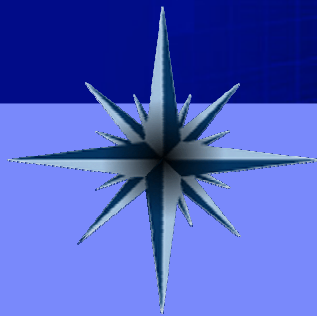




Leveraging your Mainframe Investment: Total Cost of Ownership

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

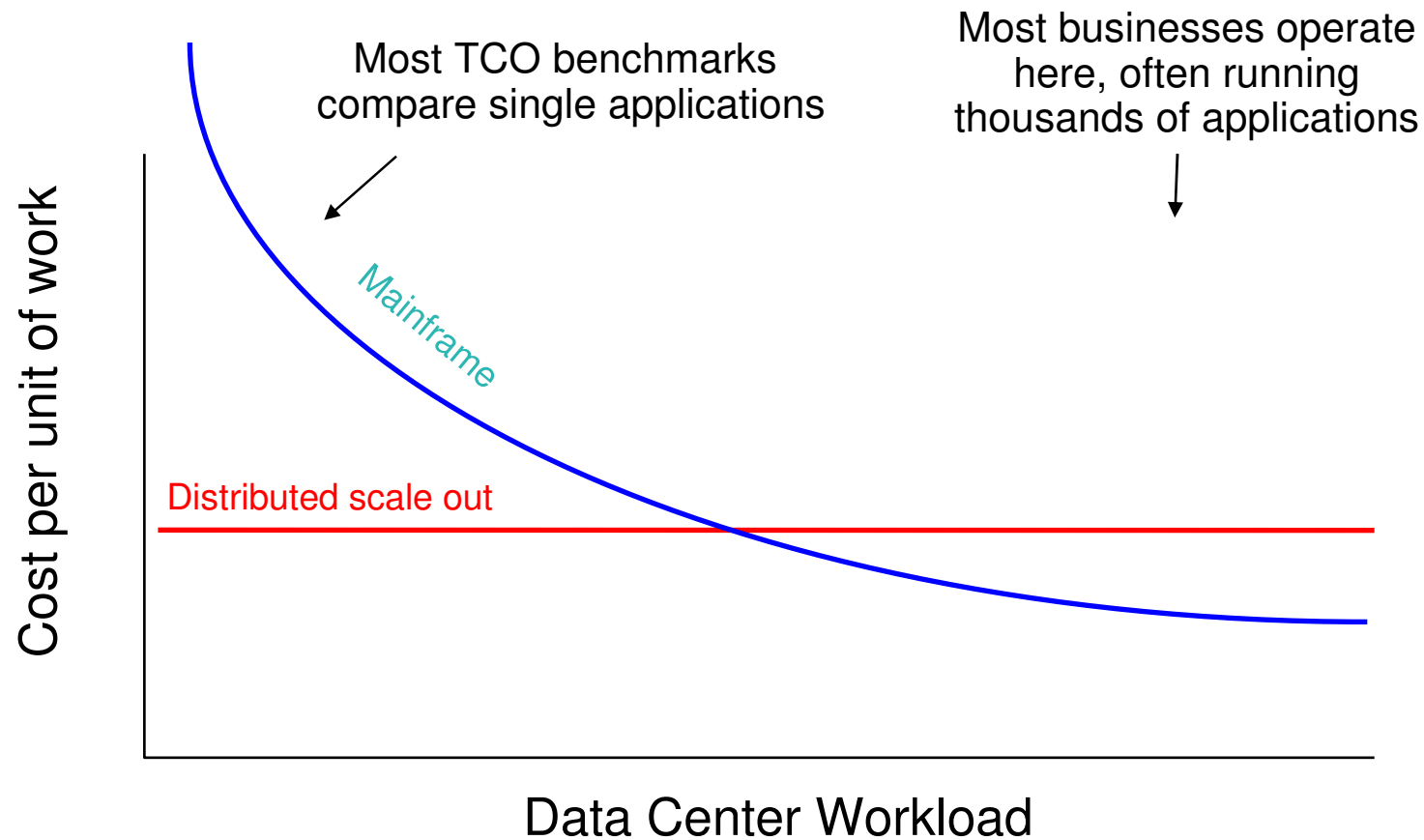
(Availability, Security, Disaster/Recovery...)

+ other Elements

(Chargeback)

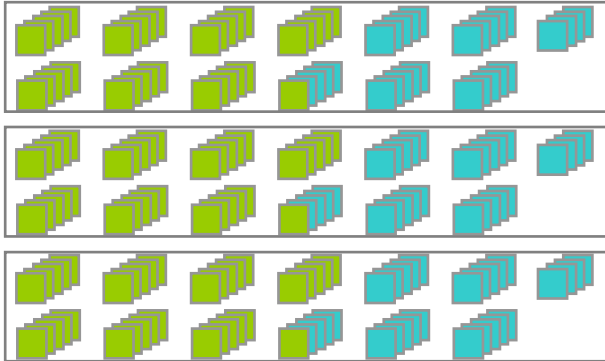
The total cost requires a total picture of your I/T assets and expenses

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)

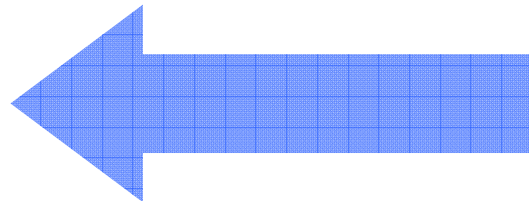


Plus:

2x HP 16-way servers : external, HP rx8620

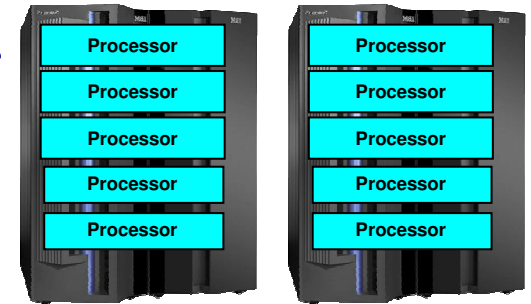
3x IBM P570 servers : Web Appl server

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

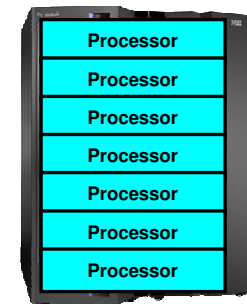


**320 Unix
processors
(816,002 RPE's)**

2x z990 5-way (production)



z990 7-way (production + test)

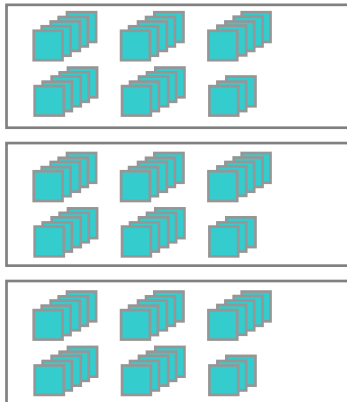


122 RPE's per MIP

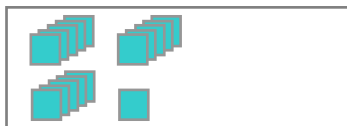
No disaster recovery

Asia Pacific Financial Services Customer Offload Project – Database Only

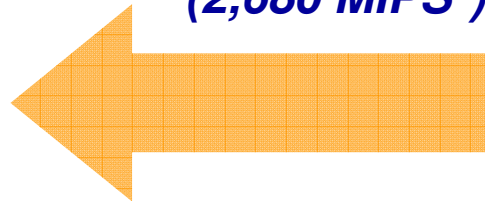
**Production Oracle RAC cluster
of 3 HP Superdome nodes
(28 processors per node)**



**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

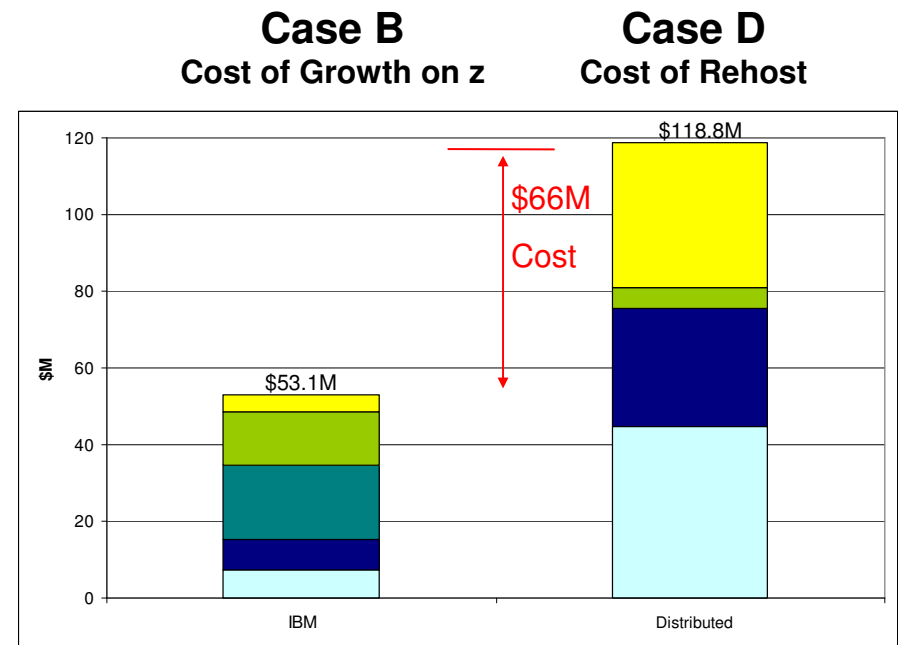
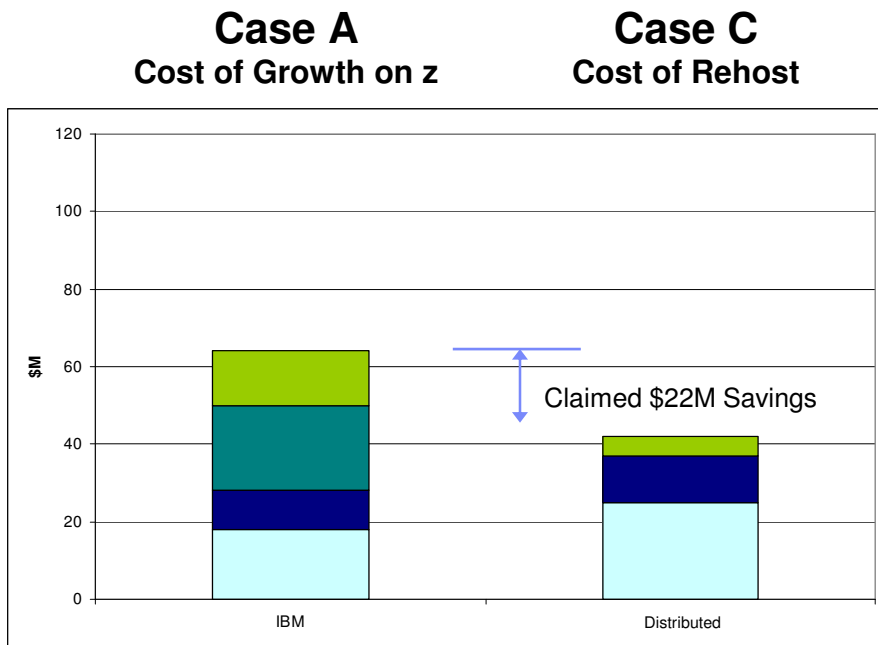
* DB2 is estimated to be 40% of total workload

Did They Save Money by Offloading?

- Competitors told the customer they would save \$22M over 4 years
- IBM analysis determined that the offload solution would actually cost **\$66M more** than growing on z

Competitor's 4 Year Cost / Savings Prediction

IBM Analysis

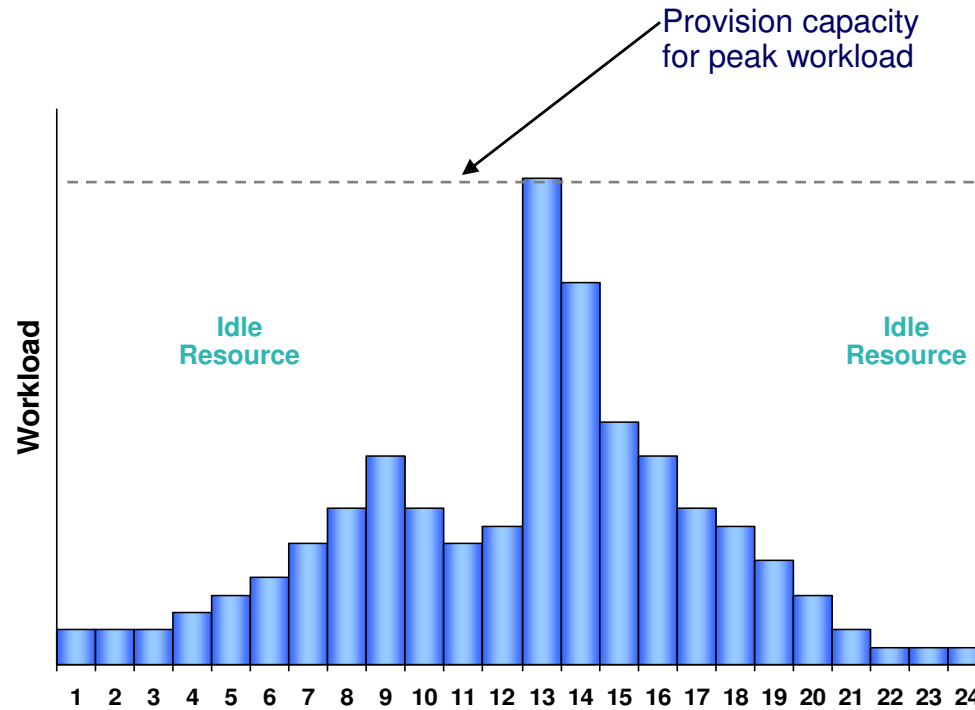


Utilization of Distributed Servers & Storage

Typical utilization of:
Windows Servers
5-

10-
%
IX Servers
to one application
10-
%
System z Servers
85-

100%
The cost of storage is typically
three times more in distributed
environments

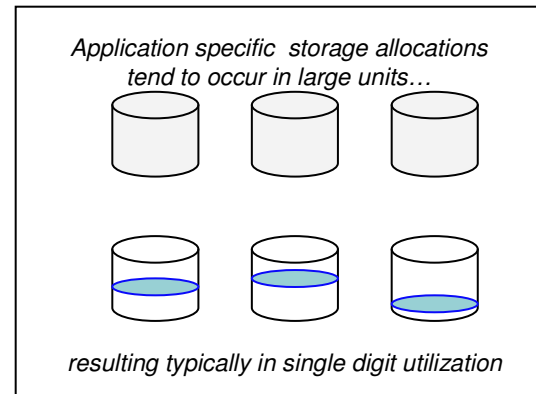


Storage Allocation

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

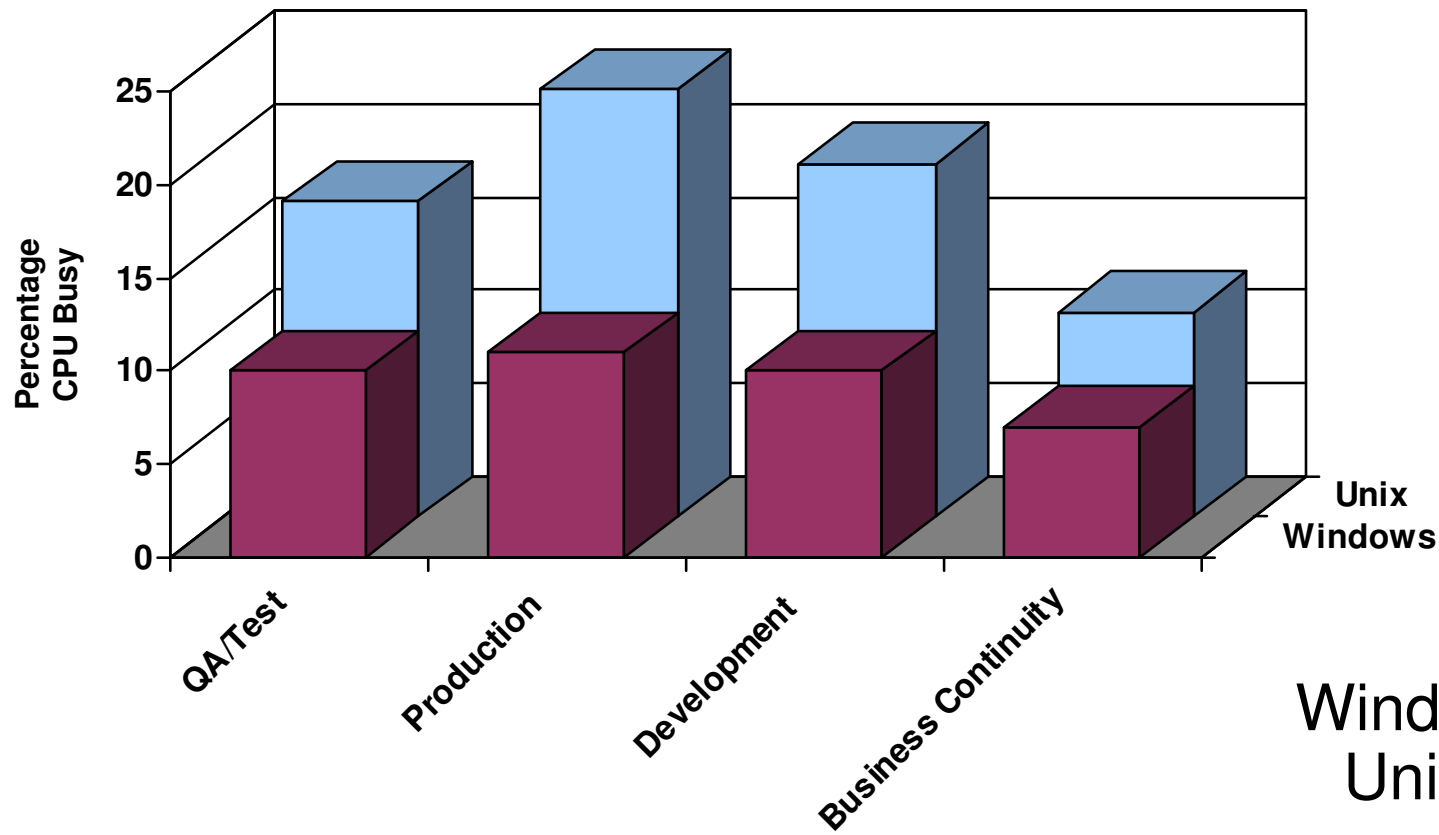
Storage Utilization

- Single digit utilization for distributed environments is not uncommon

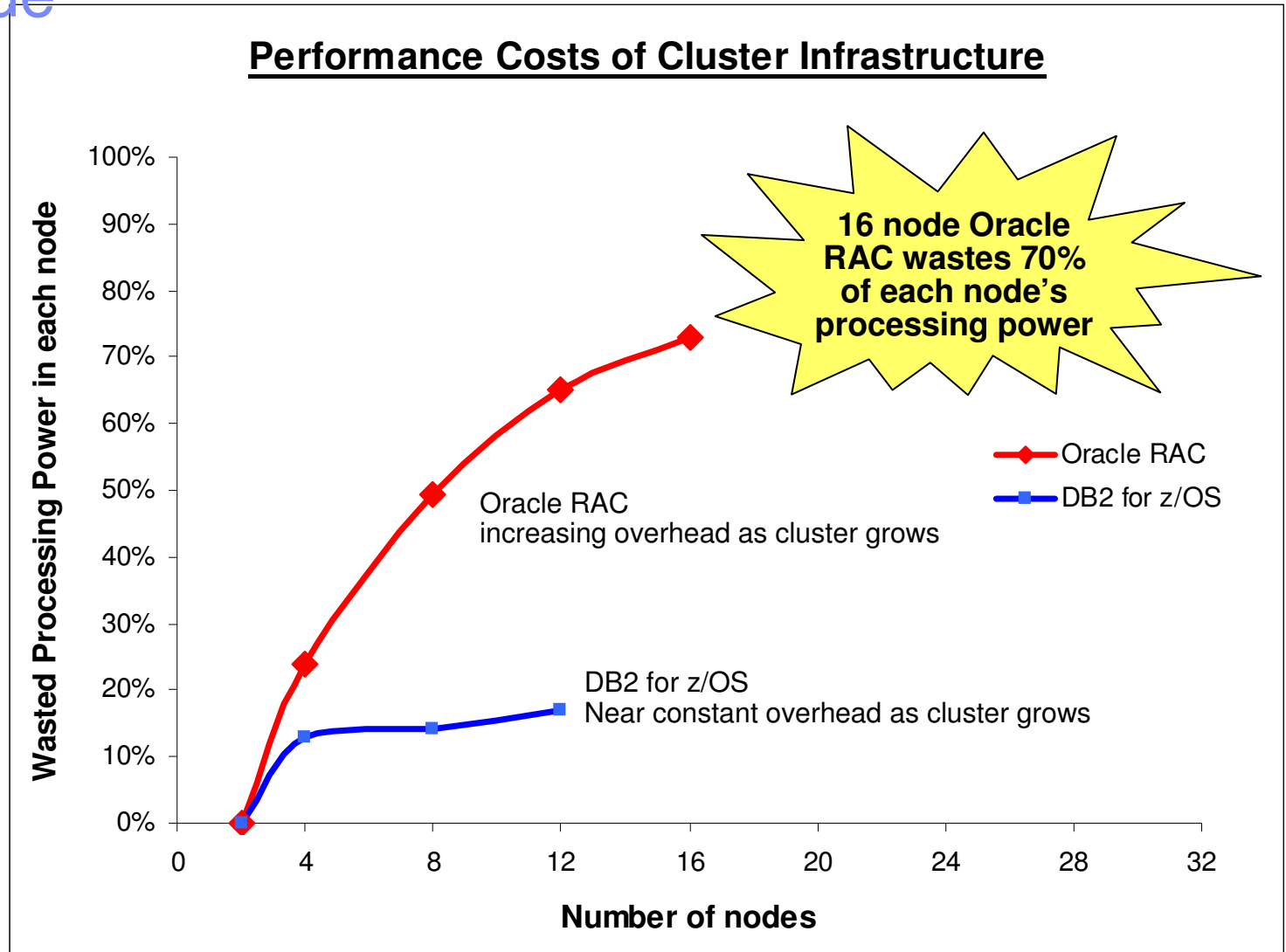


Server Utilization at a Large Financial Institution

Average Server Utilization by Class
Feb-06



Oracle RAC Overhead Wastes Processing Power in Each Node



Oracle RAC source:
 "Scale-up versus
 scale-out using Oracle
 10g with HP
 StorageWorks",
 Hewlett-Packard, 2005

DB2 for z/OS source:
 "Enterprise Data Base
 Clustering Solutions"
 ITG, October 2003

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

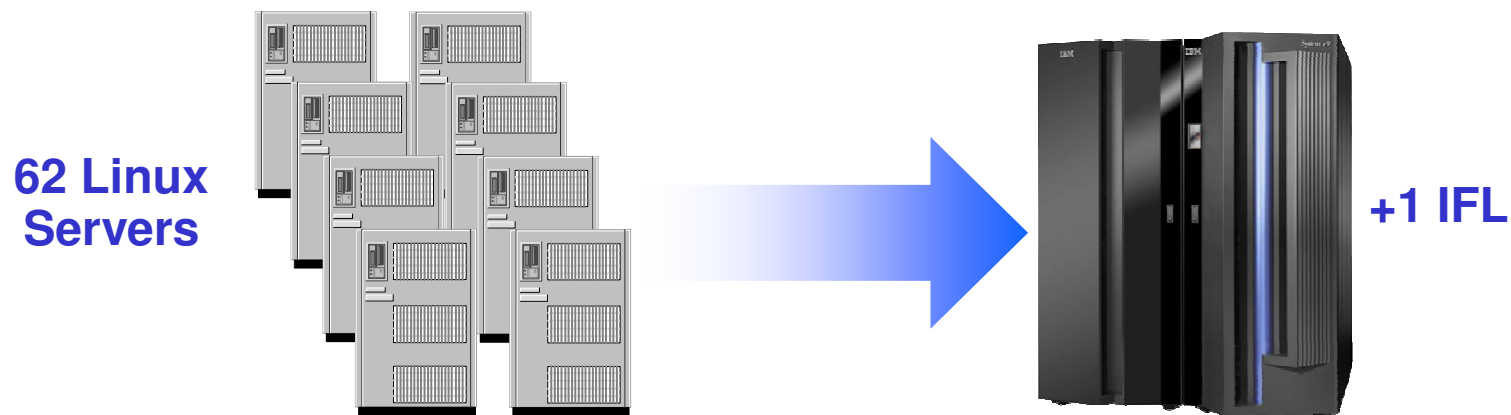


Copyright © 2006, Toyota Motor Manufacturing Kentucky, Inc.

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

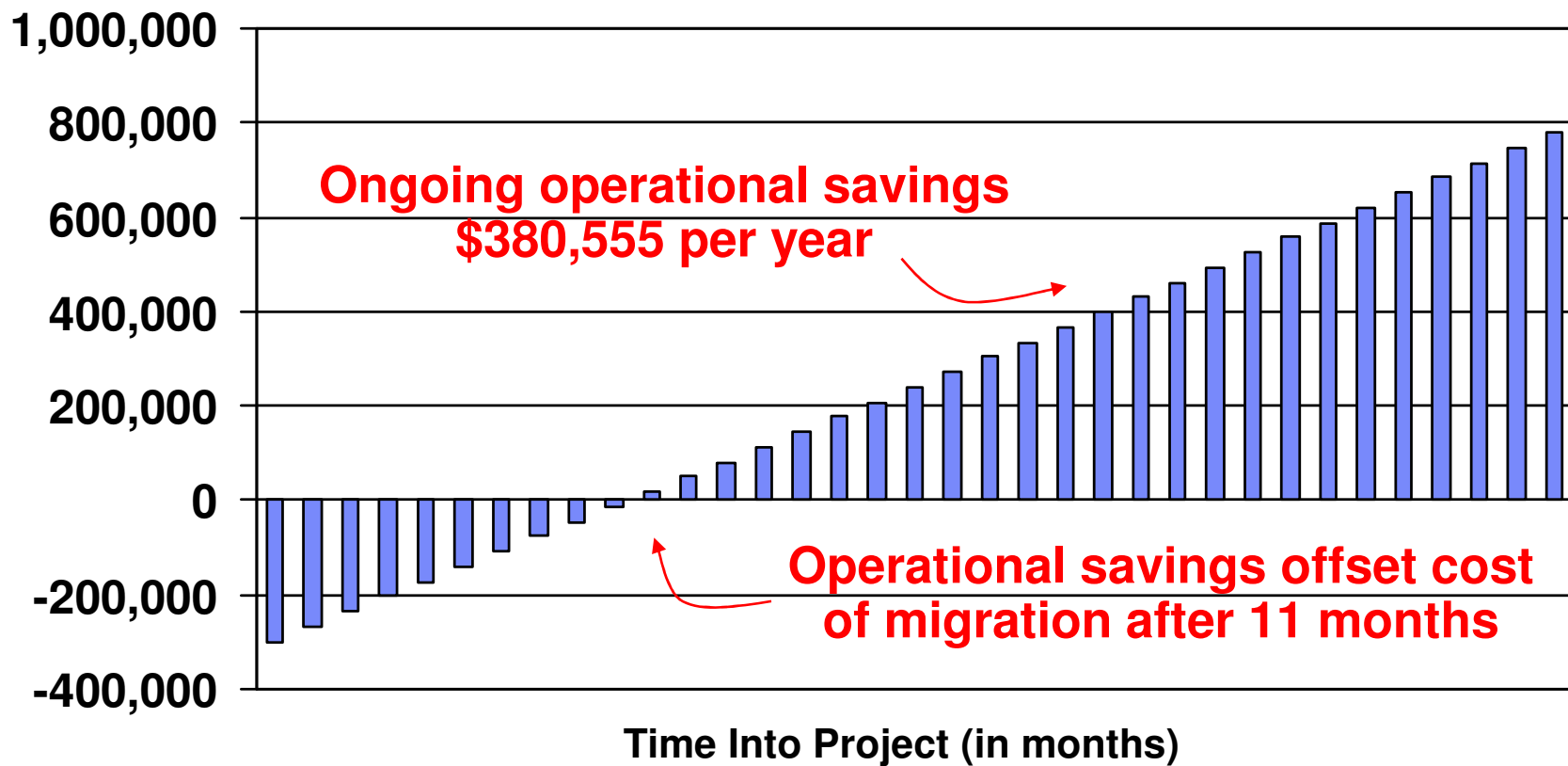
Distributed Annual Cost

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

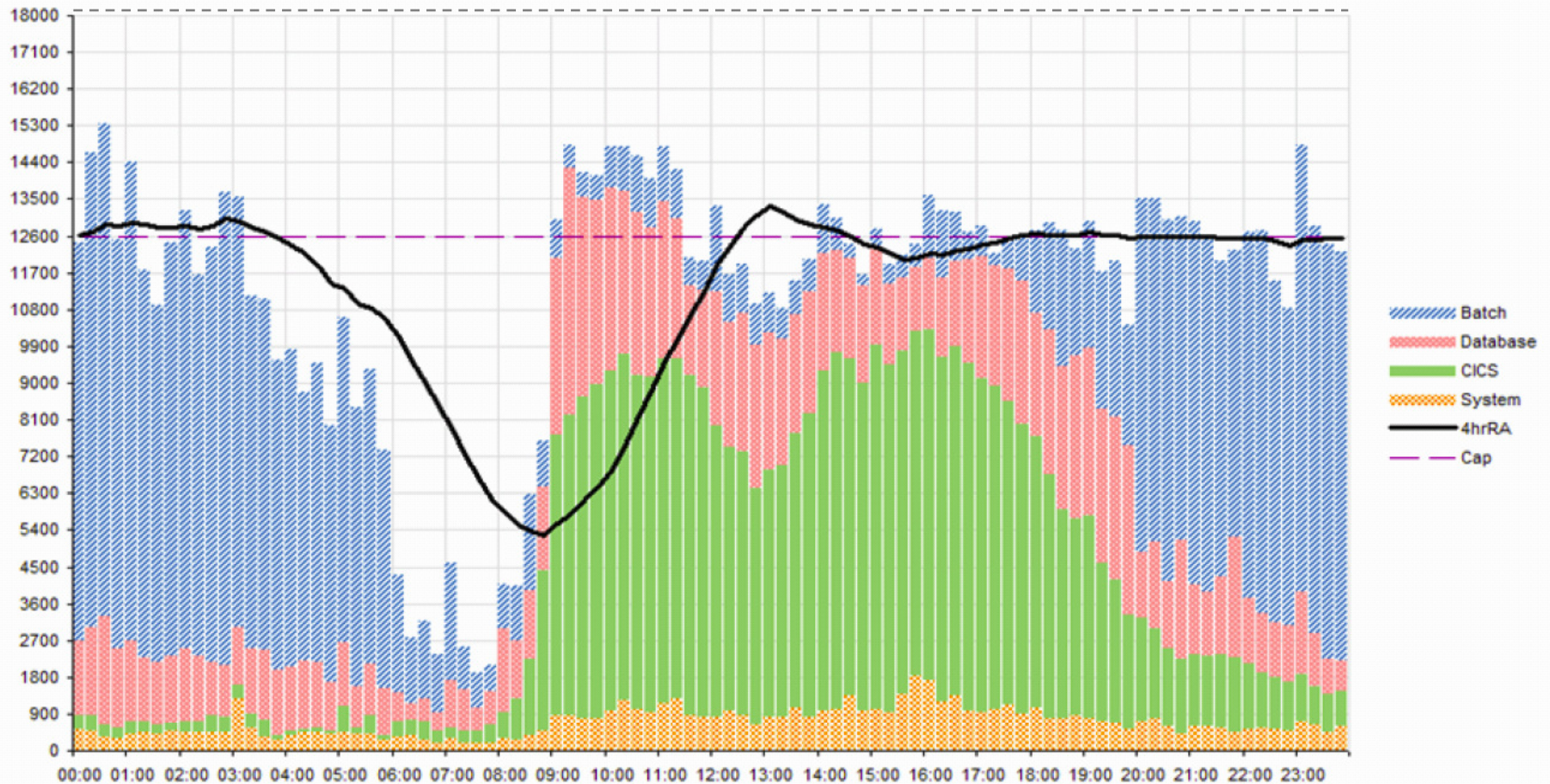
Cash Flow Analysis

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



System z Runs Many Workloads Simultaneously to Achieve High Levels of Utilization

CPU Seconds



Note:

- Each bar represents the amount of CPU seconds used in 15 minutes (= 900 seconds) with 2 10-way machines
- The way Workload Management controls the workload 4-hour rolling average to the Cap “high-water mark”

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

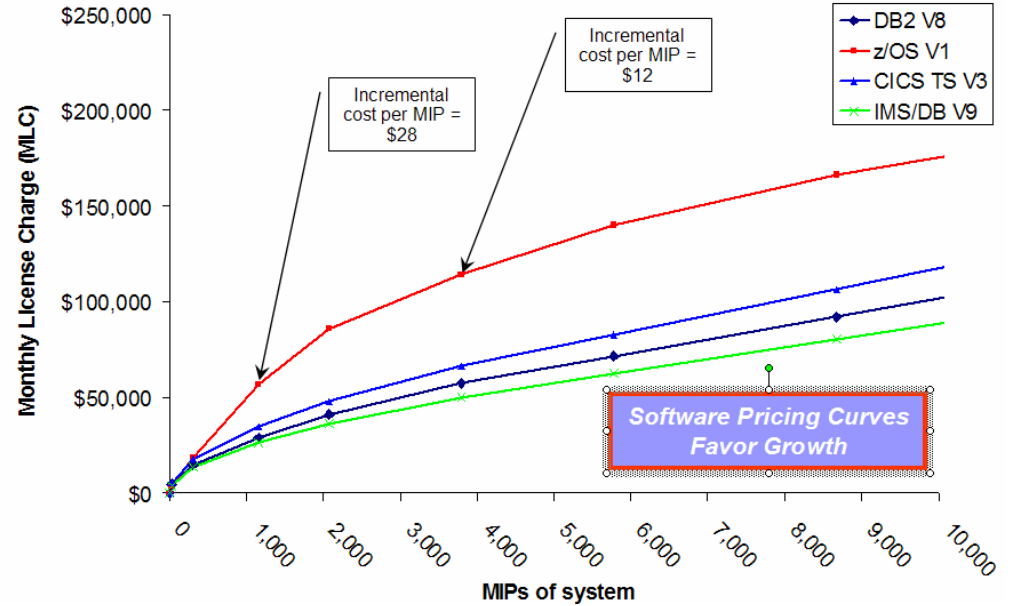
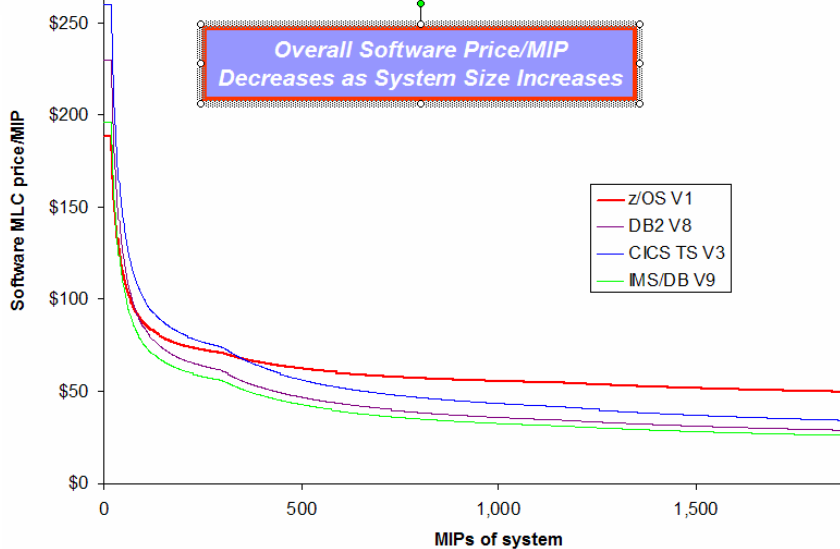
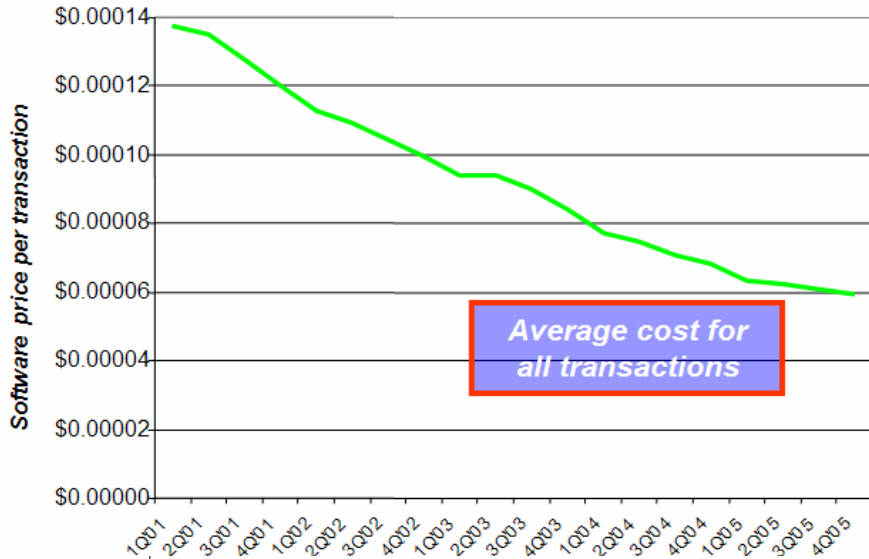
- Storage savings with DB2 vs. Oracle for a 100TB data base

	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

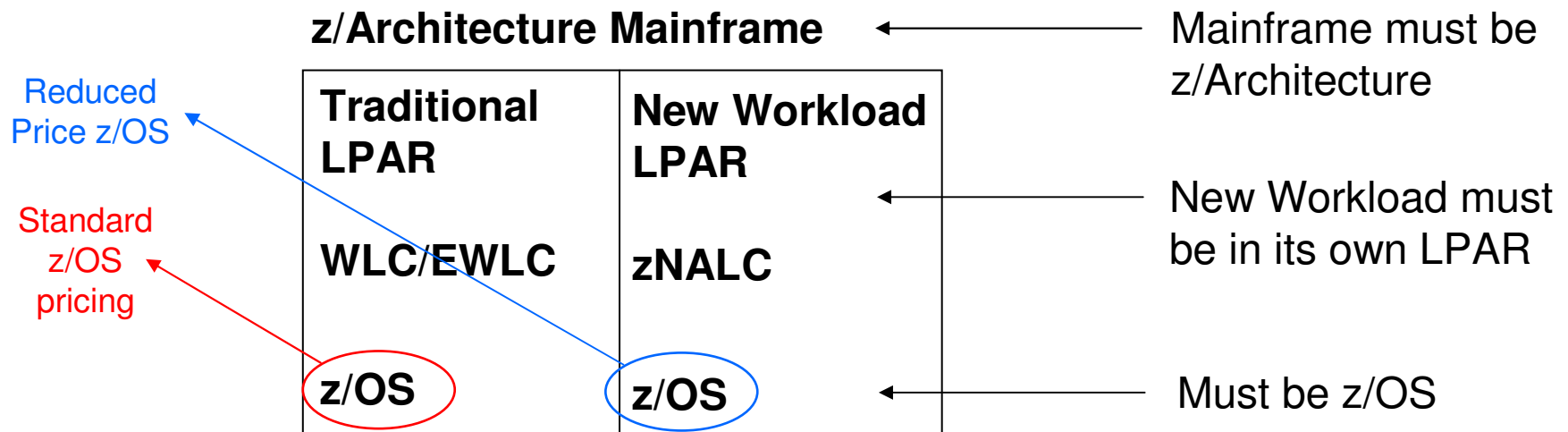


Putting This in Perspective

- 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

zNALC – It's NALC, only BETTER!

- NALC with...
 - LPAR-Level Granularity (sub-capacity)
 - 'New Workload' Criteria replaces Fixed Application List
 - Sysplex-Wide Aggregation
 - Incremental Price/Performance
- Announce & GA: 1Q2007



Portfolio Review and Analysis

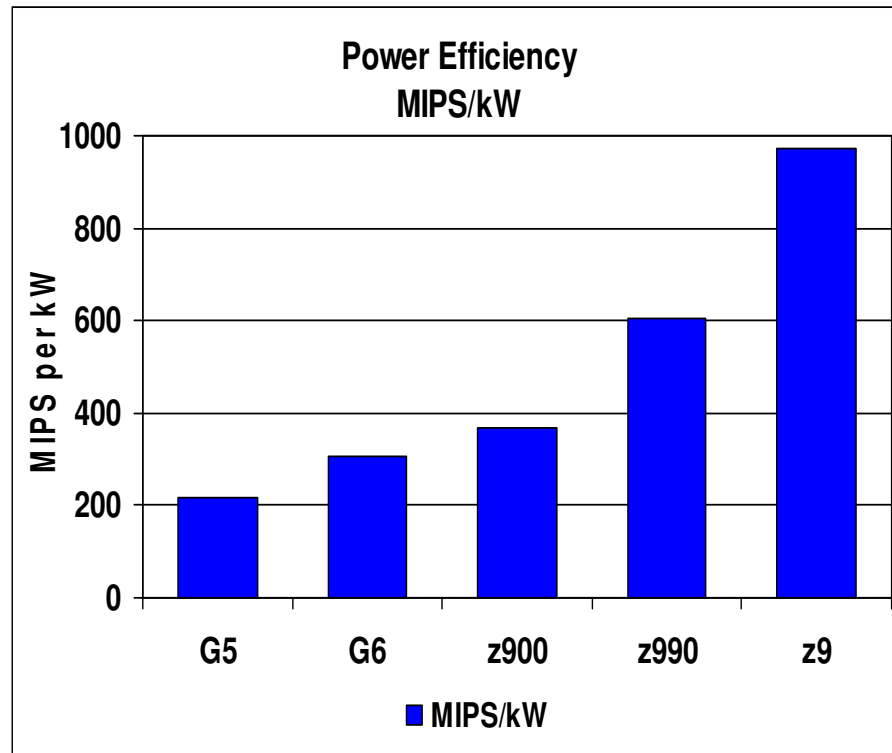
"PRA" - a study for IBM zSeries customers

- **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**

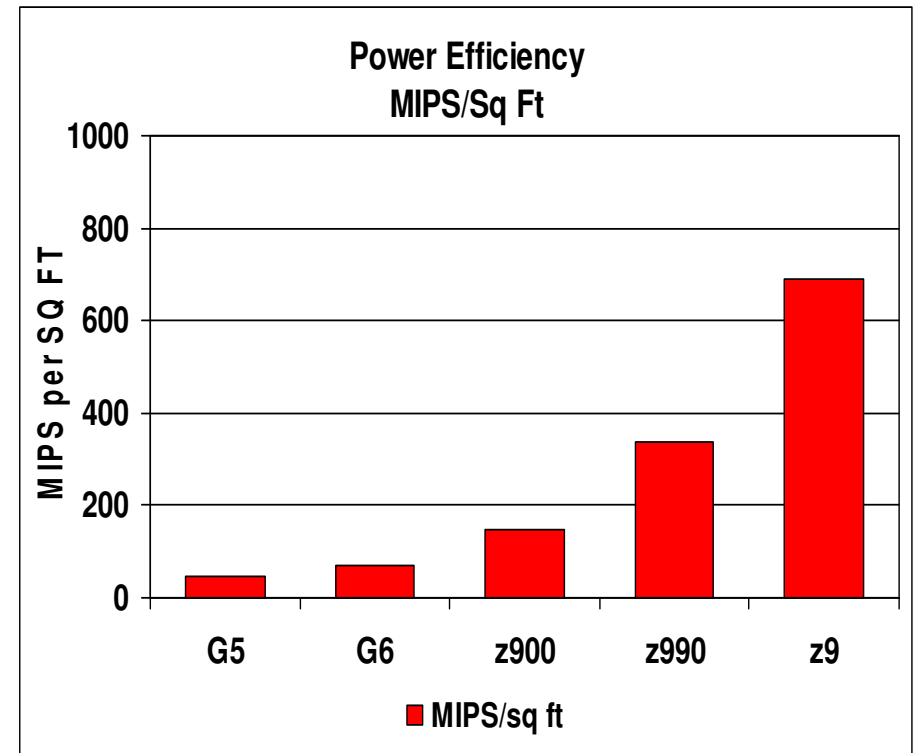
<http://www-3.ibm.com/software/solutions/softwaremigration/sps.html>

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

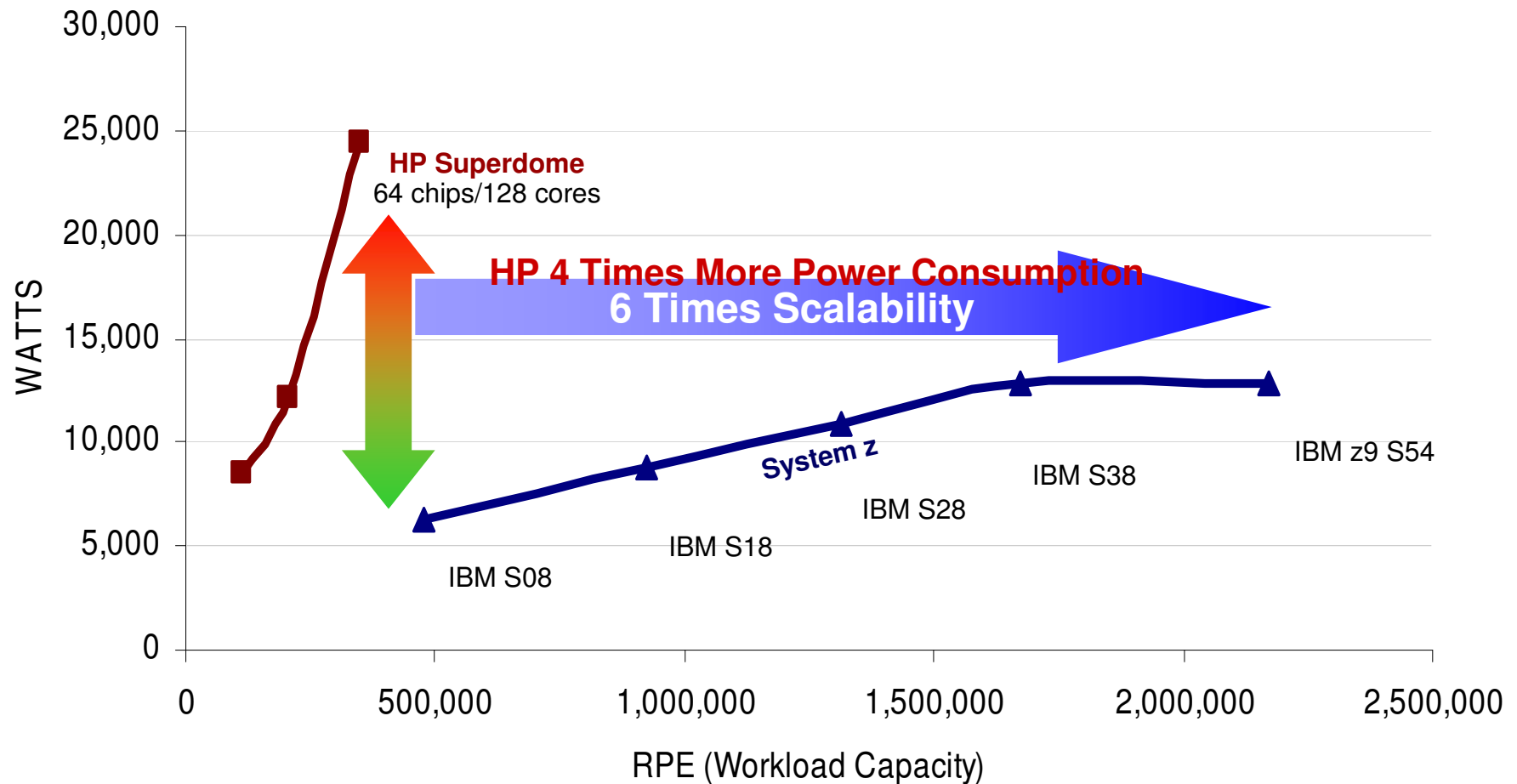


46% annual increase
in MIPS/space

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

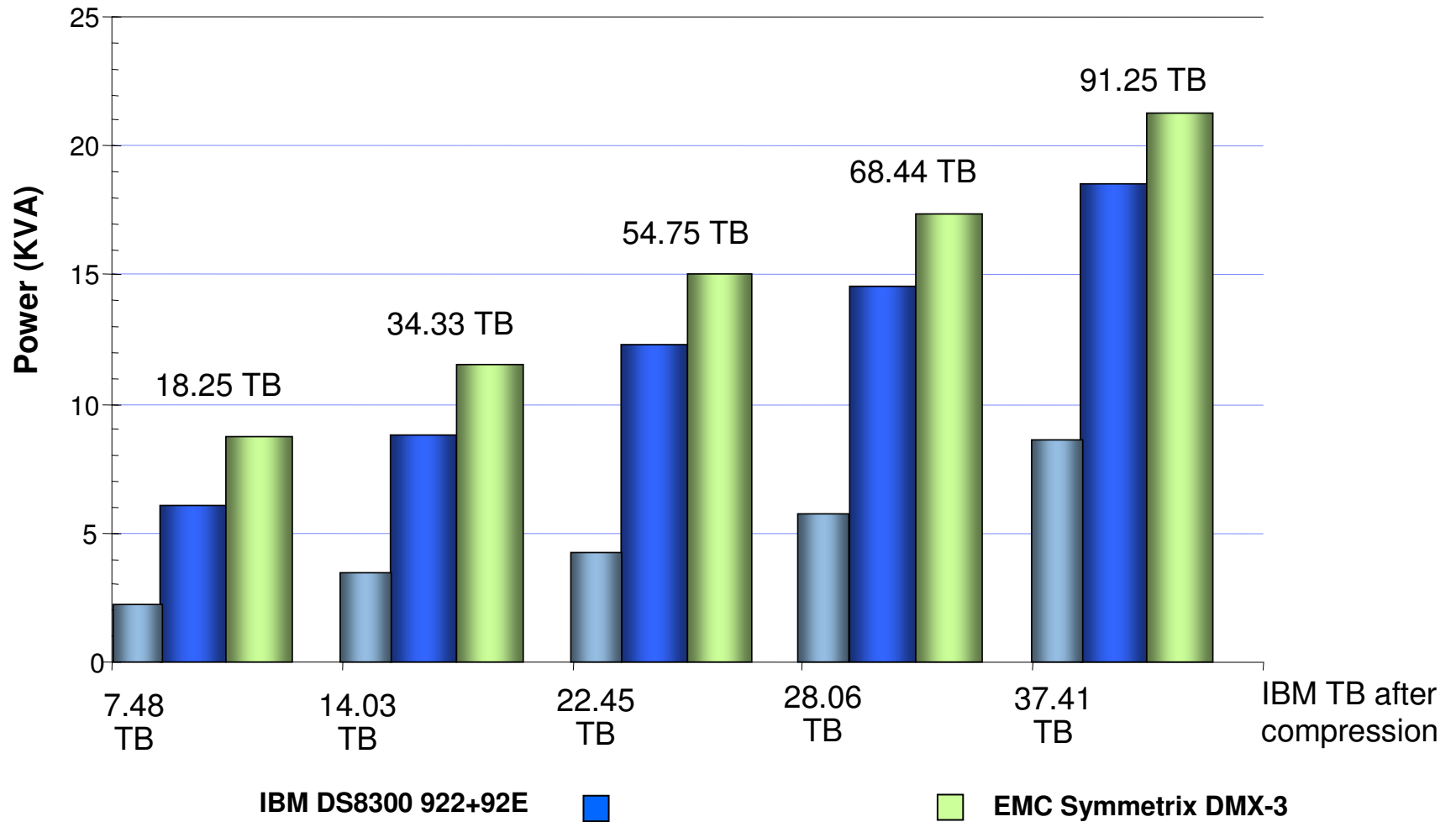
Do the Math

- 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

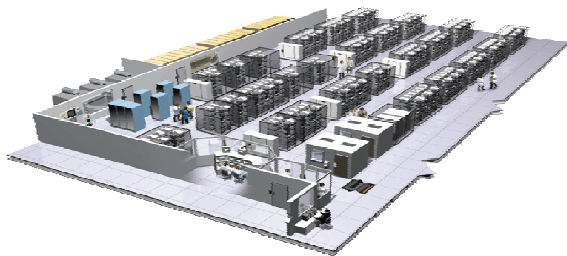
IBM DS8300 Power Consumption vs. EMC DMX-3 by Size



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

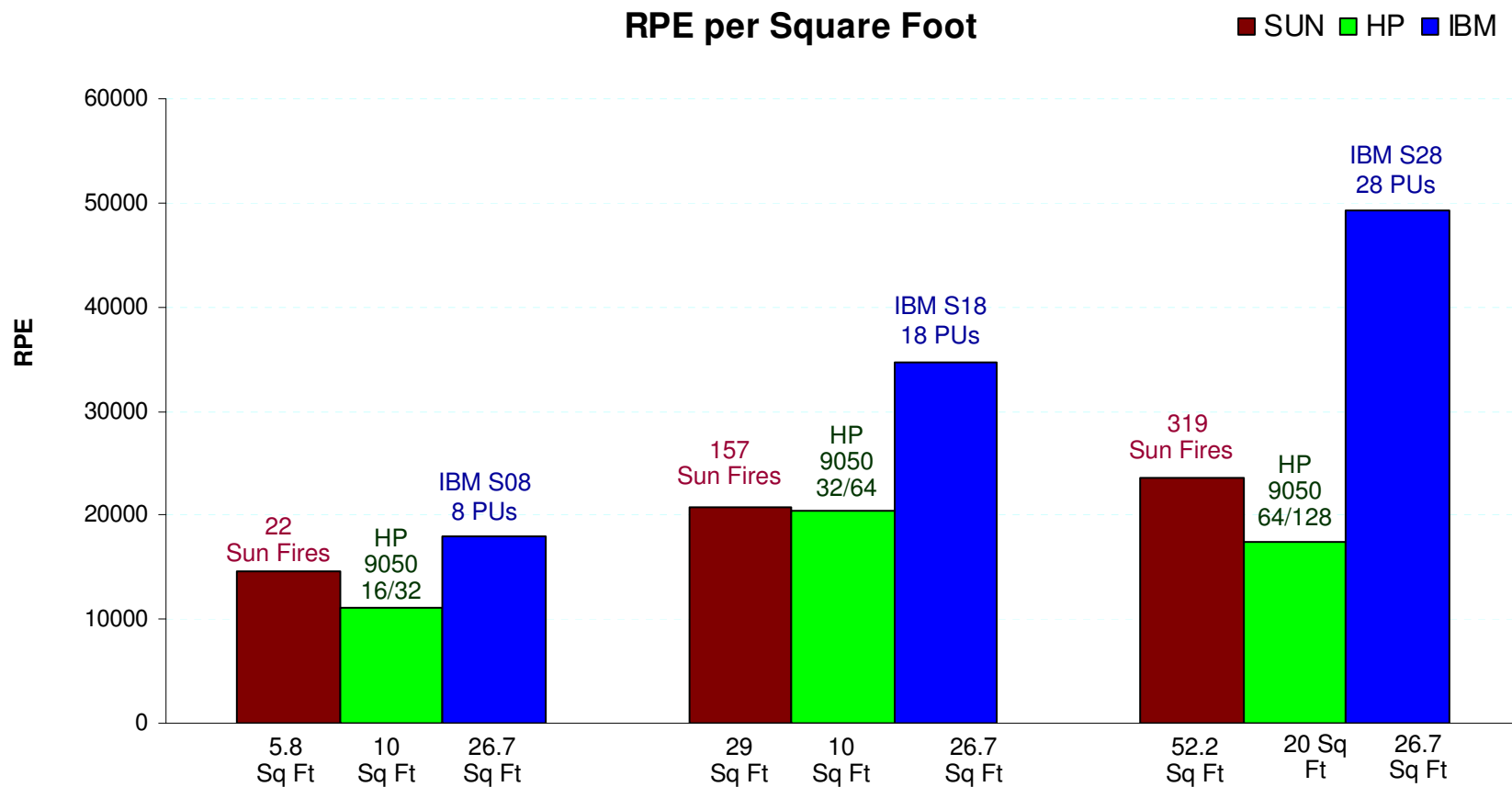


=

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



The Mainframe Also Requires a Smaller Footprint



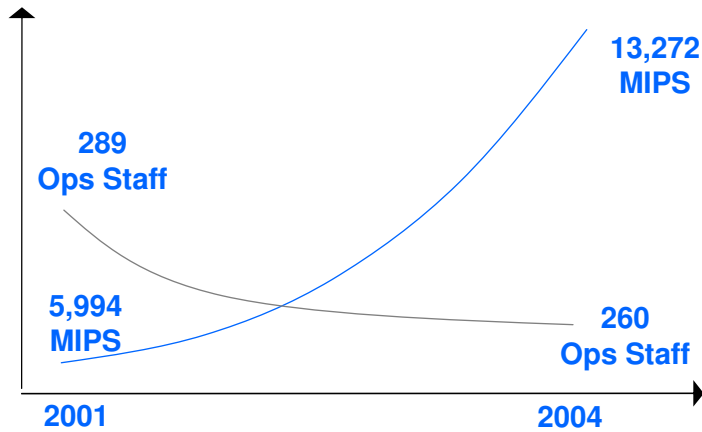


NEW YORK STATE Office for Technology Saves Money by Replacing Old Communication Hardware

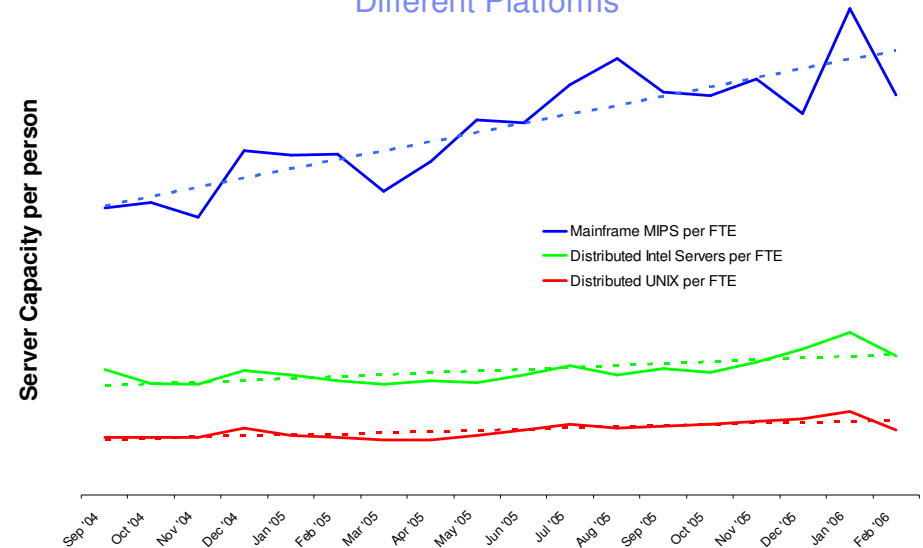
- **New York State Office for Technology (OFT)** provides IT services to state agencies, employs more than 600 people
 - Centralized data center, state-wide network infrastructure, data and voice services, and other IT services
 - E.g. Department of Motor Vehicles, NY State Higher Education Services Corporation, NY State Office of General Services.
- **Problems:**
 - OFT needed to update its communication hardware platform as two IBM 3745 Communications Controller devices were becoming obsolete
 - Needed to reclaim floor space while providing a high level of service
- **Solution:**
 - Replace and simplify aging communication controller technology with a robust, stable, secure and cost-effective operating platform on IBM System z
 - IBM Communication Controller for Linux (CCL) software emulates the 3745 device on a virtual communication controller within the System z Linux environment to support traditional Systems Network Architecture (SNA)
 - NCP function running on two 3745 base frames and eight 3746 expansion frames hardware replaced by CCL on a new z990 server with two IFL specialty engines (subsequently upgrade to a System z9)
 - CCL not only maximizes the value in existing SNA applications, but also enables an evolution toward an even simpler network infrastructure, including IP functionality and enhanced hardware independence
 - Transparently take advantage of z/VM support for zSeries hardware architecture and reliability, availability, and serviceability (RAS) features
- **Result: Quickly saved \$30,000 a year by freeing-up critical data center floor space and easier support costs – 3 year payback**

Mainframe Labor Costs Are Going Down

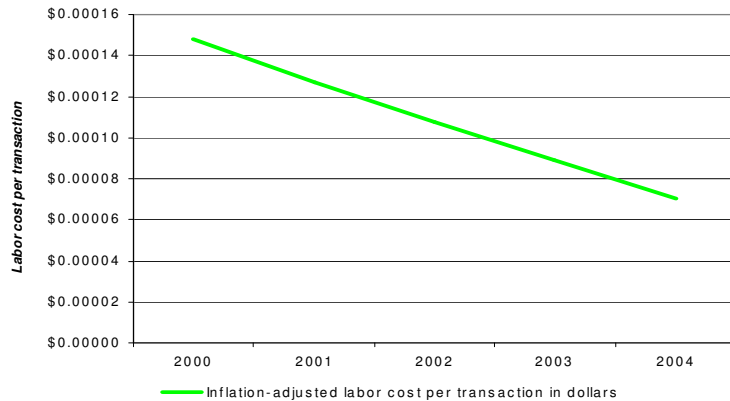
Data Center Staffing Levels for System z Have Not Increased Despite Large Increase in MIPS



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?

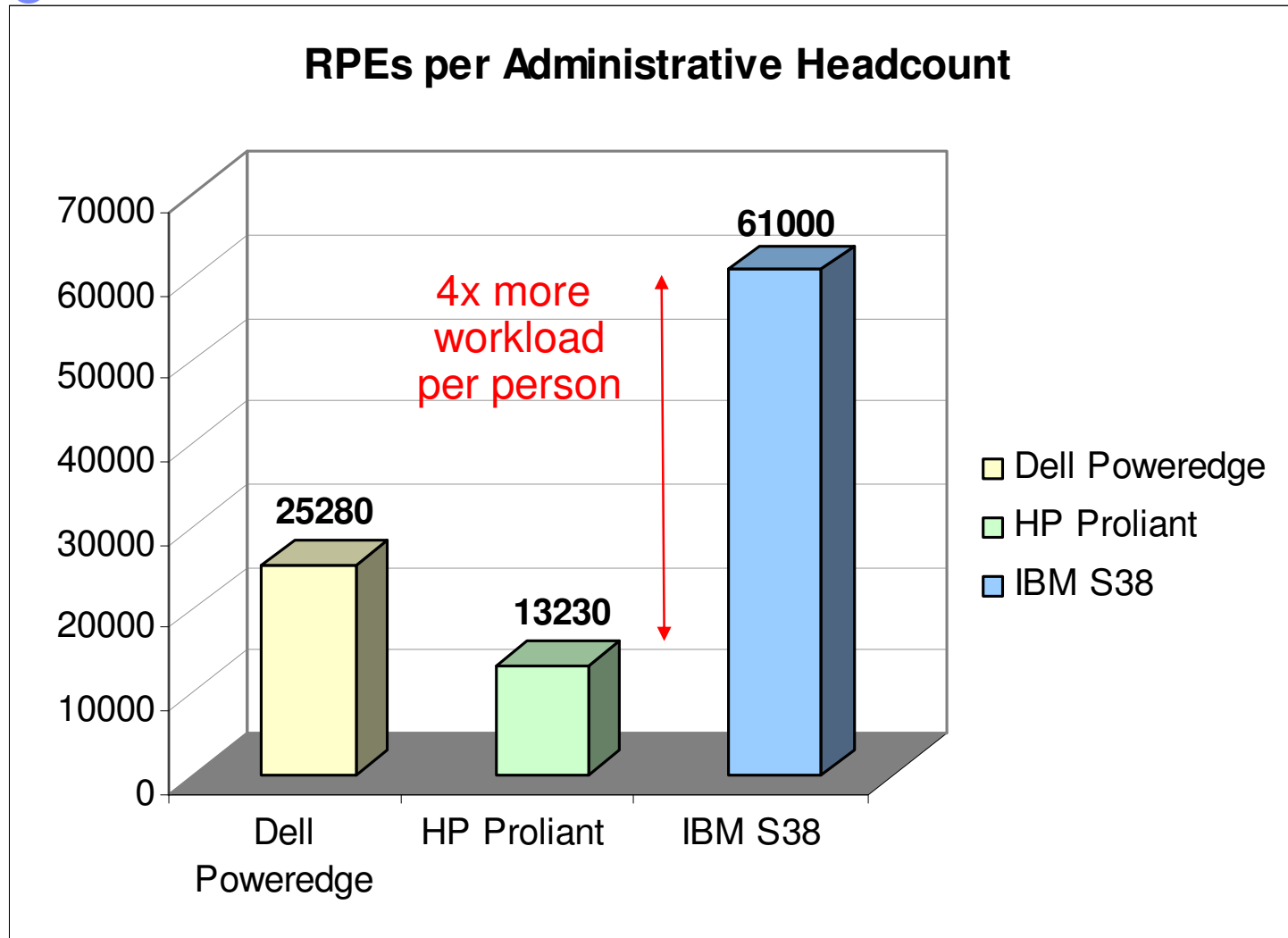
# NT Servers	# People	Ratio (s/p)
1123	68	16.5
228	20	14.4
671	51	13.1
700	65	11.5
154	18	8.5
431	61	7.1
1460	304	4.8
293	79	3.7
132	54	2.0

# 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

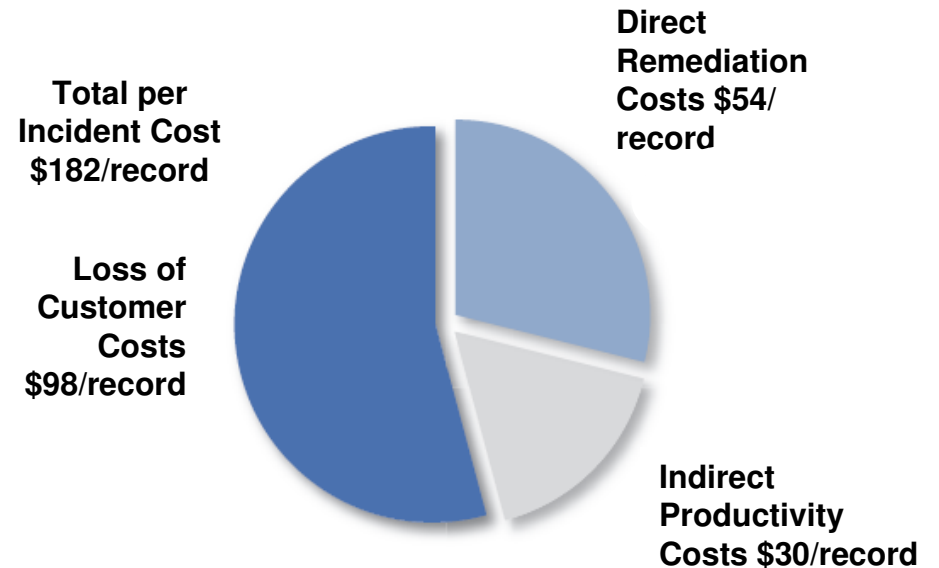
Sources: ITG Value Proposition for Siebel Enterprise Applications, Business case for IBM eServer zSeries, 2004 & Robert Frances Group, 2005

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

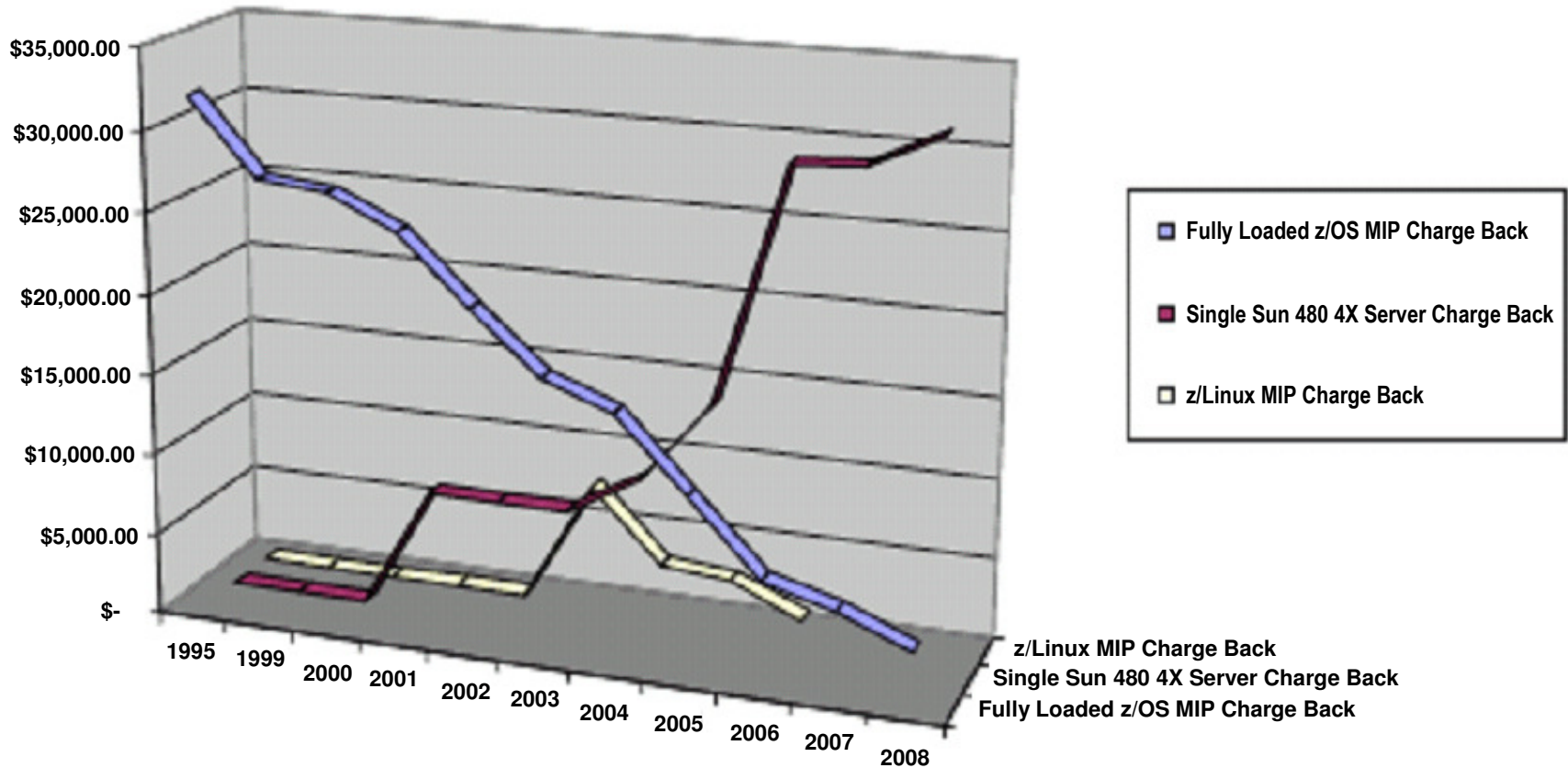
Cost of a Security Breach

- **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

How Customers Can Get the Lowest TCO on the Mainframe

1. Use the latest technology and pricing models
 - Grow core-business MIPS
 - Upgrade to System z
 - Utilize specialty processors
 - Exploit sub-capacity pricing
 - Execute an ELA or OIO
2. Maximize utilization
 - Drive mainframes at 90+% utilization, 24 hours by 7 days
 - Consolidate workload onto System z
3. Minimize other costs
 - Minimize software tool costs
 - Minimize outages and security breaches...
 - Save energy and floor space
4. Stop spiraling labor costs
5. Ensure accurate charge back of IT assets
6. Practice rigorous software asset management

Key Points:

Mainframe Costs	Distributed Costs
The cost of running incremental workload on the mainframe goes down as the total workload grows	The cost of running additional workload on distributed servers goes up more linearly
<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.

