Cost of Ownership

Determining IBM System z platform costs … through real studies

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What you will learn from this presentation:

- The way you structure a TCO analysis can profoundly affect the accuracy and thus the outcome.
- The more complete the analysis, the more favorable the result for large virtualized servers (like mainframe) in a business case.
- Industry Trends favor the mainframe – specialty engines are changing the mainframe cost landscape radically.
- Play offense with confidence, not defense.

I assume you already know what cost of ownership analysis is … and that you want to know how to do it well…

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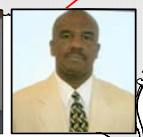

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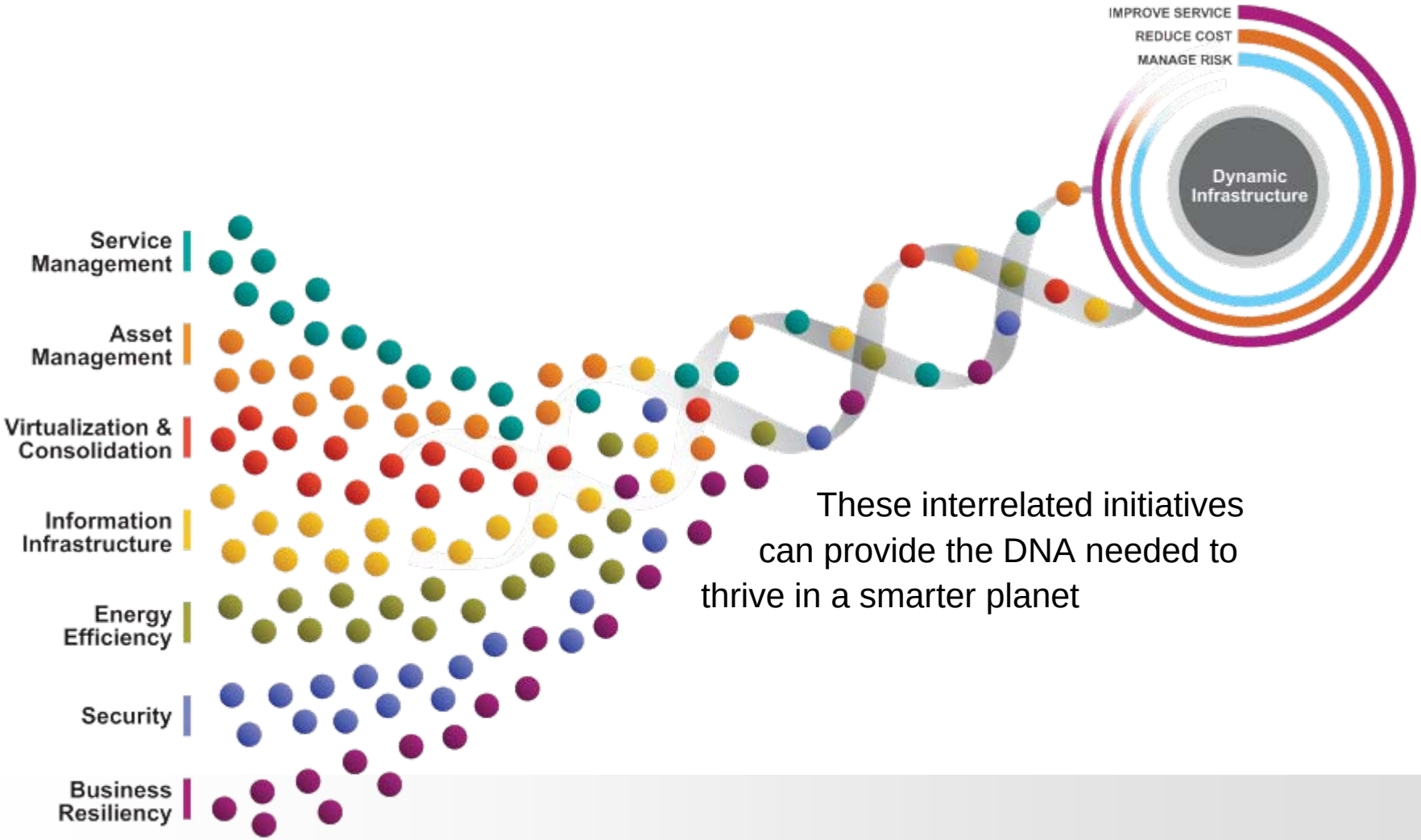
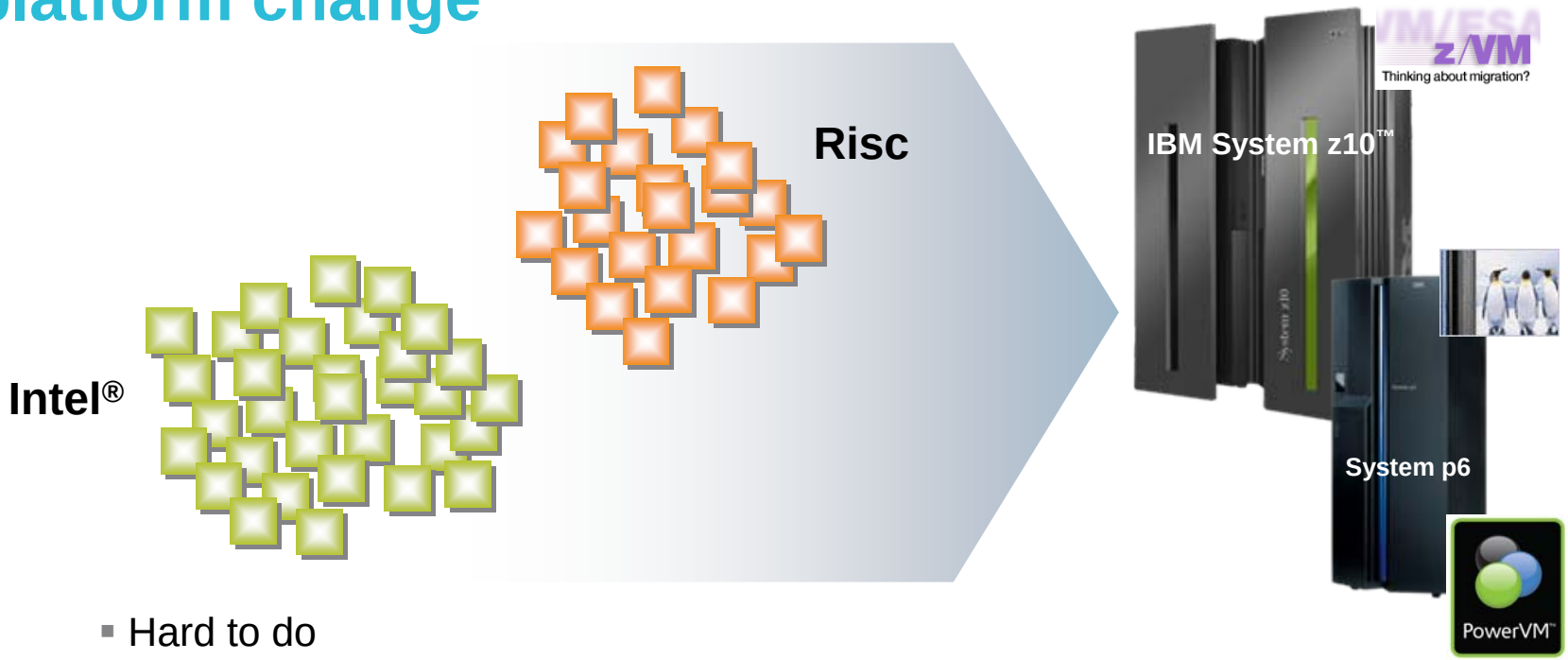
A dynamic infrastructure is a journey…



These interrelated initiatives can provide the DNA needed to thrive in a smarter planet

. . . the IBM mainframe is already there!

Your technique must be different when evaluating platform change



- Hard to do
- Requires knowledge of multiple architectures and $$
- Politically controversial
- Impact of inaccuracies is large – “leave out what???”
- Potentially big QoS improvement and savings

Can eliminate layers of infrastructure with large savings – especially if you leverage a low-cost platform.

Building the TCO business case

Defining the rules for comparing solutions

1. **Selecting architecture(s)**
   - *Platform* based analysis, not *server* analysis
2. **Picking the application – like-for-like configs & costs**
   - All components
3. **Useable capacity/utilization**
   - Different by platform and resource
4. **Cost of support staff**
   - Consider all staff affected
5. **Quality of Service**
   - Consider categories that make a difference
6. **Incremental cost analysis**
   - Samples

Selecting architecture(s)

We must compare solutions as they will be implemented, not as they can be imagined…

- **Assess the current environment to understand its strengths**
- **Build business cases:**
  - All servers of a given type should be considered along with all budget items for that type
  - Consider sunk costs as well as new costs
  - Consider storage and networking infrastructure differences
  - Tested disaster recovery
- **Where does most corporate data reside? Will we have to move that data with the solution being considered?**

Application/Like-for-like configs

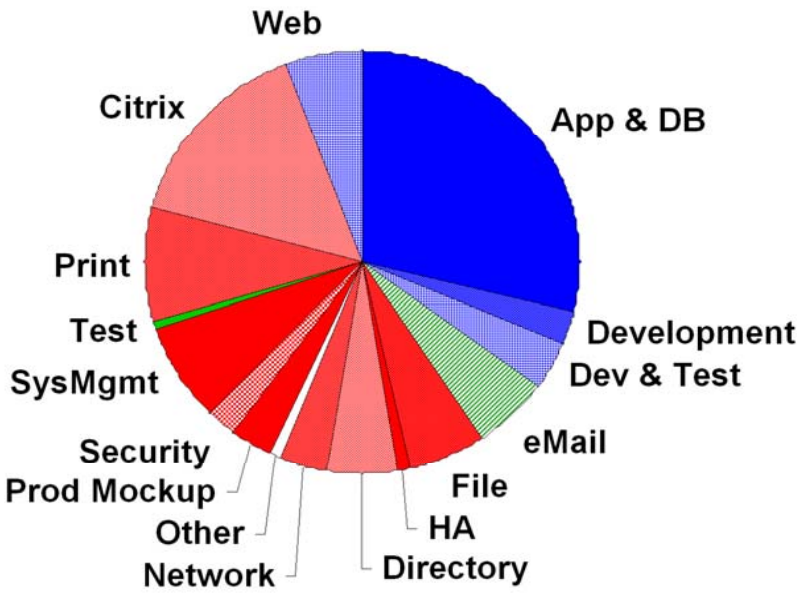
- **Production, dev, test, HA, and DR environments**
  - Web, App, DB, middleware, and other relevant components
- **Include necessary *dedicated infrastructure*:**
  - LDAP, sprayers, background, FTP, repositories, middleware, DB2 Connect™, CICS®/TG, MQSeries®, etc.
- **Include necessary *shared infrastructure*:**
  - Software engineering, A/B versioning, synthetic loads, documentation, data extracts, documentation, etc.
  - TIM/TAM, firewalls, monitoring, accounting, backup, IBM Tivoli®, SMS, billing, provisioning, code versioning, crash-and-burn servers, OS support, DB support, problem tracking, billing, etc.
- **Include *"upstream" and "downstream" systems***
- **Networking and Storage components**

Costs must be considered with a "platform" perspective. Simplifying the analysis can invalidate the outcome.

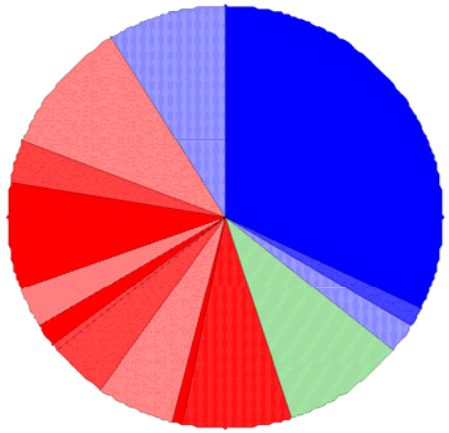
Like-for-like:

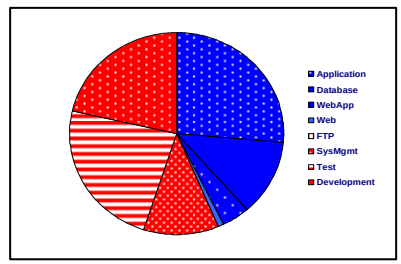
Real findings based on these concepts

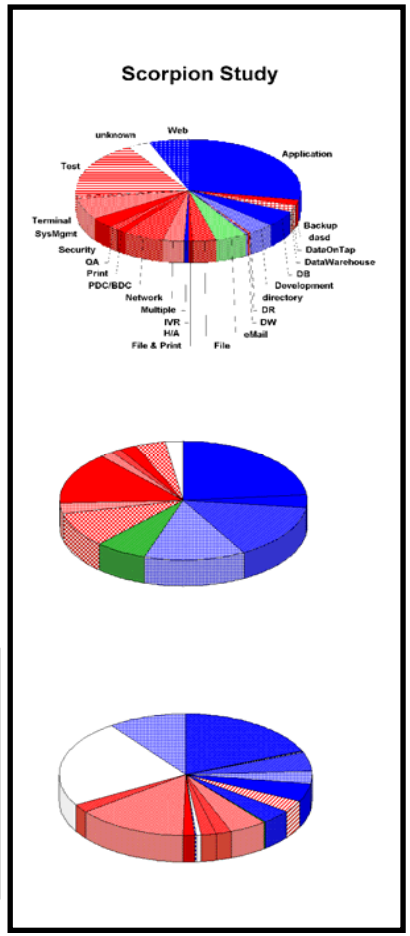
Count



RIPs







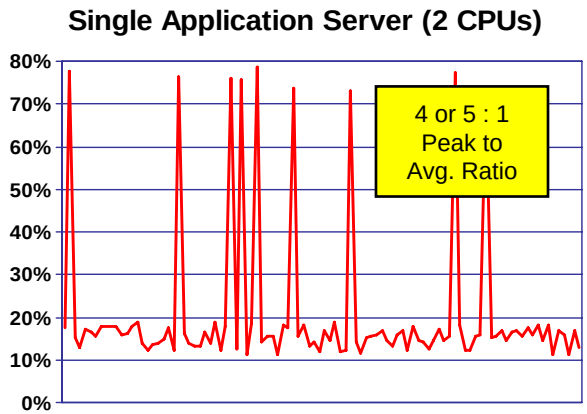
On average, only 1/3 of resources are dedicated to the production Web – App – DB serving role.

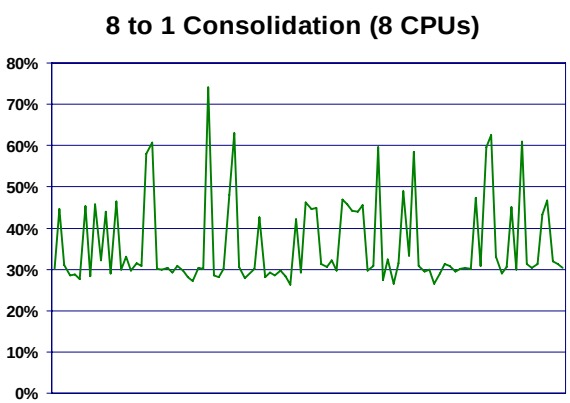
* RIP is a relative unit of transaction processing workload that is valid within the scope of this study only. It cannot be directly equated to commercial benchmarking workloads or ratings.

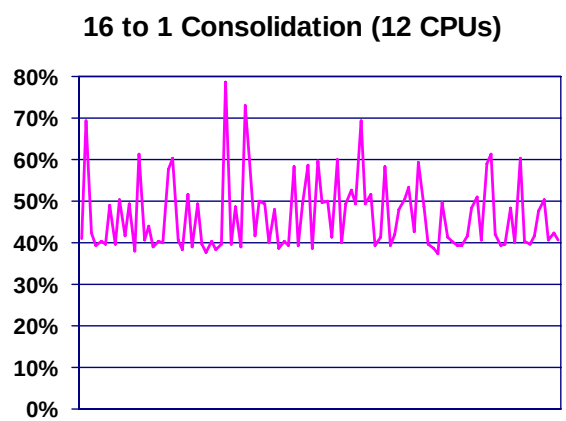
Usable capacity:

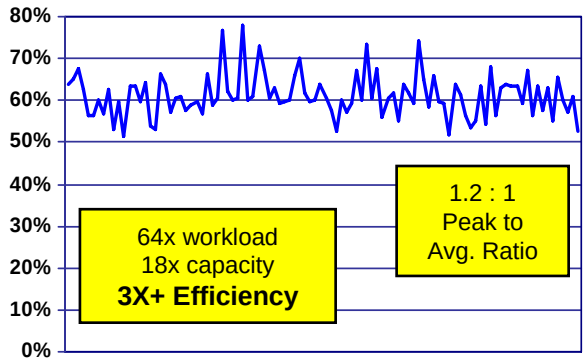
Virtualized (large) servers allow higher utilization

- **Single workload model assumptions:**
  - Average Utilization: 20.7%
  - Peak: 79%
- **As more copies of this workload are added, average utilization approaches peak**
  - 8:1 39% Average, peak 76%
  - 16:1 48% Average, peak 78%
  - 64:1 61% Average, peak 78%
- **As workload is added the number of CPUs required for the work grows at a much lower rate**



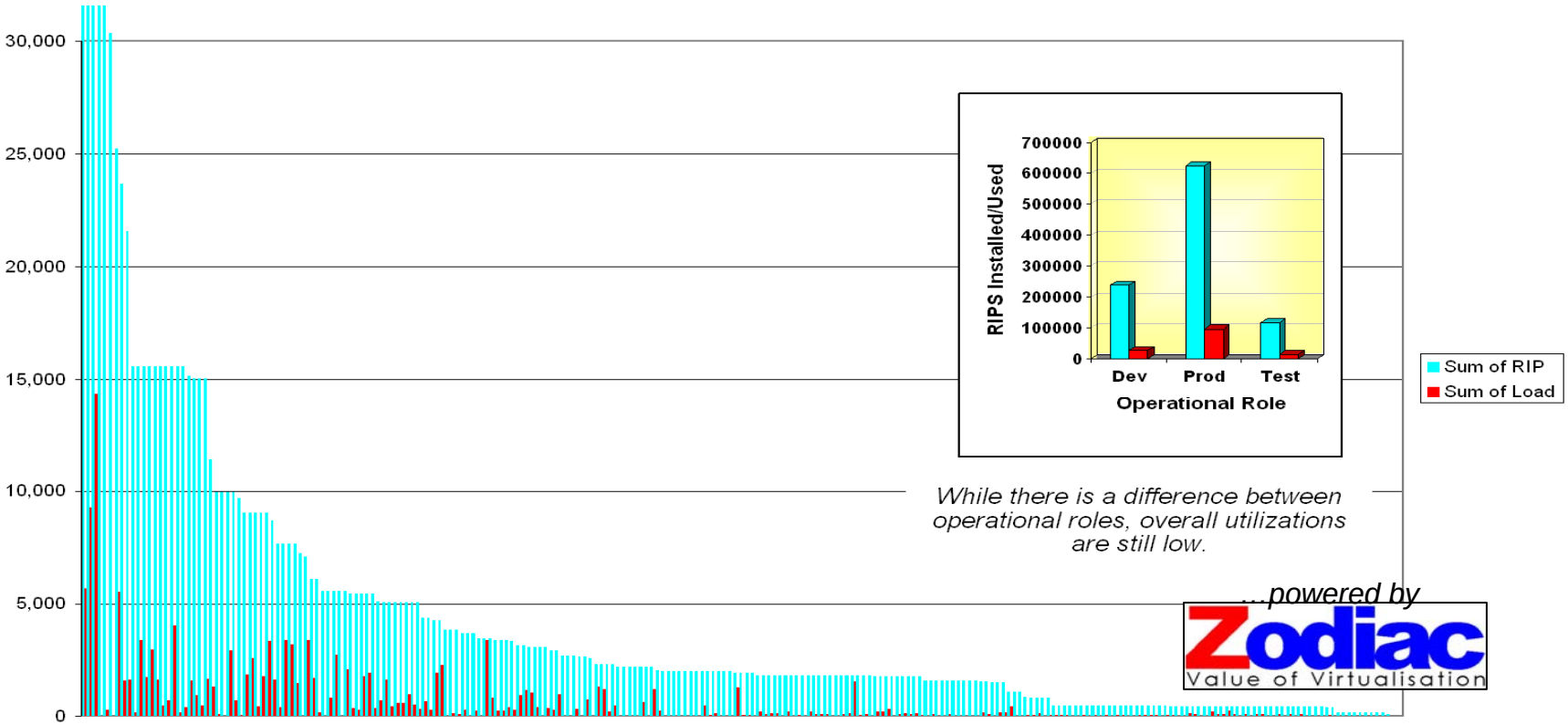






Usable capacity:

You may not know how bad it is!



While there is a difference between operational roles, overall utilizations are still low.

…powered by

Zodiac
Value of Virtualisation

Relative Internal Performance is a cross-architecture capacity estimate. It is intended to be used only within the context of this study and cannot be compared to external benchmarks or other IBM performance ratings. Load or Used RIPS is the product of estimated utilization and RIP per instance for all 250+ server instances. Mainframe CPs are not included.

Consider what is customary in your environment … not what is best practice or "possible".

Cost of support staff:

Roles and difficulty

Application Life Cycle	Wintel (remote)	Wintel (central)	RISC	IBM System x® VMware	IBM System p® IBM System i®	IBM System z®
User Needs Analysis	A	A	A	A	A	A
Application High Level Design	A	A	A	A	A	A
Middleware/data selection	A	A	A	A	A	Both
Software/Hardware selection	A	A	A	A	Both	I
Capacity Forecasting/Costing	A	A	A	Both	I	I
System Engineering	A	A	A	I	I	I
Hardware Installation	I	I	I	I	I	I
Software Installation	I	I	I	I	I	I
System Maintenance	Both	Both	Both	I	I	I
Application Installation	A	A	A	Both	Both	Both
Application Maintenance	A	A	A	A	A	A

A = Application support I = Infrastructure support

Basing support costs on the IT Organization Chart may lead to incorrect conclusions in the cost analysis. A better approach is to allocate ALL IT staff roles over an application life cycle.

The IT budget is $142 million with a staff of 597 employees (including contract workers)

($ Millions)

Operating Expenses

Full Time Equivalents (FTEs)

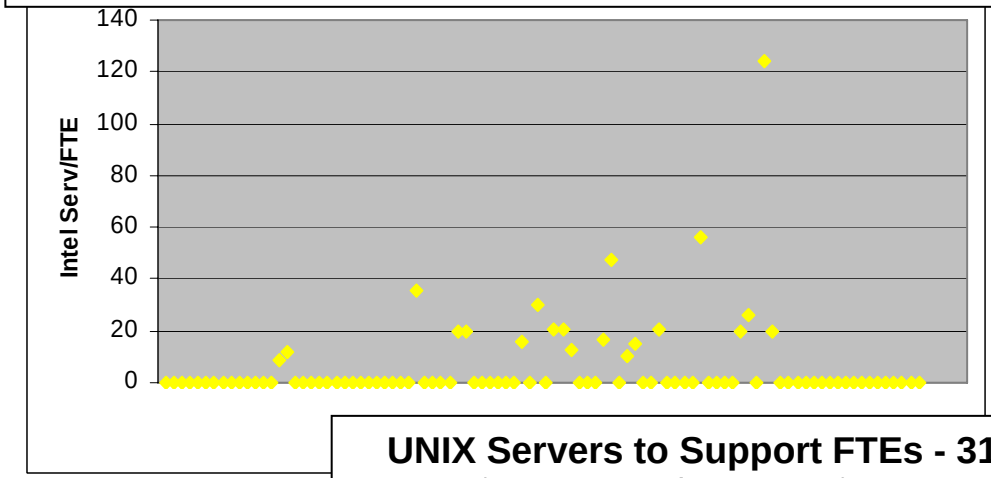
Service Category	Initial Allocation	Revised Allocation	Initial Staff Allocation	Revised Staff Allocation	SCORPION Averages
Mainframe	**39.4**	**39.4**	**83.3**	**72.9**	**60-100**
UNIX®	**0.9**	**1.2**	**6.0**	**7.1**	**14-23**
Intel	**11.1**	**14.7**	**47.9**	**79.2**	**115-231**
AS/400®	**1.6**	**1.1**	**3.4**	**1.9**	**2-4**
Storage Management	12.1	13.2	20.3	24.1	
High Volume Print	4.4	6.6	24.3	42.4	
Desktop Support	11.2	15.4	106.6	131.7	
Help Desk	2.2	2.8			
Data Network	15.5	17.6			
Voice Network	7.0	8.0	20.1	24.9	
eMail	1.6	2.1	10.7	12.4	
Internet	2.5	3.1	13.9	16.5	
Other – IMT	1.1	1.4	5.0	6.0	
Out of Scope	12.4	15.5	90.5	99.4	
Overhead	19.1	0	75.4	0	
TOTAL	**142.1**	**142.1**	**578.0**	**597.0**	

This delta could reverse the outcome.

Staffing ratios – Distributed 2000-2008

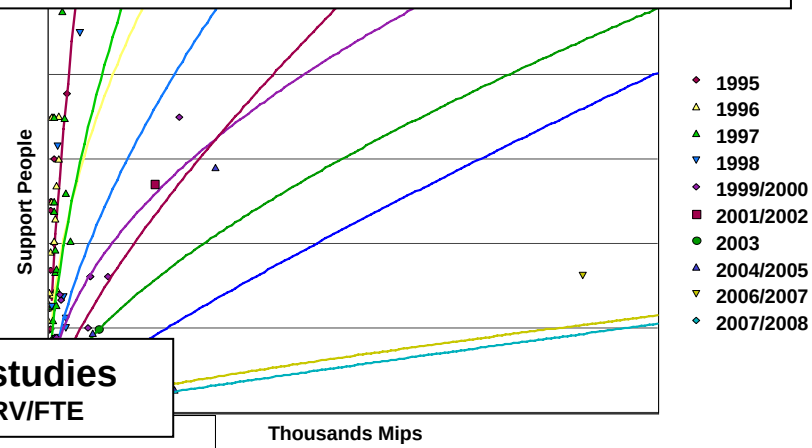
Intel Servers to Support FTEs - 30 studies over 8 years

2000/2001 average = **12 SERV/FTE** 2007/2008 average = **47 SERV/FTE**



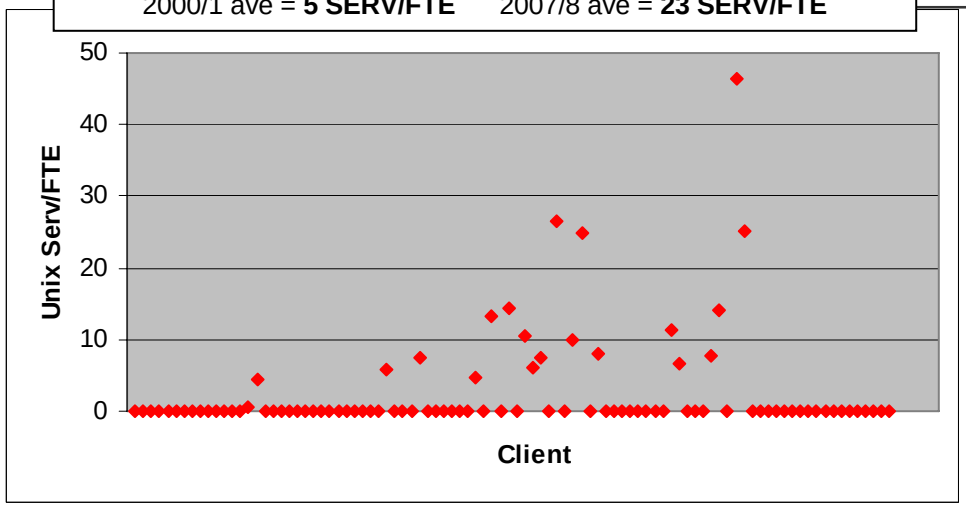
MF Mips to Support FTEs - 27 studies

2000/1 ave = **25+ Mips/FTE** 2007/8 ave = **450+ Mips/FTE**



UNIX Servers to Support FTEs - 31 studies

2000/1 ave = **5 SERV/FTE** 2007/8 ave = **23 SERV/FTE**



Distributed systems have improved by a factor of four, while MF by a factor of 20. QoS is still lagging on distributed.

Quality of service:

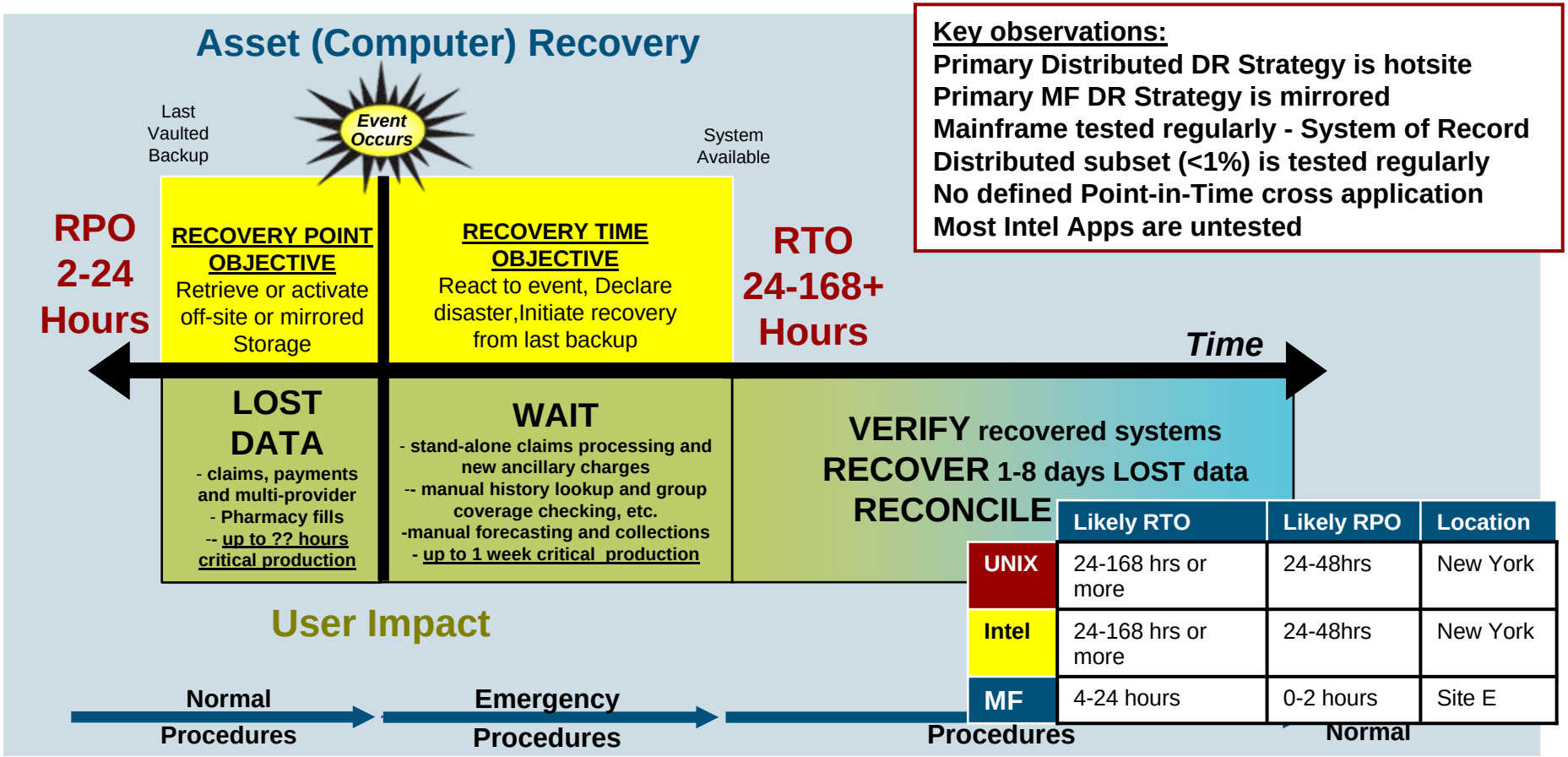
More than just hardware, software, and staff

- ***Availability***
  - Expected hours of operation
  - Planned and Unplanned outage
  - Cost/impact of outage
  - High Availability cost
- ***Disaster Recovery***
  - **Backup effort vs. automation**
  - **Disaster Scenario – RTO, RPO, NRO**
  - **Service costs - hot site**
  - **SAN & Networking effort**
- ***Infrastructure Cost***
  - Space
  - Power
  - Network Infrastructure
  - Storage Infrastructure
- ***Additional development and implementation***
  - Investment for one platform – reproduction for others
- ***Controlling and Accounting***
  - Analyzing systems cost
  - Metering/chargeback
  - Repeatability
  - Scalability
- ***Operations Effort***
  - Monitoring, Operating
  - Problem Determination
  - Server Management Tools
  - Integrated Server Management – Enterprise Wide
- ***Security***
  - Business Risk Management
  - Authentication / Authorization
  - User Administration
  - Data Security – encryption, key management
  - Server and OS Security
- ***Deployment and Support***
  - System Programming & Administration
    - Keeping consistent OS and SW Level
    - Database Effort
  - Middleware
    - SW Maintenance & Distribution (across firewall)
    - Duplication and complexity
  - Application
    - Technology Refresh & 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 Cluster Concepts
  - Response Time
  - Performance Management
  - Peak handling / scalability
  - Predictive Capacity Planning
- ***Integration***
  - Integrated Functionality vs. Functionality to be implemented (possibly with 3rd party tools)
  - Balanced System
  - Integration of / into Standards
- ***Other Availability Aspects***
  - Automated Take Over / Give back
  - Uninterrupted Take Over (especially for DB)
  - Business continuity
  - Downstream application impact
  - End User Service
  - Making fragile systems stable
- ***Skills and Resources***
  - Personnel Education
  - Availability of Resources
- ***Direct Costs***
  - Hardware acquisition & maintenance
  - Software acquisition & maintenance
  - Staff support costs
- ***Complex Costs***
  - Enterprise Agreements
  - Project capitalization & write-off
  - Acquisitions & Mergers
  - “Free” product bundles
  - Outsourcing and services
  - Corporate “sunk” costs
  - International cost accounting

Some “soft” costs are essential to the business.
A few differ significantly by platform and should be considered.

QoS – Disaster recovery:

Recovery time and recovery point differ by platform



Key observations:

Primary Distributed DR Strategy is hotsite
Primary MF DR Strategy is mirrored
Mainframe tested regularly - System of Record
Distributed subset (<1%) is tested regularly
No defined Point-in-Time cross application
Most Intel Apps are untested

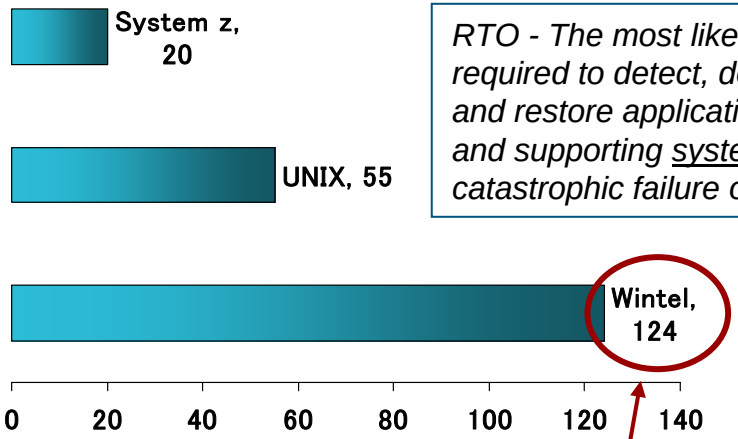
	Likely RTO	Likely RPO	Location
UNIX	24-168 hrs or more	24-48hrs	New York
Intel	24-168 hrs or more	24-48hrs	New York
MF	4-24 hours	0-2 hours	Site E

Disaster Recoverability is typically far more effective (and cheaper) for large virtualized systems. Include it if practical.

Business continuity

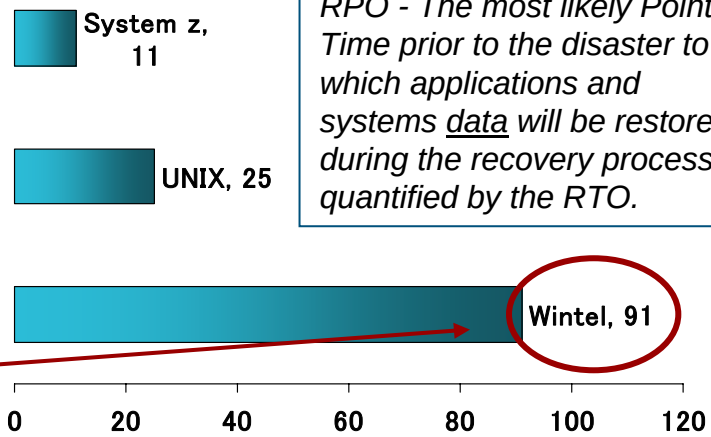
Scorpion summary 2000-2008

Recovery Time Objective (Hrs)
13 Studies



RTO - The most likely time required to detect, declare, and restore applications, data, and supporting systems from catastrophic failure or disaster.

Recovery Point Objective (Hrs)
13 Studies



RPO - The most likely Point in Time prior to the disaster to which applications and systems data will be restored during the recovery process quantified by the RTO.

One week of data loss and one week to recover on average!

Recoverability is key to reducing platform risk.
But the less recoverable the environment, the lower the cost.

Are there other issues?

Yes…

"Power usage by data centers has doubled over the last five years while the national average rate for electricity has risen by 44%."

Information Week, January, 2009

"Power and cooling will be a top 3 issue with all CIOs in the next 6-12 months."

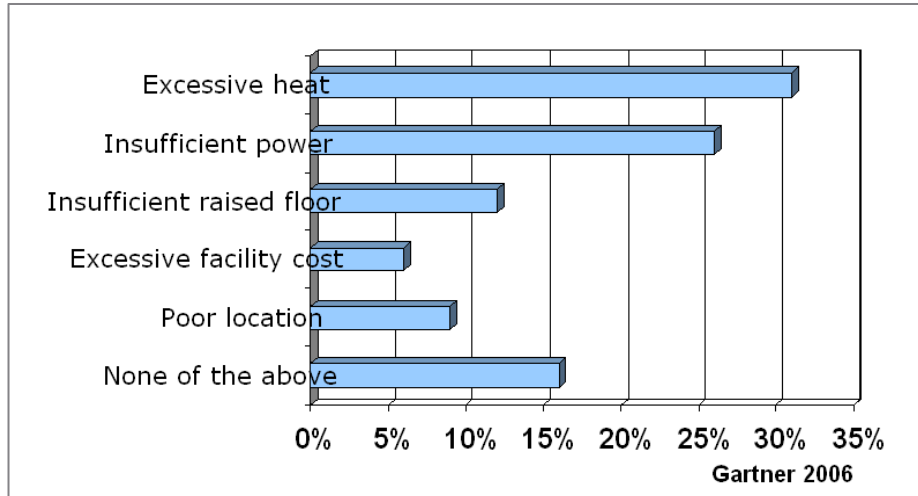
Michael Bell, Gartner Group

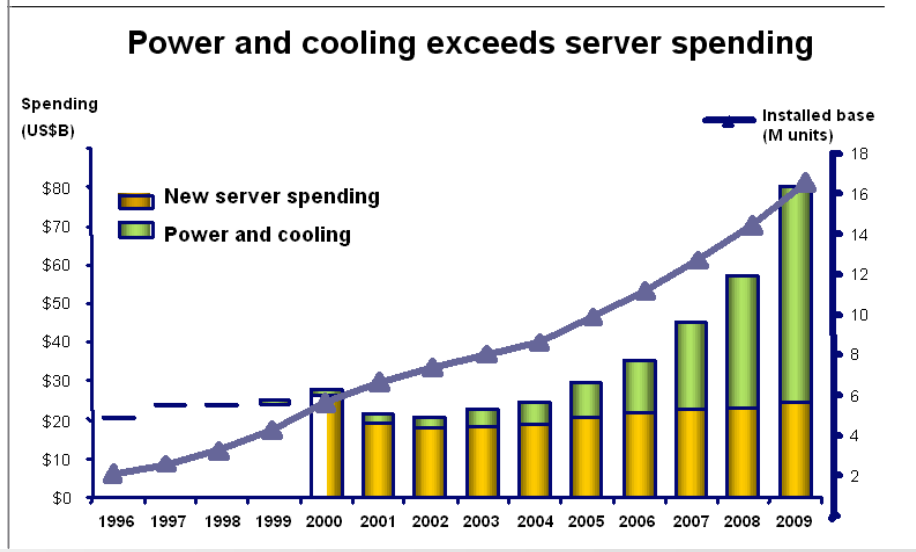
"In December of 2006, congress directed the EPA to report on power usage and growth of datacenters and enterprise servers. The goal of all this is to create a standard energy efficiency benchmark."

Information Week, January, 2009

"The cost of data center floor space is inconsequential compared with the cost of operating and cooling a data center. You pay once to power the systems and again to cool them."

Information Week, February 2006



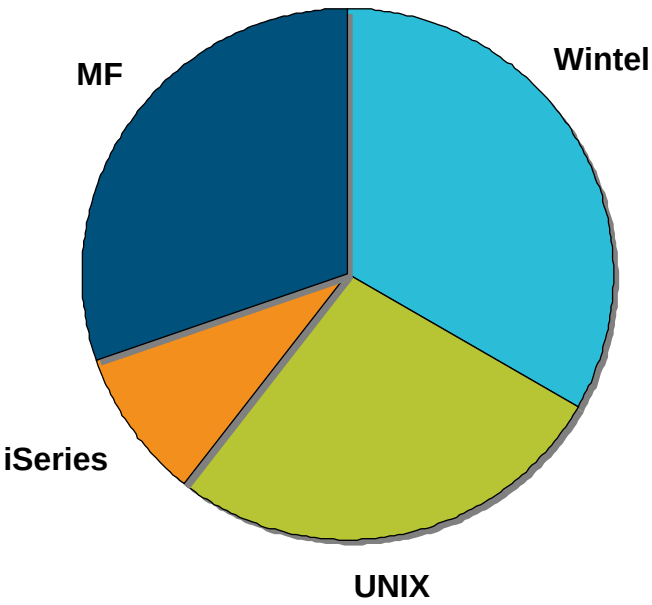


Cost per BTU may be low, but a data center expansion project is not!

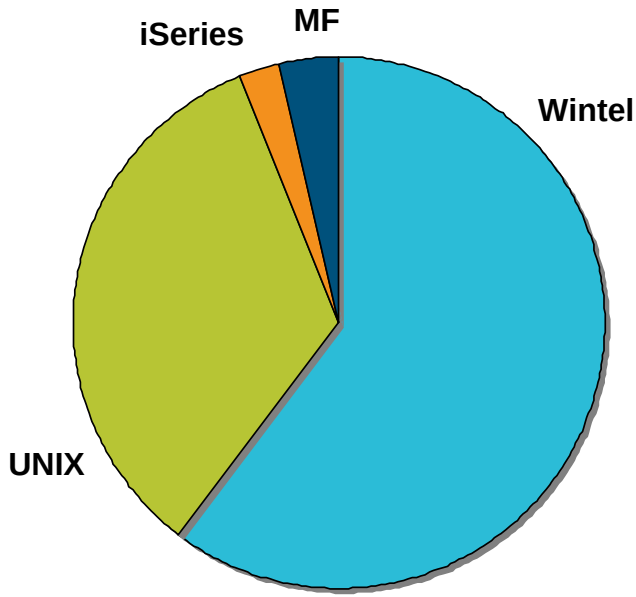
Current state

Environmental costs also differ

Used Capacity



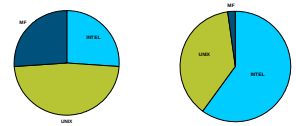
Power Draw



Ratio

Watts / Used RIP	
Wintel	16.7
UNIX	11.4
iSeries	2.6
MF	1.1

Ratio = 28:10:1



Environmental costs may not be large relative to hardware and software, unless that next inexpensive blade requires a new building!

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Building the TCO business case

Defining the rules for comparing solutions

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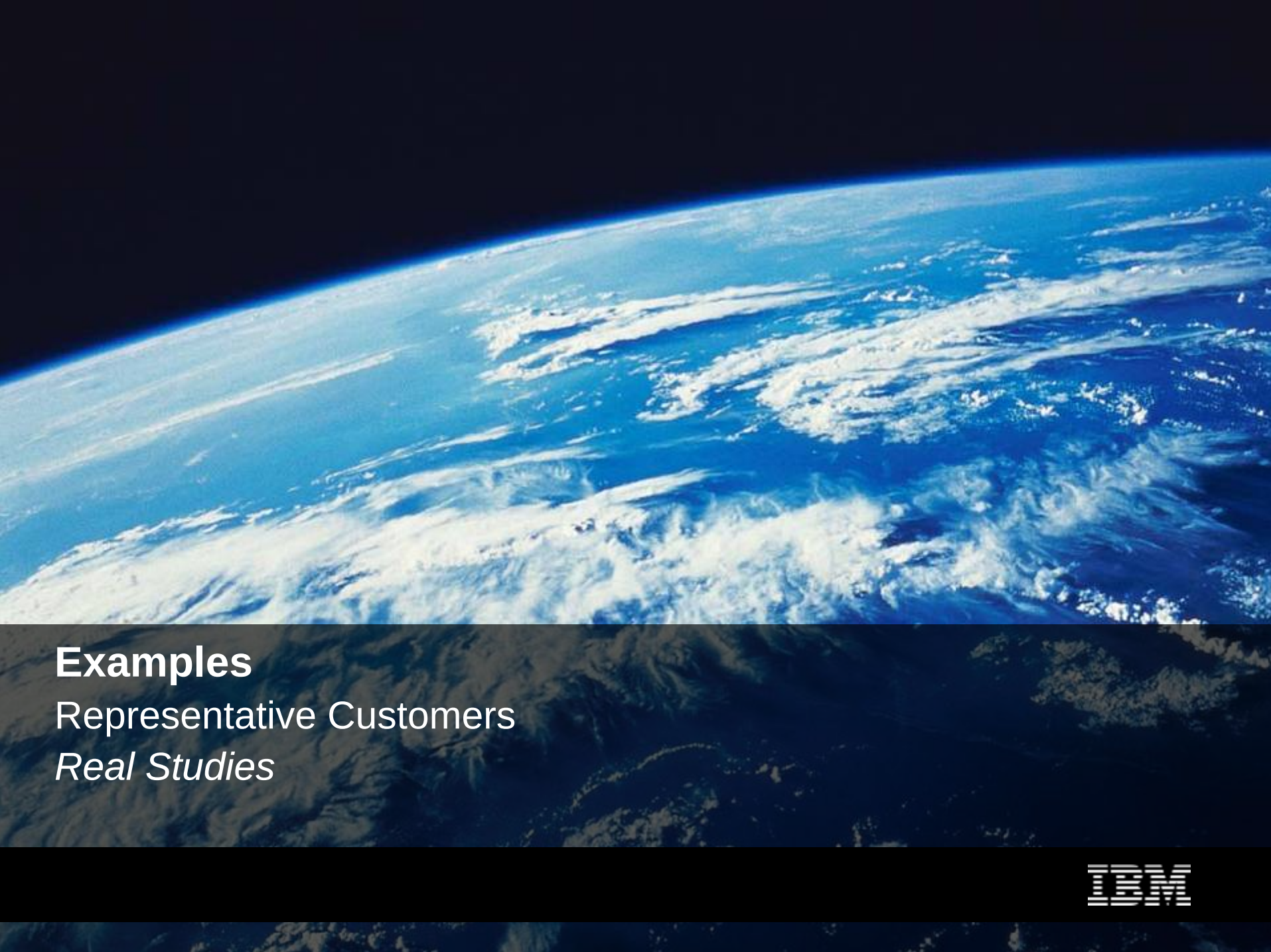


Examples

Representative Customers

Real Studies

When comparing M/F to distributed…

Approximately 80% of the time, a mainframe solution will fall within 20% of the cost of a distributed solution if all the costs are accounted for.

- Marlin Maddy, Scorpion Study Series – Part 1 – 6
  http://www-01.ibm.com/software/info/television/sv_se/noflash-systemz.html
- The more costs you can accurately account for (that means eliminating unfair costs apportioned to the mainframe – like the corporate jet) the better IBM System z looks
- The more detailed the discussion about people, management, and costs associated with ongoing operations (i.e. headcount in all its forms) the better System z looks

Sample Customer A

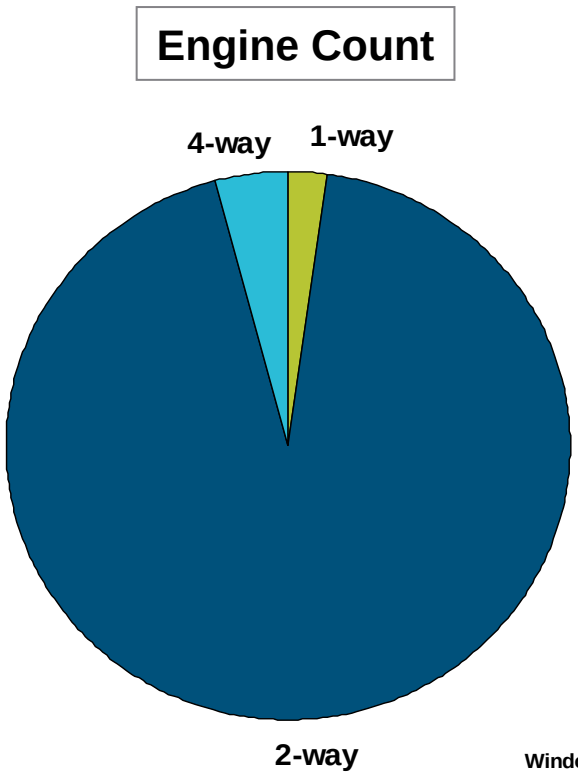
- **Medium Shop**
- **500 servers**
- **4 architectures**

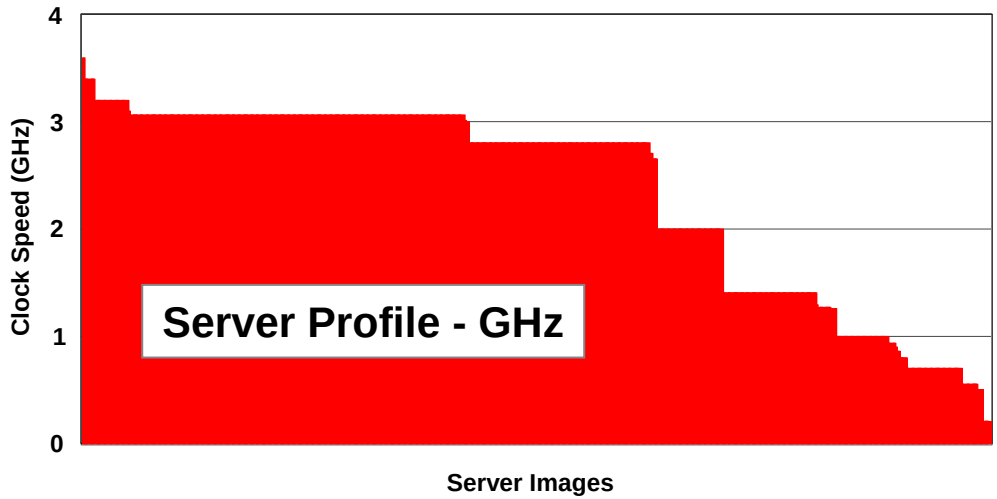
- Strategy to simplify with Microsoft® Windows® based blades
- Rapid growth
- Multiple locations including international
- Disaster recovery improvement focus
- Cost reduction through modernization
- Excellent quality data provided to IBM

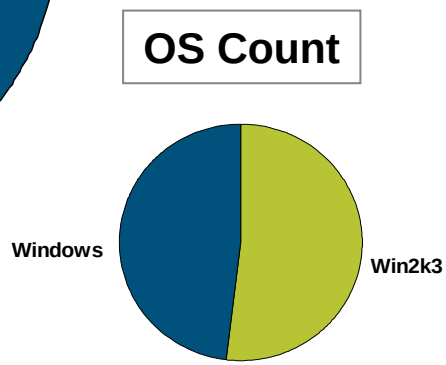
Current state

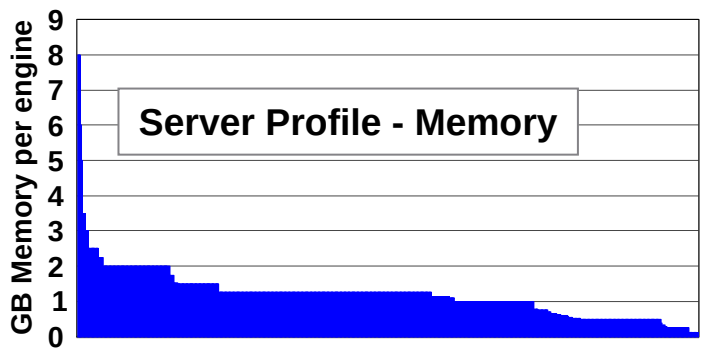
Intel Complexity is AVERAGE

The number of unique hardware combinations is proportional to the level of effort required to maintain a large inventory of servers. The ABC environment is dominated by 2-socket machines of many speeds.





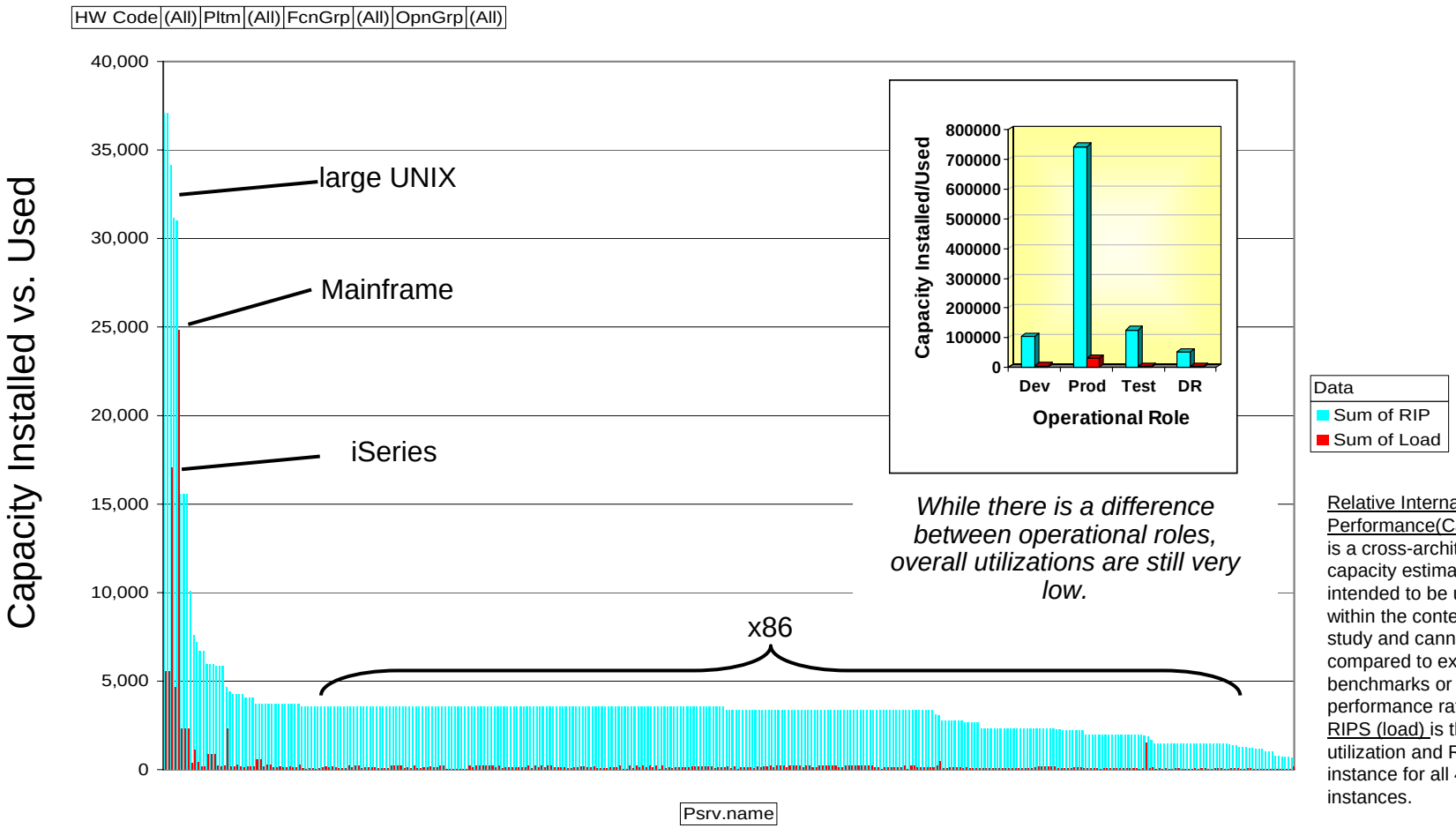




Current state

Utilization on x86 is LOW

Observing the relative performance of 350+ physical machines for which data was analyzed, both installed and used at ABC, we see a considerable amount of unused capacity, particularly for Intel. Utilizations are very low on Intel. VIRTUALIZATION will help improve this situation.



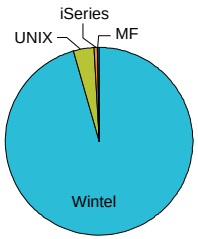
While there is a difference between operational roles, overall utilizations are still very low.

Relative Internal Performance(Capacity (RIP) is a cross-architecture capacity estimate. It is intended to be used only within the context of this study and cannot be compared to external benchmarks or other IBM performance ratings. Used RIPS (load) is the product of utilization and RIP per instance for all 450+ server instances.

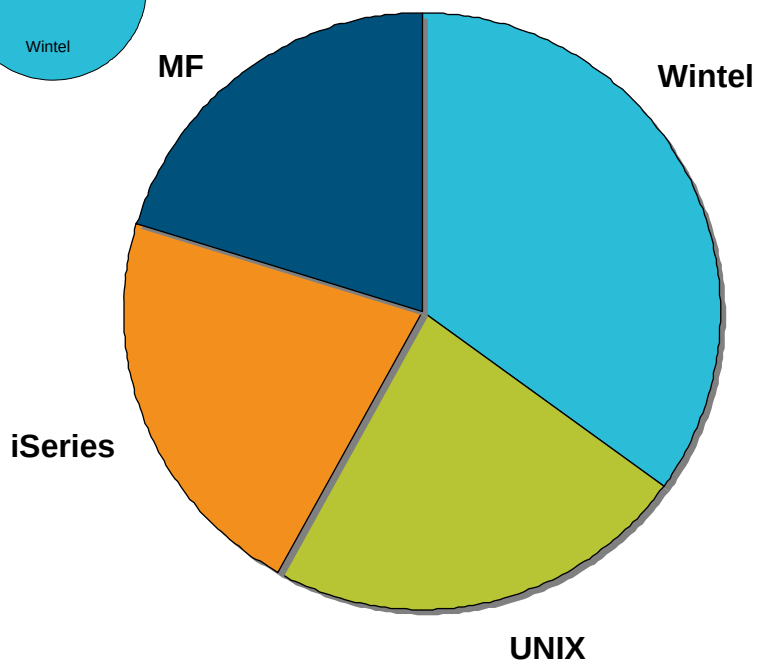
Current state

Capacity / Spend

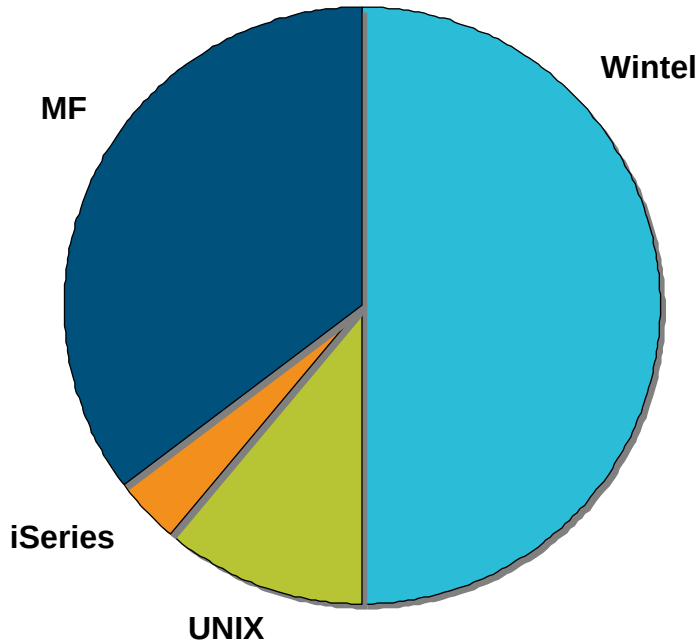
The estimated IT budget is, as expected, also dominated by Wintel machines. Most environments at ABC are heavily optimized, so these ratios would no longer apply if workloads were moved between environments. We will project workload movement with this knowledge.



Used Capacity



Estimated Budget / Spend

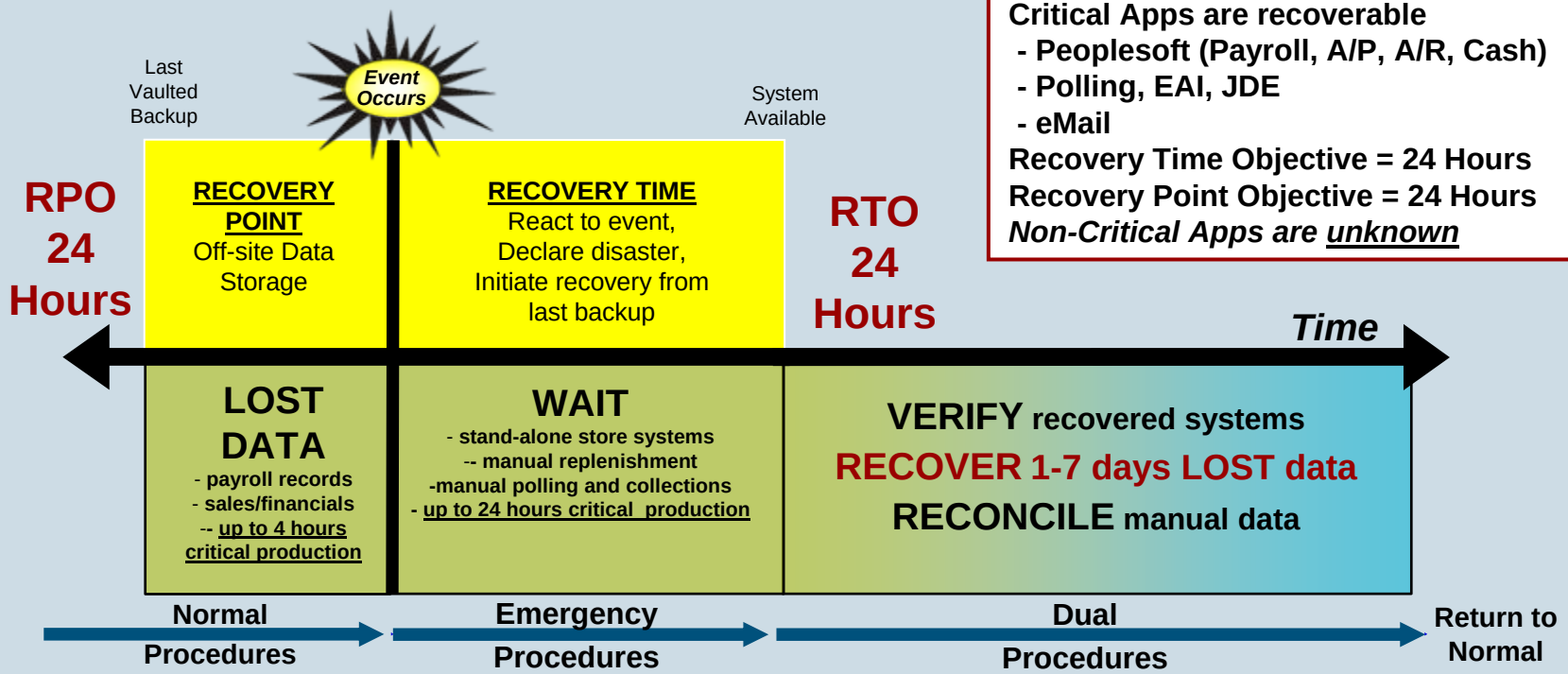


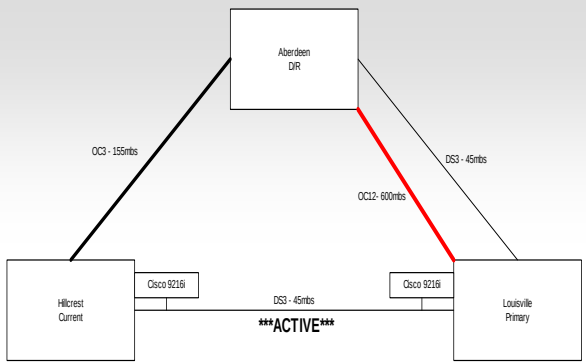
Relative Internal Performance is a cross-architecture capacity metric used here. It is to be used only within the context of this study and cannot be compared to external benchmarks or other IBM performance ratings. Load or Used RIPS is the product of estimated utilization and RIP per instance for all 450+ server instances. Mainframe CFs are not included.

QoS

DR is GOOD, but only for *Critical* Systems

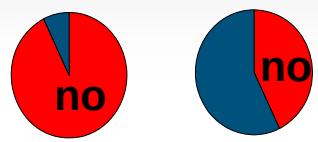
Key observations:
Critical Apps are recoverable
- Peoplesoft (Payroll, A/P, A/R, Cash)
- Polling, EAI, JDE
- eMail
Recovery Time Objective = 24 Hours
Recovery Point Objective = 24 Hours
Non-Critical Apps are unknown





SAN environment:
- Non-shared
  - Tru-copy for MF
  - MIMIX for iSeries
  - 15TB for Wintel/UNIX
  - Win=60%, U=20%
- DS3 site links
- OC12 available
- Data center move

SAN Connected Apps



Intel UNIX

Windows application servers to Blades or VMware

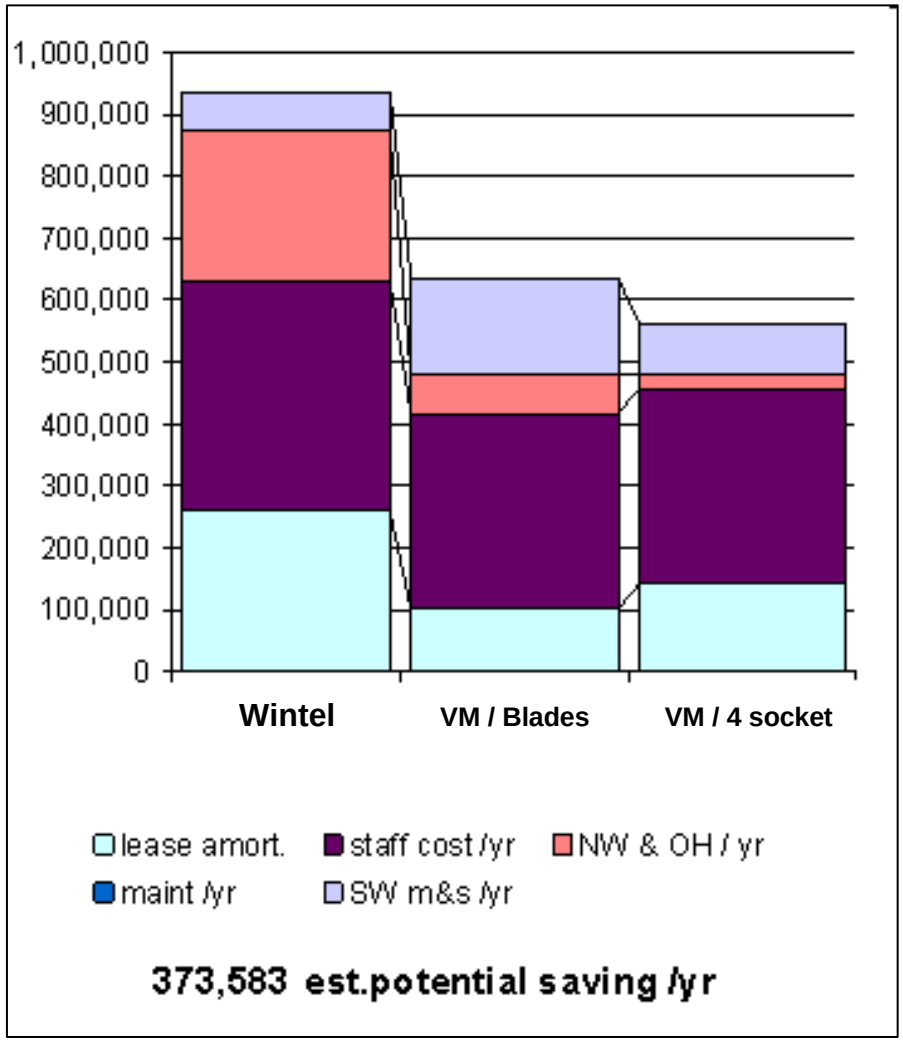
A large format Virtualized x86 solution provided excellent savings and superior Quality of Service over a smaller format blade solution.

Technical Aspects:

- 88 Logical x86 across 80 physical x86
- No image reduction
- ESX on blades vs. 4 socket machines
- Low current utilization <5%
- Utilizations (only) doubled on both alternatives
- Per port NIC costs included
- Single year business case – run rate
- Transition costs not included

Business Aspects:

- Minimal monitoring or capacity planning
- Need to improve disaster recovery
- Need to improve manageability



MF DB to Blades or Large Format x86 or System z specialty engines

System z specialty engines always compete well with x86 on price and with far superior Quality of Service and no transition effort or cost, make a compelling case.

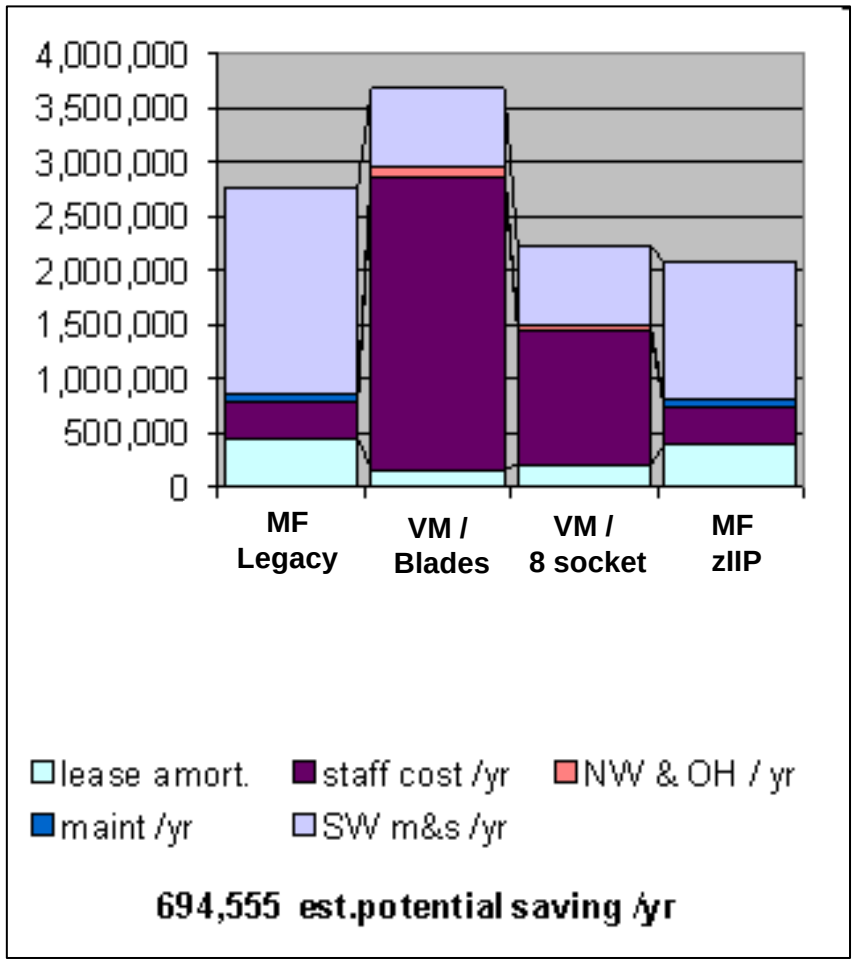
- 3+ IBM eServer™ zSeries® 900

Engines to IBM System z9® CP/zIIP pair

- Multiple z LPARS - prod/test/dev workload
- ESX on blades vs. 8 socket machines
- Very conservative software costs used
- High current utilization <80% (24 hour ave)
- Reasonable Utilizations on distributed
- Per port costs included
- Single year business case
- NO transition costs included

Business Aspects:

- Minimal monitoring or capacity planning
- Need to improve disaster recovery
- Need to improve manageability



Sample Customer C

- **Small Shop**
- **150 servers**
- **3 architectures**

- Public sector – limited cost case flexibility
- Strategy to leverage Intel to reduce cost
- Wanted to “get off the mainframe”
- Old MF applications – business critical
- Very strong user community – package orientation

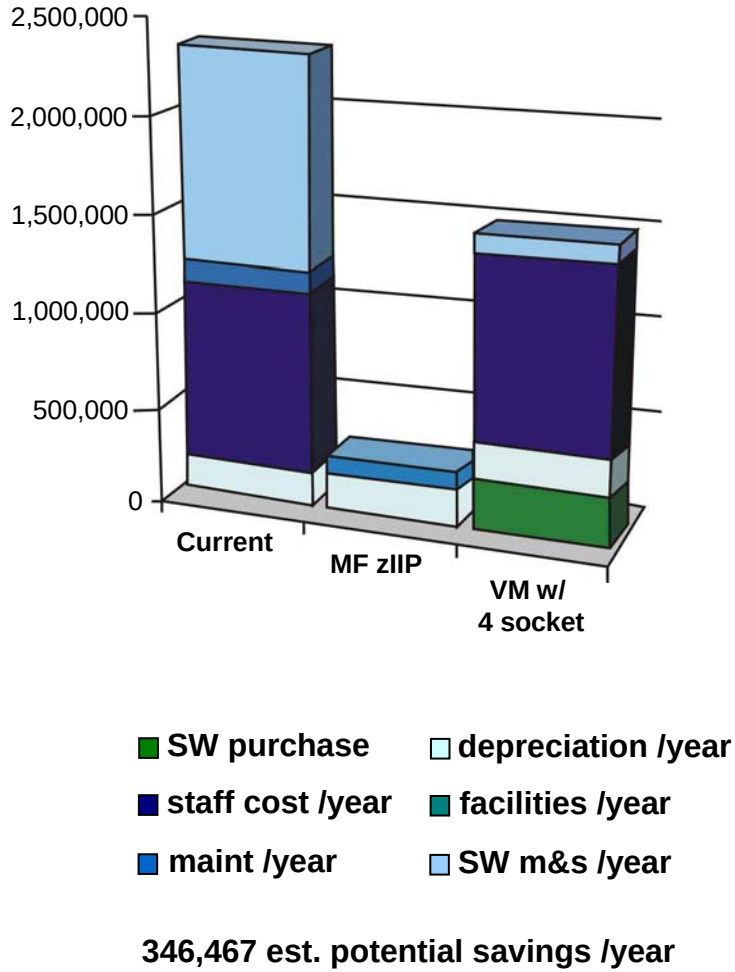
MF DB to 4 socket x86 or System z Specialty Engines

System z specialty engines, in this case reduce the cost of the existing platform significantly for workload growth.

- Upgrade to z9® zIIP
- ESX on blades vs. 4 socket machines
- Very conservative software costs used
- High current utilization <80% (24 hour ave)
- High Utilizations on distributed
- Per port costs not included
- Three year business case
- NO transition costs included

Business Aspects:

- Absolute minimum cost
- Absolute minimum effort/transition
- Need to improve disaster recovery



346,467 est. potential savings /year

Sample Customer F

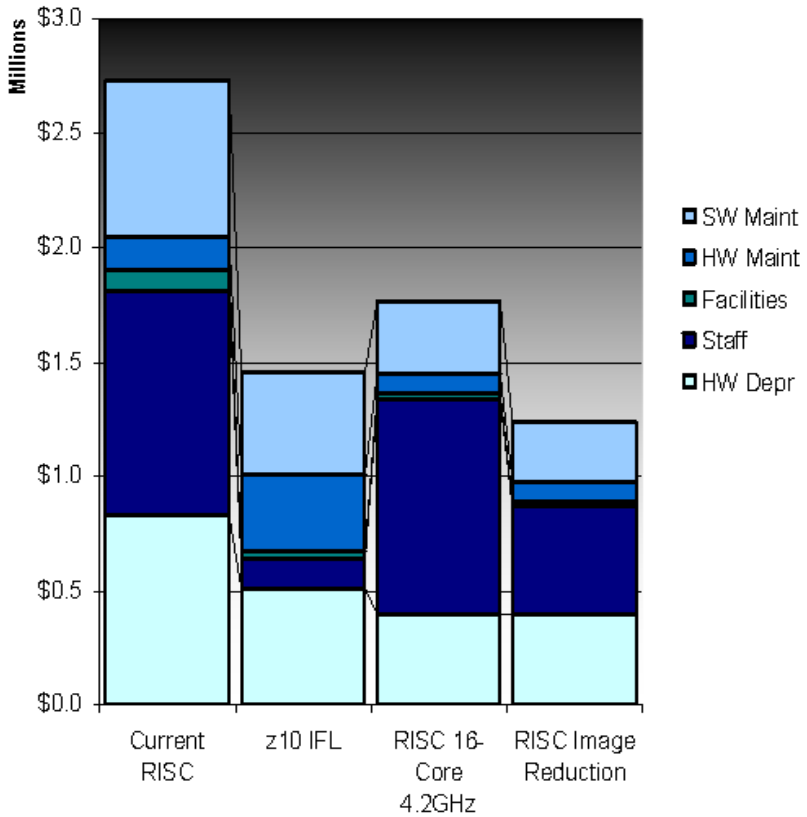
- **Large Shop**
- **1,500 servers**
- **2 locations**

- Stable environment – reducing cost & complexity
- Linux® strategy – 15% of images – JBOSS
- Virtualization strategy – 2/3 UNIX, 1/3 Wintel images
- DB2® MF applications – system of record

UNIX to 16-core UNIX or System z Specialty Engines

System z specialty engines, in this case a new footprint, reduce the cost of the environment and move processing closer to legacy data.

- Migrate to IFL only IBM System z10 Business Class™ (z10 BC™)
- Very conservative software costs used
- V. High current utilization <70%
- V. High Utilizations on target
- Per port costs not included
- Five year business case
- NO transition costs included



Business Aspects:

- Leverage existing infrastructure
- Minimize cost and effort/transition
- Need to improve disaster recoverability

$298,669 Potential Annual Savings (Est)

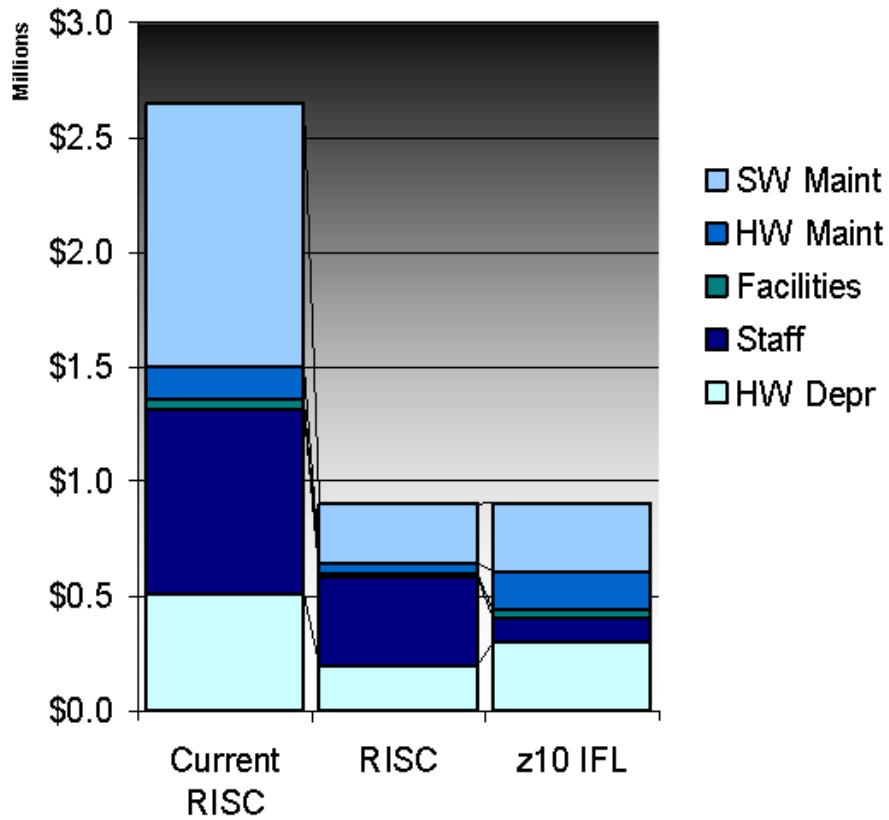
Oracle/UNIX to 8-core UNIX or System z Specialty Engines

System z specialty engines, in this case a new footprint, reduce the cost of the environment and establish a new legacy environment.

- Migrate to IFL only IBM System z10 BC
- Very conservative software costs used
- V. High current utilization <75%
- V. High Utilizations on target
- Per port costs not included
- Five year business case
- NO transition costs included

Business Aspects:

- Leverage existing infrastructure
- Minimize cost and effort/transition
- Need to improve disaster recoverability



$347,923 Potential Annual Savings (Est)

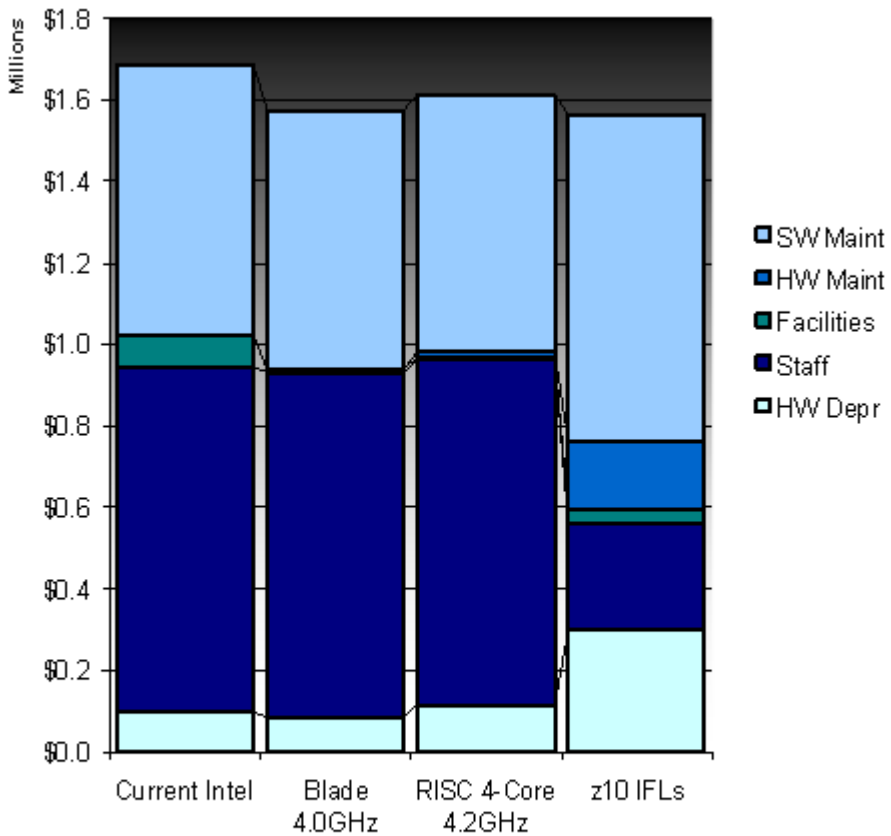
Linux/JBOSS x86 Prod to System z Specialty Engines

System z specialty engines compete very effectively on a cost basis with other new technologies, with superior Quality of Service.

- Migrate to IFL only z10 BC
- Very conservative software costs used
- Average current utilization <15%
- Average Utilizations on target
- Per port costs not included
- Five year business case
- NO transition costs included

Business Aspects:

- Leverage existing infrastructure
- Minimize cost and effort/transition
- Need to improve disaster recoverability



$23,865 Potential Annual Savings (Est)

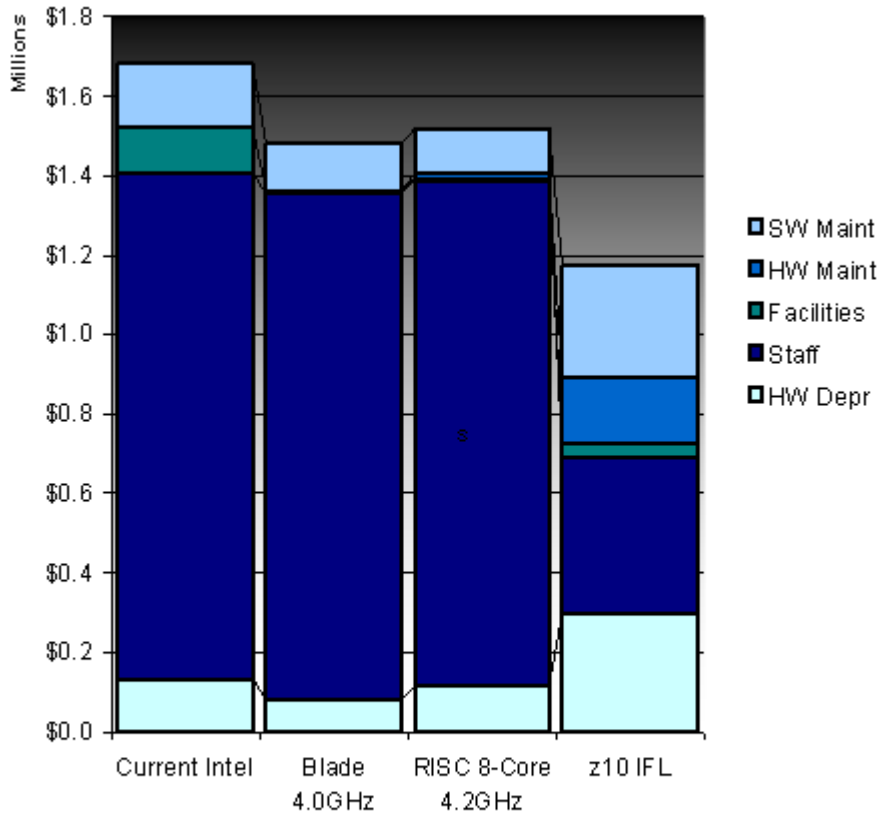
Linux x86 Test to System z Specialty Engines

System z specialty engines compete very effectively on a cost basis with other new technologies, and handle low priority work the best.

- Migrate to IFL only z10 BC
- Very conservative software costs used
- Average current utilization <12%
- High Utilizations on target
- Per port costs not included
- Five year business case
- NO transition costs included

Business Aspects:

- Leverage existing infrastructure
- Minimize cost and effort/transition
- Need to improve disaster recoverability



$101,440 Potential Annual Savings (Est)

The key to an accurate analysis?

- **Define the analysis for your own unique environment**
- **Understand the strengths of System z – don't omit them!**
  - DB2 data access – system of record – zIIPs
  - SOA strategy to do more with what we have – zAAPs
  - High availability, Tier 1 Disaster Recoverability, Security
  - High I/O bandwidth capabilities
  - Heterogeneous workloads run safely
  - Facilities savings
- **Leverage incremental costs – mixed engines**
- **Understand the strengths of z/OS®**
  - Quality of Service, built-in functions distinct from the hardware
  - Parallel Sysplex®, Geographically Dispersed Parallel Sysplex™ , GDPS®, Modern interfaces

Define the rules!

Be Proactive!

Thank you!

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