

The Voice Portal Solution Recipe:
Integrating SS7 Signaling

November 1, 2001

The Application Design Center

Intel/Dialogic

Contents

Abstract	3
Introduction	3
Components Needed	3
Systems	3
Hardware	3
Operating System	4
Dialogic.....	4
Hardware	4
Software.....	4
Nuance	4
Software.....	4
Datakinetics	4
Hardware	4
Software.....	4
Basic Hardware Configuration	5
Installation	5
General.....	5
Datakinetics.....	5
Dialogic.....	6
Voice Portal Platform	6
SS7 Channel Bank	6
Nuance	7
ADC Voice Portal	7
External Telephony Version.....	7
Audio Provider Version	7
Additional Configuration.....	8
Voice Portal Platform.....	8
DCM/NCM	8
SS7 Channel Bank	8
DCM/NCM	8
Operation	8
System Verification.....	8
Voice Portal Platform.....	9
SS7 Channel Bank	9
References.....	9

Abstract

This application note builds on the Application Design Center's Voice Portal reference recipe, extending its network capabilities into the SS7 realm. With GlobalCall support of SS7 in Dialogic System Release 5.01, there was no reason that a Speech Recognition based application using Continuous Speech Processing (CSP) and GlobalCall should not work well -and with no modifications - under SS7. The application described here proves this claim.

Testing an SS7 application can also be somewhat of a problem without specialized test gear. This note takes that into account as well. Setup, configuration instructions and source code for an SS7 channel bank are included to exercise the application.

The ADC solution recipes include descriptions and sources for all required software and hardware. Recipes also include configuration information, source code for all ADC created content and instructions for running qualification tests. If you discover any missing elements or want to make suggestions, please email us at syslab@dialogic.com.

Introduction

The purpose of this note is to lead the reader, step by step, through the installation, configuration and use of an SS7-enabled Voice Portal. The Voice Portal application is provided by the Application Design Center (ADC) for use as a Reference Recipe for the characterization of all components needed - network and voice hardware, ASR and TTS – for a working Voice Portal application. It has been run using T1, E1 and ISDN under GlobalCall. But, as GlobalCall now supports Datakinetics SS7, this protocol should be able to be used as well. Installation and configuration is, however, not quick and easy, particularly for someone new to SS7. Hence this note.

In addition to the Voice Portal system receiving and transferring calls, there needs to be a way of generating calls into the platform. SS7 test gear is in many cases an expensive luxury, and an actual SS7 network connection to a Public Network Central Office is probably even more rare. Therefore, application code and setup instructions for an SS7 "Channel Bank" are included. This allows analog station sets to be connected to a second system containing an SS7 and an MSI card, and interactive calls to be placed into the system. A Voice Portal demo without an interactive voice interface is of little practical use.

Prior to working with this document to setup an SS7 enabled Voice Portal, the reader should download and become familiarized with **SS7 Quick Testing Kit for ISUP** <http://support.dialogic.com/appnotes/an01005/index.htm>. This application note covers basic setup and testing of several DataKinetics SS7 configurations. One of these, the PCCS6 to PCCS6 configuration, is used here. The SS7 enabled GlobalCall Inbound and Outbound demos mentioned in the note can also be found in the Quick Testing Kit.

Components Needed

Systems

Hardware

Voice Portal

A mixed ISA/PCI system must be used for the Voice Portal. At the time of testing, an ISA PCCS6 card was the only type supported under GlobalCall. The JCT series of cards is PCI. The Voice

Portal itself may be a single system, or two systems may be used. Generally, a separate system for the Nuance Speech Recognition server and TTS server is desirable, as these tend to bog down a single processor system.

SS7 Channel Bank

Either a straight ISA or mixed ISA/PCI chassis can be used for the SS7 Channel Bank, depending on the types of MSI and D/240 cards that are used.

Operating System

NT 4.0, SP 6a. There is no known reason that Windows 2000 would not work as well.

Dialogic

Hardware

Voice Portal

D/240JCT-T1

SCBus cable must be used, as PCCS6 only supports SCBus. H.100/SCBus cable adapters needed for JCT/PCI card with H.100 connectors.

SS7 Channel bank

MSI card, (8, 16 or 24 ports) with power supply and breakout box for analog station sets
D240SC-T1 or D240JCT-T1 for voice resources for ringback/dialtone and for bearer channels
An SCBus cable must be used, as PCCS6 only supports SCBus. H.100/SCBus cable adapters as needed for PCI cards with H.100 connectors.

Software

SR5.01 NT SDK on both systems

Nuance

Software

NUANCE7.0.4-NT – base Nuance release

NUANCE-7-0-4-SP7-NT - Nuance service pack 7

NUANCE-AP-DIALOGIC_CSP-1-2-1-NT-7-0-4-GA - Dialogic CSP Audio Provider

Datakinetics

Hardware

Datakinetics ISA PCCS6 card, with one or 2 Line Interface Units (LIUs) in both systems

Software

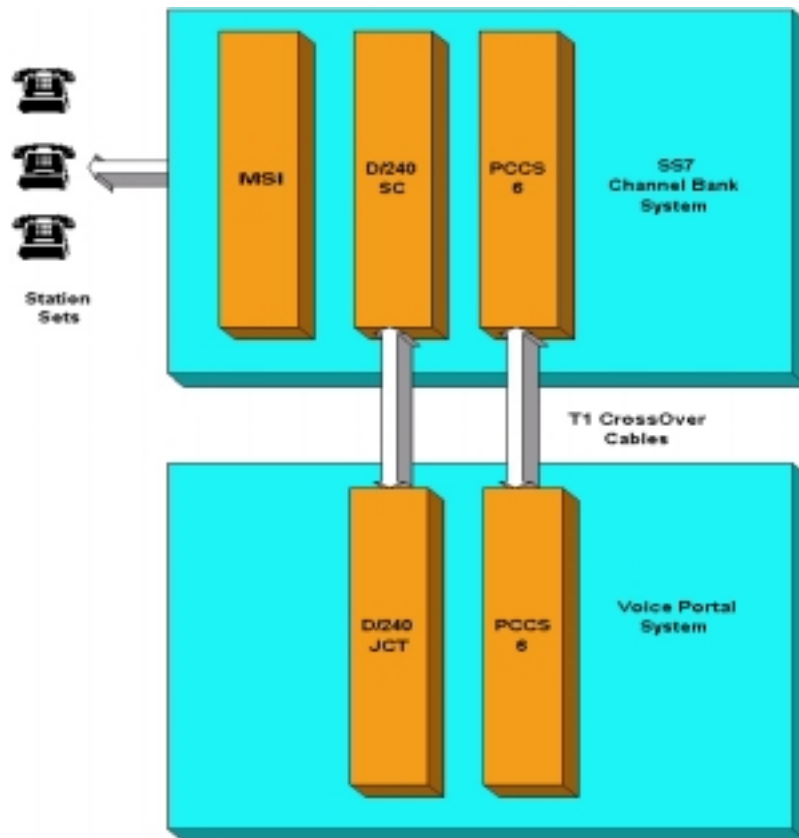
Septel Dev Package for Windows, version 2.0

Septel ISA – binary for PCCS6 - MTP, version 1.06

Septel ISA – binary for PCCS6 - ISUP, version 3.0

Septel User Part Dev Package, version 3.0

Basic Hardware Configuration



Installation

General

Use two known good T1 crossover cables, one from D/240 to D/240 card for the bearer channels. The other will run from the T1 LIU from PCCS6 to PCCS6 for the signaling link. (or LIU #1 – the topmost jack - if two there are LIUs on the card) A crossover cable will have receive tip/ring (pins 1 and 2 on an RJ-48) connected to transmit tip/ring (pins 4 and 5 on an RJ 48) rather than a straight through connection.

Datakinetics

Licensing – Licensing of Datakinetics protocols is done through the use of “license buttons”. There are lithium battery-like buttons that clip into a holder on each board, and allow the operation of any purchased protocol covered by the license button. For the SS7-enabled Voice Portal, two protocols from the SS7 suite are needed – MTP (Message transfer Part) and ISUP. (ISDN User’s Part) Firmware for the purchased protocols accompany the board and license button, and may also be downloaded from Datakinetics web site. Always verify with Datakinetics that the versions of firmware, license buttons and boards themselves are compatible.

SW Installation -

1. Install the Septel Development Package for Windows NT. Follow the suggested directory naming into a directory called “septel”
2. Move MTP protocol file “mtp76.dc2” into the septel directory

3. Move ISUP protocol file "isup76.dc2" into the septel directory
4. Move config.txt and system.txt from the SS7 Config directory and move into the septel directory
5. When building the SS7 Channel Bank under Visual C++, it will be necessary to add the file SS7Msg.h (from the SS7 Config directory) to the isup\inc directory. This is used by the application instead of the Msg.h file to resolve a naming conflict.

IRQ settings – remove any jumper on IRQ pins. Do not attempt to set IRQ yourself, as this does not need to be done on NT. IRQ section in PCCS6 installation manual only pertains to other operating systems.

I/O Ports - Default DIP switch setting of 0x200 seemed OK. Check for address in use through Win NT Diagnostics Utility/Resources/I/O Ports to verify that the chosen address is free. The utility is found under *Start/Programs/Administrative Tools (Common)*.

Shared Memory Base Address – D0000 used. Again, verify through Win NT Diagnostics Utility/Resources/Memory to verify that the chosen address is free. If the firmware fails to download to the board, another shared memory address should be tried, even though the original address may be free.

PCCS6 Driver Configuration -

1. Copy the PCCS6 driver "pccsxdvr.sys", from your installation directory into the system directory that contains drivers. This would typically be c:\winnt\system32.
2. Add the driver to the system with: *pccsxcfg -n1 -p0x200 -m0xD0000 add c:\winnt\system32\pccsxdvr.sys*. -n = number of boards, -p = I/O port address and -m = Shared Memory Base Address
3. Driver may be removed with: *pccsxcfg remove*
4. Verify that I/O Port and Shared Memory base Address appear in the WinNT Diagnostics Utility. Entry will be labeled *PCCS*
5. Verify that the driver is loaded into the system. This can be done by looking at the Devices listing for an entry called *PCCS*. Driver startup should be set to "automatic" so it will automatically be loaded when the system reboots. The Devices listing is found on the Control Panel.

A note on mixed ISA/PCI systems: If there is a problem with the firmware download, (a "reset failure" error message will be seen when the *gctload* command is issued – see **Operation** section below) first verify that I/O Ports and Shared Memory Base Address are not overlapping any existing values. If that is not the problem, remove any other PCI cards that may be in the system. Retry the download.

Dialogic

Voice Portal Platform

A "custom" install of SR 5.01 should be done:

1. Take the default packages that are already checked off
2. Select GlobalCall API Package
3. Select Continuous Speech Processing
4. On the next screen, select the GlobalCall SS7 feature
5. Proceed as normal from there

SS7 Channel Bank

No special considerations. A "typical" install of SR 5.01 may be done.

Nuance

There are no special considerations in installing Nuance. However, do read the release/installation notes provided with each package. Order is as follows:

1. Base Nuance release. A “typical” install is fine.
2. Latest Nuance service pack
3. Nuance Dialogic CSP Audio Provider

ADC Voice Portal

SS7 enabling and testing was successfully done with two versions of the ADC Voice Portal, described below.

External Telephony Version

This version of the ADC Voice Portal relies on the Dialogic Audio Provider for recognition only. Call control and prompting, including barge-in, is handled at the application level. A number of different network objects/protocols are available, but here GlobalCall was used for its SS7 support. Here is a summary of areas successfully tested using SS7:

- Inbound call handling
- Retrieval of ANI and DNIS from the IAM message
- Tx/Rx of audio
- Recognition accuracy
- Barge-in
- Outbound calls and bridging to inbound to implement tromboned (hairpin) transfer

Very little was changed to allow the application to work with SS7. The following changes beyond the standard Voice Portal application were done:

- The protocol used in `gc_Open()` is changed to “SS7”. It would normally be “isdn” or “us_mf_i”.
- The number of rings in `gc_AcceptCall()` were set to 0

There is also one hardcoded directory path in the Voice Portal that must be modified. In the `CNuanceDispatcher` class, set `NuASRPackgeDir` to the directory containing the Nuance recognition package. Rebuild the project.

Audio Provider Version

This version of the ADC Voice Portal relies on the Dialogic Audio Provider for call control, prompting and recognition. As with the External Telephony version, there are a number of different network options available. One of these is GlobalCall. In order to use GlobalCall with the SS7 protocol, make sure that the following Nuance parameters are set in the `NuanceDispatcher` class by modifying the `vpnuance.txt` configuration file:

- `audio.dialogic.GlobalCall=TRUE`
- `audio.dialogic.ISDN=FALSE`
- `audio.dialogic.Protocol=SS7`
- `audio.dialogic.Bidirectional=TRUE`

The last parameter is needed if outbound calls are to be placed. It is also possible to divide up available lines in primary and secondary groups for inbound/outbound use. Consult the Nuance documentation (Dialogic Audio Provider section) for more details on this. Inbound and outbound calls have been verified, and an Audio Provider initiated transfer works correctly.

Additional Configuration

Voice Portal Platform

DCM/NCM

1. Select D/240JCT board that should appear after auto-find procedure has completed on DCM startup
2. Under the "Misc" tab, the following CSP-related feature must be modified:
3. FirmwareFile must be changed from *Default* to *spscsp.fwl*
4. Under Action/Add Device, select the SS7 device.
5. Select PCCS6
6. Provide an ID for the board
7. Under the System tab, enter the ConfigDir to give the directory where Datakinetics executables and configuration files are installed
8. On rebooting a system once the PCCS6 board is installed, a CT Bus Broker error may be encountered when DCM is started. If this error is seen, DCM will hang on beginning its downloads. It may be necessary to get rid of the PCCS6 entry in DCM, and restart it. This can be done through the Registry Editor, REGEDIT:
 - Go to HKEY_LOCAL_MACHINE/SOFTWARE/Dialogic/Installed Boards
 - Delete the SS7 entry
 - Restart DCM, and it will rediscover the PCCS6 board
 - Reset ConfigDir as specified above, and then start the system services

SS7 Channel Bank

DCM/NCM

Auto-find procedure on DCM startup should correctly find and configure MSI and D/240 boards. For normal operation, that is all that is needed.

It may be useful to configure the SS7 board/service under DCM if the GlobalCall Inbound/Outbound demos are run for system verification. See **Operation** section below. If this is the case, proceed as with the Voice Portal Platform:

1. Under Action/Add Device, select the SS7 device.
2. Select PCCS6
3. Provide an ID for the board
4. Under the System tab, enter the ConfigDir to give the directory where Datakinetics executables and configuration files are installed

Caution: If GlobalCall Inbound/Outbound demos are not going to be run, the PCCS6 board should not be configured under DCM. Or, if they are used to verify a system, the PCCS6 board must be removed from DCM. The SS7 Channel bank will not function correctly with the Dialogic SS7 service running. SS7 events will not be delivered to the Channel Bank application.

Operation

System Verification

Before running the Channel Bank and Voice Portal, it may be useful to verify system operation using the relatively simple GlobalCall Inbound/Outbound demos. See **SS7 Quick Testing Kit for ISUP**, below. Use these versions, as they have some modifications to allow them to work with SS7. The demos run a series of simple calls (answer/play/record/play/hangup) on all 24 bearer channels.

Voice Portal Platform

Start services and processes in the following order:

1. In a command window, change directory to your DK folder, and download FW to the PCCS6 board with: `gctload -d`
2. Activate, in a command window, the SS7 link with : `mtps/ act 0 0` When the same point has been reached on the Channel Bank, activate, in a command window, the SS7 link there with : `mtps/ act 0 0` The message *Destination Available* should be seen in the window in which `gctload` was run. The SS7 link is now active, and an application can now use SS7.
3. Using DCM/NCM, start system services
4. Divide up inbound and outbound lines in the `vpgcin.txt` and `vpgcout.txt` configuration files
5. In a command window, start the Voice Portal: `r4framework`

SS7 Channel Bank

Start services and processes in the following order:

1. In a command window, change directory to your DK folder, and download FW to the PCCS6 board with: `gctload -d`
2. Activate, in a command window, the SS7 link with : `mtps/ act 0 0` When the same point has been reached on the Voice Portal, activate, in a command window, the SS7 link with : `mtps/ act 0 0` The message *Destination Available* should be seen in the window in which `gctload` was run. The SS7 link is now active, and an application can now use SS7.
3. Using DCM/NCM, start system services
4. In a command window, start the Channel Bank: `isupdemo -m0x4d` The `-m0x4d` is the application module_id set in `config.txt`. This will either refer to the GlobalCall SS7 Service if the PCCS6 board has been added to DCM and the Inbound/Outbound demos are to be run, or will be used as the ID in the Channel Bank application when checking for SS7 messages via `GCT_grab()` in the program's event loop.
5. A call may now be placed from an analog phone connected to an active jack in the MSI breakout box. Take the handset off hook, and dial any 7 digits. On the 7th digit, an IAM message will be send to the appropriate CIC on the Voice Portal system, and the Voice Portal should answer. DNIS in the IAM will be the 7 dialed digits. ANI is hardcoded into the array "a_dig" and can be changed as required. DNIS to reach the main menu of the Voice Portal is currently "555-1212".

Source Code

The C++ Framework source code is available at

<http://support.dialogic.com/appnotes/an01004/index.htm>

References

<http://www.dialogic.com/home.htm> - Intel/Dialogic's home page

<http://www.nuance.com/> - Nuance's home page

<http://www.datakinetics.co.uk/> - Datakinetics' home page

<http://support.dialogic.com/solutions/index.htm> - Application Design Center home page

http://support.dialogic.com/discuss_main/index.html - Select Solutions discussion forum

<http://support.dialogic.com/appnotes/an01003/index.htm> - ADC C++ Object Oriented Telephony Application Framework

<http://support.dialogic.com/appnotes/an01005/index.htm> - SS7 Quick Testing Kit for ISUP
<http://support.dialogic.com/appnotes/anXXXX/index.htm> - Application Design Center Voice Portal
– Nuance Integration
http://www.dialogic.com/products/d_sheets/7162web.htm - a good tutorial on the basics of SS7