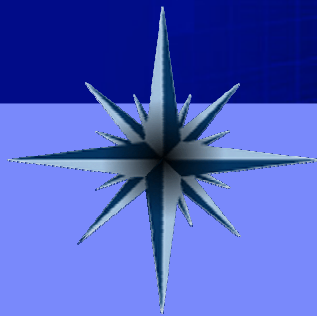




Leveraging your Mainframe Investment: Total Cost of Ownership

Ray Jones

WW Vice President, z Software



Let's Break Down the Elements of Cost

Total Cost of Ownership =

Hardware/Maintenance

+ IBM Software

+ Environmentals

+ Labor

+ required Quality-of-Service

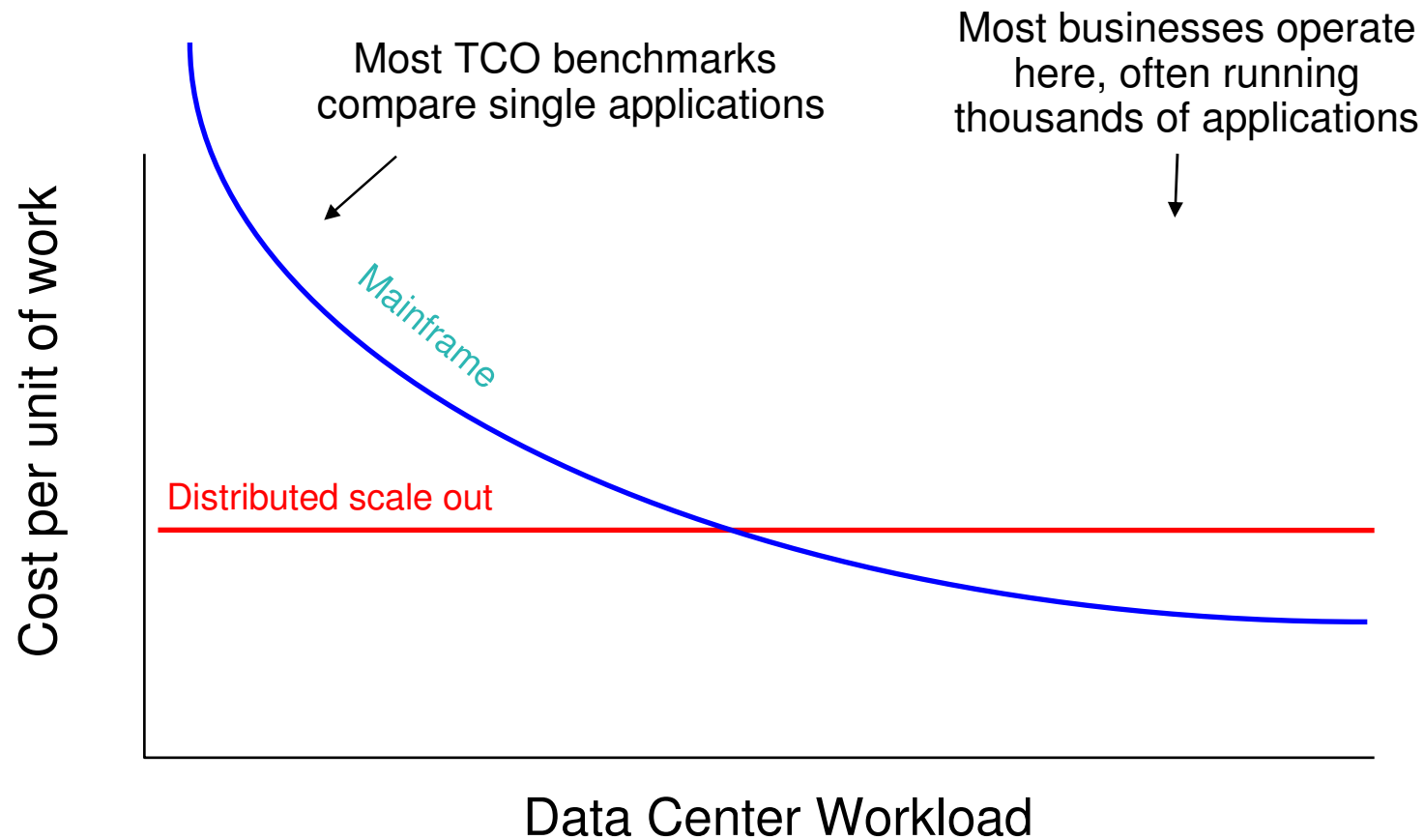
(Availability, Security, Disaster/Recovery...)

+ other Elements

(Chargeback)

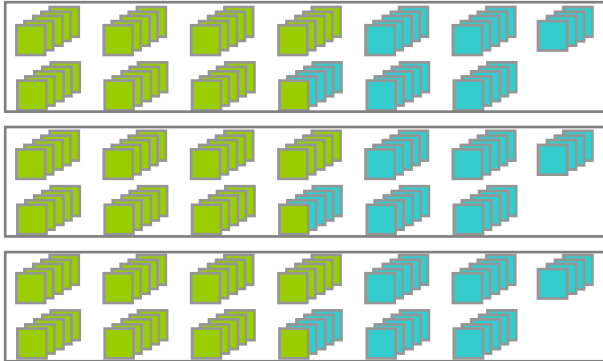
The total cost requires a total picture of your I/T assets and expenses

Mainframe Cost/Unit of Work Decreases as Workload Increases



This Was a Real Project – Why Couldn't The Same Workload Be Done With Faster Processors?

3x HP 64-way Production Application and DB



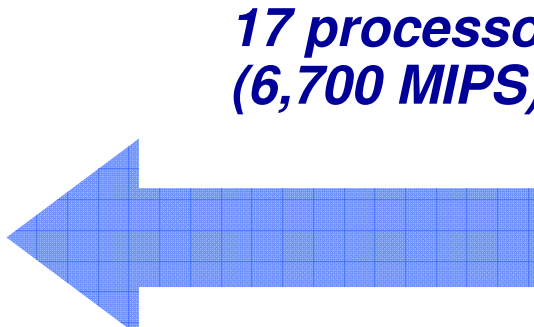
1x HP 64-way Dev&Test / Batch



2x HP 32-way PL/1 (Mgmt, Dev&Test, and Batch)



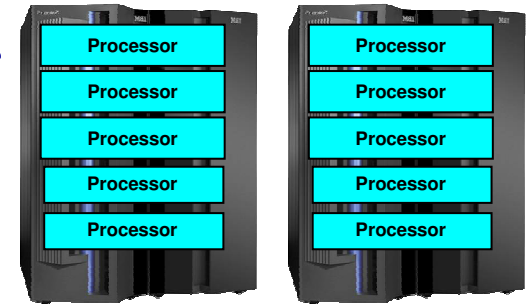
Plus:
 2x HP 16-way servers : external, HP rx8620
 3x IBM P570 servers : Web Appl server



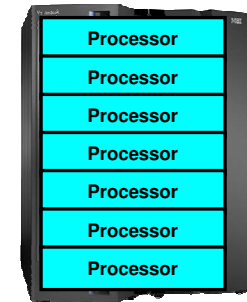
**17 processors
(6,700 MIPS)**

**320 Unix
processors
(816,002 RPE's)**

2x z990 5-way (production)



z990 7-way (production + test)

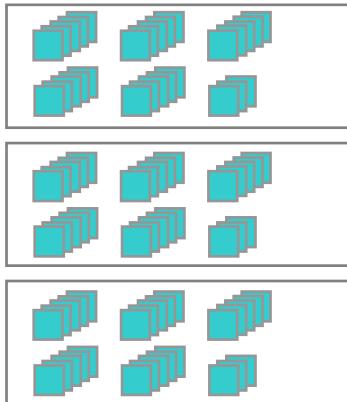


122 RPE's per MIP

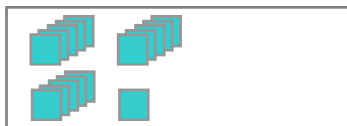
No disaster recovery

Asia Pacific Financial Services Customer Offload Project – Database Only

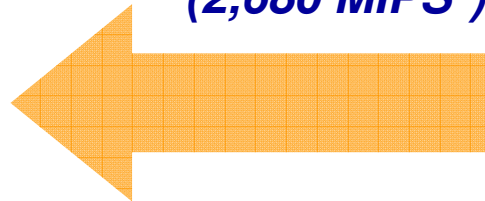
**Production Oracle RAC cluster
of 3 HP Superdome nodes
(28 processors per node)**



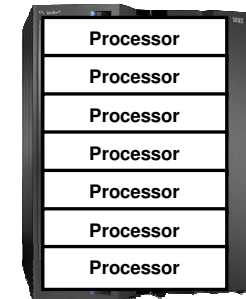
**Batch
(16 processors)**



**7 processors
(2,680 MIPS*)**



**z990 Processors for DB2
(production and development)**



**100 Unix processors
Oracle RAC
(233,510 RPE's)**

87 RPE's per MIP

No disaster recovery

* DB2 is estimated to be 40% of total workload

Utilization of Distributed Servers & Storage

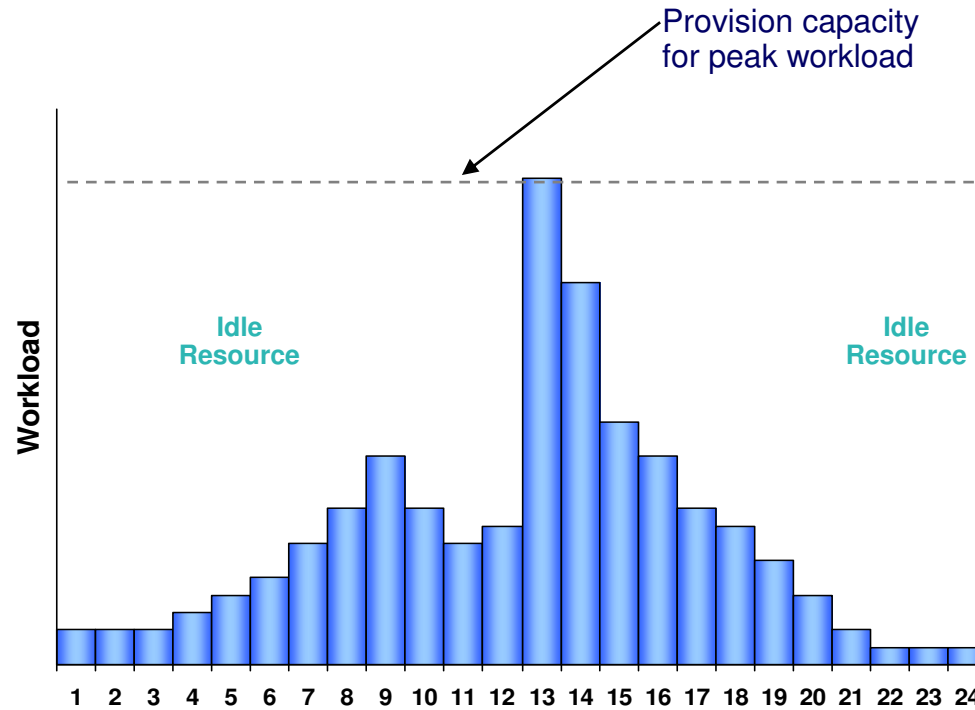
Typical utilization of:

Windows Servers	5-10%
UNIX Servers	10-20%
System z Servers	85-100%



Server dedicated to one application

The cost of storage is typically three times more in distributed environments



Storage Allocation

- Application-specific resulting in over-allocations
- Fine grained storage allocation mechanisms characteristic of mainframe storage are uncommon in distributed environments.

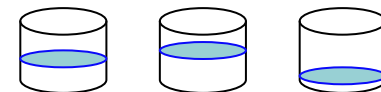
Storage Utilization

- Single digit utilization for distributed environments is not uncommon
- Storage utilization of 80% + is typical for mainframe

Storage Management

- Data disaster recovery, synchronization, and transfer requirements add complexity and cost

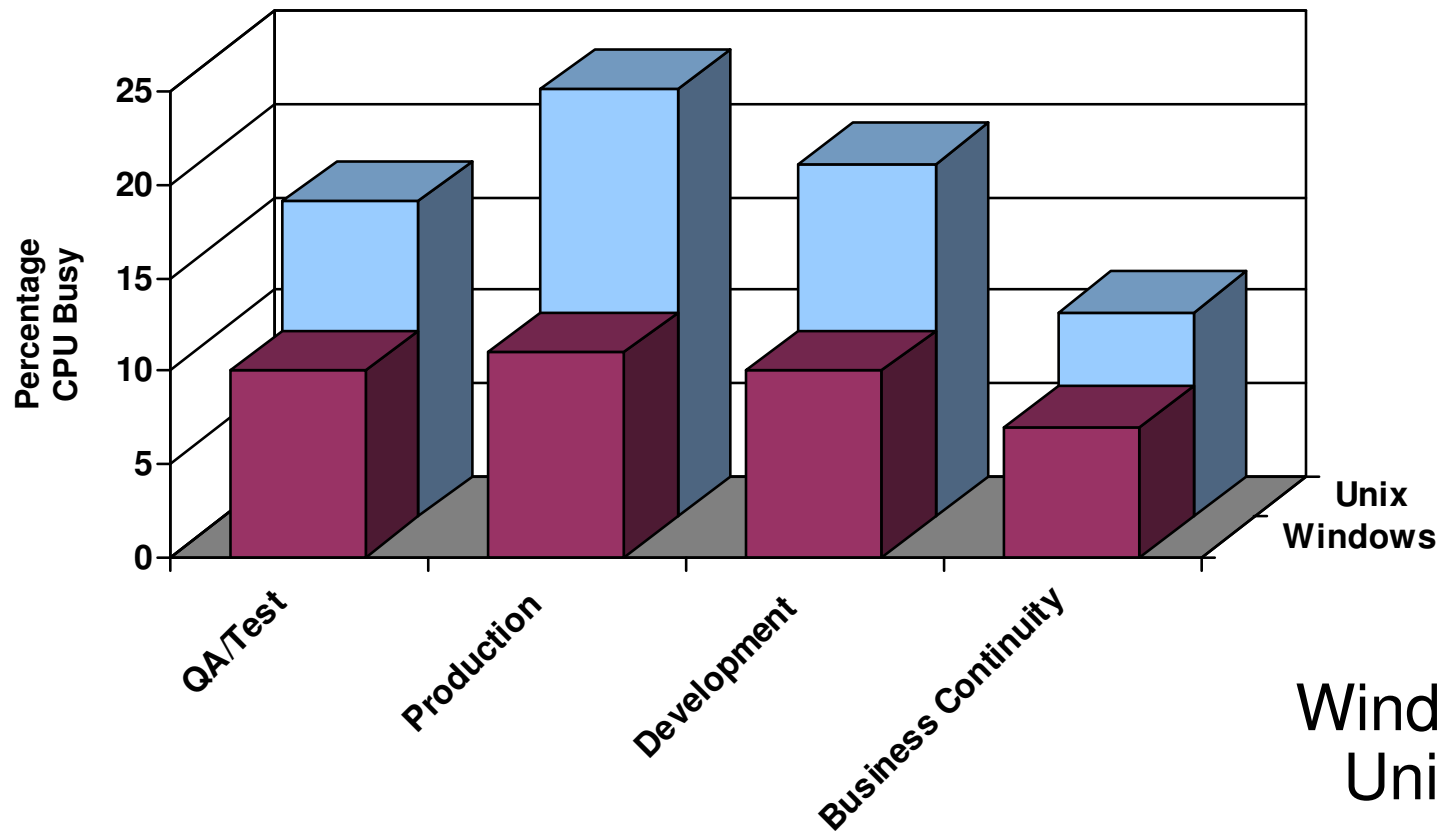
Application specific storage allocations tend to occur in large units...



resulting typically in single digit utilization

Server Utilization at a Large Financial Institution

Average Server Utilization by Class
Feb-06



Economics of Consolidation

- Consolidating workload means running multiple workloads on the mainframe at the same time
- Consolidation achieves greater **utilization of assets** which minimizes **cost per unit of work**
- Same principal was applied by Henry Ford at the dawn of the industrial era
 - It still applies today

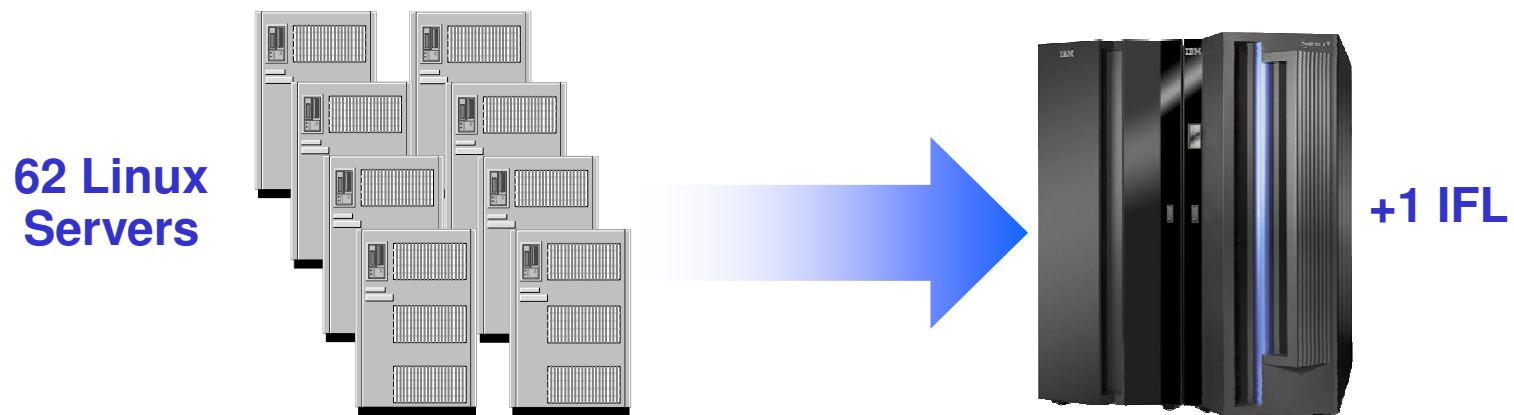


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Case Study: IBM Global Services Rolled up 62 Linux Servers onto one IFL

Up front migration cost \$299,136

Net \$780,000 savings over three years



62 Linux servers with low utilization

62 @ \$4,000 = \$248,000

Plus 62 middleware licenses

Plus 62 x \$6000 = \$372,000/yr labor

One IFL processor with high utilization

1 @ \$125,000 = \$125,000

Plus one middleware license

Plus \$120,000 x 1 = \$120,000/yr labor

Incremental Cost Breakdown

Mainframe One Time Charge

1 IFL Processor	\$125,000
Additional Memory	\$ 80,000
z/VM OTC	\$ 22,500
WAS OTC	\$ 4,000
Migration Cost	\$ 67,600
Total OTC (Cost of migration)	\$299,136

Mainframe Annual Cost

HW Maintenance	\$ 19,944
z/VM S&S	\$ 5,625
Linux S&S	\$ 14,000
WAS S&S	\$ 800
Labor 1 administrator	\$ 120,000
Power	negligible
Total Annual Costs	\$160,369

Distributed One Time Charge

Servers 62x\$4000	\$248,000
WAS OTC 62x\$4000	\$248,000
Total OTC cost (Sunk)	\$496,000

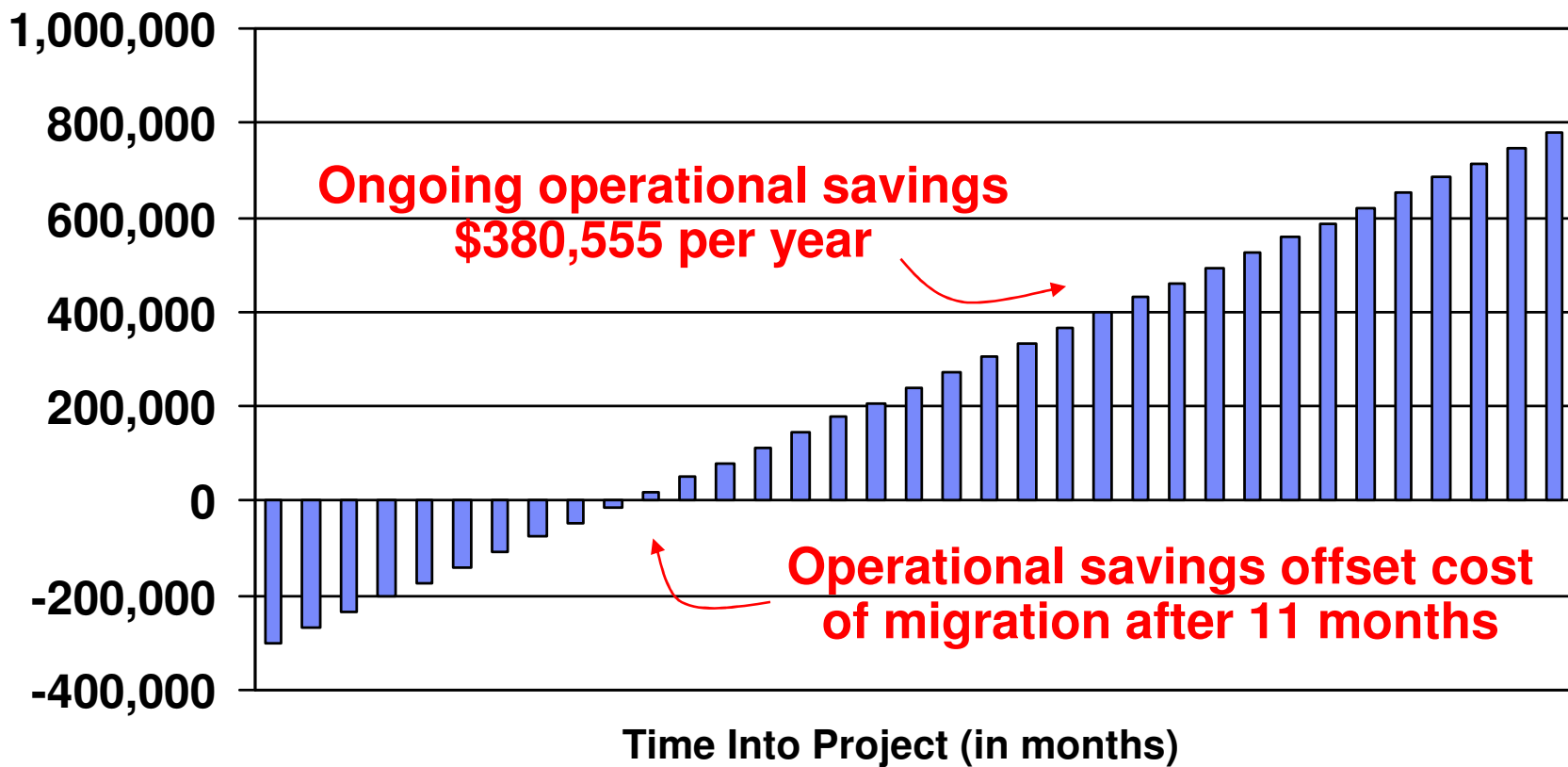
Distributed Annual Cost

Linux S&S 62x\$1000	\$62,000
WAS S&S 62x\$800	\$49,600
Labor 62x\$6,000	\$372,000
Power,space 62x\$925	\$57,324
Total Annual Costs	\$540,924

Operational cost savings = \$380,555 per year

Cash Flow Analysis

Savings Cash Flow When Consolidating 62 Lintel Servers to Linux on z/VM with One IFL



Trade-In Value Reduces Mainframe Net Present Value Costs

- Upgrade to next generation mainframe
 - Specialty processors are upgraded to next generation free of charge
 - Growing customers typically receive credit for existing MIPS investment when upgrading to new generation
 - Full [trade-in value](#) applied to upgrade and growth MIPS

- **Upgrade to next generation distributed systems**
 - Life time of 3 to 5 years
 - Must [repurchase](#) existing processor capacity plus any growth

- **Long term TCO implications can be important**

Storage Costs: DB2 Provides More Storage Savings than Oracle

- DB2 for z/OS lowers TCO by reducing storage needed
 - TPC-H Benchmark: DB2 compression of 59% vs 29% for Oracle RAC

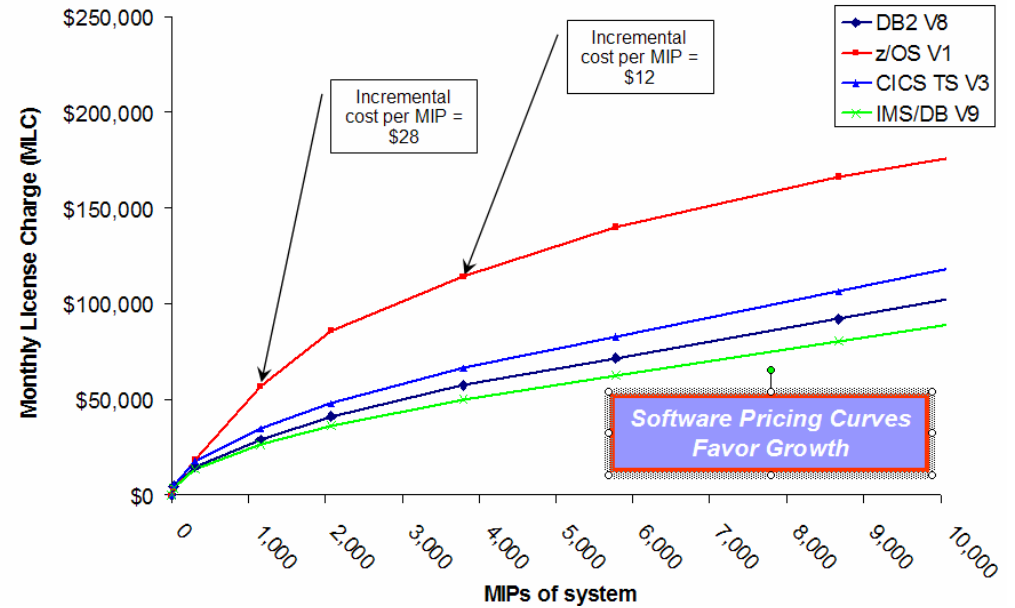
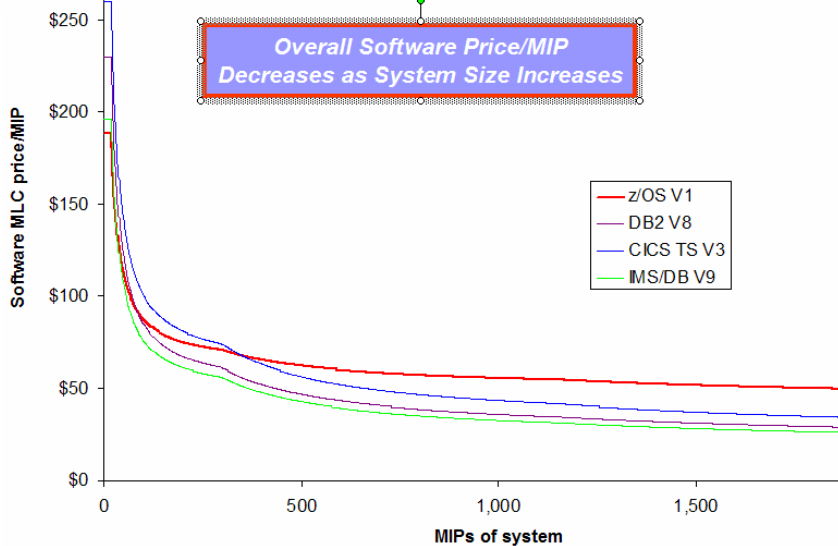
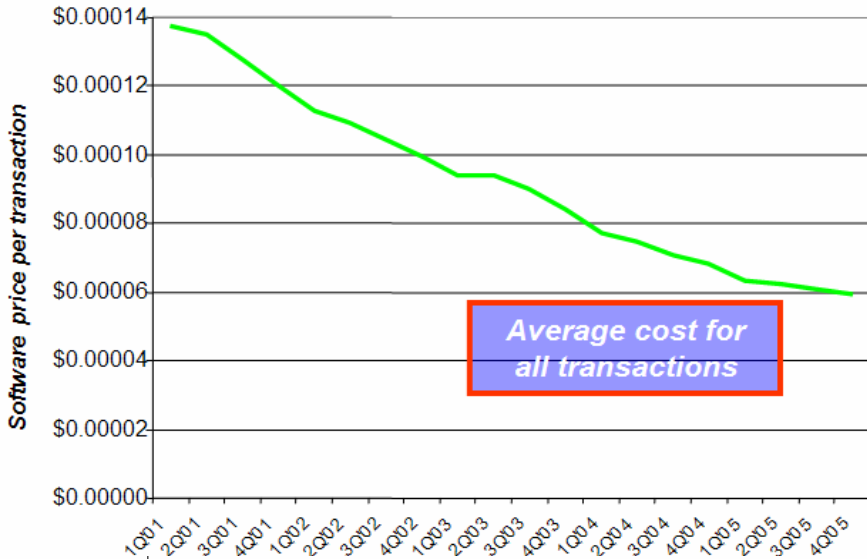
- Storage savings with DB2 vs. Oracle for a 100TB data base

	Oracle	DB2 for z/OS*
Storage System	HP XP12000 Storage	IBM System Storage DS8100
Overall database compression ratio (using TPC-H benchmark results)	29%	59%
For 100 TB uncompressed data storage needed	75 TB of HP Storage	42 TB of IBM Storage
Cost of storage	\$3.34M (\$3.1M + \$0.225M**)	\$1.45M
With compression, storage for DB2 costs <u>56% less</u> than for Oracle		

* DB2 for z/OS achieves similar compression ratios to those of DB2 for LUW

** HP Storage Software charge

IBM Software Price Per Transaction is Going Down



Putting This in Perspective

- For a typical system of 1,400 MIPS, MLC software stack costs \$59 per incremental MIP
- If a transaction is 1 million instructions, an incremental MIP can perform >2½ million additional transactions per month for Δ\$59 software cost (44K transactions per dollar)
- If these are credit card transactions of average \$100 with a commission of 2%, the business makes \$5.2M per month for a software cost of \$59 per month (88,000 times return)
- If this is a bank account averaging 3 transactions a day, the business can do 40 years of account management for a software cost of \$1

Portfolio Review and Analysis

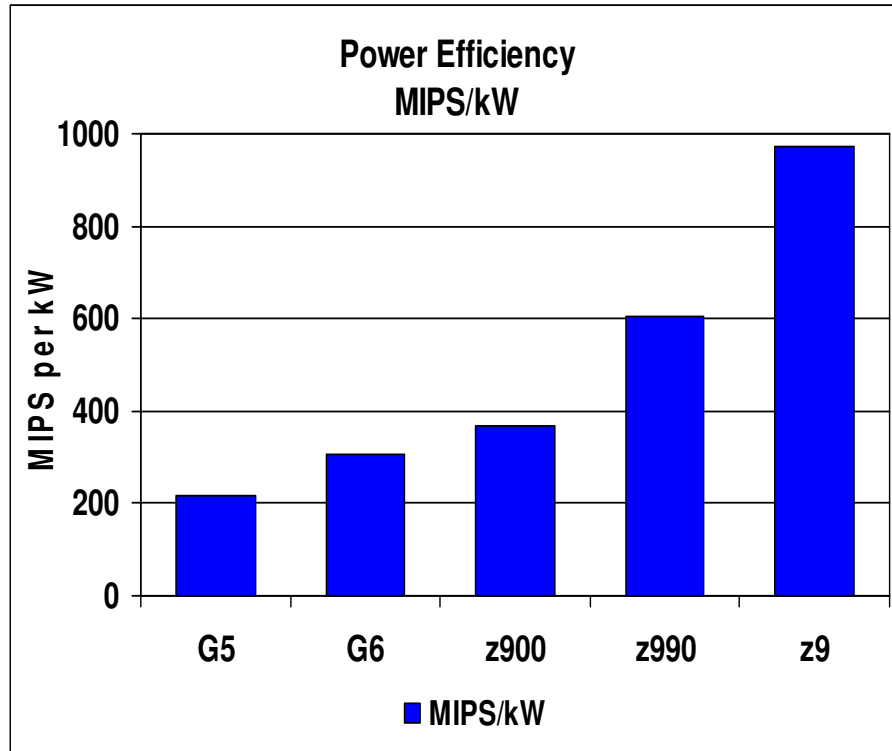
"PRA" - a study for IBM zSeries customers

- **helps understand the potential impact of processing growth on future software budgets by developing predictive costs models.**
- **provides you with a comparison of your current portfolio cost structure with those of other zSeries/S390 customers.**
- **analyzes your software portfolio to identify redundant or underutilized software products.**
- **identifies product alternatives and their cost/ benefit impact.**
- **provides you with negotiation leverage with incumbent product vendors.**
- **provides you with the latest Software Asset Management tips to help proactively manage your zSeries/S390 software portfolio**

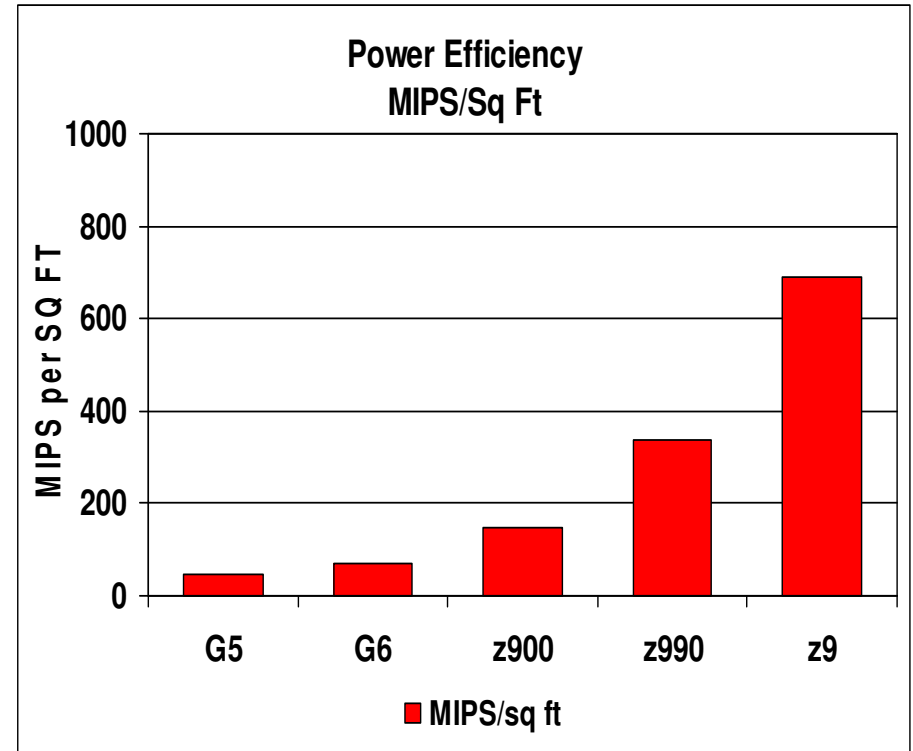
<http://www-3.ibm.com/software/solutions/softwaremigration/sps.html>

Or contact Linda Beckner at (614) 659-7192 or at Becknel@us.ibm.com.

Mainframe Exhibits Increasing Space and Power Efficiencies with Each Generation



22% annual increase
in MIPS/kW

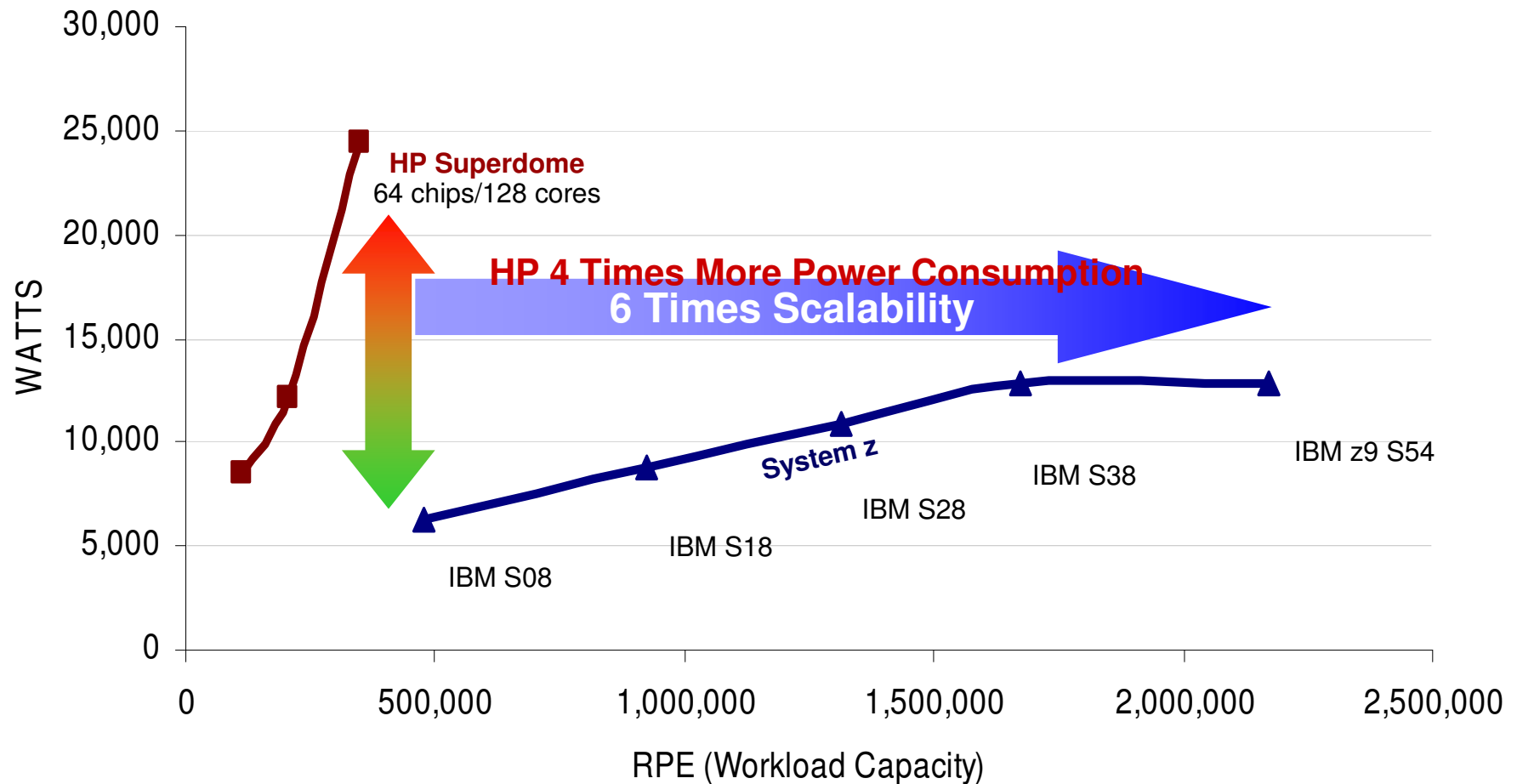


46% annual increase
in MIPS/space

Decreasing energy consumption

Decreasing square footage per MIP

Mainframe Consumes Less Power Than HP Superdome



Source for HP Servers: Ideas International, Nov 06
 Note: Uses equivalence ratio of 122 RPE's per MIP

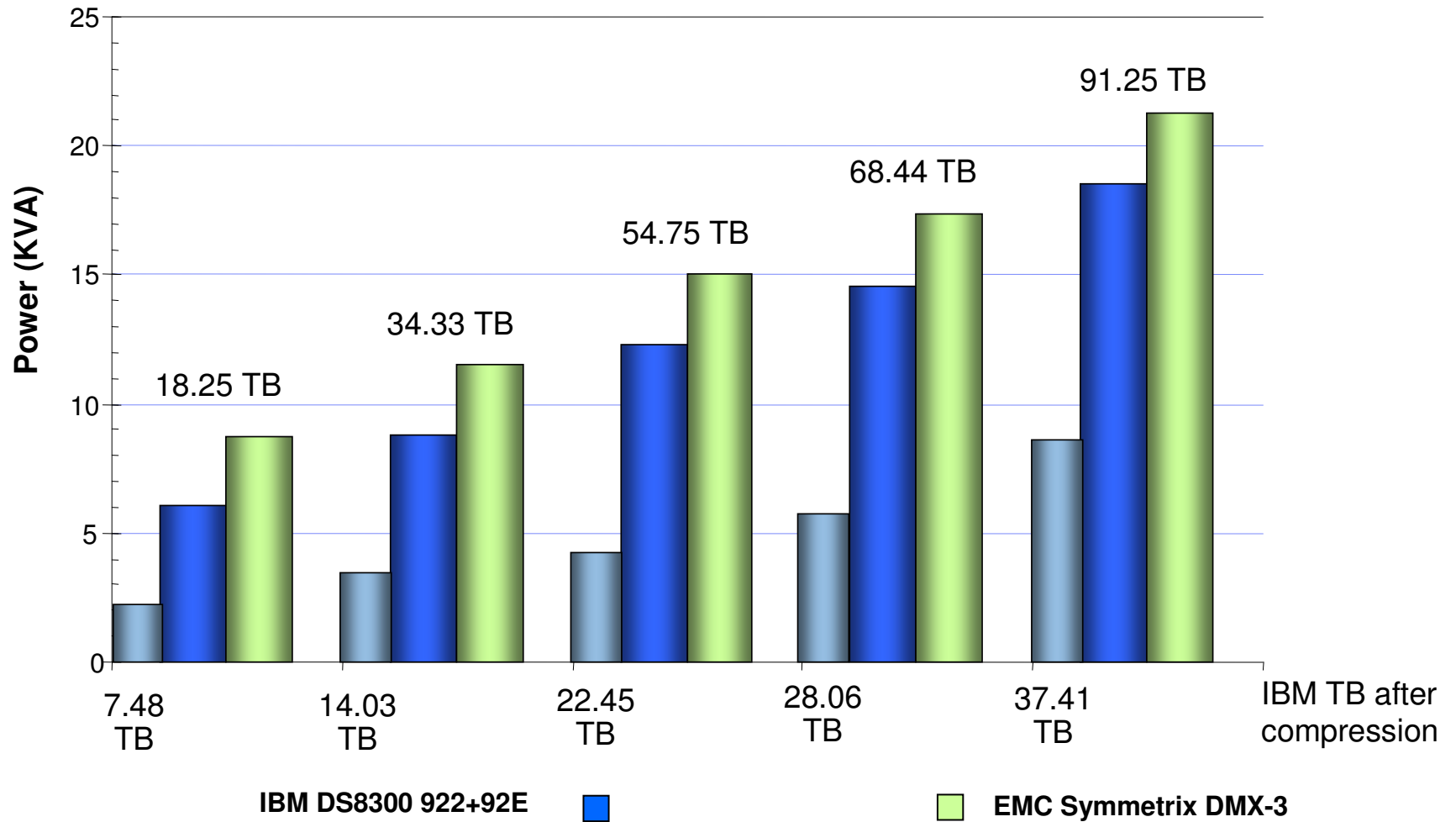
Do the Math

- HP Itanium 2 Superdome 9050 (64ch/128co)* consumes a maximum of 24,392 watts
 - $[24,392 \times \$0.09 \times (24 \times 365)]/1000 = \$19,230$ per year for electricity
- Mainframe with similar computing capacity - a System z9 S08 machine using 6.3 kW
 - **\$4,967** per year for electricity
- Similar savings on cooling capacity
 - Cost of cooling is about 60% additional
 - Superdome total **\$30,768** per year vs. Mainframe **\$7947**
 - Cost of mainframe power and cooling is **\$22,821** per year less than HP

*Rated at 350,041 RPE

IBM Storage Also Saves Energy Costs

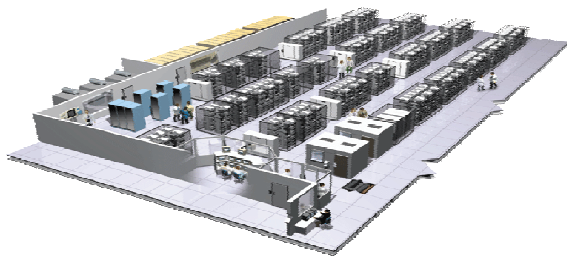
IBM DS8300 Power Consumption vs. EMC DMX-3 by Size



Study used 146 GB 15K rpm drives

An Inconvenient Truth!

Equivalent CO2 Emissions in one year



10,000 sq ft at 125
watts/ft² @ \$.09 per
kWh

\$985K per year

**11,498 tons of CO2
per year**

=

368 Chevy Tahoes



=

9424 refrigerators



=

10,549 round trips
NY to LA

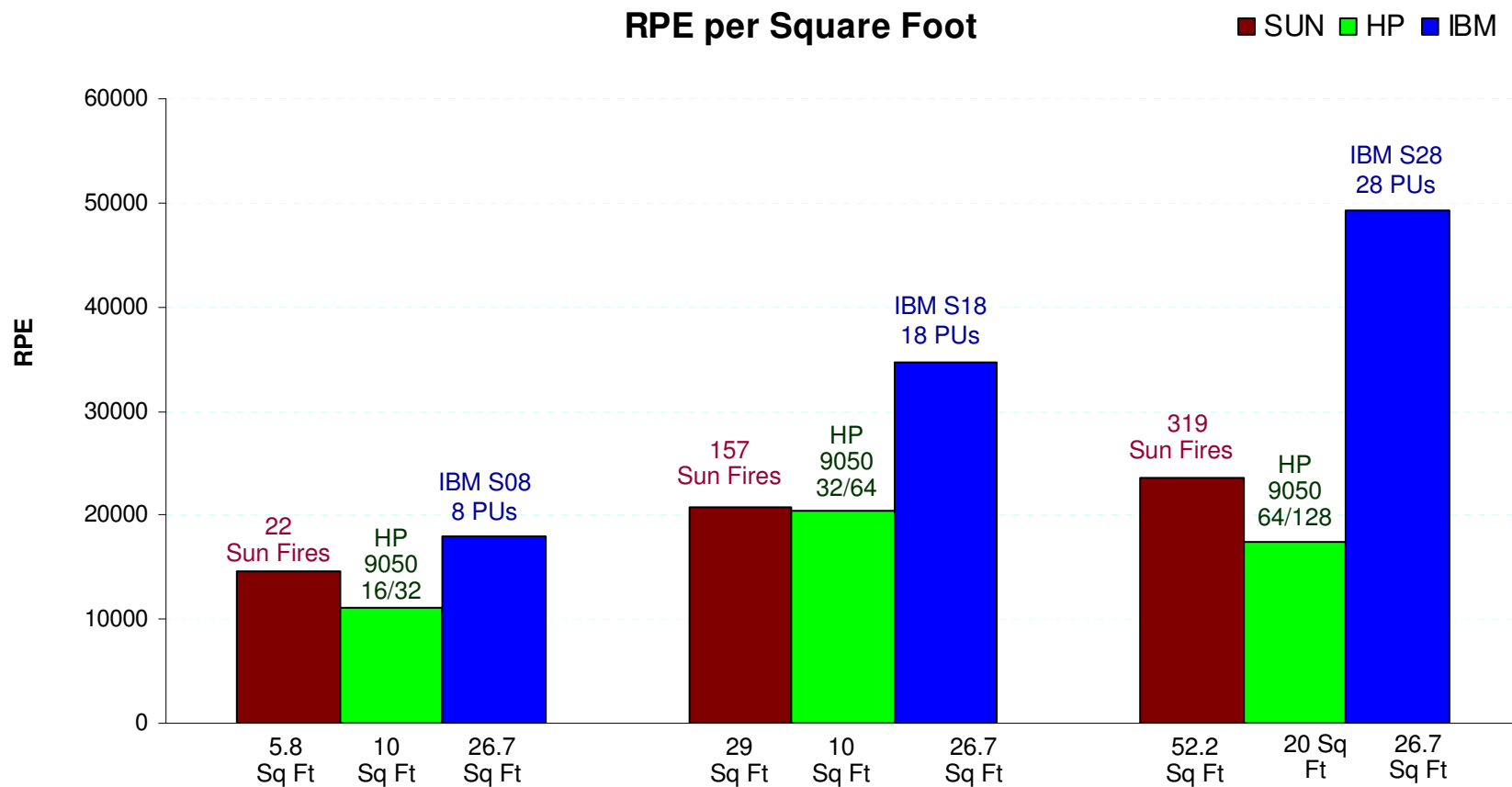


=

78,753 75 watt light
bulbs running 8 hrs/day

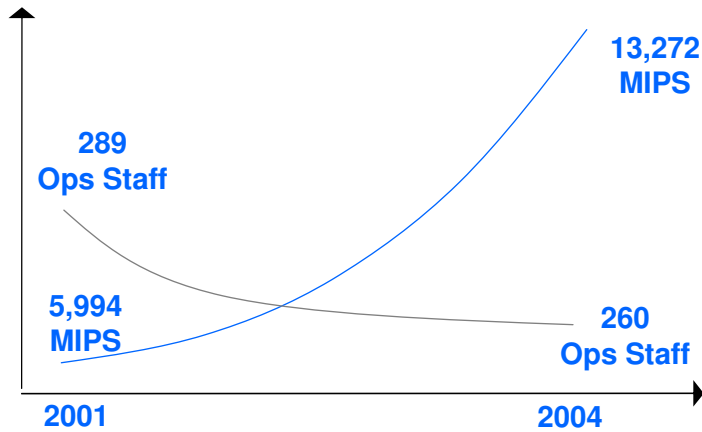


The Mainframe Also Requires a Smaller Footprint

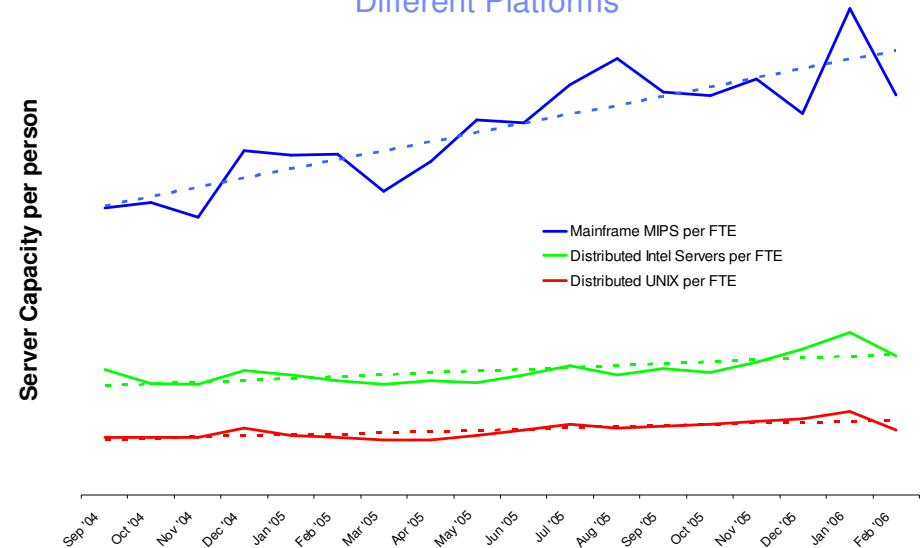


Mainframe Labor Costs Are Going Down

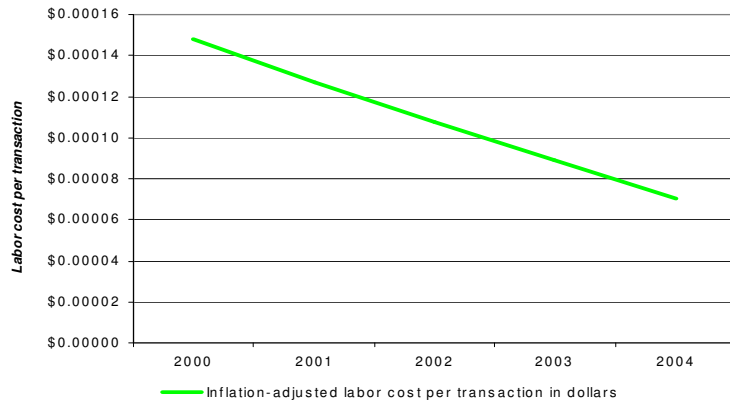
Data Center Staffing Levels for System z Have Not Increased Despite Large Increase in MIPS



Hardware Managed Per Person for Different Platforms



Labor Cost Per Transaction on System z is Decreasing



First National Bank of Omaha

	Servers	Reliability	Utilization	Staff
First move: Implemented distributed computing architecture that became too difficult to monitor, maintain, upgrade and scale	<ul style="list-style-type: none"> 30+ Sun Solaris servers 560+ Intel servers 	Un-acceptable	12%	24 people growing at 30% year
Next move: Consolidated back on the mainframe	z990	Much improved	84% with additional reserve capacity on-demand	Reduced to 8 people

Staff growth reversed by consolidating to the mainframe

Customer Survey – How Many People to Manage Servers?

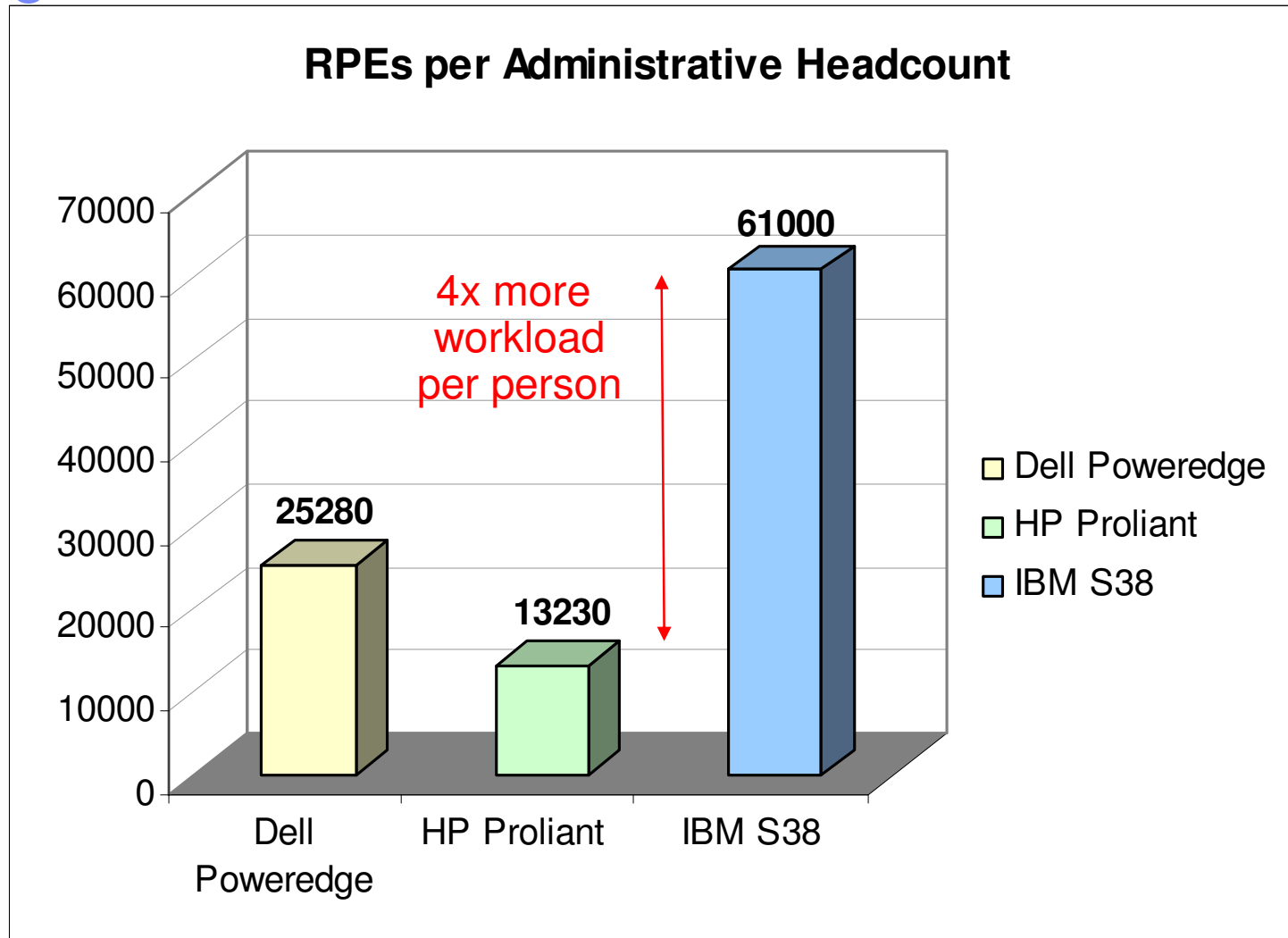
# NT Servers	# People	Ratio (s/p)
1123	68	16.5
228	20	14.4
671	51	13.1
700	65	11.5
154	18	8.5
431	61	7.1
1460	304	4.8
293	79	3.7
132	54	2.0

# UNIX Servers	# People	Ratio (s/p)
706	99	7.1
273	52	5.2
69	15	4.6
187	56	3.3
170	51	3.3
85	28	3.0
82	32	2.6
349	134	2.6
117	50	2.3
52	52	1.0

Mainframe administration productivity surveys range 167-625 MIPS per headcount (500 is typical), so...

Source: IBM Scorpion Customer Studies NOTE: Figures for total administration cost

Manage More Workload Per Headcount



Fractional Availability Improvements Are Important

Example 1: Financial Services Company

- \$300B assets, 2500+ branches, 15M customers
- Retail banking, loans, mortgages, wealth management, credit cards
- CRM System – branches, financial advisors, call centers, internet
- Number of users – 20,000+

	<i>Unix/ Oracle</i>	<i>zSeries/ DB2</i>
Availability %	99.825%	99.975%
Annual outage	15h 20m	2h 11m
Cost of Downtime	\$45.188M	\$3.591M

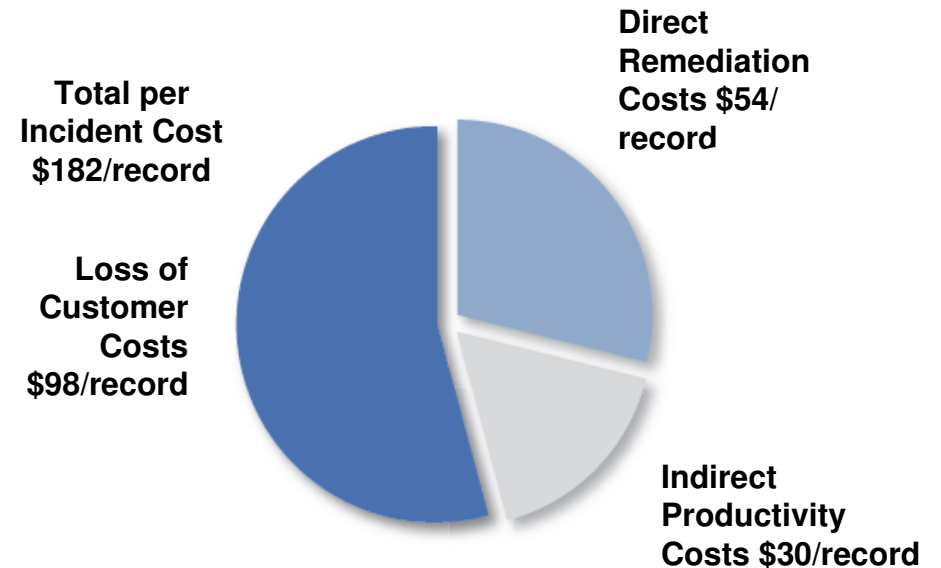
Sources: ITG Value Proposition for Siebel Enterprise Applications, Business case for IBM eServer zSeries, 2004 & Robert Frances Group, 2005

Financial Impact of Downtime Per Hour

<i>Industry segment</i>	<i>Cost</i>
Energy	\$2,818K
Telecommunications	\$2,066K
Manufacturing	\$1,611K
Financial	\$1,495K
Information Technology	\$1,345K
Insurance	\$1,202K
Retail	\$1,107K
Pharmaceuticals	\$1,082K
Banking	\$997K
Consumer Products	\$786K
Chemicals	\$704K
Transportation	\$669K

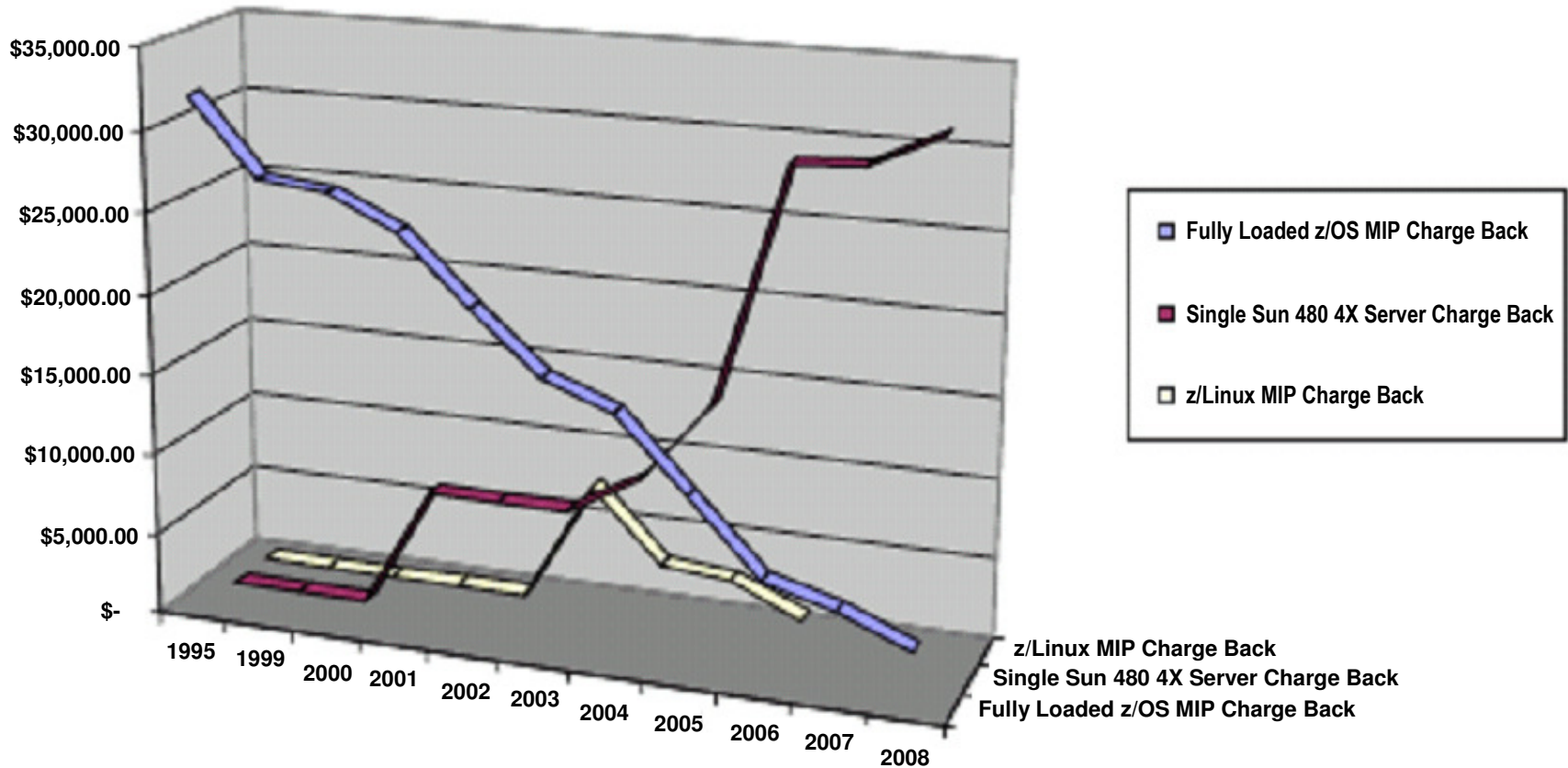
Cost of a Security Breach

- **Total costs per compromised record**
 - \$182 per record or \$4.8 million per incident
 - Incident costs reported ranged from \$226,000 to \$22 million
 - Total of \$148 million in costs across the sample of 31 companies
- Average customer loss was 2 percent of all customers, with some reporting up to 7%



Ponemon Study: 2006 Survey Cost of a Data Breach

Charge Back Practices Were Improved Over Time at a Large Financial Institution



More Accurate Charge Back Can Correct Perceptions of Relative Costs

Key Points:

Mainframe Costs	Distributed Costs
<p>The cost of running incremental workload on the mainframe goes down as the total workload grows</p>	<p>The cost of running additional workload on distributed servers goes up more linearly</p>
<ul style="list-style-type: none"> - Labor costs hold steady as workload grows 	<ul style="list-style-type: none"> - Labor is now the highest cost element in distributed environments Administrative staff costs increase in proportion to the number of servers
<ul style="list-style-type: none"> - IBM pricing policies designed to favor the addition of more workload 	<ul style="list-style-type: none"> - New workload requires additional servers and licenses
<ul style="list-style-type: none"> - Highly Efficient Power and Cooling – Small Footprint 	<ul style="list-style-type: none"> - Energy and Space cost is more linear
<ul style="list-style-type: none"> - Lower software costs per transaction as workload grows – and PRA can lower ISV tool costs 	<ul style="list-style-type: none"> - Cost of software licenses is more linear
<ul style="list-style-type: none"> - High Availability and Security Translate into low cost 	<ul style="list-style-type: none"> - Fractionally less Availability and Security can drive Significant downstream costs
<p>Customers have learned that mainframes deliver economies of scale, especially as the workload grows</p>	<p>Result – scale out strategies do not deliver equivalent economies of scale as the workload grows</p>

This pricing discussion uses published list prices



Thank you.

