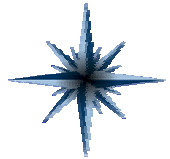# 2007 System z Summit

DESTINATION z

The Mainframe
A Revolutionary Low-Cost Platform

Mainframe Total Cost of Ownership Issues

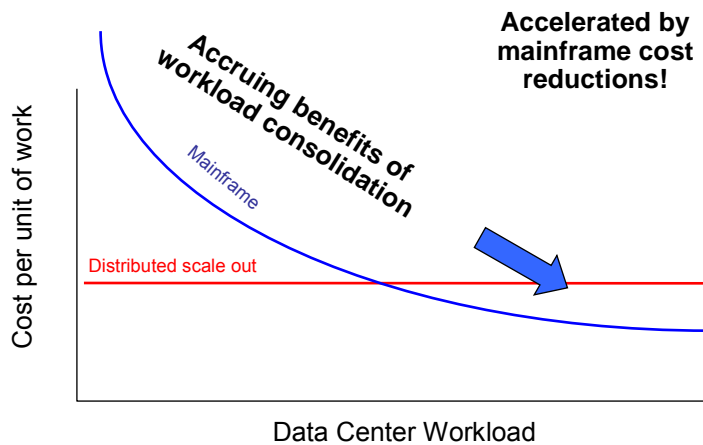Dr. John Shedletsky
VP IBM Software Competitive Technology Lab

I Had a Dream Last Night…

- I dreamed that IBM introduced a new computing platform for the 21st century that would help me beat my competitors

    - Cuts the cost of computing in half
    - Green machine that uses less electricity
    - Requires half the operational labor to keep it running
    - Can run global business transactions while never going down
    - And it would be used at the core of the world's largest business

- The name of this revolutionary platform was….   System z

Mainframe Cost Per Unit of Work Goes Down as Workload Increases

Accelerated by mainframe cost reductions!

Accruing benefits of workload consolidation

Mainframe

Distributed scale out

Cost per unit of work

Data Center Workload

Mainframe Hardware and Software Cost Reduction Features

- Hardware
  - System z9 BC models
  - Specialty processors IFL, zIIP, and zAAP discounted 91%
  - Disaster recovery processors discounted 98%
  - Virtualization enables workload consolidation
  - Capacity on demand processors (free until you use)
  - Up to 336 I/O offload processors at feature prices
  - Growing customers may upgrade installed MIPS without cost
- Software
  - MLC per incremental MIP goes down as system gets larger
  - No charge for software on zIIP and zAAP
  - One time charges are per processor for IFL (at Intel rate)
  - DB2 storage compression and cluster efficiencies
  - Sub-capacity pricing, Sysplex aggregation, technology dividend, zNALC, LPAR pooling, VSE pricing

Customers Exploit These Facts to Achieve The Lowest Cost Solutions

- Three areas where the mainframe is the lowest cost option

  - ▶ **Mainframe extensions**
    - − Extend existing mainframes with new business capabilities
    - − Large mainframe customers
    - − One half the cost of distributed scale out
  - ▶ **Consolidation**
    - − Consolidate Linux workloads onto the mainframe
    - − Medium to large customers
    - − Significant operational cost savings pay back initial investment
  - ▶ **New footprints with z9 BC**
    - − Entry point for new mainframe customers
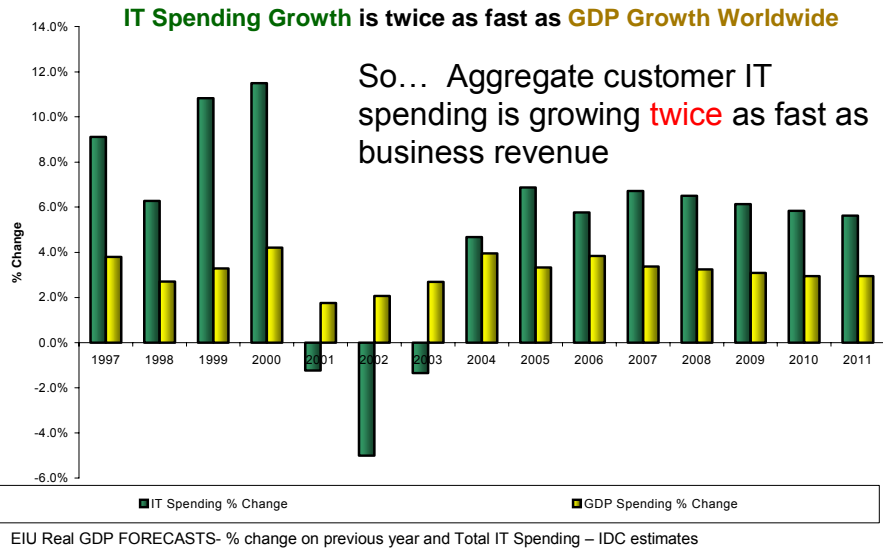   - − Lowest cost in some scenarios

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Top Fortune 500 Banks Rely on Extending System z to Run Core Business

- Top 56 banks in the Fortune 500 list are IBM System z customers

- Impressive numbers from these 56 banks in 2006
  - ▶ Average revenue growth 16% (compound annual rate)
  - ▶ Average mainframe capacity 35,000 MIPS and growing
  - ▶ Each MIP generates an average of **$1.2M revenue** and **$140,000 profit**
  - ▶ These banks drive down IT cost to meet business requirements by extending their core business applications

Growing Pains

IT Spending Growth is twice as fast as **GDP Growth Worldwide**

So… Aggregate customer IT spending is growing twice as fast as business revenue

EIU Real GDP FORECASTS- % change on previous year and Total IT Spending – IDC estimates

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Why Are IT Costs Growing Faster Than Revenue?

- Increasingly complex business requires more IT
  - ▶ Higher level of integration required
  - ▶ Better customer service and broader access
  - ▶ Specialized products for differentiated customer segments
  - ▶ Increased regulation
  - ▶ Support for knowledge workers (desktops)

- Distributed scale out exacerbates IT growth rates
  - ▶ twice business revenue growth

- Extending existing mainframe systems can contain IT growth
  - ▶ equal business revenue
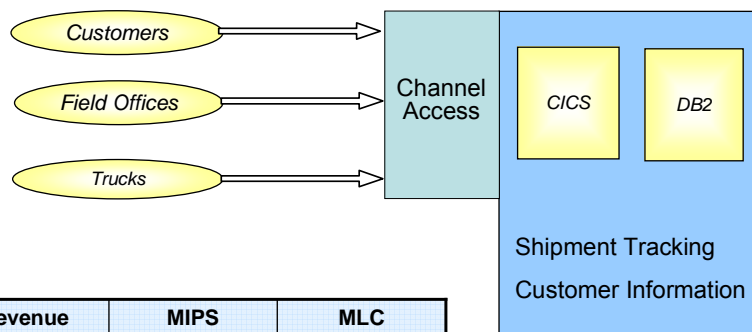
Common Mainframe Extension Solutions

- **Organic Growth – Easy Growth of Existing Workload**

- **Extend Access Channels for Internet and Call Centers**

- **Extend Data Capabilities**

- **Extend Business Insight from Corporate Warehouse**

- **Extend Security and Compliance with Tivoli Compliance Insight Manager**

Let's take a closer look at the mainframe cost advantages of some of these extension solutions …

Transportation Business Extends Core Processes to Customers and Employees

Customers → Field Offices → Trucks → Channel Access → CICS DB2

Shipment Tracking

Customer Information

|	Revenue Growth	MIPS Growth	MLC Cost Growth
2004	9.2%	45%	12%
2005	16.4%	23%	15%
2006	11.6%	22%	9%
2007			10.8%

Mainframe MLC costs track business growth

Large Bank Extends Channels Using WebSphere on System z

- **Business need**
  - ▶ Deliver new customer function across all channels

- **Solution**

  - ▶ Create **Integration Hub** using WebSphere on System z
  - ▶ Aggregate 7,000 CICS and IMS transactions into 30 WAS applications
  - ▶ zAAP processors
  - ▶ Co-location of Hub on same platform
  - ▶ Improved efficiency constrained MIPS growth

Branch

ATM

Call Center

Internet

WebSphere HUB

Corebanking

CICS & IMS Applications

Database
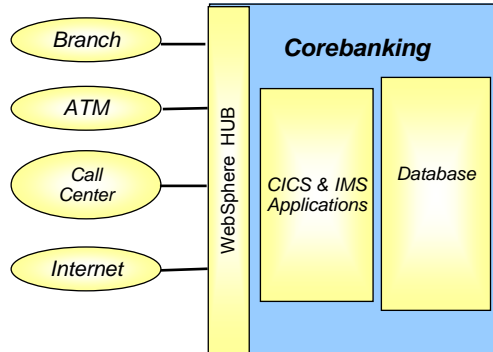
30,000 MIPS

15% mainframe MIPS growth tracks business growth

Case Study: Extend Mainframe With New WebSphere Application

Existing Mainframe

Existing Disaster Recovery Site

Add 3 LPARs for New Web Application w 820 GB storage

Prod	Dev	QA

900 MIPS additional workload

And Add Disaster Recovery w 820 GB storage

Prod	Dev	QA

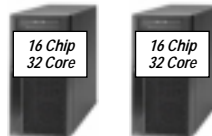**3 year cost of acquisition $3.08M**

Existing processors: 2 general purpose

Existing processors: Pay for one general purpose processor for hot disaster switch over and one "dark" DR processor at $30K

Add two processors:
one zAAP
    510 MIPS WAS (85%)
one General Purpose
    300 DB2 MIPS
    90 WAS MIPS (15%)

Pay for Capacity Backup
    two processors
    $30K each

Or Add Superdome 9000 Servers w 1.5 TB storage

Prod

Dev and QA

16 Chip 32 Core

16 Chip 32 Core

And Add Disaster Recovery w 1.5 TB storage

Prod

16 Chip 32 Core

3 year cost of acquisition $5.31M

WebSphere Application Server Incremental Cost Breakdown

Mainframe Incremental Hardware

OTC		ANNUAL	
1 GP Processor	$1,450,000		
zAAP	$125,000	Processor Maintenance * (For year 2, 3)	$88,500
2 DR Processors	$60,000		
IBM Storage (820GBx2)	$259,618	Storage Maintenance (For year 2, 3)	$12,856
TOTAL	$1,894,618	TOTAL $101,356 (year 2, 3)	

Mainframe Incremental Software

OTC		ANNUAL	
Utilities + WAS	$350,535	Utilities + WAS S&S	$56,608
		DB2 MLCx12	$77,280
		z/OS MLCx12	$38,568
		QMF MLCx12	$37,176
		Subtotal MLC x12	$153,024
TOTAL	$350,535	TOTAL	$209,632

Distributed Incremental Hardware

OTC		ANNUAL	
3 16x32 Itanium Superdome Servers	$1,451,817	Servers Maintenance (Prepaid in year 1 for 3 years)	$123,139
HP storage (1.5TBx2)	$401,220	Storage Maintenance	$22,226
TOTAL	$1,853,037	TOTAL $391,643 (year 1) $22,226 (year 2, 3)	

Distributed Incremental Software

OTC		ANNUAL	
Oracle EE & Utilities	$858,000	Oracle S&S	$188,760
WAS ND	$976,500	WS Maint (Year 2, 3)	$195,300
Unix	$98,397	Unix S&S	$44,242
		(prepaid in year 1 for 3 years)	
TOTAL	$1,932,897	TOTAL $321,486 (year 1) $384,060 (year 2, 3)	

Mainframe Processor Maintenance includes the maintenance for general purpose processors and specialty engines
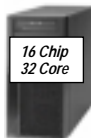
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zAAP Processor and DB2 Lowers the Cost of Acquisition

Mainframe Cost Analysis

Legend: Subscription, Maintenance, MLC

- $2,245,153
  - Hardware OTC $1,894,618
  - Software OTC $350,535
  - Year 1 Capital Cost
- $209,632 — Year 1 Annual Operating Cost
- $310,988 — Year 2 Annual Operating Cost
- $310,988 — Year 3 Annual Operating Cost

Total cost = $3,076,761

Distributed Cost Analysis

- $3,785,934
  - Hardware OTC $1,853,037
  - Software OTC $1,932,897
  - Year 1 Capital Cost
- $713,129 — Year 1 Annual Operating Cost
- $406,286 — Year 2 Annual Operating Cost
- $406,286 — Year 3 Annual Operating Cost

Total cost = $5,311,635

1.7 times more expensive

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Case Study: Extend Mainframe With 2TB Data Base Server (With Disaster Recovery)

Existing Mainframe	*Existing Disaster Recovery Site*	*Add 1 LPAR for New SAP Data Server w 820 GB Storage*	*And Add Disaster Recovery w 820 GB Storage*

Prod

966 MIPS additional workload

Prod

3 year cost of acquisition $2.29 M

Existing processors:
9 general purpose
4000 MIPS of existing DB2 workload

Existing processors:
Pay for one general purpose processor for hot disaster switch over and eight "dark" DR processors at $30K

Add two processors:
1 zIIP
386 MIPS (40%)
1 General purpose
580 MIPS (60%)

Pay for Capacity Backup
2 processors
$30K each

Or add HP Integrity rx8640 Server w 1.5 TB storage
Prod

And Add Disaster Recovery w 1.5 TB storage
Prod

16 Chip 32 Core

16 Chip 32 Core

3 year cost of acquisition $4.51 M

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Data Server With Disaster Recovery Incremental Cost Breakdown

Mainframe Incremental Hardware

OTC		ANNUAL	
1 General Processor	$1,452,500	Processor Maintenance * (For year 2, 3)	$80,868
1 zIIP Processor	$125,000		
2 DR Processors	$60,000		
IBM Storage (820GB x2)	$259,604	Storage Maintenance (For year 2, 3)	$12,856
TOTAL	**$1,897,104**	**TOTAL $93,724 (year 2, 3)**	

Mainframe Incremental Software

OTC		ANNUAL	
		DB2 MLC x12	$33,840
		z/OS MLC x12	$34,944
TOTAL	**$0**	**TOTAL**	**$68,784**

Distributed Incremental Hardware

OTC		ANNUAL	
HP Processors	$1,207,878	Processor Maintenance (prepaid in year 1 for 3 years)	$82,093
HP storage (1.5TBx2)	$401,220	Storage Maintenance	$22,226
TOTAL	**$1,609,098**	**TOTAL $268,504(year 1) $ 22,226(year 2, 3)**	

Distributed Incremental Software

OTC		ANNUAL	
Oracle EE	$1,280,000	Oracle S&S	$281,600
Unix	$252,096	Unix S&S	$71,637
		(Prepaid in year 1 for 3 years)	
TOTAL	**$1,532,096**	**TOTAL $496,512 (year 1) $281,600 (year 2, 3)**	

* Mainframe Processor Maintenance includes the maintenance for general purpose processors and specialty engines

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Data Server With Disaster Recovery – Mainframe Costs Are Lower Regardless of Data Server Size
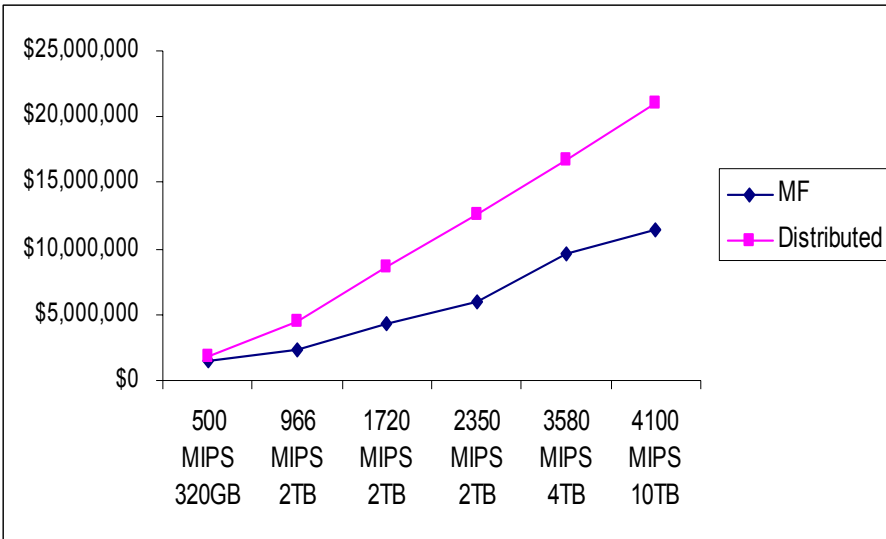
Chart showing costs ($) vs MIPS/storage configurations:

Y-axis: $0, $5,000,000, $10,000,000, $15,000,000, $20,000,000, $25,000,000

X-axis categories:
- 500 MIPS 320GB
- 966 MIPS 2TB
- 1720 MIPS 2TB
- 2350 MIPS 2TB
- 3580 MIPS 4TB
- 4100 MIPS 10TB

Legend:
- MF
- Distributed

Case Study: Extend Mainframe With a New 10TB Data Warehouse (No Disaster Recovery)

Existing Mainframe

Existing processors:
2 general purpose
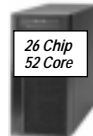
Add 1 LPAR for New Data Warehouse w 4.2 TB Storage

Prod

1,954 MIPS additional workload

3 year cost of acquisition $3.32M

Add four processors:
3 zIIP's
   1464 MIPS (75%)
1 General purpose
   489 MIPS (25%)

Or add Superdome 9000 Server w 7.5 TB storage

Prod

26 Chip
52 Core

3 year cost of acquisition $5.18M

Case Study: Extend Mainframe With a New 10TB Data Warehouse (With Disaster Recovery)

Existing Mainframe

Existing Disaster Recovery Site

Add 1 LPAR for New Data Warehouse w 4.2 TB Storage

Prod

1,954 MIPS additional workload

And add Disaster Recovery w 4.2 TB Storage

Prod

3 year cost of acquisition $3.7M

Existing processors: 2 general purpose

Existing processors: Pay for one general purpose processor for hot disaster switch over and one "dark" DR processor at $30K

Add four processors:
3 zIIP's
  1464 MIPS (75%)
1 General purpose
  489 MIPS (25%)

Pay for Capacity Backup
4 processors
$30K each

Or add Superdome 9000 Server w 7.5 TB storage

Prod

26 Chip 52 Core

And add Disaster Recovery W 7.5 TB storage

Prod

26 Chip 52 Core

3 year cost of acquisition $10.36M

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Storage Costs:
DB2 Storage Compression is a Cost Advantage

- 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 10TB data base

	Oracle	DB2 for z/OS*
Storage System	HP Enterprise Virtual Array 8100 Storage	IBM System Storage DS6800
Overall database compression ratio (using TPC-H benchmark results)	29%	59%
For 10 TB uncompressed data storage needed	7.5 TB of HP Storage	4.2 TB of IBM Storage
Cost of storage (3 year TCA)	$319,270 + $15,113 x 3 = **$364,609**	$234,101 + $13,164 x 2** = **$260,429**
With compression, storage for DB2 costs 29% less than for Oracle		

*DB2 for z/OS achieves similar compression ratios to those of DB2 for LUW
**IBM storage maintenance fee for the first year is included in the warranty

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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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Two Kinds of Workload Consolidation

Extension Workloads
Incremental growth on System z

New Application	New Application	New Application
2009	2008	2007

Programmers

**Roll-up**
Migrate to achieve lower costs
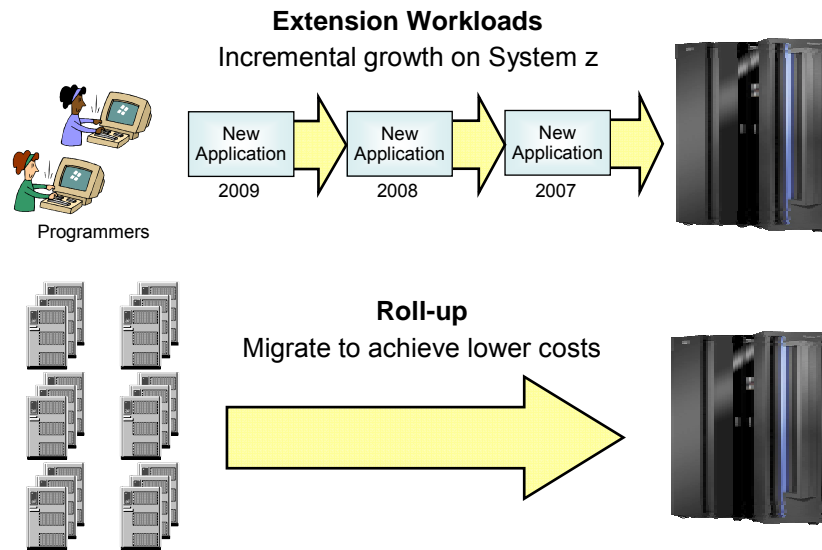
Cost Savings From Consolidation

- Extension Workloads
  - ▶ No migration cost
  - ▶ Each new application is an incremental workload
  - ▶ Each new incremental workload costs less than distributed deployment
  - ▶ Save money now, each time

- Rollup Consolidation
  - ▶ Initial migration cost to consolidate
  - ▶ Lower ongoing operating cost
  - ▶ Enjoy lower operating costs after pay back period
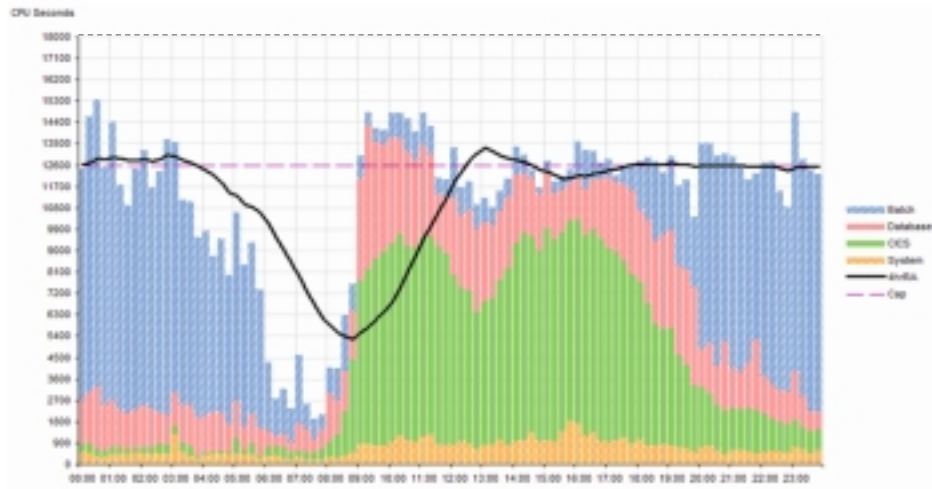 - ▶ Pay now, Save money going forward

Server Utilization at a Large Financial Institution

Average Server Utilization by Class
Feb-06

Windows 5-10%
Unix 10-20%
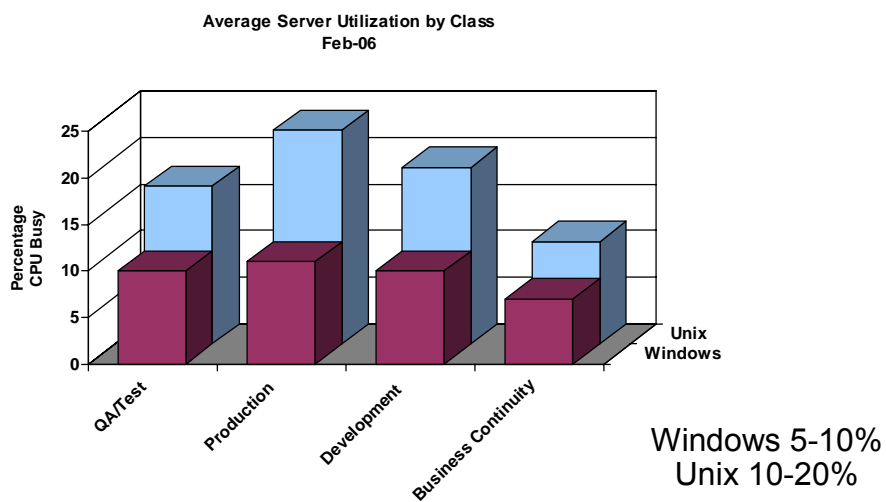
System z Runs Many Workloads Simultaneously to Achieve High Levels of Utilization

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"

Workloads That Can be Consolidated on a Mainframe

What	Where	Specialty Processor	How
Linux Applications	Linux on z/VM	IFL	Recompile
Linux Middleware - IBM Brands (DB2, WebSphere, Lotus, Rational, Tivoli) - Oracle Database - etc.	Linux on z/VM	IFL	Rehost
Linux Packaged Applications - SAP - Oracle - etc.	Linux on z/VM	IFL	Rehost
.NET Applications	WebSphere Linux on z/VM	IFL	Mainsoft

More Workloads That Can be Consolidated on a Mainframe

What	Where	Specialty Processor	How
Growth of Existing Mainframe Workload	z/OS	--	Capacity on demand
New CICS or IMS Applications	z/OS	--	Develop
Data Warehouse	z/OS	zIIP	Deploy
SAP Database Server	z/OS	zIIP	Deploy
WebSphere Application Server	z/OS	zAAP	Deploy
WebSphere Portal Server	z/OS	zAAP	Deploy
WebSphere Process Server	z/OS	zAAP	Deploy
Domino	z/OS	--	Deploy

Nationwide® On Your Side™ Saves $16+ Million with Linux on System z

- **Problems:**
  - ► High TCO including data center power and floor space scarcity
    - − New facility would cost $10M+
  - ► Long server provisioning process

- **Solution:**
  - ► **350** servers consolidated to **15** z990 IFLs, supported by 3 staff
    - − 12 mission critical applications with 100,000+ users/day
  - ► 50% reduction in hardware costs and OS support efforts
    - − Significant savings on middleware costs
  - ► Dramatically faster provisioning speed (months → days)
  - ► 80% reduction in floor space and power conservation
  - ► Fast implementation (4 months)
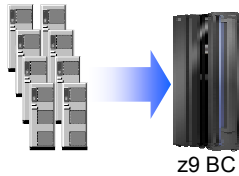 - ► Simple, robust mainframe high availability and disaster recovery

Improved TCO, Speed & Simplification

Case Study: Nexxar - Financial Services

80 Intel x86 Servers

1 IFL

z9 BC

z/VM supports Nexxar's strategy of acquiring firms by providing secure workload isolation for each "private label" relationship

- Operating costs reduced by 30% per year
- Capacity-on-demand can handle activity spikes
- System z9 cryptography provided assurance required by Nexxar's customers
- Started with one IFL, will add more as needed
- Staff support reduced by 75% due to z9 BC

New mainframe footprint customer

Case Study: Québec Government Runs Oracle at IFL Prices

- Consolidated 165 Oracle databases on to 125 Linux virtual machines on a z9-EC with 3 IFL's
  - ▶ Reduced cost of hardware and software by 30%
    - − Saved $800,000 in licensing cost in the first year
  - ▶ Used RACF for consistent security
  - ▶ Each administrator can manage 100 Linux images
  - ▶ Easy migration
    - − One migration per day
    - − Create new Linux server in 30 min (vs. 1 week – 3 months)
    - − Clone Oracle DB instance in 30-45 min (vs. 10 – 14 hours)
  - ▶ Inherited benefits of z platform – workload management, availability, disaster recovery, I/O bandwidth
  - ▶ Expect to migrate at least 100 Oracle databases per year

IBM Internal Project to Consolidate Linux Servers Onto Mainframes With IFL's

- IBM expects substantial savings by consolidating 3,917 Linux servers to 28 mainframes

- $82M operational savings per year
  - ▶ 86% savings in system admin cost
  - ▶ 85% savings in floor space
  - ▶ 81% savings in power
  - ▶ 57% savings in network
  - ▶ 41% savings in software support
  - ▶ 19% savings in disk storage maintenance

IBM Internal Consolidation Project – Annual Cost Per Distributed Server

Annual Operations Cost Per Server (Averaged over 3917 Distributed Servers)		Annual Cost Per Server Image After Consolidation	
Power	$731	$141	5.2x
Floor Space	$987	$147	6.7x
Annual Server Maintenance	$777	$4,512	
Annual connectivity Maintenance	$213	$64	3.3x
Annual Disk Maintenance	$203	$165	1.2x
Annual Software support	$10,153	$6,015	1.7x
Annual Enterprise Network	$1,024	$460	2.2x
Annual Sysadmin	$20,359	$2,763	7.4x
Total Annual Costs	$34,447	$14,267	2.4x

The largest cost component was labor for system administration - 7.8 servers per headcount @ $159,800/yr/headcount

How much more it costs to run unconsolidated

System z9 BC and EC Comparison

IBM System z9 Business Class (2096)

- 2 models – Up to 7-way
  - 480 MIPS processor
  - 1,786 MIPS + 3 IFL's

- Memory – up to 64 GB

- I/O
  - Two Logical Channel Subsystems
  - Up to 420 ESCON channels
  - Up to 112 FICON channels
  - Enhanced FICON Express2 and 4
  - HiperSockets – up to 16

- Up to 30 logical partitions

IBM System z9 Enterprise Class (2094)

- 5 models – Up to 54-way
  - 580 MIPS processor
  - 17,801 MIPS

- Memory – up to 512 GB

- I/O
  - Four Logical Channel Subsystems
  - Up to 1024 ESCON channels
  - Up to 336 FICON channels
  - Enhanced FICON Express2 and 4
  - HiperSockets – up to 16

- Up to 60 logical partitions

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Case Study: New Database Application on zLinux on New BC Footprint (600 GB)

Z9 BC machine 1 LPAR for New Database application w 270 GB Storage

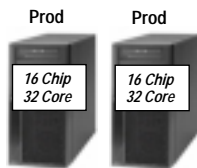**1200 MIPS workload**

3 IFL: 1200 MIPS (100%)

Disaster Recovery Site w 270 GB Storage

1 IFL for hot disaster switch over 2 "dark" DR processors at $15K

3 year cost of acquisition $1.65 M

Or 2 HP Superdome 9000 Servers w 450 GB storage

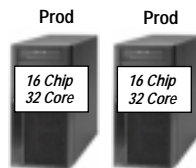| Prod	Prod
16 Chip 32 Core	16 Chip 32 Core

And Add Disaster Recovery w 450 GB storage

Prod	Prod
16 Chip 32 Core	16 Chip 32 Core

3 year cost of acquisition $12.76 M

TCO zSummit Stamford Pitch.ppt

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New Database Application on zLinux BC Cost Breakdown

Mainframe Hardware

OTC		ANNUAL	
3 IFL Processors	$285,000	Processor Maintenance * (For year 2, 3)	$50,328
2 frames	$310,000		
DR processors	$125,000		
IBM Storage (270GB x2)	$232,236	Storage Maintenance (For year 2, 3)	$12,856
TOTAL	$952,236	TOTAL $63,184 (year 2, 3)	

Mainframe Software

OTC		ANNUAL	
		DB2 S&S (Year 2,3)	$22,500
DB2	$112,500	DB2 Tool Kit S&S	
DB2 Tool Kit	$114,000	(Year 2, 3)	$22,800
zVM	$67,500	zVM S&S	$16,875
		Linux	$45,000
		$61,875 (year 1)	
TOTAL	$294,000	TOTAL $107,175 (year 2, 3)	

Distributed Hardware

OTC		ANNUAL	
HP Processors	$4,688,512	Processor Maintenance $608,264 (prepaid in year 1 for 3 years)	
HP storage (450GB x2)	$371,520	Storage Maintenance	$15,246
		TOTAL $1,840,038 (year 1)	
TOTAL	$5,060,032	$15,246 (year 2,3)	

Distributed Software

OTC		ANNUAL	
Oracle EE & Utilities	$3,328,000	Oracle & Utilities S&S	$732,160
Unix	$200,832	Unix S&S (prepaid in year 1 for 3 years)	$35,072
		TOTAL $837,376 (year 1)	
TOTAL	$3,528,832	$732,160 (year 2, 3)	

Mainframe Processor Maintenance includes the maintenance for general purpose processors and specialty engines

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Case Study: New WebSphere Application on zLinux on New BC Footprint

Z9 BC machine 1 LPAR for New Websphere application w 270 GB Storage

480 MIPS workload
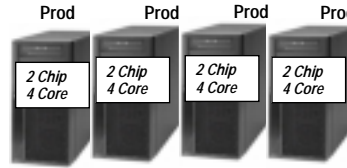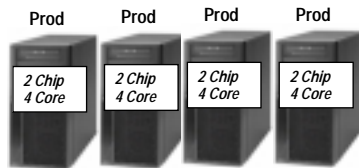
Need 1 processors:
1 IFL: 480 MIPS (100%)
320 MIPS WAS, 160 MIPS DB2
Or 4 HP Integrity rx2620 w 450 GB storage

Prod | Prod | Prod | Prod
2 Chip 4 Core | 2 Chip 4 Core | 2 Chip 4 Core | 2 Chip 4 Core

Disaster Recovery Site w 270 GB Storage

Pay for one IFL

3 year cost of acquisition $1.00 M

And Add Disaster Recovery w 450 GB storage

Prod | Prod | Prod | Prod
2 Chip 4 Core | 2 Chip 4 Core | 2 Chip 4 Core | 2 Chip 4 Core

3 year cost of acquisition $1.54 M

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New WebSphere Application on zLinux on New BC Footprint - Cost Breakdown

Mainframe Hardware

OTC		ANNUAL	
1 IFL Processors	$95,000	Processor Maintenance * (For year 2, 3)	$16,776
2 frames	$310,000		
DR processors	$95,000		
		Storage Maintenance (For year 2, 3)	$12,856
IBM Storage (270 x2 GB)	$232,236		
TOTAL	**$732,236**	**TOTAL**	**$29,632 (year 2, 3)**

Mainframe Software

OTC		ANNUAL	
		DB2 S&S	$7,500
		DB2 Tool Kit S&S	$7,600
DB2	$37,500		
DB2 Tool Kit	$38,000	WAS S&S (Year 2,3)	$3,100
		zVM S&S	$5,625
zVM	$22,500		
WAS	$15,500	Linux	$15,000
			$20,625 (year 1)
TOTAL	**$113,500**	**TOTAL**	**$38,825 (year 2, 3)**

Distributed Hardware

OTC		ANNUAL	
HP Processors	$130,360	Processor Maintenance (prepaid in year 1 for 3 years)	$5,263
HP storage (450 x2 GB)	$371,520	Storage Maintenance	$15,246
		TOTAL	**$32,534 (year 1)**
TOTAL	**$501,880**		**$15,246 (year 2,3)**

Distributed Software

OTC		ANNUAL	
Oracle EE & Utilities	$277,333	Oracle S&S	$61,013
WAS ND	$330,667	WAS Maint	$66,133 (year 2,3)
Unix	$14,560	Unix S&S	$11,456
		(prepaid in year 1 for 3 years)	
		TOTAL	**$95,381 (year 1)**
TOTAL	**$622,560**		**$127,147 (year 2, 3)**

Summary of z9 BC Cost Studies

Three year cost of acquisition for a new footprint z9BC compared to the cost of an equivalent HP distributed deployment. Disaster recovery included.

Workload	Operating System	Size of New Workload (MIPS)	Total Cost for z9BC ($M)	Total Cost for Distributed ($M)
WebSphere	z/Linux	480	1.00	1.71 (8 HP 4 cores)
WebSphere	z/Linux	480	1.00	3.28 (2 HP 16 cores)
DB2	z/Linux	1200	1.65	14.89 (4HP 32 cores)
DB2	z/OS	200	2.22	2.05 (2 HP 4 cores)
DB2	z/OS	344	2.54	3.46 (2 HP 12 cores)
DB2	z/OS	344	2.54	4.33 (4 HP 4 cores)
WebSphere	z/OS	480	3.97	3.28 (2 HP 16 cores)
WebSphere	z/OS	1500	5.47	16.19 (6 HP 32 cores)
DB2	z/OS	2200	7.61	18.93 (6 HP 32 cores)
DB2 Data Warehouse	z/OS	1800	7.94	12.15 (2HP 56 cores)

Tough Customer

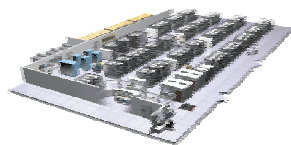The distributed servers run twice as fast as the mainframe processors, and they are cheap.

I don't believe your TCO comparison. I want to offload.

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What About Saving Money By Offloading?

CONSOLIDATION

OFFLOAD

Distributed
Costs More

System Z
Costs Less

Same story in reverse – Same answer
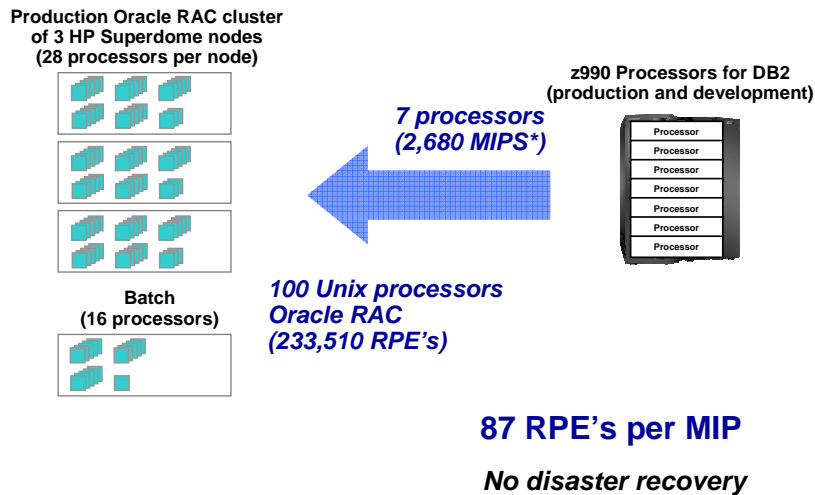Server *proliferation* instead of consolidation
More cost instead of less

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This Was a Real Project – Why Couldn't The Same Workload Be Done With 8½ Fast Processors?

3x HP 64-way Production Application and DB

2x z990 5-way (production)

*17 processors
(6,700 MIPS)*

z990 7-way (production + test)

1x HP 64-way Dev&Test / Batch

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

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

122 RPE's per MIP

No disaster recovery
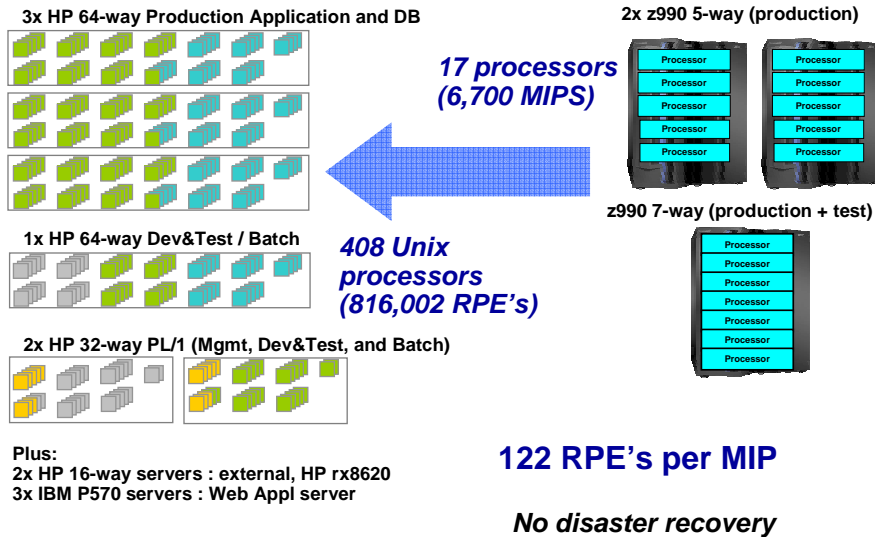
Asia Pacific Financial Services Customer Offload Project – Database Only

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

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

*7 processors
(2,680 MIPS*)*

**Batch
(16 processors)**

*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

An Inconvenient Truth!

Equivalent CO_2 Emissions in one year
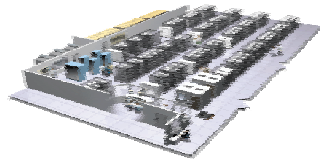
	=	368 Chevy Tahoes
10,000 sq ft at 125 watts/ft^2 @ $0.09 per kwH	=	9,424 refrigerators
$985K per year		
11,498 tons of CO_2 per year	=	10,549 round trips NY to LA
	=	78,753 light bulbs (75W) running 8 hrs/day

Fast and Hot Distributed Servers

Managing power dissipation is limiting clock speed increases

2004 Frequency Extrapolation

Clock Speed (MHz) vs. years 1990–2010
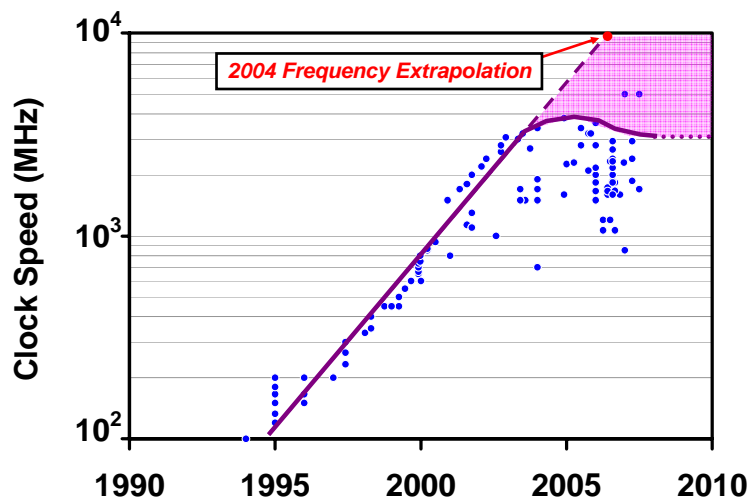
Mainframe Consumes Less Power Than HP Superdome

HP Superdome
64 chips/128 cores
$30,768 per year

HP 4 Times More Power Consumption
6 Times Scalability

System z

IBM z9 S18

IBM z9 S28

IBM z9 S38

IBM z9 S54

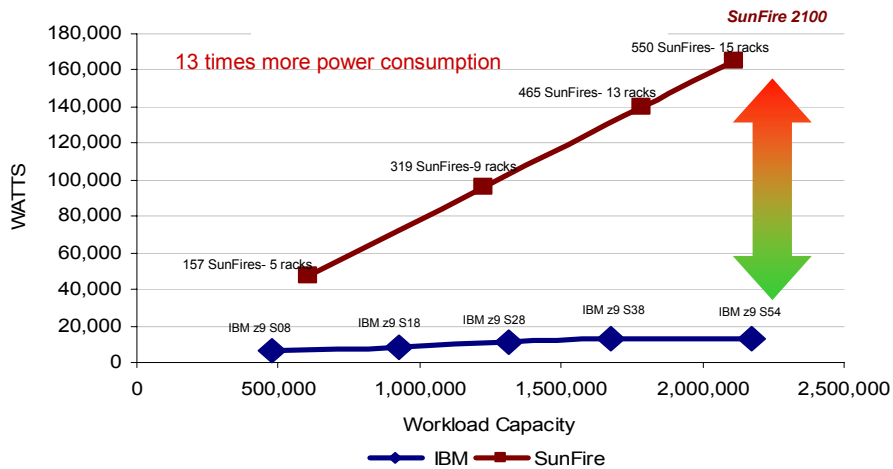IBM z9 S08
$7,947 per year

WATTS

Workload Capacity
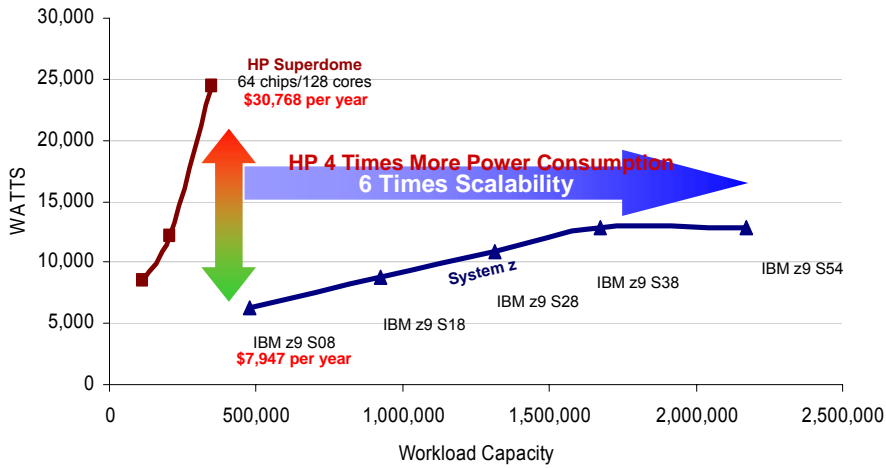
Source for HP Servers: Ideas International, Nov 06

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Mainframe Consumes Less Power Than SunFire Server Farms

SunFire 2100

13 times more power consumption

550 SunFires- 15 racks

465 SunFires- 13 racks

319 SunFires-9 racks

157 SunFires- 5 racks

IBM z9 S08

IBM z9 S18

IBM z9 S28

IBM z9 S38

IBM z9 S54

WATTS

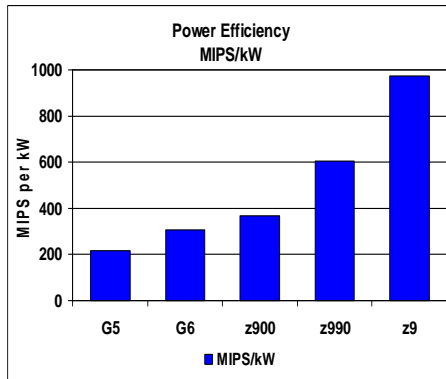Workload Capacity

IBM   SunFire

Source for SunFire 2100 Servers: Ideas International, Nov 06

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Mainframe Exhibits Increasing Power and Space Efficiencies with Each Generation

Power Efficiency
MIPS/kW

Power Efficiency
MIPS/Sq Ft

22% annual increase
in MIPS/kW
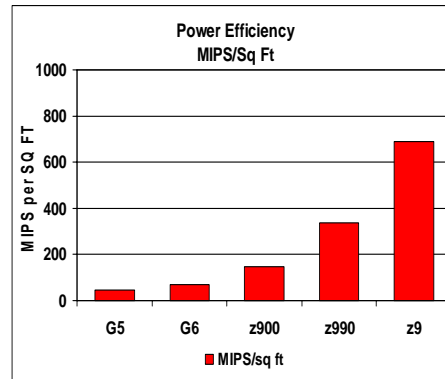
46% annual increase
in MIPS/square foot

Decreasing energy consumption per MIP   Decreasing square footage per MIP

Power and Space Costs

- The cost of electricity to power and cool the servers
  - ▶ Electricity usage differences are large, but the costs are typically small in magnitude compared to other project costs

- The cost to re-arrange servers on the floor to take advantage of existing cooling vents
  - ▶ One customer spent $250K to place Superdomes near the vents

- The cost to upgrade cooling capacity

- The ultimate cost – build a new data center facility at $400 per square foot or more

Mainframe Labor Costs Per MIP Declining

- A major bank went from 128 MIPS/person to 597 MIPS/person in 8 years with no extra people
- Gartner showed the MIPS/person doubling in 3 years at another site
- An outsourcer stated they doubled MIPS with only 20% increase in headcount

- IBM Survey five years ago, average MIPS per person
  - ▶ **50** for z/OS

- Typical MIPS per person today
  - ▶ **150 to 500** for z/OS   (1,300 to 2,000 for zLinux)

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	2.4

# UNIX Servers	# People	Ratio (s/p)
3917	502	7.8
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

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

Mainframe Administration Is More Productive

Thousands of Workload Units Managed Per Person
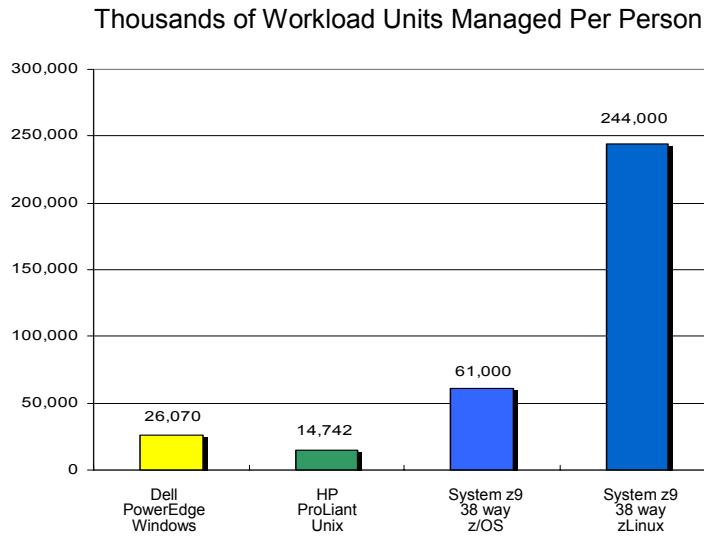
Labor For Server Set Up and Teardown

OTC hours per server type
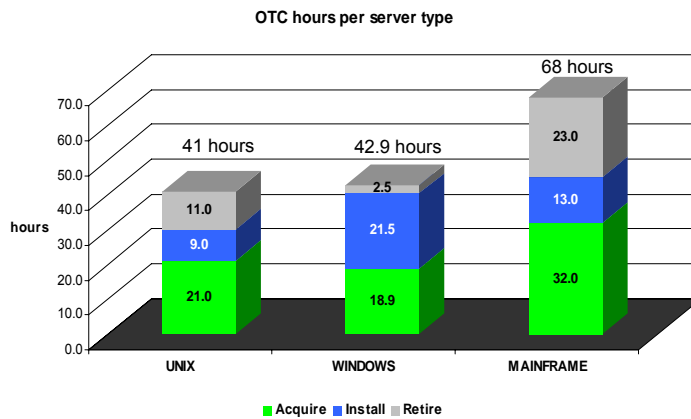
In a consolidation environment each mainframe requires 65% more labor to set up and teardown than a single distributed server, yet the mainframe can consolidate 100's of distributed servers.
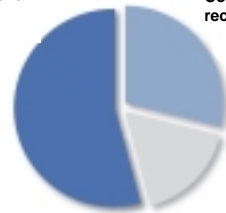
Cost of a Security Breach

- **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%

Total per Incident Cost $182/record

Direct Remediation Costs $54/record

Loss of Customer Costs $98/record

Indirect Productivity Costs $30/record

Ponemon Study: 2006 Survey Cost of a Data Breach

Case Studies Summary

- Mainframe extension of WebSphere workload on System z costs less than distributed deployment

- Mainframe extension of Data Server on System z costs less than Oracle on HP Superdome

- Mainframe extension of Data Warehouse workload on System z costs less than Oracle on HP Superdome

- Roll up consolidation of Linux servers onto System z saves big money

- New footprint of System z BC costs less than distributed alternative in many cases

- System z uses less power and requires less operational labor

Customer Objections

Your story makes sense, but my charge back for the mainframe is still much higher.
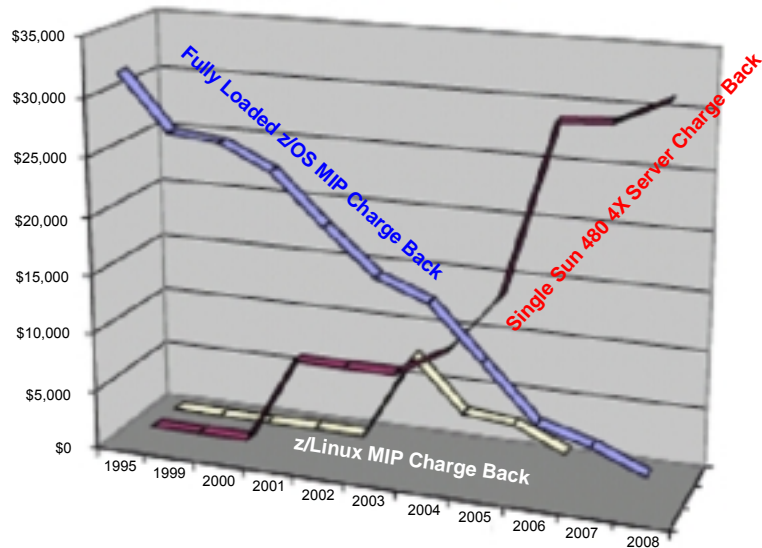
Charge Back Follies

- Bad charge back practices can create the false impression that the **mainframe costs too much**

  - Good practices allow business units to understand the economic impact of IT resource decisions

- Mainframe Charges are typically overstated
  - It's easy to assign unrecoverable cost to the mainframe
  - Unrelated allocation of corporate overhead
  - Disproportional allocation of data center overhead
  - System Programming teams that support specific business projects
  - Security support for all platforms and businesses…

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

Fully Loaded z/OS MIP Charge Back

Single Sun 480 4X Server Charge Back

z/Linux MIP Charge Back

$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0

1995 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008

More Accurate Charge Back Can Correct Perceptions of Relative Costs

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