



Step by Step Guide

E1/T1 PRI Card Installation

Asterisk

Step by Step Guide

E1/T1 PRI Card Installation
(with Asterisk-1.2.31.1)

Version 1.0

Table of Contents

Hardware Setup	1
Software Installation	2
Test Environment.....	2
Installation of Pre-requisite packages	2
Installation of Libpri package	2
Installation of ZAPTEL package	4
Installation of Asterisk Package	5
Software Configuration	6

Hardware Setup

1. Insert the PRI (PCI/PCIe) card in the corresponding slot
2. Check if the installed PRI card is detected using the below command

```
[root@pbx1 ~]# lspci -vvvvv
```

3. Check the output of the given command and ensure if there is a line
Bridge: PLX Technology, Inc. Unknown device d44d (rev 01)

```

Bus: primary=03, secondary=04, subordinate=04, sec-latency=64
I/O behind bridge: 0000e000-0000e0ff
Memory behind bridge: fbf00000-fbffffff
Prefetchable memory behind bridge: fff00000-000ffffff
Secondary status: 66MHz+ FastB2B- ParErr- DEVSEL=medium >TAbort- <TAbort- <MAbort- <SERR- <PERR-
BridgeCtl: Parity+ SERR+ NoISA- VGA- MAbort- >Reset- FastB2B-
Capabilities: [40] Power Management version 2
        Flags: PMEClk- DSI- D1+ D2- AuxCurrent=0mA PME(D0+,D1-,D2-,D3hot+,D3cold-)
        Status: D0 PME-Enable- DSel=0 DScale=0 PME-
Capabilities: [50] Message Signalled Interrupts: 64bit+ Queue=0/0 Enable-
        Address: 0000000000000000 Data: 0000
Capabilities: [60] Express PCI/PCI-X Bridge IRQ 0
        Device: Supported: MaxPayload 128 bytes, PhantFunc 0, ExtTag-
        Device: Latency L0s <64ns, L1 <1us
        Device: AtnBtn- AtnInd- PwrInd-
        Device: Errors: Correctable- Non-Fatal- Fatal- Unsupported-
        Device: RlxdOrd- ExtTag- PhantFunc- AuxPwr- NoSnoop-
        Device: MaxPayload 128 bytes, MaxReadReq 512 bytes
        Link: Supported Speed 2.5Gb/s, Width x1, ASPM L0s L1, Port 0
        Link: Latency L0s <1us, L1 <16us
        Link: ASPM Disabled CommClk- ExtSynch-
        Link: Speed 2.5Gb/s, Width x1

04:00.0 Bridge: PLX Technology, Inc. Unknown device d44d (rev 01)
Subsystem: PLX Technology, Inc. Unknown device 9030
Control: I/O+ Mem+ BusMaster- SpecCycle- MemWInv- VGASnoop- ParErr- Stepping- SERR- FastB2B-
Status: Cap+ 66MHz- UDF- FastB2B+ ParErr- DEVSEL=medium >TAbort- <TAbort- <MAbort- >SERR- <PERR-
Interrupt: pin A routed to IRQ 185
Region 0: Memory at fbfffc00 (32-bit, non-prefetchable) [size=128]
Region 1: I/O ports at ec00 [size=128]
Region 2: Memory at fbfff000 (32-bit, non-prefetchable) [size=2K]
Region 3: Memory at fbffe800 (32-bit, non-prefetchable) [size=2K]
Capabilities: [40] Power Management version 1
        Flags: PMEClk- DSI- D1- D2- AuxCurrent=0mA PME(D0+,D1-,D2-,D3hot+,D3cold-)
        Status: D0 PME-Enable- DSel=0 DScale=3 PME-
Capabilities: [48] #06 [0000]
Capabilities: [4c] Vital Product Data

```

PLX Technology will be found, if you cannot see the PLX Technology, please poweroff your server and try another PCI slot, if it still does not help, you have to check the compatibility issue between the card and your PCI bus.

Software Installation

Test Environment

Libpri-1.2.3

zaptel-tor3-1.2.17.1

asterisk-1.2.31.1

centos 5.5 (kernel version: 2.6.18-274.12.1.el5)

Installation of Pre-requisite packages

1. Install all of Asterisk's dependencies that are required to compile asterisk.
 - a. Run the followings commands to install the required packages needed for compiling ZAPTEL drivers from source.

```
[root@pbx1 ~]# yum install bison bison-devel ncurses ncurses-  
devel zlib zlib-devel openssl openssl-devel gnutls-devel gcc  
gcc-c++ libxml2
```

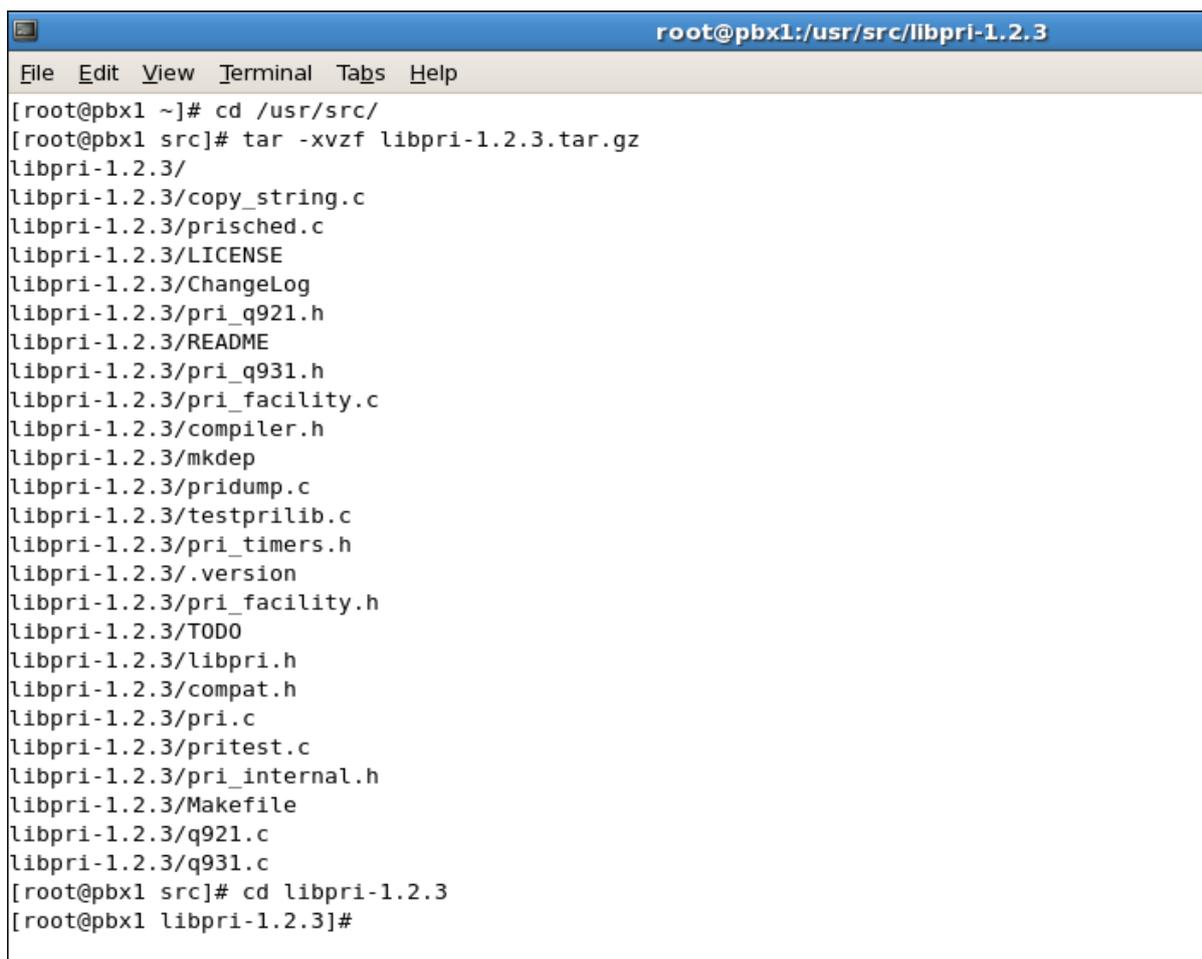
Installation of Libpri package

1. Go to `/usr/src` directory
2. Download libpri by running the following command

```
[root@pbx1 src]# wget  
http://downloads.asterisk.org/pub/telephony/libpri/releases/li  
bpri-1.2.3.tar.gz
```

3. Expand the downloaded file

```
[root@pbx1 src]# tar -xvzf libpri-1.2.3.tar.gz
```



```
root@pbx1:/usr/src/libpri-1.2.3
File Edit View Terminal Tabs Help
[root@pbx1 ~]# cd /usr/src/
[root@pbx1 src]# tar -xvzf libpri-1.2.3.tar.gz
libpri-1.2.3/
libpri-1.2.3/copy_string.c
libpri-1.2.3/prisched.c
libpri-1.2.3/LICENSE
libpri-1.2.3/ChangeLog
libpri-1.2.3/pri_q921.h
libpri-1.2.3/README
libpri-1.2.3/pri_q931.h
libpri-1.2.3/pri_facility.c
libpri-1.2.3/compiler.h
libpri-1.2.3/mkdep
libpri-1.2.3/pridump.c
libpri-1.2.3/testprilib.c
libpri-1.2.3/pri_timers.h
libpri-1.2.3/.version
libpri-1.2.3/pri_facility.h
libpri-1.2.3/TODO
libpri-1.2.3/libpri.h
libpri-1.2.3/compat.h
libpri-1.2.3/pri.c
libpri-1.2.3/pritest.c
libpri-1.2.3/pri_internal.h
libpri-1.2.3/Makefile
libpri-1.2.3/q921.c
libpri-1.2.3/q931.c
[root@pbx1 src]# cd libpri-1.2.3
[root@pbx1 libpri-1.2.3]#
```

4. Go to libpri folder and install the package using following commands as shown in the below screenshot

```
[root@pbx1 src]# cd libpri-1.2.3
[root@pbx1 src]# make clean; make ; make install
```

```

root@pbx1:/usr/src/libpri
File Edit View Terminal Tabs Help
[root@pbx1 libpri]# make; make install; make config
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT copy_string.o -
MF .copy_string.o.d -MP -c -o copy_string.o copy_string.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT pri.o -MF .pri.
o.d -MP -c -o pri.o pri.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT q921.o -MF .q92
1.o.d -MP -c -o q921.o q921.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT prished.o -MF
.prished.o.d -MP -c -o prished.o prished.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT q931.o -MF .q93
1.o.d -MP -c -o q931.o q931.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT pri_aoc.o -MF .
pri_aoc.o.d -MP -c -o pri_aoc.o pri_aoc.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT pri_cc.o -MF .p
ri_cc.o.d -MP -c -o pri_cc.o pri_cc.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT pri_facility.o
-MF .pri_facility.o.d -MP -c -o pri_facility.o pri_facility.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT asnl_primitive.
o -MF .asnl_primitive.o.d -MP -c -o asnl_primitive.o asnl_primitive.c
gcc -Wall -Werror -Wstrict-prototypes -Wmissing-prototypes -g -fPIC -O2 -MD -MT rose.o -MF .ros
e.o.d -MP -c -o rose.o rose.c

```

Next, we'll install ZAPTEL. ZAPTEL is the set of linux kernel modules and also a set of tools for interfacing with TDM cards. More importantly, ZAPTEL provides timing to several asterisk components, such as the MeetMe application as well as Music on Hold. If you don't have a proper timing source installed, you'll notice lots of stuttering pauses in any kind of audio playback (Music on Hold, IVR prompts, voicemail greetings) from asterisk. If you don't have any TDM hardware installed in your server, ZAPTEL also provides a "dummy" driver that will provide a timing source to asterisk.

Installation of ZAPTEL package

1. Download the ZAPTEL driver with tools, which are available at <http://www.allo.com/firmware/pri-card/zaptel-tor3-1.2.17.1.tar.gz>

```
[root@pbx1 src]# wget http://www.allo.com/firmware/pri-card/zaptel-tor3-1.2.17.1.tar.gz
```

2. Expand the downloaded file and enter into that directory as shown in the below screenshot.

```
[root@pbx1 src]# tar -xvzf zaptel-tor3-1.2.17.1.tar.gz
[root@pbx1 src]# cd zaptel-tor3-1.2.17.1
```

3. Compile its contents, and install the ZAPTEL driver as show in the below screenshot

```
[root@pbx1 zaptel-tor3-1.2.17.1]# make; make install; make config
```

```
root@pbx1:/usr/src/zaptel-tor3-1.2.17.1
File Edit View Terminal Tabs Help
[root@pbx1 zaptel-tor3-1.2.17.1]# make; make install; make config

make -C /lib/modules/2.6.18-274.12.1.el5/build SUBDIRS=/usr/src/zaptel-tor3-1.2.17.1 HOTPLUG_FIRMWARE=yes modules
make[1]: Entering directory `/usr/src/kernels/2.6.18-274.12.1.el5-1686'
CC [M] /usr/src/zaptel-tor3-1.2.17.1/zaptel-base.o
/usr/src/zaptel-tor3-1.2.17.1/zaptel-base.c:188: warning: 'fcstab' defined but not used
LD [M] /usr/src/zaptel-tor3-1.2.17.1/zaptel.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/tor3t.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/tor3e.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/tor2.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/torisa.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/wcusb.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/wcfxo.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/wctdm.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/wctdm24xxp.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/ztdynamic.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/ztd-eth.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/wct1xxp.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/wctel1xp.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/pciradio.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/ztd-loc.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/wctel2xp.o
CC [M] /usr/src/zaptel-tor3-1.2.17.1/ztdummy.o
```

If there is any problem with the driver patch used for installation, please contact support@allo.com

Installation of Asterisk Package

1. Download the Asterisk 1.2.31.1 version from <http://downloads.asterisk.org/pub/telephony/asterisk/old-releases/>
2. Expand the downloaded asterisk file as shown below

```
[root@pbx1 src]# tar xvzf asterisk-1.2.31.1.tar.gz
```

3. Go to asterisk folder and compile the packages as shown in the screenshot

```
[root@pbx1 asterisk-1.2.31.1]# make; make install; make samples
```

```

root@pbx1:/usr/src/asterisk-1.2.31.1
File Edit View Terminal Tabs Help
[root@pbx1 asterisk-1.2.31.1]# make; make install; make config
build_tools/make_version_h > include/asterisk/version.h.tmp
if cmp -s include/asterisk/version.h.tmp include/asterisk/version.h ; then echo; else \
    mv include/asterisk/version.h.tmp include/asterisk/version.h ; \
fi

rm -f include/asterisk/version.h.tmp
if cmp -s .cleancount .lastclean ; then echo ; else \
    make clean; cp -f .cleancount .lastclean;\
fi

build_tools/make_defaults_h > defaults.h.tmp
if cmp -s defaults.h.tmp defaults.h ; then echo ; else \
    mv defaults.h.tmp defaults.h ; \
fi
make[1]: Nothing to be done for 'depend'.
make[1]: Leaving directory `/usr/src/asterisk-1.2.31.1/cdr'
make[1]: Entering directory `/usr/src/asterisk-1.2.31.1/funcs'
make[1]: Nothing to be done for 'depend'.
make[1]: Leaving directory `/usr/src/asterisk-1.2.31.1/funcs'
make[1]: Entering directory `/usr/src/asterisk-1.2.31.1/utils'
make[1]: Nothing to be done for 'depend'.
make[1]: Leaving directory `/usr/src/asterisk-1.2.31.1/utils'
make[1]: Entering directory `/usr/src/asterisk-1.2.31.1/stdtime'
make[1]: Nothing to be done for 'depend'.
make[1]: Leaving directory `/usr/src/asterisk-1.2.31.1/stdtime'
cd editline && unset CFLAGS LIBS && test -f config.h || CFLAGS="-O6" ./configure
make -C editline libedit.a
make[1]: Entering directory `/usr/src/asterisk-1.2.31.1/editline'
make[1]: `libedit.a' is up to date.
make[1]: Leaving directory `/usr/src/asterisk-1.2.31.1/editline'
make[1]: Entering directory `/usr/src/asterisk-1.2.31.1/db1-ast'
make[1]: `libdb1.a' is up to date.
make[1]: Leaving directory `/usr/src/asterisk-1.2.31.1/db1-ast'
make[1]: Entering directory `/usr/src/asterisk-1.2.31.1/stdtime'
make[1]: `libtime.a' is up to date.
make[1]: Leaving directory `/usr/src/asterisk-1.2.31.1/stdtime'
gcc -pipe -Wall -Wstrict-prototypes -Wmissing-prototypes -Wmissing-declarations -g3 -Iinclude -I../include -D_REENTRANT -D_GNU_SOURCE -O6 -march=i686 -DZAPTEL_OPTIMIZATIONS -fomit-frame-pointer -c -o channel.o channel.c

```

Now you have successfully compiled and installed Libpri, ZAPTEL and Asterisk.

Software Configuration

1. Load the ZAPTEL drivers

```
[root@pbx1 ~]# /etc/init.d/zaptel start
```

2. Use "genzaptelconf" to finish auto configuration:

```
[root@pbx1 ~]# genzaptelconf
```

3. Check the output configured channels using the following commands. It will list the configure channels.

```
[root@pbx1 ~]# ztcfg -vvvv
```

```
root@pbx1:~  
File Edit View Terminal Tabs Help  
[root@pbx1 ~]# ztcfg -vvvvvv  
  
Zaptel Configuration  
=====
```

```
SPAN 1: CCS/HDB3 Build-out: 133-266 feet (DSX-1)  
SPAN 2: CCS/HDB3 Build-out: 133-266 feet (DSX-1)  
SPAN 3: CCS/HDB3 Build-out: 133-266 feet (DSX-1)  
SPAN 4: CCS/HDB3 Build-out: 133-266 feet (DSX-1)
```

```
Channel map:
```

```
Channel 01: Clear channel (Default) (Slaves: 01)  
Channel 02: Clear channel (Default) (Slaves: 02)  
Channel 03: Clear channel (Default) (Slaves: 03)  
Channel 04: Clear channel (Default) (Slaves: 04)  
Channel 05: Clear channel (Default) (Slaves: 05)  
Channel 06: Clear channel (Default) (Slaves: 06)  
Channel 07: Clear channel (Default) (Slaves: 07)  
Channel 08: Clear channel (Default) (Slaves: 08)  
Channel 09: Clear channel (Default) (Slaves: 09)  
Channel 10: Clear channel (Default) (Slaves: 10)  
Channel 11: Clear channel (Default) (Slaves: 11)  
Channel 12: Clear channel (Default) (Slaves: 12)  
Channel 13: Clear channel (Default) (Slaves: 13)  
Channel 14: Clear channel (Default) (Slaves: 14)  
Channel 15: Clear channel (Default) (Slaves: 15)  
Channel 16: D-channel (Default) (Slaves: 16)  
Channel 17: Clear channel (Default) (Slaves: 17)  
Channel 18: Clear channel (Default) (Slaves: 18)  
Channel 19: Clear channel (Default) (Slaves: 19)  
Channel 20: Clear channel (Default) (Slaves: 20)  
Channel 21: Clear channel (Default) (Slaves: 21)  
Channel 22: Clear channel (Default) (Slaves: 22)  
Channel 23: Clear channel (Default) (Slaves: 23)  
Channel 24: Clear channel (Default) (Slaves: 24)  
Channel 25: Clear channel (Default) (Slaves: 25)  
Channel 26: Clear channel (Default) (Slaves: 26)  
Channel 27: Clear channel (Default) (Slaves: 27)
```

4. Configure the zapata.conf file:

```
[root@pbx1 ~]# vi /etc/asterisk/zapata.conf
```

Edit the file as shown in the screenshot :


```

root@pbx1:~
File Edit View Terminal Tabs Help
# Autogenerated by /usr/sbin/genzaptelconf -- do not hand edit
# Zaptel Configuration File
#
# This file is parsed by the Zaptel Configurator, ztcfg
#
# It must be in the module loading order

# card-1 Global data
span=1,0,1,ccs,hdb3
# termtype: te
bchan=1-15,17-31
dchan=16
#echocancel=no
# Span 2: TE4/0/2 "T4XXP (PCI) Card 0 Span 2"
span=2,0,1,ccs,hdb3
# termtype: te
bchan=32-46,48-62
dchan=47
#echocancel=no
# Span 3: TE4/0/3 "T4XXP (PCI) Card 0 Span 3"
span=3,0,1,ccs,hdb3
# termtype: te
bchan=63-77,79-93
dchan=78
#echocancel=no
# Span 4: TE4/0/4 "T4XXP (PCI) Card 0 Span 4"
span=4,0,1,ccs,hdb3
# termtype: te
bchan=94-108,110-124
dchan=109
#echocancel=no

loadzone = us
defaultzone = us
~
"/etc/zaptel.conf" 37L, 698C                                20,1          All

```

6. Edit the dialplan (/etc/asterisk/extensions.conf)

```

[from-pstn]
exten => s,1,Answer() // answer the inbound call
exten => s,n,Playback(cc_welcome) //please message
exten => s,n,Hangup()

[from-internal]
exten => _X.,1,Dial(zap/g1/${EXTEN})
exten => _X.,n,Hangup

```

7. Start the asterisk and connect the Asterisk CLI

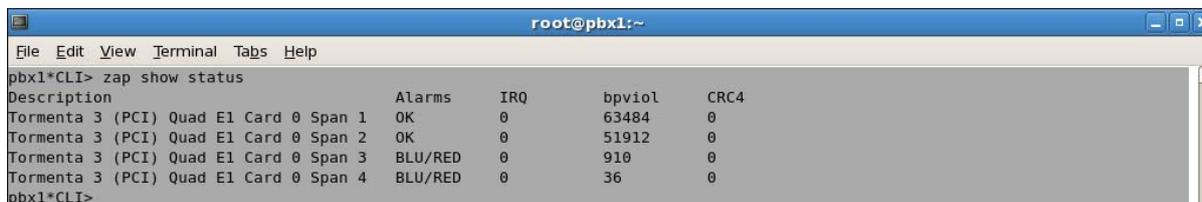
```

[root@pbx1 ~]# /etc/init.d/asterisk start
[root@pbx1 ~]# asterisk -r

```

8. Check the status of four spans .

Here is an example shows the spans status of B400P/B400E card

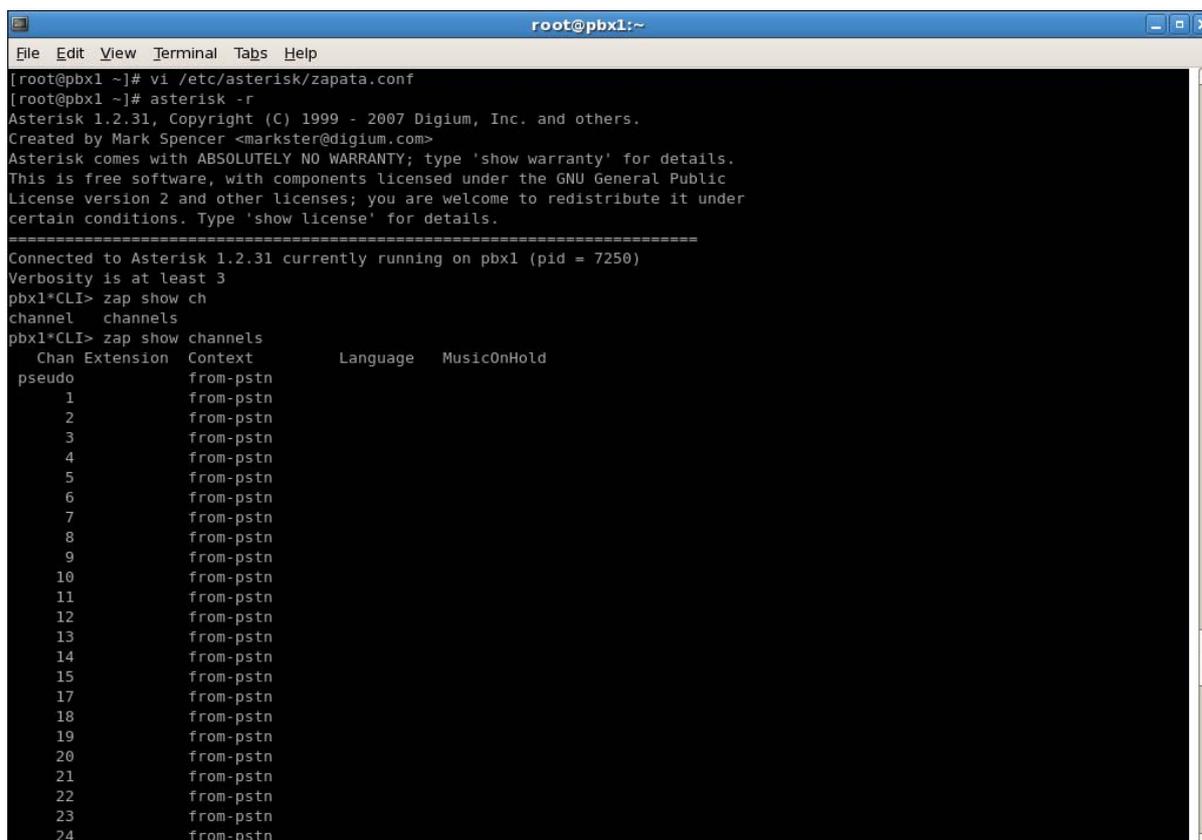


```

root@pbx1:~
File Edit View Terminal Tabs Help
pbx1*CLI> zap show status
Description                               Alarms   IRQ      bpviol   CRC4
Tormenta 3 (PCI) Quad E1 Card 0 Span 1    OK       0        63484    0
Tormenta 3 (PCI) Quad E1 Card 0 Span 2    OK       0        51912    0
Tormenta 3 (PCI) Quad E1 Card 0 Span 3    BLU/RED  0        910      0
Tormenta 3 (PCI) Quad E1 Card 0 Span 4    BLU/RED  0        36       0
pbx1*CLI>

```

9. Check the configured zap channels in asterisk using “ zap show channels “ as shown in the screenshot.



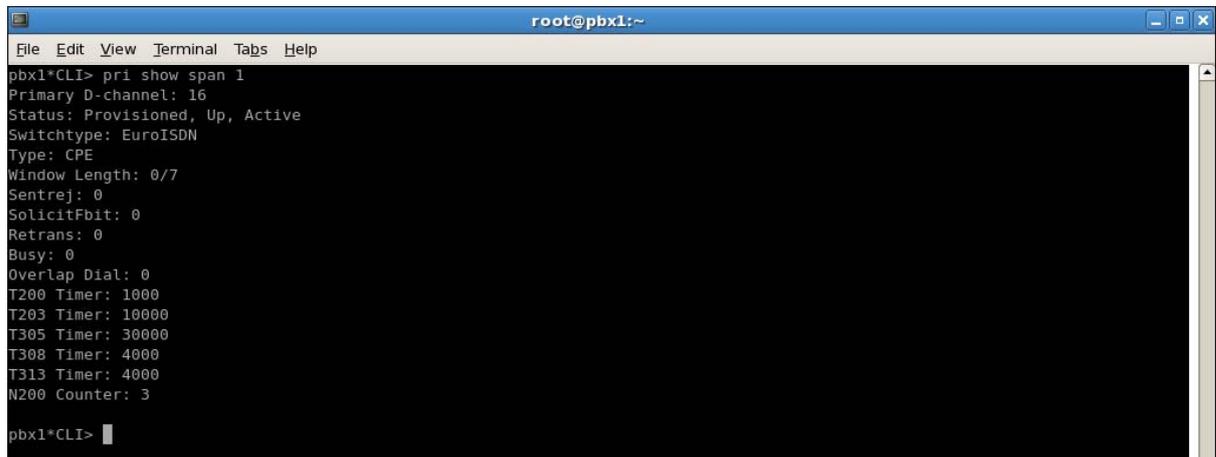
```

root@pbx1:~
File Edit View Terminal Tabs Help
[root@pbx1 ~]# vi /etc/asterisk/zapata.conf
[root@pbx1 ~]# asterisk -r
Asterisk 1.2.31, Copyright (C) 1999 - 2007 Digium, Inc. and others.
Created by Mark Spencer <markster@digium.com>
Asterisk comes with ABSOLUTELY NO WARRANTY; type 'show warranty' for details.
This is free software, with components licensed under the GNU General Public
License version 2 and other licenses; you are welcome to redistribute it under
certain conditions. Type 'show license' for details.
=====
Connected to Asterisk 1.2.31 currently running on pbx1 (pid = 7250)
Verbosity is at least 3
pbx1*CLI> zap show ch
channel channels
pbx1*CLI> zap show channels
Chan Extension Context Language MusicOnHold
pseudo
1 from-pstn
2 from-pstn
3 from-pstn
4 from-pstn
5 from-pstn
6 from-pstn
7 from-pstn
8 from-pstn
9 from-pstn
10 from-pstn
11 from-pstn
12 from-pstn
13 from-pstn
14 from-pstn
15 from-pstn
17 from-pstn
18 from-pstn
19 from-pstn
20 from-pstn
21 from-pstn
22 from-pstn
23 from-pstn
24 from-pstn

```

10. Then check the check the PRI status of all spans

Here is an example output of PRI span 1



```
root@pbx1:~  
File Edit View Terminal Tabs Help  
pbx1*CLI> pri show span 1  
Primary D-channel: 16  
Status: Provisioned, Up, Active  
Switchtype: EuroISDN  
Type: CPE  
Window Length: 0/7  
Sentrej: 0  
SolicitFbit: 0  
Retrans: 0  
Busy: 0  
Overlap Dial: 0  
T200 Timer: 1000  
T203 Timer: 10000  
T305 Timer: 30000  
T308 Timer: 4000  
T313 Timer: 4000  
N200 Counter: 3  
pbx1*CLI>
```

Now the system is ready to make calls using these configured zap channels.