NetPerformer® System Reference

VHF over IP

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VHF over IP standard support (EUROCAE WG67 ED-137)

This chapter includes the following:

- EUROCAE WG67 ED-137
- NetPerformer in VCS ENDPOINT Mode
- NetPerformer in GRS ENDPOINT Mode

1.1 EUROCAE WG67 ED-137

EUROCAE WG67 ED-137 documents provide the basis for interoperability between different VHF equipment and gateways over IP. This interoperability is done using standard SIP and RTP VoIP protocols for VHF voice transport, as well as using RTP extender field for the transport of the Push to Talk (PTT) on-hook/off-hook transitions.

It is when NetPerformer is configured to use SIP voice method instead of PowerCell and that T1/E1 or E&M voice ports are set in Push-to-Talk mode that this VHF over IP standard will be used.

For more details about NetPerformer Push-to-Talk support, refer to the *SDM-9XXX Hardware Installation Guide* (Doc. # 1588), available on the Companion CD, in the following sections:

- 9.3 - About Push To Talk (PTT)
- 9.4 - Configuring Push To Talk.

1.1.1 NetPerformer in VCS ENDPOINT Mode

NetPerformer can be used as a gateway between a voice communication system (VCS) and WG-67 equipped IP radios, as seen in the diagram bellow:

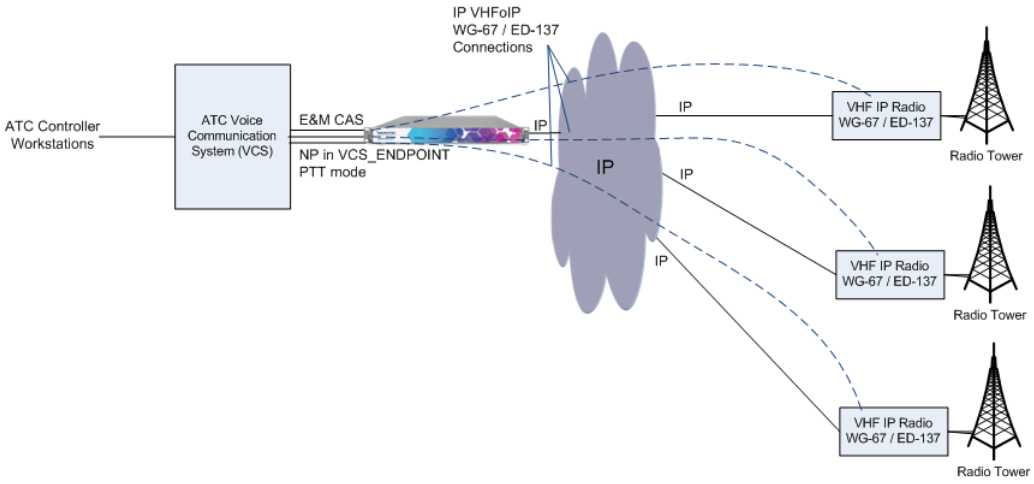

Figure 1-1: NetPerformer in VCS ENDPOINT Mode

In this case the NetPerformer unit is set in VCS ENDPOINT mode and communicates directly with ED-137 radios on the IP side and via T1/E1 or E&M ports on the VCS side.

1.1.2 NetPerformer in GRS ENDPOINT Mode

The NetPerformer can also be used as a gateway between a WG-67 equipped IP voice communication system (VCS) and legacy VHF radios, as seen in the diagram bellow::

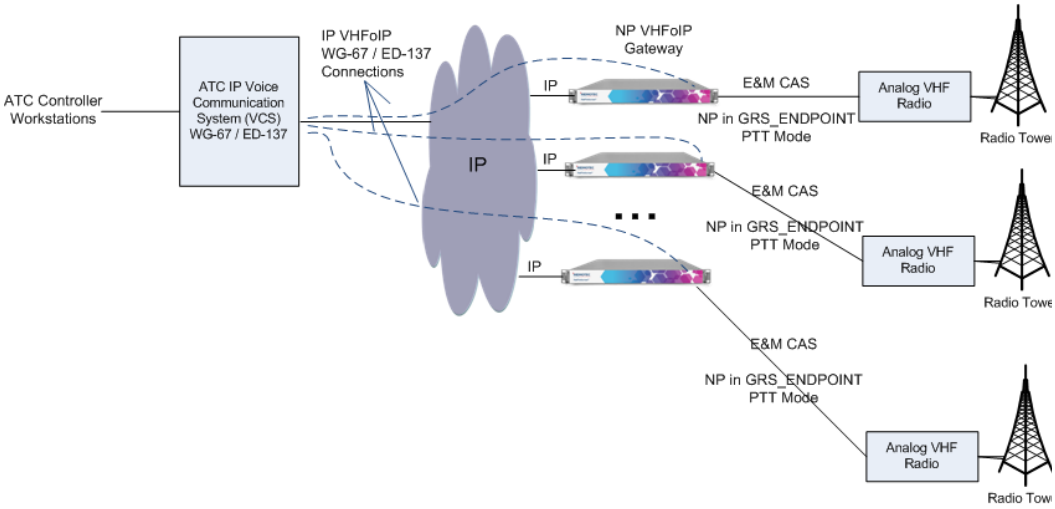

Figure 1-2: NetPerformer in GRS ENDPOINT Mode

In this case the NetPerformer units are set in PTT Answer mode and communicate directly with the ED-137 equipped VCS system on the IP side and via T1/E1 or E&M ports to the VHF radios.

2

Configuration Example NetPerformer to NetPerformer

This chapter includes the following:

- NetPerformer to NetPerformer
- HUB Unit Configuration.
- REMOTE-RADIO Unit Configuration

2.1 NetPerformer to NetPerformer

Following is an example of VHF over IP configuration using two NetPerformer units. Note that VHF over IP, as per EUROCAE WG67 ED-13 standard, is supported by all the main VHF equipment vendors. As such, by using this standard the NetPerformer can inter-operate directly with other vendors IP Voice Communication System (VCS) at the HUB or IP Radio at the remote locations as illustrated in previous figures.

Therefore, it is only for configuration purposes that we show two NetPerformer communicating to each using EUROCAE WG67 ED-137 to convert TDM (E&M or E1) VCS and Radio VHF traffic to IP. In practice, in this type of application, the NetPerformer will be used only at one end:

- At the HUB site to communicate with remote standard based IP Radio VHF or,
- At the remote location(s) to communicate with the central site IP Voice Communication System (VCS)..

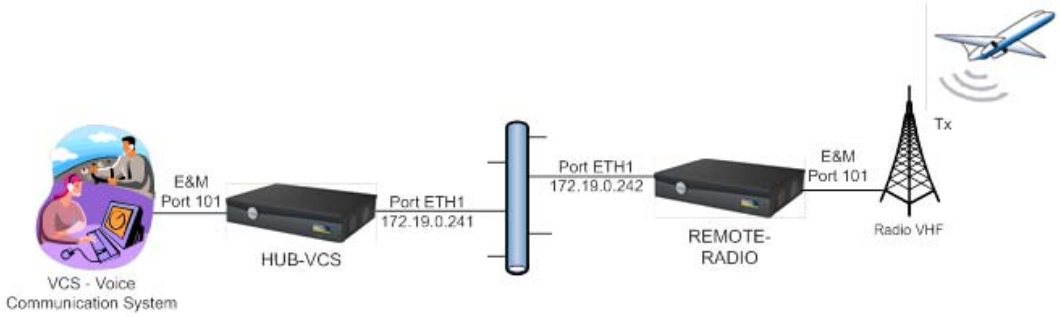

Figure 2-1: Standard based VHF over IP Between two NetPerformer Units

2.1.1 HUB Unit Configuration

The following provides essential parameter values for configuring the NetPerformer unit at the Hub site as per Figure 2-1:

HUB-VCS - SIP License:

```
HUB-VCS>PLS
PRODUCT LICENSE STATUS
LICENSE> Enter a new license key (NO/YES,def:NO) ? Y
LICENSE> ENTER LICENSE
LICENSE> (xxxx-xxxx-xxxxxxxx-xxxx) (def:) ? AAAA-BBBB-CCCCCCCC-DDDD
LICENSE> SIP VoIP license (AAAA-BBBB-CCCCCCCC-DDDD)
         entered successfully
         Execute Reset Unit (RU) command to apply the new license.
```

HUB-VCS - Global Parameters

```
HUB-VCS>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SLOT) ? GLOBAL
GLOBAL> Unit name.................................HUB-VCS
GLOBAL> PowerCell version.........................V1
...
```

```
GLOBAL> Tone settings.............................NORTH AMERICA
GLOBAL> Jitter buffer (ms)........................40
GLOBAL> Global CIR for FR over IP..................10000000
...
GLOBAL> Voice transport method.....................SIP VOIP
GLOBAL  > Digital port clock source................INTERNAL
```

HUB-VCS - Extended Parameters

```
HUB-VCS>EP
EXTENDED PARAMETERS
IP> Multihomed type...............................DISABLED
SIP> (SUPPSERV) Transfer supplementary services.....DISABLE
VPORT 101> (EMSEIZUREDETECTTIME) E&M seizure detect time (ms) 20
VPORT 101> (PTTCONTROLAUTOCONNECT) PTT-Control automatic connection
ENABLE
```

HUB-VCS - Eth #1 Parameters

```
HUB-VCS>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/LDC/PORT/PVC/REDUNDANCY/
SLOT/SS7/USER/ALL,def:GLOBAL) ? PORT
Port number (ETH1/ETH2/CSL/1,def:ETH1) ?
PORT ETH 1> Protocol..............................ETH AUTO
PORT ETH 1> Link integrity........................YES
PORT ETH 1> LAN speed (mbps)......................AUTO
PORT ETH 1> MAC address...........................000000000000
PORT ETH 1> Redundancy MAC address active..........NO
PORT ETH 1> DHCP..................................DISABLE
PORT ETH 1> IP address 1..........................172.019.000.241
PORT ETH 1> Subnet mask 1 (number of bits).........24 {255.255.255.000}
PORT ETH 1> IP address 2..........................000.000.000.000
PORT ETH 1> Subnet mask 2 (number of bits).........8 {255.000.000.000}
PORT ETH 1> Redundancy IP address 1................000.000.000.000
PORT ETH 1> Redundancy subnet mask 1 (number of bits) 8 {255.000.000.000}
PORT ETH 1> Redundancy IP address 2................000.000.000.000
PORT ETH 1> Redundancy subnet mask 2 (number of bits) 8 {255.000.000.000}
PORT ETH 1> Allow routing between IP networks.......NO
PORT ETH 1> Frame size............................1500
PORT ETH 1> IP RIP................................DISABLE
PORT ETH 1> OSPF..................................DISABLE
```

HUB-VCS - IP Parameters

```
HUB-VCS>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SIP) ? IP
Item (BOOTP/DNS/FTP/GLOBAL/HTTP/NAT/OSPF/RADIUS/SNMP/SOURCE-STATIC/
STATIC/TELNET/TIMEP,def:BOOTP) ? GLOBAL
IP> Router.......................................ENABLE
IP> Multihomed type...............................DISABLED
IP> Route broadcast to end station.................NO
IP> OSPF AS boundary router........................NO
IP> RIP AS boundary router.........................NO
IP> IP DSCP for SIP...............................0
IP> Allow LAN-to-LAN IP routing....................NO
IP> Port number for the transparent protocols.......1025
```

HUB-VCS - SIP Global Parameters

```
HUB-VCS>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:IP) ? SIP
SIP> (GLOBAL/TIMER/AUTHENTICATION/CODEC NEGO/PROXY/ALL,
def:CODEC NEGO) ? GLO
SIP Global> Administrative status..................ENABLE
SIP Global> Default dialstring dest. address........000.000.000.000
SIP Global> Default dialstring UDP port.............5060
SIP Global> Force IP source address.................
SIP Global> Header syntax form.....................FULL FORM
SIP Global> REGISTER ANI digits/Gateway ID..........
SIP Global> DEFAULT ANI digits.....................
SIP Global> Redirect server........................DISABLE
```

HUB-VCS - SIP Codec Negotiation Parameters

```
HUB-VCS>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SIP) ?
SIP> (GLOBAL/TIMER/AUTHENTICATION/CODEC NEGO/PROXY/ALL,
def:GLOBAL) ? CODEC
SIP Codec Negotiation> G729.........................YES
SIP Codec Negotiation> G723.........................NO
SIP Codec Negotiation> G726-16K.....................NO
SIP Codec Negotiation> G726-24K.....................NO
SIP Codec Negotiation> G726-32K.....................NO
SIP Codec Negotiation> G726-40K.....................NO
SIP Codec Negotiation> G711 alaw....................YES
SIP Codec Negotiation> G711 ulaw....................YES
```

HUB-VCS - SLOT 1 / LINK Parameters

```
HUB-VCS>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SIP) ? SLOT
SLOT> Slot number (1/2,def:1) ? 1
Item (LINK/CHANNEL,def:CHANNEL) ? LI
PORT 100> Status....................................ENABLE
PORT 100> Pcm encoding law..........................A-LAW
PORT 100> E&M type..................................5
```

HUB-VCS - SLOT 1 / Channel 1 Parameters

```
HUB-VCS>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SLOT) ?
SLOT> Slot number (1/2,def:1) ?
Item (LINK/CHANNEL,def:LINK) ? CHA
SLOT> Port number (1-4/ALL,def:1) ?
VOICE 101> Protocol.................................G729
VOICE 101> DSP packets per frame                12345678
VOICE 101> Packetization selection (Y/N).......NYNNNNNN
VOICE 101> Signaling type...........................IMMEDIATE START
VOICE 101> Hoot & Holler application................NO
VOICE 101> Analog E&M type..........................4 WIRE
VOICE 101> TE timer (s).............................0
VOICE 101> Push to Talk application.................VCS ENDPOINT
VOICE 101> Silence suppression level................1
```

```
VOICE 101> Local inbound voice level (db)...........0
VOICE 101> Local outbound voice level (db)..........0
VOICE 101> Echo canceller...........................ENABLE
VOICE 101> Double talk threshold (db)...............6
VOICE 101> Echo suppressor..........................ENABLE
VOICE 101> Pulse frequency (pps)....................10
VOICE 101> Activation type..........................AUTODIAL
VOICE 101> Speed dial number.......................2011
VOICE 101> TONE type:..............................DTMF
VOICE 101> TONE regeneration:.......................1
...
VOICE 101> Fwd digits..............................NONE
VOICE 101> DTMF power ratio.........................5
```

HUB-VCS – MAP Configuration

```
HUB-VCS>DMF
DISPLAY MAP FILE
NUMBER OF MAPS: 1

MAP 2011> Map type..................................DIALIP
MAP 2011> Entry digits..............................2011
MAP 2011> Digits string length......................4
MAP 2011> Egress hunt group pattern.................NONE
MAP 2011> Strip prefix number of digits.............I0 E0
MAP 2011> Ingress\Egress prepend string.............NONE
MAP 2011> Ingress\Egress append string..............NONE
MAP 2011> Enter an IP address.......................172.19.0.242
```

2.1.2 REMOTE-RADIO Unit Configuration

The following provides essential parameter values for configuring the NetPerformer unit at the remote radio site as per Figure 2-1:

REMOTE-RADIO - SIP License

```
REMOTE-RADIO>PLS
PRODUCT LICENSE STATUS
LICENSE> Enter a new license key (NO/YES,def:NO) ? Y
LICENSE> ENTER LICENSE
LICENSE> (xxxx-xxxx-xxxxxxxx-xxxx) (def:) ? EEEE-FFFF-GGGGGGGG-HHHH
LICENSE> SIP VoIP license (EEEE-FFFF-GGGGGGGG-HHHH)
         entered successfully
         Execute Reset Unit (RU) command to apply the new license.
```

REMOTE-RADIO - Global Parameters

```
REMOTE-RADIO>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SLOT) ? GLOBAL
GLOBAL> Unit name..................................REMOTE-RADIO
GLOBAL> PowerCell version..........................V1
...
GLOBAL> Tone settings..............................NORTH AMERICA
GLOBAL> Jitter buffer (ms).........................40
GLOBAL> Global CIR for FR over IP..................10000000
...
GLOBAL> Voice transport method.....................SIP VOIP
GLOBAL  > Digital port clock source................INTERNAL
```

```
REMOTE-RADIO - Extended Parameters
REMOTE-RADIO>EP
EXTENDED PARAMETERS
IP> Multihomed type.............................DISABLED
SIP> (SUPPSERV) Transfer supplementary services.....DISABLE
VPORT 101> (EMSEIZUREDETECTTIME) E&M seizure detect time (ms) 20
```

REMOTE-RADIO - Eth #1 Parameters

```
REMOTE-RADIO>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/LDC/PORT/PVC/REDUNDANCY/
SLOT/SS7/USER/ALL,def:GLOBAL) ? PORT
Port number (ETH1/ETH2/CSL/1,def:ETH1) ?
PORT ETH 1> Protocol.............................ETH AUTO
PORT ETH 1> Link integrity.......................YES
PORT ETH 1> LAN speed (mbps).....................AUTO
PORT ETH 1> MAC address..........................000000000000
PORT ETH 1> Redundancy MAC address active.........NO
PORT ETH 1> DHCP.................................DISABLE
PORT ETH 1> IP address 1.........................172.019.000.242
PORT ETH 1> Subnet mask 1 (number of bits).......24 {255.255.255.000}
PORT ETH 1> IP address 2.........................000.000.000.000
PORT ETH 1> Subnet mask 2 (number of bits).......8 {255.000.000.000}
PORT ETH 1> Redundancy IP address 1..............000.000.000.000
PORT ETH 1> Redundancy subnet mask 1 (number of bits) 8 {255.000.000.000}
PORT ETH 1> Redundancy IP address 2..............000.000.000.000
PORT ETH 1> Redundancy subnet mask 2 (number of bits) 8 {255.000.000.000}
PORT ETH 1> Allow routing between IP networks.....NO
PORT ETH 1> Frame size...........................1500
PORT ETH 1> IP RIP...............................DISABLE
PORT ETH 1> OSPF.................................DISABLE
```

REMOTE-RADIO - IP Parameters

```
REMOTE-RADIO>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SIP) ? IP
Item (BOOTP/DNS/FTP/GLOBAL/HTTP/NAT/OSPF/RADIUS/SNMP/SOURCE-STATIC/
STATIC/TELNET/TIMEP,def:BOOTP) ? GLOBAL
IP> Router.......................................ENABLE
IP> Multihomed type.............................DISABLED
IP> Route broadcast to end station..............NO
IP> OSPF AS boundary router.....................NO
IP> RIP AS boundary router......................NO
IP> IP DSCP for SIP.............................0
IP> Allow LAN-to-LAN IP routing..................NO
IP> Port number for the transparent protocols.....1025
```

REMOTE-RADIO - SIP Global Parameters

```
REMOTE-RADIO>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:IP) ? SIP
SIP> (GLOBAL/TIMER/AUTHENTICATION/CODEC NEGO/PROXY/ALL,
def:CODEC NEGO) ? GLO
SIP Global> Administrative status..................ENABLE
SIP Global> Default dialstring dest. address........000.000.000.000
```

```
SIP Global> Default dialstring UDP port.............5060
SIP Global> Force IP source address.................
SIP Global> Header syntax form.....................FULL FORM
SIP Global> REGISTER ANI digits/Gateway ID..........
SIP Global> DEFAULT ANI digits......................
SIP Global> Redirect server........................DISABLE
REMOTE-RADIO - SIP Codec Negotiation Parameters
REMOTE-RADIO>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SIP) ?
SIP> (GLOBAL/TIMER/AUTHENTICATION/CODEC NEGO/PROXY/ALL,
def:GLOBAL) ? CODEC
SIP Codec Negotiation> G729.........................YES
SIP Codec Negotiation> G723.........................NO
SIP Codec Negotiation> G726-16K.....................NO
SIP Codec Negotiation> G726-24K.....................NO
SIP Codec Negotiation> G726-32K.....................NO
SIP Codec Negotiation> G726-40K.....................NO
SIP Codec Negotiation> G711 alaw....................YES
SIP Codec Negotiation> G711 ulaw....................YES
```

REMOTE-RADIO - SLOT 1 / LINK Parameters

```
REMOTE-RADIO>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SIP) ? SLOT
SLOT> Slot number (1/2,def:1) ? 1
Item (LINK/CHANNEL,def:CHANNEL) ? LI
PORT 100> Status....................................ENABLE
PORT 100> Pcm encoding law..........................A-LAW
PORT 100> E&M type..................................5
```

REMOTE-RADIO - SLOT 1 / Channel 1 Parameters

```
REMOTE-RADIO>DP
DISPLAY PARAMETERS
Item (BRIDGE/CLASS/CUSTOM/ELOG/GLOBAL/IP/IPX/MAP/PORT/PVC/REDUNDANCY/
SIP/SLOT/SS7/USER/ALL,def:SLOT) ?
SLOT> Slot number (1/2,def:1) ?
Item (LINK/CHANNEL,def:LINK) ? CHA
SLOT> Port number (1-4/ALL,def:1) ?
VOICE 101> Protocol.................................G729
VOICE 101> DSP packets per frame                12345678
VOICE 101> Packetization selection (Y/N).......NYNNNNNN
VOICE 101> Signaling type...........................IMMEDIATE START
VOICE 101> Hoot & Holler application................NO
VOICE 101> Analog E&M type..........................4 WIRE
VOICE 101> TE timer (s).............................0
VOICE 101> Push to Talk application.................GRS ENDPOINT
VOICE 101> Silence suppression level................1
VOICE 101> Local inbound voice level (db)...........0
VOICE 101> Local outbound voice level (db)..........0
VOICE 101> Echo canceller...........................ENABLE
VOICE 101> Double talk threshold (db)...............6
VOICE 101> Echo suppressor..........................ENABLE
VOICE 101> Pulse frequency (pps)....................10
VOICE 101> Activation type..........................SWITCHED
VOICE 101> TONE type:...............................DTMF
```

```
VOICE 101> TONE regeneration:.....................1
...
VOICE 101> Fwd digits.............................NONE
VOICE 101> DTMF power ratio.......................5
```

REMOTE-RADIO - MAPs

```
HUB-VCS>DMF
DISPLAY MAP FILE
NUMBER OF MAPS: 1

MAP 2011> Map type................................DIALSTRING
MAP 2011> Entry digits............................2011
MAP 2011> Digits string length....................4
MAP 2011> Egress hunt group pattern...............SEQUENTIAL
MAP 2011> Egress hunt group ports.................101
MAP 2011> Strip prefix number of digits...........I0 E0
MAP 2011> Ingress\Egress prepend string...........NONE
MAP 2011> Ingress\Egress append string............NONE
```

3

SIP+/VHF over IP (ED-137) enhancements

This chapter includes the following:

- *SIP+ (ED-137) Features*
- *SIP+ license and DSP Resources*
- *SIP+ Profile Configuration Parameters*

3.1 SIP+ (ED-137) Features

SIP+ provides the following additional VHF over IP functionalities:

- Compresses VHF over IP traffic coming for Voice Communication System (VCS) or Ground Radio Station (GRS) from G.711 to G.729 internally in the NetPerformer
- Supports separate IP radios for TX and RX
- Supports up to four VCSs accessing the same radio (shared access)
- Best Signal Selection (Voting)

These new features are available on the NetPerformer SDM-9XXX series when the SIP+ license is activated on units equipped with Digital Signal Processor (DSP). Note that the SIP+ license includes everything that is currently supported with the regular SIP VoIP license, as well as these four new features. As such, the SIP+ license does not need to be added on top of the regular SIP license.

The SIP+ option introduces the concept of SIP+ Connections and SIP+ Matrix which provide VHFoIP spoofing capabilities (local VCS and GRS emulation), including parameters for the configuration of the SIP+ features:

3.1.1 VHFoIP G.711 to G.729 Transcoding

VHFoIP traffic is compressed from G.711 to G.729 internally in the NetPerformer.

Example 1

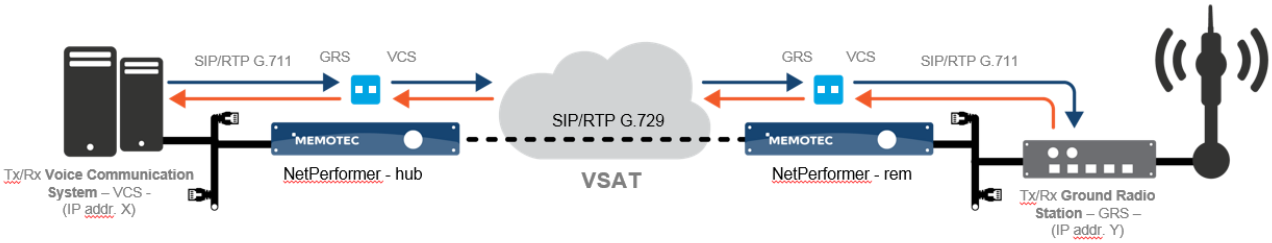

Figure 3-1: VHFoIP G.711 to G.729 Traffic Compression - Example 1

Example 2

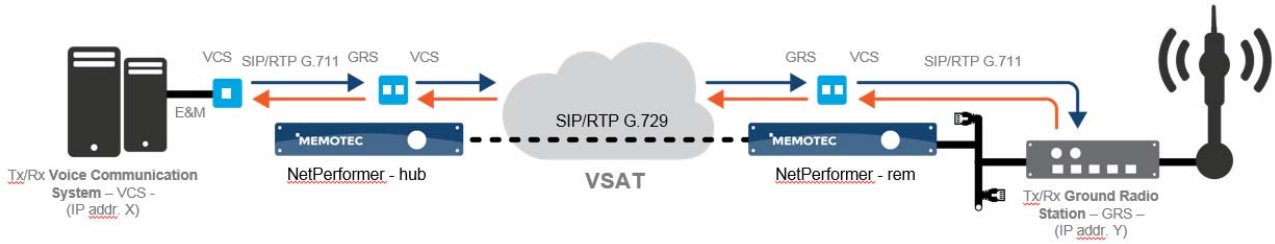

Figure 3-2: VHFoIP G.7111 to G.729 Traffic Compression - Example 2

As illustrated above, SIP+ Connections in the NetPerformer can be set in VCS or GRS mode, depending on the type of VHFoIP equipment they are connected to.

SIP+ connections going toward external VCS or GRS devices typically use G.711 (64k codec) over IP. On the other end, SIP+ connections used between NetPerformers typically use G.729 (8k codec). Note that both codec types require DSP resources for voice handling and voice compression by the NetPerformer.

SIP+ Matrix is used to define the traffic flows and rules to be used between the external and internal VCS and GRS spoofing connections.

More details regarding the SIP+ connections and matrix configuration parameters are available in “SIP+ Profile Configuration Parameters” on page 3-8.

3.1.2 Managing Multiple Radios (Tx/Rx, Primary/Secondary)

In this case, NetPerformer acts as an ED-137 VCS Proxy.

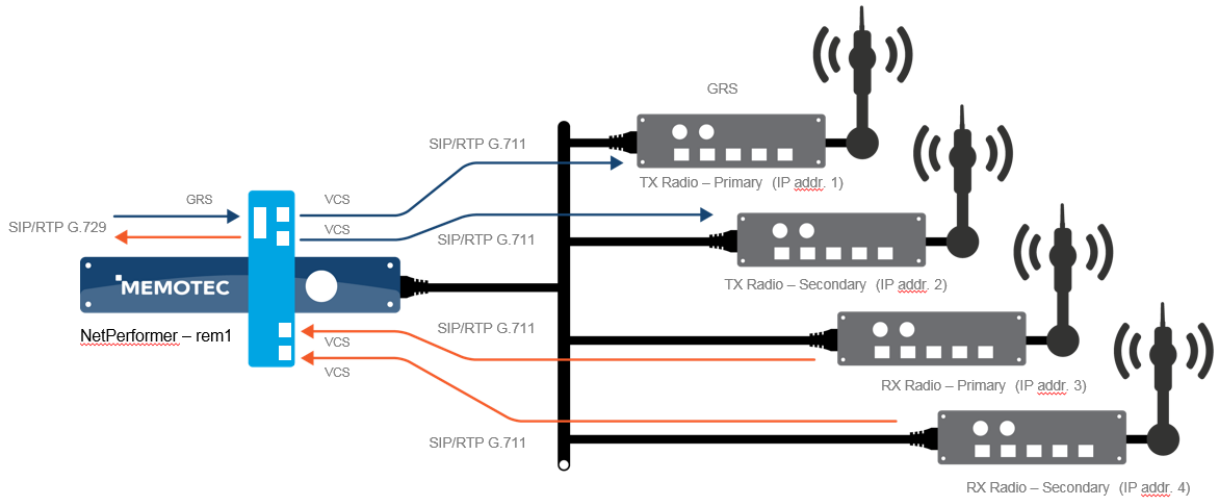

Figure 3-3: Managing Multiple Radios (Tx/Rx, Primary/Secondary)

SIP+ matrix includes up to 4 VCS connection points which are used to provide the means to configure the management of multiple TX/RX radios (primary/secondary) concentrated to one full duplex radio channel to be connected to the central site(s) VCS.

Managing Multiple Radios (primary/ secondary)

The solution supports the concept of radio primary/secondary, consisting of four radios (Tx primary/secondary and Rx primary/secondary), where the functionality of switching from the primary radio to the secondary radio is integrated in the NetPerformer.

Note that the NetPerformer remains permanently connected to both radio transmitters and both radio receivers and manages the traffic flows based on the criteria defined in the SIP+ matrix used by those connections.

Radio Receivers

Both receivers provide audio information/SQU to the NetPerformer over IP. The NetPerformer is responsible for processing and forwarding only one stream of audio signals/SQU. The selection of which audio stream to be routed is based on the state of the RX radio (via R2S Keep Alive for example) with priority given to the primary RX radio when both RX radios are up.

Radios Transceivers

The NetPerformer is connected to both TX radios, but provides audio/PTT information to the “active” TX radio only, which will broadcast the audio.

The NetPerformer automatically makes a TX radio primary/standby switching in case of

- Manual switching
- IP connection loss to the TX primary radio, (via R2S Keep Alive for example)

Radios status

In the NetPerformer, status display information is provided to show which TX and RX radios are used (primary or secondary). This information is available via the Display States (**DS/CONNECTION**) command and by using the real time display command: Display Connection Status (**DCS**). More information about these display commands are available in “SIP+ Monitoring Displays” on page 3-20.

3.1.3 Managing Multiple VCSs accessing one radio (shared access)

Provides the ability for one radio site (GRS) to be accessed from multiple centers (VCS).

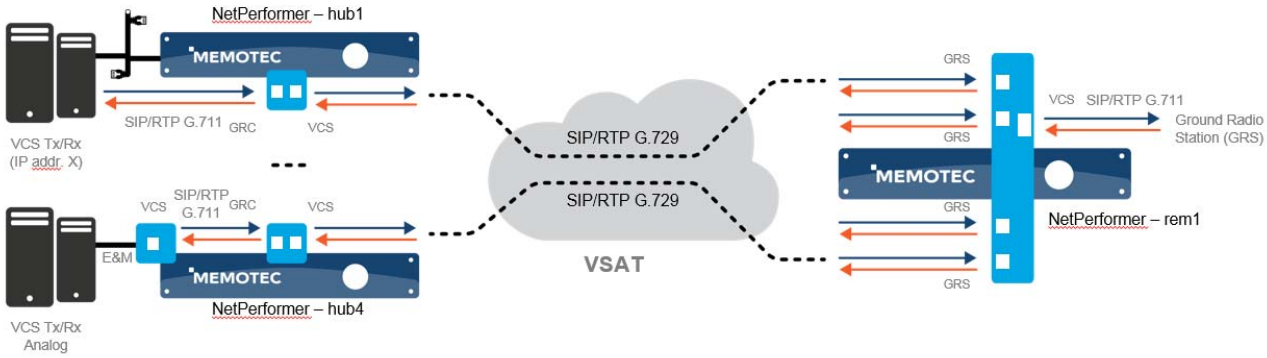

Figure 3-4: Managing Multiple VCSs Accessing One Radio

SIP+ matrix includes up to 4 VCS and 4 GRS connection points that are used to configure the management of multiple radios (primary/secondary) to one radio channel, as well as the management of multiple VCSs accessing one radio.

The NetPerformer provides the ability for one radio site to be accessed from multiple centers (VCS), with the goal of allowing the provision/contingency to resume operations in the event of an emergency or VCS location backup requirements.

All the centers (VCS) should be connected to a remote radio and be able to transmit (the PTT lockout and priority applying) to the radio and receive from the same radio simultaneously.

The NetPerformer should provide arbitrage of the concurrent access to the same radio channel through one of the following configurable media management systems:

- PTT lockout: A second radio call is blocked if the radio is busy. A sound notification is sent to the center when access is denied.
- PTT priority annulment: a second radio call with higher priority can interrupt an ongoing radio call from another center.

3.1.4 Best Signal Selection (BSS Voting)

The NetPerformer device at the central site (VCS side) uses a voting algorithm that uses the RSSSi (Received Signal Strength Indicator) measurement provided by the remote ED-137 IP radios as specified in the ED-137B specification section: *ANNEX B BEST SIGNAL SELECTION AND AUDIO LEVEL QUALITY INDEX RECEPTION*.

Example 1

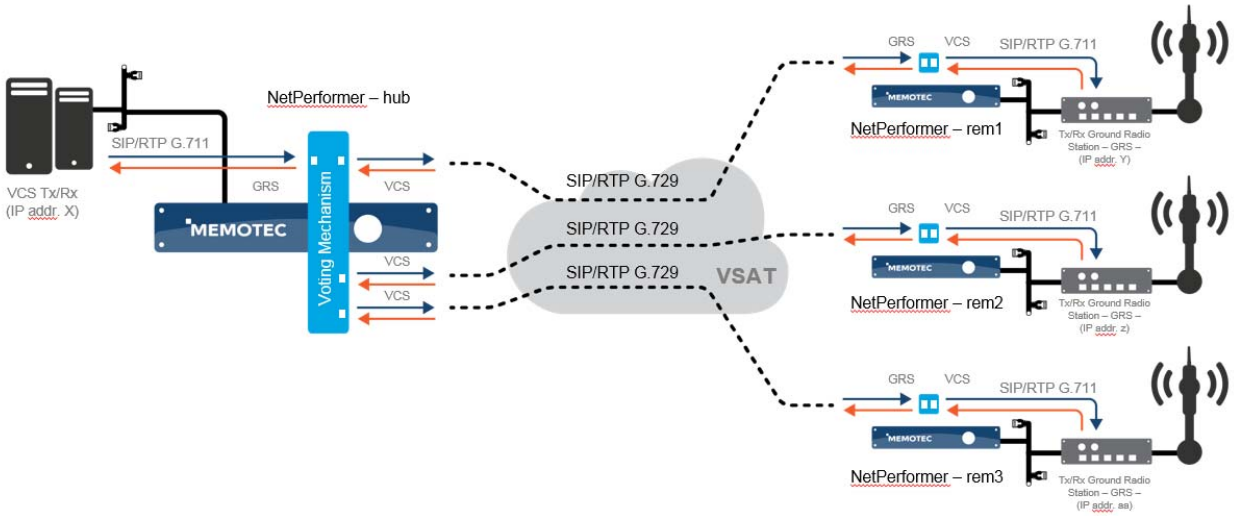

Figure 3-5: BSS Voting - Example 1

Example 2

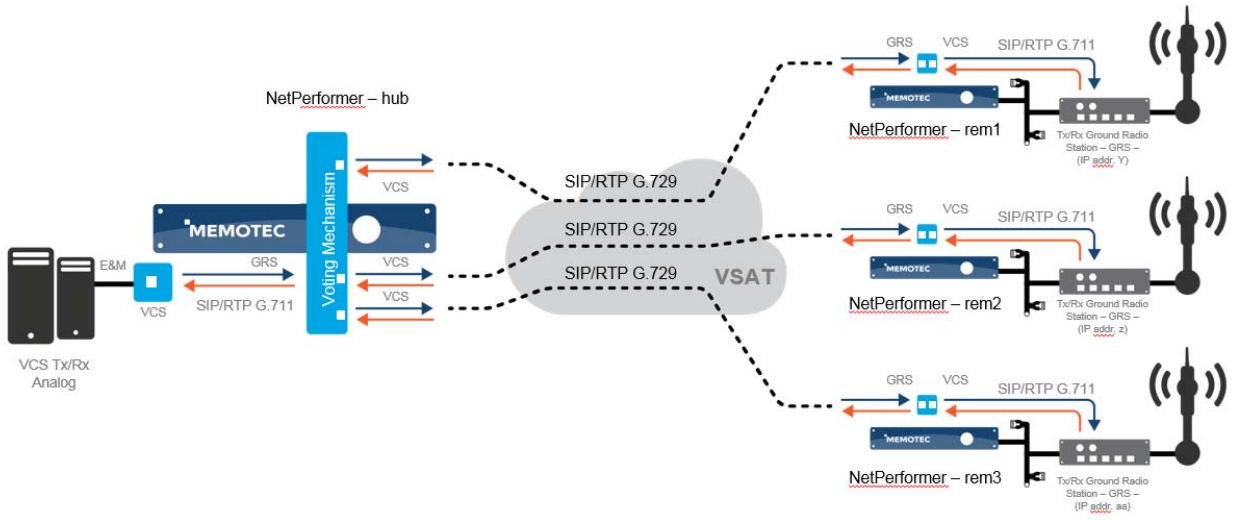

Figure 3-6: BSS Voting - Example 2

3.2 SIP+ license and DSP Resources

SIP+ functionalities are available on the SDM-9XXX platform using one SIP+ license per unit. The number of SIP+ connections that the unit is able to process/compress depends on the number of channels available on the DSP modules, or on the DSP on-board the motherboard in the case of the SDM-9140. As such, a unit not equipped with DSP resources would not be able to do much in SIP+.

3.3 SIP+ Profile Configuration Parameters

3.3.1 SIP+ CONNECTION PARAMETERS

The SIP+ Connection defines the internal DSP SIP+ connection(s) going toward external IP Radios (GRS) or IP VCS endpoints.

Protocol

Console	SNMP	Text-based Config
Protocol	ConnectionProtocol	[Connection#] Protocol

Description: Determines the operating protocol for this connection channel toward the ED-137 VHF over IP device.

Protocol parameter.

- **OFF**: Select this value when the connection is not used.
- **G.723**: A standards-based voice codec (G.723.1) designed for video conferencing and telephony over standard phone lines, with real-time encoding and decoding
- **G726 16K**: Adaptive Differential Pulse Code Modulation at 16 Kbps. Conforms to ITU-T Recommendation G.726
- **G726 24K**: G.726 at 24 Kbps
- **G726 32K**: G.726 at 32 Kbps
- **G726 40K**: G.726 at 40 Kbps
- **G.729**: CS-ACELP voice compression at 8 Kbps according to ITU-T Recommendation
- **PCM64K**: Pulse Code Modulation with non-linear compression at 64 Kbps
- **LDCD**: Low Delay Codec as 16 Kbps.

Values: *OFF, G.723, G726 16K, G726 24K, G726 32K, G726 40K, G.729, PCM64K*

Default: *OFF*

Local Use

Console	SNMP	Text-based Config
Local use	ConnectionLocalUse	[Connection#] LocalUse

Description: Determines if the connection channel toward the ED-137 VHF over IP device is local and, as such, will use the Global Parameters Local Jitter Buffer value to establish this connection instead of the Network Jitter Buffer value.

Values: *NO, YES*

Default: *NO*

DSP packets per frame / Packetization selection (Y/N)

Console	SNMP	Text-based Config
DSP packets per frame packetization selection (Y/N)	ConnectionRate1ppf ConnectionRate2ppf ConnectionRate3ppf ConnectionRate4ppf ConnectionRate5ppf[	Connection#] Rate1ppf

Description: Sets the buffering scheme for voice packetization, which determines how many voice sample/packets are put per IP frame.

Values: To set the buffering scheme for voice packetization, enter *N* (no) or *Y* (yes) beneath the numbers 1 to 5 indicated for the DSP packets per frame.

Default: *YNNNN* (single buffering)

Push to Talk application

Console	SNMP	Text-based Config
Push to Talk application	ConnectionAnalogEmPushTalk	[Connection#] AnalogEmPushTalk

Description: Determines if the connection is acting as a VCS ENDPOINT connected to a VHFoIP Radio or if the connection is acting as a GRS ENDPOINT (radio) connected to a control station (VCS) unit.

Values: *GRS ENDPOINT, VCS ENDPOINT*

Default: *GRS ENDPOINT*

PTT ID

Console	SNMP	Text-based Config
PTT ID	ConnectionPttId	[Connection#] PttId

Description: This parameter is PTT-id assigned by the GRS receiver, transceiver or transmitter endpoint during the SIP session establishment.

Values: *AUTOMATIC, 0-63*

Default: *AUTOMATIC*

Activation Type

Console	SNMP	Text-based Config
Activation type	ConnectionActivationType	[Connection#] ActivationType

Description: Determines how the SIP+ connection is activated.

Values: *SWITCHED, AUTODIAL*

Default: *SWITCHED*

SWITCHED: The NetPerformer selects the calling party according to a configurable Speed dial number that the user enters in the telephone set. All speed dial numbers are defined in the Voice Mapping Table along with the associated destination IP address, extension number and optional dialing sequence to be forwarded to the attached voice equipment.

AUTODIAL: Autodial line activation behaves like a switch that always dials to the same NetPerformer unit or set of external units/devices. The NetPerformer reaches the destination unit location using a predefined number. This number is permanently configured for the connection and is defined in the Voice Mapping Table. Like hotline activation, the NetPerformer begins the calling procedure with the destination site as soon as the device connected to the voice channel goes off hook.

Speed dial number

For AUTODIAL Activation only

Console	SNMP	Text-based Config
Speed dial number	ConnectionSpeedDialNum	[Connection#] SpeedDialNum

Description: Specifies which speed dial number is dialed when an off-hook condition occurs on this voice connection. Select a valid speed dial number from the Voice Mapping Table.

Values: *0 - 9*, * for each digit, determined by Voice Mapping Table entries

Default: *NONE*

Ingress ANI operation mode

Console	SNMP	Text-based Config
Ingress ANI operationmode	ConnectionIngressANIMode	[Connection#] IngressANIMode

Description: Ingress ANI digits can be defined at both ends of a NetPerformer connection. Typically, ingress ANI is defined at the remote location and is transported to the central site.

However, it can operate in the other direction, depending on the direction of the call. During call setup, the ingress ANI digits are transported from the site where the call originates to the site that receives the call, over the voice channels involved in the connection. The Ingress ANI operation mode parameter determines the source of the ANI digits that are sent with the call:

Values: *NONE, INSERT, ALWAYS, GATEWAY ID*

- **NONE**: The NetPerformer sends only those ANI digits that have been received from the Telco equipment
- **INSERT**: The NetPerformer inserts the ingress ANI digits that are defined locally on the voice channel, but only if the Telco equipment did not send any ANI digits
- **ALWAYS**: The NetPerformer always sends the ingress ANI digits that are defined locally on the voice channel and ignores any ANI digits received from the Telco equipment.
- **GATEWAY ID**: The NetPerformer always inserts the gateway number in the INVITE message during call setup to define the source of the call.

Default: *NONE*

Ingress CHANNEL ANI digits

Console	SNMP	Text-based Config
Ingress CHANNEL ANI digits	ConnectionIngressChannel ANIDigits	[Connection#] IngressChannelANIDigits

Description: Specifies the ANI digits that are sent during call setup when the Ingress ANI operation mode requires locally defined ingress ANI digits (INSERT or ALWAYS setting).

Values: Maximum 20-character alphanumeric string: *0-9, A-D, *, #*

Default: no value

3.3.2 SIP+ MATRIX PARAMETERS

The SIP+ matrix defines the traffic flow, the operation parameters, and the connections used between the NetPerformer and the external VCS or GRS end-points. The applications that are supported, such as the ability to compress VHFoIP traffic from G.711 to G.729, are as follows:

For traffic flow directed towards external VCS end-points:

- Best Signal Selection (Voting)

For traffic flow directed towards external radios (GRS end-points):

- Supports separate IP radios for TX and RX
- Supports up to four VCS accessing the same radio (shared access)

Active

Console	SNMP	Text-based Config
Active	MatrixActive	[Matrix#] Active

Description: Activates or deactivates an SIP+ matrix configuration.

Values: *NO, YES*

Default: *NO*

Direction toward external VCS or GRS

Console	SNMP	Text-based Config
Direction toward external VCS or GRS	MatrixDirection	[Matrix#] Direction

Description: Determines if the SIP+ matrix operation is defined for external VCS or external GRS endpoints.

Values: *VCS, GRS*

Default: *VCS*

3.3.2.1 Parameters for operation set with direction toward external VCS

Best Signal Selection (BSS Voting)

Console	SNMP	Text-based Config
Best Signal Selection (BSS Voting)	MatrixBSSVoting	[Matrix#] BSSVoting

Description: Defines if the SIP+ matrix performs Best Signal Selection (BSS voting), and provides radio traffic to the VCS end-point via the remote radio that has the best quality signal reception.

Values: *YES, NO*

Default: *YES*

Broadcast TX on all IP radios (BSS)

For the "Best Signal Selection (BSS Voting)" parameter set to YES.

Console	SNMP	Text-based Config
Broadcast TX on all IP radios (BSS)	MatrixBSSBroadcast	[Matrix#] BSSBroadcast

Description: Defines if the SIP+ matrix, when set with BSS voting to YES, performs TX broadcast of the traffic received from the VCS to all remote radio endpoints. Note that when this parameter is set to *NO*, traffic received from the VCS is transmitted only to the remote radio which has the best signal quality in reception (i.e.: TX follow RX).

Values: *YES, NO*

Default: *YES*

Separate TX and RX from VCS

Console	SNMP	Text-based Config
Separate TX and RX from VCS	MatrixGRSSeparateTxRx	[Matrix#] GRSSeparateTxRx

Description: Defines if the SIP+ matrix is connected to the VCS using two separate GRS endpoint connections (one for transmission and one for reception), or using one single GRS endpoint connection supporting both TX and RX.

Values: *NO, YES*

Default: *NO*

GRS ENDPOINT TX Connection number

For the "Separate TX and RX from VCS" parameter set to YES.

Console	SNMP	Text-based Config
GRS ENDPOINT TX Connection number	MatrixGRSTxConn	[Matrix#] GRSTxConn

Description: Defines the SIP+ matrix's GRS ENDPOINT connection used for transmission (TX) to the VCS.

Values: *NONE, 2000-2119*

Default: *NONE*

GRS ENDPOINT RX Connection number

For the "Separate TX and RX from VCS" parameter set to YES.

Console	SNMP	Text-based Config
GRS ENDPOINT RX Connection number	MatrixGRSRxConn	[Matrix#] GRSRxConn

Description: Defines the SIP+ matrix's GRS ENDPOINT connection used for reception (RX) from the VCS.

Values: *NONE, 2000-2119*

Default: *NONE*

GRS ENDPOINT Connection number

For the "Separate TX and RX from VCS" parameter set to NO.

Console	SNMP	Text-based Config
GRS ENDPOINT Connection number	MatrixGRSConn	[Matrix#] GRSConn

Description: Defines the SIP+ matrix's GRS ENDPOINT connection used for both transmission (TX) and reception (RX) to and from the VCS.

Values: *NONE, 2000-2119*

Default: *NONE*

VCS ENDPOINT 1st to 4th Connection number

For the "Best Signal Selection (BSS Voting)" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT 1st Connection number	MatrixVCSConn1	[Matrix#] VCSConn1
VCS ENDPOINT 2nd Connection number	MatrixVCSConn2	[Matrix#] VCSConn2
VCS ENDPOINT 3rd Connection number	MatrixVCSConn3	[Matrix#] VCSConn3
VCS ENDPOINT 4th Connection number	MatrixVCSConn4	[Matrix#] VCSConn4

Description: Defines the SIP+ matrix's VCS ENDPOINT connection used for transmission and reception to up to four remote radio (GRS) endpoints.

VHFoIP traffic received on these VCS ENDPOINT connections (up to 4) are analyzed by the NetPerformer regarding their signal quality measurements. Only traffic received from the most reliable VCS ENDPOINT connection is forwarded to the GRS ENDPOINT connection.

Values: *NONE, 2000-2119*

Default: *NONE*

VCS ENDPOINT Connection number

For the "Best Signal Selection (BSS Voting)" parameter set to NO.

Console	SNMP	Text-based Config
VCS ENDPOINT Connection number	MatrixVCSConn	[Matrix#] VCSConn

Description: Defines the SIP+ matrix's single VCS ENDPOINT connection used for both transmission (TX) and reception (RX) to the remote GRS endpoint when BSS voting is disabled.

Values: *NONE, 2000-2119*

Default: *NONE*

3.3.2.2 Parameters for operation set with direction toward external GRS

Separate IP radios for TX and RX

Console	SNMP	Text-based Config
Separate IP radios for TX and RX	MatrixVCSSeparateTxRx	[Matrix#] VCSSeparateTxRx

Description: Defines if the SIP+ matrix is connected to the radio (GRS) using two separate VCS endpoint connections (one for transmission and one for reception), or using one single VCS endpoint connection that supports both TX and RX.

Values: *NO, YES*

Default: *NO*

VCS ENDPOINT TX Connection number

For the "Separate IP radios for TX and RX" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT TX Connection number	MatrixVCSTxConn	[Matrix#] VCSTxConn

Description: Defines the SIP+ matrix's VCS ENDPOINT connection used for transmission (TX) to the IP TX radio.

Values: *NONE, 2000-2119*

Default: *NONE*

VCS ENDPOINT RX Connection number

For the "Separate IP radios for TX and RX" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT RX Connection number	MatrixVCSRxConn	[Matrix#] VCSRxConn

Description: Defines the SIP+ matrix's VCS ENDPOINT connection used for reception (RX) from the IP RX radio.

Values: *NONE, 2000-2119*

Default: *NONE*

VCS ENDPOINT Connection number

For the "Separate IP radios for TX and RX" parameter set to NO.

Console	SNMP	Text-based Config
VCS ENDPOINT Connection number	MatrixVCSConn	[Matrix#] VCSConn

Description: Defines the SIP+ matrix's VCS ENDPOINT connection used for both transmission (TX) and reception (RX) to and from the IP radio.

Values: *NONE, 2000-2119*

Default: *NONE*

Redundant IP radio

Console	SNMP	Text-based Config
Redundant IP radio	MatrixRedunIPRadios	[Matrix#] RedunIPRadios

Description: Defines if the SIP+ matrix will be connected to the radio (GRS) in redundant mode using primary radio(s) as main units and secondary radio(s) as backups.

Values: *NO, YES*

Default: *NO*

VCS ENDPOINT Primary Connections numbers

For the "Separate IP radios for TX and RX" parameter set to YES, and for the "Redundant IP radio" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT Primary TX Connection number	MatrixVCSPriTxConn	[Matrix#] VCSPriTxConn

Description: Defines the SIP+ matrix's VCS ENDPOINT primary connection used for transmission (TX) to the main IP TX radio.

Values: *NONE, 2000-2119*

Default: *NONE*

For the "Separate IP radios for TX and RX" parameter set to YES, and for the "Redundant IP radio" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT Primary RX Connection number	MatrixVCSPriRxConn	[Matrix#] VCSPriRxConn

Description: Defines the SIP+ matrix's VCS ENDPOINT primary connection used for reception (RX) from the main IP RX radio.

Values: *NONE, 2000-2119*

Default: *NONE*

For the "Separate IP radios for TX and RX" parameter set to NO, and for the "Redundant IP radio" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT Primary Connection number	MatrixVCSPriConn	[Matrix#] VCSPriConn

Description: Defines the SIP+ matrix's VCS ENDPOINT primary connection used for both transmission (TX) and reception (RX) to and from the main IP radio.

Values: *NONE, 2000-2119*

Default: *NONE*

VCS ENDPOINT Secondary Connections numbers

For the "Separate IP radios for TX and RX" parameter set to YES, and for the "Redundant IP radio" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT Secondary TX Connection number	MatrixVCSSecTxConn	[Matrix#] VCSSecTxConn

Description: Defines the SIP+ matrix's VCS ENDPOINT Secondary connection used for transmission (TX) to the backup IP TX radio.

Values: *NONE, 2000-2119*

Default: *NONE*

For the "Separate IP radios for TX and RX" parameter set to YES, and for the "Redundant IP radio" parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT Secondary RX Connection number	MatrixVCSSecRxConn	[Matrix#] VCSSecRxConn

Description: Defines the SIP+ matrix's VCS ENDPOINT Secondary connection used for reception (RX) from the backup IP RX radio.

Values: *NONE, 2000-2119*

Default: *NONE*

For the “Separate IP radios for TX and RX” parameter set to NO, and for the “Redundant IP radio” parameter set to YES.

Console	SNMP	Text-based Config
VCS ENDPOINT Secondary Connection number	MatrixVCSSecConn	[Matrix#] VCSSecConn

Description: Defines the SIP+ matrix’s VCS ENDPOINT Secondary connection used for both transmission (TX) and reception (RX) to and from the backup IP radio.

Values: *NONE, 2000-2119*

Default: *NONE*

3.4 SIP+ Monitoring Displays

3.4.1 Display States Connection (DS/CONNECTION) command

This command provides a onetime display (snapshot) of the state of the SIP+ connections configured in the unit, as well as information about their protocols, the matrixes handling the connections, and the connection state of the Push to Talk (PTT), Squelch (SQU) and Best Signal Selection (BSS) Quality Index values.

Following is an example of a Display States Connection (**DS/CONNECTION**) displaying the connections and matrix used to manage a Radio with separate IP units for transmission and reception.

```
REMOTE>DS
DISPLAY STATES
Item (CONNECTION/DHCPSRV/GLOBAL/GROUP/PORT/PVC/REDUNDANCY/SIP/SLOT,
def:CONNECTION) ? CONNECTION
Connection number (2000/2001/2002/ALL,def:ALL) ? ALL
CONNECTION 2000> State.............................CONNECTED
CONNECTION 2000> Protocol..........................G729
CONNECTION 2000> Negotiated Codec Payload..........18
CONNECTION 2000> Last error........................
CONNECTION 2000> Traffic Type......................VOICE
CONNECTION 2000> Direction (Matrix).................TX/RX (1)
CONNECTION 2000> BSS Quality Index..................RSSI 15 (> -70 dBm)
CONNECTION 2000> RX PTT state......................OFF
CONNECTION 2000> TX PTT state......................OFF
CONNECTION 2000> RX SQU state......................OFF
CONNECTION 2000> TX SQU state......................OFF

CONNECTION 2001> State.............................CONNECTED
CONNECTION 2001> Protocol..........................PCM64K
CONNECTION 2001> Negotiated Codec Payload..........8
CONNECTION 2001> Last error........................
CONNECTION 2001> Traffic Type......................VOICE
CONNECTION 2001> Direction (Matrix).................RX (1)
CONNECTION 2001> BSS Quality Index..................RSSI 15 (> -70 dBm)
CONNECTION 2001> RX PTT state......................OFF
CONNECTION 2001> TX PTT state......................OFF
CONNECTION 2001> RX SQU state......................OFF
CONNECTION 2001> TX SQU state......................OFF

CONNECTION 2002> State.............................CONNECTED
CONNECTION 2002> Protocol..........................PCM64K
CONNECTION 2002> Negotiated Codec Payload..........8
CONNECTION 2002> Last error........................
CONNECTION 2002> Traffic Type......................VOICE
CONNECTION 2002> Direction (Matrix).................TX (1)
CONNECTION 2002> BSS Quality Index..................NOT USED
CONNECTION 2002> RX PTT state......................OFF
CONNECTION 2002> TX PTT state......................OFF
CONNECTION 2002> RX SQU state......................OFF
CONNECTION 2002> TX SQU state......................OFF
```

3.4.2 Display Connection State (DCS) command

This command provides the same information as the Display States Connection (**DS/CONNECTION**) command, but in a compact table format with the connection states displayed in Real-time via information refresh.

Following is an example of a Display Connection State (**DCS**) displaying the connections and matrix used to manage a Radio with separate IP units for transmission and reception.

```
---------------------------------- SIP+ CONNECTIONS --------------------------
#    Status    Protocol Dir/M   BSS Quality         RX-PTT TX-PTT RX-SQU TX-SQU
2000 CONNECTED G729     TXRX/1  RSSI 15 (> -70 dBm) OFF    OFF    OFF    OFF
2001 CONNECTED PCM64K   RX/1    RSSI 15 (> -70 dBm) OFF    OFF    OFF    OFF
2002 CONNECTED PCM64K   TX/1    NOT USED            OFF    OFF    OFF    OFF
2003 OFF
2004 OFF
2005 OFF
2006 OFF
2007 OFF
2008 OFF
2009 OFF
2010 OFF
2011 OFF
2012 OFF
2013 OFF
2014 OFF
2015 OFF
2016 OFF
2017 OFF
2018 OFF
2019 OFF
-------------------------------------------------------------------------------
Use LEFT and RIGHT arrow keys to change Connection page. Other keys : press K.
```

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