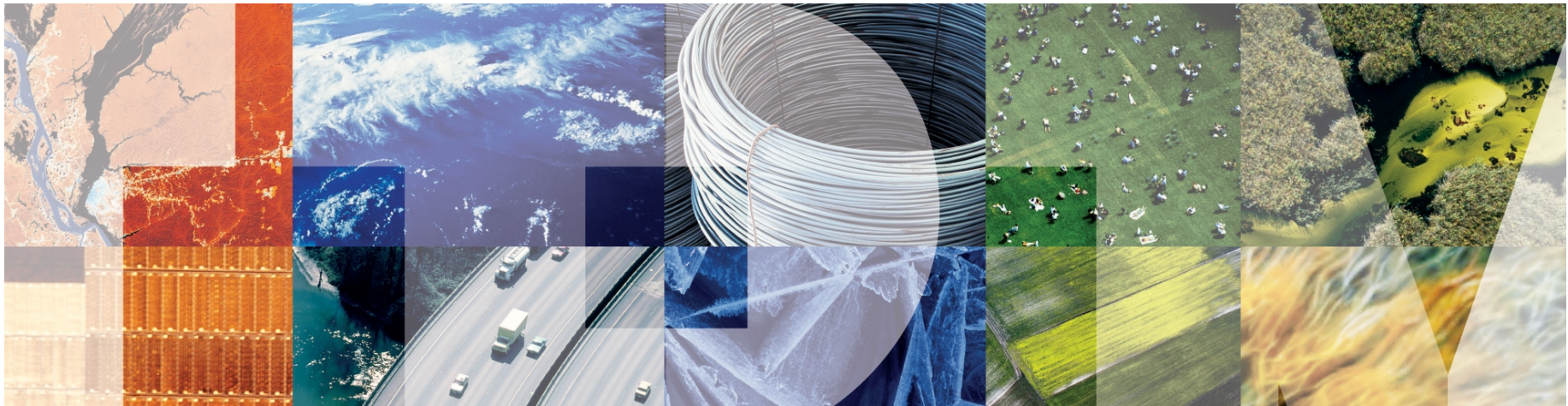


Server Consolidation using the Highly Scalable IBM Enterprise Linux Server



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NOTES: Linux penguin image courtesy of Larry Ewing (lewing@isc.tamu.edu) and The GIMP

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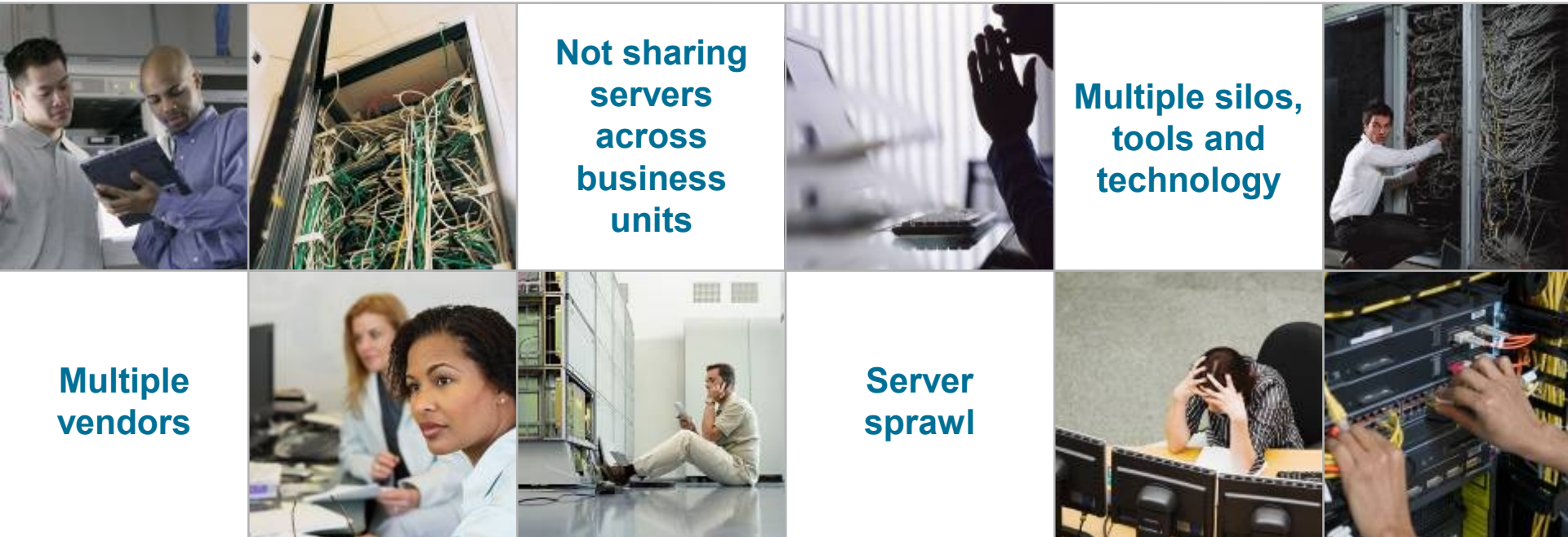


Agenda

- What is Consolidation
- Consolidate What?
- Common Consolidation Scenarios
- Cost Comparison
- Consolidation Examples
- IBM's own Transformation
- Best Practices
- Lessons Learned
- Summary



Is this your IT infrastructure?



Not sharing servers across business units

Multiple silos, tools and technology

Multiple vendors

Server sprawl

Possible causes my include :

- Mergers and acquisitions (Integration of applications, Multiple locations,...)
- New applications, Multiple operating systems
- Demand or growth (New customers, New employees,...)



Consolidation and Virtualization will reduce complexity and provide many other benefits.

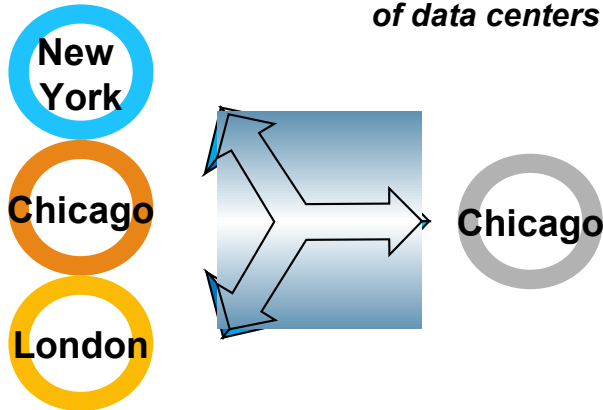
- Support a significant company growth rate with a flexible and scalable infrastructure
- Save money by improved server and storage utilization (up to 60 percent)
- Improve system availability with less hardware
- Save staff time by managing all your disparate software, technologies and systems more effectively
- Free up money from operations to fund IT projects that increase business revenue



What is Consolidation? There are four basic consolidation strategies.

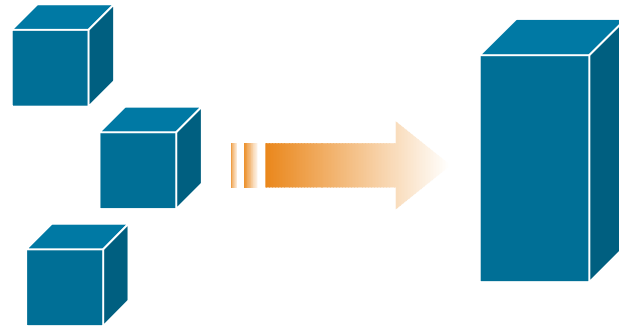
Centralisation

Reducing the number of data centers



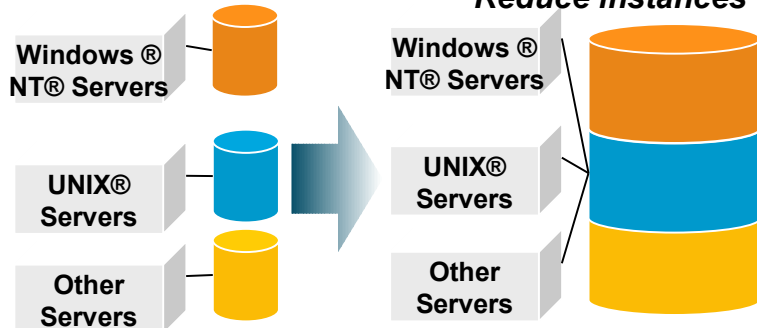
Physical Consolidation (e.g. by Virtualization)

Reducing older servers with fewer more powerful systems



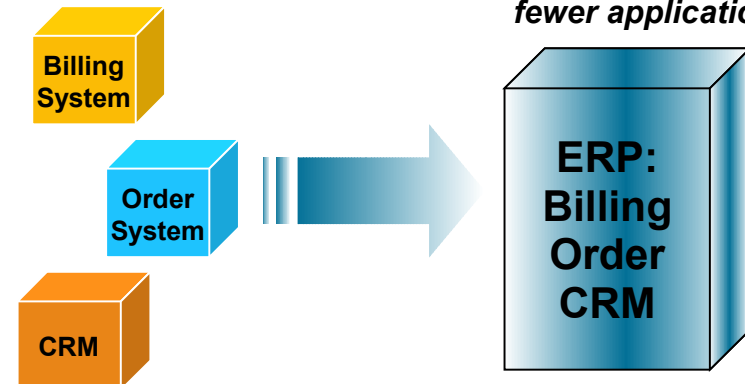
Data Consolidation & Integration

Centralises data from different sources. Reduce instances

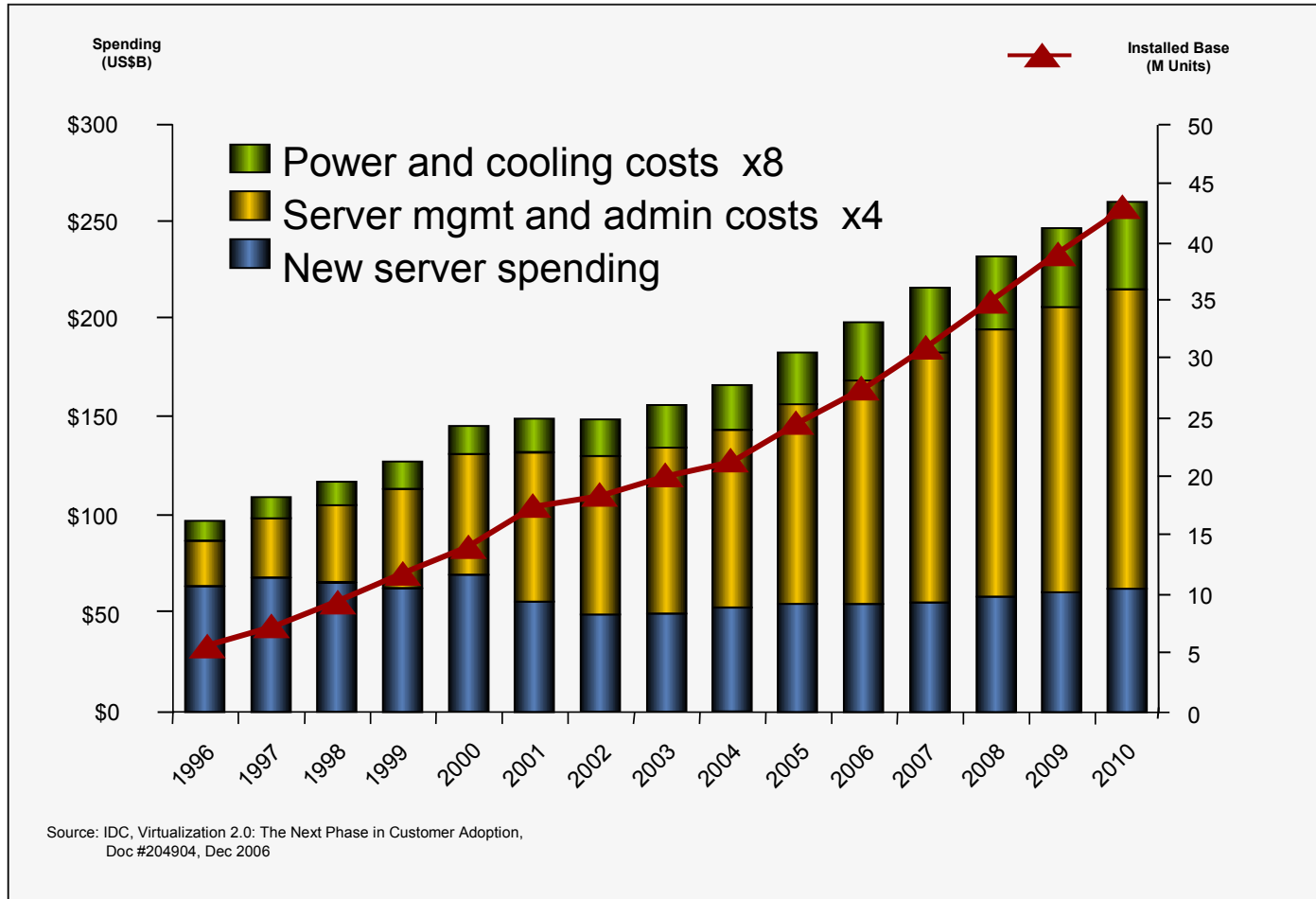


Application Integration (= Functional Consolidation)

Migrates several applications into fewer applications



System management costs are continuously increasing while HW spendings have been stabilized over the last years



- Individual ROI can be shown after TCO study
- Instantly reduced payment streams using IBM Global Financing

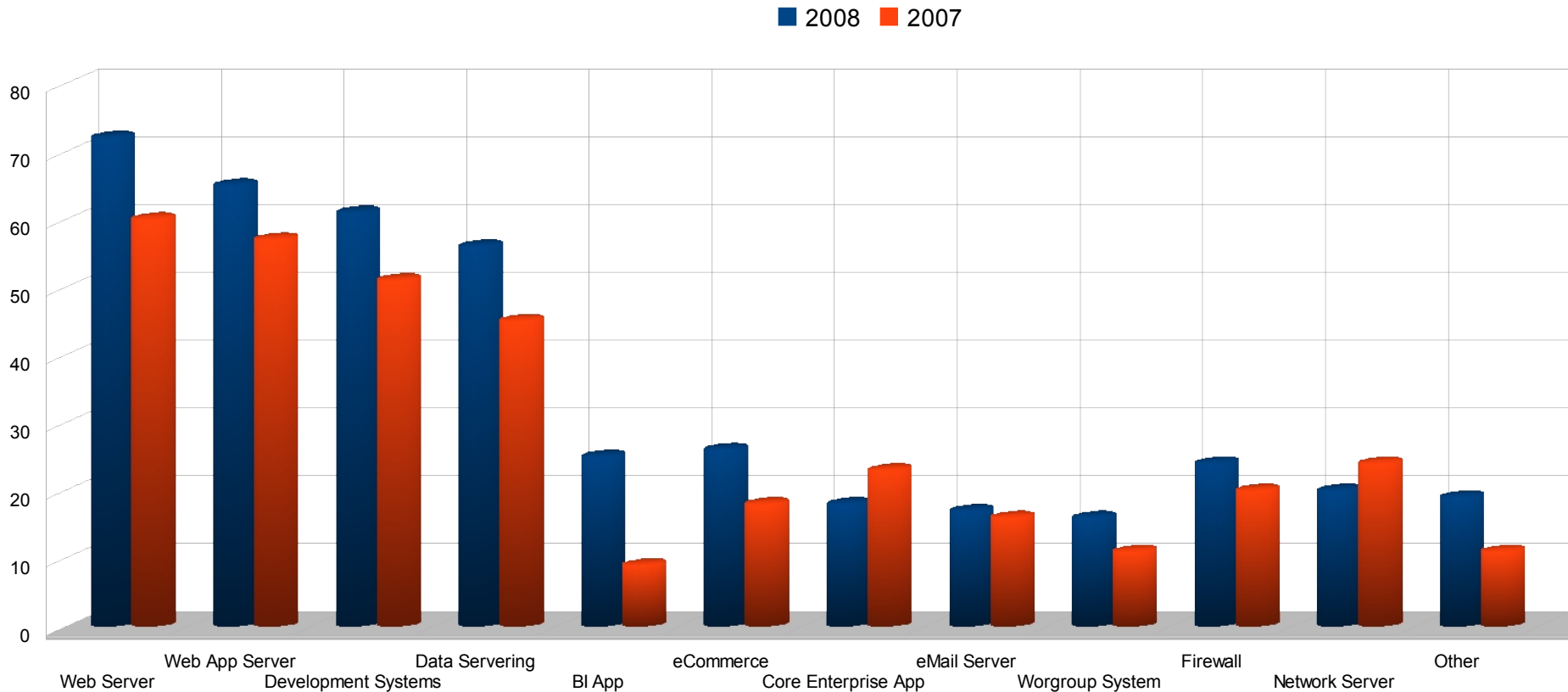


What Makes A Best Fit Workload for ELS?

- **Leverage classic strengths of the z Hardware**
 - High availability
 - High i/o bandwidth capabilities
 - Flexibility to run disparate workloads concurrently
 - Requirement for excellent disaster recovery capabilities
 - Security
- **Shortening end to end path length for applications**
 - Co-location of applications
 - Consolidation of applications from distributed servers
 - Reduction in network traffic
 - Simplification of support model
- **Consolidation Effect**
 - **Power requirements**
 - **Software costs**
 - **People Costs**
 - **Real Estate**
 - **Workloads requiring EXTREME Flexibility**

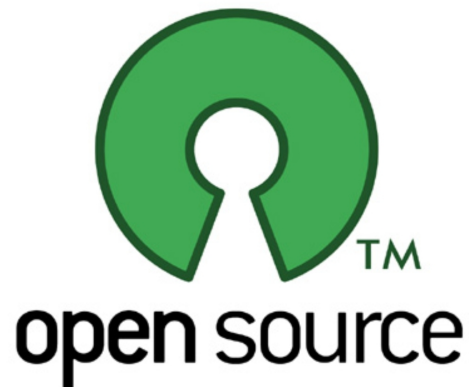


Consolidate What? Surveys indicate customers use ELS for:



Common Consolidation Scenarios

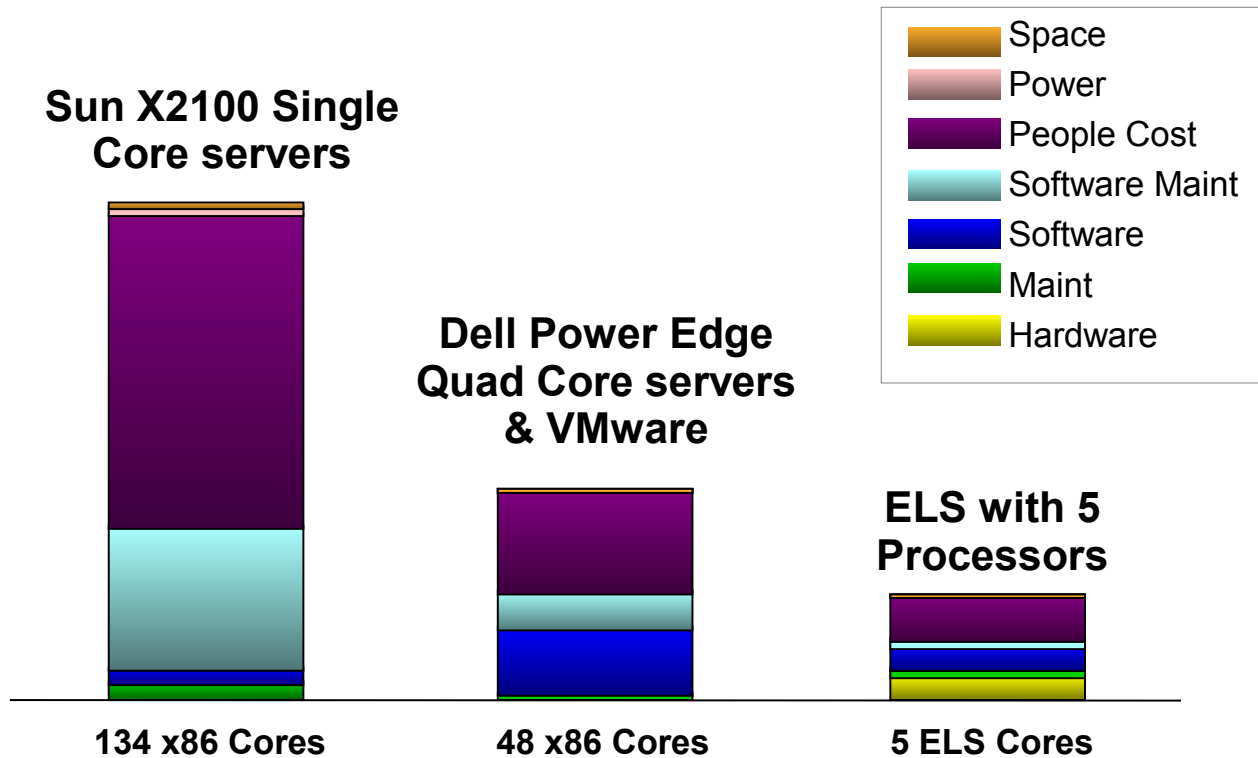
ORACLE®



Reduce cost through consolidation on ELS

Consolidating 134 Linux servers to 5 ELS Cores Can save up to 50% over x86 w/ VMware

Oracle DB Workload, 3-Year Total IT Cost

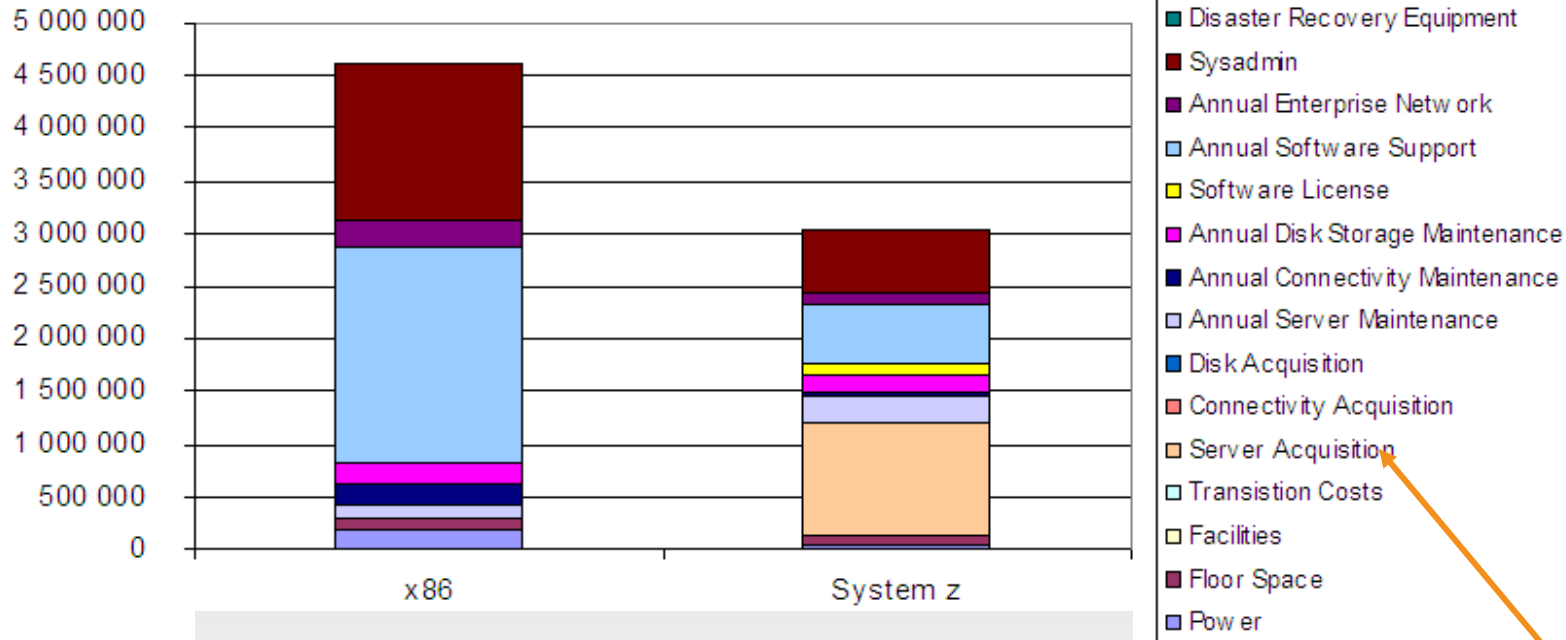


Your IT Cost may vary



Large Bank Saves \$1.5M with Oracle on ELS vs. 45 Oracle x86 Servers!

5-year Costs Distribution



72% reduction in SW maintenance costs
95% reduction in connectivity costs
75% reduction in power/cooling costs
60% reduction in System Admin costs

Note: Upgrade required for ELS; Dell and HP were existing HW

| 5-year Cost Comparison | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year |
|------------------------|-----------|-----------|-----------|------------|------------|
| x86 | 923 625 | 1 847 250 | 2 770 874 | 3 694 499 | 4 618 124 |
| System z | 1 482 559 | 1 871 822 | 2 261 085 | 2 650 348 | 3 039 611 |
| Delta | 558 934 | 24 572 | -509 789 | -1 044 151 | -1 578 513 |



Large Bank Reduces Space, Energy Requirements and Saves \$1.5M + (Details for Previous Chart)

| | FROM ... | TO ... |
|---------------------------------|----------------------|---|
| Current hardware infrastructure | 45x86 (HP + Dell) | IBM System z10 Enterprise Class (z10™ EC) |
| Footprints | 45 | 1 |
| Cores | 111 | 4 |
| Avg utilization | Less than 10% | 60% |
| Peak utilization | 35% | 85% |
| # DBs, size of DB | 111 Oracle DB | 111 Oracle DB |
| Application | Oracle 10G databases | Oracle 10G databases |
| OS | Linux | Linux RedHat RHEL5 + z/VM® |
| Energy usage | | 75% less |
| Floor Space usage | | 28% less |
| TCO: 5 years | \$4.62M | \$3.04M / savings: \$1.58M |

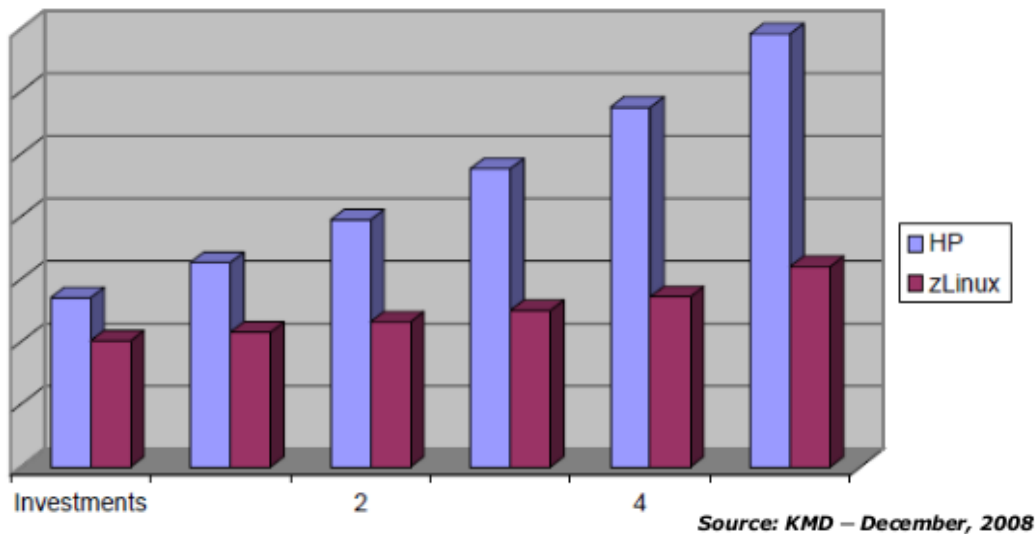
Summary of Benefits:

- 111 to 1 core reduction, 27:1 footprint reduction
- Up to 72% software maintenance cost reduction
- Improved application reliability, and efficient Disaster Recovery capabilities



Another Unix Consolidation Example

- KMD, Denmark's largest locally-owned information technology (IT) service provider, ran out of capacity on its four, large Hewlett-Packard HP-UX/PA-RISC-based HP 9000 servers.
- What KMD did was migrate its Perspektiv payroll/human resource applications environment off of the HP-UX operating environment over to Linux partitions running on an IBM ELS
- And by doing this, KMD was not only able to greatly increase its application processing capacity — but was also able demonstrate very significant cost-of-acquisition savings over a five year period.



Source: http://www.clabbyanalytics.com/uploads/KMD_Case_Study_Rev_1.pdf



IBM's own smart transformation

IBM IT Transformation

- IBM's IT transformation continues: our own IT investments over the past 5 years have delivered a cumulative benefit yield of \$4.1B.

| | 1997 | Today |
|---------------------|--------|-------|
| CIOs | 128 | 1 |
| Host data centers | 155 | 7 |
| Web hosting centers | 80 | 5 |
| Network | 31 | 1 |
| Applications | 15,000 | 4,700 |

Data Center Efficiencies Achieved

- Consolidation and virtualization - thousands of servers onto approximately 30 IBM ELS Servers
- Additional virtualization leveraging System p, System x and storage across enterprise.
- Substantial savings being achieved in multiple dimensions: energy, software and system management and support costs.



Project Big Green

- The virtualized environment will use 80% less energy and 85% less floor space.
- 2X existing capacity, no increase in consumption or impact by 2010.



Cloud-enabled on demand IT delivery solution

- Self-service for 3,000 IBM researchers across 8 countries.
- Real time integration of information and business services.



Possible Infrastructure Simplifications

| Unit | Distributed | ELS | % Reduction |
|------------------------------|-------------|-------|-------------|
| Software Licenses | 26,700 | 1,800 | 93% |
| Ports | 31,300 | 960 | 97% |
| Cables | 19,500 | 700 | 96% |
| Physical Network Connections | 15,700 | 7,000 | 55% |

Results will vary based on several factors including # of servers and work load types

Best Practices for Consolidation with Linux

Major tasks in a successful consolidation project

1. Define potential consolidation area (the scope)
 - "all Intel servers", "all Solaris servers", "all Webservers in business unit xyz", ...
2. Gather an inventory of all applications and servers
 - including hardware, middleware and applications
3. Assess feasibility of a Linux migration of these systems
 - detailed analysis of all relevant systems and software
 - categorize them into groups (red/yellow/green)
4. Develop a technical concept based on Linux and get an offer from IBM
 - new concept might be based on ELS, Linux Cluster/BladeCenter or VMware on high-end System x, ...
 - measured utilization data of the existing systems is essential for a sizing of the new systems
5. Compare costs with current environment
 - define in advance how to treat migration costs and soft factors like manageability, availability, flexibility, value of open source, ...



Lessons Learned

- **When consolidating, avoid change where possible**
 - Oracle, SAP and IBM products like Websphere are good examples of the 3000+ applications supported now
 - Migration Factory can help with later migrations that need application recompilation and optimization
- **Space, power and cooling savings are delivered by physical consolidation**
- **The highest costs are still with people needed to run the systems, some for the hardware but many for the software**
- **As far as the Linux OS is concerned, keep resources such as memory the same as before**
 - This can lead to a need for a lot of memory in the target server
 - z/VM can help virtualise this memory
- **It is still common to have one application per OS image**
- **There is still the need to have development and test images**
- **Need standardization to reduce complexity and free up investment in people**
 - z/VM provides tools to assist and enable standardization, leading to significant freeing of people resources



ELS Achieves High Core-to-Core Ratios When Consolidating from Distributed Environments

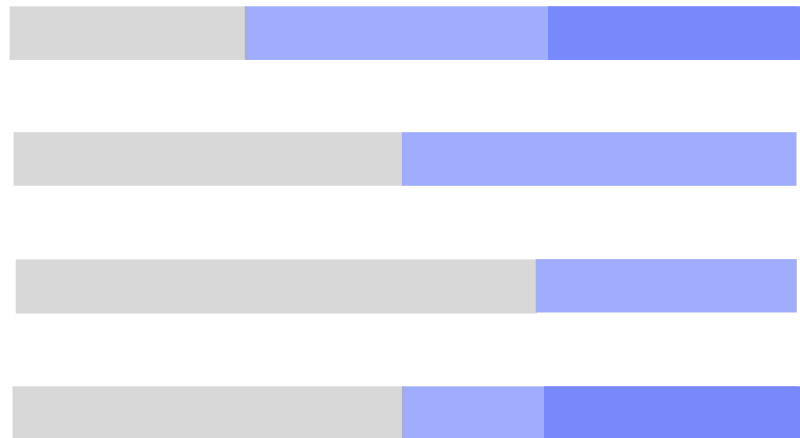
| Customer | Distributed Cores | IBM System z10™ Cores | Ratio of distributed to ELS cores* |
|----------------------------|--------------------------|------------------------------|---|
| Nationwide | 350 | 15 | 23 to 1 |
| Government Agency | 292 | 5 | 58 to 1 |
| Pension Fund Agency | 1324 | 36 | 36 to 1 |

* Client results will vary based on each specific customer environment including types of workloads, utilization levels, target consolidation hardware, and other implementation requirements.



Summary: The benefits of a consolidated server environment

- Cost savings
- Based on IBM's experience, the following represents the typical savings that organizations may realize:
 - Hardware costs **reduced 33 to 70%**
 - Maintenance costs **reduced up to 50%**
 - Support costs **reduced by as much as 33%**
 - Floor space and facility costs **reduced 33 to 50%**
- Improved IT flexibility
- Improved business flexibility



Questions?



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