

A Fresh Look at the Mainframe

When the Mainframe Really IS the Lowest Cost Platform

Where Should ODI's Applications Be Deployed?

We are going to be rolling out lots of new applications. Which is the best server to run them on?



On Demand Insurance
CIO

It's quite simple... the mainframe. You already have one, and you know it has the best qualities of service and lowest risk.



IBM

What About TCO?

But won't that be too expensive?



On Demand Insurance
CIO

No, on the contrary. The more you put on the mainframe, the more you save. Let me show you how!



IBM

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Key Points – Distributed Costs

- The cost of running additional workload on distributed servers goes up linearly
 - ▶ Labor is now the highest cost element in distributed environments
 - ▶ Administrative staff costs increase in proportion to the number of servers
 - ▶ New workload requires additional servers
 - ▶ Cost of additional servers is linear
 - ▶ Cost of software licenses is linear
 - ▶ Electrical and air conditioning costs also increasing
- **Result – scale out strategies do not reduce the cost per unit of work as the workload grows**

Owing to the nature of individual contracts, some details of this pricing discussion may be at variance with specific instances

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Key Points – Mainframe Costs

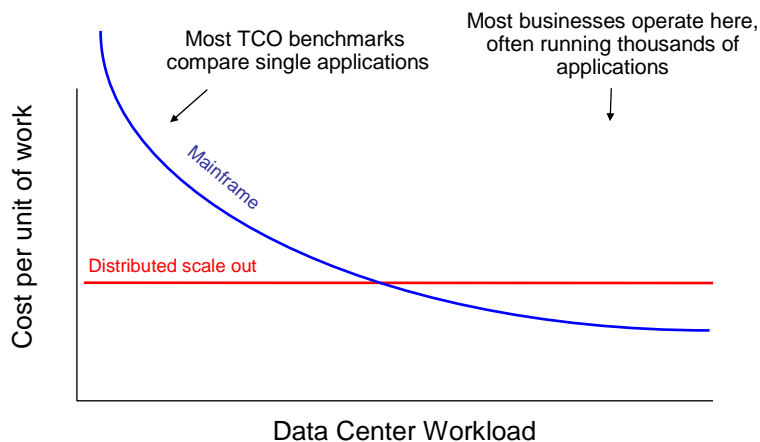
- The cost of running incremental workload on the mainframe goes down as the total workload grows
 - ▶ Labor costs hold steady as workload grows
 - ▶ IBM pricing policies designed to favor the addition of more workload
 - ▶ Special hardware pricing for new workload types
 - ▶ Lower software costs per transaction as workload grows
 - ▶ Lower electrical and air conditioning consumption than server farms
- **Customers have learned that mainframes running high workloads are the most cost efficient platform**

Owing to the nature of individual contracts, some details of this pricing discussion may be at variance with specific instances

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Mainframe Cost Per Unit of Work Goes Down as Workload Increases



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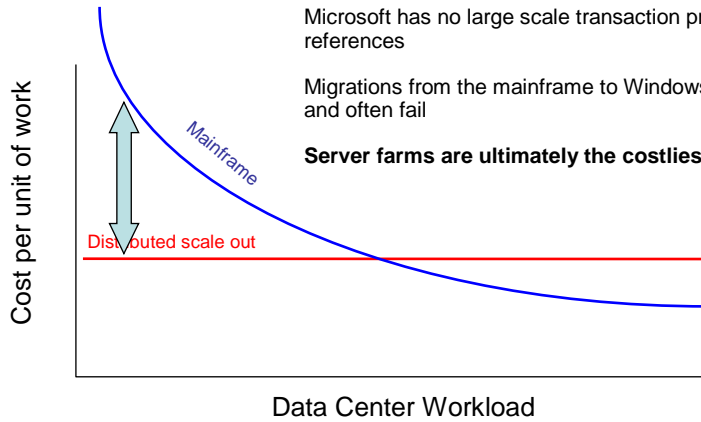
Microsoft Mainframe Alliance Likes to Focus Here, One Application at a Time, But....

The operating characteristics of Windows fall short of mainframe qualities

Microsoft has no large scale transaction processing references

Migrations from the mainframe to Windows are difficult and often fail

Server farms are ultimately the costliest environment



First National Bank of Omaha

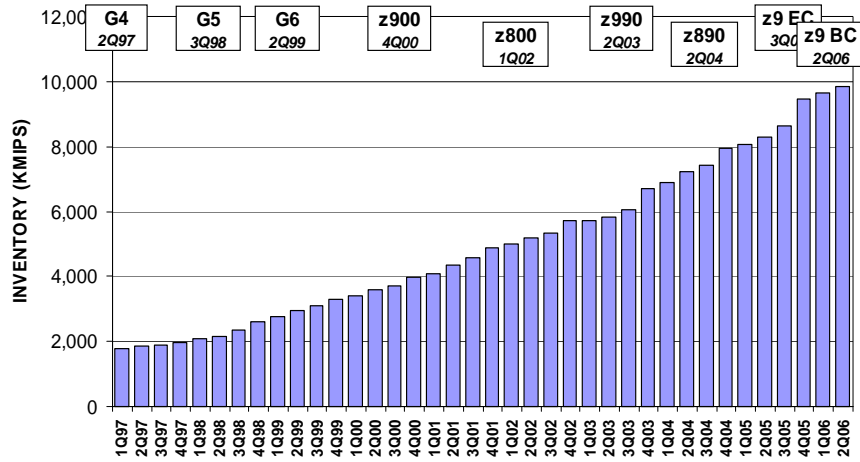


	Servers	Reliability	Utilization	Staff
First move: Implemented distributed computing architecture that became too difficult to monitor, maintain, upgrade and scale	<ul style="list-style-type: none"> 30+ Sun Solaris servers 560+ Intel servers 	Un-acceptable	12%	24 people growing at 30% year
Next move: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

Seven times better utilization on mainframe hardware

- Seven times better utilization also reduces **storage**, software licensing, labor, power, and air conditioning costs accordingly

Customers Are Installing More MIPS



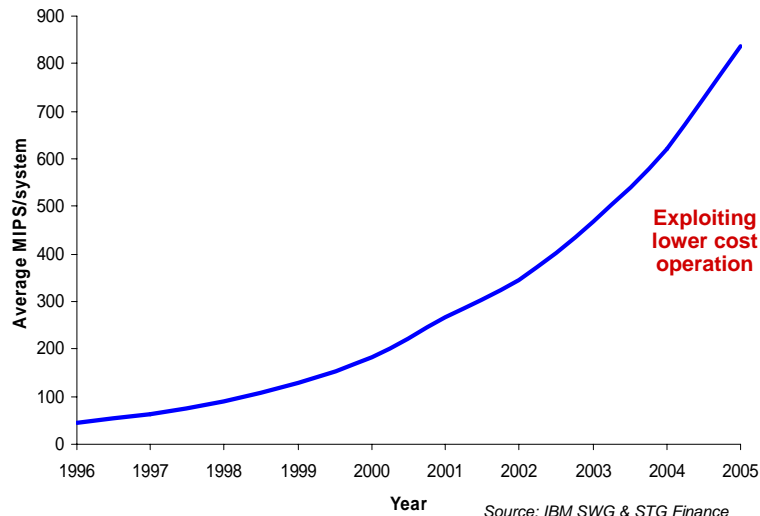
CAGR 1997-2005 = 22%

Source: IBM STG Finance

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Average Size of Mainframe Systems WW is Increasing



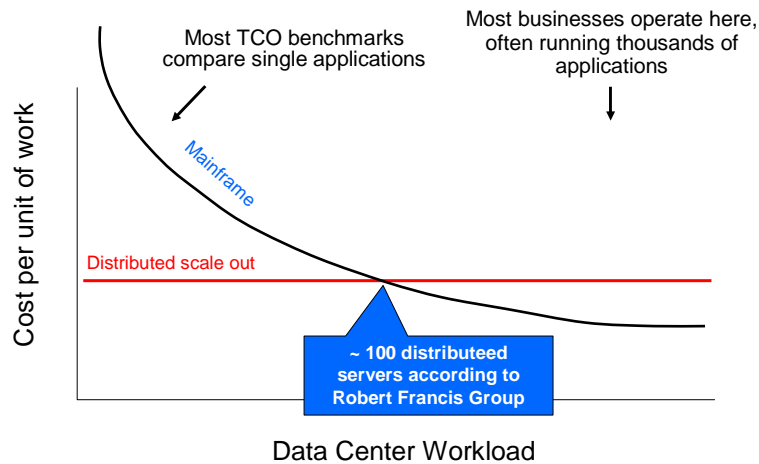
Source: IBM SWG & STG Finance

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Where is the Cross Over Point?

It depends on your environment ...



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Let's Break Down the Elements of Cost

Total Cost of Ownership =

Hardware

+ Software

+ Environmentals

+ Labor

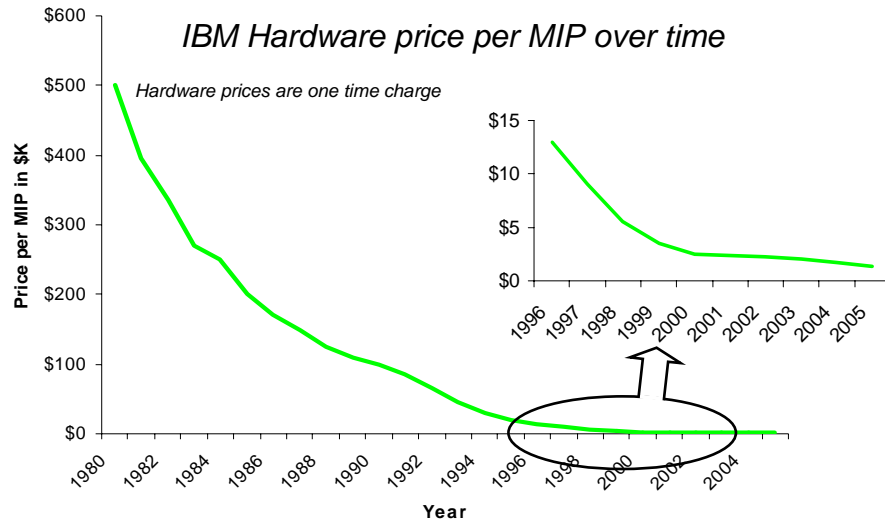
+ required Quality-of-Service

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

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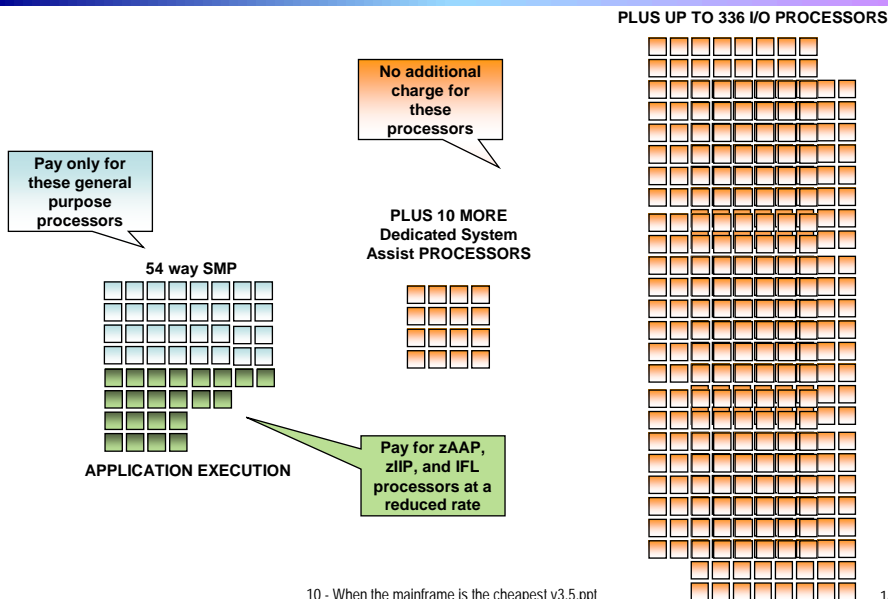
Mainframe Hardware Cost is Decreasing



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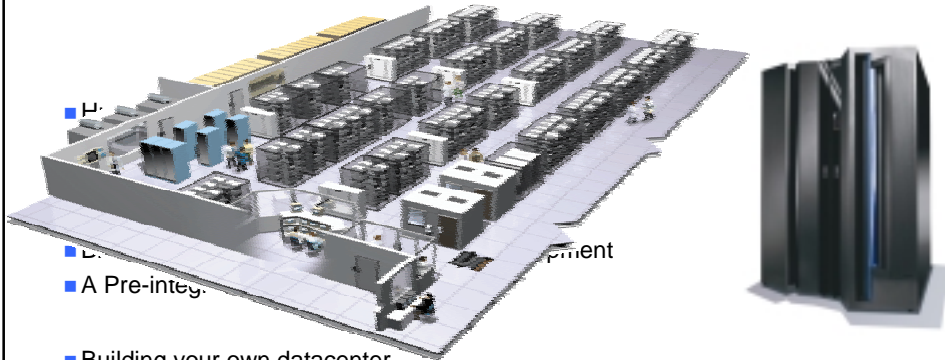
No Additional Charge For System Assist and I/O Processors



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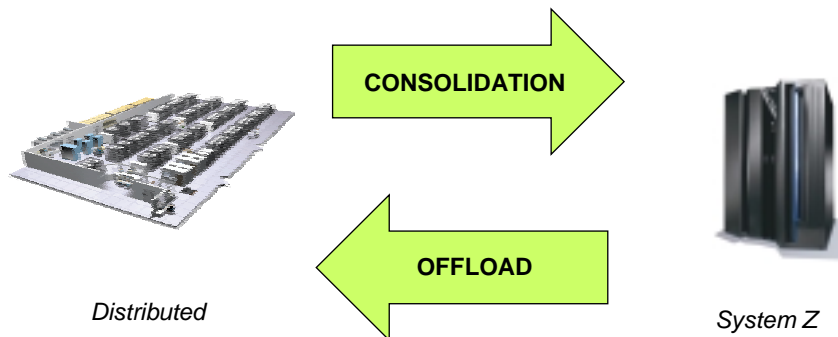
Datcenter in a Box



- Building your own datacenter is costly and complex
- Data Silos and Synchronization
- Networking
- Linear Staffing Costs
- Frequent Outages

Resulting in tremendous efficiencies
No extra charge for this deep pre-integration!

TCO Comparisons

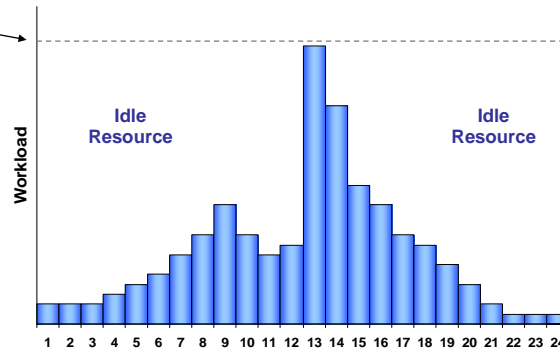


Utilization of Distributed Servers

Provision capacity for peak workload



Server dedicated to one application

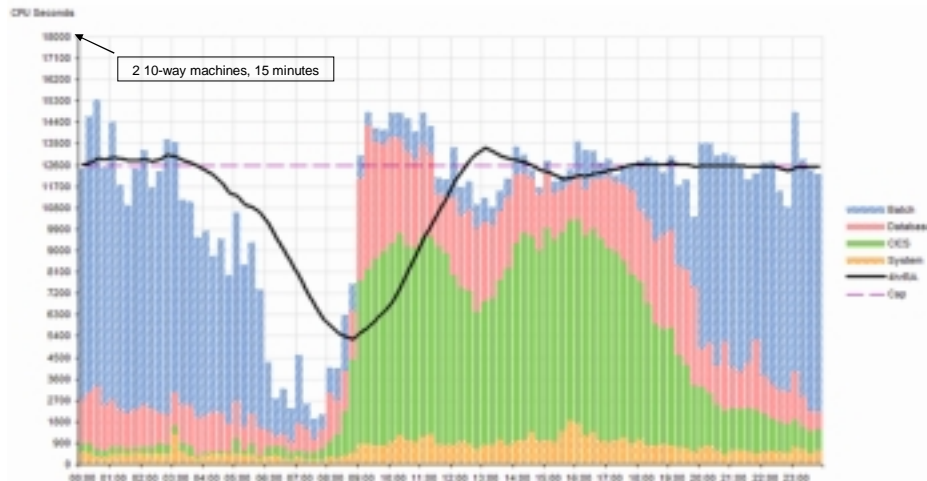


- ▶ Typical utilization of Windows Servers 5 – 10%
- ▶ Typical utilization of UNIX Servers 10 – 20%
- ▶ Typical utilization of System z Servers 85 – 100%

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System z Virtualization and Workload Management Achieve High Levels of Utilization



Note:

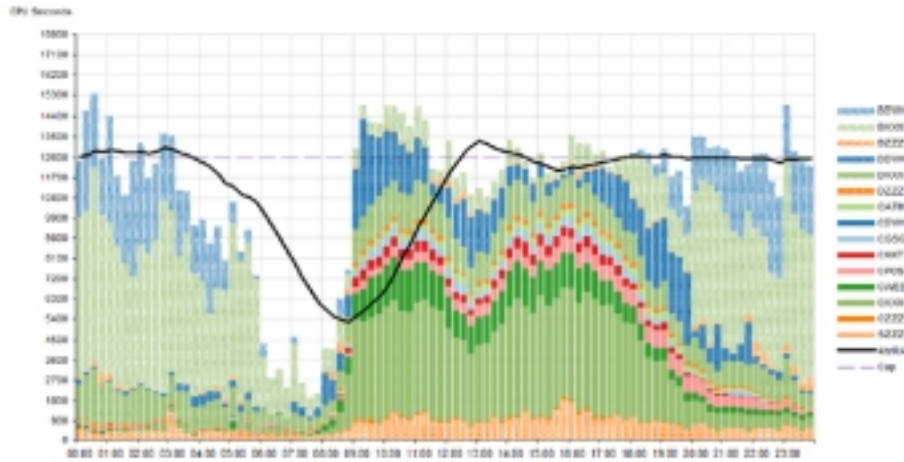
- Each bar represents the amount of CPU seconds used in 15 minutes (= 900 seconds) with 2 10-way machines
- The way Workload Management controls the workload 4-hour rolling average to the Cap "high-water mark"

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System z Virtualization and Workload Management Achieve High Levels of Utilization

CICS, DB2, Batch Workload Profile – Mon 27 March (15 applications)



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Distributed Systems Storage Utilization

Allocation

- Storage allocations tend to be application specific resulting in over-allocations
- Fine grained storage allocation mechanisms characteristic of mainframe storage are uncommon in distributed environments.

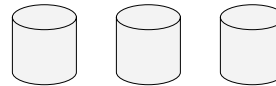
Utilization

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

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

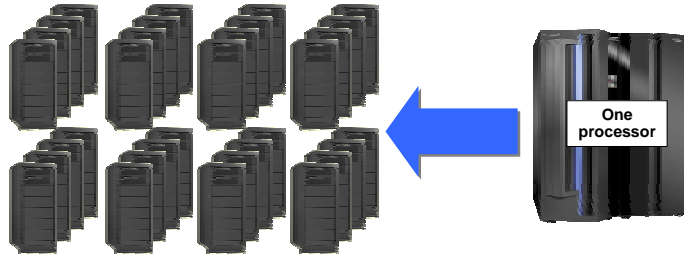
The cost of storage is typically three times more in distributed environments

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Asian Financial Services Customer

- 7 workloads using 420 MIPS on a mainframe
- TCO analysis to offload to distributed UNIX Systems



32 Unix Servers with 79 Processors

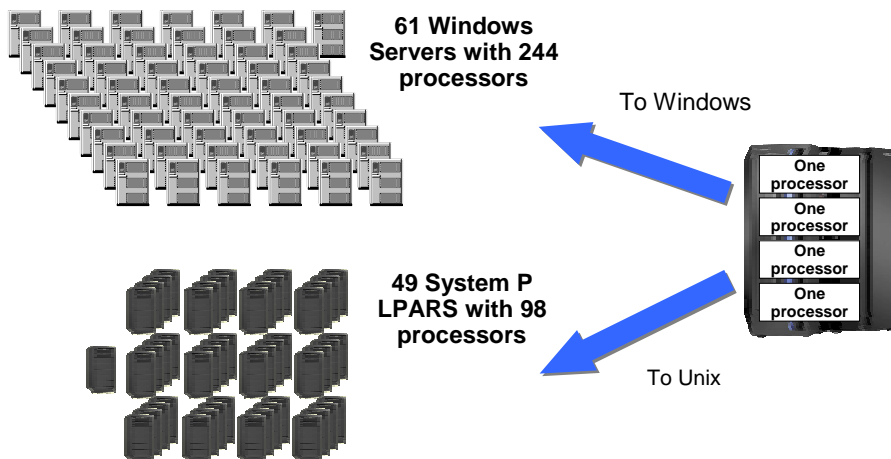
Conclusion: Same TCO with no benefit from additional migration cost & risk

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European Banking Customer

TCO Analysis to Offload CICS Transaction Workload



Conclusion: Same TCO with no benefit from additional migration cost & risk

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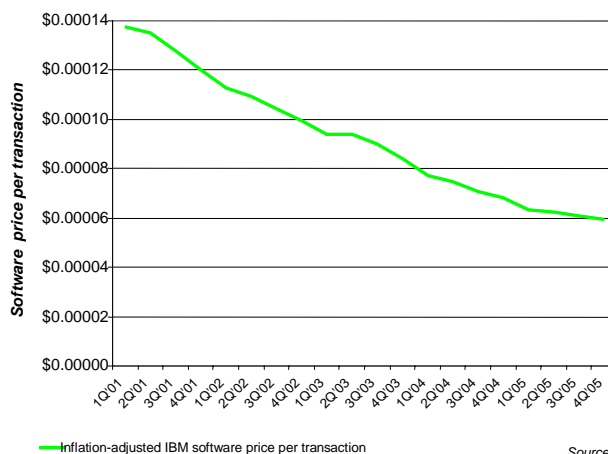
Why Do Servers Proliferate in Offload Scenarios?

- The following considerations contribute to server proliferation
 - ▶ De-multiplexing of applications to dedicated servers
 - One application workload per server group
 - Peak-to-average provisioning yields low utilization
 - Batch workload conversion to "transaction style"
 - Separate servers for production, failover, development/test
 - Infrastructure servers for systems management
 - ▶ Processing comparisons
 - Language expansion (CICS/COBOL path lengths are highly optimized)
 - Conversion factor (MIPS to TPM-C or RPE) worsens as I/O rates increase
- Other TCO considerations
 - ▶ Provision for continued growth in workload year to year
 - ▶ Dual environments during migration
 - ▶ 3 to 5 year lifetime for distributed servers requires repurchase
 - ▶ Partial offloads eliminate the lowest cost MIPS first

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IBM Software Price Per Transaction is Also Going Down



57% decrease in past 60 months

➤ **17% decrease per year**

What makes the price go down?

Pricing curves favor growth

Specialty processors (zAAPs, zIIPs, IFLs)

Technical pricing allowances

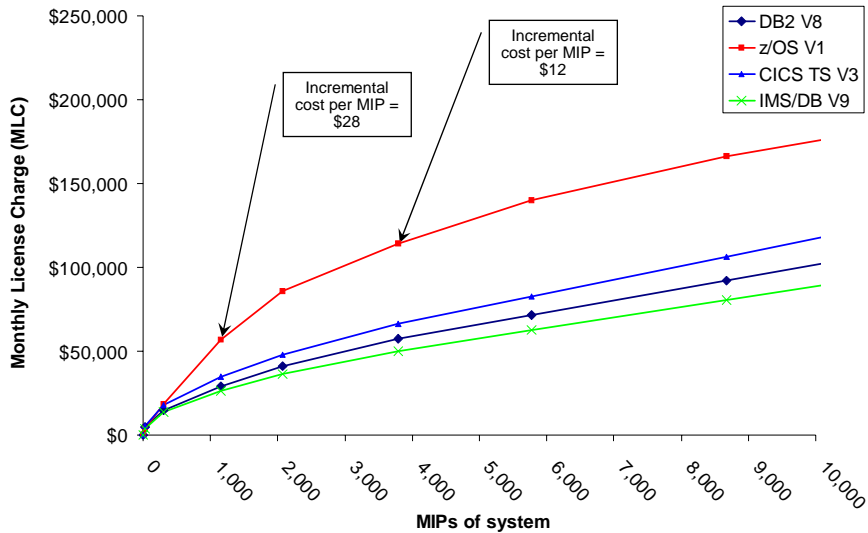
— Inflation-adjusted IBM software price per transaction

Source: IBM SWG Finance
 Data is WW customer revenue only (not IGS)
 Data includes specialty engines
 'Highway conditions .. mileage may vary'

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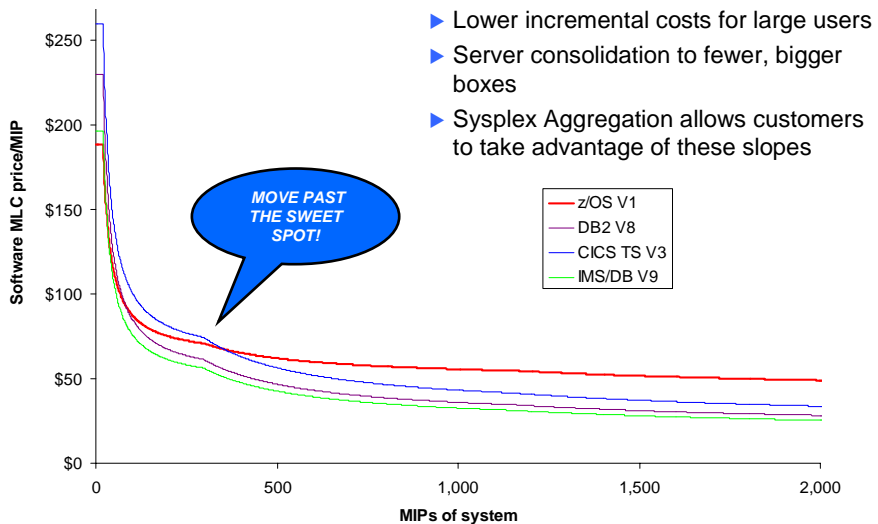
Software Pricing Curves Favor Growth



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Overall Software Price Per MIP Decreases as System Size Increases



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Putting This in Perspective

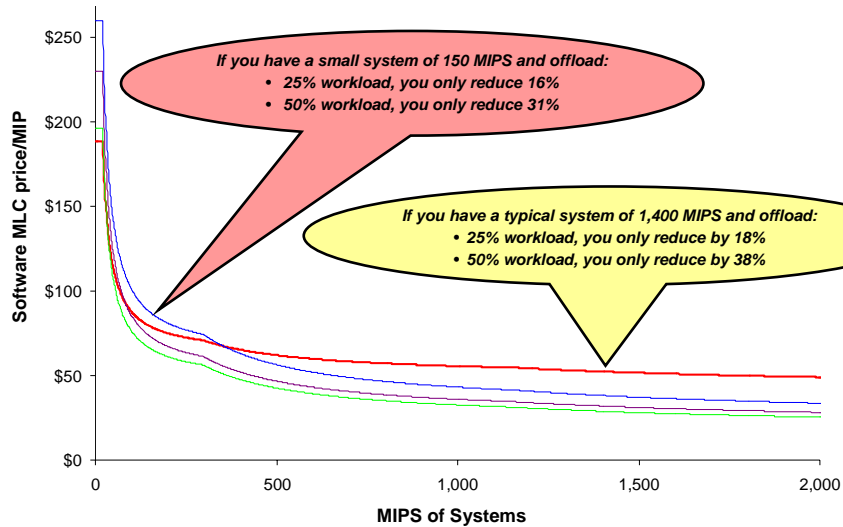
- For a typical system of 1,400 MIPS, MLC software stack costs \$59 per incremental MIP
- If a transaction is 1 million instructions, an incremental MIP can perform >2½ million additional transactions per month for Δ\$59 software cost (44K transactions per dollar)
- **If these are credit card transactions** 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

Comment on the Mainframe

*“Then we looked at the one million plus transactions every day that 2,000 of our employees generated, and we start to do the math and you realize that the **per transaction cost is really very modest.**”*

Kevin Campbell, Chief Application Architect, Univar USA

Let's Consider How this Works in Reverse ... Lowest Cost MIPS are Offloaded First



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IBM Actually Charges on the Basis of MSUs (Millions of Service Units Per Hour)

- 1 MSU currently is equal to about 7.3 MIPS (for a z9 EC)

So...

- Software for a 580 MIPS machine will be charged at a rate of 81 MSU's

Various ratings online at:

MSUs <http://ibm.com/zseries/library/swpriceinfo/hardware.html>

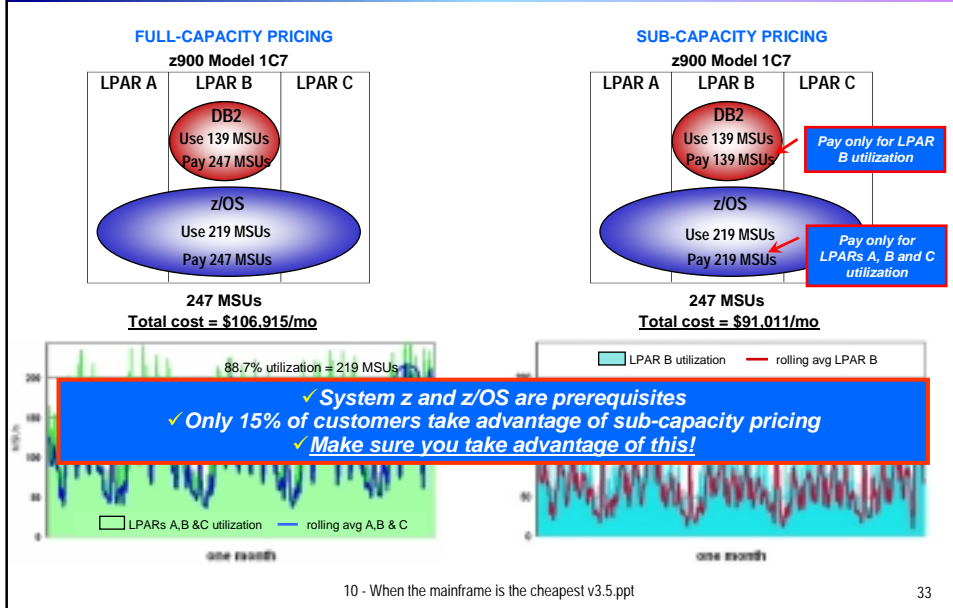
LSPR MIPS <http://ibm.com/zseries/lspr>

Hardware SRM Constants <http://ibm.com/zseries/srm>

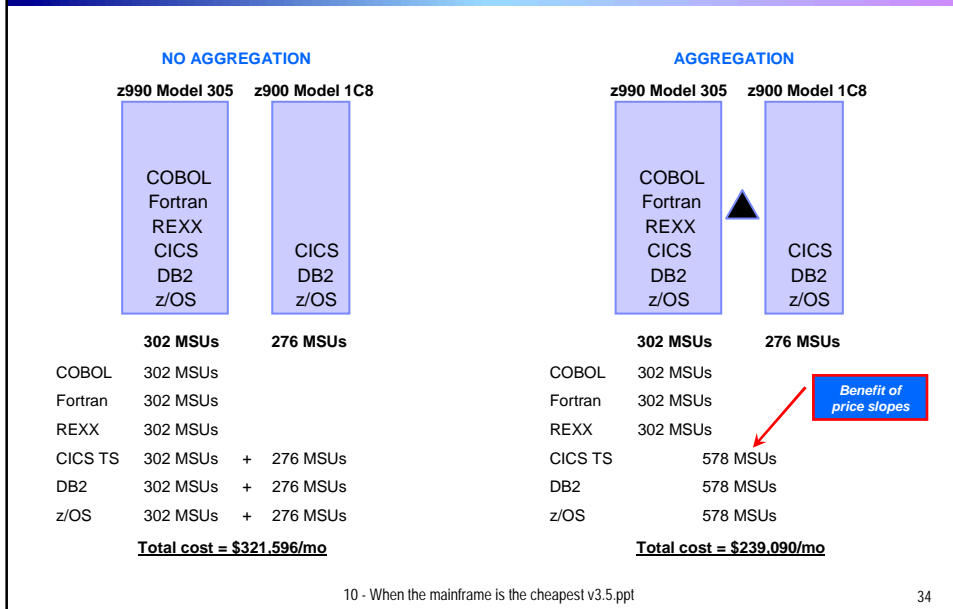
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Example of Sub-Capacity Pricing, Saving ~ \$16K MLC



Example of Sysplex Aggregation, Saving >\$82K MLC



Specialty Processors

- Same as general purpose CPU's except limited to specific uses
 - ▶ zAAP runs any Java workload
 - ▶ zIIP runs specified data base workloads
 - ▶ IFL runs Linux (natively or under VM)

- Hardware is \$95K–\$125K one time charge
 - ▶ Approximately 14% of general purpose price
 - ▶ **No charge** for software running on zAAP/zIIP
 - ▶ IBM software running on IFL is priced per IFL processor (not per image)
 - ▶ Free upgrade to next generation!

- In typical scenarios, zAAP/zIIP can reduce annual (software) and OTC charges (hardware and software) by ~40%



Example of a zAAP

Consider a transactional environment that would execute on a 2-processor z9 EC mainframe (1132 MIPS).

If one of the general processors were converted to a zAAP to run most of the Java, leaving a 1-processor z9 EC mainframe (580 MIPS)

WAS	1132 MIPS	\$29K	(maintenance)
C/CS	1132 MIPS	\$390K	
DB2	1132 MIPS	\$327K	
z/OS	1132 MIPS	\$621K	
TOTAL		\$1,367K	annual charges

WAS	580 MIPS	\$16K	(maintenance)
C/CS	580 MIPS	\$272K	
DB2	580 MIPS	\$223K	
z/OS	580 MIPS	\$349K	
TOTAL		\$860K	annual charges

Two general purpose processors	\$1,600K	
WAS	\$145K	
TOTAL	\$1,745K	One time charge

One general purpose processor	\$800K	
One zAAP processor	\$125K	
WAS	\$80K	
TOTAL	\$1,005K	One time charge

In this example, with zAAP, the annual (software) charges are reduced by 37% and OTC charges (hardware and software) are reduced by 43%

They may be additional savings if sub-capacity pricing were used

Example of a zIIP

Consider a data warehouse environment that would execute on a 2-engine z9 EC mainframe (1132 MIPS).

DB2	1132 MIPS	\$327K	
z/OS	1132 MIPS	\$621K	
TOTAL		\$948K	annual charges

If one of the processors were converted to a zIIP to run remote SQL, star schema queries, and DB2 utilities, leaving a 1-processor z9 EC mainframe (580 MIPS)

DB2	580 MIPS	\$223K	
z/OS	580 MIPS	\$349K	
TOTAL		\$572K	annual charges

Two general purpose processors	\$1,600K	
TOTAL	\$1,600K	One time charge

One general purpose processor	\$800K	
One zIIP processor	\$125K	
TOTAL	\$925K	One time charge

*In this example, with zIIP, the annual (software) charges are **reduced by 40%** and OTC charges (hardware) are **reduced by 42%***

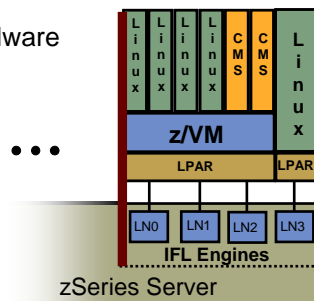
There may be additional savings if sub-capacity pricing were used

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Integrated Facility for Linux (IFL) Makes Linux Consolidation Even More Attractive

- Linux Consolidation
 - ▶ Port multiple Linux systems to run as separate images under z/VM
 - ▶ Good economics due to typically low utilization of distributed servers
- Use of IFL engine reduces the price further
 - ▶ IFL specifically limited to Linux workloads
- IFL Requirements
 - ▶ z9-109, z990, z900, z890 or z800 hardware platform
 - ▶ No z/OS requirements
 - ▶ No limit on the number of IFLs



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Distributed Power Costs Have Become a Major Issue

- According to the Wall Street Journal, distributed server farms can generate as much as **3,800** watts per square foot
 - ▶ In 1992 it was 250 watts/sq foot

- *“Power-related problems in 2005 will cause 4 of the 20 major failures, up from 2 of 20 last year”* (The Uptime Institute)

- By comparison, a System z9 consumes **107-312** watts per square foot – *one tenth or less the amount*
 - ▶ Switching on an IFL processor consumes only 60-75 watts

Downtime and Security are Significant Unexpected Costs

- Mainframes run at 99.999% availability
 - ▶ average unplanned downtime ~ 5 minutes/year

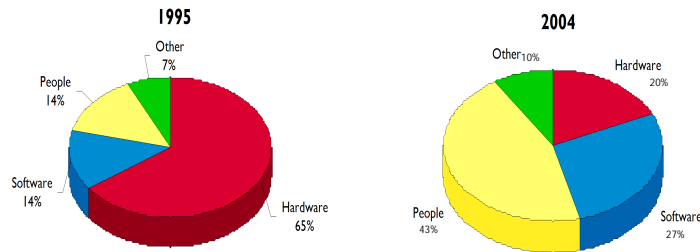
- Downtime and security issues can mean more than economic loss
 - ▶ Regulatory compliance
 - Fines
 - Other penalties
 - ▶ Market competitiveness
 - ▶ Customer loyalty
 - ▶ Business image & reputation

Financial Impact of Downtime Per Hour

Industry segment	Cost
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

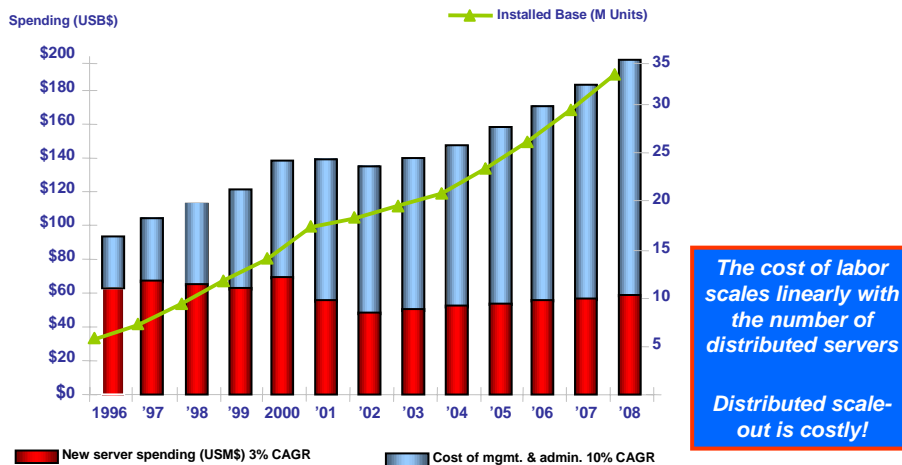
Source: Robert Frances Group 2005

People Expense has Become the Dominant Component of TCO



Based on IBM Scorpion customer analyses

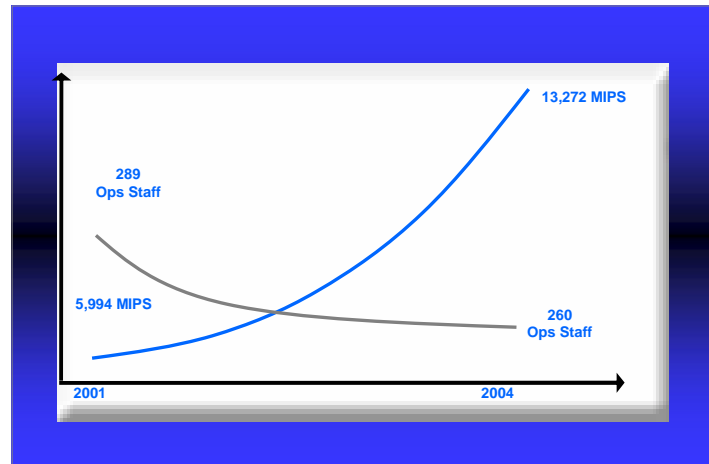
Since 2000, Labor Costs Have Exceeded the Cost of All Servers ... and are *Still* Growing



The cost of labor scales linearly with the number of distributed servers
Distributed scale-out is costly!

Source: IDC

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



$$\frac{5,994}{289} = 21 \text{ MIPS/HC}$$

$$\frac{13,272}{260} = 51 \text{ MIPS/HC}$$

Source: Gartner

A Comparison of Labor Costs for Two Environments That Execute Roughly Equivalent Workloads

Topic	System z- 3,192 MIPS	900 Distributed Servers
Operations	\$105K 10% of 6 FTEs	none
Customer Engineers	\$52K..... 0.3 FTEs \$50K LAN charges \$35K z- charges	\$400K SUN charges \$300K LAN charges \$40K p- charges \$100K HP charges
Systems Engineers	\$551K 3.15 FTEs	\$5,250K.....30 FTEs (Operations in the Systems charge)
Security Admin	None	\$600K
Total	<u>\$793K</u>	<u>\$6,690K</u>

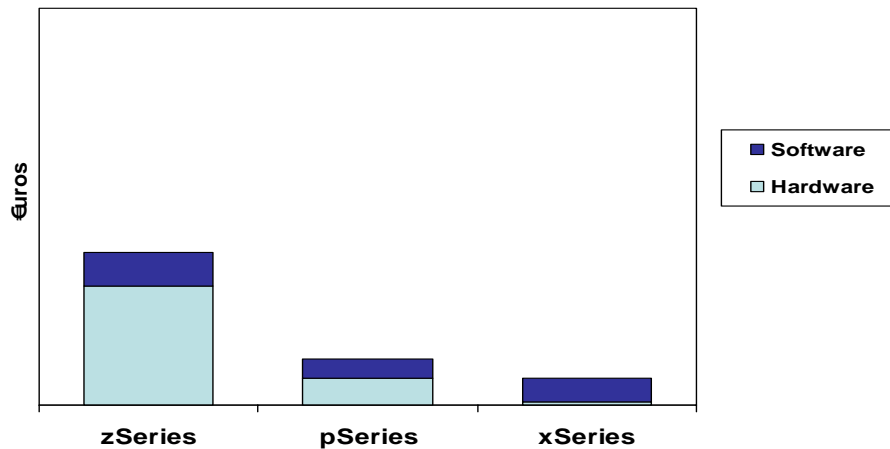
In this case, System z requires 1/8 the labor costs of the distributed environment

Source: IBM SWG Data Center

A Customer Example: Taking Only TCA Into Consideration

*German financial institution
running WebSphere*

Acquisition cost over 4 Years



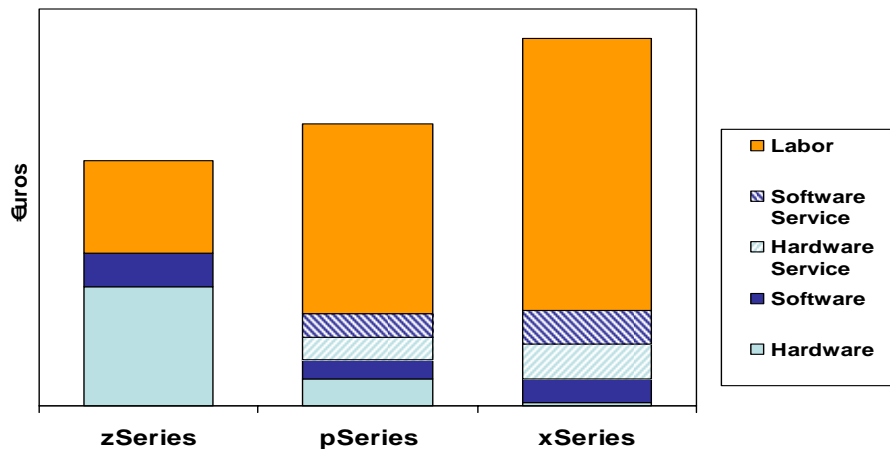
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Plus the People & Service Costs

*Distributed servers have higher
service, monitoring and support
costs – and cost more to deploy!*

Total cost over 4 Years

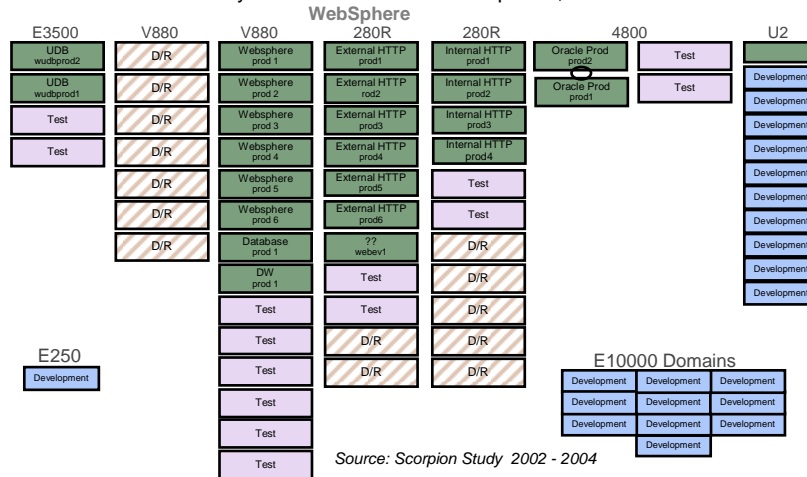


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Example: A Customer Thought SUN Was 1/5th the Cost of the Mainframe, but Perception... Isn't Always Reality!

- US Finance customer thought they only had 24 UNIX servers
 - But these were just the PRODUCTION servers
 - In addition they had 49 servers for Development, Test and Disaster Recovery

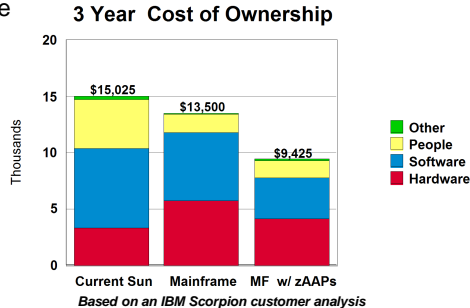


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People Costs are Often *Hidden* in Distributed Implementations

- They needed 14 people to support these 73 servers
 - At only 20% utilization
 - Each server cost \$20K per annum to support
- A comparable z- implementation would have required just 20 processors
 - 5 people to support

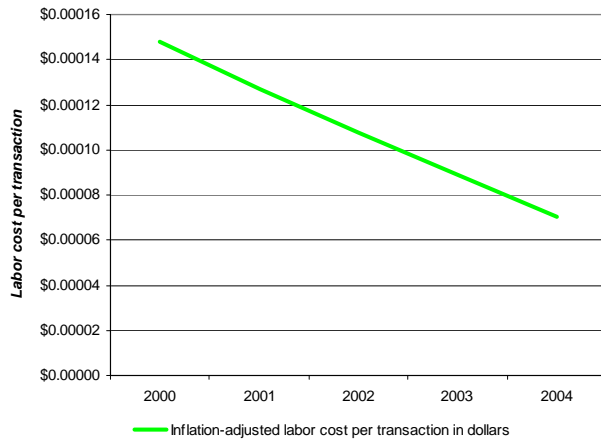


- The customer thought the Solaris environment was 1/5 the cost of the mainframe...
...but in fact the **z-TCO was 37% less**

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Labor Cost Per Transaction on System z is Decreasing



16.9% decrease per year

What makes the price go down?

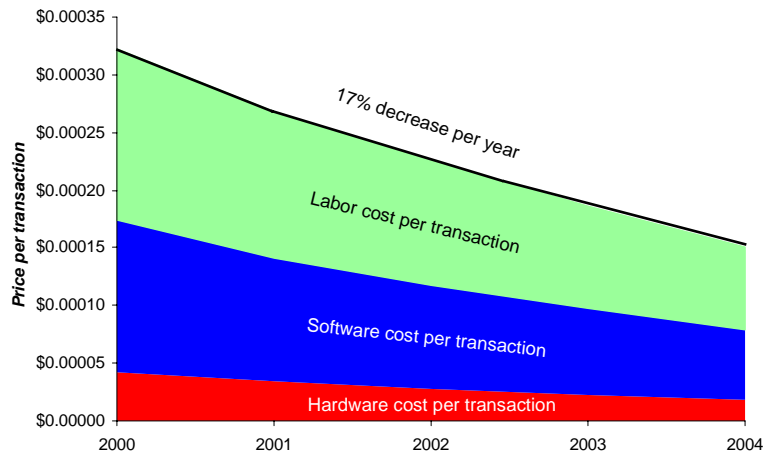
- Increasing workloads
- Data-center-in-a-box design reduces need for labor
- Scalability of the mainframe
 - Ease of incremental upgrade
- Inherent reliability of the mainframe
 - Fewer repairs and patches
- Intelligent Workload Management
 - Including CICSplexSM
- Minimal security risks & breaches
- IBM integration, testing & support

Source: IBM Global Services UK

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Conclusion: Total Mainframe Hardware, Software & Labor Costs Have Been Cut in Half in 4 Years

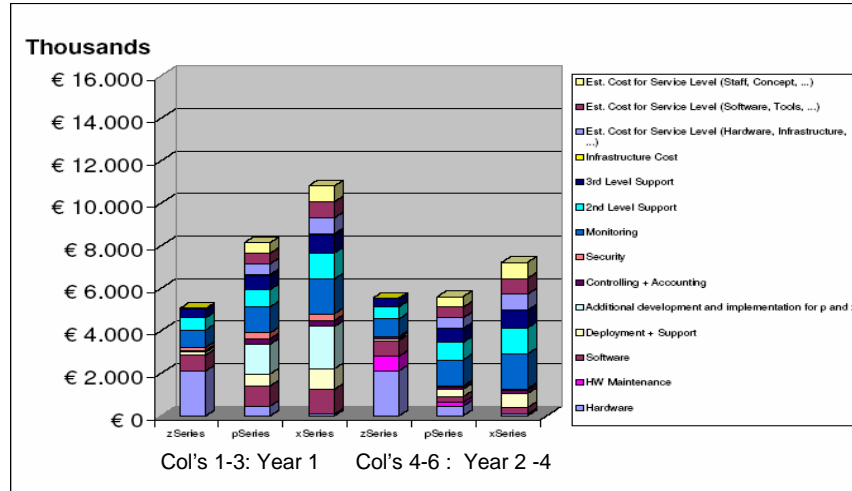


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GAD TCO Study – a WebSphere Banking Example

Distributed servers have higher service, monitoring and support costs and cost more to develop and implement



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Tale of Two Customers

	Baldor	Welch's
Supplier	IBM	Dell
Moved From....	3 Mainframes and 8 Unix Servers	S/390 and AS/400
Moved to...	1 z990 System z Server	100 Intel Servers
Virtualization	z/VM	VMWare
Decision to Completion Time	Approximately 6 months	Started sometime before June 2005 "...project will continue into 2007"
IT Staff	Down to 38	50
IT Spending	1.2% of Sales (and still declining....now down to 0.9%)	About 2.5% of Sales
Max Power consumption	15.8 kW	48.4 kW

Three years ago, Baldor's IT director had investigated migrating to a Windows server environment with cluster fail-over. *"We thought we were going to save a ton of money,"* but the systems crashed all the time, he noted, and the idea was quickly abandoned.

"We have a very stringent requirement of being up all the time ... Weighing heavily in support of the mainframe was its track record. There hadn't been any mainframe downtime since 1997"

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Summary

- The proper comparison between mainframe and distributed is not a single application benchmark
- The proper comparison is a distributed data center versus a mainframe, running high volume mixed workloads
- Under this comparison, mainframes have significant cost advantages

How Customers Can Get the Lowest TCO on the Mainframe

1. Move past the “sweet-spot” to realize lower prices
 - ▶ Grow core-business MIPS
2. Use the latest technology and pricing models
 - ▶ Upgrade to System z
 - ▶ Utilize specialty processors
 - ▶ Utilize sysplex aggregation
 - ▶ Exploit sub-capacity pricing
 - ▶ Execute an ELA
3. Maximize utilization
 - ▶ Drive mainframes at 90+% utilization, 24 hours by 7 days
 - ▶ Consolidate workload onto System z
4. Minimize other costs
 - ▶ Minimize software tool costs
 - ▶ Minimize outages and security breaches...
5. Stop spiraling labor costs



**Thank
YOU**

**On Demand Insurance
CEO** **On Demand Insurance
CIO** **IBM**

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