



Going Green Makes Economic Sense

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A person is climbing a ladder against a blue background with a globe-like pattern. The person is wearing a dark jacket and a cap, and is positioned on the left side of the frame. The ladder is made of white rungs and is leaning against the globe. The overall scene is dimly lit, with the person's face and the ladder rungs being the primary light sources.

Agenda

- Why Go Green?
- What stopped us in the Past?
- How we did it.
- Benefits reaped.
- Resource Available

A person wearing a white protective suit and a mask is working in a server room. The person is standing in a narrow aisle between rows of server racks. The lighting is dim, and the overall atmosphere is technical and focused.

Why Go Green?

- Lower Carbon Footprint helps in saving the environment: (Source: SR Research)
1 Server= Midsize Sports Car (15mpg)
5B yearly to power Servers in Asia Pac
- Significant Energy Cost Savings on Data center Operation.
- Better/Higher Performance for hosted clients
- Easier Security and Management
- Increase (Limited) Hosting Capacity

What Stopped us in the Past?

- Lack of Advances in Hardware
 - High Speed Processors with low power consumption was not available
 - High capacity drives with low power consumption were not available
- Lack of reliable Server Virtualization Software
- Initial test deployments did not make much economic sense. (sp with increased support issues)

A person wearing a hard hat and safety vest is walking through a server room aisle, illuminated by overhead lights. The server racks are visible on both sides of the aisle.

How we did it.

- Took advantage of technological advancements
 - Upgrade Server hardware
 - Server Consolidation/Virtualization
- Smarter cooling procedures
 - Lower loads @ Night
 - Air Flow Layout

A person in a dark environment, possibly a server room, looking at a glowing screen or device. The scene is dimly lit, with the person's face and the device they are looking at being the primary light sources. The background shows some structural elements of the room, possibly racks or panels.

Technology Advancements

- High Powered CPUs
 - Quad Xeon, and Corei7
- Low Power Storage Devices
 - 2.5” Hard drives
 - SSD
- Server Virtualization
 - Windows 2008 HyperV
 - Parallels’ Virtuozzo
 - VMWare
- Flourescent -> Compact Bulb->LED

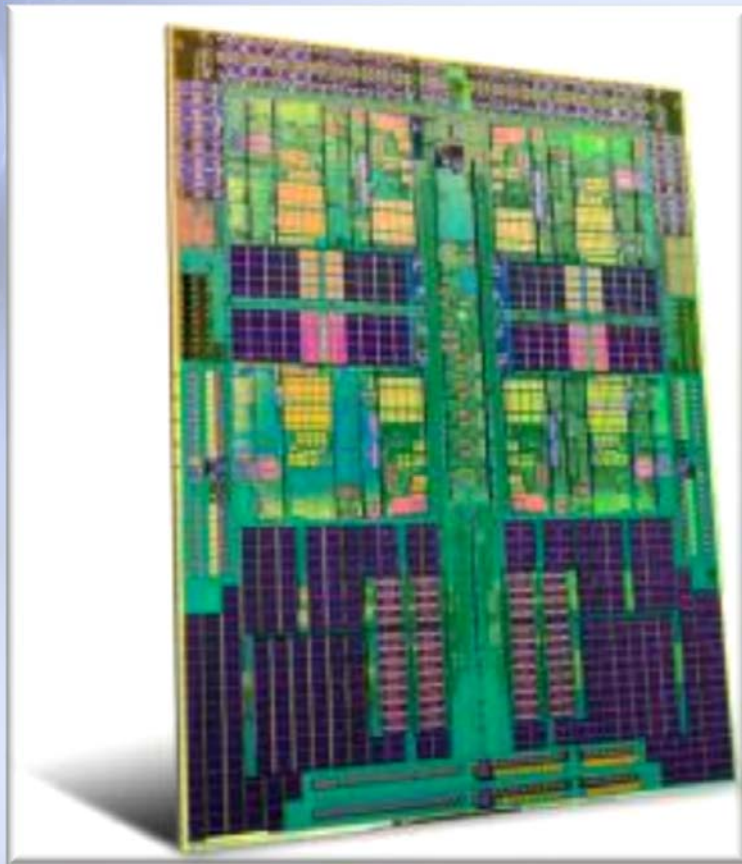
Higher Processing Power @ Lower energy consumption

Compare Processors

Name	Intel® Core™ i7-940 Processor (8M Cache, 2.93 GHz, 4.80 GT/s Intel® QPI)	Intel® Core™ i7-920 Processor (8M Cache, 2.66 GHz, 4.80 GT/s Intel® QPI)	Intel® Xeon® Processor X3210 (8M Cache, 2.13 GHz, 1066 MHz FSB)	Intel® Xeon® Processor E5405 (12M Cache, 2.00 GHz, 1333 MHz FSB)
Frequency	2.93 GHz	2.66 GHz	2.13 GHz	2 GHz
Front Side Bus			1066 MHz	1333 MHz
Cache	8 MB	8 MB	8 MB	12 MB
Product Family	Product Family	Product Family	Product Family	Product Family
Code Name	Bloomfield	Bloomfield	Kentsfield	Harpertown
Intel® 64 Architecture	✓	✓	✓	✓
Intel® Virtualization Technology	✓	✓	✓	✓
Enhanced Intel SpeedStep®	✓	✓	✓	✓
Demand Based Switching	✓	✓	✗	✗
Intel® Trusted Execution Technology	✗	✗	✗	✗
Execute Disable Bit	✓	✓	✓	✓
Intel® Stable Image Platform	✗	✗	✗	✗
Mfg Avail	2+ Yrs	2+ Yrs	2+ Yrs	2+ Yrs
Product Status	Launched	Launched	Launched	Launched
Launch Date	Q4'08	Q4'08	Q1'07	Q4'07
Number of Cores	4	4	4	4
Lithography	45 nm	45 nm	65 nm	45 nm
Core Voltage	0.800V-1.225V	0.800V-1.225V	0.85V-1.5V	0.975V-1.212V
Max TDP	130 Watts	130 Watts	105 Watts	80 Watts
Tcase	67.9°C	67.9°C	62.2°C	67°C
Package Size	42.5mm x 45.0mm	42.5mm x 45.0mm	37.5mm x 37.5mm	37.5mm x 37.5mm
Bulk 1k Estimated Price	\$562.00	\$284.00	\$188.00	\$209.00
Sockets	FCLGA1366	FCLGA1366	LGA775	LGA771

AMD's 'Sip Energy'

- To be available 2nd Qtr 09
- Quad Proc Under 55 watts !

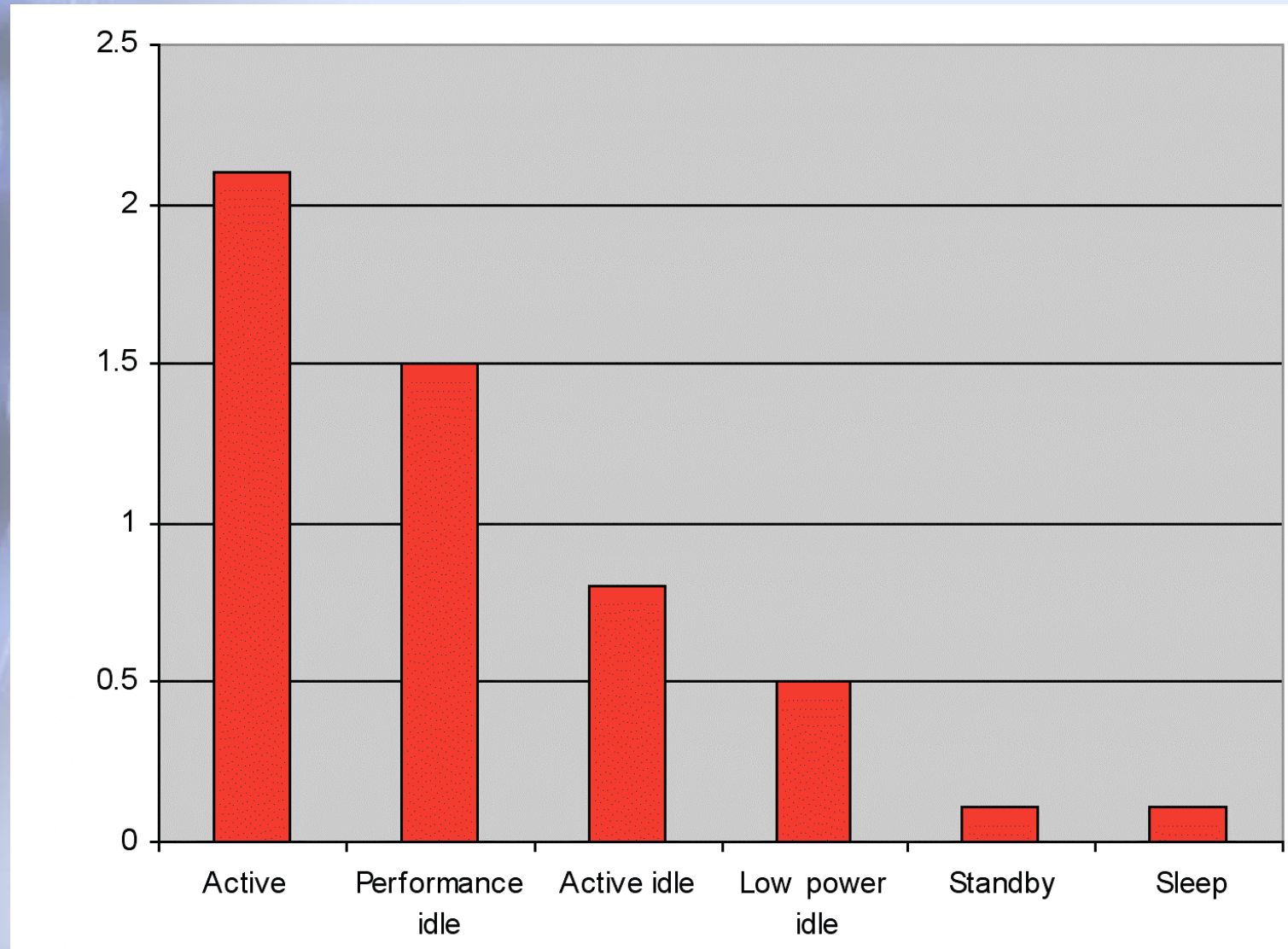




Advances in Storage Devices

- Using 2.5" Vs 3.5"
 - 2.1 watts vs 9.5 watts
 - 1.4 m MTBF vs 500K MTBF
 - Lower Surface Temperatures
- Ordered 2.5" bracket kit for retrofitting

Power Saving Features of 2.5"



SSDs (Solid State Drives)

- Ref SSD (Intel X25E)
- Compared with 2.5"
 - Even lower power @ .06W!
 - Higher MTBF @ 2million hours!
 - Capacity of 32gb, 64gb, 128gb(samsung), 256gb(samsung), 512gb(toshiba)
 - Wider Operating Temperature
 - Higher Operating Shock 1000G/0.5ms
- Ideal for boot or system drives
- (Included as FYI. Not Implemented Yet)

SSDs

- See Also
- <http://www.youtube.com/watch?v=Dt6VbOY3xE0>



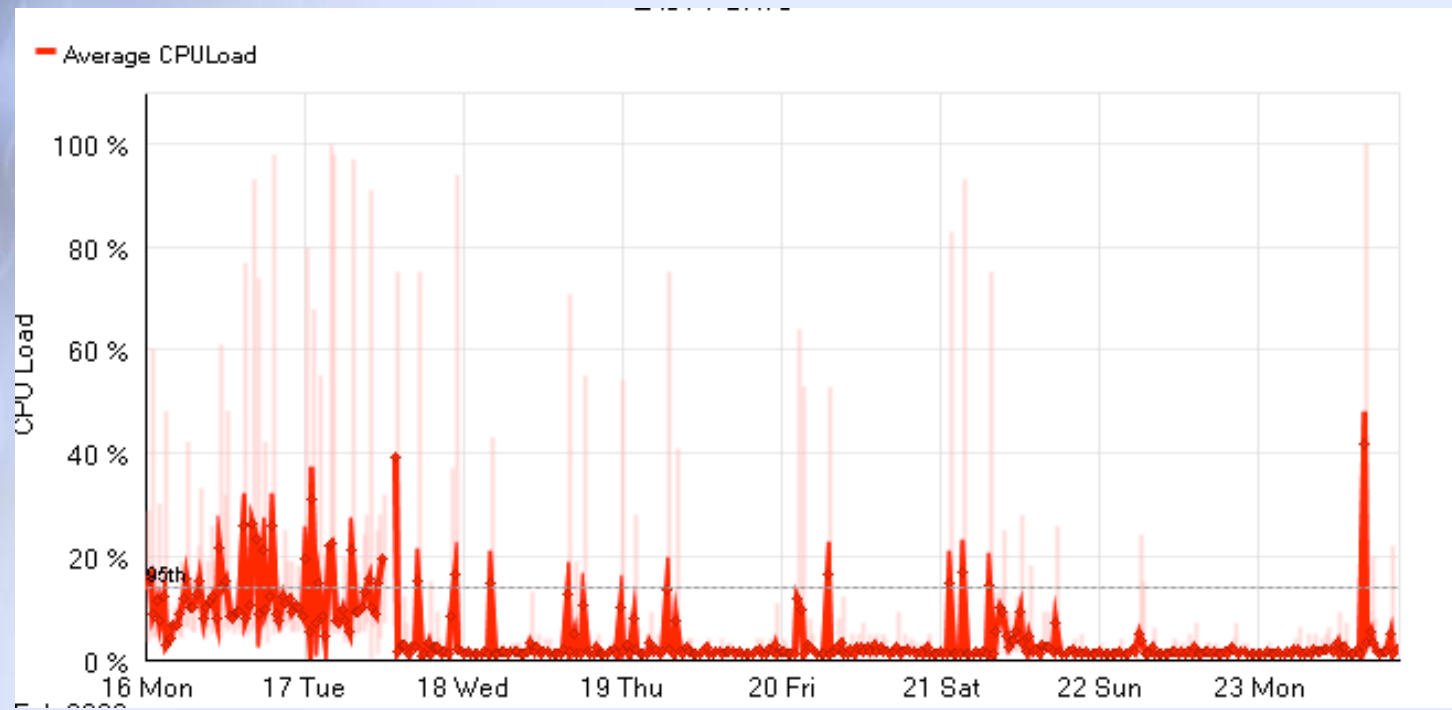
A person wearing a hard hat and safety vest is walking through a server aisle, looking at a server rack. The scene is dimly lit with blue and white tones.

Server Consolidation

- Migrated applications on 20 servers (now retired) into 4 Quad Xeon Servers
- Reduced Wiring Jungle
- Reduced Attack footprint
- Increased Individual app performance!
(60 % of the time the individual server load is idle, w/ Server Consolidation, each VS can use that 60% extra capacity!)

Better Applications?

- 25X better PHP on IIS 7 fastcgi support?
- 50% faster PHP on litespeed vs Apache?





Smart Cooling Procedures

- Reduce AHUs from 3 Units during the Day to 2 Units during the night
- Looking at Inverter Technology (4 ticks)
- Changed the Rack layout to spread heat away from cooler air flow
- Monitored Cisco Router Temperature via SNMP

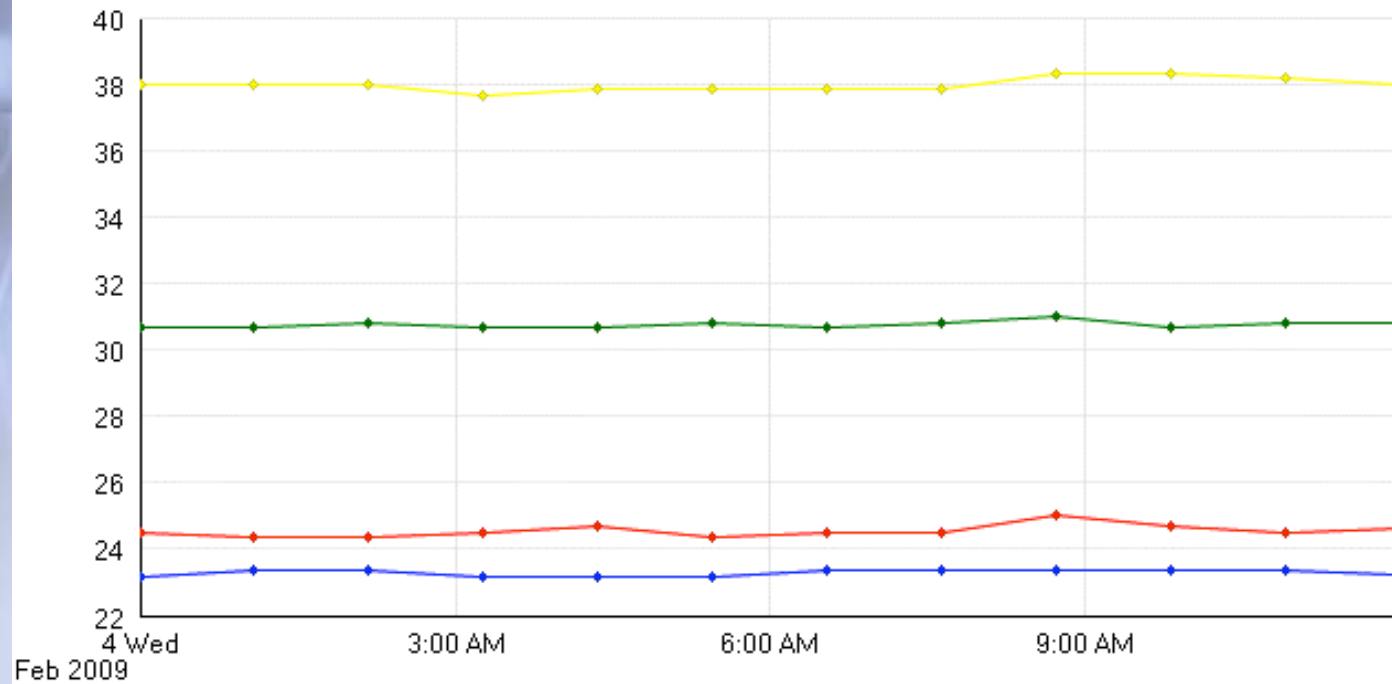
SNMP monitoring of Cisco Router Temp via MIB

Custom Chart - ciscoEnvMonTemperature1StatusValue - Universal Device Poller Chart

ciscoEnvMonTemperature1StatusValue - Universal Device Poller Chart

TODAY
RTR-CAL-7206

- Temperature1
- Temperature2
- Temperature3
- Temperature4





Benefits Reaped

- Smaller number of Servers = Increased Rack Space available..(also lesser switch ports)
- Lower energy consumption = Savings on energy costs
Collateral savings for:
 - Backup UPS systems
 - Backup Power Generators
- Higher Web Performance from sharing Quad Xeon Processors.
- Faster Disaster Recovery via File Image of the Virtualized Servers

Resources/References

- Intel QuadXeon, Core i7
- Intel X25e
- Windows2008 HyperV
- Parallels Virtuozzo
- VMWare
- https://roianalyst.alinean.com/xeon_server_estimator_virtualization/launch.html

Thank You

- Wilson L. Chua
- www.bitstop.ph
- www.bnshosting.net