



Experiences with VMWare Virtualisation

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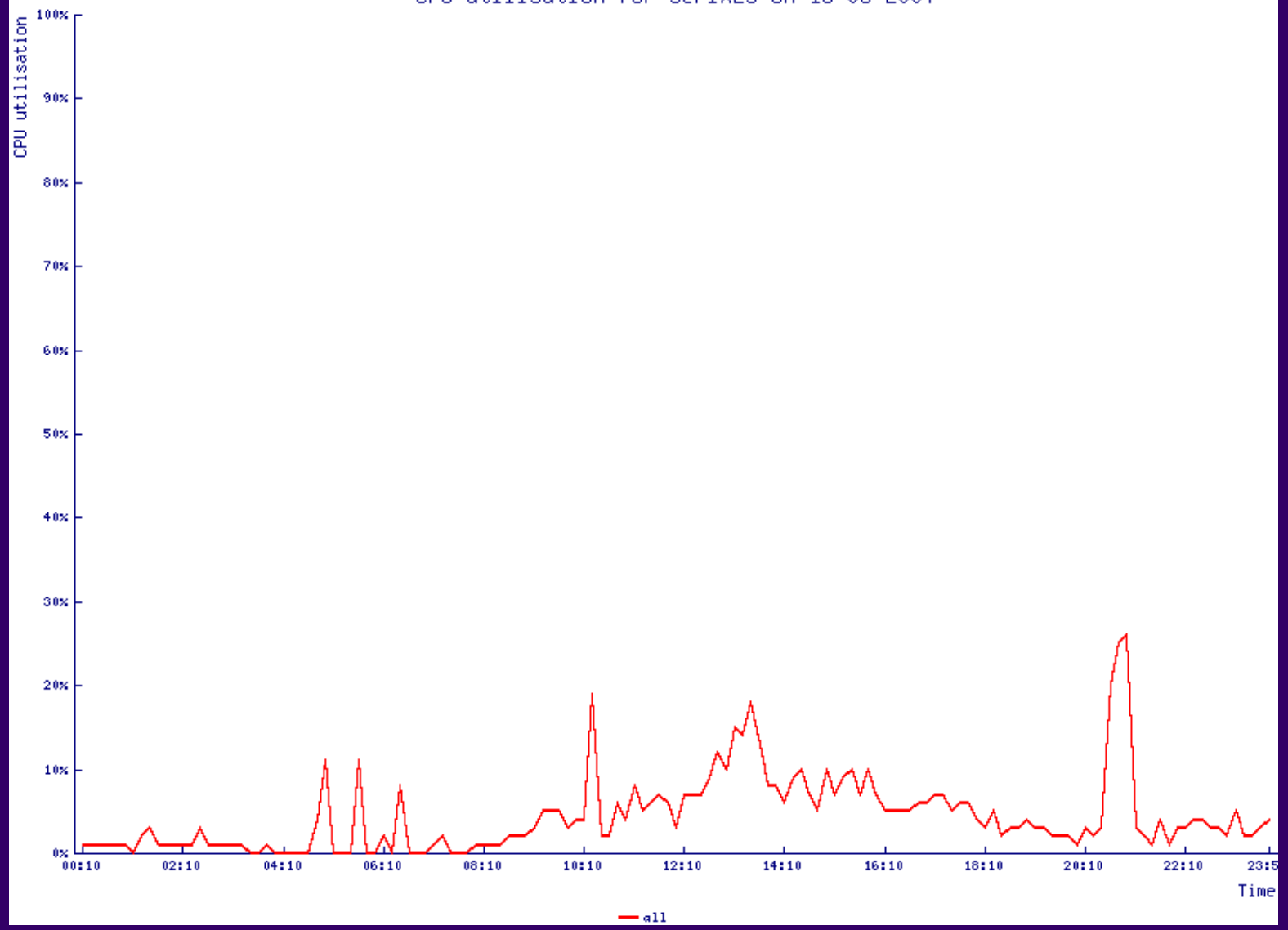
University of Essex



Infrastructure: Summer 2005.

- 80+ servers (50/50 split of Linux (Debian) and Windows).
- Close examination of servers showed ...
 - Lots of unused CPU cycles

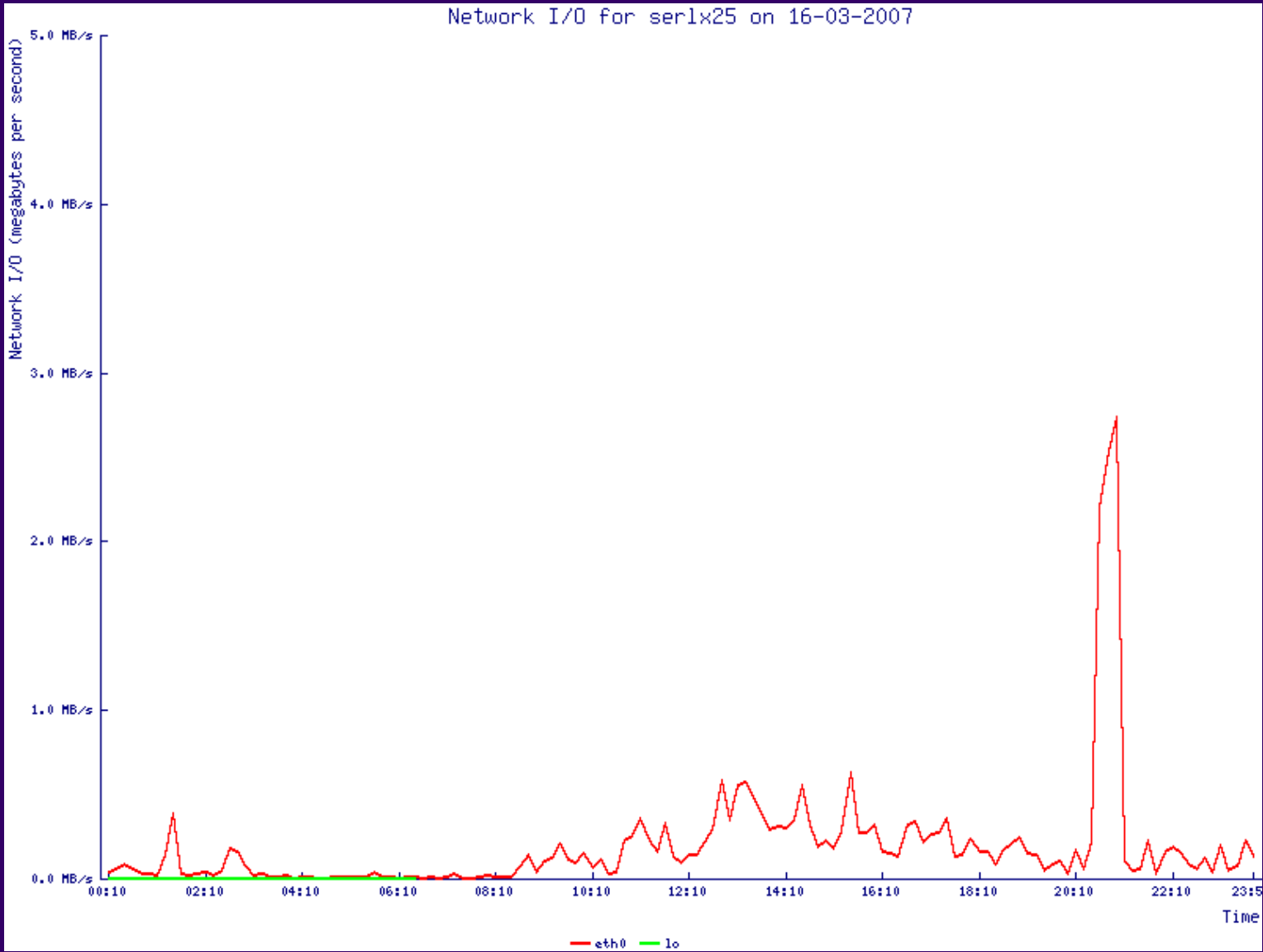
CPU utilisation for serlx25 on 16-03-2007





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- Close examination of servers showed ...
 - Lots of unused CPU cycles
 - Lots of unused network capacity





Infrastructure: Summer 2005.

- 80+ servers (50/50 split of Linux (Debian) and Windows).
- Close examination of servers showed ...
 - Lots of unused CPU cycles
 - Lots of unused network capacity
 - Lots of unused disk capacity
- So, maybe we could benefit from virtualisation?

Infrastructure: Autumn 2006

- Planning to replace 6 of 8 Linux file servers in 2006
 - Historically, each server had its own disks
 - And at least 3TB storage would be required
 - So, 2006 might be a good year to invest in a SAN ... BUT
 - No experience of SAN
 - Big bang replacement too risky



Initial plan: Summer '05

- Purchase small SAN with upgrade capacity
- Attach
 - 2 x Exchange servers
 - 1 x Windows file servers
- Gain some experience of using SAN and get a feel for its capabilities
- Upgrade SAN or re-consider in Summer '06



But what about virtualisation?

- Requirements
 - Must run Linux (preferably Debian)
 - Must run Windows Server
 - Ideally should allow SAN connectivity
 - Ideally should be supported!



	Linux Support	Windows	SAN	Support
XEN				
Microsoft Virtual PC				
VMWare ESX Server				



	Linux Support	Windows	SAN	Support
XEN	Y	?	?	?
Microsoft Virtual PC				
VMWare ESX Server				



	Linux Support	Windows	SAN	Support
XEN	Y	?	?	?
Microsoft Virtual PC	N	Y	?	Not really
VMWare ESX Server				



	Linux Support	Windows	SAN	Support
XEN	Y	?	?	?
Microsoft Virtual PC	N	Y	?	Not really
VMWare ESX Server	Y	Y	Y	Y*

Revised plans: Summer '05

- Purchase small SAN with upgrade capacity
- Attach 3xDell PowerEdge 2850s, 8G RAM, 2x2.8G CPU
 - 2 x VMWare ESX Server
 - Serving 2 x Exchange servers
 - Some debian servers
 - Other 'experimental' stuff
 - 1 x Windows file server



Initial results

- Exchange servers worked fine.
- Interestingly, each exchange server only required
 - 1.5G RAM
 - 1x2G CPU
 - + disk space (☹)
- Linux VMs worked fine too
- Performance good all round



Additional VMWare feature

- VMotion
 - Allows live moving of running virtual server between two physical VMWare servers
 - Requires that virtual servers be on SAN
 - Good for DR
 - Good to show off too!



VMWare Management

- via SSH and command line
- via web client

root@seresx04.essex.ac.uk: VMware Virtual Infrastructure Web Access - Windows Internet Explorer

https://seresx04.essex.ac.uk/ui/vManage.do

File Edit View Favorites Tools Help

VMware Web Access

seresx04.essex.ac.uk

Virtual Machines

- seresx04.essex.ac.uk
- serlx17 - servaXY fileserver
- serlx24 - serveXY fileserver
- serlx25 - servfXY fileserver
- serlx43 - nagios server
- sernt12 - exchange1
- sernt24 - domain controller
- sernt26 - exchange4

Summary

Virtual Machines

Name	CPU	Memory
serlx17 - servaXY fileserver	111 MHz	1 GB
serlx24 - serveXY fileserver	64 MHz	1 GB
serlx25 - servfXY fileserver	115 MHz	1,017 GB
serlx43 - nagios server	106 MHz	391 MB
sernt12 - exchange1	298 MHz	1 GB
sernt24 - domain controller	123 MHz	818 MB
sernt26 - exchange4	333 MHz	1 GB

Items 1 - 7 / 7

Local intranet 100%

Start Command Prompt Event Viewer Active Directory Use... DameWare Mini Rem... root@seresx03:/vmf... sernt29 - Virtual Infr... root@seresx04.es... 22:09



VMWare Management

- via SSH and command line
- via web client
- via Virtual Infrastructure

sernt29 - Virtual Infrastructure Client

File Edit View Inventory Administration Help

Inventory Scheduled Tasks Events Admin Maps

Hosts & Clusters

- Essex Servers
 - seresx00.essex.ac.uk
 - seresx01.essex.ac.uk
 - seresx02.essex.ac.uk
 - seresx03.essex.ac.uk
 - seresx04.essex.ac.uk**
 - serlx17 - servaXY file
 - serlx24 - servaXY file
 - serlx25 - servfXY file
 - serlx43 - nagios serv.
 - sernt12 - exchange1
 - sernt24 - domain cor
 - sernt26 - exchange4
 - Southend Servers

seresx04.essex.ac.uk VMware ESX Server, 3.0.1, 32039

Summary Virtual Machines Resource Allocation Performance Configuration Tasks & Events Alarms Permissions Maps

General

Manufacturer: **Dell Computer Corporation**
 Model: **PowerEdge 2850**
 Processors: **4 CPU x 2.793 GHz**
 Processor Type: **Intel(R) Xeon(TM) CPU 2.80GHz**
 Hyperthreading: **Active**
 Number of Nics: **2**

State: **connected**
 Virtual Machines: **7**
 VMotion Enabled: **yes**
 Active Tasks:

Resources

CPU usage: **1788 MHz**
 4 x 2.793 GHz

Memory usage: **7.52 GB**
 12.00 GB

Datstore	Capacity	Free
EX_O5	133.50 GB	16.19 GB
Disaster Recovery...	199.75 GB	8.11 GB
VM Disk	309.50 GB	23.86 GB
VMDisk2	805.00 GB	36.58 GB
MDrives	1.57 TB	115.32 GB
ESX04 Local Disk	26.25 GB	22.68 GB
EX_DATA	534.50 GB	118.51 GB
EX_LOGS	133.50 GB	38.38 GB

Network: VM Network

Commands

- New Virtual Machine
- New Resource Pool
- Enter Maintenance Mode
- Reboot
- Shutdown

Recent Tasks

Name	Target	Status	Initiated by	Time	Start Time	Complete Time
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Tasks Alarms

Command Prompt Event Viewer Active Directory Users a... DameWare Mini Remote ... root@seresx03:/vmfs/v... sernt29 - Virtual Infra... CAMPUS\bret 22:05

sernt29 - Virtual Infrastructure Client

File Edit View Inventory Administration Help

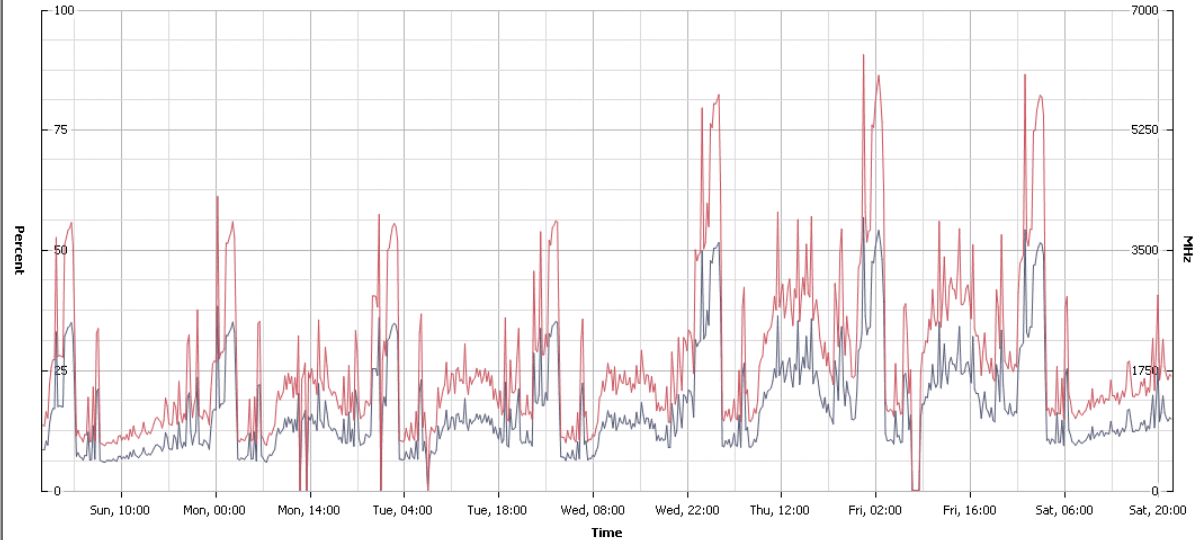
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seresx04.essex.ac.uk VMware ESX Server, 3.0.1, 32039

Summary Virtual Machines Resource Allocation Performance Configuration Tasks & Events Alarms Permissions Maps

CPU/Past Week, 10/03/2007 22:05:46 - 17/03/2007 22:05:46 [Change Chart Options...](#)



Performance Chart Legend

Key	Object	Measurement	Units	Latest	Maximum	Minimum	Average
■	seresx04.essex...	CPU Usage (Average/Rate)	Percent	14.92	56.92	0	16.96
■	seresx04.essex...	CPU Usage in MHz (Average/Rate)	MHz	1667	6359	0	1895.38

Recent Tasks

Name	Target	Status	Initiated by	Time	Start Time	Complete Time

sernt29 - Virtual Infrastructure Client

File Edit View Inventory Administration Help

Inventory Scheduled Tasks Events Admin Maps

Virtual Floppy 0 Virtual CDROM(ide0.0)

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 - sernt12 - exchange1
 - sernt24 - domain cor
 - sernt26 - exchange2
- Southend Servers

serlx17 - servaXY fileserver

Summary Performance Tasks & Events Alarms Console Permissions Maps

CPU/Past Week, 10/03/2007 22:06:41 - 17/03/2007 22:06:41 [Change Chart Options...](#)

Performance Chart Legend

Key	Object	Measurement	Units	Latest	Maximum	Minimum	Average
■	serlx17 - servaXY...	CPU Usage (Average/Rate)	Percent	5.02	21.02	0	4.85
■	serlx17 - servaXY...	CPU Usage in MHz (Average/Rate)	MHz	139	586	0	134.56

Recent Tasks

Name	Target	Status	Initiated by	Time	Start Time	Complete Time

Tasks Alarms

CAMPUS\bret

Start Command Prompt Event Viewer Active Directory Users and Groups DameWare Mini Remote Control root@seresx03:vmfs/v... sernt29 - Virtual Infra... 22:07



Infrastructure: Spring 2006

- Convinced of benefits of VMWare
- Windows file server migrated into VM infrastructure
- Physical server now used as additional VMWare server
- More servers migrated to VMWare

Infrastructure: Summer 2006

- Additional SAN disk purchased
- Additional 2 SAN attached VMWare servers
- Upgraded initial 3 SAN attached servers (more memory, faster CPUs)
- 7 Linux file servers now served via VMWare
- Total of 38 Virtual servers (plus room for expansion)



What wouldn't we do on VM

- Anything requiring intensive CPU
 - Incoming SMTP servers (exim / MailScanner / SpamAssassin)
 - Compute servers
 - but what are desktop machines these days ...
- Possibly not for MS SQL
- Our time server



Problems

- Some NFS problems not previously present ... might be possible kernel issue.
- VMotion issues not mentioned by sales people
- Provides new and creative ways for administrators to shoot yourself in the foot ... (see <http://people.reed.edu/~tuckers//jokes/foot.html>)
- Can have timing issues



Thanks for listening