Attendee Dashboard

Control Panel
• Click plus [+] icon to expand menus
• Click minus [-] icon to collapse menus

Questions Panel
• Type and submit your questions in the Questions Pane
• Located on the right hand side of your screen
Agenda

• Introduction to Sangoma
• A116 Board Overview
• Wanpipe Driver Installation
• System Design Considerations
• Self Help and Technical Support
• Closing
Broad Line of Great Products

- Voice Telephony Boards
  - Analog/digital/hybrid, WAN, ADSL
- Session border controllers
- Microsoft Lync
- VoIP Gateways
  - NetBorder SIP to TDM
  - SS7 to SIP
- Software Applications
  - NetBorder Express, Call Progress Analyzer...
- Transcoding (boards/appliances)
- Fiber connectivity (STM1)
- Wireless products
- Cloud based monitoring
Vibrant Ecosystem of Clients & Partners

Open Source Telephony
Ready to use drivers for Sangoma boards

Contact Center
OEM Integration with major software suites

Proprietary PBX and IVR
Plug-in to major soft-PBX and IVRs

Carriers, Cloud, Data Ntwks
Proven Infrastructure Technology
The Most Complete Range of Telecom Interface Boards

- **Analog Lines**
  - A200
  - A400

- **Digital Spans (T1/E1)**
  - A101
  - A102
  - A104
  - A108

- **Combos**
  - B600
  - B601

- **ISDN BRI**
  - A500
Recent Addition – W400

• 4 x GSM Modules
  – Quad Band GSM
  – Looks like 4 mobile phones
  – Used in PBX applications to establish mobile to mobile calls
Today’s Focus: A116

- Sangoma pushes the envelope again
- First to offer 8 span boards
- New A116 offers 16 spans per board
- 480 calls in a single PCI Express Expansion slot
- Reduce operational costs in hosted environments
  - More ports per “U”
  - Less power consumption
Product Highlights

• 16 T1/E1 on a single PCI Express interface, Data and Voice usage can co-exist within the same board
• Compatible with all commercially available motherboards
• Optional Echo Cancellation provides carrier grade echo cancellers
• Complete Asterisk and FreeSWITCH support
• Field Upgradable Firmware
Product Highlights

• Supports up to 32.8 Mbps of full duplex data throughout 480 voice calls using 16 T1/E1/J1 spans
• Dimensions: Full height by half length (107mm x 176mm)
• Line decoding: HDB3, AMI, B8ZS
• Framing: CRC-4, Non CRC4, ESF, SF, D4, J1 (Japan)
• Supports Robbed Bit Channel Associated Signaling (CAS) and ISDN PRI
• T1/E1 and fractional T1/E1, multiple channel HDLC per line for mixed data/TDM voice applications
• Both Windows and Linux support
Adjustable Packet Size

Default Dahdi Packet Size

8 bytes (1 ms)

Dahdi

Dahdi SW EC

Wanpipe driver

Sangoma Hardware

Dynamic Dahdi Packet Size

Recycled with Chunk = 16, 40, 80 bytes

Dahdi

Dahdi EC

Wanpipe driver

HWEC

Sangoma Hardware

Note:
8 bytes = 1 ms
16 bytes = 2 ms
40 bytes = 5 ms
80 bytes = 10 ms
System Interrupt Reduction

![Bar chart showing system interrupts per second for different board types and packet sizes.]

Packet Size:
- 8 bytes (1 ms)
- 16 bytes (2 ms)
- 40 bytes (5 ms)
- 80 bytes (10 ms)

Board Type:
- A101
- A102
- A104
- A108
- A116

System IRQs per second
More details on Interrupts and Packet Sizes

• Reduces system interrupts load
• Allowing for larger call volumes
• It is crucial to leverage this feature when building large systems with the A116
• See our Whitepaper at http://go.sangoma.com/wp/asterisk
A116 Cabling and Accessories

A116

68 pin SCSI dense connector

PCle Interface

Rack mountable breakout panel

Punch Down Cable
Lifetime Warranty

• As with all Sangoma boards
It all runs on WANPIPE

- Drives all Sangoma Boards: WANPIPE®
- Suite of drivers and utilities for all Sangoma hardware
- Used in a wide range of applications
  - Open Source Telephony apps: Asterisk / FreeSWITCH
  - Custom / Proprietary voice/data applications
- Linux & Windows
## A116 Pricing and SKUs

<table>
<thead>
<tr>
<th>Description</th>
<th>SKU</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A116 with E/C</td>
<td>A116DE</td>
<td>$6,495</td>
</tr>
<tr>
<td>A116 without E/C (for Data)</td>
<td>A116E</td>
<td>$3,495</td>
</tr>
<tr>
<td>16 port Breakout Panel with 68 pin connector cable</td>
<td>SCEC-A116-PNLKIT</td>
<td>$295</td>
</tr>
<tr>
<td>Punch down cable with loose 68 color coded wires</td>
<td>CBL-649</td>
<td>$225</td>
</tr>
</tbody>
</table>
• The unified device driver core provides application support for:
  – Dahdi: API support for Dahdi with Asterisk
  – TDM API: libsangoma* API support for FreeSWITCH
  – DATA API: libsangoma* API support over HDLC

* libsangoma is a library that provides OS abstraction to the Wanpipe Driver Voice & Data API system calls so that the user application remains OS independent
WANPIPE for Dahdi

• Modules involved with Asterisks deployments
WANPIPE for FreeSWITCH

- Modules involved with FreeSWITCH deployments
- FreeTDM is maintained by Sangoma Technologies
WANPIPE Utilities

- WANPIPE provides a set of utilities to configure, start, stop and manage Sangoma hardware
  - Wancfg: For board configuration
  - Wanrouter: For control commands
  - Wanpipemon: Monitoring and troubleshooting

WANCFG

- Utility to create configuration files
- Each mode of operation has its own variation
  - For Asterisk: Dahdi mode -> wancfg_dahdi
  - For FreeSWICH: API mode -> wancfg_fs
  - Data routing -> wancfg_tdm_api
• Set of control commands
• “wanrouter start/stop/restart”
  – Starts, stops, and restarts all configured ports by loading the correct kernel modules and then applying the configuration for each port
• “wanrouter hwprobe”
  – Shows all Sangoma cards installed in the system and recognized by the current Wanpipe drivers
• “wanrouter status”
  – Shows the state of all running ports.
• “wanrouter version”
  – Shows the version of the currently installed driver

• Monitoring Commands
  • “wanpipemon –p aft”
    – Display all the possible command variation for AFT cards
  • “wanpipemon –I wXg1 –c Ta”
    – Show the line alarms for a T1/E1/J1 port

  [Link](http://wiki.sangoma.com/Wanpipemon-T1-E1-physical-Line-alarms)

• “wanpipemon –I wXg1 –c trd”
  – Show a line trace for the interface

  [Link](http://wiki.sangoma.com/wanpipe-wireshark-pcap-pri-bri-wan-t1-e1-tracing)
WANPIPE Installation

- Asterisk systems
- FreeSWITCH systems
- API development
Steps for Asterisk Systems

• Install the Sangoma board into server

• Download system related dependencies:

• Download and install asterisk, dahdi and libpri (make && make install)
  -> [http://www.asterisk.org/downloads](http://www.asterisk.org/downloads)

• Download and install Sangoma Wanpipe driver (typically in `usr/src/` directory)
  -> `tar xzf wanpipe-7.0.3.tgz`
  -> `cd /usr/src/wanpipe-7.0.3`
  -> `./Setup install`

• Type ‘wanrouter hwprobe’ to verify successful driver installation
  -> Sangoma card info will display.

• Configure card for asterisk using ‘wancfg_dahdi’
Asterisk Systems Folders

- **Asterisk**
  - Chan_dahdi
  - Dahdi
  - Wanpipe

  - `/etc/asterisk/chan_dahdi.conf`
  - `/etc/dahdi/systems.conf`
  - `/etc/wanpipe/wanpipeX.conf`
  - `/etc/wanpipe/wanrouter.rc`
  - `/etc/wanpipe/scripts/ start | stop`
Steps for FreeSWITCH Systems

• Install Sangoma card into server
• Download system related dependencies:
• Download and install Sangoma Wanpipe driver
  -> tar xjfz wanpipe-7.0.3.tgz
  -> cd /usr/src/wanpipe-7.0.3
  -> make && make install
• Type ‘wanrouter hwprobe’ to verify successful driver installation
  -> Sangoma card info will display
Steps for FreeSWITCH Systems

• Download Sangoma ISDN library
  -> 32-bit
  -> 64-bit
  library: ftp://ftp.sangoma.com/linux/libsng_isdn/libsng_isdn-current.x86_64.tgz

• Install Sangoma ISDN library
  -> tar xfz libsng_isdn-current.<arch>.tgz
  -> make install
Steps for FreeSWITCH Systems

- Download latest FreeSWITCH from GIT
  -> git clone git://git.freeswitch.org/freeswitch.git
- cd freeswitch
- ./bootstrap
- Edit modules.conf and uncomment
  libs/freetdm/mod_freetdm
- Configure the build system using "configure"
  -> ./configure --prefix=<location to install FreeSWITCH to>
- make && make install
- Now configure your entire FreeSWITCH system:
  -> wancfg_fs
FreeSWITCH Systems Folders

FreeSWITCH

FreeTDM

Wanpipe

/usr/local/freeswitch/conf/autoload_configs/freetdm.conf.xml

/usr/local/freeswitch/conf/freetdm.conf

/etc/wanpipe/wanpipeX.conf

/etc/wanpipe/wanrouter.rc

/etc/wanpipe/scripts/ start | stop
Custom Application Development (APIs)

• Install Sangoma card into server
• Download and install system dependencies
• Download and install Sangoma Wanpipe driver
  -> tar xzf wanpipe-7.0.3.tgz
  -> cd /usr/src/wanpipe-7.0.3
  -> make && make install
• Type ‘wanrouter hwprobe’ to verify successful driver installation
  -> Sangoma card info will display.
• Review the API documentation to learn how to work with Wanpipe and Sangoma hardware
  -> cd /etc/wanpipe/api/libsangoma
  -> sample cpp application

*** Support Contract from Sales dept. required for API Support
SYSTEM DESIGN CONSIDERATIONS
System Design Considerations

- Chunk size
- Hardware Echo Cancellation
- System Occupancy
  - CPU / how to distribute load to cores
  - Memory
- Clocking Distribution
- Cabling
- IRQ Balance
- VM Kernels – do not use
Chunk Size

• Recommendation for A116 is chunk size = 40
• Default Wanpipe installation= 8 (dahdi default)
• Change chunk size using the following installation script:
  -> ./Setup install - -dahdi-chunk=40
  -> will recompile Dahdi to change chunk size
• To Verify change: ifconfig MTU=40 (default 8)

Must have Sangoma hardware with HWEC to take advantage
Hardware Echo Cancellation

- Echo Cancellation is key for any VoIP Systems
- Cannot be done in software – CPU of your host system will not be able to support call density
- Sometimes interconnection service say they do EC for you, but who would you really trust to deliver voice quality – you need to be in control, it is your solution after all!
- Sangoma does not recommend the use of the A116 in voice systems without this option (dahdi chunk)
System/Server Considerations

- Use at least Quad Core I7 or Quad Core Xeon
- At least 4GB RAM
- CPU at load should never peak over 80%, average 60%
- Similar for Memory
Clocking Distribution

- Digital telecom systems need to work off the same clock source.
- Generally derived from Telco interconnect.
- For the A116:
  - Ports 1-8: must have the same clock source.
  - Ports 9-16: must have the same clock source.
- To configure for all ports connected to telco, select ‘NORMAL’ and ‘pri_cpe’ in ‘wancfg_dahdi/wancfg_fs’.
- If port 1 is connected to telco, and all other ports are connected to another PBX, select MASTER and pri_net. Use port 1 for clock reference for all other ports for consistency.
- In general, overrun issues mean a problem with clocking.
Cabling

• 68-pin with breakout panel
  – RJ45 connectors are standard pinouts

<table>
<thead>
<tr>
<th>pin</th>
<th>signal</th>
<th>pin</th>
<th>signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RRING</td>
<td>5</td>
<td>TTIP</td>
</tr>
<tr>
<td>2</td>
<td>RTIP</td>
<td>6</td>
<td>unused</td>
</tr>
<tr>
<td>3</td>
<td>unused</td>
<td>7</td>
<td>unused</td>
</tr>
<tr>
<td>4</td>
<td>TRING</td>
<td>8</td>
<td>unused</td>
</tr>
</tbody>
</table>

• CBL-649 6-Feet punch down cable pinout
**IRQ Balance**

- Server must be configured to balance load across all its cores
- IRQ Balance is a downloadable utility (i.e. yum, for Redhat)
- `/etc/init.d/irqbalance start`
- This is installed by default on standard CentOS Linux systems

```bash
-> cat /proc/interrupts
```

```
0: 123 0 0 0 IO-APIC-edge timer
1: 2 0 0 0 IO-APIC-edge i8042
4: 1 0 0 0 IO-APIC-edge
8: 1 0 0 0 IO-APIC-edge rtc0
9: 0 0 0 0 IO-APIC-fasteoi acpi
12: 4 0 0 0 IO-APIC-edge i8042
16: 1679 3490306 161143 1046873 IO-APIC-fasteoi rename3
19: 210451 83950711 0 142549 IO-APIC-fasteoi wanpipe1
```

```bash
-> top
```

```
top - 14:04:03 up 21 days, 2:39, 2 users, load average: 0.24, 0.23, 0.18
Tasks: 213 total, 2 running, 211 sleeping, 0 stopped, 0 zombie
Cpu0 :  0.0%us,  4.3%sy, 10.3%ni,  85.4%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Cpu1 :  0.0%us,  2.3%sy,  6.3%ni,  91.4%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Cpu2 :  0.3%us,  1.0%sy,  0.7%ni,  98.0%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Cpu3 :  0.0%us, 10.3%sy,  0.0%ni,  89.7%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Mem: 7969268k total, 1818940k used, 6150328k free, 232504k buffers
Swap: 10272760k total,  0k used, 10272760k free, 1013316k cached
```
VM Kernels

• Sangoma boards do not run in a virtualized environment

• Should not use virtualized kernels even if you are not using virtualization
  – Adds latency, latency is not good for real time systems

• Best to use Standard CentOS distribution of Linux
  – This is the distribution that Sangoma uses for Quality Assurance testing
SELF HELP AND TECHNICAL SUPPORT
Getting Help

• Wiki
  -> wiki.sangoma.com

• Support.sangoma.com
  – Open ticket, under ‘Sangoma Boards’
  – Upload configuration using ‘Support logger’
    -> collects configuration files and Sangoma command results and packages everything up
• Only recently came up with 8 spans board
• Does not have 16 spans offering
• Drivers limited to Asterisk and Linux
  – No windows, no FreeSWITCH, no APIs
• More costly to build large systems
  – More servers required
  – More investment
• Cannot alter chunk size to reduce system load
• Highest density OST board in the market
• Adjustable Packet Size scales much better
• Optional On-board Echo Cancellation
• Lifetime warranty
• Asterisk and FreeSWITCH support via Wanpipe
• 2 connection options:
  – Rack mountable breakout panel with cable
  – Open ended cable to connect to punch block
• Ideal for high density/volume solutions
Contact Us

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THANK YOU!