



E1/T1 PRI Card (2 & 4 Ports) PCI/PCIe

User Manual

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Overview

CEM digital cards are telephony PCI & PCI-e cards used for open source Asterisk based systems. CEM-4PRI & CEM-4PRIe are four ports ISDN PRI E1 or T1 PCI & PCI-e cards respectively. CEM-2PRI & CEM-2PRIe are two ports ISDN PRI E1 or T1 PCI & PCI-e cards respectively. Using CEM-SOLUTIONS.NET digital PRI card & open source Asterisk PBX on a stand alone PC, users can create their IP PBX telephony solution include all the sophisticated features of traditional PBX, and extend features such as voicemail in IP PBX.

Features

- Four ISDN PRI E1/T1 ports (120 channels) or Two ISDN PRI E1/T1 ports (60 channels)
- Supports standard telephony and data protocols. (Including PRI protocol families for voice and PPP, Cisco HDLC and Frame Relay data modes)
- 100% compatible all features of Asterisk PBX
- PRI ISDN protocol stack
- Suitable for 3.3 volts and 5.0 volts 32 bit PCI 2.2 slot & PCI-e x1 slot

Applications

- ISDN PRI IP PBX
- ISDN Least Cost Routers
- Voice over IP PRI termination gateways
- IVR system
- Call Center
- Traditional Calls/VoIP Calls Conference
- Callback Service
- ISDN Test Equipment

Hardware requirement

Least recommended hardware configuration

- 1.6-GHz Pentium IV
- 512 MB RAM
- 3.3V or 5V 32bit PCI slot (2.2) / PCI-e x1 slot (1.0a)

Card dimensions

15.4cm x 8.7cm x 1.8 cm

Software Installation

CEM Solutions Digital cards hardware are only supported under Linux. It requires drivers and libraries which are not integrated with the Linux kernel.

Recommendation

Linux distributions: CentOS 5.4/5.5/5.7 and Ubuntu 10.04/11.10

Asterisk Version: Asterisk 1.4/1.6/1.8/11

CEM Dahdi Driver Version: Dahdi 2.4.x/2.5/2.6/2.7

For an introduction to Asterisk, including additional information on its configuration, setups, and features, please refer to: <http://www.asterisk.org>

To install your CEM-4PRI/CEM-4PRIe/CEM-2PRI/CEM-2PRIe card, you will need:

- Full Linux kernel 2.6.32 (or later) source code.
- Development libraries and headers for ncurses
- Development libraries and headers for zlib and openssl
- Development libraries and headers for newt
- GCC and standard software build tools

Installation Test Environment considered:

OS	:	CentOS 6.3
Kernel version	:	2.6.32.x.x.x
Asterisk version	:	Asterisk-1.8.12.2
Libpri version	:	libpri-1.4.12
CEM Dahdi Driver	:	Dahdi 2.6.1
Hardware	:	CEM-4PRI/CEM-4PRIe/CEM-2PRI/CEM-2PRIe

1. After inserting the card into your PCI slot, boot your machine to linux and execute the following command to list the devices detected by the PCI bus:

```
# lspci -vn
```

Confirm the output lists a device with CEM Solutions PCI vendor ID which is “d44d”. The output will be similar to the following:

```
02:00.0 Bridge: PLX Technology, Inc. Unknown device d44d (rev 01)
          Subsystem: PLX Technology, Inc. Unknown device 9030
```

Note: The output of `lspci` may or may not state “cem-solutions.net”. If it does not, this does not indicate a problem and the device ID may change based on latest chip.

The CEM card identifier should be listed. If a card identifier is not listed, then your machine is not PCI 2.2 (or higher), and the card will not work.

2. To install Libpri, Dahdi and Asterisk in CentOS, we have to install the following prerequisite packages:

```
bison bison-devel zlib zlib-devel openssl openssl-devel gnutls-devel flex gcc gcc-c++
```

Execute the following command to install the above mentioned packages:

```
# yum install bison bison-devel zlib zlib-devel openssl openssl-devel  
gnutls-devel flex gcc gcc-c++ libxml2
```

3. Download the libpri software in path /usr/src, which is available at <http://downloads.asterisk.org/pub/telephony/libpri/old/>

```
# wget http://downloads.asterisk.org/pub/telephony/libpri/old/libpri-1.4.12.tar.gz
```

4. Expand the downloaded libpri under /usr/src/ directory, compile its contents, and install the drivers.

```
# tar -zxvf libpri-1.4.12.tar.gz  
# cd libpri-1.4.12  
# make  
# make install
```

5. Download Dahdi software under /usr/src directory, which is available at <http://www.cem-solutions.net/firmware/pri-card/drivers/dahdi-linux-complete-2.6.1+2.6.1.tar.gz>

6. Untar the downloaded file, compile and install using the below commands

```
# cd /usr/src/  
# tar -zxvf dahdi-linux-complete-2.6.1+2.6.1.tar.gz  
# cd dahdi-linux-complete-2.6.1.2+2.6.1  
# make  
# make install  
# make config
```

7. Asterisk installation

For using Asterisk for your application, follow the steps below.
Download the Asterisk 1.8.12.2 release version.

```
# wget  
http://downloads.asterisk.org/pub/telephony/asterisk/releases/asterisk-1.8.12.2.tar.gz  
# cd /usr/src/  
# tar -zxvf asterisk-1.8.12.2.tar.gz  
# cd asterisk-1.8.12.2  
# ./configure  
# make  
# make install
```

If this is the first Asterisk installation on this system, you should install the sample configuration files. To do this, run:

```
# make samples  
# make config
```

Note: Running this command will overwrite any older Asterisk configuration files that you have in the /etc/asterisk directory.

Software Configuration

This session will provide steps for configuring signaling mode, once you are done with the signaling mode continue with module & channel configuration.

E1/T1/MFCR2 mode settings

E1 Mode

Add “tor3e” at the end of /etc/dahdi/modules, so that while starting dahdi driver CEM card modules will load automatically

T1 Mode

To configure the PRI card in T1 signaling mode, please add the following line in the relevant files,

- (i) Add “tor3e” at the end of /etc/dahdi/modules, so that while starting dahdi driver CEM card modules will load automatically
- (ii) Add “options tor3e eltloVERRIDE=1 # for T1 Signaling” at the end of /etc/modprobe.d/dahdi.conf

MFCR2 Mode

To configure the PRI card in MFCR2 signaling mode, please add the following line in the relevant files,

- (i) Add “tor3e” at the end of /etc/dahdi/modules, so that while starting dahdi driver CEM card modules will load automatically
- (ii) Add “options tor3e mfcr2=1 # for MFCR2 Signaling” at the end of /etc/modprobe.d/dahdi.conf

Note: Basically tor3e driver module installs the PRI card as E1 mode. No need to set any options for E1 signaling mode.

- **Module & channel Configuration**
 - (i) Add “#include dahdi-channels.conf” at the end of /etc/asterisk/chan_dahdi.conf
- **Restart Dahdi**
 - (i) /etc/init.d/dahdi stop
 - (ii) /etc/init.d/dahdi start
 - (iii) Now you can see the tor3e module also loaded.
- **Generate Configuration files**
 - (i) Type “dahdi_genconf -vvvv” to generate configuration files
 - (ii) Type “dahdi_cfg -vvvv” to configure the channels

Hardware LEC Module setup

This session will provide steps for updating Hardware LEC module,

1. Download the firmware for Hardware LEC module from *CEM-SOLUTIONS* web site from this link <http://www.cem-solutions.net/firmware/pri-card/OCT6-LEC-128.tar.gz>
2. Copy the downloaded file in the following path,
 1. /usr/lib/hotplug/firmware
 2. /lib/firmware
3. Extract the file on those two folders,
 1. tar zxvf OCT6-LEC-128.tar.gz in /usr/lib/hotplug/firmware
 2. tar zxvf OCT6-LEC-128.tar.gz in /lib/firmware
4. Reboot the machine

Test Configuration

This session will provide steps for verifying the setup.

- Execute Asterisk using the following command

```
# asterisk -vvvvvvvvc
```

- Verify the span status using the following CLI command

```
CLI> dahdi show status
Description                               Alarms   IRQ   bpviol  CRC4
Tormenta 3 (PCI) Quad E1 Card 0 Span 1    OK       0     2       0
Tormenta 3 (PCI) Quad E1 Card 0 Span 2    OK       0     1       0
Tormenta 3 (PCI) Quad E1 Card 0 Span 3    OK       0     3       0
Tormenta 3 (PCI) Quad E1 Card 0 Span 4    OK       0     0       0
```

With all verifications done, you are now ready to make calls through the PRI card.

Sample Dialplan Configuration

Edit the dialplan `vim /etc/asterisk/extensions.conf`

```
[from-pstn]
exten => s,1,Answer() // answer the inbound call
exten => s,n,Playback(demo-congrats) //Default demo voice file
exten => s,n,Hangup()

[from-internal]
exten => _X.,1,Dial(Dahdi/g0/${EXTEN})
exten => _X.,n,Hangup
```

Reference

<http://www.cem-solutions.net>

<http://www.asterisk.org>

<http://www.voip-info.org>

<http://www.digium.com/en/>