5 Culprits that Kill Asterisk® IP-PBX Performance

…and what you can do about them

Agenda

- Goal of Webinar
- Xorcom Credentials
- The 5 Culprits
- Load Test Results
- Guidelines for Best Performance
- Questions & Answers

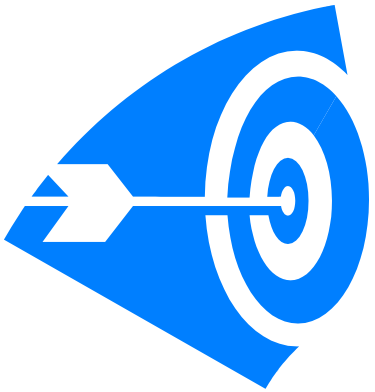
Common Misconception

- Choosing a high-priced server will give you the best performance

- You will pay too much for an unsuitable solution

Goal of the Webinar

- Clarification
  - This discussion relates to workhorse PBX, not residential or demo systems
- Review parameters that affect performance
  - Criteria for choosing hardware
  - Ways to optimize software
- Pass along lessons learned



Xorcom Credentials

- Established in 2004
- All products are based on Asterisk
- Xorcom drivers: standard component in Asterisk since v. 1.2.4 (Feb ‘06)
- Award-winning, flexible and modular telephony interface solutions based on XPP™ technology (USB2)
- Emphasis on built-in reliability

About IP Gateways...

Feature	Astribank	IP Gateway
Central management via Asterisk IP-PBX	✔	✘
LAN-independent architecture	✔	✘
Fully Asterisk integrated	✔	✘
Redundant power supply	✔	✘
Reliable fax support	✔	✘
Auto detection by Asterisk IP-PBX	✔	✘
Auto configuration by Asterisk IP-PBX	✔	✘
Low Cost of Ownership (COO)	✔	✘

So…what are the 5 culprits?

1. CPU
2. Firmware-Motherboard Design
3. Chipset
4. Peripherals
5. Application

1. CPU

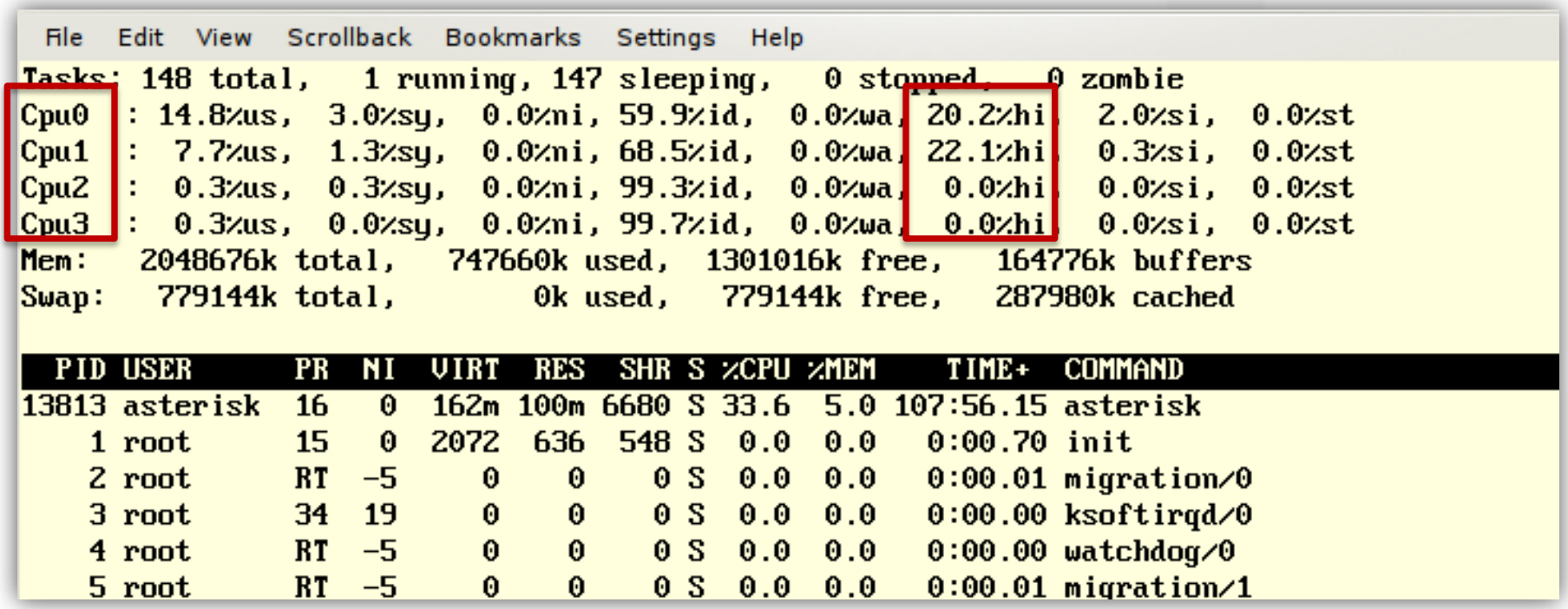
- Speed
  - Disable CPU Hyper-Threading when you have many Astribanks connected
- Number of Cores
  - Additional cores are beneficial, especially when additional applications (such as call centers) are run on top of Asterisk
- MMU (Memory Management Unit) performance
  - Some processors under test have demonstrated bad MMU performance

2. Firmware/Motherboard Design

- Core Workload Optimization
  - Some motherboards with multiple cores are not optimized for operation with Asterisk
- Interrupt Efficiency - Hardware Interrupt Handling Mode
  - Performance often improves when the Astribank driver is configured to perform the heaviest tasks on software interrupts instead of on the hardware interrupts
  - Interrupt handling should be evenly distributed among the cores

Unbalanced Load on CPU Cores

- Hardware interrupts



3. Chipset

- Ethernet chipset
- USB chipset
- For large installations (hundreds of analog ports), an additional PCI-based USB controller can be used to ease the load on the motherboard's USB

4. Peripherals

- Memory speed (RAM)
- Hard disks, memory size and RAM disk
  - Insufficient RAM will adversely affect the operating system by accessing the hard disk instead (swapping)
  - Greatly reduces processing performance
  - 1GB RAM is typically sufficient for standard Elastix installation (without recording)

5. Application

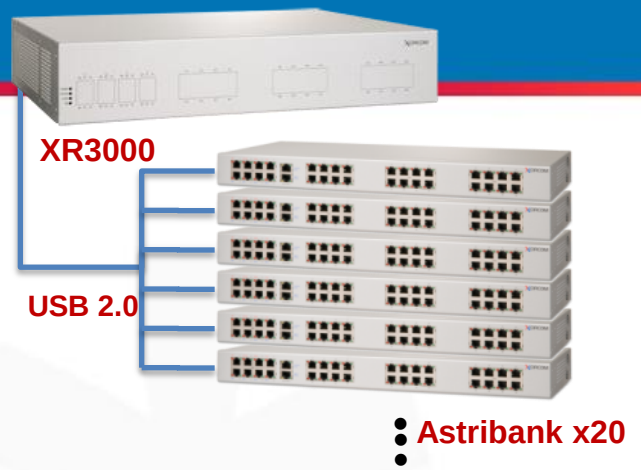
- Asterisk Stack Size
  - Larger stack size is more stable for high loads
  - This command removes the stack size limitation:

    `ulimit –s unlimited`
- Asterisk Optimization
  - e.g., turn off the FOP if it's not being used
- OSLEC Optimization
  - Use MMX (Xorcom-specific design)
  - Set different EC tail sizes for different ports
- ChanMute
  - Compile DAHDI with the OPTIMIZE_CHANMUTE enabled

XR3000 Load Tests

- **#1: XR3000 Analog**
  - (20) XR0008 devices
  - 32 FXS ports each
- **#2: XR3000 Digital / G.729**
  - (4) XR0056 devices
  - 4 E1/T1 ports each
  - G.729 SIP calls
- **#3: XR3000 Digital / G.711a**
  - (4) XR0056 devices
  - 4 E1/T1 ports each
  - G.711a SIP calls

Test #1

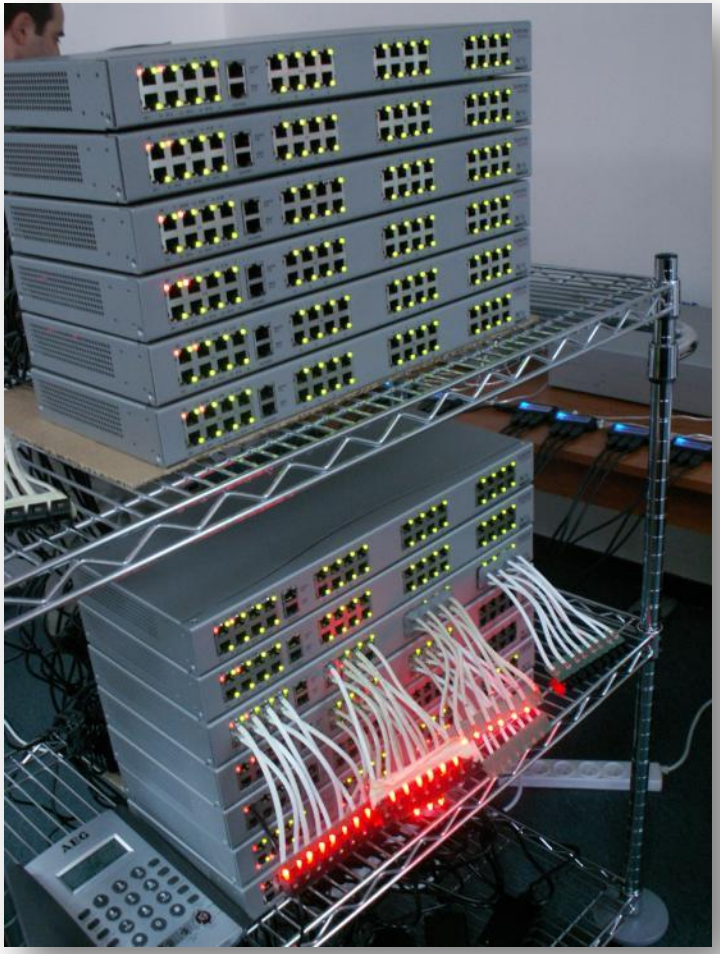


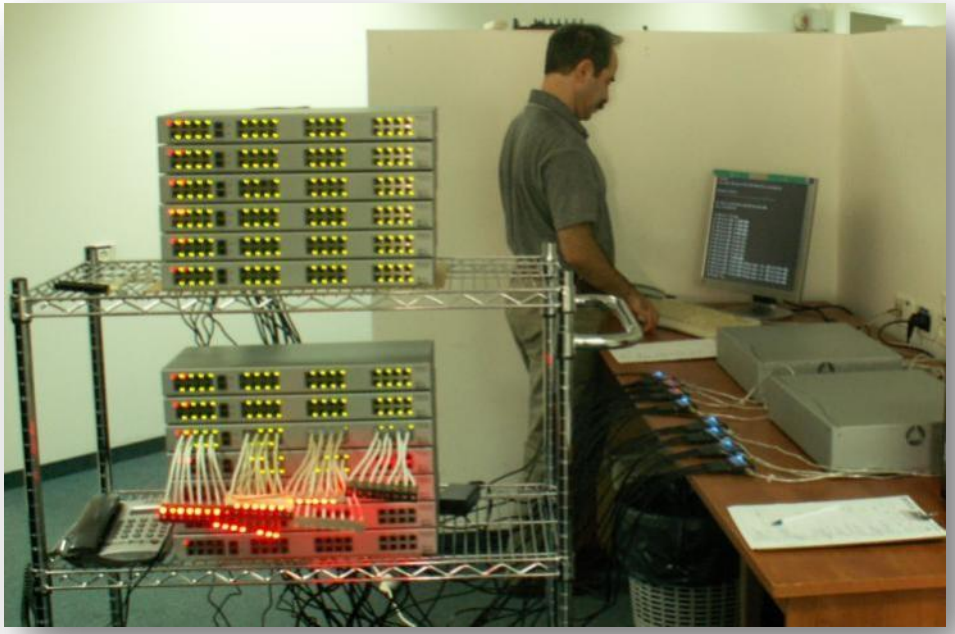
Test #2

Test #3

Results are published at: http://www.xorcom.com/load-tests/load-tests.html

Xorcom Lab





Test Conditions

Software Version:

Elastix: 1.6-12

DAHDI: 2.2.1

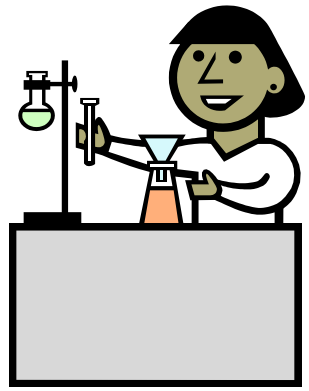
Asterisk: 1.4.29

Codec used: Open source codec_g729-ast14-gcc4-glibc-pentium4.so

Previously noted performance improvement measures were taken.

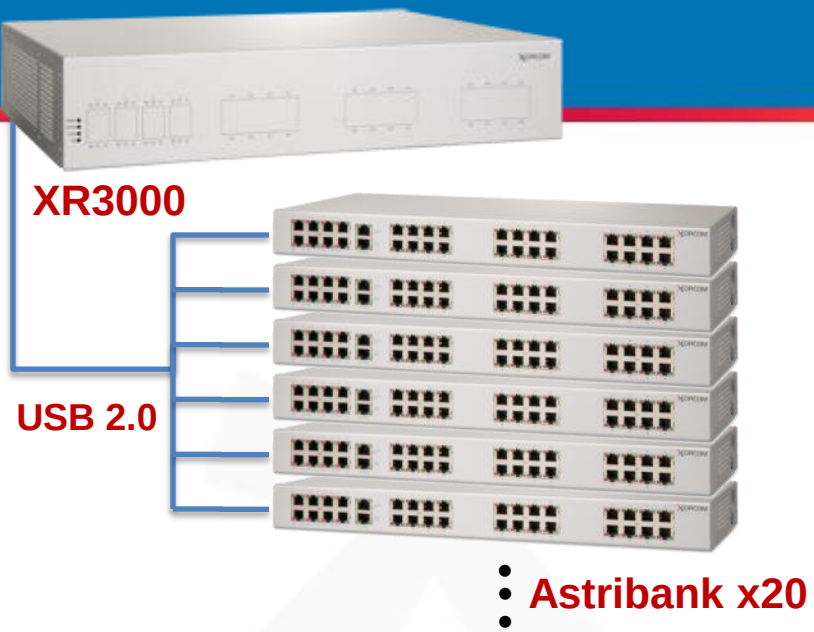
The Asterisk extensions context was defined as follows:

```
[music-test]
exten => s,1,Answer()
exten => s,2,Playback(music-8khz-10min)
exten => s,3,Goto(2)
```



Test #1 Results

- **XR3000 with 20 XR0008 devices (32 FXS ports each)**
  - FXS extensions: 640
  - IO ports: 160
  - Total DAHDI channels: 800



Echo Canceller Tail Size (taps)	Maximum Number of Simultaneous Calls	
	CPU: Core 2 Duo E8400 3 GHz RAM: DDR2 1 GB 800 MHz	CPU: Core 2 Quad Q9550 2.83GHz RAM: DDR2 4 GB 800 MHz
256	164	168
128	280	272
64	388	377
32	488	476
Disabled echo canceller	640	640

Test #2 Results

- **XR3000 with 4 XR0056 devices (4 E1/T1 ports each) connected and G.729 SIP calls.**
  - E1 ports: 16
  - Total DAHDI channels: 480

Echo Canceller Tail Size (taps)	Maximum Number of Simultaneous Calls	
	CPU: Core 2 Duo E8400 3 GHz RAM: DDR2 1 GB 800 MHz	CPU: Core 2 Quad Q9550 2.83GHz RAM: DDR2 4 GB 800 MHz
256	220	260
128	260	360
64	260	420
32	260	420
Disabled echo canceller	280	480

Test #3 Results

- **XR3000 with 4 XR0056 devices (4 E1/T1 ports each) connected and G.711a SIP calls.**
  - E1 ports:
  - Total DAHDI channels:
  - Add'l PCI Ethernet board EN-9230TX-32 used

Echo Canceller Tail Size (taps)	Maximum Number of Simultaneous Calls	
	CPU: Core 2 Duo E8400 3 GHz RAM: DDR2 1 GB 800 MHz	CPU: Core 2 Quad Q9550 2.83GHz RAM: DDR2 4 GB 800 MHz
256	340	240
128	440	340
64	480	430
32	480	480
Disabled echo canceller	480	480

Load Test Conclusions

- For G.729 -> E1 calls
  - Quad core processor (Q9550, 2.83 GHz) provides 50% better results
- For G.711 alaw -> E1 calls
  - Dual core processor (E8400, 3 GHz) provides 24% better results
- For systems with large number of FXS:
  - Dual core processor (E8400, 3 GHz) is best
- **Important Note**: processing-intense applications such as call centers, conference bridges and predictive dialers will require the ***more robust processor***!!!

Guidelines for Best Performance

- High CPU core speed
- Fast RAM
- Evenly distributed hardware interrupts handling between cores
- Hyper-threading should be disabled
- Delegate most work on hardware interrupts to so-called 'tasklets'
- *The bottom line: it is impossible to get clear guidelines from hardware manufacturers, so test, test, and test some more...*

THANK YOU

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