



Server Consolidation: A Total Approach

Paul O'Sullivan

Strategy and Architecture Manager
BNP Paribas UK

Overview

- What is Server Consolidation?
- Different approaches:
 - Virtual Machines - Windows
 - Logical Partitions - Sun/HP/IBM/DEC
 - Physical Partitions - HP
 - Single Instance OS - IBM
 - Multiple Instance OS - HP/IBM/Windows
 - Mixing OS's on same physical machine
- **Case Studies**
- How to size servers for Server Consolidation
- Conclusions

What is Server Consolidation?

- Definition and Drivers for Change
- Current market definition
- Comparison with other IT consolidation programs

Definition of Server Consolidation:

“Desire for maximum operational efficiency from your infrastructure with minimum business risk.”

Paul O’Sullivan (me)



Drivers for Change

Infrastructure, not business-driven initiative

- 'If it is not broken, then why fix'?

Minimum disruption to normal business operations

- Offer increased level of service
- Developers want more processing power, distributed applications
- CIO want a reduction in costs with no sacrifices in quality of service

Desire to reduce infrastructure overheads

- Networks - Cables, Ports
- Storage - local SCSI drives, shelves, cabling, rack space
- Data Center - Heat and Power, Cabinets, air-conditioning
 - Finite data center room, especially Western Europe
- Legacy hardware: maintenance and costs

Gartner - survey

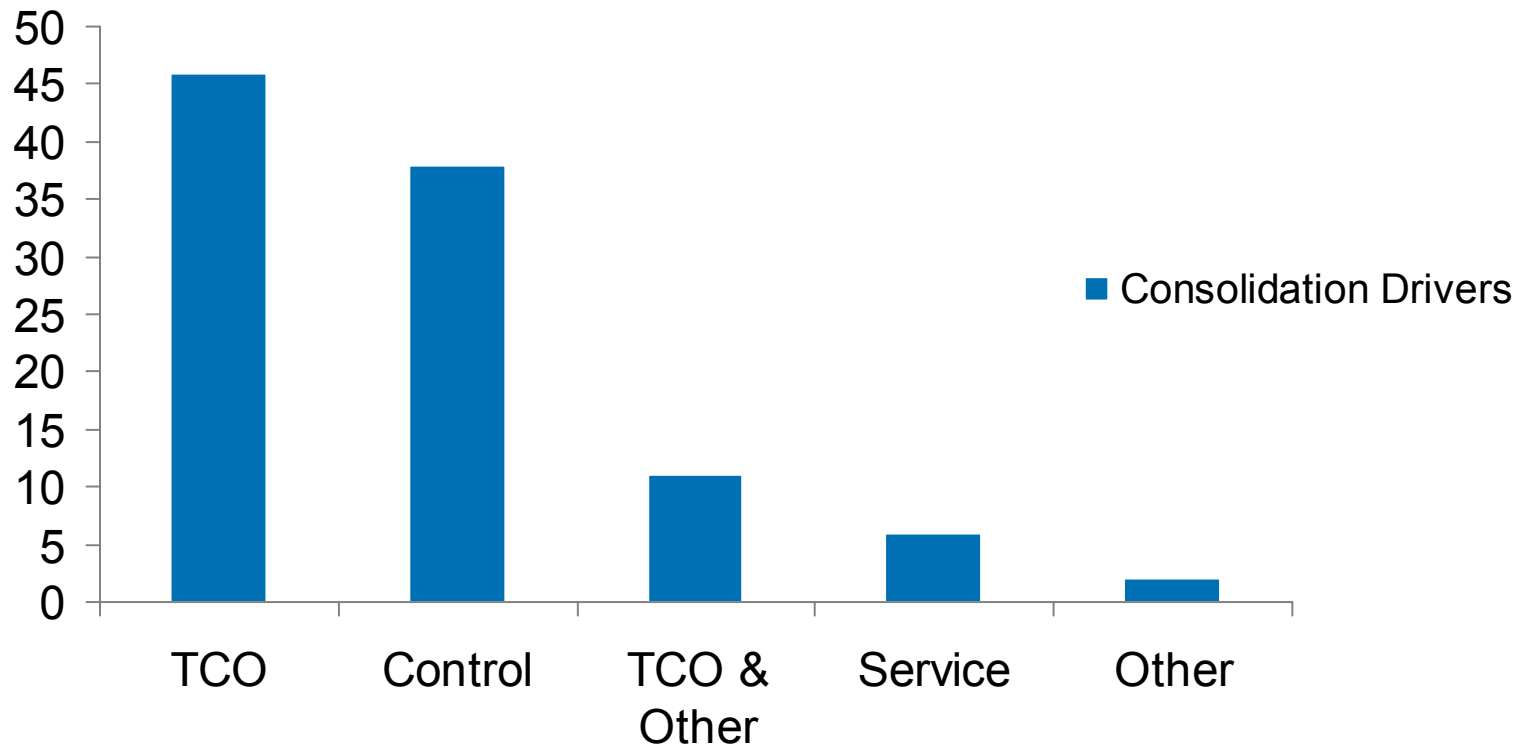
Five Reasons for Server Consolidation Program

1. Only reason is to reduce total cost of ownership (TCO)
2. Mainly to reduce TCO, but other reasons also
3. To gain control in order to manage the systems better (security, availability, disaster recovery)
4. To provide better service and agility
5. Other?

Gartner Research (December 2003)

Responses

Gartner Survey: December 2003



Does consolidation work elsewhere?

Many enterprises have already done this in Storage Consolidation

Chosen technologies which offer guaranteed interoperability between OS and platforms

- EMC - HP, Tru64, VMS, Solaris, IBM, Windows 2000/NT
- HP - HP, Tru64, VMS, Solaris, IBM, Windows 2000/NT - EVA
- Interoperability on storage management software
- Switches: Brocade/McData - Seamless operation between vendors

We can learn from storage vendors in approach



Cross-vendor approaches

- Windows
- UNIX
- Other

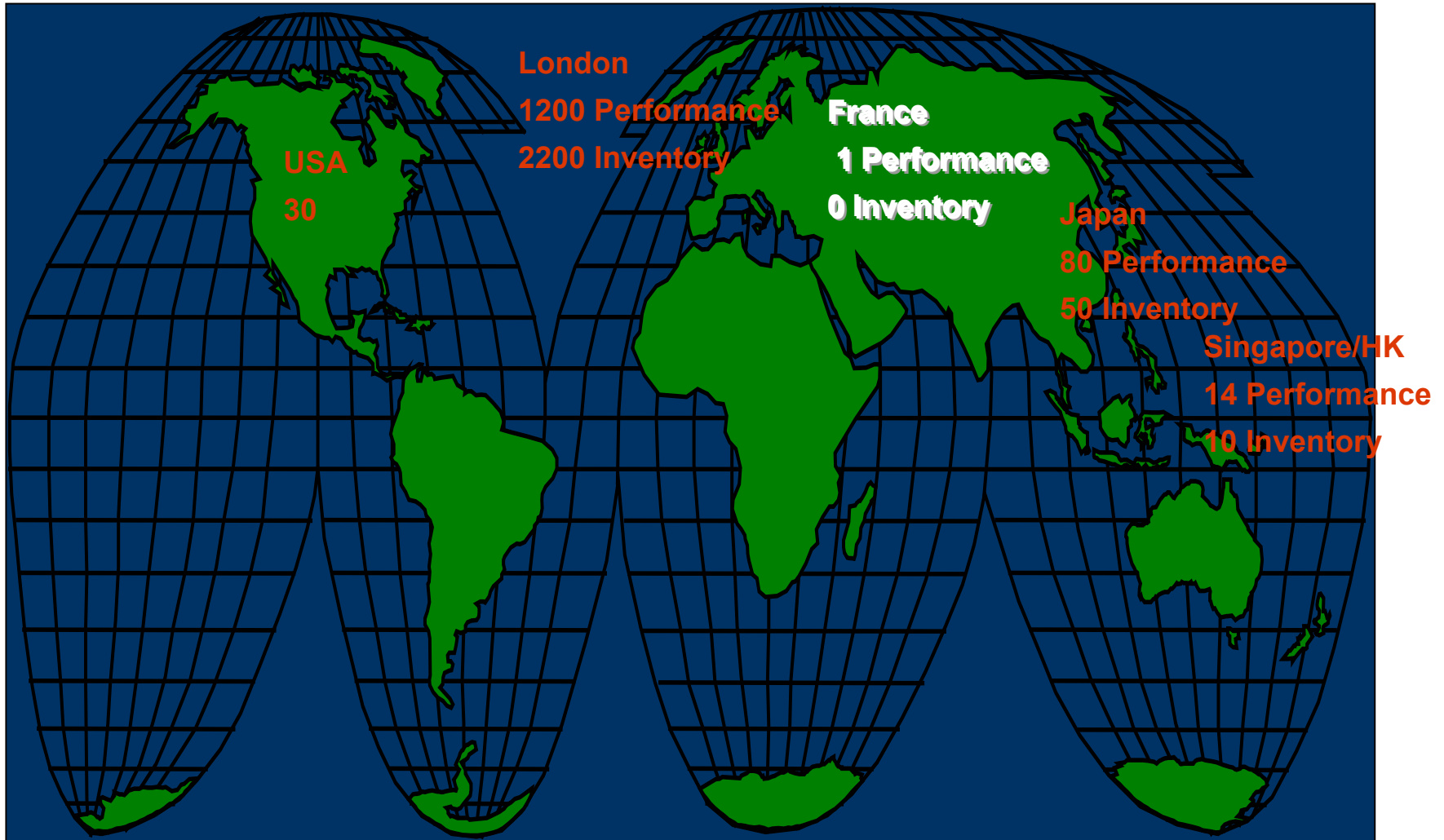
Approaches for Windows - issues

Common Issues for Windows platforms

- Many enterprises, lots of small & 'cheap' machines
- But too many physical machines, NIC's, local storage, patch panels, cables, power supplies, power draw etc
 - Inefficient use of resources
 - Many machines with low CPU consumption anyway
 - DHCP issues
 - Overnight power-off of servers
 - High maintenance - parts

Find out your current server population first
Use asset capture products with autodiscovery

Server Consolidation Infrastructure rollout BNPP



Controlled by two central servers in London

Approaches for Windows - virtualize

Virtualizing the environment

Use software, such as Vmware , to: -

- Consolidate storage - moved to SAN, retire 20Tb of physical SCSI drives
- Consolidate NIC: 2 or 3 per physical Vmware host, retire 200 NICs, patching, cables etc.
- Offer Resilience - SAN storage for development. Re-usable storage
- Less heat, power, cabling, asset inventory

Issues

Microsoft support issues with VMware

Storage - grow SAN infrastructure to support new load from physical servers.

Licensing - Server Consolidation is not Software consolidation!
License costs may kill you - most vendors do not do special deals...

Approaches for UNIX - platforms

All vendors offer consolidation platforms

- Very Large Footprint and expensive
- Frequently, only vendor allowed to maintain hardware
- Tru64/VMS licensing issues
- OS version issues:

Cause application re-certification - who pays?

- Non-standard depth - 24+ inches in 42U base

Server Market in transition

HP: DECAAlpha to Itanium - wait for hardware

Waiting for HP-UX 11.3 -port from Tru64

Waiting for VMS 8.2 -port from Alpha/VAX

Sun: - Sparc to Intel - port from Sparc

IBM - Power V - No porting required



Approaches for UNIX - partitions

Partitioning

Hard partitions

- Electrically isolated nodes. Can be powered off independently of chassis
- HP GS series 160,320,1280
- HP Superdome - HPUX only today

Good for Resilience. Less risk. One hardware fault on a node (CPU, memory) cannot crash another.

Soft Partitions

- Non-isolated nodes.
- One component can cause whole machine to fail (unlucky)
- Hard to get maintenance windows
- eg IBM pSeries 670/690,870,P680, Sun E1xk
- Vendors generally say 'Up to customer to plan with business users for downtime'

Approaches for UNIX - limits

Minimum partition sizes today

- IBM 1 CPU (5.3 sub-CPU for production 12 months away)
- HP GS320, 160 4 quad building block
- HP 1280 2 CPU from 8 octal (?) building block
- HP Superdome (HP-UX PA-RISC sub-CPU now, other OS following)
- Sun 1 CPU

Consolidation of many low power, older development hardware onto newer components

- New hardware is vastly over-powered for development systems
- Clearly can be uneconomic

Approaches for UNIX - software

If using single OS instance on Server Consolidation Platform

- **Software** tools are not really up to the job to spread resources
- All vendors have software workload managers
 - Problem is that cannot partition IO, Memory, Fiber Channel
- CPU can be partitioned, but only WLM-managed process can hit the common page file and affect the whole system

Not recommend for critical Tier 1 production systems

Approaches for UNIX - single or multiple nodes?

Multiple nodes

- Ensure that priority production nodes have access to dedicated fiber channel cards
 - Lay out partitions with development node next to production node to reduce over IO load through centralized bus.
 - All these server consolidation platforms have finite internal bus speeds and it is unlikely that if you put all tier 1 production systems together, performance would be optimum

Case Studies: BNP Paribas London

- Current Status of Server Consolidation
 - Windows platforms
 - UNIX platforms

Case Study: BNP Paribas London

Had desire for Server Consolidation

Reasons:

- Finite Data Center space

- Increasing server population

Platforms:

- Windows - application servers

- Linux - application servers

- VMS - application servers

- UNIX - database servers

 - AIX program

 - HP-UX program

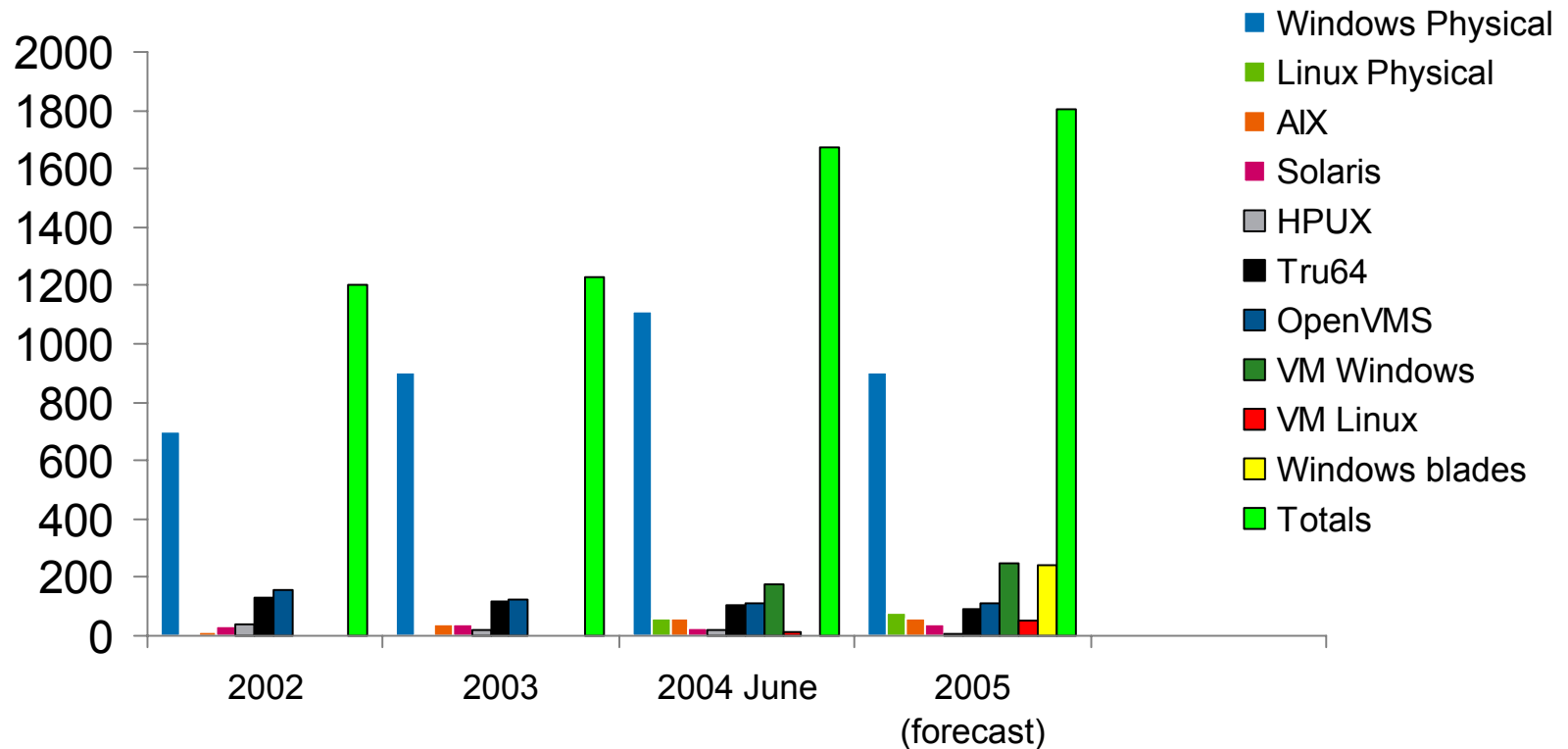
 - Tru64 program

 - Sun program

 - VMS program

Case Study

Total Server Numbers London 2002-2004



Case Study: BNP Paribas London

Through 2000-2003 increase in physical servers

- New applications and upgrading in applications
- Migration from OpenVMS application servers to NT

2004-2005 Migration from NT to Windows 2000

2004 - VMware program introduced

- VMware - virtual servers on single physical host.

Development deployment today:

- 25 new Physical Servers hosting 198 Windows development nodes
- 21 existing physical nodes migrated to virtual servers
- Requirements for new development servers fulfilled by VM environment

Case Study: Windows benefits

Physical

77 New development servers saved

5 cabinets saved. Average U size: 200

NICs 90+ cards

Storage saved: 154 18Gb drives, average 90 36Gb drives

CPU's saved: over 140

Memory saved: over 200Gb

Time and management

231 Build mandays: (average 3 mandays/server) = \$138k

77 Project mandays: (average 1 mandays/project/server) = \$69k

19 Patching mandays: 19 + (weekend work moves/changes) = \$7.6k

Administration

19 Procurement/Asset Tracking/Data Center Planning (set 0.25 day per server)

Unable to accommodate new requirements in Data Centers without VMware



Case Study: HPUX Server Consolidation

HPUX PA-RISC

- 21 Servers - 3+ years old
- Expensive to maintain
- Physically imposing: 5 x 42U+We

Candidates identified

- L,D,K classes

Migrate to IBM AIX for application reasons

- 2 CPU partitions in pSeries per node

Expect to reduce to 2 archive servers by 2005/6

We have 2 Itanium servers in test. Poor support from HP.

No 11i.3 beta program, no VMS 8.1 CD.

Case Study: Tru64 Server Consolidation

Tru64

- 97 Servers 1-7 years old
 - Expensive to maintain, end of life
 - Pedestal and Rack-mounted
- Current Tru64 platform
 - Ingres database applications
- Candidates identified
 - end of life applications not moving
 - migration path to Oracle - replatform onto other UNIX
 - consolidate existing GS partition
 - move enterprise servers to departmental servers

Case Study: AIX Server Consolidation

RS6000

62 Servers 1-3 years old

- All being depreciated
- All rackmounted currently

Candidates identified

- Backup servers not moving
- Current 650M2 not moving (partitionable)
- migration path to new P580 POWER V 2005
 - 5.3 required for sub-CPU partitioning

Case Study: AIX Server Consolidation

P690/670 IBM's platform of choice for consolidation

- 1-16/32 CPU's POWER IV+ 1.7Ghz/1.45Ghz processor
- Up to 512Gb physical memory

Partitioning Issues

- Lowest unit of consolidation = 1 CPU (common across all vendors)
- Sub-cpu consolidation not until AIX 5.3, Power V
- Are we going to use them?
- Probably not - wait until Power V 1-16 CPU comes out end of year

Case Study: Sun Server Consolidation

Sparc

38 Servers 1-5 years old

All rackmounted currently

Candidates identified

Decommissioning in progress

Re-platforming other applications

Residual servers recently-purchased

Small footprint

1-4 CPU's only

No enterprise class machines installed

Expect to reduce Sun by 10 servers by end of year

Case Study: Linux Consolidation

Intel

- 78 Servers 0-1 years old
- 12 Vmware Linux servers

New deployments

- Development servers built on Vmware/Redhat Advanced Server
- Saving 12 physical servers
- Migrated from Intel applications

Case Study: VMS Consolidation

VAX/Alpha

102 Servers 1-15 years old

41 VAXes

61 DECAAlpha

3 GS320

Candidates identified

- Decommissioning in progress
- Moving VAX application to alpha

Residual servers recently-purchased

Move to DS25 or ES45 and park

Expect to reduce VMS by 15 servers by end of year.

Hosting other Group activities may increase

Sizing Enterprises for Consolidation

Asset Capture
Performance Analysis
Capacity Planning

Methodology

Use **Inventory** tool to establish perimeter

Use **Performance Analysis** tool on all nodes for an extended period of time

Identify servers to be consolidated

Use **Capacity Planning** tool

- Define and characterize workloads
- Create/Validate base model – System, workload
- “What if” - Saturation Analysis
- Could we have used the vendors themselves?
 - No.
 - No tools, limited experience, would probably get it wrong
- BNPP London uses PAWZ, FindIT and eCAP from PerfCap Corporation

Asset Capture Tool

Common Problems

- Automated gathering of system configuration
- Had to work across:
 - Windows, Linux, HPUX, Tru64, Solaris, AIX, VMS
- Auto-discovery essential
- Web interface, SQL database
- Ease of deployment and update
- Agent based:
 - SMNP - not enough data
 - Not all servers run SMNP
 - Had to be security-aware - firewalls
 - Had to be cheap, and reliable
- BNPP London choice: PerfCap FindIT

Performance Analysis Tool

Same requirements as Asset Capture Tool

- Automated gathering of system configuration
- Had to work across:
 - Windows, Linux, HPUX, Tru64, Solaris, AIX, VMS
 - Had to be security-aware - firewalls
 - Had to be cheap, and reliable
 - Web interface, SQL database
- BNPP London choice: PerfCap PAWZ (since 1999)

Capacity Planning Tool

Same requirements as Asset Capture/Performance Analysis Tool

- Had to work across:
 - Windows, Linux, HPUX, Tru64, Solaris, AIX, VMS
- Has to identify workloads, response times
- Has to combine workloads on dissimilar platforms
- Has to provide saturation analysis to give headroom
- Has to provide extensive what-if:
 - Change CPU/Memory/SAN
 - Change workload (+/- processes per workload)
 - Change anything (upscale/downsize)
- BNPP London choice: PerfCap Planner (since 1998)
 - My choice (since 1994...)

Asset Capture Example - FindIT

FindIT Client - PerfCap Corporation: Fixed Applet Size - Microsoft Internet Explorer provided by BNP Paribas

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Create Mobil...

Address http://lons00105124:100

BNP PARIBAS

Manage View Help

FindIT

- France
- Japan
- London
- Singapore
- USA

NodeList:

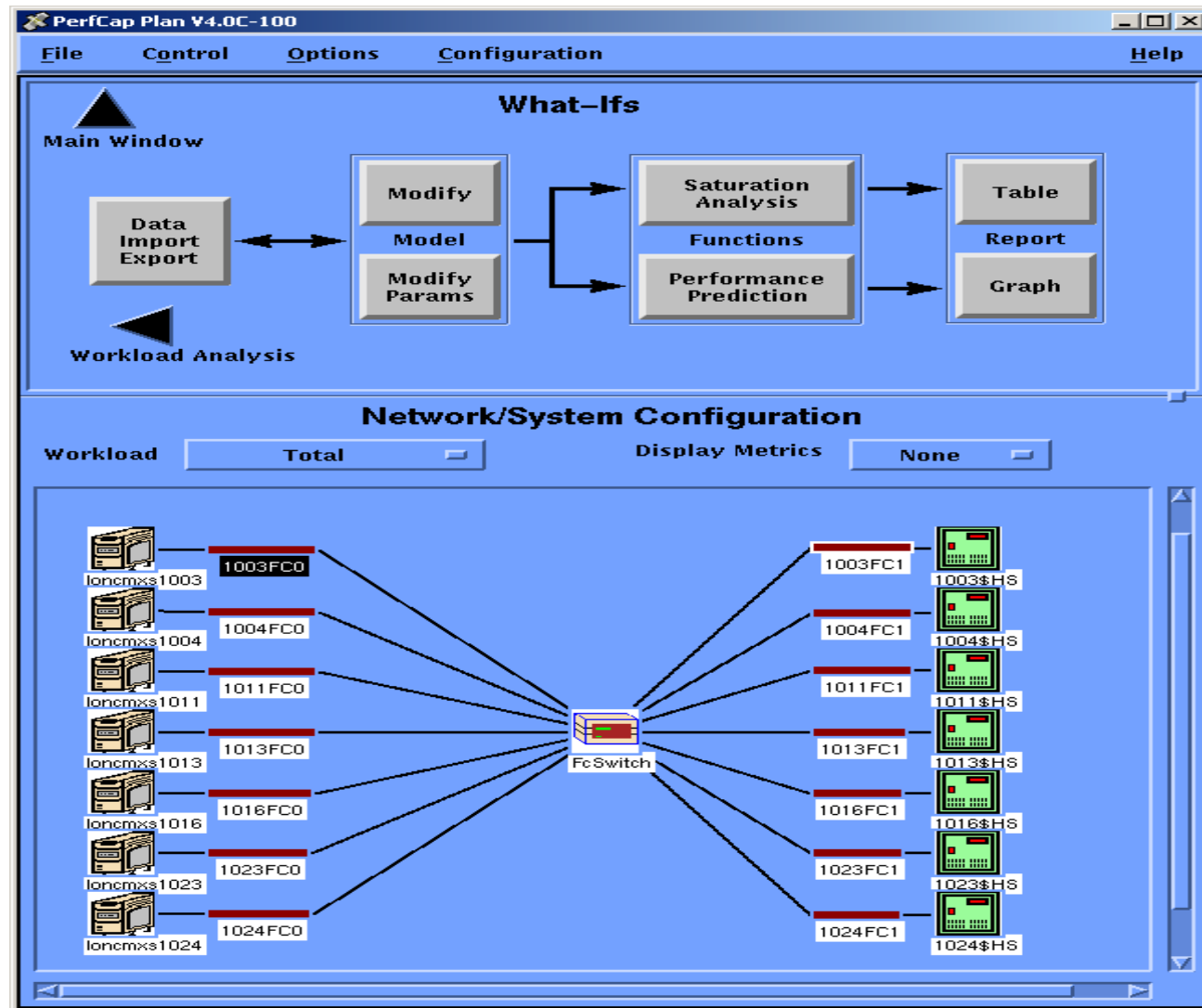
Hostname	OS	OS Version	Model #	Memory	# CPUs	# Disks	Last Boot	Last Change	Last Po
GLMONITO...	SUN		Sun Ultra 2 UPA/SBus (2...	1000.0	1	0		May 12, 2003	
LDNP10	OpenVMS	V7.1-1H1	AlphaServer 1000A 5/500	128.0	1	9	Dec 05, 2002	Jan 15, 2004	Jan 15, 200
LDNP52	OpenVMS	V7.3-1	AlphaServer 1200 5/533 ...	512.0	1	6	Jun 27, 2003	Jan 15, 2004	Jan 15, 200
LHW457	OpenVMS	V7.2-1H1	AlphaServer GS320 6/731	4096.0	4	7	Jan 12, 2004	Jan 15, 2004	Jan 15, 200
LHW459	OpenVMS	V7.2-1H1	AlphaServer 4100 5/533 ...	5120.0	3	8	Sep 10, 2003	Jan 07, 2004	Jan 07, 200
LHW67	OpenVMS	V7.1-1H1	AlphaServer 1200 5/533 ...	512.0	2	6	Aug 10, 2003	Jan 15, 2004	Jan 15, 200
LHW81	OpenVMS	V7.1	AlphaServer 4100 5/466 ...	512.0	1	8	Aug 14, 2003	Dec 12, 2003	Oct 14, 200
LNA850	OpenVMS	V7.2-1	COMPAQ AlphaServer D...	2560.0	2	20	Jan 09, 2004	Jan 15, 2004	Jan 15, 200
LNA870	OpenVMS	V7.2-1	COMPAQ AlphaServer D...	1536.0	2	20	Oct 15, 2003	Jan 15, 2004	Jan 15, 200
LNAR79	OpenVMS	V7.1	VAX 4000-106A	128.0	1	3	Sep 20, 2003	Jan 15, 2004	Jan 15, 200
LNP115	OpenVMS	V7.1-1H1	AlphaServer 1200 5/533 ...	512.0	2	11	Jun 24, 2003	Dec 12, 2003	Dec 03, 200
LNW135	OpenVMS	V7.2-1	COMPAQ AlphaServer D...	1024.0	1	7	Oct 02, 2003	Jan 15, 2004	Jan 15, 200
LNW136	OpenVMS	V7.2-1	COMPAQ AlphaServer D...	1024.0	1	6	Aug 31, 2002	Jan 15, 2004	Jan 15, 200
LNW137	OpenVMS	V7.2-1	COMPAQ AlphaServer D...	1024.0	1	8	Aug 31, 2002	Jan 15, 2004	Jan 15, 200
LNW138	OpenVMS	V7.2-1	COMPAQ AlphaServer D...	1024.0	1	8	Aug 31, 2002	Jan 15, 2004	Jan 15, 200
LNW141	OpenVMS	V7.1	AlphaServer 2100 4/200	512.0	3	8	Jul 30, 2002	Dec 29, 2003	Jan 01, 200
LNW192	OpenVMS	V7.1	VAXstation 4000-90A	128.0	1	9	Dec 29, 2003	Jan 15, 2004	Jan 15, 200
LNW193	OpenVMS	V7.1	VAXstation 4000-90A	128.0	1	6	Aug 23, 2003	Jan 15, 2004	Jan 15, 200
LNW206	OpenVMS	V7.1	VAXstation 4000-90A	128.0	1	5	Sep 10, 2002	Jan 15, 2004	Jan 15, 200
LNW223	OpenVMS	V7.2-2	AlphaServer 1200 5/533 ...	512.0	1	5	Apr 22, 2003	Jan 15, 2004	Jan 15, 200
LNW233	OpenVMS	V7.1-1H1	AlphaStation 250 4/266	128.0	1	8	May 06, 2003	Jan 15, 2004	Jan 15, 200
LNW234	OpenVMS	V7.1-1H1	AlphaStation 250 4/266	128.0	1	9	Jun 25, 2001	Jan 15, 2004	Jan 15, 200
LNW257	OpenVMS	V7.2-1H1	AlphaServer GS320 6/731	4096.0	4	13	Nov 16, 2003	Jan 15, 2004	Jan 15, 200
LNW268	OpenVMS	V7.2-1H1	AlphaServer GS320 6/731	4096.0	4	13	Nov 16, 2003	Jan 15, 2004	Jan 15, 200
LNW2			VAXstation 4000-90	128.0	1	15	Aug 29, 2001	Sep 20, 2003	Dec 03, 200
LNW2			AlphaServer 2100 4/275	1024.0	4	9	Jun 01, 2003	Dec 29, 2003	Dec 03, 200
LNW2			AlphaServer 1000 4/233	384.0	1	6	May 30, 2002	Jan 15, 2004	Jan 15, 200
LNW2			AlphaServer 2100 4/275	256.0	2	6	Sep 03, 2003	Jan 15, 2004	Jan 15, 200
LNW2			VAXstation 4000-90A	80.0	1	6	Dec 18, 2001	Sep 27, 2003	Dec 03, 200
LNW3			VAXstation 4000-90A	128.0	1	8	Jun 30, 2003	Jan 15, 2004	Jan 15, 200

Generate Configuration Report
View Config Changes
Edit FindIT settings
Delete Node from FindIT
Download now
Get Diagram

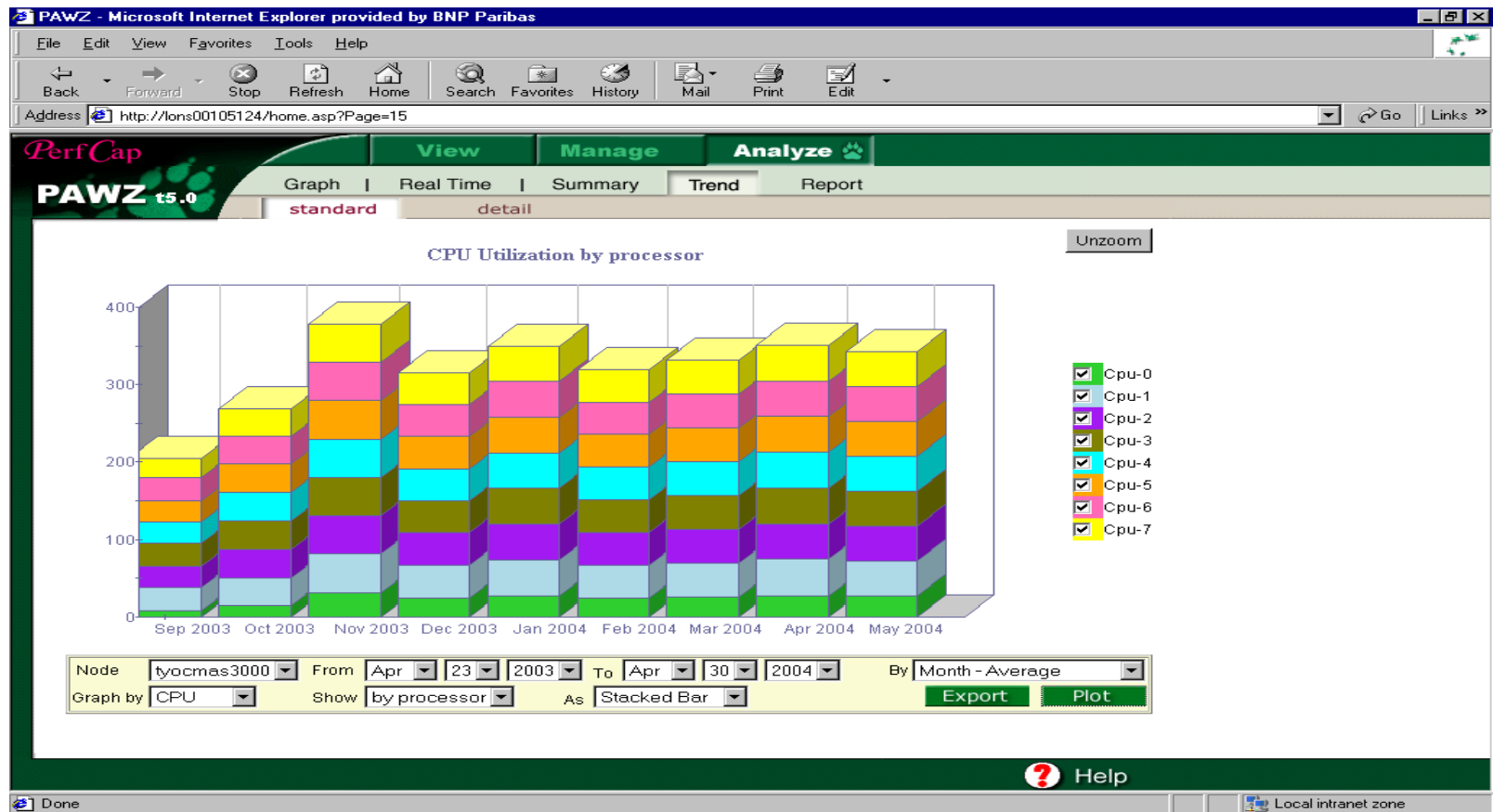
200 Most Recent Configuration Changes

Hostname	IP Address	Location	Resource type	Description
LONS00105327	LONS0010532...	London	name	Node name changed for node LONS00105327 from LONS...
LONS00105327	LONS0010532...	London	Node	environment changed from to BCP
LONS00105325	LONS0010532...	London	Location	Location of node LONS00105325 changed from to London
LONS00105325	LONS0010532...	London	Node	environment changed from to Production
LONS00105327	LONS0010532...	London	Application	Application hotfix KB824146 added to node
LONS00105327	LONS0010532...	London	Application	Application LEGATO added to node

Capacity Planning Example - ECAP



Performance Analysis Example - PAWZ



Conclusions

Findings

Savings

Futures

Conclusions

Selling idea to business

Tools to help

Technical challenges

Futures

Encouraging signs

- New IBM Power V offer sub-CPU partitioning

 - Wait for 5.3 AIX

- Itanium Superdome offers mixed OS with sub-CPU partitioning - HPUX only today

- Blades offer better CPU performance for most low performing applications

Futures

- Need hardware to offer mixed OS support

- Itanium Superdome: HP, Linux, Windows, VMS

- Why not Itanium/64 bit blades?

- Offer SAN storage

- Offers VMS/HP/Linux/Windows in one chassis



Savings

Windows Savings: -

- VMWare for Windows

- Saves space, power, cabling, order management, mandays

- 1:16 ratio from physical servers

- No saving on software licenses

UNIX Savings:

- Elimination of older hardware

- Reduced hardware maintenance costs

- Reducing data centre resources - heat, power

Conclusions

Generally:

- Do have a toolset to analyze and plan for sizing a new server
- Do consider depreciation issues before you start
- Use asset capture tools to find out what you have

Selling idea to businesses

- Do keep business applications/databases on same OS platform
- Validation of new OS version for application/database much faster than porting from HP to IBM for example.
- Businesses are paid to provide an uninterrupted service to users, not follow whim of latest analyst trends

Conclusions

- Toolset needs
 - Assess system performance of all platforms under review
 - Perform capacity planning based on your own workload to assess what-if
 - You will never get budget for benchmarks
 - Enterprise management tools are not the same as capacity planning and performance analysis tools
 - Hardware vendors will generally guess and not be responsible for the results

Conclusions

- Technical challenges
 - Do give production systems their own fiber channel infrastructure
 - Do consider a BCP/DR solution at same time, with data replication (eg DRM, SRDF) automated on remote site
 - Applications not efficient on more than 8 CPUs.
 - Could start with 1-8 ways with partitioning
 - Economical way to do it
 - 16 way + too expensive, too big

Contact details

Questions?

Paul O'Sullivan

BNP Paribas

T (011 44 207 595 3103)

E Paul.O'Sullivan@bnpparibas.com