IBM Systems and Technology Group 2007

Total Cost of Ownership (TCO): Comparing System z and Distributed Platforms

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A recent article

The new TCO and the value of the mainframe

Published on: **11 Jan 2007**

The Mainstream -- January 2007 -- Issue 22

In the past decade, the costs of supporting corporate IT infrastructures have changed significantly, as has the landscape itself. Personnel expense as a percentage of IT costs has tripled, and software expenses have doubled, while hardware is less than one-third of its percentage of costs of 10 years ago. In fact, according to industry analyst IDC, since 2000, labor costs have exceeded the cost of all servers … and those costs are still growing.

These dynamics are driven by several things – all of which point to the need to reevaluate the total cost of ownership of your data center, from distributed to the mainframe.

The Mainstream spoke with Marlin Maddy, Executive IT Consultant for IBM Systems Technology Group. Maddy leads the "Scorpion" team in the group's Lab Services Consulting. The group has conducted more than 300 studies across all different platforms since its inception in 1999. Some of these were funded by IBM, some by customers.

"We look at the customer's environment, or part of it, depending on the scope

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Have you heard/made these statements?

" My mainframe cost 2x, 5x, 10x compared to my distributed environment“ Mainframe

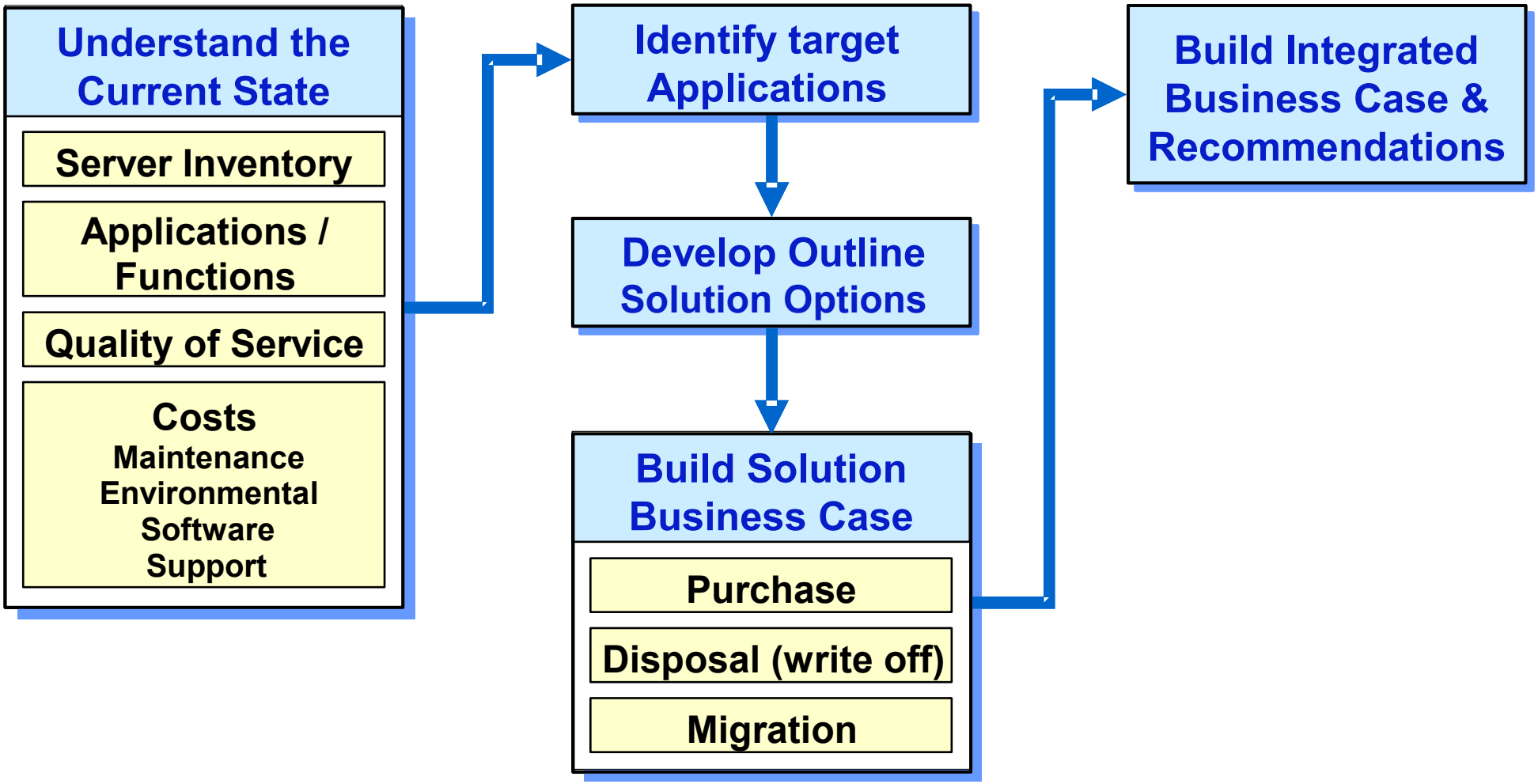
“Mainframe software costs are expensive and are driving me off the platform” Mainframe

"We are on a get off the mainframe strategy“ Mainframe

"We keep adding servers and people“ Distributed

“Our infrastructure can not support our servers” Distributed

Recommended study flow



Considerations for comparative analysis. How do we level the playing field so we can make a good platform decision?

1. **Select the Type of Analysis**
   - Will we do TCA or TCO or ICO? What is the difference?
2. **Choose the Application(s) – are they strategic, mission critical, infrastructure?**
   - What is the "current environment"? Can we make assumptions about the future?
3. **Include all components - What components does the application need?**
   - How much resource sharing is possible? Are some components in place?
4. **Consider only useable capacity - Know your workload and the target!**
   - Will my environment have to change to do this? How much?
5. **Choose realistic, scalable staffing numbers - Will we have to add staff?**
   - Can history show us the future? Who does what, and will it change?
6. **Build business cases that reflect real costs, not necessarily practices**
   - Chargeback mechanisms? Upgrade versus disposal?
7. **Quantify Quality of Service - in dollars if possible**
   - Cost of outage? Recoverability? Performance & Response time?
8. **What is the impact of this application in the greater context of the enterprise?**
   - There may be positive and negative impacts.

And there are more items to consider…

1.Select the type of analysis

1. **Total Cost of Acquisition (TCA)**
   - The easiest and fastest to do
   - Typically considers new hardware and software
   - Well oriented to computer professionals - forward looking, technology based, no financials
   - Vendors love it - oriented to glossy brochures, a functional matrix/cost comparison
   - The least useful to IT department - leads to complexity and duplication

2. **Total Cost of Ownership (TCO)**
   - Not as easy to do, but still project oriented
   - Typically considers new hardware, software, environmentals, staff, and other
   - Many Rules of Thumb in the press - sense of security
   - Consultants love it - easy to add value, difficult to confirm - fishing expeditions
   - Useful to gain understanding of cost growth areas

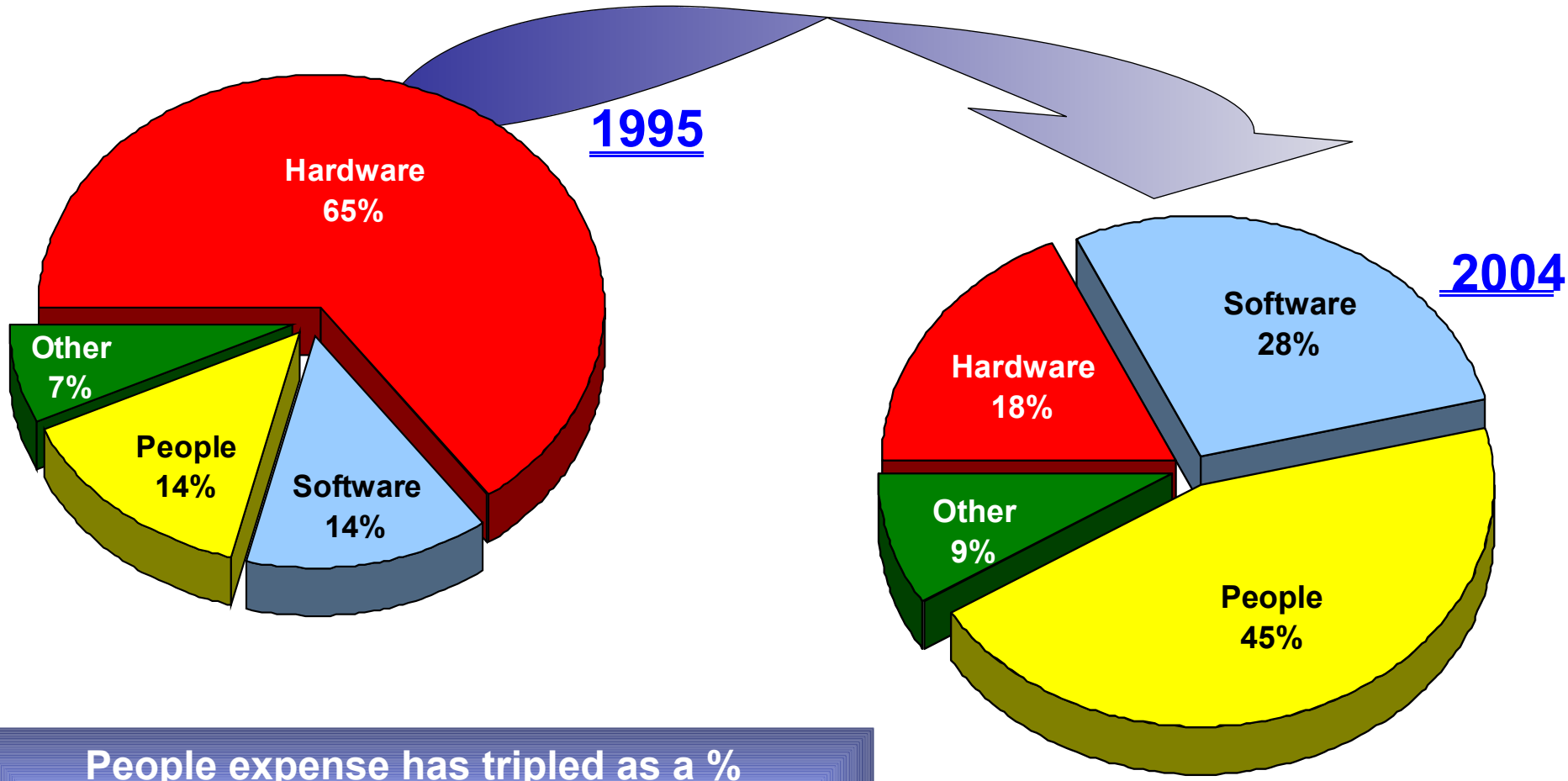
3. **Incremental Cost of Ownership (ICO)**
   - Most accurate
   - Most difficult and thus most infrequently used - usually one-of-a-kind
   - Depends on understanding the current environment - implementation context
   - Typically considers current and new hardware, software, environmentals, staff, and other
   - Can include or exclude the cost of strategic change - one project can fund another
   - Is **NOT** the budget $$ divided by MIPS or machines, times the new stuff!

Build business cases that reflect real costs, not practices

- **Business case horizon – 3 years**
  - Upgrade vs. disposal vs. reuse vs. “free”
  - Being “fair” may not be fair
- **Chargeback**
  - Mainframe chargeback pools are typically 50 -60% overstated
    - Software contracts
    - People – Operations and monitoring
    - Default bucket – history
  - Open systems charged by box, regardless of cost/complexity
  - Infrastructure omitted all together
  - Incremental cost is 20 -25% of the full chargeback cost
    - Hardware price/performance
    - Software flat slope, ISVs?
    - Do you need to hire additional people? New skills?

Throughout the past 10 years the cost dynamics of supporting corporate IT infrastructures has changed significantly as has the landscape.

We typically see…

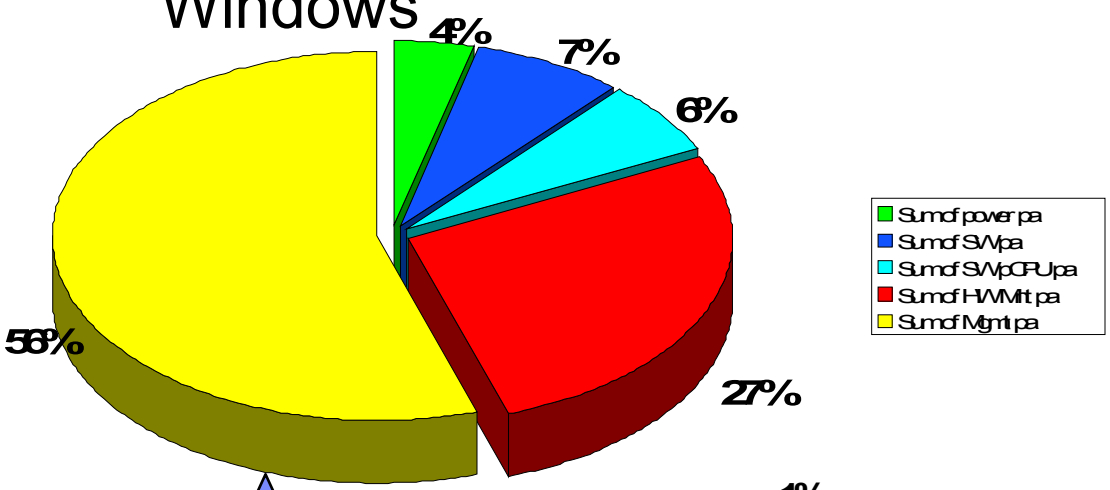


People expense has tripled as a %
Software expense has doubled as a %
Hardware is less than 1/3 of its original %

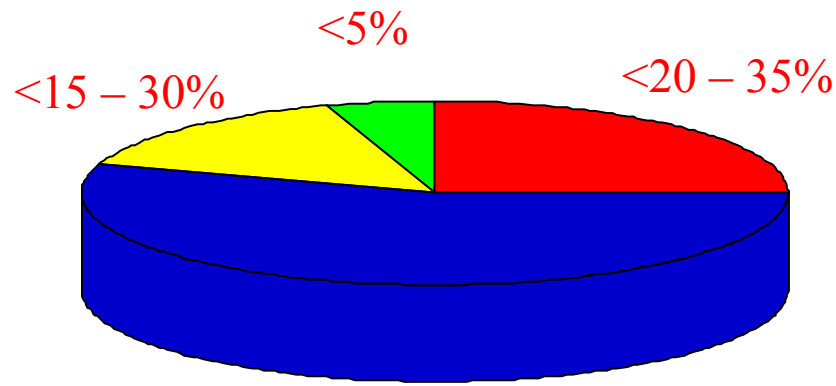
Server Annual Cost Distribution

These are typical customer examples

Windows

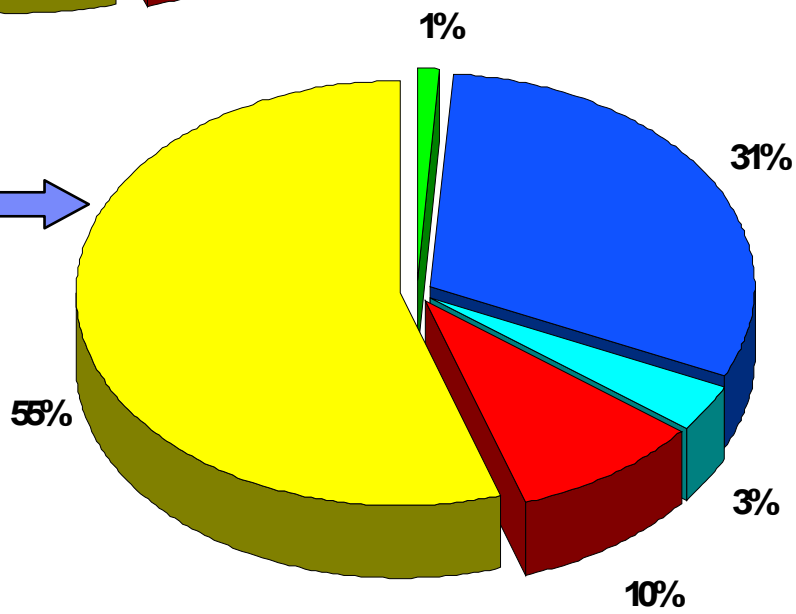


Mainframe

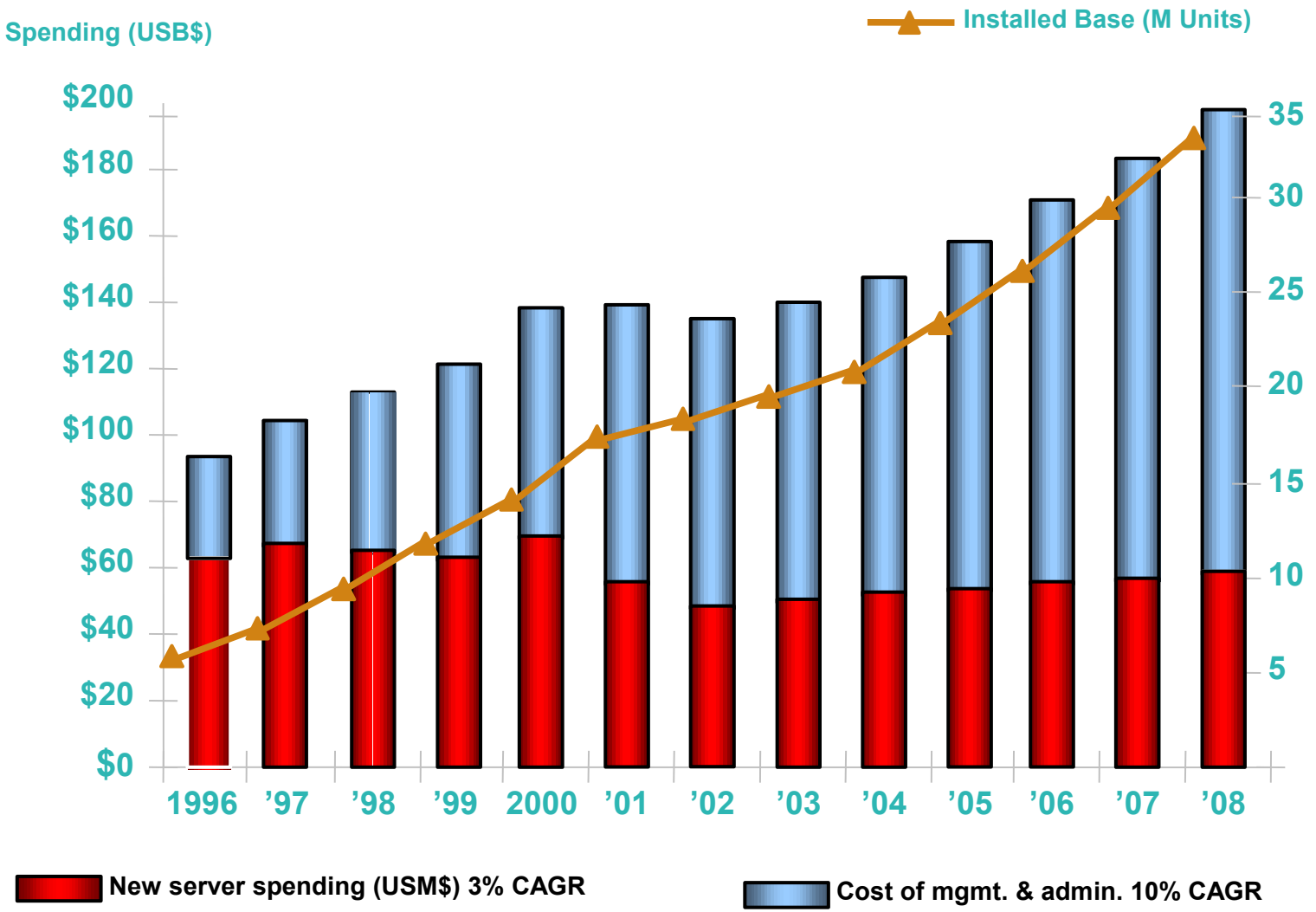


The key is people

Unix



IDC Finds that Since 2000, Labor Costs Have Exceeded the Cost of All Servers … and are *Still* Growing

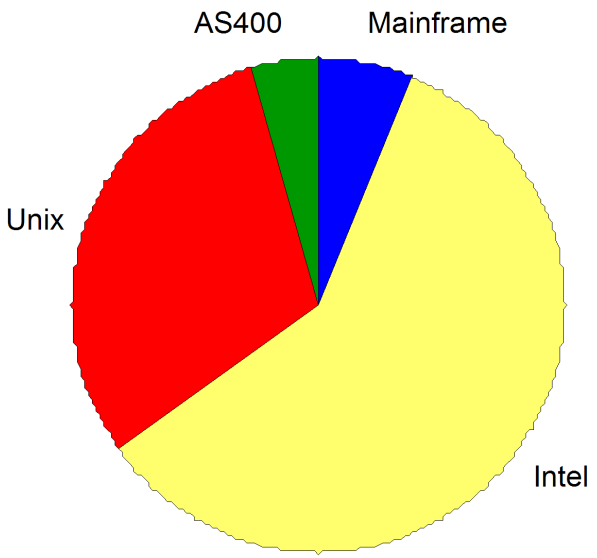


Distributed scale-out is costly!

Source: IDC

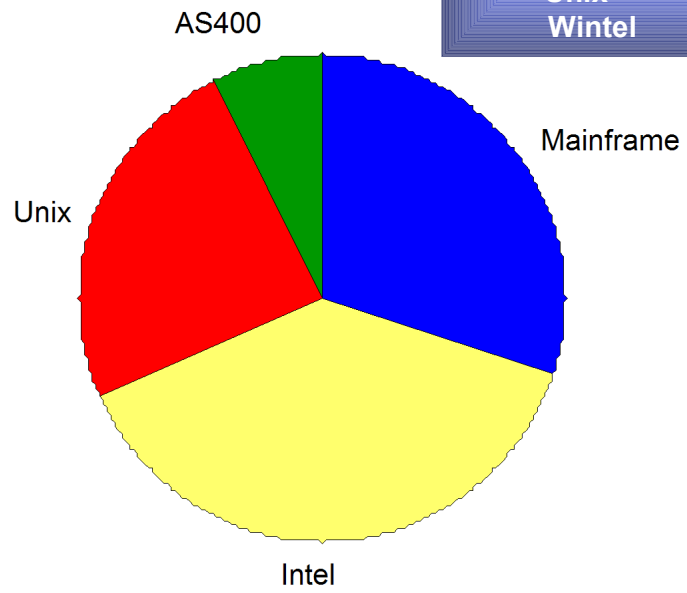
Installed vs. Used capacity

Installed Capacity: 33M tpms*



Used Capacity: 4M tpms*

Typical Utilization	
Mainframe	80 – 90%
Unix	10 – 20%
Wintel	5 – 12%



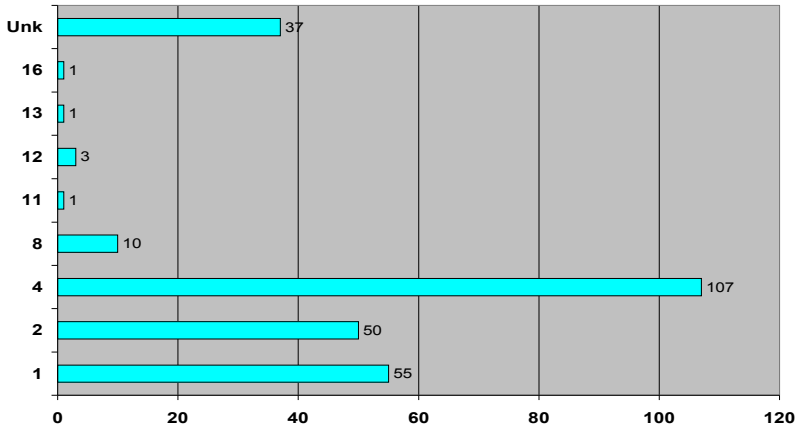
* system capacity (tpms) is an approximation of the transaction processing capability of each system. It cannot be compared to other commercial ratings or benchmarks and is invalid outside of the context of this IBM study.

Server utilization varies significantly by platform and that needs to be accounted for in the business case. The mainframe environment is used most efficiently, but is it the most or least expensive .

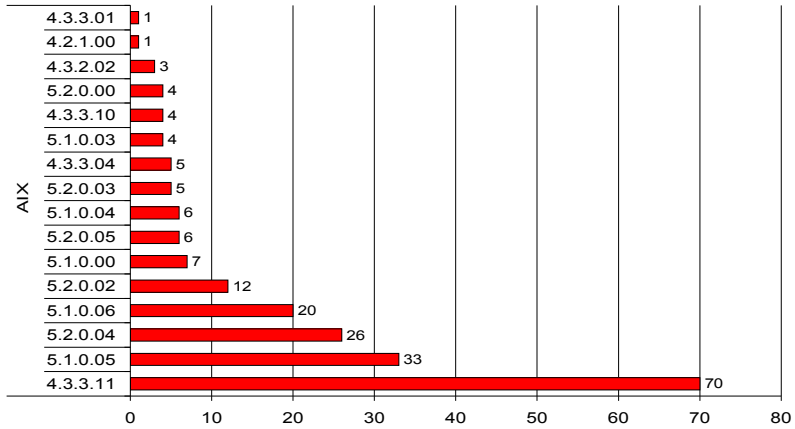
A Typical Distributed Environment

Are facilities an issue?

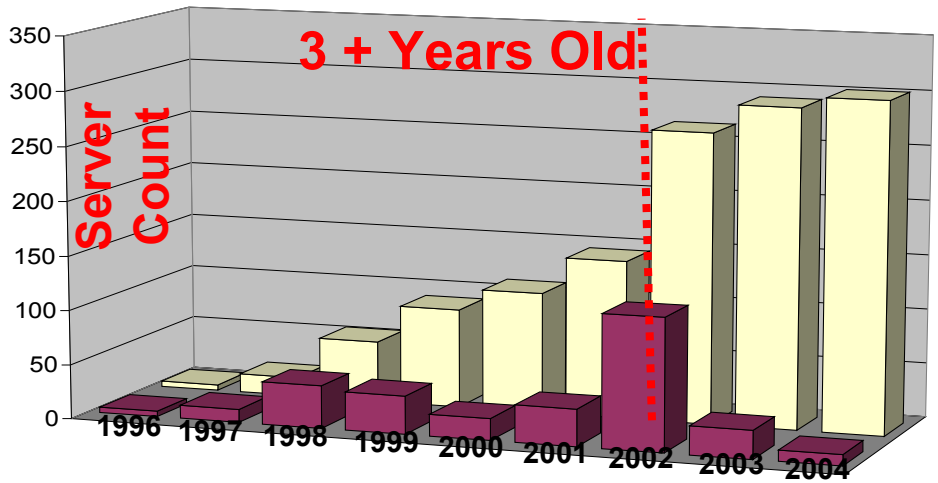
Lots of 1w, 2w, 4w boxes



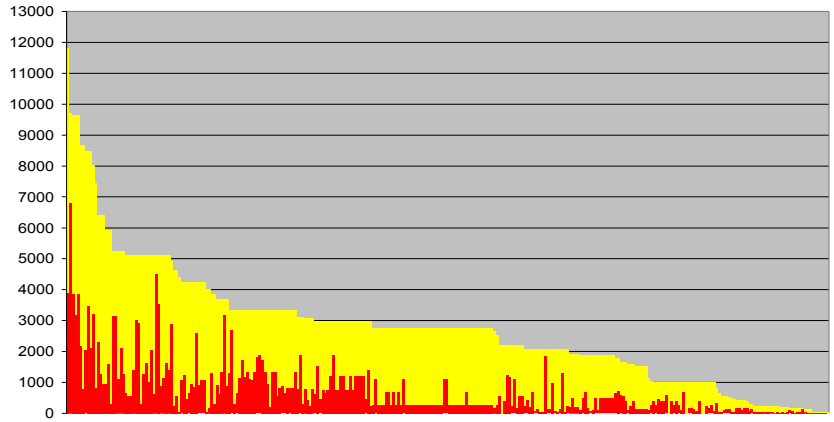
Multiple operating system releases



Many servers are old



Servers are under utilized



What is the greatest facility problem with your primary data center?

"**Power and cooling** will be a top 3 issue with all CIO's in the next 6-12 months"

Michael Bell – Gartner Group

"**Power and cooling** costs will increase to more than one-third of the total IT budget"

Robert Frances Group, January 2006

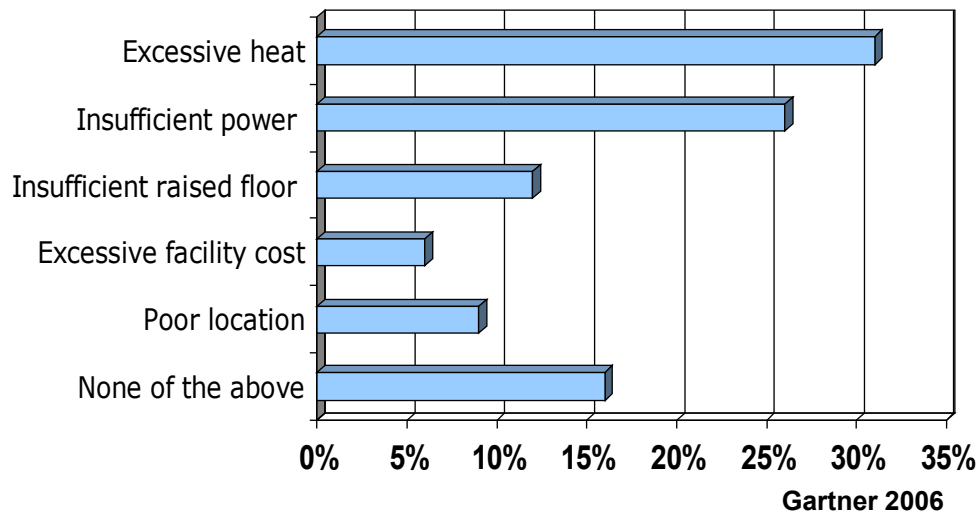
"The cost of datacenter floor space is inconsequential compared with the cost of operating and cooling a datacenter"

"You pay once to power the systems and again to cool them"

Information Week, February 2006

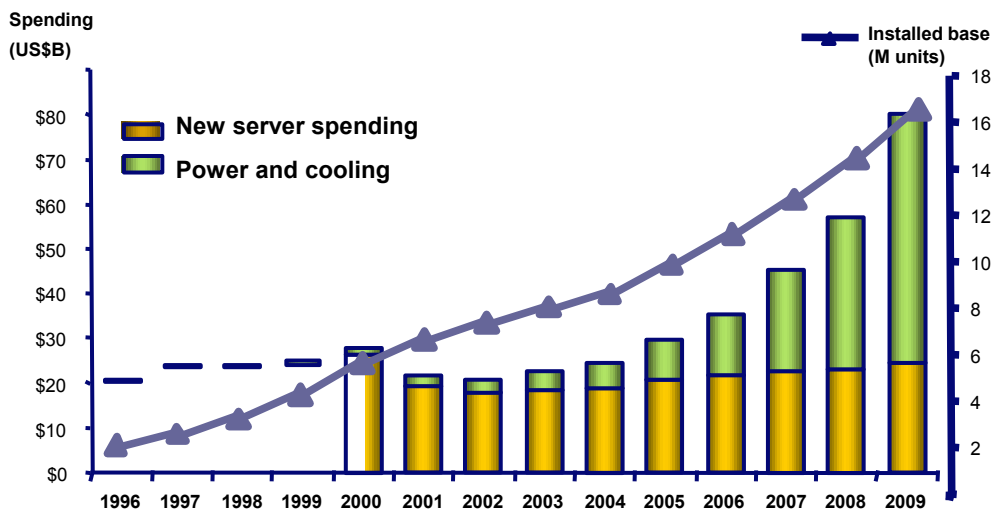
"And again and again for" redundancy

Marlin Maddy, February 2006



Gartner 2006

Power and cooling exceeds server spending



IDC 2006

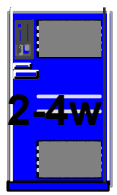
Datacenter Reality

- Mainframe
  - Well managed
  - Rock solid QoS
  - Expensive (perception)
  - Lowest TCO (reality)
- UNIX and Intel
  - Proliferation of servers
  - Lower systems utilization
  - Staffing growth
  - Inexpensive HW (perception)

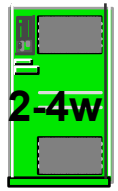
Server Proliferation

- Describe a current application environment
  - Production
    - Database server? How many?
    - Application server? How many?
    - Messaging server? How many?
    - Failover servers? For each?
  - Additional Servers
    - Development servers? Multiple levels?
    - Test servers? Multiple levels?
    - Systems test? Multiple levels?
    - Quality Assurance servers?
    - Education servers?
  - Disaster Recovery
    - Do you have a DR site?
- How many applications/types of workload do you have?

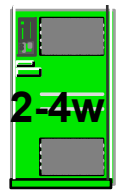
e-business Servers - Complexity and Cost



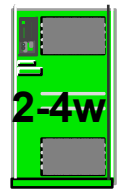
Web/App



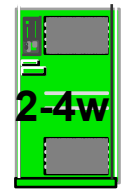
App F/O



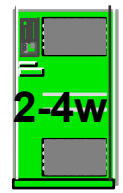
Development



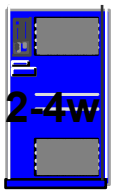
Test



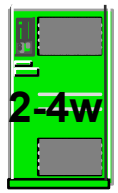
Web/AppD/R & QA



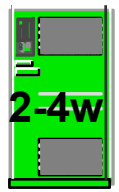
D/R F/O



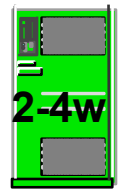
Messaging



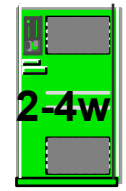
Messaging F/O



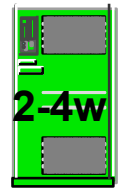
Test/Education



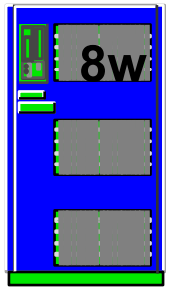
Integration



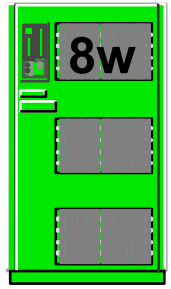
Messaging D/R & QA



D/R F/O



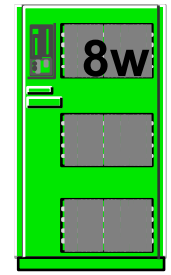
Database



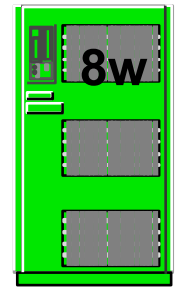
Database F/O

Hardware
- 3 primary production servers
- 16 total servers
  5:1 ratio

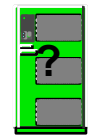
Software
- 32+ processors for database software
  ~ $1.8M for 3yrs
- 15+ processors for application software

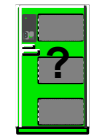


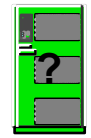
Database D/R & QA



D/R F/O







Why is utilization low?

- Use of response time as a measure of capacity
  - Buy rather than tune
- Backup, development, test, training and integration servers
- Peaked, spiky workloads on dedicated rather than shared hardware
- I/O Bound workloads, contention
- Utilization controlled to avoid system stress and outages
- Incompatible release levels
- Incompatible maintenance windows

Summary of Server Scorecard Metrics

Example

	Mainframe	UNIX	Intel
People Efficiency	**Very Good**	**Average to Low**	**Very Good** **tend to be cloned infrastructure applications**
Prime Shift Utilization	**Very high (65-85%)**	**Fair/Good (10-20%)**	**Very low (1- 8%)**
Online Availability	**Excellent (99.9-99.95%)** **** DB2® avail. = 99.98%***	**Fair/Good (98.5-99.7%)** **** Oracle avail. = 99.35***	**Not known (97.0-99.0%)**
Total Spend / Year	**.. M$ / year**	**.. M$ / year**	**.. M$ / year**
Usual Incremental Cost Ratio to Mainframe	**1.0**	**0.9 – 1.5 x** ***** IBM System p® 0.7 - 1.2x***	**<1.0 - 4.0 x**
Typical Incremental to Current Cost Ratio	**20 - 25 %**	**50 - 60%**	**50 - 60%**

* actual customer measurement

** based on multiple studies

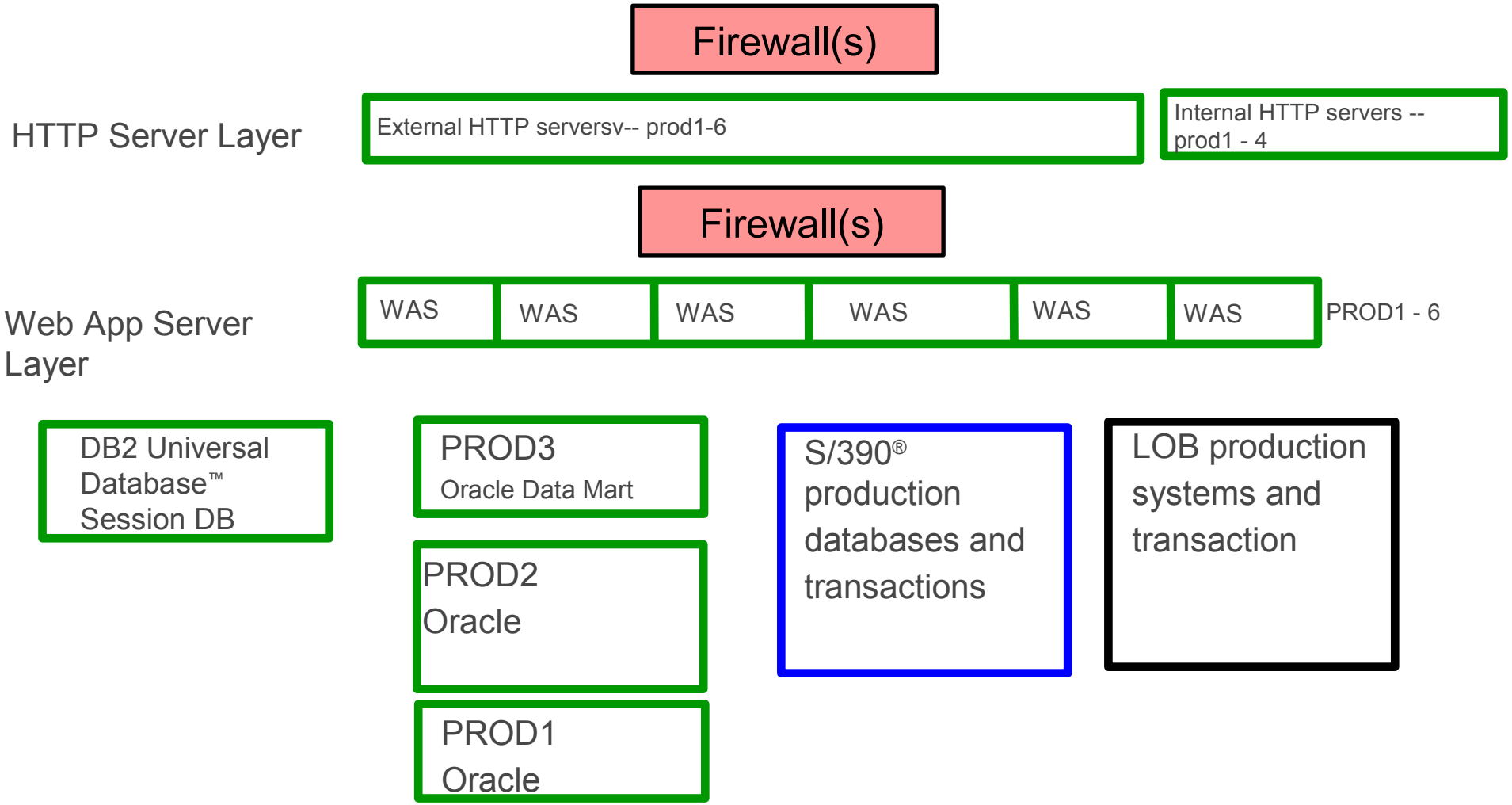
Customer Studies

- WebSphere® customer
- Hardware
  - 5000+ MIPS
  - 1000+ servers (25% UNIX)
- Software
  - WebSphere currently on Solaris
  - Oracle and DB2®

Customer perception:

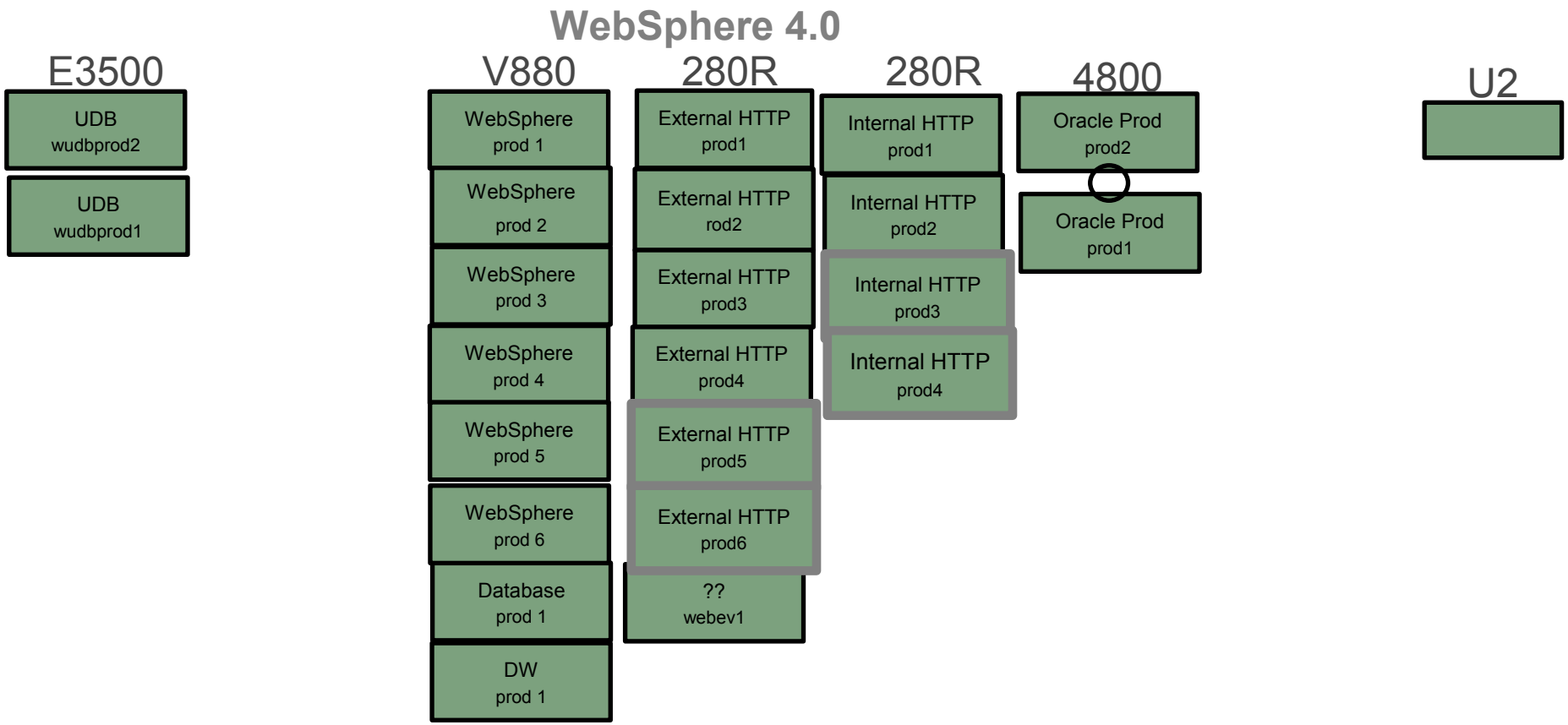
Solaris environment is 1/5 the cost of the mainframe

Current Production WebSphere Environment



Source: Scorpion Study 1999 - 2004

Production SUN Server Architecture

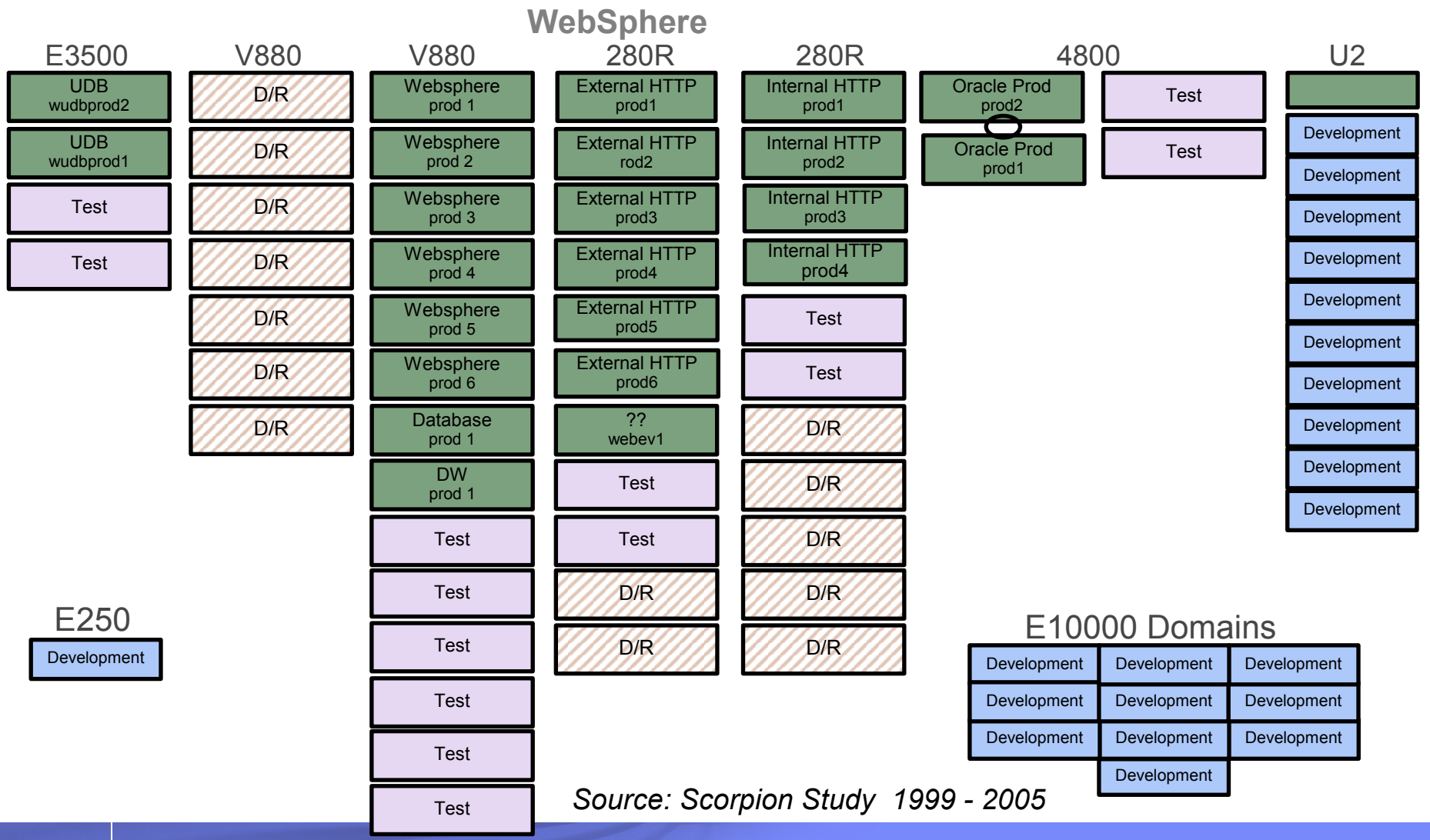


Source: Scorpion Study 1999 - 2004

Customer Example: Distributed SUN Server Solution – perception…

isn't always reality!

- **Customer perception was that the mainframe was 5x the cost of the existing Sun implementation**

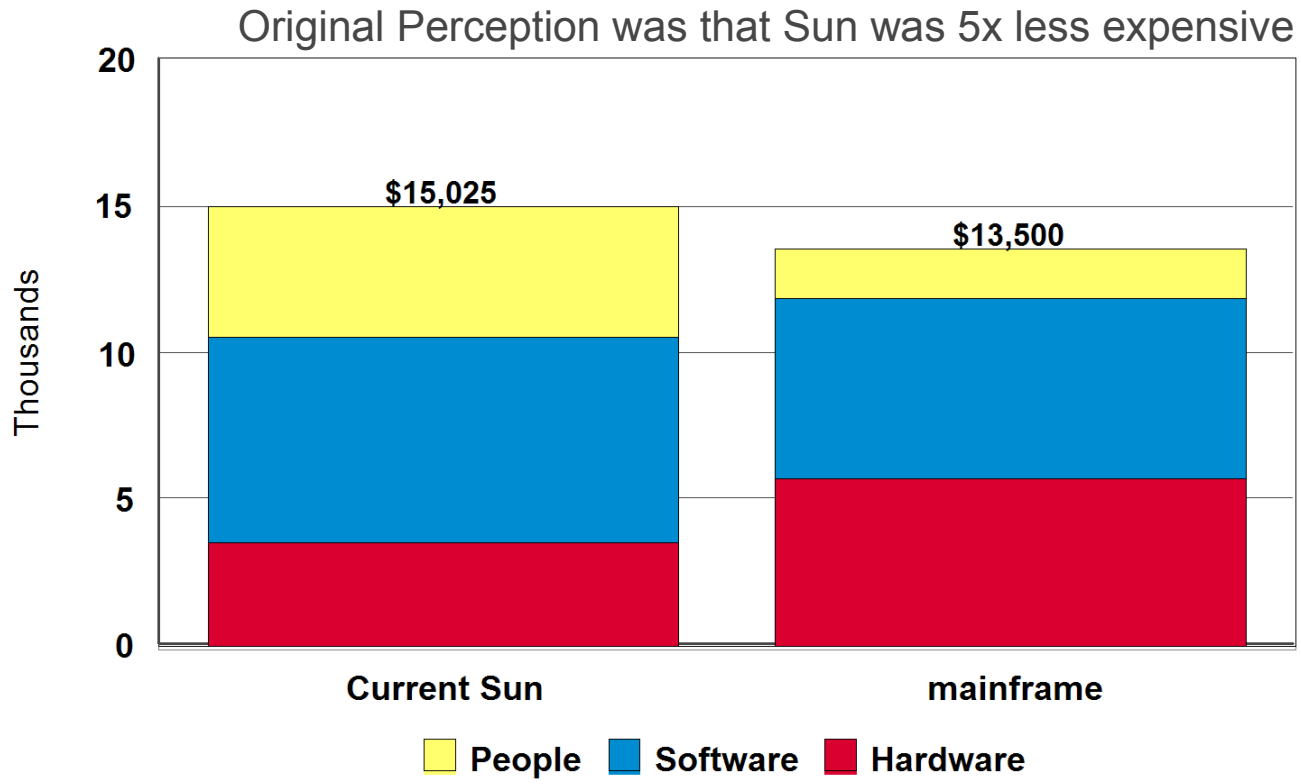


Source: Scorpion Study 1999 - 2005

EEE Corp: WebSphere Business Case

Hardware at street prices
- some Sun equipment was "used"
Software based on customers' actual environment
QoS & back-end connectivity not addressed

Software licenses
Oracle @ $40K / proc., WebSphere @ $10K / proc.
DB2 @ $20K / proc., Development serv. @ $25K / proc.
Annual maintenance 20%
Average rate for servers $11.5K/yr

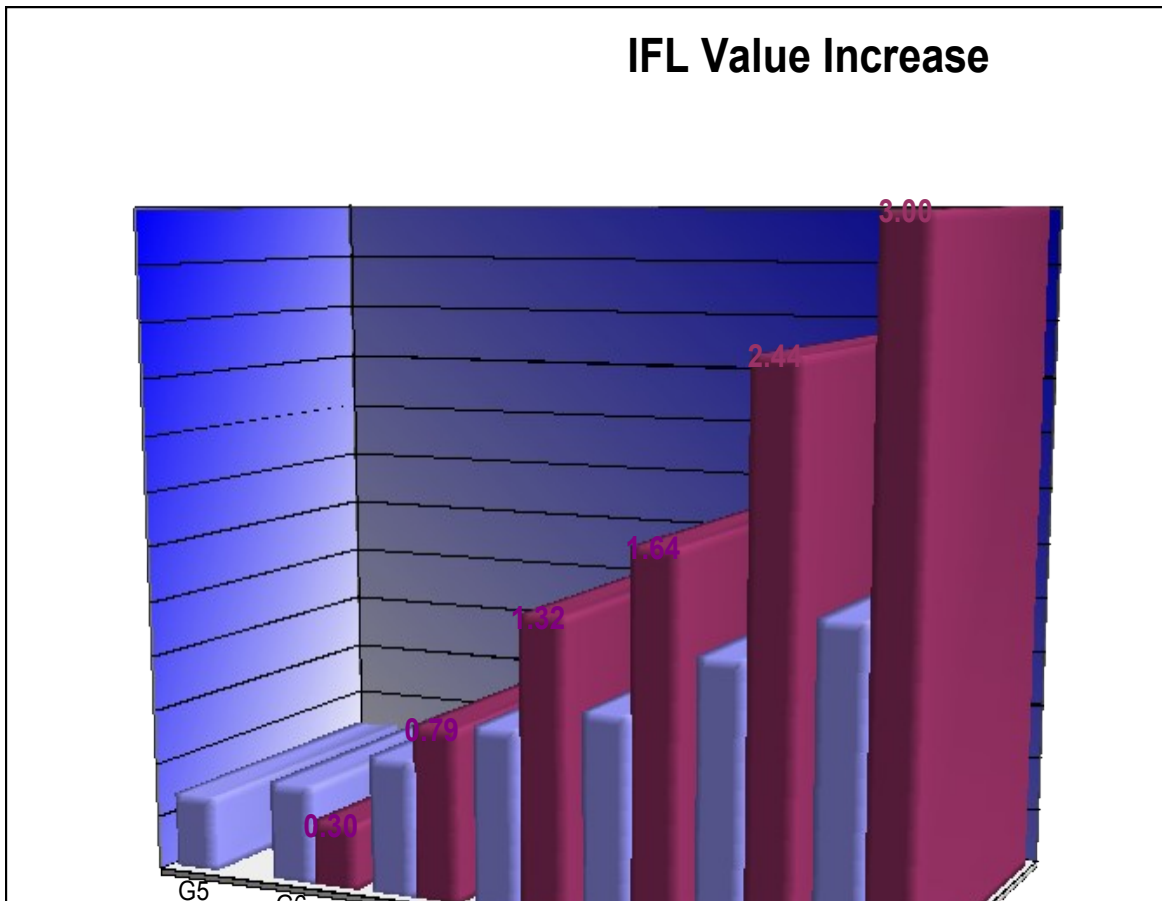


IBM System z savings 10% / 3 year TCO

Source: Scorpion Study 1999 - 2004

Unique Value of Integrated Facility for Linux® (IFL)

- IFL Price has remained constant
- IFLs move with upgrades
- 30% more capacity!!!
- zAAP follows same model
- Distributed model over same time:
  - 2 Technology Refreshes (New Hardware)
  - 2 System migrations



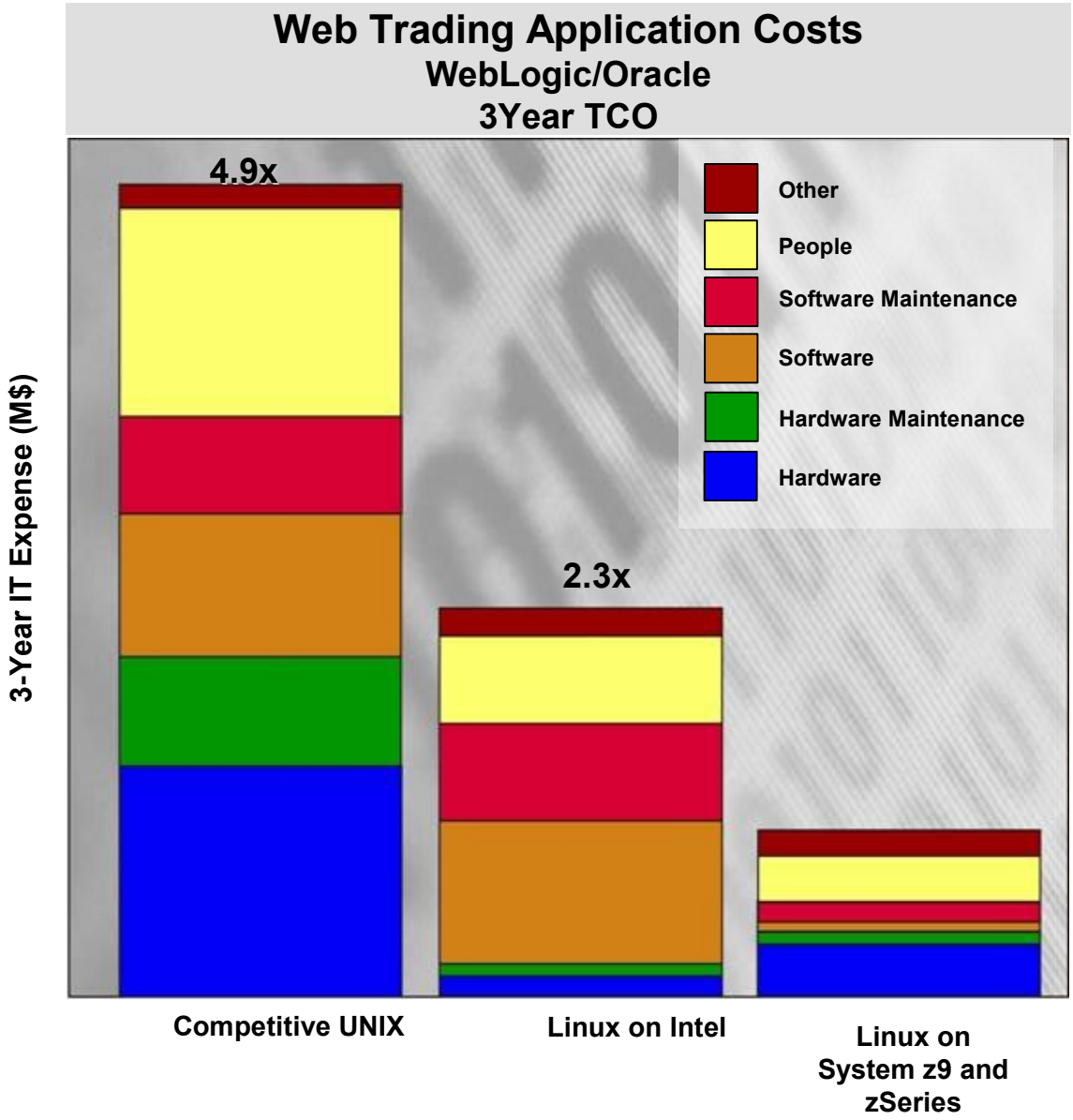
TCO Impact of Mainframe Consolidations

Your TCO may vary:

- Potential for dramatic reductions in software expense for processor based licenses
- Significant reductions in power and cooling costs are typical
  - *Cost curve is not linear: when will infrastructure break?*
  -
- People savings from virtualization
- Increased processor utilization

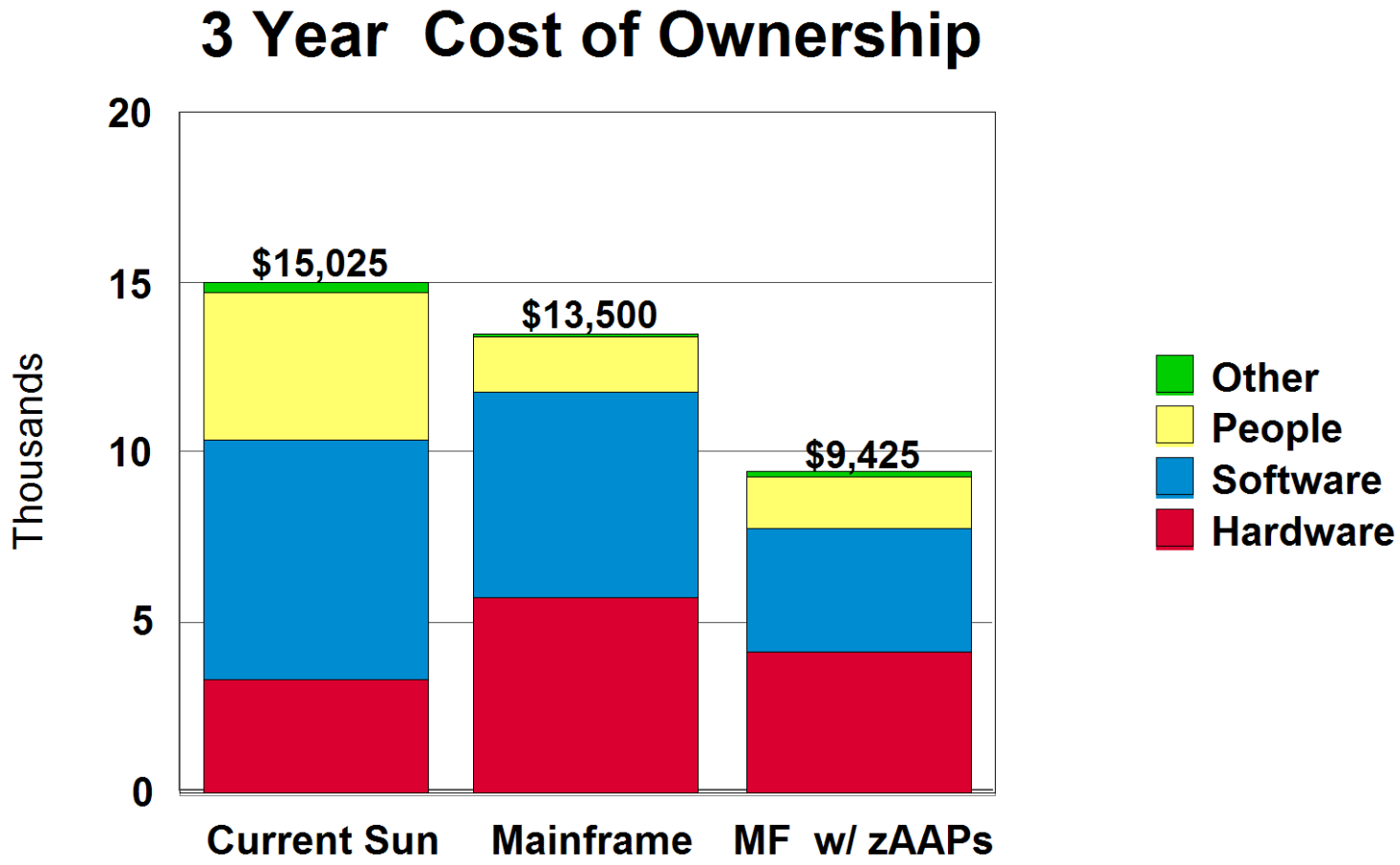
Source: Capricorn whitepaper

Workload consolidation using Linux on a mainframe can result in significant TCO savings



Source: Scorpion Study 1999 - 2005

What about zSeries Application Assist Processors (zAAPs)?



With zAAP processors, zSeries savings would have been 37%

Source: Scorpion Study 1999 - 2004

6 Case Studies: from Microsoft® Windows® or Solaris to ...

	Type	Current Servers	Target Solution Area	3-Year Saving
1	NT infrastructure	300 Windows	1 z/VM® (100 Linux, 7 IFLs)	~50%-60%
2	Large Web portal	39 Solaris	39 x-Linux (2&4w)	~60%-70%
3	Oracle datamarts	110 Solaris	2 p-AIX®-HACMP (24w)	~55%-60%
4	Intranet servers	81 Windows	21 x-Windows (2w)	~40%-45%
5	Web trading	24 Solaris domains	1 z/VM (24 Linux)	~60%-70%
6	Non-prod Windows	144 Windows	18 x-Windows 4w, VMWare	~35%-40%

Source: Capricorn whitepaper

What Makes the Best Fit for z

- **Leverage classic strengths of the zSeries**
  - High availability
  - High i/o bandwidth capabilities
  - Flexibility to run disparate workloads concurrently
  - Requirement for excellent disaster recovery capabilities
  - Security
  - Facilities - 15 yrs ago did you think facilities would be a mainframe strength
- **Shortening end to end path length for applications**
  - Collocation of applications
  - Consolidation of applications from distributed servers
  - Reduction in network traffic
  - Simplification of support model

- WebSphere MQ Series
- DB2 Connect
- CICS Transaction Gateway
- IMS Connect for Java
- Web Logic/WebSphere and JAVA applications development
- Applications requiring top end disaster recovery model
- LDAP security services
- IBI Web Focus

Summary – Reducing TCO with System z

Chargeback methodology works against the mainframe

It feeds the "expensive" perception

Specialty engines can **significantly lower the total cost** of the mainframe

The typical total server to production server ratio is between **3:1 or 5:1** for a distributed app.

The incremental cost of capacity on a zSeries is less expensive than distributed servers

- **UNIX - 0.9 – 1.5 x compared to mainframes**
- **Windows - <1.0 - 4.0 x compared to mainframes**

System z (**z/OS**) has a significant business case advantage in
people, availability, and utilization

System z (**Linux/VM**) has a significant business case advantage in
people, software, utilization, and failover

Have a Great Day!

Full range of TCO factors considerations – often ignored

- *Availability*
  - High availability
  - Hours of operation
- *Backup / Restore / Site Recovery*
  - Backup
  - Disaster Scenario
  - Restore
  - Effort for Complete Site Recovery
  - SAN effort
- *Infrastructure Cost*
  - Space
  - Power
  - Network Infrastructure
  - Storage Infrastructure
- *Additional development and implementation*
  - Investment for one platform – reproduction for others
- *Controlling and Accounting*
  - Analyzing the systems
  - Cost
- *Operations Effort*
  - Monitoring, Operating
  - Problem Determination
  - Server Management Tools
  - Integrated Server Management – Enterprise Wide
- *Security*
  - Authentication / Authorization
  - User Administration
  - Data Security
  - Server and OS Security
  - RACF vs. other solutions
- *Deployment and Support*
  - System Programming
    - Keeping consistent OS and SW Level
    - Database Effort
  - Middleware
    - SW Maintenance
    - SW Distribution (across firewall)
  - Application
    - Technology Upgrade
    - System Release change without interrupts
- *Operating Concept*
  - Development of an operating procedure
  - Feasibility of the developed procedure
  - Automation
- *Resource Utilization and Performance*
  - Mixed Workload / Batch
  - Resource Sharing
    - shared nothing vs. shared everything
  - Parallel Sysplex vs. Other Concepts
  - Response Time
  - Performance Management
  - Peak handling / scalability
- *Integration*
  - Integrated Functionality vs. Functionality to be implemented (possibly with 3rd party tools)
  - Balanced System
  - Integration of / into Standards
- *Further Availability Aspects*
  - Planned outages
  - Unplanned outages
  - Automated Take Over
  - Uninterrupted Take Over (especially for DB)
  - Workload Management across physical borders
  - Business continuity
  - Availability effects for other applications / projects
  - End User Service
  - End User Productivity
  - Virtualization
- *Skills and Resources*
  - Personnel Education
  - Availability of Resources