt	–	Defines the maximum total number of lines supported across all profiles. This parameter is applicable only for a VoIP endpoint.	Total number of FXS interfaces (e.g. 4).
MaxSessionsPerLine	unsignedInt	–	Defines the maximum number of voice sessions supported for any given line across all profiles. A value greater than one indicates support for CPE provided conference calling. This parameter is applicable only for a VoIP endpoint.	1

Name	Type	Write	Description	Comment
MaxSessionCount	unsignedInt	–	Defines the maximum total number of voice sessions supported across all lines and profiles. (This might differ from MaxLineCount if each line can support more than one session for CPE provided conference calling. This value MAY be less than the product of MaxLineCount and MaxSessionsPerLine.)	same value as MaxLineCount
SignalingProtocols	string(256)	–	Defines the comma-separated list of signaling protocols supported. Each item is an enumeration of: "SIP" "MGCP" "MGCP-NCS" "H.248" "H.323" Each entry MAY be appended with a version indicator in the form "/X.Y". For example: "SIP/2.0" The list MAY include vendor-specific protocols, which MUST be in the format defined in [3]. For example: "X_EXAMPLE-COM_MyProt"	"SIP"
Regions	string(256)	–	Defines the comma-separated list of geographic regions supported by the CPE. Each item is the list MUST be an alpha-2 (two-character alphabetic) country code as specified by ISO 3166. An empty list indicates that the CPE does not support region-based customization via the Region parameter in the VoiceService.{i}.VoiceProfile.{i} object.	<empty>
RTCP	boolean	–	Defines support for RTCP. A true value indicates support for the object VoiceService.{i}.VoiceProfile.{i}.RTP.RTCP. This parameter is applicable only for a VoIP endpoint.	True

Name	Type	Write	Description	Comment
SRTP	boolean	–	Defines support for SRTP. A true value indicates support for the object VoiceService.{i}.VoiceProfile.{i}.RTP.SRTP. A true value also indicates that the SRTPKeyingMethods and SRTPEncryptionKeySizes parameters in this object are present. This parameter is applicable only for a VoIP endpoint.	True
SRTPKeyingMethods	string(256)	–	Defines comma-separated list of keying protocols supported by this endpoint for SRTP. Each item is an enumeration of: "Null" "Static" "SDP" "IKE" This list MAY include vendor-specific keying methods, which MUST use the format defined in [3]. This parameter is applicable only if the SRTP parameter in this object is equal to true. **Note:** This parameter is NOT part of *EndpointProfile*, but it's mandatory when SRTP is supported.	"Static"
SRTPEncryptionKeySizes	string(256)	–	Defines comma-separated list of unsigned integers, each represented a supported SRTP encryption key size. This parameter is applicable only if the SRTP parameter in this object is equal to true.	according to SRTPofferedSuites parameter possible values, the only supported value is "128"
RTPRedundancy	boolean	–	Defines support for RTP payload redundancy as defined in RFC 2198. A true value indicates support for VoiceService.{i}.VoiceProfile.{i}.RTP.Redundancy. This parameter is applicable only for a VoIP endpoint.	True

Name	Type	Write	Description	Comment
DSCPCoupled	boolean	–	Defines a true value that indicates that the CPE is constrained such that transmitted call control packets use the same DSCP marking as transmitted RTP packets. If the value is true, the CPE MUST NOT support the DSCPMark parameter for call control. This parameter is applicable only for a VoIP endpoint.	False
EthernetTaggingCoupled	boolean	–	Defines a true value that indicates that the CPE is constrained such that transmitted call control packets use the same Ethernet tagging (VLAN ID Ethernet Priority) as transmitted RTP packets. If the value is true, the CPE MUST NOT support the VLANIDMark or EthernetPriorityMark parameters within a call control object (e.g., SIP, MGCP, or H323). This parameter is applicable only for a VoIP endpoint.	False
PSTNSoftSwitchOver	boolean	–	Defines a true value that indicates the CPE is capable of supporting the PSO_Activate Facility Action, which allows a call to be switched to a PSTN FXO (Foreign eXchange Office) line. This parameter is applicable only for a VoIP endpoint.	False
FaxT38	boolean	–	Defines support for T.38 fax. A true value indicates support for the object VoiceService.{i}.VoiceProfile.{i}.FaxT38. This parameter is applicable only for a VoIP endpoint.	True
FaxPassThrough	boolean	–	Defines support for fax pass-through. A true value indicates support for the parameter VoiceService.{i}.VoiceProfile.{i}.FaxPassThrough. This parameter is applicable only for a VoIP endpoint.	True

Name	Type	Write	Description	Comment
ModemPassThrough	boolean	–	Defines support for modem pass-through. A true value indicates support for the parameter VoiceService.{i}.VoiceProfile.{i}.ModemPassThrough. This parameter is applicable only for a VoIP endpoint.	True
ToneGeneration	boolean	–	Defines support for tone generation. A true value indicates support for the object VoiceService.{i}.VoiceProfile.{i}.Tone. A true value also indicates that the ToneDescriptionsEditable, PatternBasedToneGeneration, and FileBasedToneGeneration parameters in this object are present. This parameter is applicable only for a VoIP endpoint.	False
RingGeneration	boolean	–	Defines support for ring generation. A true value indicates support for control of ring generation via the VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Ringer object. A true value also indicates that the RingDescriptionsEditable, PatternBasedRingGeneration, and FileBasedRingGeneration parameters in this object are present. This parameter is applicable only for a VoIP endpoint.	False
NumberingPlan	boolean	–	Defines support for a configurable numbering plan. A true value indicates support for a configurable numbering plan via the VoiceService.{i}.VoiceProfile.{i}.NumberingPlan object. This parameter is applicable only for a VoIP endpoint.	False
ButtonMap	boolean	–	Defines support for a configurable button map. A true value indicates support for a configurable button map via the VoiceService.{i}.VoiceProfile.{i}.ButtonMap object. This parameter is applicable only for a VoIP endpoint.	False

Name	Type	Write	Description	Comment
VoicePortTests	boolean	–	Defines support for remotely accessible voice-port tests. A true value indicates support for the VoiceService.{i}.PhyInterface.{i}.Tests object. This parameter is applicable only for a VoIP endpoint.	False
.VoiceService.{i}.Capabilities. Codecs.{i}.	object	–	Table to describe the set of supported codecs. Each entry refers to a distinct combination of codec and bit rate. The table MUST include a distinct entry for each supported combination of these parameters. Applicable only for a VoIP endpoint.	This table will be populated with entries for each supported coder (as per CoderName_Type enum and applicable bit-rates). If possible we should limit list of supported coders to those supported in current DSP template only. For each entry, default coder parameters (e.g. p-time) will be specified. Note: This table is NOT mapped to Coders (CoderName) table. The latter is mapped to Line.{i}.Codec.List table.
EntryID	unsignedInt [1:]	–	Defines a unique identifier for each entry in this table.	
Codec	string(64)	–	Defines an identifier of the type of codec. Enumeration of: "G.711MuLaw" "G.711ALaw" "G.726" "G.729" "G.729a" "G.729e" "G.728" "G.723.1" "G.722" "G.722.1" "G.722.2" "GSM-FR" "GSM-HR" "GSM-EFR" "iLBC" The parameter MAY instead be a vendor-specific codec, which MUST be in the format defined in [3]. For example: "X_EXAMPLE-COM_MyCodec"	
BitRate	unsignedInt	–	Defines a Bit Rate in bits per second. The value MUST be among the values appropriate for the specified codec.	

Name	Type	Write	Description	Comment
PacketizationPeriod	string(64)	–	Defines a comma-separated list of supported packetization periods, in milliseconds, or continuous ranges of packetization periods. Ranges are indicated as a hyphen-separated pair of unsigned integers. Examples: "20" indicates a single discrete value. "10, 20, 30" indicates a set of discrete values. "5-40" indicates a continuous inclusive range. "5-10, 20, 30" indicates a continuous range in addition to a set of discrete values A range MUST only be indicated if all values within the range are supported.	
SilenceSuppression	boolean	–	Indicates support for silence suppression for this codec.	
.VoiceService.{i}.VoiceProfile.{i}.	object	C	Support for creation and deletion of Profiles is REQUIRED only if more than one Profile is supported as indicated by VoiceService.{i}.Capabilities.MaxProfileCount.	A single instance of VoiceProfile object will be created. Add/remove operations will NOT be supported.
Enable	string	W	Enables or disables all lines in this profile, or places it into a quiescent state. Enumeration of: "Disabled" "Quiescent" "Enabled" On creation, a profile MUST be in the Disabled state. In the Quiescent state, in-progress sessions remain intact, but no new sessions are allowed. Support for the Quiescent state in a CPE is optional. If this parameter is set to "Quiescent" in a CPE that does not support the Quiescent state, it MUST treat it the same as the Disabled state.	Only 'Enabled' state will be supported.
NumberOfLines	unsignedInt	–	Defines the number of instances of Line within this VoiceProfile. Applicable only for a VoIP endpoint.	Number of entries in Hunt Group (TrunkGroups) table of type FXS.

Name	Type	Write	Description	Comment
Name	string(64)	W	Defines a human-readable string to identify the profile instance.	'Default Profile' Write operation will not be supported.
SignalingProtocol	string(64)	W	Defines the protocol to be used for this profile. A single protocol selected from among the available protocols indicated in VoiceService.{i}.Capabilities.SignalingProtocols.	"SIP"
MaxSessions	unsignedInt	W	Defines the limit on the number of simultaneous voice sessions across all lines in this profile. Must be less than or equal to VoiceService.{i}.Capabilities.-MaxSessionCount. (This MAY be greater than the number of lines if each line can support more than one session, for example for CPE provided conference calling.)	We will assume that a single session is supported per line – hence we will use the same value as for NumberOfLines.
DTMFMethod	string(64)	W	Defines the method by which DTMF digits MUST be passed. Enumeration of: "InBand" "RFC2833" "SIPInfo" If the parameter DTMFMethodG711 is non-empty, then this parameter applies only when the current codec is not G.711. The value "SIPInfo" is applicable only if the SignalingProtocol is SIP. This parameter is applicable only for a VoIP endpoint.	RxDTMFOption==0 && TxDTMFOption==1 → "SIPInfoNortel" RxDTMFOption==0 && TxDTMFOption==3 → "SIPInfo" RxDTMFOption==0 && TxDTMFOption==2 → "Notify" RxDTMFOption==3 && TxDTMFOption==4 → "RFC2833" RxDTMFOption==0 && TxDTMFOption==0 && DTMFTransportType==2 → "InBand" Any other combination → "Other" (read-only) **Note:** These are _global_ parameters. They may be overwritten by setting corresponding parameter in IPProfile. If we manage to "link" TelProfile and IPProfile together (see …) , we'll use parameters from IPProfile; otherwise global parameters will be used.

Name	Type	Write	Description	Comment
DTMFMethodG711	string(64)	W	Defines the method by which DTMF digits MUST be passed if the current codec is G.711. Enumeration of: "InBand" "RFC2833" "SIPInfo" An empty value for this parameter indicates that the value of the DTMFMethod parameter is to apply whether or not the current codec is G.711. The value "SIPInfo" is applicable only if the SignalingProtocol is SIP. This parameter is applicable only for a VoIP endpoint.	We support "empty" values only.
.VoiceService.{i}.VoiceProfile. {i}.RTP.	object	–	Voice profile parameters related to the voice stream sent via RTP. Applicable only for a VoIP endpoint.	
LocalPortMin	unsignedInt [0:65535]	W	Defines the base of port range to be used for incoming RTP streams for this profile.	BaseUDPport (or use Media Realm's Port Range Start, if Media Realm is defined)
DSCPMark	unsignedInt [0:63]	W		
TelephoneEventPayloadType	unsignedInt [0:128]	W	Defines the payload type to be used for RTP telephone events. This parameter indicates the payload type to be used for DTMF events if RFC 2833 transmission of DTMF information is in use.	According to RFC 2833 PayloadType.
.VoiceService.{i}.VoiceProfile. {i}.Line.{i}.	object	C	Defines the support for creation and deletion of Lines is REQUIRED only if more than one Line is supported as indicated by VoiceService.{i}.Capabilities .MaxLineCount.	An instance of this object is created for each Hunt Group / TrunkGroup entry of type FXS. Add operation will be supported only if some "unused" FXS line exists. It will create a new entry in Hunt Group / TrunkGroup table. Remove operation will delete corresponding entry from Hunt Group table.

Name	Type	Write	Description	Comment
Enable	string	W	Enables or disables this line, or places it into a quiescent state. Enumeration of: "Disabled" "Quiescent" "Enabled" On creation, a line MUST be in the Disabled state. In the Quiescent state, in-progress sessions remain intact, but no new sessions are allowed. Support for the Quiescent state in a CPE is optional. If this parameter is set to "Quiescent" in a CPE that does not support the Quiescent state, it MUST treat it the same as the Disabled state (and indicate Disabled in the Status parameter).	Quiescent state is not supported. Disabled state is implemented "at TR069 level only" (the entry will NOT exist in Hunt Group table).
Status	string	–	Indicates the status of this line. Enumeration of: "Up" "Initializing" "Registering" "Unregistering" "Error" "Testing" "Quiescent" "Disabled"	The following statuses are supported: - Up - Disabled
CallState	string	–	Indicates the call state for this line. Enumeration of: "Idle" "Calling" "Ringing" "Connecting" "InCall" "Hold" "Disconnecting"	Need to query SIP database to get this info.
.VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Codec.	object	–	This object indicates the state of the transmit and receive codec for this voice line instance.	**Note:** This object shows the data about currently established media session (i.e. the data should be taken from MediaEngine).
TransmitCodec	string(64)	–	Defines the codec currently in use for the outgoing voice stream. Enumeration from the list of available codecs as given in the VoiceService.{i}.Capabilities.Codecs table.	
ReceiveCodec	string(64)	–	Defines the codec currently in use for the incoming voice stream. Enumeration from the list of available codecs as given in the VoiceService.{i}.Capabilities.Codecs table.	

Name	Type	Write	Description	Comment
TransmitBitRate	unsignedInt	–	Defines the codec bit rate in bits per second for the codec currently in use for the outgoing voice stream.	
ReceiveBitRate	unsignedInt	–	Defines the codec bit rate in bits per second for the codec currently in use for the incoming voice stream.	
TransmitSilenceSuppression	boolean	–	Defines whether or not silence suppression is in use for the outgoing voice stream.	
ReceiveSilenceSuppression	boolean	–	Defines whether or not silence suppression is in use for the incoming voice stream.	
TransmitPacketizationPeriod	unsignedInt	–	Defines the current outgoing packetization period in milliseconds.	
.VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Codec.List.{i}.	object	–	Table to describe the set of codecs enabled for use with this line. Each entry in this table refers to a distinct combination of codec and bit rate. When a Line is created, this object MUST be populated with the set of supported codecs matching the VoiceService.{i}.Capabilities.Codecs table. The ACS MAY restrict and/or prioritize the codec support for this profile using this object. Applicable only for a VoIP endpoint.	The table will be populated with all supported coders (similar to Capabilities.Codecs table). Each "Enabled" object will be mapped to the entry in Coders (CoderName) table. Index in Coders table will be determined according to the object's Priority parameter. "Disabled" objects will exist "at TR-069 level only".
EntryID	unsignedInt [1:]	–	Defines the unique identifier for each entry in this table. The value MUST match that of the corresponding entry in the VoiceService.{i}.Capabilities.Codecs table.	Similar to Capabilities.Codecs
Codec	string(64)	–	Defines the Identifier of the codec type. The value MUST match that of the corresponding entry in the VoiceService.{i}.Capabilities.Codecs table.	Initial value - similar to Capabilities.Codecs; when "Enabled" – CoderName_Type
BitRate	unsignedInt	–	Defines the Bit rate in bits per second. The value MUST match that of the corresponding entry in the VoiceService.{i}.Capabilities.Codecs table.	Initial value - similar to Capabilities.Codecs; ; when "Enabled" – CoderName_Rate

Name	Type	Write	Description	Comment
PacketizationPeriod	string(64)	W	Defines the comma-separated list of supported packetization periods, in milliseconds, or continuous ranges of packetization periods as defined in VoiceService.{i}.Capabilities.Codecs.PacketizationPeriod. The set of packetization periods may be restricted by modifying the value of this parameter to a more restricted set of values than is listed in VoiceService.{i}.Capabilities.Codecs.PacketizationPeriod. The CPE MUST ignore any values or portions of ranges outside of those specified in VoiceService.{i}.Capabilities.Codecs.Packetization.Period.	Initial value – similar to Capabilities.Codecs; when "Enabled" – CoderName_PacketInterval Can be modified by user.
SilenceSuppression	boolean	W	Indicates support for silence suppression for this codec. If silence suppression is supported, it can be disabled for this codec/bit-rate by setting this parameter to false	Initial value – similar to Capabilities.Codecs; when "Enabled" – CoderName_SCE Can be modified by user.
Enable	boolean	W	This parameter is REQUIRED to be writable only if there is more than one entry in this table.	When set to 'true' corresponding entry in Coders (CoderName) table is created (with index that corresponds to Priority parameter). ***When set to 'false', corresponding entry is removed from the Coders table***. **Note:** in DR add 2 options: Either not able option to put DISABLE to this param, or add new field of Admin-State to Coder Tables
Priority	unsignedInt [1:]	W	This parameter is REQUIRED to be writable only if there is more than one entry in this table.	Will be used to determine index of entry in Coders (CoderName) table. When value is changed and Enable=='true' existing Coders entry will be removed and a new entry will be created instead (with a new index).
.VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Session.{i}.	object	–	Information on each active session associated with this voice line instance.	Information about currently active call – should be taken from SIP DB.
SessionStartTime	date time	–	Defines the time that the session started, in UTC.	
SessionDuration	Unsignedint	–	Defines the duration time of the current session, in seconds.	
FarEndIPAddress	string	–	Defines the IP address of far end VoIP device.	

Name	Type	Write	Description	Comment
FarEndUDPPort	unsignedInt [0:65535]	–	Defines the UDP port used for current RTP session in the far end device.	
LocalUDPPort	unsignedInt [0:65535]	–	Defines the local UDP port used for current RTP session.	
.VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Stats.	object	–	Statistics for this voice line instance.	Will be mapped to corresponding PMs (if such exist), SIP or VE counters. We may need to create new PMs to support all needed counters.
ResetStatistics	boolean	W	Defines when set to one, resets the statistics for this voiceline. Always False when read.	
PacketsSent	unsignedInt	–	Defines the total number of RTP packets sent for this line.	
PacketsReceived	unsignedInt	–	Defines the total number of RTP packets received for this line.	
BytesSent	unsignedInt	–	Defines the total number of RTP payload bytes sent for this line.	
BytesReceived	unsignedInt	–	Defines the total number of RTP payload bytes received for this line.	
PacketsLost	unsignedInt	–	Defines the total number of RTP packets that have been lost for this line.	
Overruns	unsignedInt	–	Defines the total number of times the receive jitter buffer has overrun for this line.	
Underruns	unsignedInt	–	Defines the total number of times the receive jitter buffer has underrun for this line.	
IncomingCallsReceived	unsignedInt	–	Defines the total incoming calls received.	
IncomingCallsAnswered	unsignedInt	–	Defines the total incoming calls answered by the local user.	
IncomingCallsConnected	unsignedInt	–	Defines the total incoming calls that successfully completed call setup signaling.	
IncomingCallsFailed	unsignedInt	–	Defines the total incoming calls that failed to successfully complete call setup signaling.	
OutgoingCallsAttempted	unsignedInt	–	Defines the total outgoing calls attempted.	
OutgoingCallsAnswered	unsignedInt	–	Defines the total outgoing calls answered by the called party.	

Name	Type	Write	Description	Comment
OutgoingCallsConnected	unsignedInt	–	Defines the total outgoing calls that successfully completed call setup signaling.	
OutgoingCallsFailed	unsignedInt	–	Defines the total outgoing calls that failed to successfully complete call setup signaling.	
CallsDropped	unsignedInt	–	Defines the total number calls that were successfully connected (incoming or outgoing), but dropped unexpectedly while in progress without explicit user termination.	
TotalCallTime	unsignedInt	–	Defines the cumulative call duration in seconds.	

5.3.1 Endpoint Profile Extensions

The following parts of TR-104 are not part of Endpoint profile (Endpoint:1) however are applicable to MSBR due to one of the following:

■ are implied from the way we implement VoiceService.1.Capabilities object.

■ were explicitly requested by potential customer

Table 5-2: Endpoint Profile Extensions Table

Name	Type	Write	Description	Comment
.VoiceService.{i}.VoiceProfile.{i}.	object	–		
FaxPassThrough	string	W	Specifies the behavior of the CPE for pass-through of fax data. Enumeration of: "Disable" "Auto" "Force" The value "Disable" prevents the CPE from switching to a fax pass-through mode. The value "Auto" allows the CPE to automatically detect fax data to determine whether or not to switch to a fax pass-through mode. The value "Force" forces the CPE to switch to a fax pass-through mode regardless of whether fax signaling is detected. If this parameter is supported, the capability VoiceService.{i}.Capabilities.FaxPassThrough MUST be equal to true. This parameter is appropriate only for a VoIP endpoint.	According to IsFaxUsed and FaxTransportMode parameters: **Read:** (IsFaxUsed==2) || ((IsFaxUsed==0) && (FaxTransportMode==2)) →"Auto" Otherwise → "Disabled" **Write:** "Auto" → IsFaxUsed=2 "Disable"→ IsFaxUsed=0, FaxTransportMode=0 (unless FaxT38.Enable == true) **Note**: the same values may be taken from "default" IPProfile 0.
ModemPassThrough	string	W	Specifies the behavior of the CPE for passthrough of modem data. Enumeration of: "Disable" "Auto"	According to V21ModemTransportType, V22ModemTransportType, V23ModemTransportType, V32ModemTransportType, V34ModemTransportType

Name	Type	Write	Description	Comment
			"Force" The value "Disable" prevents the CPE from switching to a modem pass-through mode. The value "Auto" allows the CPE to automatically detect modem data to determine whether or not to switch to a modem pass-through mode. The value "Force" forces the CPE to switch to a modem pass-through mode regardless of whether modem signaling is detected. If this parameter is supported, the capability VoiceService.{i}.Capabilities.ModemPassThrough MUST be equal to true. This parameter is appropriate only for a VoIP endpoint.	and BellModemTransportType parameters: **Read:** If all VxxModemTransportType == 2 → "Auto" otherwise → "False" **Write:** "Auto" → all VxxModemTransportType = 2 "Disable" → all VxxModemTransportType = 0
.VoiceService.{i}.VoiceProfile.{i}.RTP.RTCP.	object	–	Voice profile parameters related to RTCP. If this object is supported, the capability VoiceService.{i}.Capabilities.RTCP MUST be equal to true. Applicable only for a VoIP endpoint.	Neither of the below parameters are configurable via WEB/CLI/INI file.
Enable	boolean	W	Enables or disables RTCP.	Internal parameter: RtcpInterval==0
TxRepeatInterval	unsignedInt [1:]	W	Defines the Transmission repeat interval, in milliseconds	Internal parameter: RtcpInterval
VoiceService.{i}.VoiceProfile.{i}.RTP.SRTP.	object	–	Defines the Voice profile parameters for secure voice transmission via SRTP. If this object is supported, the capability VoiceService.{i}.Capabilities.SRTP MUST be equal to true. Applicable only for a VoIP endpoint.	
Enable	boolean	W	Enables or disables the use of SRTP. If RTCP is enabled, a true value of this parameter also implies the use of SRTCP.	EnableMediaSecurity
KeyingMethods	string(256)	W	Defines a comma-separated list of keying methods that may be used. The value MUST be a subset of those listed in the parameter VoiceService.{i}.Capabilities.SRTP KeyingMethods.	"Static" Write operation will not be supported.
EncryptionKeySizes	string(256)	W	Defines a comma-separated list of encryption key sizes that may be used. The value MUST be a subset of those listed in the parameter VoiceService.{i}.Capabilities.SRTP EncryptionKeySizes.	According to SRTPofferedSuites parameter. But since we support only "128" – this is the only possible value.
VoiceService.{i}.VoiceProfile.{i}.RTP.Redundancy	object	–	Defines Voice profile parameters for RTP payload redundancy as defined by RFC 2198. If this object is supported, the capability VoiceService.{i}.Capabilities.Redun	

Name	Type	Write	Description	Comment
			dancy MUST be equal to true. Applicable only for a VoIP endpoint.	
Enable	boolean	W	Enables or disables the use of RTP payload redundancy as defined by RFC 2198.	RTPRedundancyDepth
PayloadType	unsignedInt [0:127]	W	Defines the Payload Type of RTP packet using RFC 2198. Values should be within the range of dynamic Payload Types (96-127).	RFC2198PayloadType
FaxAndModemRedundancy	int[-1:5]	W	Specifies the redundancy number for fax and modem pass-through data transmissions. A non-negative value indicates that RFC 2198 is to be used for fax and modem pass-through data. The value indicates the number of redundant copies to be transmitted (the total number transmitted is one plus this value). A value of -1 indicates RFC 2198 is not to be used for fax and modem pass-through data. If the optional parameter ModemRedudancy is present, then FaxAndModemRedudancy applies only to fax transmissions, but not to modem transmissions.	FaxRelayRedundancyDepth
VoiceService.{i}.Voice Profile.{i}.FaxT38	object	–	Defines T.38 Fax information for devices that support T.38 relay. If this object is supported, the capability VoiceService.{i}.Capabilities.FaxT38 MUST be equal to true. Applicable only to a VoIP endpoint.	
Enable	boolean	W	Enables or disables the use of T.38.	According to IsFaxUsed and FaxTransportMode parameters: **Read**: ((IsFaxUsed==1) || (IsFaxUsed==3) || ((IsFaxUsed==0) && (FaxTransportMode==1)) → true otherwise → false **Write:** true → IsFaxUsed=1 false → IsFaxUsed=0, FaxTransportMode=0 (unless FaxPassThrough == "Auto") **Note:** The same values may be taken from "default" IPProfile 0.
BitRate	unsignedInt	W	Defines the maximum data rate for fax. Enumeration of the following values: ▪ 2400 ▪ 4800 ▪ 7200 ▪ 9600 ▪ 12000	mapped to FaxRelayMaxRate

Name	Type	Write	Description	Comment
			▪ 14400 ▪ 33600	
HighSpeedPacketRate	unsignedInt	W	Defines the rate at which high speed data will be sent across the network, in milliseconds. Enumeration of the following values: ▪ 10 ▪ 20 ▪ 30 ▪ 40	Mapped to FaxModemBypassBasicRTPPacketInterval
HighSpeedRedundancy	unsignedInt [0:3]	W	Specifies the packet-level redundancy for high-speed data transmissions (i.e., T.4 image data). The value MUST be in the range 0 through 3.	FaxRelayRedundancyDepth
LowSpeedRedundancy	unsignedInt [0:5]	W	Specifies the packet-level redundancy for low-speed data transmissions (i.e., T.30 handshaking information). The value MUST be in the range 0 through 5.	FaxRelayEnhancedRedundancyDepth
.VoiceService.{i}.VoiceProfile.{i}.Line.{i}.	object	C	Defines support for creation and deletion of Lines is REQUIRED only if more than one Line is supported as indicated by VoiceService.{i}.Capabilities.MaxLineCount.	
DirectoryNumber	string(32)	W	Defines the directory number associated with this line. May be used to identify the line to the user. In case of H.323 signaling, this MUST be an E.164 number.	TrunkGroup_FirstPhoneNumber (from corresponding entry in Hun Group table)
.VoiceService.{i}.VoiceProfile.{i}.Line.{i}.CallingFeatures.	object	–	Defines Voice line parameters related to optional endpoint based calling features.	
CallerIDNameEnable	boolean	W	Enables or disables the transmission of caller ID information on outgoing calls.	This and the next parameters will be mapped to Caller Display Information table (CallerDisplayInfo) CallerDisplayInfo_IsCidRestricted
CallerIDName	string(256)	W	Defines a string used to identify the caller.	CallerDisplayInfo_Displaystring

5.4   SIP Endpoint Profile

MSBR complies with Version 1 of SIP Endpoint profile (SIPEndpoint:1) as defined in TR-104 section 4.3.

Table 5-3: SIP Endpoint Profile Table

Name	Type	Write	Description	Comment
.VoiceService.{i}.Capabilities.SIP.	object	–	Defines SIP-specific capabilities. Applicable only if SIP is among the list of supported protocols.	
Role	string	–	Defines the role of this VoIP CPE. Enumeration of: "UserAgent" "BackToBackUserAgents" "OutboundProxy" A single VoiceService instance MUST have only one role. If a device includes the capabilities for more than one role, each role MUST be represented as separate VoiceService instances.	Always set to "UserAgent"
Extensions	string(256)	–	Defines a comma-separated list of SIP extension methods supported. SIP extension methods MUST be in the form of the method name in upper case. The list MAY include vendor-specific extensions, which MUST use the format defined in [3]. Examples: ▪ "REFER" ▪ "INFO" ▪ "X_EXAMPLE-COM_MyExt"	"REFER, INFO" SUBSCRIBE , etc..
Transports	string(256)	–	Defines a comma-separated list of SIP transport protocols supported. Each entry is an enumeration of: ▪ "UDP" ▪ "TCP" ▪ "TLS" ▪ "SCTP" The list MAY include vendor-specific transports, which MUST use the format defined in [3].	According to SIPTransportType UDP/TCP/TLS
URISchemes	string(256)	–	Defines a comma-separated list of URI schemes supported beyond the URI schemes required by the SIP specification. Each URI scheme is given by the URI prefix, without the colon separator. Example: ▪ "tel, fax"	"" (empty)
EventSubscription	boolean	–	Defines support for SIP event subscription. A true value indicates support for the VoiceService.{i}.VoiceProfile.{i}.SIP.EventSubscribe and VoiceService.{i}.VoiceProfile.{i}.Line.{i}.SIP.EventSubscribe.{i} objects.	False

Name	Type	Write	Description	Comment
ResponseMap	boolean	–	Defines support for SIP response map. A true value indicates support for the VoiceService.{i}.VoiceProfile.{i}.SIP.ResponseMap object. This parameter is applicable only for a VoIP endpoint.	False
.VoiceService.{i}.VoiceProfile.{i}.SIP.	object	–	Defines Voice profile parameters that are specific to SIP user agents.	
ProxyServer	string(256)	W	Defines a Host name or IP address of the SIP proxy server. All SIP signaling traffic MUST be sent to the host indicated by this parameter and the port indicated by the ProxyServerPort parameter unless OutboundProxy parameter is non-empty or a different route was discovered during normal operations SIP routing operation. Regardless of which host the traffic gets sent to (the ProxyServer or the OutboundProxy), the value of this parameter MUST be used to derive the URI placed into the SIP Route header field of all requests originated by this end-point unless a different proxy host was discovered dynamically during normal SIP routing operations.	ProxyIp_IpAddress from the 1st entry in "default" Proxy Set (0); note that ProxyIp_IpAddress contains _both_ hostname and port – hence some manipulation is needed. During "write" operation ensure that IsProxySet parameter is set to 1). During "read" operation, if IsProxySet parameter is set to 0, return empty string.
ProxyServerPort	unsignedInt [0:65535]	W	Defines the Destination Port to be used in connecting to the SIP server.	ProxyIp_IpAddress from the 1st entry in "default" Proxy Set (0); note that ProxyIp_IpAddress contains _both_ hostname and port – hence some manipulation is needed.
ProxyServerTransport	string	W	Defines the Transport protocol to be used in connecting to the SIP server. Must be chosen from among the transports supported, as indicated by VoiceService.{i}.Capabilities.SIP.Transports. Enumeration of: ▪ "UDP" ▪ "TCP" ▪ "TLS" ▪ "SCTP"	According to ProxyIp_TransportType from the 1st entry in "default" Proxy Set (0
RegistrarServer	string(256)	W	Defines a Host name or IP address of the SIP registrar server. If this parameter is empty, the CPE MUST obtain all of the registrar server configuration information, including host name or IP address, port, and transport protocol, from the corresponding ProxyServer parameters (ProxyServer, ProxyServerPort, and ProxyServerTransport), ignoring all of the registrar server parameters (RegistrarServer, RegistrarServerPort and	RegistrarIP **Note:** RegistrarIP may contain both hostbname and port – hence some manipulation is needed.

Name	Type	Write	Description	Comment
			RegistrarServerTransport).	
RegistrarServerPort	unsignedInt [0:65535]	W	Defines the Destination port to be used in connecting to the SIP registrar server. If the RegistrarServer parameter is empty, the CPE MUST obtain all of the registrar server configuration information, including host name or IP address, port, and transport protocol, from the corresponding ProxyServer parameters (ProxyServer, ProxyServerPort, and ProxyServerTransport), ignoring all of the registrar server parameters (RegistrarServer, RegistrarServerPort and RegistrarServerTransport).	RegistrarIP **Note:** RegistrarIP may contain both hostbname and port – hence some manipulation is needed
RegistrarServerTransport	string	W	Defines the Transport protocol to be used in connecting to the registrar server. Must be chosen from among the transports supported, as indicated by VoiceService.{i}.Capabilities.SIP.Transports. Enumeration of: "UDP" "TCP" "TLS" "SCTP" If the RegistrarServer parameter is empty, the CPE MUST obtain all of the registrar server configuration information, including host name or IP address, port, and transport protocol, from the corresponding ProxyServer parameters (ProxyServer, ProxyServerPort, and ProxyServerTransport), ignoring all of the registrar server parameters (RegistrarServer, RegistrarServerPort and RegistrarServerTransport).	According to RegistrarTransportType
UserAgentDomain	string(256)	W	Defines a CPE domain string. If empty, the CPE SHOULD use its IP address as the domain.	ProxyName
UserAgentPort	unsignedInt [0:65535]	W	Defines a port used for incoming call control signaling.	LocalSIPPort or TCPLocalSIPPort or TLSLocalSIPPort – according to SIPTransportType
UserAgentTransport	string	W	Defines the Transport protocol to be used for incoming call control	SIPTransportType

Name	Type	Write	Description	Comment
			signaling. Must be chosen from among the transports supported, as indicated by VoiceService.{i}.Capabilities.SIP.Transports. Enumeration of: ▪ "UDP" ▪ "TCP" ▪ "TLS" ▪ "SCTP"	
OutboundProxy	string(256)	W	Defines the Host name or IP address of the outbound proxy. If a non-empty value is specified, the SIP endpoint MUST send all SIP traffic (requests and responses) to the host indicated by this parameter and the port indicated by the OutboundProxyPort parameter. This MUST be done regardless of the routes discovered using normal SIP operations, including use of Route headers initialized from Service-Route and Record-Route headers previously received. The OutboundProxy value is NOT used to generate the URI placed into the Route header of any requests.	Outbound Proxy will be mapped to the 1st entry in PREFIX table that (if exists) must look as follows: [PREFIX] FORMAT PREFIX_Index = PREFIX_DestinationPrefix, PREFIX_DestAddress, PREFIX_SourcePrefix, PREFIX_ProfileId, PREFIX_MeteringCode, PREFIX_DestPort, PREFIX_SrcIPGroupID, PREFIX_DestHostPrefix, PREFIX_DestIPGroupID, PREFIX_SrcHostPrefix, PREFIX_TransportType, PREFIX_SrcTrunkGroupID; PREFIX 0 = *, 10.8.211.180, *, 0, 255, 0, -1, , -1, , -1, -1; [\PREFIX]
OutboundProxyPort	unsignedInt [0:65535]	W	Defines the Destination port to be used in connecting to the outbound proxy. This parameter MUST be ignored unless the value of the OutboundProxy parameter in this object is non-empty.	PREFIX_DestPort (see above)
RegistrationPeriod	unsignedInt [1:]	W	Defines the Period over which the user agent must periodically register, in seconds.	RegistrationTime
RegisterExpires	unsignedInt [1:]	W	Defines the Register Request Expires header value, in seconds.	RegistrationTime (the same value as RegistrationPeriod)
.VoiceService.{i}.VoiceProfile.{i}.Line.{i}.SIP.	object	–	Defines the Voice line parameters that are specific to SIP call signaling.	
AuthUserName	string(128)	W	Defines the Username used to authenticate the connection to the server.	This and the next parameter will be mapped to the corresponding entry in Authentication table. Authentication_UserId On write, we will ensure that AuthenticationMode is

Name	Type	Write	Description	Comment
				set to 3 (PerFXS). On read, if AuthenticationMode is not set to 3 (PerFXS), empty string will be returned.
AuthPassword	string(128)	W	Defines the Password used to authenticate the connection to the server. When read, this parameter returns an empty string, regardless of the actual value.	Authentication_UserPassword On write, we will ensure that AuthenticationMode is set to 3 (PerFXS). On read, if AuthenticationMode is not set to 3 (PerFXS), empty string will be returned.

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