



MGCP Protocol

Teldat-Dm 791-I

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Table of Contents

Chapter 1	Introduction	1
1.1	MGCP Protocol: Description	1
1.2	Features available in the router	2
Chapter 2	MGCP Protocol Configuration	3
2.1	Configuring MGCP	3
2.1.1	APPLICATION	3
2.1.2	[NO] BACKHAUL-IP-TOS	4
2.1.3	[NO] CALL-AGENT	4
2.1.4	[NO] DTMF-RELAY	4
2.1.5	[NO] FALLBACK-MGCP	4
2.1.6	[NO] IP-TOS	5
2.1.7	EXIT	5
Chapter 3	MGCP Protocol Monitoring.	6
3.1	MGCP Monitoring.	6
3.1.1	Accessing the monitoring prompt	6
3.1.2	Monitoring commands	6
Chapter 4	Configuration Example	11
4.1	Media Gateway without survival	11
4.2	Media Gateway with survival	12

Chapter 1 Introduction

1.1 MGCP Protocol: Description

Media Gateway Control Protocol (MGCP) is a protocol that allows IP Telephony Servers or Call Agents to control Media Gateways, which provide the conversion between the audio signals on telephone circuits and RTP packets that carry audio over IP networks. The protocol appeared when the signaling and media conversion functions were separated into different devices, giving rise to a distributed gateway architecture with one component handling the signaling and another translating the telephone circuit audio signals into IP packet streams. MGCP allows the Call Agent to control the conversion done in the Media Gateways.

The separation of functions works well in gateways that connect the telephone network switch nodes with a large number of voice channels and with common signaling channels. However, MGCP can also be used in Media Gateways with few channels, with analog interfaces, and even with in-band signaling such as FXS/FXO.

Unlike other protocols used in IP telephony, such as H.323 or SIP, MGCP is a master/slave protocol that doesn't handle calls or typical signaling information like called or calling numbers, and therefore the Media Gateway doesn't have a dial plan configured. MGCP creates, modifies and deletes connections between traditional telephone circuits known as *endpoints* and remote IP endpoints, basically configuring the codec, packeting, IP and RTP stream port. As the call agent provides the call control function, MGCP Media Gateways don't need as much intelligence as H.323 or SIP gateways.

Through MGCP, the Media Gateway can be requested to detect certain events and generate signals. Packages of events and signals are defined to increase control capabilities and allow, for example, the detection and reproduction of DTMF tones in the telephone interface, the reproduction of call progress tones and voice messages, or the detection of RTP stream events such as the receipt of unreachable ICMP packets that indicate a loss of RTP stream.

The Call Agent generates actions in the Media Gateways based on signaling exchanged with the call endpoints. There are several ways of exchanging signaling information in a telephone circuit involving an MGCP Media Gateway. In interfaces that employ channel-associated signaling (CAS), the signaling goes implicitly in MGCP in the form of DTMF tones, call progress tones or hook-on and hook-off events. There are specific packages of MGCP events and signals for the different types of CAS signaling. When the telephone circuits use common-channel signaling (CCS), such as SS7 and ISDN, a specific protocol is required to send this information over IP and a new component, known as a Signaling Gateway, which is responsible for connecting the traditional telephone network signaling to the Call Agent, comes into play. The IETF SIGTRAN group has defined various standard protocols for this, and proprietary protocols are also available. The IP links that the signaling gateways establish to transport the conventional telephone signaling are often referred to as Backhaul connections.

MGCP uses UDP transport to send messages and the routine port is 2427. MGCP messages are texts and are divided into commands and responses. The commands are as follows:

EPCF: EndpointConfiguration. The Call Agent sends this to configure the telephone circuit codification characters.

CRCX: CreateConnection. Sent by the Call Agent to create a connection between the Media Gateway *endpoint* and an IP destination.

MDCX: ModifyConnection. Sent by the Call Agent to modify connection parameters.

DLCX: DeleteConnection. Sent by the Call Agent to delete a connection.

RQNT: NotificationRequest. Sent by the Call agent to request signal generation and/or event detection.

NTFY: Notify. Sent by the Media Gateway to report the detection of an event.

AUEP: AuditEndpoint. Sent by the Call Agent to obtain the status of an *endpoint*.

AUCX: AuditConnection. Sent by the Call Agent to obtain the status of a connection.

RSIP: RestartInProgress. Sent by the Media Gateway to report the deletion of service *endpoints* or restoration of service.

Messages are retransmitted expecting a confirmation response. The responses contain a three-digit code which is explained below:

000-099: Response confirmation.

100-199: Provisional response.

200-299: Correct result.

400-499: Temporary error.

500-599: Permanent error.

800-899: Specific codes for each packet.

The connection creation and modification commands and responses use SDP to describe connection configurations.

1.2 Features available in the router

Our router implements an MGCP Media Gateway with ISDN interfaces that are compatible with the *Cisco Unified Communication Manager* (CUCM) Call Agent. To do this it implements version 0.1 of the MGCP protocol used by this Call Agent and acts as a Signaling Gateway to send Q.931 signaling from the ISDN interfaces to the Call Agent over a TCP Backhaul connection according to the protocol used by Cisco.

Although CUCM doesn't provide a generic MGCP Media Gateway, our Gateway can register as if it were an IOS-based Cisco router. The BRI interfaces making up part of the MGCP Media Gateway generate *endpoints* with the same names that the BRIs from a Cisco VIC2-2BRI-NT/TE card in a 2801 router would have. In the specific case of using the motherboard BRI interface, and given that this consists of a single BRI, you must only configure the VIC2-2BRI-NT/TE card port 0 in slot 0, subunit0. In the case of PRI interfaces, the generated endpoints correspond to those the PRI from a Cisco VIC2-1MFT-T1E1-E1 card in a 2801 router has.

You can configure an ordered list of up to three Call Agents so that if the connection to the primary Call Agent is lost, the device will try and use the next one on the list that has connectivity (*failover*). This allows for redundancy in Call Agent clusters. When the link to the higher priority Call Agent becomes active again, MGCP signaling reverts to the prioritized call agent (*switchback*). If there were established calls when one of these two incidents occurred, then the signaling is immediately redirected to the corresponding Call Agent, while the calls are maintained, but with a more limited functionality.

You can also enable the MGCP *fallback* function. This allows the router's IP telephony system to use the ISDN interfaces when it loses connection to the configured Call Agents. To do this, the router takes control of the Q.931 signaling and, in MGCP mode, sends it to the Call Agent through the TCP Backhaul link. This change in signaling management means that the calls cannot be maintained in the switch.

The interface becomes available to the router's IP telephony system and the calls are managed through the configured dial-peers, allowing calls to be established with other device interfaces, SIP or H.323 destinations, or even Skinny terminals registered in the SCCP server. In this way, we have a complete survival solution in our router which permits autonomous functionality when there is no connectivity to the Call Agents, and for any device be it analog, SIP, Skinny or H.323.

When the device detects that the connection to the Call Agent has been restored, the ISDN interfaces switch back to MGCP mode and the Call Agent regains control of the MGCP Media Gateway. To check that there is an established connection to the Call Agent before switching, you can configure a timer that activates when connectivity is detected; if the connection to the Call Agent is still up when the configured wait time expires, the device switches to MGCP mode. You can also try to approximate the router recovery wait time to that of the telephones, if they have one.

Chapter 2 MGCP Protocol Configuration

2.1 Configuring MGCP

To configure the MGCP protocol, enter **protocol mgcp** from the general configuration menu.

Syntax:

```
Config>protocol mgcp
-- MGCP protocol configuration --
MGCP config>
```

The options available from the MGCP configuration menu are:

```
MGCP config>?
  application           MGCP application configuration
  backhaul-ip-tos      Configure IP TOS for backhaul packets
  call-agent           Remote Call Agent configuration
  dtmf-relay           DTMF Relay
  fallback-mgcp        Fallback from MGCP to Telephony
  ip-tos               Configure IP TOS for MGCP packets
  no                   Negate a command or set its defaults
  exit
MGCP config>
```

2.1.1 APPLICATION

This command configures global MGCP parameters.

2.1.1.1 [NO] APPLICATION ADDRESS

Configures the source IP address that's used for MGCP signaling, the Backhaul protocol and RTP traffic between the device and the IP telephones. This IP address must be assigned to one of the device's interfaces.

If no IP is specified, the internal address is used.

Syntax:

```
MGCP config>application address <ip-address>
MGCP config>
```

2.1.1.2 [NO] APPLICATION DOMAIN-NAME

Configures the device's domain name. As this is only used in MGCP to determine the device that each *endpoint* belongs to, it doesn't need to be configured in a DNS server.

If no name is specified, the device's host name is used.

Syntax:

```
MGCP config>application domain-name <host>
MGCP config>
```

2.1.1.3 [NO] APPLICATION GATEWAY

This command activates the Gateway application, provided that there is a Call Agent configured that can be connected to.

Syntax:

```
MGCP config>application gateway
MGCP config>
```

2.1.1.4 [NO] APPLICATION PORT

Configures the source UDP port for MGCP. By default, port 2427 is used.

Syntax:

```
MGCP config>application port <udp-port>
MGCP config>
```

2.1.2 [NO] BACKHAUL-IP-TOS

This command configures the TOS in the IP header of Backhaul packets sent by the device. The total TOS byte is configured using its hexadecimal value. The default is 0x68.

Syntax:

```
MGCP config>backhaul-ip-tos ?
  <hex 0x0..0xff>   Hexadecimal value in the specified range
MGCP config>
```

2.1.3 [NO] CALL-AGENT

This command configures the MGCP Call Agent that the device connects to through the MGCP and Backhaul protocols. First you enter its IP address or domain name; then you can specify the UDP listening port for MGCP which the Call Agent uses if not using the default port 2427. The Backhaul TCP listening port value used by the Call Agent is equal to the MGCP port value plus one.

You can specify up to three Call Agents, in descending priority order; so the one with the highest priority is the first on the list. If the device can't connect to the first Call Agent, it tries the second, and if it can't connect to that one either it tries the third. If the device is connected to a Call Agent and detects connectivity to a higher priority Call Agent, it disconnects and connects to the one with higher priority (*switchback*).

Syntax:

```
MGCP config>call-agent <ip-addr_or_host> [port <port>]
MGCP config>
```

2.1.4 [NO] DTMF-RELAY

Indicates what must be done to handle DTMFs. This command is disabled by default, which means that the tone is simply transmitted as audio when received from the ISDN.

2.1.4.1 DTMF-RELAY RFC2833

This command generates an RTP event (in accordance with RFC 2833) when a DTMF tone is detected by the ISDN. It also allows handling said events when they are received through RTP. You can specify the type of payload to use if it differs from the default value, 101.

Syntax:

```
MGCP config>dtmf-relay rfc2833 [payload-type <value>]
MGCP config>
```

2.1.5 [NO] FALLBACK-MGCP

This command enables *fallback* when connectivity is lost to all configured Call Agents. The device takes over the ISDN interfaces and permits calls to be made over them using the telephony system configured in the router. This is disabled by default, which means the device cannot restore the ISDN interfaces to their normal mode when the connection is lost and they therefore become inoperable.

Syntax:

```
MGCP config>fallback-mgcp
MGCP config>
```

2.1.5.1 [NO] FALLBACK-MGCP RECOVERY-DELAY

Configures the length of time the device waits, when in fallback, between detecting connectivity to the Call Agent and switching to MGCP mode, taking over all functions again. This command is used to avoid frequent changes of state if the connection to the Call Agent is continuously lost and recovered.

The default is 0 seconds, i.e., recovery is immediate.

Syntax:

```
MGCP config>fallback-mgcp recovery-delay <period>
MGCP config>
```

2.1.6 [NO] IP-TOS

This command configures the TOS in the IP header of MGCP packets sent by the device. The total TOS byte is configured using its hexadecimal value. The default is 0x68.

Syntax:

```
MGCP config> ip-tos ?
  <hex 0x0..0xff>   Hexadecimal value in the specified range
MGCP config>
```

2.1.7 EXIT

The **EXIT** command takes you back to the general configuration prompt, *Config*>.

Example:

```
MGCP config>exit
Config>
```


Chapter 3 MGCP Protocol Monitoring

3.1 MGCP Monitoring

3.1.1 Accessing the monitoring prompt

To access the MGCP monitoring prompt, enter **protocol mgcp** from the root monitoring menu.

```
+protocol mgcp
MGCP Monitor
MGCP Mon+
```

3.1.2 Monitoring commands

All the MGCP monitoring commands must be entered at the above-specified prompt, MGCP Mon+.

The commands are described below.

3.1.2.1 ? (HELP)

Allows you to view the options available in the menu you are in. Typing it at the end of a command will list the options for that command. The commands available in the corresponding console menu for monitoring are:

```
MGCP Mon+?
  clear      Clear counters
  list      List MGCP information
  exit
MGCP Mon+
```

3.1.2.2 CLEAR STATISTICS

This command sets the received packet counters back to zero.

Example:

```
MGCP Mon+clear statistics
MGCP Mon+
```

3.1.2.3 LIST

The following subcommands are available at this level:

3.1.2.3.1 LIST ALL

Displays all the information relating to the MGCP protocol, including the status of the application and descriptions of the *endpoints* and connections.

Example:

```
MGCP Mon+list all
Application Gateway state: Running
Current Call Agent: cal.id.teldat.com:2427
Call Agents status:
  CA1    connected. Addr: cal.id.teldat.com:2427
  CA2    connected. Addr: ca2.id.teldat.com:2427

Fallback mode:  Enabled/OFF
Last Fallback start time:      2008-10-07 10:39:21
Last Fallback end time:        2008-10-07 10:39:32

Application Gateway: Protocol statistics
-----
Packets received: 6
Command packets received: 4
Response packets received: 2
```

```

Endpoints registered
-----
BRI/S0/SU3/P0/1
Ifc:bri3/0 chan 1. State: disconnected

BRI/S0/SU3/P0/2
Ifc:bri3/0 chan 2. State: disconnected

BRI/S0/SU3/P1/1
Ifc:bri3/1 chan 1. State: disconnected

BRI/S0/SU3/P1/2
Ifc:bri3/1 chan 2. State: disconnected

Active connections
-----
No active connections found

MGCP Mon+

```

3.1.2.3.2 LIST APPLICATION

Displays global information relating to the MGCP protocol. Shows the Gateway application's status, which can be *Running* or *Down*. If there is at least one Call Agent connected, it shows which one is currently active, the one that MGCP is communicating with. It also lists all configured Call Agents and their connection statuses: *connected* or *disconnected*.

It also provides details on *Fallback* (emergency) status. First it shows whether *Fallback* is *Enabled* or *Disabled* and, if enabled, whether the feature is currently active in the gateway (*ON/OFF*). Then you can see exactly when the gateway last switched over to emergency mode and when it recovered by connecting to a Call Agent.

Finally, it describes statistics about packets received from MGCP; not only commands such as CRCX or RQNT, but also responses to commands sent by the device, such as RSIP or NTFY.

Example:

```

MGCP Mon+list application
Application Gateway state: Running
Current Call Agent: cal.id.teldat.com:2427
Call Agents status:
    CA1    connected. Addr: cal.id.teldat.com:2427
    CA2    connected. Addr: ca2.id.teldat.com:2427

Fallback mode: Enabled/OFF
Last Fallback start time:      2008-10-07 10:39:21
Last Fallback end time:        2008-10-07 10:39:32

Application Gateway: Protocol statistics
-----
    Packets received: 126
    Command packets received: 49
    Response packets received: 77

MGCP Mon+

```

3.1.2.3.3 LIST CONNECTIONS

Displays detailed information about the active connections, describing, for each one, firstly the ISDN part with its counters; and secondly, the RTP traffic with the packet statistics and with the group of used addresses and ports.

Example:

```

MGCP Mon+list connections
Active connections
-----
Conn 13 ISDN: ifc bri2/0 chan 2 RTP: addr 172.24.122.101 port 20442
ISDN:
    last rx delay 5(83/78), buffered rx frames 6, missed rx frames 27 fax errors
0 (since last print)

```

```

s1 0, s2 4, ints 4554 rx bytes 364140 tx bytes 360000 codec err 0 dup frames
0 cng 0
RTP:
  RTP Delay: 40/60/40 (val/max/min), Var 0/0/0(val/max/min), RFC2833 DTMF: Yes,
  SRTP No, Delay 200/40(max/min)
  RTP/RTCP Local Addresses In: 172.24.121.1:16384/172.24.121.1:16385, Out: 172.
24.121.1:16384/172.24.121.1:16385
  RTP/RTCP Remote Addresses In: 172.24.122.101:20442/172.24.122.101:20443, Out:
172.24.122.101:20442/172.24.122.101:20443

Conn 53 ISDN: ifc g703port3/0 chan 1 RTP: addr 172.24.121.130 port 41000
ISDN:
  last rx delay 0(9/9), buffered rx frames 0, missed rx frames 0 fax errors 0 (
since last print)
  s1 0, s2 0, ints 0 rx bytes 305344 tx bytes 349344 codec err 0 dup frames 0 c
ng 0
RTP:
  RTP Delay: 40/60/40 (val/max/min), Var 1/1/0(val/max/min), RFC2833 DTMF: Yes,
  SRTP No, Delay 200/40(max/min)
  RTP/RTCP Local Addresses In: 172.24.121.1:16388/172.24.121.1:16389, Out: 172.
24.121.1:16388/172.24.121.1:16389
  RTP/RTCP Remote Addresses In: 172.24.121.130:41000/172.24.121.130:41001, Out:
172.24.121.130:41000/172.24.121.130:41001

Conn 4 ISDN: ifc g703port3/0 chan 31 RTP: addr 172.24.27.110 port 41000
ISDN:
  last rx delay 0(21/21), buffered rx frames 0, missed rx frames 0 fax errors 0
(since last print)
  s1 0, s2 0, ints 0 rx bytes 212256 tx bytes 223776 codec err 0 dup frames 0 c
ng 0
RTP:
  RTP Delay: 40/60/40 (val/max/min), Var 1/1/0(val/max/min), RFC2833 DTMF: Yes,
  SRTP No, Delay 200/40(max/min)
  RTP/RTCP Local Addresses In: 172.24.121.1:16392/172.24.121.1:16393, Out: 172.
24.121.1:16392/172.24.121.1:16393
  RTP/RTCP Remote Addresses In: 172.24.27.110:41000/172.24.27.110:41001, Out: 1
72.24.27.110:41000/172.24.27.110:41001

MGCP Mon+
```

3.1.2.3.4 LIST ENDPOINTS

Lists the *endpoints* that have registered in the Call Agent, indicating each one's name and corresponding interface. This name is configurable in the configuration menu for the specific interface. It also shows whether or not the *endpoint* has an active connection through the *connected* or *disconnected* status. If it is connected, a summary on the connection is shown.

Firstly the IP address and the end port used to maintain the RTP traffic is given, and also the connection index assigned by the device. Then you can see the send or receive state, which can be: *recv only* to only receive, *send only* to only send, or *send-recv* to both send and receive. Following this you can see the progress of the connection, depending on whether or not the following elements have been received in MGCP messages: *loc opts*, which establish the local options in the connection, and *remote desc*, which details the information from the remote end. Lastly, three connection parameters are shown: the codec used, packeting period and whether vad (*voice activity detection*) is turned on.

Example:

```

MGCP Mon+list endpoints
Endpoints registered
-----
BRI/S0/SU0/P0/1
Ifc:bri0/0 chan 1. State: disconnected

BRI/S0/SU0/P0/2
Ifc:bri0/0 chan 2. State: disconnected

BRI/S0/SU2/P0/1
Ifc:bri2/0 chan 1. State: disconnected
```

```
BRI/S0/SU2/P0/2
Ifc:bri2/0 chan 2. State: connected to 172.24.122.101:20442
ConnID: 13. Mode: send-recv. Pkts recvd: loc opts yes - remote desc yes
Codec: g711Ulaw. Pkt period: 20. Vad: no

BRI/S0/SU2/P1/1
Ifc:bri2/1 chan 1. State: disconnected

BRI/S0/SU2/P1/2
Ifc:bri2/1 chan 2. State: disconnected

S0/SU3/DS1-0/1
Ifc:g703port3/0 chan 1. State: connected to 172.24.121.130:41000
ConnID: 53. Mode: send-recv. Pkts recvd: loc opts yes - remote desc yes
Codec: g711Ulaw. Pkt period: 20. Vad: no

S0/SU3/DS1-0/2
Ifc:g703port3/0 chan 2. State: disconnected

S0/SU3/DS1-0/3
Ifc:g703port3/0 chan 3. State: disconnected

S0/SU3/DS1-0/4
Ifc:g703port3/0 chan 4. State: disconnected

S0/SU3/DS1-0/5
Ifc:g703port3/0 chan 5. State: disconnected

S0/SU3/DS1-0/6
Ifc:g703port3/0 chan 6. State: disconnected

S0/SU3/DS1-0/7
Ifc:g703port3/0 chan 7. State: disconnected

S0/SU3/DS1-0/8
Ifc:g703port3/0 chan 8. State: disconnected

S0/SU3/DS1-0/9
Ifc:g703port3/0 chan 9. State: disconnected

S0/SU3/DS1-0/10
Ifc:g703port3/0 chan 10. State: disconnected

S0/SU3/DS1-0/11
Ifc:g703port3/0 chan 11. State: disconnected

S0/SU3/DS1-0/12
Ifc:g703port3/0 chan 12. State: disconnected

S0/SU3/DS1-0/13
Ifc:g703port3/0 chan 13. State: disconnected

S0/SU3/DS1-0/14
Ifc:g703port3/0 chan 14. State: disconnected

S0/SU3/DS1-0/15
Ifc:g703port3/0 chan 15. State: disconnected

S0/SU3/DS1-0/17
Ifc:g703port3/0 chan 17. State: disconnected

S0/SU3/DS1-0/18
Ifc:g703port3/0 chan 18. State: disconnected

S0/SU3/DS1-0/19
Ifc:g703port3/0 chan 19. State: disconnected
```

```
S0/SU3/DS1-0/20
Ifc:g703port3/0 chan 20. State: disconnected

S0/SU3/DS1-0/21
Ifc:g703port3/0 chan 21. State: disconnected

S0/SU3/DS1-0/22
Ifc:g703port3/0 chan 22. State: disconnected

S0/SU3/DS1-0/23
Ifc:g703port3/0 chan 23. State: disconnected

S0/SU3/DS1-0/24
Ifc:g703port3/0 chan 24. State: disconnected

S0/SU3/DS1-0/25
Ifc:g703port3/0 chan 25. State: disconnected

S0/SU3/DS1-0/26
Ifc:g703port3/0 chan 26. State: disconnected

S0/SU3/DS1-0/27
Ifc:g703port3/0 chan 27. State: disconnected

S0/SU3/DS1-0/28
Ifc:g703port3/0 chan 28. State: disconnected

S0/SU3/DS1-0/29
Ifc:g703port3/0 chan 29. State: disconnected

S0/SU3/DS1-0/30
Ifc:g703port3/0 chan 30. State: disconnected

S0/SU3/DS1-0/31
Ifc:g703port3/0 chan 31. State: connected to 172.24.27.110:41000
ConnID: 4. Mode: send-recv. Pkts recvd: loc opts yes - remote desc yes
Codec: g711Ulaw. Pkt period: 20. Vad: no

MGCP Mon+
```

3.1.2.4 EXIT

The **EXIT** command exits the MGCP monitoring prompt and returns to the previous prompt.

Example:

```
MGCP Mon+exit
+
```

Chapter 4 Configuration Example

4.1 Media Gateway without survival

The device is a router in an office with SIP telephones and one of the router's ISDN basic interfaces is used to make and receive calls over the PSTN. A cluster of three remote Call Agents is also available, with two of them acting as backup for the main one. The device acts as an MGCP Media Gateway to route calls over the ISDN interface. It does this by connecting to the highest priority Call Agent through MGCP. The router also sends the ISDN signaling through a Backhaul connection to the same Call Agent, so it also acts as a Signaling Gateway. With regard to the SIP telephones, they are registered with the previous Call Agent and access the WAN through the router.

In order for the telephones to receive DTMF tones, the corresponding event arrives via RTP communication in accordance with RFC 2833. Interface channels B1 and B2 should be named BRI/1/0/1 and BRI/1/0/2. We want the device to connect to one of the other available Call Agents when connectivity to the main one is lost. The telephones must also connect to said Call Agent to continue operating. It is understood that, if connectivity to all Call Agents is lost, it will not be possible to provide the telephony service.

The example schema is shown below.

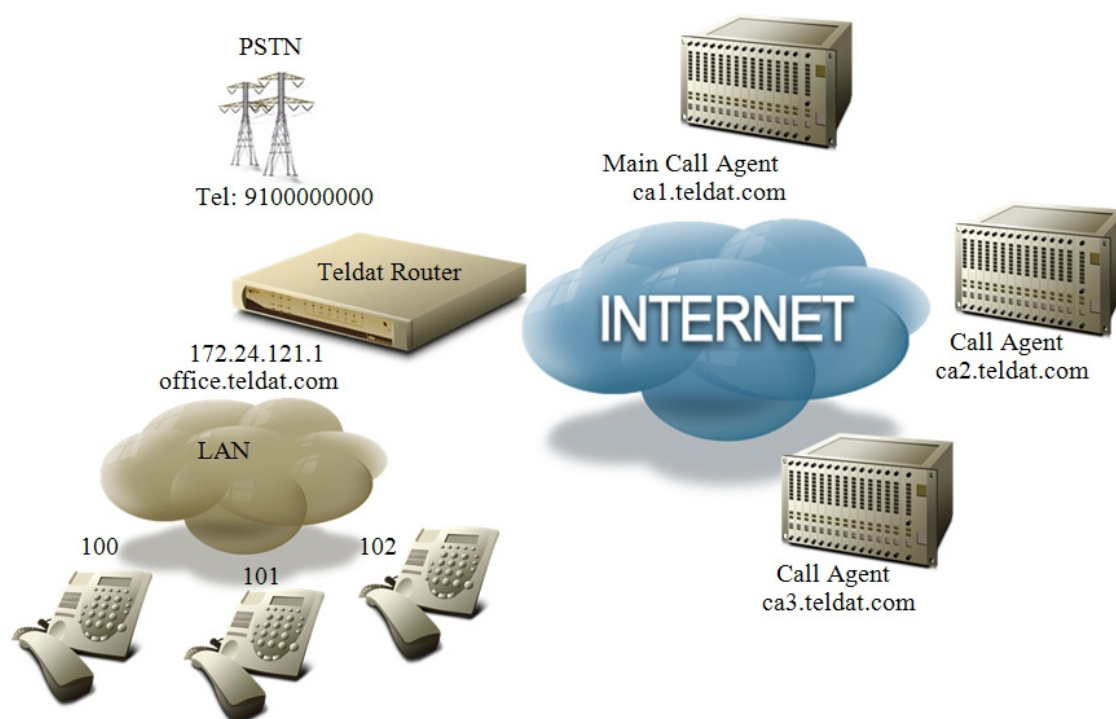


Fig. 1: Media Gateway without survival

First, you need to associate the BRI interface with the corresponding VOIP. Then, in the BRI interface configuration, you indicate that you want to operate in MGCP mode and that the initial part of the *endpoint* names is required.

```

network voip1/0
; -- VoIP interface Configuration --
  base-interface
; -- Base Interface Configuration --
  base-interface bri1/0 255 link
  base-interface bri1/0 255 number-of-circuits all
;
  exit
;
exit
;
network bri1/0
; -- BRI ISDN Configuration --
  set global mgcp backhaul
  set global mgcp endpoint-id BRI/1/0
;
exit

```

Given that we only know the domain names of the Call Agents and not their IP addresses, you need to configure a DNS server to resolve the domain names into IP addresses.

```
feature dns
; -- DNS resolver user configuration --
  server 172.24.75.192
exit
```

Lastly, configure the MGCP protocol:

```
protocol mgcp
; -- MGCP protocol configuration --
  application gateway
  application address 172.24.121.1
  application domain-name oficina.teldat.com
  call-agent ca1.teldat.com
  call-agent ca2.teldat.com
  call-agent ca3.teldat.com
  dtmf-relay rfc2833
exit
```

The IP address and the domain name used by the application are established. You also specify the three Call Agent addresses, which must be configured in the order indicated so that the ca1.teldat.com server has the highest priority. To finish, you need to configure the DTMF tones to generate events in accordance with RFC 2833.

The rest of the configuration, such as the dial-plan, should be done in the Call Agents and telephones, which have the most control and intelligence in this scenario.

4.2 Media Gateway with survival

In this new scenario, we have an office similar to the one in the previous example, although in this case the telephones are Skinny and we have an ISDN primary interface instead of a basic interface. The biggest difference is that now we only have one Call Agent and if connectivity to it is lost, we want the device to switch to fallback mode in order to use the ISDN interface through the device's IP telephony system. Additionally in this state, the telephones must register in an SCCP server in the device, so that calls can continue to be made between them and the public network through the PRI interface. For the telephones to work in this way, the Call Agent must be configured with the router as its backup device.

Among other requirements, when the ISDN line is retained, we want the device to reproduce a voice message, found in the index 1 of memory, in the line. When in fallback mode, the calls from the public network make all the telephones ring, so any of them can receive the call. Regarding calls to the public network, code G711 with A law is used. When connectivity to the Call Agent is recovered, rather than having the device immediately reconnect, we want it to wait for one minute to ensure the Call Agent's stability before restoring full MGCP functionality.

The schema for this new example is as follows:

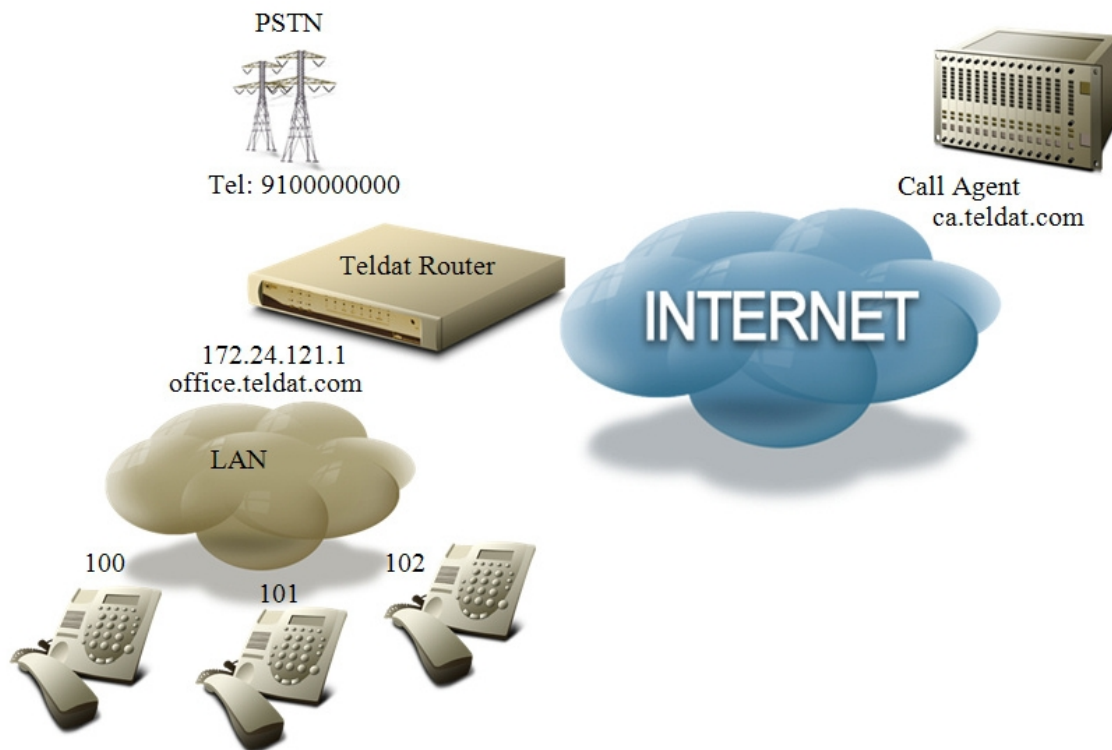


Fig. 2: Media Gateway with survival

To configure the VOIP and ISDN interfaces, you now also need to take into account the fallback operation, creating a global profile and associating it with the VOIP interface.

```

global-profiles dial
; -- Dial Profiles Configuration --
  profile voip default
  profile voip inout
  profile voip isdn-type audio
;
exit
;
network voip1/0
; -- VoIP interface Configuration --
  line 1 hold voice-message 1
;
  base-interface
; -- Base Interface Configuration --
  base-interface g703port1/0 255 link
  base-interface g703port1/0 255 profile voip
  base-interface g703port1/0 255 number-of-circuits all
;
exit
;
exit
;
network g703port1/0
; -- T1E1 / G703 Configuration --
  isdn mgcp backhaul
  pri-group timeslots 1-31
;
exit

```

We only know the domain name of the Call Agent, so to connect to it, we need to configure the DNS server that DNS requests are sent to.

```

feature dns
; -- DNS resolver user configuration --
  server 172.24.75.192
exit

```

The MGCP protocol is configured. Only one Call Agent is established, consequently there aren't any backup Call

Agents. The FALLBACK-MGCP command is necessary to enable the device to switch to fallback mode when it loses connectivity to the Call Agent. We also indicate that we want the device to wait one minute before switching to MGCP mode.

```
protocol mgcp
; -- MGCP protocol configuration --
  application gateway
  application address 172.24.121.1
  application domain-name oficina.teldat.com
  call-agent ca.teldat.com
  fallback-mgcp recovery-delay 60s
exit
```

We need an operational Skinny server in the device for when the telephones lose connectivity to the Call Agent and want to register in the device. The following commands provide the most basic functionality.

```
protocol sccp
; -- Skinny protocol configuration --
  application address 172.24.121.1
  application server
exit
```

Now all that remains to be done is to configure the dial-plan to be used in fallback state.

```
telephony
; -- Telephony configuration --
  dial-peer 1 group
    destination-pattern 910000000
    target group 1
  exit
;
  dial-peer 2 voice-port
    codec g711alaw
    destination-pattern T
    target voice-port voip1/0 1
  exit
;
  peer-group 1
    dynamic-peers
  exit
;
exit
```

The first dial-peer serves to direct calls coming in via ISDN to all terminals that have registered dynamically, in this case the Skinny telephones. The second dial-peer serves to send all outgoing calls through the PRI interface.