

Application Note

**Configuring an SS7 Demo
System Using Dialogic[®]
DSI Components with
Dialogic[®] Host Media
Processing Software
Release 3.1LIN**

Configuring an SS7 Demo System Using Dialogic® DSI Components with Dialogic® Host Media Processing Software Release 3.1LIN

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Executive Summary

This application note presents an SS7 demo system using Dialogic® DSI Components (SS7) with Dialogic® Host Media Processing Software Release 3.1LIN to demonstrate to users familiar with SS7 concepts that the SS7 configuration process can occur very quickly.

Those opting to use the demo can download components and licenses from the Dialogic Support website, including Dialogic HMP Software 3.1LIN, Dialogic® DSI Protocol Stacks (Dialogic® DSI SIGTRAN Stack and Dialogic® DSI SS7 Stack), other Dialogic® Distributed Signaling Interface (DSI) Components (SS7), as well as a license allowing 10 hours of consecutive DSI SS7 system use and 30 days of Dialogic HMP Software use. Sample code is provided in this application note, and configuration files are also available for download.

Although this application note refers to Dialogic HMP Software 3.1LIN, the SS7 configuration could be adapted to work on the Windows® operating system.

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Introduction

SS7 configuration can sometimes be daunting, particularly for the uninitiated. But a working SS7 demo using Dialogic® Distributed Signaling Interface (DSI) Components with Dialogic® Host Media Processing Software Release 3.1LIN can be easily assembled if one opts to reference this application note, and to use the configuration files provided. A self-contained demo system that can allow a back-to-back connection can be configured very quickly.

Users can download the components and licenses, with the exception of the Dialogic® HMP Interface Boards (T1/E1 interface boards), from the Dialogic® Support website, including Dialogic HMP Software 3.1, the Dialogic® DSI SIGTRAN Stack, the Dialogic® DSI SS7 Stack, other DSI Components (SS7), as well as a license allowing 10 hours of consecutive DSI SS7 system use and 30 days of Dialogic HMP Software use. Sample code is provided in this application note, and configuration files are also available for download (see the *For More Information* section).

The DSI SS7 platform can then be used with several of the demos supplied with Dialogic HMP Software. These demos use Dialogic® Global Call API, a high-level call control API that abstracts the operations used to handle inbound calls and make outbound calls. The “GC Basic Call Model” demo concentrates on signaling, and allows multiple simultaneous calls to be set up and torn down. The “M3G-SIP Gateway” demo uses SS7 signaling and bearer channels to be able to deliver multimedia (audio and video) over the 3G-324M protocol. It demonstrates how one can interface to a 3G network by providing an example of a 3G-3G loopback connection using SS7 signaling.

Although this application note focuses on Dialogic HMP Software 3.1, the SS7 configuration could be adapted to work on the Windows® operating system. Do note, however, that the Dialogic® 3G API is not available on Dialogic® Host Media Processing Software Release 3.0 for Windows®.

Background and Architecture

This application note is not intended to be an SS7 tutorial (see the For More Information section for support information). The information provided in this application note assumes basic SS7 knowledge and mainly covers how one can set up and use the system described in the *Introduction* section. However, an overview of the overall architecture provides good background. Figure 1 shows the major software and hardware components involved.

The SS7 configuration can support a single system with a back-to-back connection. This means that there are two DSI SIGTRAN endpoints on the system — two circuit groups and linksets. Both use the same IP address for their SIGTRAN signaling link, and communicate over the local loopback IP address. DS0 bearer channels also use a loopback configuration. In this case, there is a physical T1/E1 loopback cable used between two spans in the Dialogic® HMP Interface Board (DNI Board).

The DSI Components are installed and run separately from Dialogic HMP Software media processing. The following Dialogic® DSI Protocol Stacks and Layers are used:

- DSI SIGTRAN Stack — Allows SS7 messages to be reliably transported over an IP network using a common IP and SCTP base and adaptation layers
- DSI SCTP Layer— Stream Control Transmission Protocol (SCTP) is used by SIGTRAN to reliably transport SS7 messages in an IP network from a Signaling Gateway to a SIGTRAN IP signaling point. Adaptation layers (DSI M2PA Layer, DSI M2UA Layer, DSI M3UA Layer, and DSI SUA Layer) use the SCTP as a transport service.
- DSI MTP3 Layer — Message Transfer Part, highest (third) layer — concerned with moving data between end points in the network
- DSI M2PA Layer — Part of DSI SIGTRAN Stack that allows SS7 MTP3 messages to be transferred to an IP network
- DSI ISUP Layer — ISDN User Part — provides signaling protocol for call setup and teardown over a circuit-switched network

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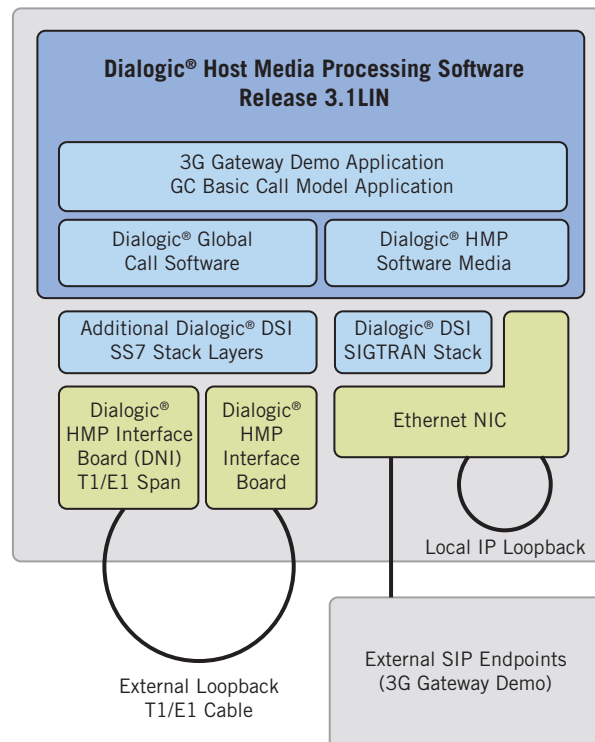


Figure 1. High-Level Architecture

In addition to its industry-standard SS7 layers, the Dialogic® DSI SS7 Stack contains an interface layer to the Dialogic® Global Call API. There, an application can use simplified call control commands to establish and terminate SS7 calls.

Two Global Call API-based demo applications were tested with the Dialogic® DSI Protocol Stack configuration:

- **GC Basic Call Model** — A simple, multi-channel inbound and outbound call demo that runs a number of simultaneous call setups and teardowns
- **M3G-SIP Gateway** — A 3G to SIP gateway application which, on one side, demonstrates 3G mobile connectivity to a remote 3G-324M endpoint using the Dialogic® 3G-324M (M3G) library. The other side of the M3G-SIP-MM Gateway application bridges the call to a local SIP endpoint or Multimedia (audio and video) endpoint. In addition, a loopback 3G-3G call may also be demonstrated. In this case, a 3G network connection is not needed.

Both demos are further described in their demo documentation (see the *For More Information* section)

- *Dialogic® Global Call API Demo Guide*
- *Dialogic® 3G-324M Multimedia Gateway Demo Guide*

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Configuring an SS7 Demo System

SS7 Configuration Files

Two standard configuration files, `system.txt` and `config.txt`, are used with the Dialogic® DSI Components (SS7) systems. They contain the information used to run and interconnect the various pieces that can be used to build different SS7 configurations. The annotated files below do not describe all possible parameters — instead they point out lines that are relevant to this DSI SIGTRAN Stack back-to-back configuration.

System.txt

```
* The following lines identify the various modules, running on this
* system, used in this SIGTRAN configuration.
*
LOCAL 0x00 * Timer Task
LOCAL 0xcf * s7_mgt - Management/config task
LOCAL 0xef * s7_log - Display and logging utility
LOCAL 0xc2 * mbm - Management task
LOCAL 0xd0 * SCTPD (daemon) module
LOCAL 0xd1 * Sctp module
LOCAL 0xc1 * M2PA module
LOCAL 0x22 * MTP3 module
LOCAL 0x23 * ISUP module
LOCAL 0x4d * GCSS7 (GlobalCall interface) module
*
* Start-up commands for all local tasks. Note that
* <LINUXDEV_DIR> will be replaced by the installation script
* by the full path needed to reach the executables - for example
* "/root/Desktop/SS7/linux_dev"
*
* Processes started with "-t" are running in trial mode - they will
* automatically halt after 10 hours and must be restarted
*
FORK _PROCESS <LINUXDEVDIR>tim_lnx
FORK _PROCESS <LINUXDEVDIR>tick_lnx
FORK _PROCESS <LINUXDEVDIR>sctpd
FORK _PROCESS <LINUXDEVDIR>sctp
FORK _PROCESS <LINUXDEVDIR>m2pa_lnx6 -t
FORK _PROCESS <LINUXDEVDIR>mtp_lnx6 -t
FORK _PROCESS <LINUXDEVDIR>mbm -d
FORK _PROCESS <LINUXDEVDIR>isp_lnx6 -t
FORK _PROCESS <LINUXDEVDIR>s7_mgt -d
FORK _PROCESS <LINUXDEVDIR>s7_log -fss7.log
```

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Config.txt

```
* Basic system configuration. <IPADDR> is replaced by the system's
* IP address.
*
CNSYS:IPADDR=<IPADDR>,PER=0;
*
* SIGTRAN signaling link configuration. Two signaling links are
* specified at the given IP addresses and ports. Endpoints are either
* S)erver or C)lient. M2PA message transport is used.
SNSLI:SNLINK=1,IPADDR=<IPADDR>,SNEND=S,SNATYPE=M2PA,M2PA=1,PPORT=3565;
SNSLI:SNLINK=2,IPADDR=<IPADDR>,SNEND=C,SNATYPE=M2PA,M2PA=2,PPORT=3565;
*
* MTP Parameters:
* MTP_CONFIG <reserved> <reserved> <options>
MTP_CONFIG 0 0 0x00000000
*
* Two linksets are defined. Each has a unique ID. Starting point
* codes ?? given for the local and adjacent linkset point at one
* another.
*
* MTP_LINKSET <linkset_id> <adjacent_spc> <num_links> <flags>
* <local_spc> <ssf>
MTP_LINKSET 0 900 1 0x0000 959 0x08
MTP_LINKSET 1 959 1 0x0000 900 0x08
*
* Two signaling links are defined, one in each linkset.
* MTP_LINK <link_id> <linkset_id> <link_ref> <slc> <board_id> <blink>
* <stream> <timeslot> <flags>
*
MTP_LINK 0 0 0 0 0 1 0 0 0x80000006
MTP_LINK 1 1 0 0 0 2 0 0 0x80000006
*
* Define a route for each remote signaling point. For linksets
* 900/959, send to SIGTRAN message queue (ID 0x20)
* MTP_ROUTE <dpc> <linkset_id> <user_part_mask>
*
MTP_ROUTE 900 0 0x0020
MTP_ROUTE 959 1 0x0020
*
* ISUP parameters:
* Configure ISUP module. . Since SS7 is run under GlobalCall,
* 0x4d is always reserved for GC SS7. (msg queue address for GC)
```

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```
* ISUP_CONFIG <reserved> <reserved> <user_id> <options> <num_grps>
* <num_ccts> [<partner_id>]
*
ISUP_CONFIG 0 0 0x4d 0x0414 2 64 *$ num_grps_auto=y num_ccts_auto=y
*
* Configure ISUP circuit groups. Number of groups same as number of
* links. 900/959 relates back to linksets/links.
* Number of circuits is arbitrary, we only use 2 to test.
* Destination Point Code (DPC) for 1st group is 900, Origination
* Point Code (OPC) is 959.
* Base Circuit Identification Code (CIC) - starting circuit number for
* that group. CIC_mask - 7fff masked with circuits in the circuit
* group - if 0, circuit used for signaling, if 1 clear channel for
* bearer.
* ISUP_CFG_CCTGRP <gid> <dpc> <base_cic> <base_cid> <cic_mask>
* <options> <user_inst> <user_id> <opc> <ssf> <variant> <options2>
*
ISUP_CFG_CCTGRP 0 900 0x01 0x01 0x7fff7fff 0x249001c 0 0x4d 959 0x8 0x01 0x00d0 *$
conform=ISUP
ISUP_CFG_CCTGRP 1 959 0x01 0x21 0x7fff7fff 0x249001c 0 0x4d 900 0x8 0x01 0x00d0 *$
conform=ISUP
*
ISUP_TRACE 0x3f 0x7f 0xffff
```

Gcss7.cfg

The configuration file gcss7.cfg is used by Global Call API to tie the DSI (SS7) subsystems to the Global Call API used by the applications.

```
#####
# Type of System Configuration #
#####

# Leave commented out or set to "None" when not using Dialogic SS7.
# Depending on the value of this parameter, the sections below, that
# are specific to some configurations (SeptelCard, SIU, SIU.Dual,
# UserPart) will be used or not. The "UserPart" configuration is used
# for ISUP/TUP only config where lower layers are not of concern -
# e.g. a SIGTRAN configuration.
# Format: String - ["None", "Card", "SIU", "DualSIU", "UserPart"]
System.Configuration = "UserPart"
```


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```
#####
# Parameters for the GlobalCall SS7 Call Control Library #
#####

# If defined, this parameter will cause the library logging to be
# activated at the first gc_Open() of an SS7 circuit and the trace
# file will have the specified name.
# Format: String
Library.LogFile = "ss7.log"

# Logging Level for the library
# Format: String - ["None", "Errors", "All"]
# Default: "Errors" (and Warnings)
Library.LogLevels = "All"

# Maximum size of the library log in kilobytes
# Format: Integer, Default: 200
#Library.LogMaxSize = 2000

#####
# Parameters for the Dialogic SS7 service/daemon #
#####

# Logging Level for the service (Dlgs7.log)
# Format: String - ["None", "Errors", "All"]
# Default: "Errors" (and Warnings)
Service.LogLevels = "All"

# Maximum size of the service log in kilobytes
# Format: Integer, Default: 200
#Service.LogMaxSize = 2000

# Does the service need to start GCTLOAD automatically?
# Format: String - ["Yes", "No"]
Service.GCTLOAD_Control = "Yes"

# Path to GCTLOAD (Used only if GCTLOAD_Control is set to 'Yes')
# For Setpel Cards, the parameter defaults to the same path as
# ConfigDir. Note that <LINUXDEV_DIR> is replaced by the full
# path needed to reach the executables.

# Format: String
Service.GCTLOAD_Path = "<LINUXDEVDIR>"

# GCT-environment module id used by the service
# Format: Integer, Default: 0x4d
Service.ModuleID = 0x4d
```

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```
#####
# Configuration for Septel Card or SIGTRAN Systems #
#####

# Path to the config.txt file. Note that <LINUXDEV_DIR> is replaced
# by the full path needed to reach the executables.

# Format: String
SeptelCard.ConfigDir = "<LINUXDEVDIR>"

# Format: String - ["None", "All"]
SeptelCard.Auto_Links_Activation = "All"

#####
# Parameters that are related to config.txt #
#####

# Circuit Group configuration, Group ID must match the
# values in config.txt
# "trunk_name" could be any of "dkBx", "dtiBy" or "dumBz"
# "base_TS" optional parameter defaults to 1 if not set, it
# must be set if "Pref_SIU" is to be specified.
# "Pref_SIU" optional parameter can have "SIUA" or "SIUB" values only
# CGrp <gid> <"trunk_name"> [<base_TS> [<"Pref_SIU">]]
CGrp 0 dtiB1
CGrp 1 dtiB2
```

Downloading Trial Dialogic® DSI Components (SS7) and Dialogic® HMP Software

Dialogic HMP Software 3.1 may be downloaded at <http://www.dialogic.com/support/helpweb/hmp/hmplinux/hmp31/default.htm>. You may already have a media license, obtained when the Dialogic® HMP Interface Board (DNI) was purchased. If not, a 4 port trial license can be downloaded at http://www.dialogic.com/products/ip_enabled/download/hmp_download.htm#enabling.

You can use the following packages if opting to replicate the SS7 environment described in this application note:

- DSI SS7 Development Package for Linux, V5.09, dpkInx6.Z at http://membersresource.dialogic.com/ss7/ss7.asp?url=_releases/ss7/genericinfo/developmentpackages/linux/dpkInx6.Z
- Binary for Linux — M2PA, V2.00, m2pa_inx6.zip at http://membersresource.dialogic.com/ss7/ss7.asp?url=_releases/ss7/hostprotocolsoftware/linux/m2pa_inx6.zip
- Binary for Linux — M3UA, V4.02, m3ua_inx6.zip at http://membersresource.dialogic.com/ss7/ss7.asp?url=_releases/ss7/hostprotocolsoftware/linux/m3ua_inx6.zip
- Binary for Linux — ISUP, V5.01, isp_inx6.zip at http://membersresource.dialogic.com/ss7/ss7.asp?url=_releases/ss7/hostprotocolsoftware/linux/isp_inx6.zip
- Binary for Linux — MTP3, V4.00, mtp_inx6.zip at http://membersresource.dialogic.com/ss7/ss7.asp?url=_releases/ss7/hostprotocolsoftware/linux/mtp_inx6.zip
- Configuration files available for download — 11115_SS7_DSI_HMP_Demo_code.tgz at <http://www.dialogic.com/goto/?11115>

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A trial license is built into each of the Dialogic® DSI M2PA, DSI MTP, and DSI ISUP Layers. If they are started in trial mode, the processes will run for ten consecutive hours, then terminate and require a restart. This should be adequate time for running demos and testing the products.

System Installation and Configuration

Since the SS7 configuration assumes a back-to-back (loopback) setup, a DNI Board with at least two T1/E1 spans would be necessary, such as one of the following models:

- Dialogic® DNI/601TEPHMP Digital Network Interface Board — dual span
- Dialogic® DNI/610TEPEHMP Digital Network Interface Board — dual span
- Dialogic® DNI/1200TEPHMP Digital Network Interface Board — quad span
- Dialogic® DNI/1210TEPEHMP Digital Network Interface Board — quad span
- Dialogic® DNI/2410TEPEHMP Digital Network Interface Board — octal span

A T1/E1 loopback cable should be connected between the spans that correspond to dtiB1 and dtiB2. These are the RJ-45 jacks closest to the red/green/yellow LEDs on the back of the board. Other board devices may be used; however, the configuration files described in this application note assume usage of the dtiB1 and dtiB2.

Dialogic HMP Software should be installed first. Follow the standard installation instructions at http://www.dialogic.com/manuals/hmp31lin/release_install.pdf, as described in the *Dialogic® Host Media Processing Software Release 3.1LIN Software Installation Guide* (see the *For More Information* section). Pick the second item from the menu of packages — Dialogic® DNI boards and HMP software.

The T1/E1 spans on the selected DNI Board must be set to run in a Clear Channel (non-voice) mode:

1. Start the CLI interpreter with `telnet localhost`.
2. Log in to CLI as user “root”, password “public”.
3. Shut down the media server with `conf system ipmedia stop` and wait for the system to completely stop.
4. `show hardware` and note DNI device ID (X).
5. Configure the first two spans of the DNI board with E1 clear channel protocol:
 - `conf hardware pstn X 1 protocol 5`
 - `conf hardware pstn X 2 protocol 5`
6. Apply these changes with `conf system pstn apply`.
7. DNI-HMP bridge devices must be configured. Check current settings with:
 - `show hardware bridge`
8. Notice that BH (board-host) and HB (host-board) stream capacity is fully loaded to maximum voice. Sufficient Data Streams

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Y (one per channel) must be added to device X:

- `conf hardware bridge dev X bh-datastream Y`
- `conf hardware bridge dev X hb-datastream Y`

To do this, it may be necessary to reduce `bh-voicestream` and `hb-voicestream` so that the combination of voice and data do not exceed BH or HB stream capacity.

9. Restart media: `conf system ipmedia start` and exit CLI with `quit`.

The following steps should be done as the Linux root user:

1. Create a directory for the Linux development package. Uncompress it with the Linux command `tar xvfz dpklnx6.Z`.
2. Uncompress ISUP, MTP, M2PA, and M3UA executables in the directory containing the Linux development files with the command `unzip xxxx.zip`. Make them executable with `chmod filename u+x`.
3. Uncompress the config files and scripts with the command `tar xvfz 11115_SS7_DSI_HMP_Demo_code.tgz`. A script is supplied to simplify `config.txt` and `system.txt` file modifications. Make sure the script, `config_setup.sh`, is executable: `chmod u+x config_setup.sh`.
4. Run `config_setup.sh`. Enter your system's IP address, the full pathname of the directory containing the Linux development package, and the Dialogic installation directory.
5. Finally, configure the location of the SS7 `gctload` dynamic library:
 - Edit `/etc/ld.so.conf` to include the Linux development package directory.
 - Run `ldconfig` to update the runtime linker's configuration: `ldconfig -v`. This creates a symbolic link to the GCT library shared object within the directory: `libgctlib.so.1 -> libgctlib.so.1.0.0`.

Starting Dialogic HMP Software and DSI SS7 Services

By default, Dialogic HMP Software system services will start when the system is booted. However, once `config_setup.sh` has been run, they must be shut down and restarted to start DSI SS7. This can be done with `dlstop` and `dlstart`.

Once the Dialogic HMP Software system services and DSI SS7 are started, demo applications can be run. Starting with GC Basic Call Model demo is generally simpler than using the M3G-SIP Gateway demo.

Running GC Basic Call Model

GC basic call model is located under `/usr/dialogic/demo/gc_basic_call_model`. There is a pre-built executable and a config file called `cg_basic_call_model.cfg`. Find the SS7 configuration section and uncomment the two lines. Run `gc_basic_call_model`. Two channels — an inbound and an outbound — will be active and DSI SS7 calls will be made between them.

More information on this demo may be found in the *Dialogic® Global Call API Demo Guide* (see the *For More Information* section).

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Running the M3G-SIP Gateway

The M3G-SIP gateway demo is much more involved than the GC basic demo. It can be used in loopback mode to simulate a 3G-324M network. On either side of the 3G endpoints, a SIP/RTP based media server or SIP softphone can be used to provide or view the audio-visual stream. Information for setting up and running the demo, including SS7 configuration, can be found in the *Dialogic® 3G-324M Multimedia Gateway Demo Guide* (see the *For More Information* section).

For More Information

A Zip file containing the configuration files can be downloaded at <http://www.dialogic.com/goto/?11115>

Dialogic® Distributed Signaling Interface Components (SS7) information:

Signaling Product Information —

http://www.dialogic.com/products/signalingip_ss7components/signaling_software.htm

Dialogic® Signaling and DSI Components (SS7), Software and Documentation Download —

<http://www.dialogic.com/support/helpweb/signaling/software1.htm>

Dialogic DSI SS7 and DSI SIGTRAN Signaling Forum —

<http://www.dialogic.com/forums/forums/forum-view.asp?fid=12>

Dialogic DSI SIGTRAN additions in *Dialogic® Host Media Processing Software 3.1LIN Release Update* —

http://www.dialogic.com/manuals/hmp31lin/release_update.pdf

Demo Documentation:

- *Dialogic® Global Call API Demo Guide* —

http://www.dialogic.com/manuals/docs/globalcall_demo_hmp_v3.pdf

- *Dialogic® 3G-324M Multimedia Gateway Demo Guide* —

http://www.dialogic.com/manuals/docs/3g324m_demo_v1.pdf

Dialogic® Host Media Processing Software Release 3.1LIN information:

Host Media Processing Software Product Information —

http://www.dialogic.com/products/ip_enabled/hmp_software.htm

Dialogic® Host Media Processing (HMP) Software Downloads —

http://www.dialogic.com/products/ip_enabled/download/hmp_download.htm

For installation instructions: *Dialogic® Host Media Processing Software Release 3.1LIN Software Installation Guide* —

http://www.dialogic.com/manuals/hmp31lin/release_install.pdf

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Dialogic® Distributed Signaling Interface Components (SS7) Technotes:

Guide to running the Dialogic® Signaling Short Message Service (SMS) Sample Software Application —

<http://www.dialogic.com/support/helpweb/signaling/technotes/tn1033.htm>

Quick Guide to Dialogic® Signaling Software SS7 gctload Messages —

<http://www.dialogic.com/support/helpweb/signaling/technotes/tn1034.htm>

How to Programmatically Bring a Dialogic® SS7 Sub System in Service —

<http://www.dialogic.com/support/helpweb/signaling/technotes/tn1035.htm>

Configuring Signaling Boards for Monitoring —

<http://www.dialogic.com/support/helpweb/signaling/default.htm>

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