Asterisk VOIP Integration with Nortel Meridian-1

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Introduction

This document is an ongoing effort to assist the VoIP community in integrating IP to existing costly and proprietary TDM-based PBX systems. These integrations are popular as businesses desire the need for new technology while needing to protect existing capital investment in their telecommunications equipment. Many of you may find Asterisk to be a suitable alternative to your PBX manufacturer's proprietary and costly IP integration solutions. Please keep in mind that there will be features that are standard on your traditional PBX that may not be available or compatible with Asterisk. At the same time, there will be new features in Asterisk that are not normally available on your traditional PBX. Some degree of engineering combined with a little bit of art will be required to successfully integrate these systems. As a result, we welcome all comments and suggestions to be e-mailed to agpham@mnits.net as we continually update and perfect documentation of these integration procedures.

Warning & Disclaimer

1. I, along with the organization I represent or have affiliation with are not responsible in any circumstance for consequential damages resulting from activities performed with the information provided herein.
2. Proficiency with the Nortel Meridian-1 platform is STRONGLY ADVISED as unknown moves, adds or changes can and may result in significant detrimental business impact to your organization.
3. It is highly recommended that a full backup is conducted and verified prior to any changes taking place.
4. Create a management process that documents all changes made in the event settings need to be reversed.
5. Extensive regression testing has not been conducted; please proceed entirely at your own risk.

Prerequisite

1. Proficiency of Meridian-1 X11 overlays and administration interface.
2. Proficiency of Asterisk configuration and command-line interface (CLI)
3. Administrator level access to Meridian-1
4. Operating System (OS) "Root-level" access to Asterisk Server.
5. Adequate Meridian-1 ports licensed and available for use (TMDI, DCH, BCH, MSDL, etc.)
6. Network diagram and dialing plan has been created and finalized for Meridian-1 and Asterisk
7. Understand and/or determine T1 clocking sources and methodology (LD 73)
8. T1 Interface Crossover Cable between Meridian-1 & Asterisk (NTBK04AA 1.544 Mbyte Carrier Cable)
9. T1 Loopback Plug for Diagnostics (schematics can be found at section below)

Nortel Meridian-1 Configuration Procedure

At the time of this publication, this configuration has been tested and used on a Meridian-1 Option 11C Release 25.40 running a TMDI card (NTRB21) with PRI signaling. There will be variants including MSDL cards that you may use on larger enterprise switches (Options 61C/81C/SL100)

■ Backing Up Your Switch

a. Commit all potential changes since last midnight's batches. Do a LD 43 EDD
b. Backup all switch data to your preferred and compatible storage medium (PCMCIA, floppy, etc.).
c. Any other contingency methods your process, procedures manual or DRP may designate.

■ Print Out Trunk & Route Configuration

Use Procomm Plus, Hyper Terminal or your preferred application to capture and print out all the following:

Common Equipment	Action Device & No.	Routes	Route List	Coord. Dial Plan
LD 22	LD 22	LD 21	LD 86	LD 87
REQ PRT	REQ PRT	REQ PRT	REQ PRT	REQ PRT
TYPE CEQU	TYPE ADAN	TYPE RDB	FEAT RLB	FEAT CDP
				TYPE DSC

■ Build PRI Loop

```
LD 17
REQ CHG
TYPE CEQU                (Common Equipment)
- TDS
- CONF
- DLOP x 23 ESF          (x = loop #, 23 = # of voice ch., ESF = frame fmt.)
- MODE PRI
-- TMDI YES
-- LCMT B8S
```

■ Build D-Channel (DCH)

```
LD 17
REQ CHG
TYPE ADAN                (Action Device and Number)
- ADAN NEW DCH x         (x = DCH to be used)
- CTYP TMDI
- CDNO x                 (x = TMDI card number)
- DES ASTERISK_VOIP
- USR PRI
- IFC ESS5               (Lucent 5ESS switch-type)
- CO_TYPE STD
-- DCHL x                (x = D-channel PRI loop #)
- PRI
- OTBF
- DRAT 64KC
- CLOK INT               (clock internally—check your clocking source)
- SIDE USR
- CNEG 1
- RLS 1
- RCAP ND2
- OVLR
- OVLS
- MBGA
- TIMR
- LAPD
```

■ Build Route Data Block (RDB)

```
LD 16
REQ NEW
TYPE RDB
CUST 0
DMOD
ROUT x                          (x = route number)
```

DES ASTERISK_VOIP
TKTP TIE
ESN NO
- DDMI
- ATDN
SAT NO
RCLS INT
DTRK YES
BRIP NO
- DGTP PRI
- CBCR NO
- MODE PRA
- IFC ESS5 (Lucent 5ESS switch-type)
- SBN NO
- PNI 00001
- NCNA YES
- NCRD YES
- INAC NO
- CHTY BCH
- CTYP
- INAC YES
- ISAR NO
-- NCOS 0
DAPC NO
CPFXS YES
- DSEL VOD
PTYP PRI
AUTO
- DNIS
-- DCDR
IANI
ICOG IAO
RANX NO
SRCH LIN
TRMB
STEP
ACOD xxxx (*xxxx* = trunk access code for trunk)
CLEN x (CLID entry number in LD 15 NET_DATA)
- TCPP
- PII
TARG 1 (like TGAR, trunk access restriction group)
BILN
IDC NO
ANTK
SIGO
CNTL
MUS
RACD
EQAR
FRL
OHQ
OHQT
CBQ
AUTH
TTBL
PLEV
MCTS

ALRM

■ Build B-Channels (BCH)

```
REQ NEW 23
TYPE TIE
TN x x x x              (x x x x = l n s u terminal number)
DES ASTERISK_VOIP
PDCA
PCML MU
CUST 0
NCOS x                  (x = network class of service group...
                         make high and restrict in Asterisk or make lower to
                         restrict entire BCH group to certain privilege)
RTMB x 1                (x = the new route #, 1 = first member #)
INC YES
NITE
MNDN 1
TGAR x                  (x = trunk group access restriction)
AST
CLS
TKID
```

■ Build Route List

```
LD 86
REQ NEW
CUST 0
FEAT RLB
RLI x                   (x = Pick a vacant Route List Index #)
ENTR 0
LTER NO
ROUT xx                 (xx = Use the new Route # you created above)
TOD
CNV NO
EXP NO
FRL 0
DMI 0
FCI 0
FSNI 0
SBOC NRR
OHQ NO
CBQ NO
ISET 0
NALT 0
MFRL 0
OVLL 0
```

■ Build Coordinated Dialing Plan

```
LD 87
REQ NEW
CUST 0
FEAT CDP
TYPE DSC
DSC xx                  (xx = Steering Code) [e.g., 60 for 60xx or 60xxx]
```

```
FLEN 0
DSP LSC
RLI x
NPA
NXX
```

■ Meridian Mail Integration

At the time of this writing, we have created the below method to integrate Meridian Mail. There are no solutions for MWI (message waiting indication) and quick mailbox retrieval by pressing # + password at the MM prompt.

▪ *Create Phantom ACDN to route calls to Meridian Mail*

```
LD 23
REQ  NEW
TYPE ACD
CUST 0
ACDN xxxx                (xxxx = Phantom ACD #)
MWC  NO
DSAC NO
MAXP 4                   (Allow 4 maximum ports)
SDNB NO
BSCW NO
ISAP NO
AACQ NO
RGAI NO
ACAA NO
FRRT
SRRT
NRRT
FROA NO
NCFW xxxx                (xxxx = Meridian Mail DN)
FNCF NO
FORC NO
RTQT 0
SPCP YES
OBTN NO
RAO  NO
CWTH 1
NCWL NO
BYTH 0
OVTH 2047
TOFT NONE
HPQ  NO
OCN  NO
OVDN
IFDN
OVBU LNK LNK LNK LNK
EMRT
MURT
RTPC NO
STIO
TSFT 20
HOML YES
RDNA NO
NRAC NO
```

```
DAL  NO
RPRT NO                  (Disable ACD reporting)
RAGT 4
DURT 30
RSND 4
FCTH 20
CRQS 100
IVR  NO
```

▪ *Create a new mailbox with the phantom DN or add it to an existing mailbox.*

Asterisk Configuration Procedure

This sample configuration is based on using Digium's Wildcard T100P single span T1 card.

■ /etc/zaptel.conf

```
# Zaptel Configuration File
#
# This file is parsed by the Zaptel Configurator, ztcfg
#
#
# First come the span definitions, in the format
# span=<span num>,<timing>,<line build out (LBO)>,<framing>,<coding>[,yellow]
#
# The timing parameter determines the selection of primary, secondary, and
# so on sync sources.  If this span should be considered a primary sync
# source, then give it a value of "1".  For a secondary, use "2", and so on.
# To not use this as a sync source, just use "0"
#
# The line build-out (or LBO) is an integer, from the following table:
# 0: 0 db (CSU) / 0-133 feet (DSX-1)
# 1: 133-266 feet (DSX-1)
# 2: 266-399 feet (DSX-1)
# 3: 399-533 feet (DSX-1)
# 4: 533-655 feet (DSX-1)
# 5: -7.5db (CSU)
# 6: -15db (CSU)
# 7: -22.5db (CSU)
#
# The framing is one of "d4" or "esf" for T1 or "cas" or "ccs" for E1
#
# Note: "d4" could be referred to as "sf" or "superframe"
#
# The coding is one of "ami" or "b8zs" for T1 or "ami" or "hdb3" for E1
#
# E1's may have the additional keyword "crc4" to enable CRC4 checking
#
# If the keyword "yellow" follows, yellow alarm is transmitted when no
# channels are open.
#
span=1,1,0,esf,b8zs                  ; see above for information
bchan=1-23                           ; B-channel range
dchan=24                             ; D-channel number
loadzone = us
defaultzone=us
```

■ /etc/asterisk/zapata.conf

```
; Zapata telephony interface
; Configuration file

[channels]

language=en                          ; Default English language
```

```
context=default                     ; Default context
musiconhold=default                 ; Music-on-Hold Class of Music

switchtype=5ess                     ; Lucent 5ESS Switch Type
channel => 1-23                     ; T1 Voice Channel Range
signalling=pri_net                  ; Network-side Signaling method

usecallerid=yes                     ; Whether or not to use caller ID
hidecallerid=no                     ; Whether or not to hide outgoing caller ID (Override with
*67 or *82)

callwaiting=yes                     ; Whether or not to enable call waiting on FXO lines
usecallingpres=yes                  ; Whether or not use the caller ID presentation for the
                                          outgoing call that the calling switch is sending
callwaitingcallerid=yes             ; Support Caller*ID on Call Waiting

threewaycalling=yes                 ; Support three-way calling
transfer=yes                        ; Support flash-hook call transfer (requires three way
calling)
cancallforward=yes                  ; Support call forward variable
callreturn=yes                      ; Whether or not to support Call Return (*69)

echocancel=yes                      ; Enable echo cancellation
echocancelwhenbridged=yes           ; Disable echo cancellation when bridging TDM (by reverse
echo cancellation)

rxgain=0.0                          ; Default receive gains (in dB)
txgain=0.0                          ; Default transmit gains (in dB)

group=1                             ; Logical groups assigned to allow outgoing rollover (0-31)
callgroup=1                         ; Call Group (ring groups) #
pickupgroup=1                       ; Pickup Group #

faxdetect=both                      ; Fax Detection - incoming/outgoing
```

Troubleshooting Nortel Meridian-1

■ Loop and channel statistics

```
LD 60
STAT x            (x = loop number)
```

■ D-Channel statistics

```
LD 96
STAT DCH x        (x = DCH)
```

■ Clocking or improper line coding? Verify frame slips, bipolar violations, etc.

```
LD 60
LCNT x            (x = loop number) Views loop counters

RCNT x            (x = loop number) Resets loop counters
```

■ To view incoming and outgoing D-Channel messages

```
LD 96
ENL MSGI x        (x = DCH) Enables Incoming DCH Messages
ENL MSGO x        (x = DCH) Enables Outgoing DCH Messages

DIS MSGI x        (x = DCH) Disables Incoming DCH Messages
```

```
DIS MSGO x          (x = DCH) Disables Outgoing DCH Messages
```

■ To trace incoming and outgoing calls

```
LD 80
```

.trac 0 xxxx *(where xxxx is a DN)*

This will give information on any call present on the DN or indicate idle, it is possible to enter the ACOD of a route as a DN and this will result in an indication of the condition either idle or busy of every trunk member of the route.

.trac l ch *(where l is the loop and ch is the channel of a particular digital trunk member) *

This is useful when after tracing an ACOD of a digital route, ISDN, DPNSS or similar, you may then trace any of the channels marked busy to check their call status.

.trac x x *(where x x is a TN on an Option 11C Meridian)*

This will give details of any calls on the TN and if it is a digital set the status of every key.

.trac xx x xx xx *(where xx x xx xx is a TN on a Meridian 61C and above)*

This gives the same information as the command above.

■ How to Enable and Disable TMDI Card

NOTE: Many often times TMDI cards misbehave and require it to be physically reseated.
NOTE: Never remove card from switch until red OOS (out of service) LED is indicated on card.
NOTE: Always observe anti-static precautions by wearing static discharge band when handling equipment.

```
LD 96
DIS TMDI x ALL          (x = TMDI card #) Disables TMDI card
ENL TMDI x FDL          (x = TMDI card #) Enables TMDI & force DL
```

■ How to Enable and Disable DCH

NOTE: Whenever changing switch-types, it is imperative to FDL to download the new D-channel firmware.

```
LD 96
DIS DCH x ALL           (x = DCH #) Disables DCH
ENL DCH x FDL           (x = DCH #) Disables DCH & Force Download
```

■ How to Enable & Disable Loop Span

```
LD 60
DIS x                   (x = loop number) Disables span
ENL x                   (x = loop number) Enables span
```

■ Avoiding and Dealing with Corruption

Though rare, we have seen all types of corruption. Whenever possible, try to observe the following:

1. First try to disable, reseat, re-enable card with force download (FDL) of D-channel.

2. If you need to make changes to configuration records, it is always best practice to OUT your configuration and recreate NEW configurations. Keep this in mind especially when attempting to change your switch types in LD 17 ADAN and LD 16 RDB. This process is just as sensitive as working with ACD records if not more.
3. Do not commit changes LD 43 EDD until you are certain there are no complications. As worst case scenario, you can still INI your switch to revert back to old settings since last midnight's batches or the last EDD if you are caught in an extremely bad situation. However, we do not recommend frequent INI of the switch as it can also cause fatal problems.

Troubleshooting Asterisk

Getting Asterisk configured is much straightforward than Nortel. Here are some simple diagnostic procedures:

■ Wildcard T100P Zaptel Interfaces

1. Are Zaptel drivers installed properly? Reference document can be found at http://www.digium.com/downloads/quick_install_zaptel_asterisk.pdf
2. Use zttool to view interface statistics. RED ALARM? Check if Nortel side is UP? Check Connections.

■ Asterisk PRI Messages & Statistics

```
asterisk -vvvvvvr              (enter Asterisk CLI)
PRI INTENSE DEBUG SPAN x       (enable intense debug of PRI span x)
```

Useful References

1. **Meridian-1 Software I/O Guide – Administration, Document # 553-3001-311**
   This is helpful in identifying features & options for various overlays (LD's)
   Adobe Acrobat PDF version can be found at http://www.nortelnetworks.com

2. **Meridian-1 Software I/O Guide – Maintenance, Document # 553-3001-511**
   Contains various diagnostic and maintenance overlays
   Adobe Acrobat PDF version can be found at http://www.nortelnetworks.com

3. **Meridian-1 Software I/O Guide – System Messages, Document # 553-3001-411**
   Helpful for troubleshooting and cross-referencing system messages.
   Adobe Acrobat PDF version can be found at http://www.nortelnetworks.com

4. **Nortel NTBK04AA 1.544 Mbyte Carrier Cable Schematics**
   http://www.tek-tips.com/viewthread.cfm?qid=888559

5. **Cisco's How-to on Making a T1 Loopback Plug**
   http://www.cisco.com/warp/public/471/hard_loopback.html

6. **Internet Websites & Forums:**
   a. http://www.tek-tips.com – Good forums on Nortel Meridian PBX's
   b. http://www.voip-info.org – Asterisk Resource Forums & Wi-ki pages
   c. http://www.asterisk.org – Asterisk Product Page
   d. http://www.nortelnetworks.com – Nortel General Technical Reference
   e. http://www.digium.com – Manufacturer of T1 hardware