zEnterprise Economics – A Look At Mainframe TCO

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Session Number 11725

Abstract

- The economics of mainframe computing are often poorly understood – multi-million dollar platform decisions are often made based on hearsay, anecdote, prejudice and inaccurate accounting systems. For any platform decision, the needs of a company's stakeholders are best served by a comprehensive understanding of the true costs – and the economic ramifications of the alternatives. This session explores the reality and dynamics of the true Total Cost of Ownership of enterprise servers and the mainframe. I'll use real-life customer examples to illustrate the underlying phenomena.

- We'll also discuss how IBM's zEnterprise system is optimized to enable hybrid computing, and conclude by examining the potential of such a system to save money through the optimization of hardware, software, labor and facilities costs.

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Note

- We have quantified various case studies using list prices and appropriate assumptions, but the intent of the cases is illustrative rather than definitive. Results and costs will vary.

- The examples should be used as starting points for further specific and more detailed evaluation. IBM's experienced Eagle team can help you make the most accurate analysis.

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Agenda

I. Mainframe TCO Characteristics

II. zEnterprise Economics

  • Cost Per Workload Examples

  • Why zBX is better than do-it-yourself

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I. MAINFRAME TCO CHARACTERISTICS

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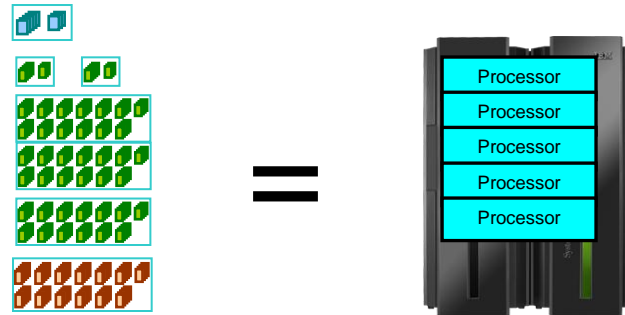zEnterprise Economics - August 2012

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Mainframe Economics

Mainframe Cost Per Unit of Work Goes Down as Workload Increases
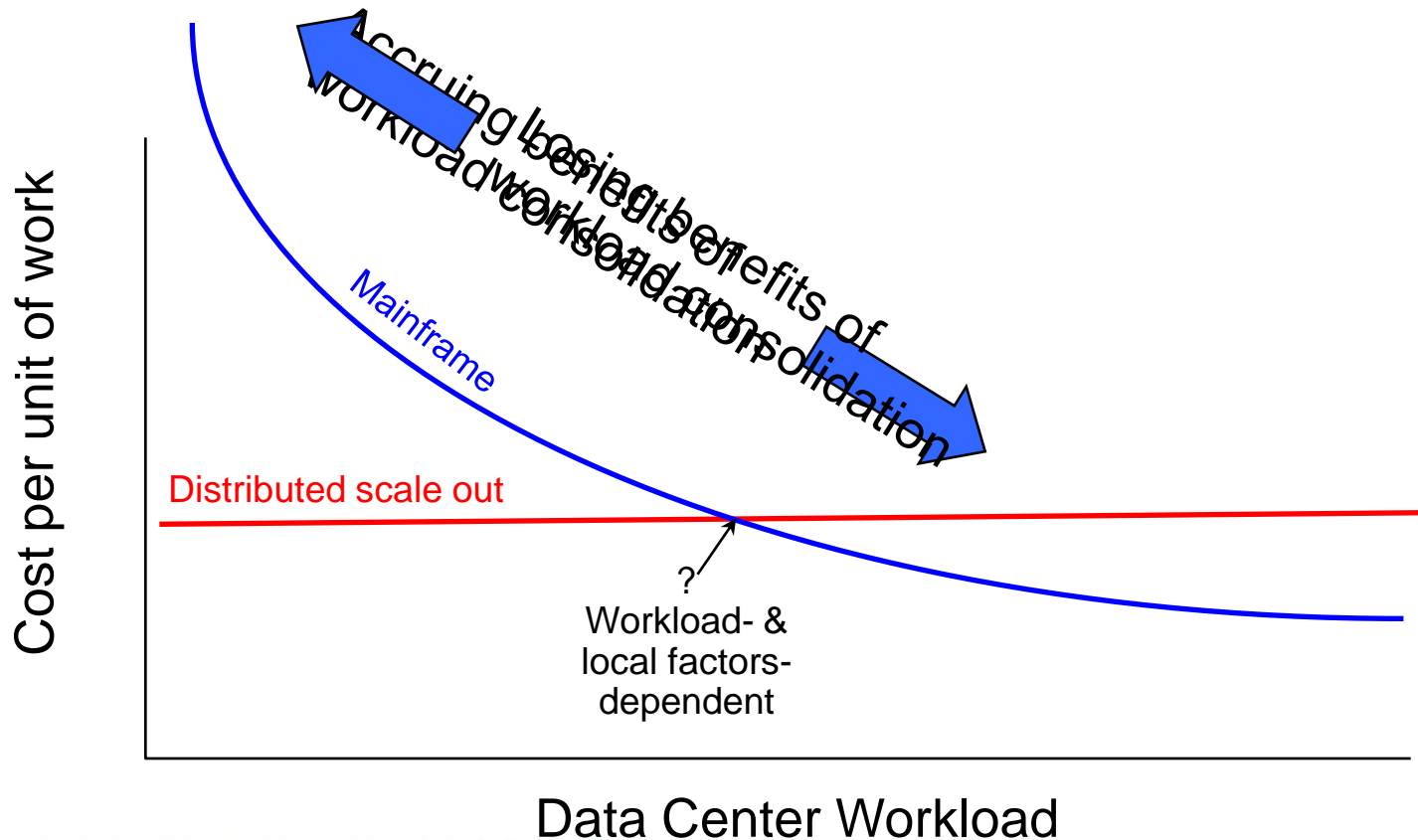
TCO Top Down Methodology

1. Establish Equivalent Configurations

## 2. Price out Total Cost of Acquisition

3. Add cost of labor and environmentals

1. Banking Benchmark Comparison

System z can process 55M+ txns/hour

Kookmin Bank
- ▶ **IBM System z and DB2**
- ▶ **TCS BaNCS**
- ▶ **15,353** Transactions/second
- ▶ **50** Million Accounts
- ▶ IBM benchmark for customer

System z and BaNCS Online Banking Benchmarks

Chart — transactions per second (tps) vs MIPS:
- 2,603
- 4,360
- 6,622
- 7,443
- 8,983
- 15,353
- **HP maximum benchmark 10,716**

• **State Bank of India***
- • **HP Itanium Superdome**
- • **TCS BaNCS**
- • **10,716** Transactions/second
- • **500** Million Accounts
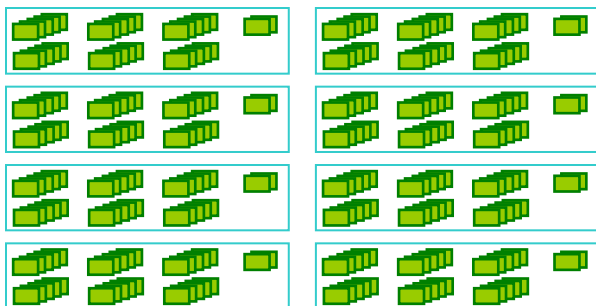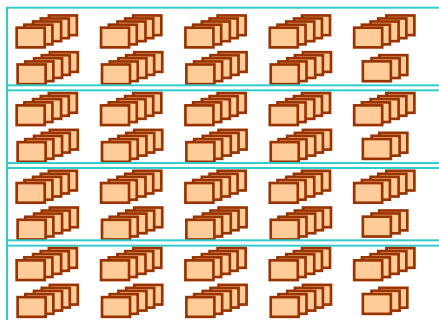- • Largest banking benchmark performance claimed by HP
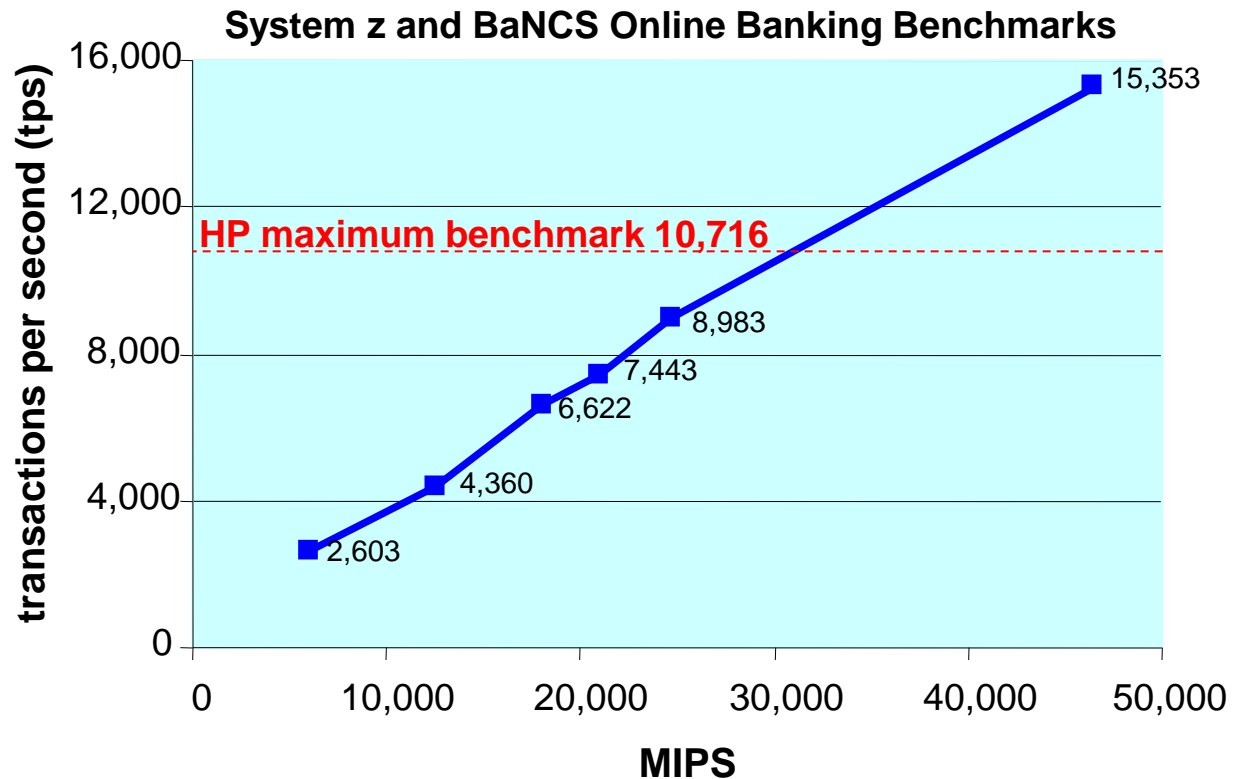
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Compare Processors Needed To Achieve 10,716 tps (with z196)

BaNCS Application Servers:
    8x HP Superdome (16ch/32co)

TCS BaNCS
        1x z196-741

41 processors

(31,040 MIPS)

448 processors

(1,834,300 Performance Units)

BaNCS Database Servers:
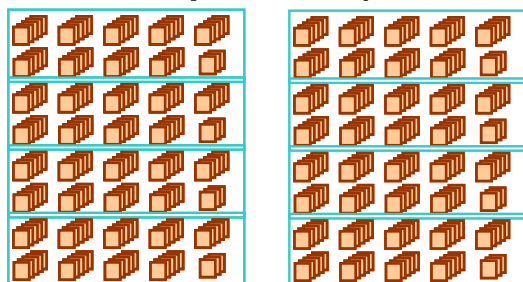   **4x HP Superdome (24ch/48co)**

57.6 PUs per MIPS

Note: Both platforms scaled to the same performance rating (10,716 tps)

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Compare Processors Needed To Achieve 10,716 tps (z196) with Dev/QA

BaNCS Application Servers:
  16x HP Superdome (16ch/32co)

TCS BaNCS
  1x z196-753

53 processors

(40,313 MIPS)

896 processors

(3,668,600 Performance Units)

BaNCS Database Servers:
  8x HP Superdome (24ch/48co)

91 PUs per MIPS

NOTE: Double Distributed Servers, add +30% MIPS to System z for Dev/QA

Note: Both platforms scaled to the same performance rating (10,716 tps)

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Compare The 5-Year Green Field Acquisition Costs Of The Platforms

HP Superdome Servers   **IBM z196**
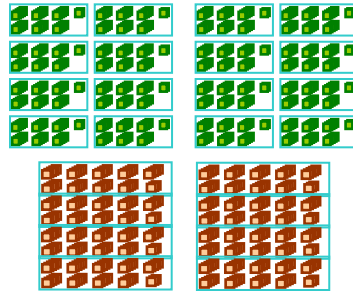
	HP Superdome Servers	IBM z196
Servers	24 (896 cores)	1 (53 cores)
OS, Database	HP-UX, Oracle	z/OS, DB2
Energy (kWh)	3,045K	283K
5 Year TCO	$180M	$124M **31% Less**

Scalability Not Demonstrated   *Excellent Scalability*

Notes: Cost of packaged application software not included; list prices used.

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Lesson Learned

- It takes *far more processor cores* to deploy on a distributed platform

    - Performance Units per MIP have ranged from 87 to 670

    - A typical number is 122

- Performance Unit Capacity for various distributed servers can be found in the Server Consolidation Analysis Report from Ideas International
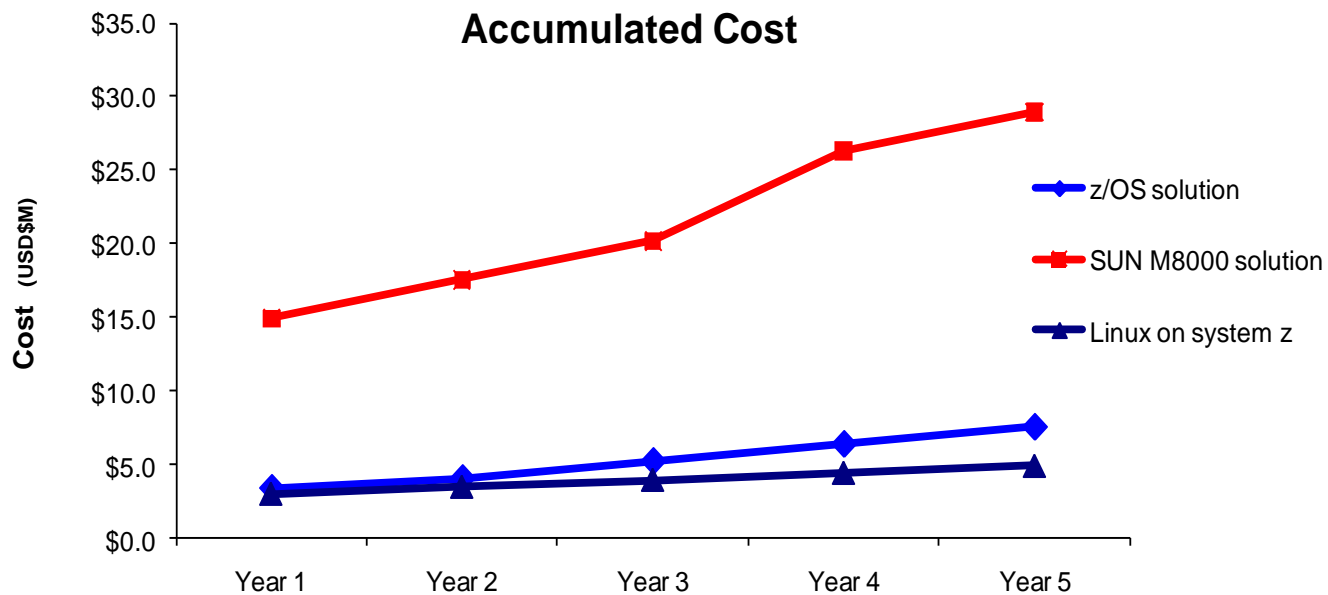
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Bank Study Shows WebSphere Process Server On Sun Costs 5.8X More Than System z

- Currently 3 distributed Sun servers running WebSphere workload
- Compare running same workload on IBM System z using zLinux or z/OS
- Scope
  1. Cost – HW, SW, Power, and Floor Space, but NOT labor
  2. Discipline – Production, QA, Development/Test, and DR
  3. Five Year TCO including HW acquisition in 1st and 4th year
  4. 3,033 MIPS of workload on z/OS
  5. 3,791 MIPS of workload on Linux for System z

Distributed TCO is $21,214,907 (3.8X) more expensive than z/OS over 5 years

Distributed TCO is $23,802,441 (5.8X) more expensive than Linux for System z over 5 years

Accumulated Cost

Legend:
- z/OS solution
- SUN M8000 solution
- Linux on system z

Y-axis: Cost (USD$M) from $0.0 to $35.0
X-axis: Year 1, Year 2, Year 3, Year 4, Year 5

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Case Studies Demonstrate Consistent TCO Advantage

Scenarios	Cost of Distributed vs. z			Distributed Cost Ratio	Cores vs. Paid z Processors			Core Ratio
Deploy New Applications on Mainframe								
– Database Server	$6.4M	vs	$5.0M	1.3x	60	vs	4	15 : 1
– WebSphere Application	$7.4M	vs	$3.0M	2.4x	132	vs	4	33 : 1
– Data Warehouse	$8.4M	vs	$4.7M	1.8x	120	vs	6	20 : 1
– Data Warehouse w Analytics	$13.4M	vs	$8.4M	1.6x	160	vs	8	20 : 1
– Communications Backbone	$5.5M	vs	$4.2M	1.3x	64	vs	4	16 : 1
– SOA Solution	$17.2M	vs	$3.5M	4.9x	132	vs	4	33 : 1
– SOA Solution vs Sun	$34.2M	vs	$3.5M	9.8x	252	vs	4	63 : 1
– Spatial Database Server	$6.9M	vs	$5.0M	1.4x	120	vs	6	20 : 1
– Major Retailer	$8.3M	vs	$7.0M	1.2x	22	vs	5	4.4 : 1
				2.9x				**25 : 1**

Rule of Three:

The cost of deploying a new application will usually be less on a mainframe if:

1. It is an incremental workload on an existing mainframe
2. It can make use of a specialty processor
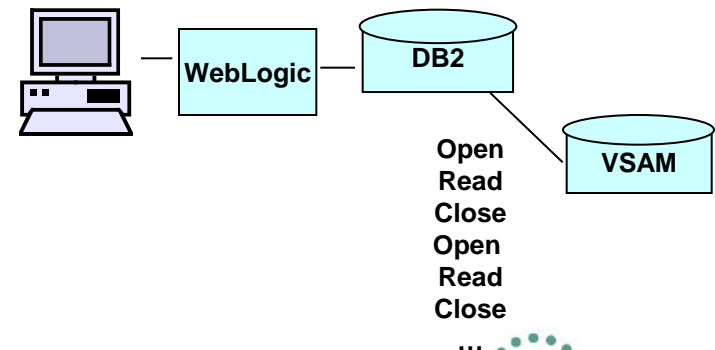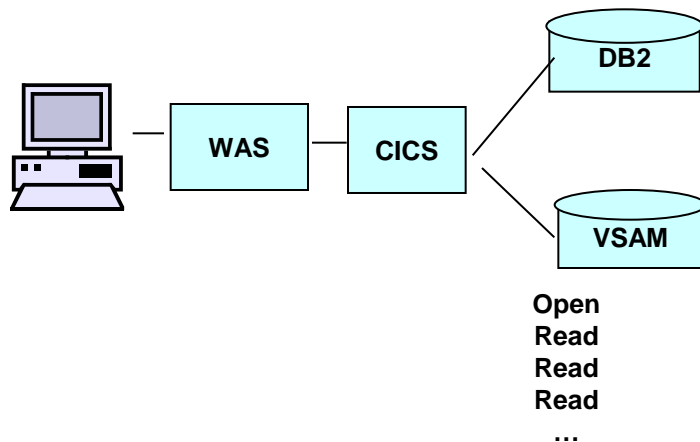3. Disaster recovery is required

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Summary of 60+ Customers

Average Cost Ratios (z vs Distributed)

		z	Distributed	z vs distributed (%)
Offload	**5-Year TCO**	**$14,617,537**	**$25,016,633**	**58.43%**
	Annual Operating Cost	$2,930,180	$3,342,404	87.67%
	Software	$9,349,434	$10,045,104	93.07%
	Hardware	$3,045,738	$4,007,849	75.99%
	System Support Labor	$3,207,949	$5,109,879	62.78%
	Electricity	$36,144	$191,862	18.84%
	Space	$56,027	$148,727	37.67%
	Migration	$586,808	$8,716,612	6.73%
	DR	$715,357	$2,707,487	26.42%
	Average MIPS	3,128		
	Total MIPS	140,759		
New Workload	**5-Year TCO**	**$2,295,560**	**$6,821,249**	**33.65%**
	Annual Operating Cost	266,530	693,442	38.44%
	Software	1,073,625	2,785,542	38.54%
	Hardware	669,311	1,313,598	50.95%
	System Support Labor	1,418,025	1,247,685	113.65%
	Electricity	13,920	$85,569	16.27%
	Space	7,993	291,656	2.74%
	Migration	0	0	
	DR	68,005	2,269,640	3.00%
	Average MIPS	5,012		
	Total MIPS	15,035		
Consolidation	**5-Year TCO**	**$8,713,071**	**$14,347,493**	**60.73%**
	Annual Operating Cost	$1,087,137	$2,328,635	46.69%
	Software	$3,641,376	$9,734,725	37.41%
	Hardware	$3,068,105	$1,570,789	195.32%
	System Support Labor	$2,380,009	$4,491,882	52.98%
	Electricity	$192,962	$375,922	51.33%
	Space	$130,731	$270,787	48.28%
	Migration	$2,294,437	$0	
	DR	$416,326	$632,933	65.78%
	Average MIPS	10,635		
	Total MIPS	15,035		

Transportation Company Inefficient Data Access

- ## Customer concerns
  - "High MLC cost" and 30%+ annual growth rate of MIPS
  - Wanted to move applications off mainframe to reduce MIPS

- ## Lessons Learned
  - Many applications access VSAM data on z
  - Some CICS logic moved down to WebLogic (1,000 MIPS),
  - Some CICS logic moved to DB2 store procedure
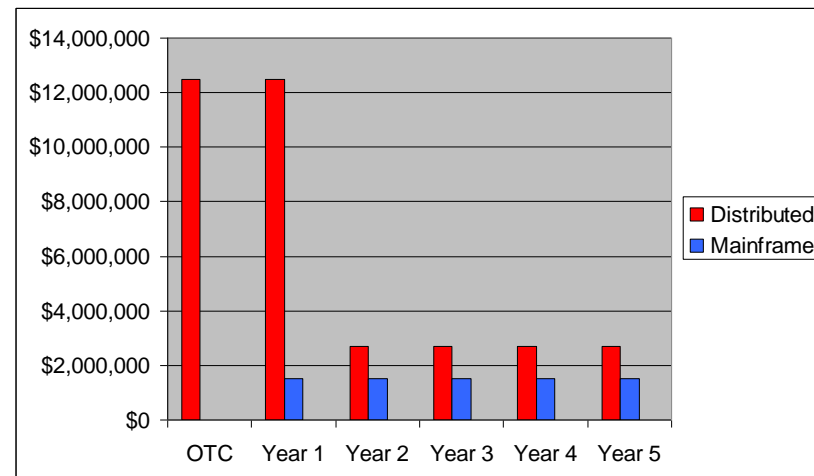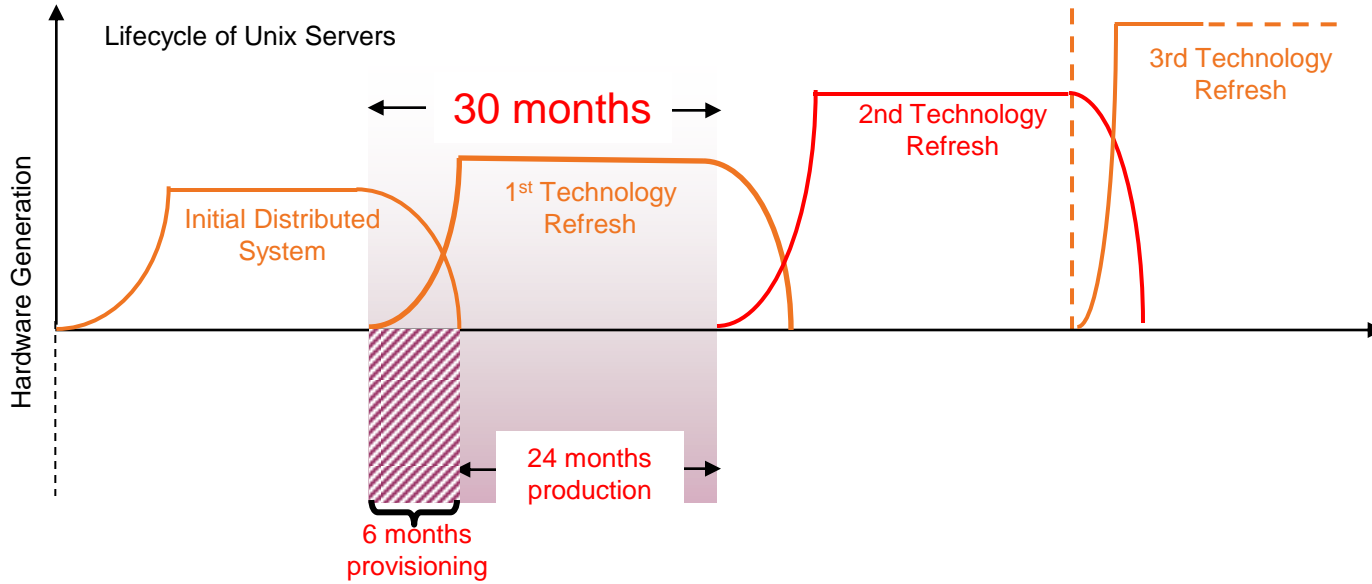 - Inefficiency of data access from distributed servers increased MIPS

DB2

WAS — **CICS**

VSAM

Open
Read
Read
Read
…

WebLogic — **DB2**

Open
Read
Close
Open
Read
Close
…

VSAM

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Government Agency
Data Expansion

- ## Customer concerns
  - ### Mainframe too expensive
  - ### Wanted to move applications from mainframe to Bull (p5 based) servers

- ## Lesson Learned
  - ### Most data in IMS and DB2 on z
  - ### Infeasible to move IMS on z to Oracle on UNIX
    - Database expansion from IMS hierarchical to Oracle RDB
      - 2x-3x expansion of database
      - Additional 2x-3x CPU for data processing
    - Scalability limitation of Oracle RAC
      - Need to partition large database
      - Round-robin fail-over arrangement of Oracle RAC servers would cripple performance

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Food Retail
Systems Management Costs

- ## Customer concerns
  - ### Mainframe too expensive
  - ### Approached by Oracle to move PeopleSoft applications to UNIX

- ## Lesson Learned
  - ### Moving system management tools to distributed servers increases software costs
    - #### Tools pricing based on the # of cores to be managed
    - #### For 2 UNIX servers (32 cores), these tools alone would require $8.4M OTC purchase plus $1.8M annual subscription fees
    - #### Typically, <20% of mainframe capability is available on distributed

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Large Financial Services Customer

Lifecycle of Unix Servers

Hardware Generation

← **30 months** →

Initial Distributed System

1st Technology Refresh

2nd Technology Refresh

3rd Technology Refresh

6 months provisioning

24 months production

In each 36 month lease there are only 30 months production use.

Setup and tear-down time costs 25% more. Plus . . . 41 hours of FTE setup and tear down labor per server = $3,075

Lifecycle of Mainframe Generations

Hardware Generation

36 months

36 months

36 months

Initial Mainframe System

1st Technology Refresh

2nd Technology Refresh

1 Weekend
upgrading to new hardware and software levels

Time

36 months production

No need to retire the server, upgrade in place.
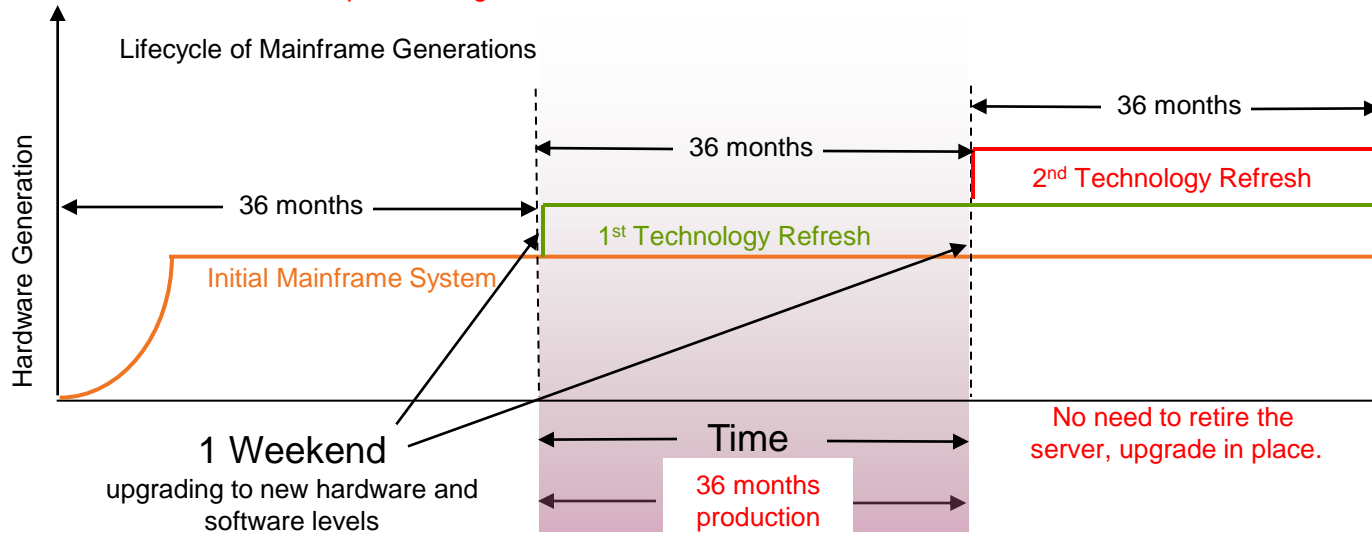
Weekend upgrades performed by IBM; capacity on demand pricing.

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Automotive Manufacturing
Un-utilized MIPS

- ## Customer concerns
  - Need to deploy a sales incentive application
  - "mainframe too expensive"

- ## Lesson Learned
  - Client does not use VWLC Pricing, existing "white space" capacity can support the new application, only $0.8M of application tools will be needed
  - In comparison, the distributed solution would cost over $18M

Financial Institution
No more power

- ## Customer concerns
  - The customer needed to add new distributed servers for Oracle applications
  - The local utility company prohibits adding more cables in the metropolitan area

- ## Lesson Learned
  - Consolidate 56 HP servers into 4 IFL avoid the power constraint
  - Fewer cores also reduce software license cost

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Another Dubious Offloading Decision

- **Offload ~1,000 MIPS workload from mainframe**
  - ▶ BUT mainframe software charges do not change
  - ▶ Why?
    - Sub-capacity pricing charges are calculated on peak of 4 hour rolling average
    - Offloaded workload did not contribute to the peak
    - **Offloaded workload was running "for free"**

Total Workload, 4 Hour Average, Work for Offload
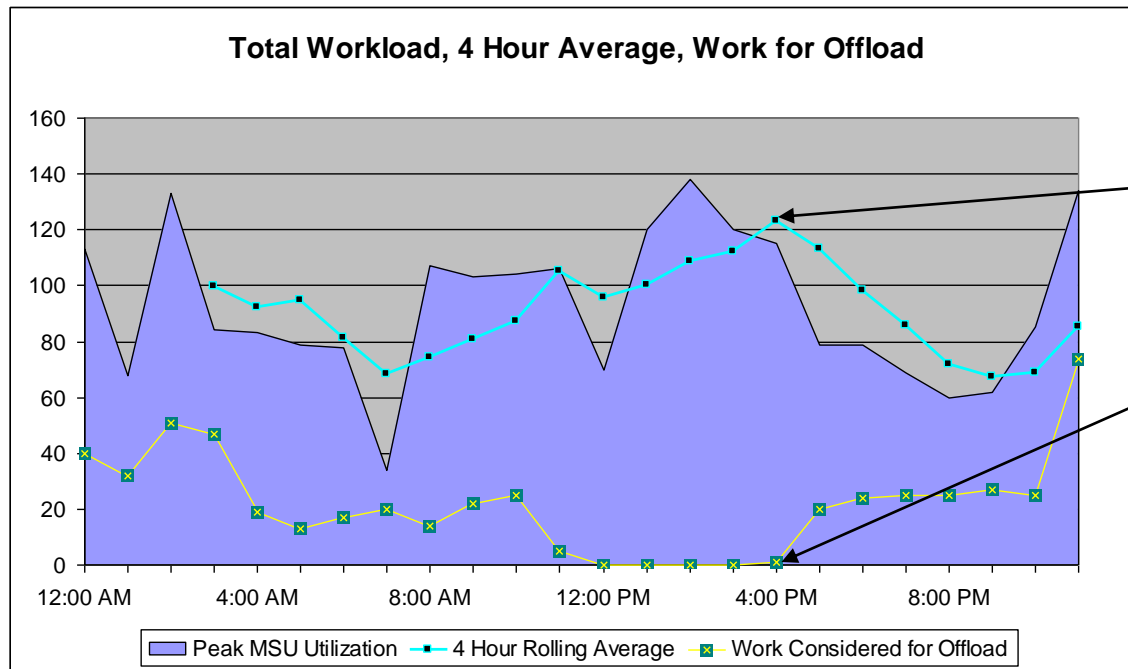
Peak 4 hour average = 123 MSU at 4pm

At 4pm, offloaded workload MSU = 0

Hardware and software licenses for distributed servers cost an additional 1m€

Legend: Peak MSU Utilization — 4 Hour Rolling Average — Work Considered for Offload

Not All Mainframe Management Software Could Be Replaced At Government Agency

Total **Distributed** Software Costs

$53.8M (5 yrs.)

Distributed Software Identified	Initial OTC	Maint. (per yr)
DB2	$4.50M	$0.99M
DB2 Recovery Expert	$1.58M	$0.35M
DB2 Optim Perf. Manager	$1.31M	$0.29M
DB2 Adv. Access Control	$1.23M	$0.27M
DB2 PureScale	$2.18M	$0.48M
IBM Optim DB Admin.	$0.66M	$0.15M
MQ	$0.82M	$0.18M
System Automation	$3.56M	$0.78M
Workload Scheduler	$0.78M	$0.17M
Access Manager	$0.51M	$0.11M
Micro Focus	$8.89M	$1.60M
Micro Focus Studio Ed.	$0.84M	$0.11M
Additional Products	$2.61M	$0.57M

Total **System z** Software Costs

$30.0M (5 yrs.)

44% less

- Only 12 of 26 mainframe system management products available on distributed platform
- Of those, functionality not equivalent
  - Operations automation not as robust
  - Tape solution missing
  - Database tools missing
  - No RTM1 and RTM2
  - Lack of SMF and RMF
- Development costs for repair of missing functionality not included

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Why So Many Distributed Servers?

- De-multiplexing of applications to dedicated servers
    - One application workload per server group
    - Low utilization due to peak-to-average and growth provisioning
    - Batch workload stresses I/O capabilities
    - Separate servers for production, failover, development/test, disaster recovery

- Processing comparisons
    - Language expansion (CICS/COBOL path lengths are highly optimized)
    - Conversion factor (MIPS to PUs) worsens as I/O rates increase
    - Oracle RAC inefficiencies compared to DB2

- This affects Total Cost of Ownership
    - Also 3 to 5 year lifetime for distributed servers requires repurchase
    - Dual environments during migration

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Why Do People Think Distributed Computing Is Cheaper?

Inaccurate charge back!

Charge Back Practices Were Improved Over Time at a Large Financial Institution
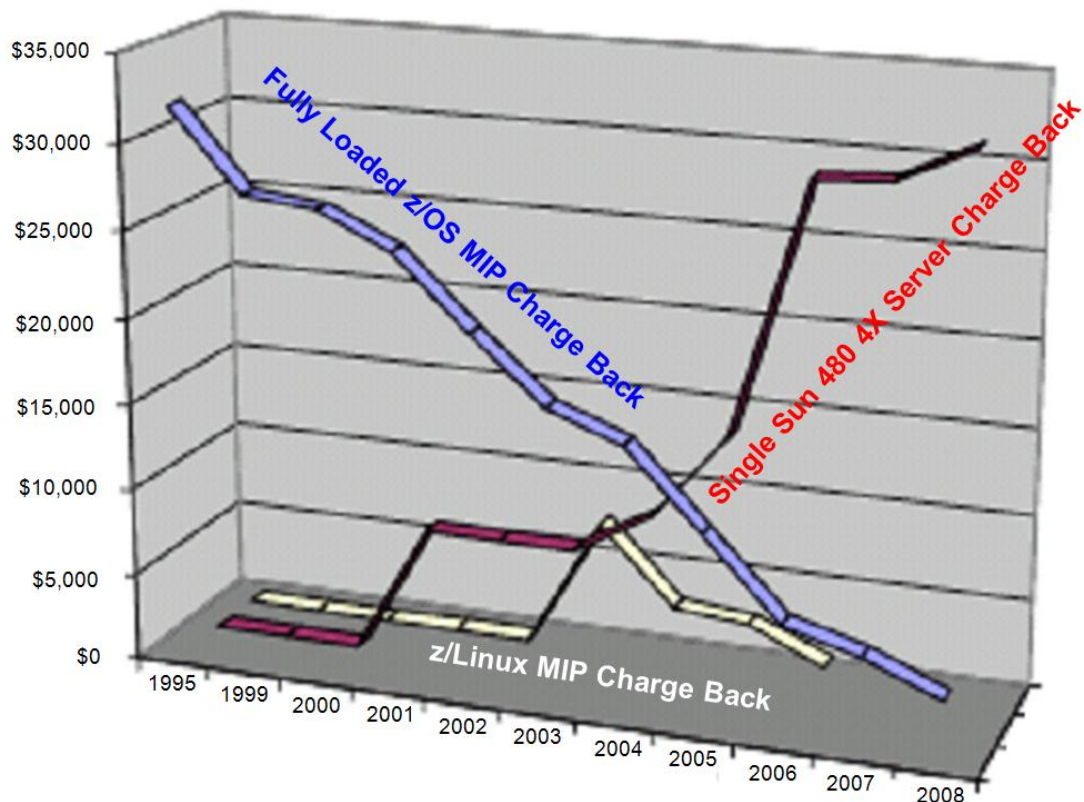
More Accurate Charge Back Can Correct Perceptions of Relative Costs

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Financial Charge Back May Not Be Optimized For Accuracy

IBM System z CICS/DB2

Total MIPS 11,302

MIPS Used for commercial claims processing production/dev/test **2,418**

Claims per year **4,056,000**

Build

Which system costs less for future growth?

Calculate cost per workload

HP Servers + ISV

Production Servers

HP 9000 Superdome rp4440

HP Integrity rx6600

Dev/Test Servers

HP 9000 Superdome rp5470

HP Integrity rx6600

Claims per year **327,652**

Buy

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Allocated Annual Costs for Two Systems

	Mainframe	Distributed
Hardware	$1,302,205	$87,806
Hardware Maint	$315,548	
Software IBM MLC	$4,842,384	
Software Non IBM OTC	$647,843	$196,468
Software Non IBM MLC	$5,027,936	
Storage	$877,158	
Network	$418,755	
Support Staff	$2,324,623	$257,289
Platform + Staff Total	$15,756,452	$541,563
Platform + Staff Claims Allocation	$3,371,880	$541,563
Billing Center	$1,611,650	
Call Center	$2,920,090	
Development	$1,907,382	
Total	$9,811,002	$541,563
Claims Processed	4,056,000	327,652
$ Per Claim	**$2.42**	**$1.65**

Provided by customer finance department

Mainframe costs easily identified, distributed costs difficult to identify

Billing and call center costs allocated to mainframe, but would be the same for either option

Development still required to customize packaged software for each new contract

Chargeback says distributed is lower cost

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True Costs Per Workload

	Mainframe	Distributed
Hardware	$1,302,205	$87,806
Hardware Maint	$315,548	
Software IBM MLC	$4,842,384	
Software Non IBM OTC	$647,843	$196,468
Software Non IBM MLC	$5,027,936	
Storage	$877,158	?
Network	$418,755	?
Support Staff	$2,324,623	$257,289
Platform + Staff Total	$15,756,452	$541,563
Platform + Staff Claims Allocation	$3,371,880	$541,563
Billing Center	Same	Same
Call Center	Same	Same
Development	$1,907,382	$193,271
Total	$5,279,262	$734,834
Claims Processed	4,056,000	327,652
$ Per Claim	**$1.30**	**$2.24**

Still can't identify distributed storage and network costs

Billing and call center costs would be the same for either option

Development cost to customize ISV packaged software for each new contract

Mainframe actually has lower cost per claim

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A Note On Support Staff Annual Costs

IBM System z CICS/DB2

$0.79 per claim

$0.12 per claim

Total MIPS 11,302

MIPS Used for commercial claims processing production/dev/test **2,418**

Claims per year **4,056,000**

Mainframe support staff has 6.6x better productivity

HP Servers + ISV

Production Servers

HP 9000 Superdome rp4440
HP Integrity rx6600

Dev/Test Servers

HP 9000 Superdome rp5470
HP Integrity rx6600

Claims per year **327,652**

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Chargeback Guidelines

- Do you know your REAL "cost per MIPS per year"?

- IBM studies indicate the following typical ranges:

Installation Size (MIPS)	<500	500-1,000	1,000-5,000	5,000-10,000	>10,000
Annual cost per MIPS	>$10K	$8K-$12K	$6K-$10K	$4K-$8K	$2K-$4K

- Higher than these ranges indicate possible anomalies that could cause bad decision-making
  - Gartner shows similar range and numbers

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IBM Eagle Studies Show Most Mainframe Workloads Are Already Best Fit On z/OS

- **If outside these ranges consider an IBM Eagle Study**

- **A Total Cost of Ownership analysis study for customers**
  - Cost and risk analysis of mainframe vs alternative
  - Tailored to individual customer needs
    - Cost factors unique to each enterprise, and often
    - Costs evaluated over five-year period

- **Since 2007, the Eagle Team has performed over 200 TCO studies**
  - Average cost of growing on System z was **41% less** than distributed

For more information, contact Craig Bender @ IBM to discuss your particular situation

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II. ZENTERPRISE ECONOMICS

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Smarter Computing

Strategies to achieve breakthrough reductions in cost of IT

New metric for the age of Smarter Computing

COST PER WORKLOAD

Accurately allocating cost in a virtualized environment

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Smarter Computing With zEnterprise Delivers Breakthrough Economics

Platforms Optimized For Different Workloads		**Consistent Structured Management**
z/OS · z/VM · AIX · Linux		
Best fit for workload		*Consistent structured practices*
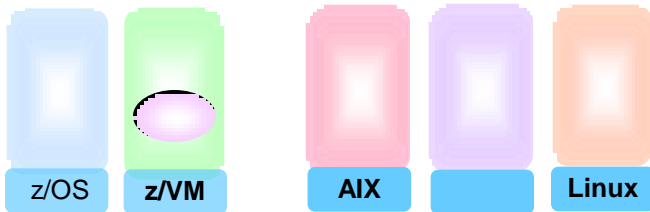
Lowest Cost Of Acquisition Per Workload

Lowest Cost Of Operation Per Workload

Lowest Cost Per Workload

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zEnterprise – Environments Optimized For Different Workloads

z/OS	z/VM
	Linux Image
	Linux Image
	Linux Image

PR/SM
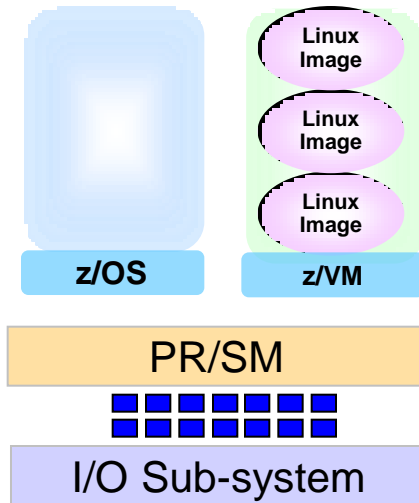
I/O Sub-system

- Scales to 96 cores
- Parallel Sysplex
- Dedicated I/O Sub System
- Superior qualities of service

AIX

Power Hypervisor

POWER7 Blades
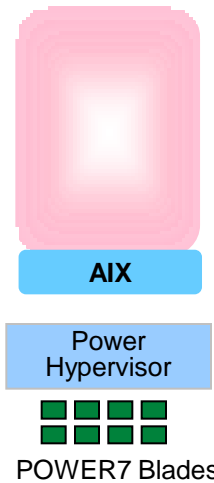
- Scales to 8 cores per blade
- 4 threads per core
- Floating point accelerators

Linux | **Windows**

KVM

Intel HX5 Blades
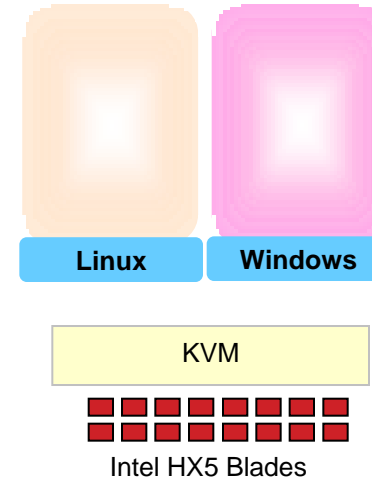
- Scales to 16 cores per blade
- 2 threads per core
- Commodity I/O
- Modest qualities of service

Specialized appliances

← **Structured Management** →

zEnterprise Workload Optimizations

- **Optimizations to deliver lowest cost per workload for**

  - **Service Oriented Architecture workloads**

  - **Web processing front-ends**

  - **Transactional core workloads**

  - **Private clouds**

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Optimized For SOA Environments

Enterprise Service Bus benchmark comparison

BizTalk Server

Windows

SB

Linux

messages

messages
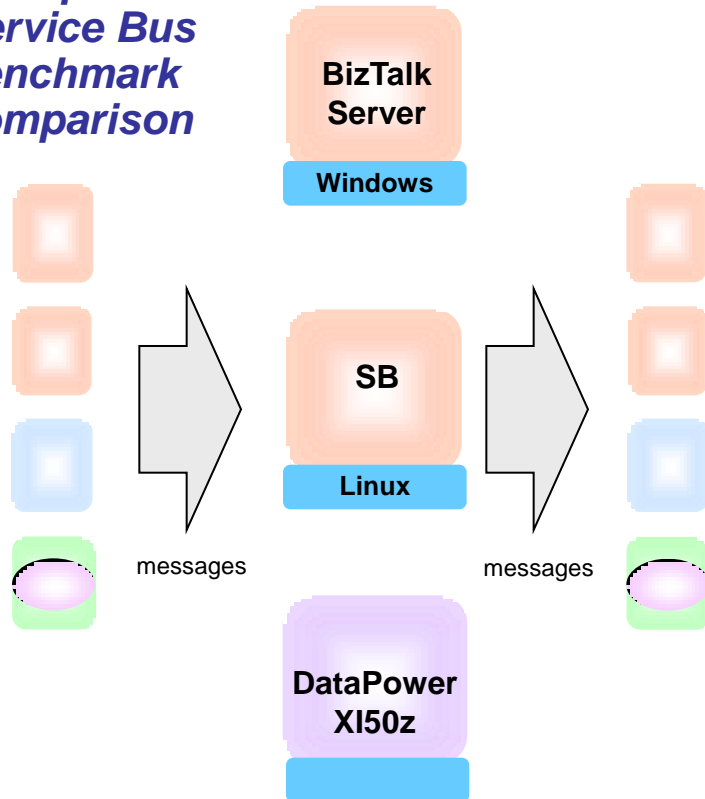
DataPower XI50z

Microsoft BizTalk Server
Windows on Intel Server

4 sockets, 32 cores
128 GB

492 messages per sec
$764 per mps

Competitor Service Bus
Oracle Linux on HP DL380

2 sockets, 12 cores
128 GB

5,839 messages per sec
$120 per mps

5,117 messages per sec

$52 per mps

DataPower
XI50z in zBX

HS 22, 8 cores

Source: IBM internal benchmarks. Tests consists of measuring maximum throughput of ESB while performing a variety of message mediation workloads: pass-through, routing, transformation, and schema validation.

3 yr TCA calculation includes hardware acquisition, maintenance, software acquisition and S&S. Publicly available US list prices, prices will vary by country.

Optimized For Web Front-End Workloads

Web facing front-end

Message hub

CICS/DB2 core system

AIX on Power Blade

DataPower XI50z

z/OS

WAS	ESB	CICS/DB2
AIX		z/OS

zEnterprise BladeCenter Extension (zBX)

zEnterprise
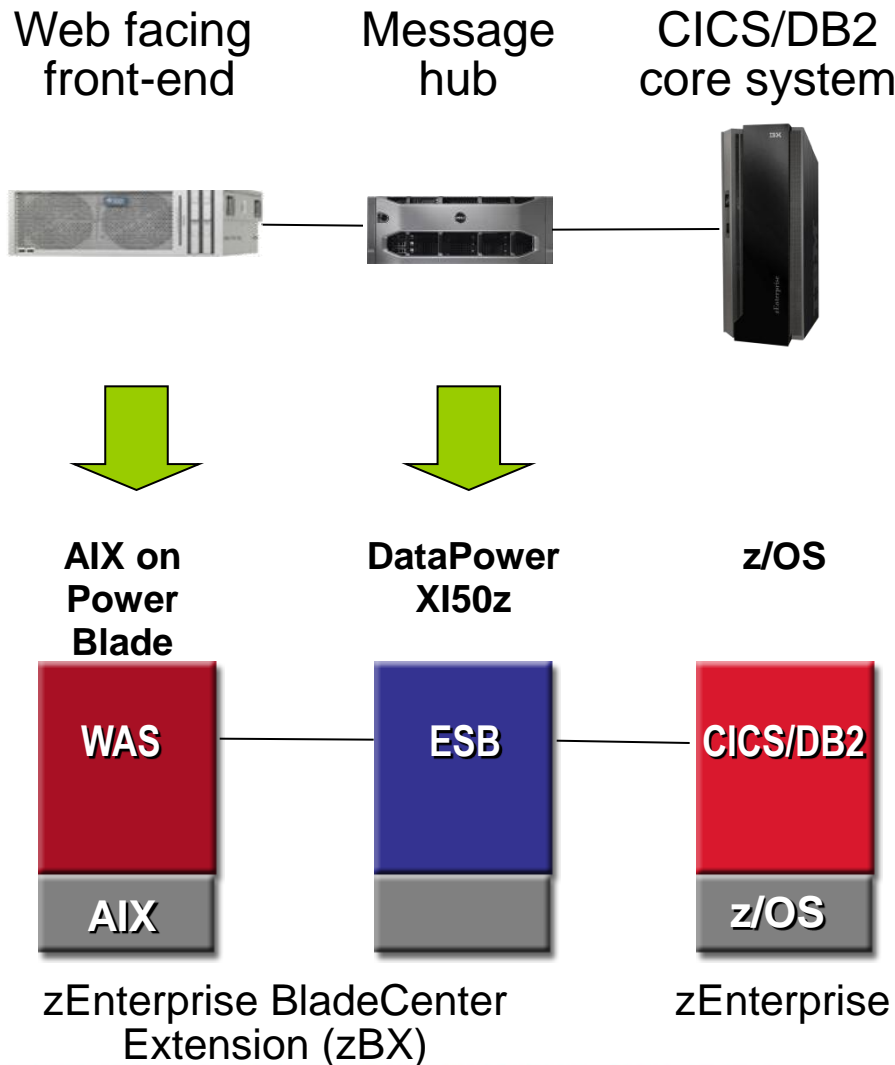
- Extends mission critical quality of service to hybrid environments
- Virtualization for workload isolation
- Run as ensemble of virtual servers
- Unified management of virtual machines
- Manage ensemble as a single workload with service goals
- Assign best fit to Power blade for lowest cost per workload
- Embedded pre-configured data network

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Web Front-Ends Cost 59% Less On zEnterprise

24 mission-critical web facing applications

Web Facing

Message Driven

24 workloads each driving 3080 tps
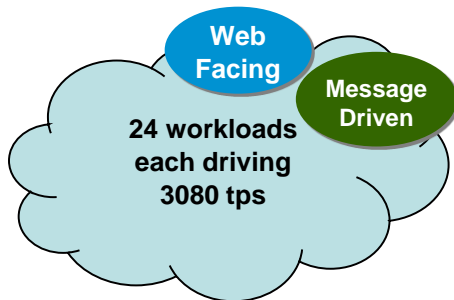
High availability
Workload isolation

Competitive Packaged System
24 Sun Fire X4170 M2
12-core Xeon servers
in ¾ rack
2 HP DL380 servers
(for ESB)
312 cores total

Sun Fire Servers

Competitive system relies on physical workload isolation

$693K
Per workload
3yr TCA
Front-end HW+SW
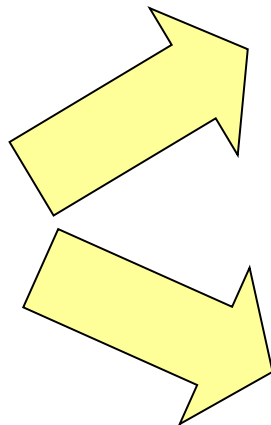
WebSphere App Server
24 POWER7
8-core blades
2 DataPower XI50z
in zBX
192 cores total

101001001010011001
101001001010011001
101001001010011001
101001001010011001

Power Blades in zBX

$193K
Per workload
3yr TCA
Front-end HW+SW

Source: IBM internal benchmarks. Competitive Packaged System includes Competitive Application Server and Sun Fire x4170M2 servers. 3 yr TCA calculation includes hardware acquisition, maintenance, software acquisition and S&S. U.S. list prices. Prices will vary by country.

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zEnterprise Economics - August 2012

Collapse SAP Front-End Applications Onto zEnterprise Platform
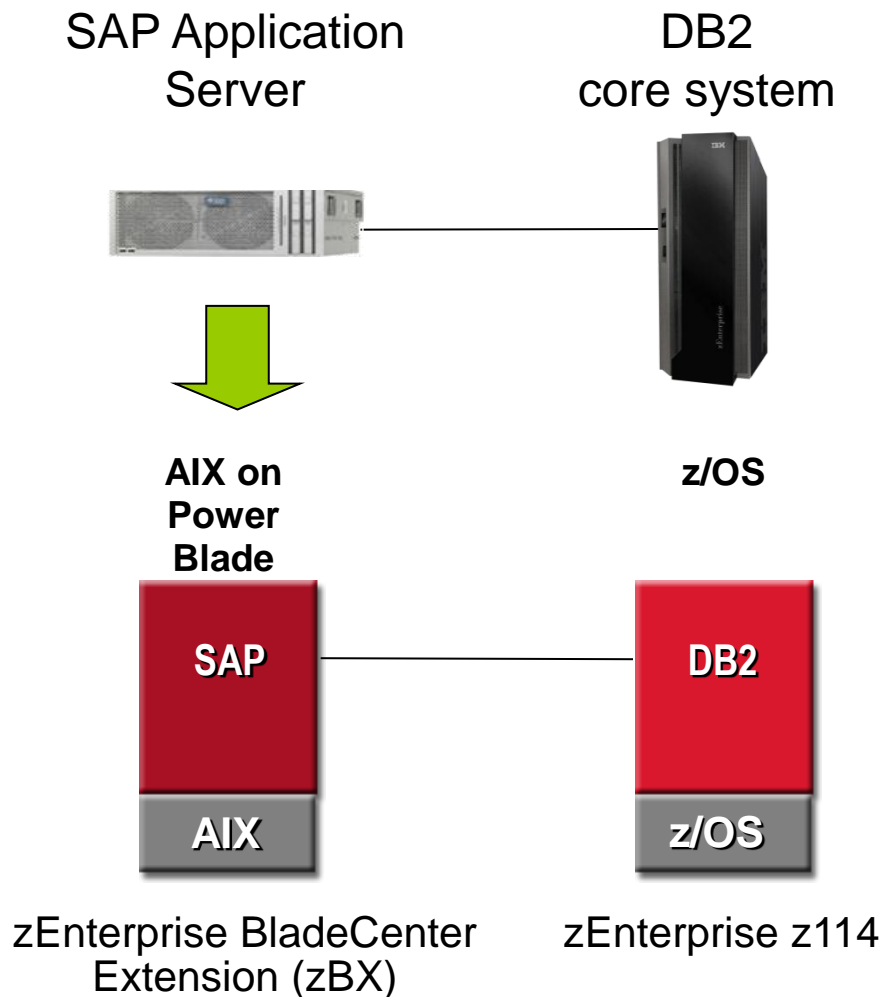
SAP Application
Server

DB2
core system

**AIX on
Power
Blade**

z/OS

SAP

DB2

AIX

z/OS

zEnterprise BladeCenter
Extension (zBX)

zEnterprise z114

- Run as ensemble of virtual servers

- Unified management of virtual machines

- Manage ensemble as a single workload with service goals

- Assign best fit to Power blade for lowest cost per workload

- Embedded pre-configured data network

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SAP Applications Cost 20% Less On zEnterprise

20 front-end SAP applications on older SPARC T2+ servers

34 SPARC T4-1 blades in SUN rack
272 cores total

T3-1B

$58K
Per workload
3yr TCA
Front-end
infrastructure

SAP
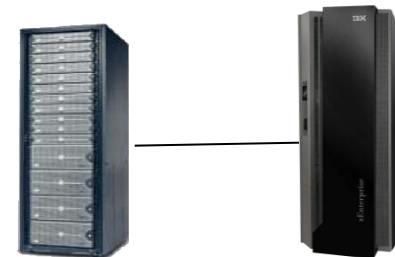
20 workloads

Upgrade to new SPARC T4 hardware

20
SPARC T5440
32 core servers
538,120 total SAPs
640 cores total
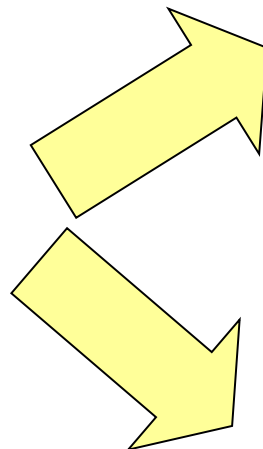
23 POWER7 blades in zBX
184 cores total

101001001010010
10100100101001
10100100101001
10100100101001

zBX

$44K
Per workload
3yr TCA
Front-end
infrastructure

Power Blades in zBX

Based on IBM internal sizing benchmarks for SAP. 3 yr TCA calculation
includes hardware acquisition, maintenance, software acquisition and S&S.
U.S. list prices. Prices will vary by country.

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Optimized For Transaction Processing With High Availability

- Specialized hardware - Coupling Facility

  - Dedicated processor with specialized microcode to coordinate shared resources

  - High speed inter-connect to clustered systems

  - Hardware invalidation of local cache copies

  - Special machine instructions

- Exploited by IMS, CICS, DB2, MQ, and other middleware on z/OS for transaction processing

Data Sharing

Complete your sessions evaluation online at SHARE.org/AnaheimEval
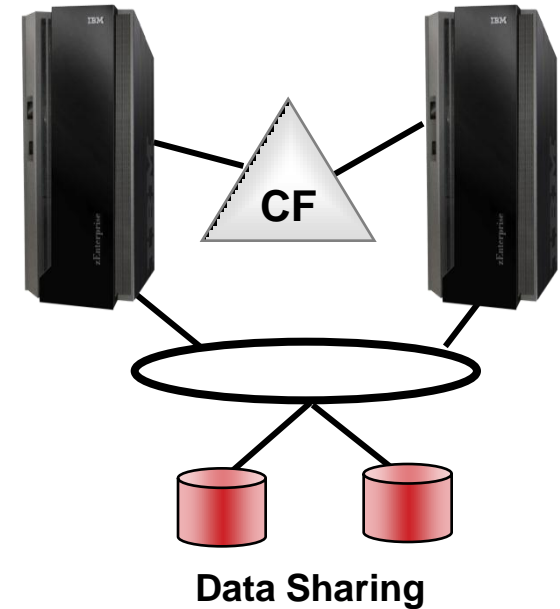
Moving Transaction Processing Workloads Off z/OS Rarely Reduces Cost

Typical Eagle TCO Study For A Financial Services Customer

4 HP Proliant DL 980 G7 servers

Production   Development
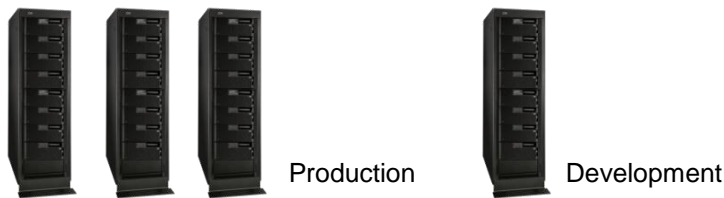
256 cores total

Hardware	$1.6M
Software	$80.6M
Labor (additional)	$8.3M
Power and cooling	$0.04M
Space	$0.08M
Disaster Recovery	$4.2M
Migration Labor	$24M
Parallel Mainframe costs	$31.5M
Total (5yr TCO)	**$150M**

System z z/OS Sysplex

2,800 MIPS

Hardware	$1.4M
Software	$49.7M
Labor	Baseline
Power and cooling	$0.03M
Space	$0.08M
Disaster recovery	$1.3M
Total (5yr TCO)	**$52M**

65% less

Companies With Mainframe-Biased IT Achieve Lower IT Costs Per Unit

Industry	Measure	Average IT Cost of Goods	Mainframe Biased	Distributed Biased	% Mainframe Cost Less Than Distributed
Bank	Per Teller Transaction	$0.31	$0.12	$0.35	66%
Mortgage	Per Approved Loan	$263.67	$98.38	$290.80	66%
Credit Card	Per Transaction	$0.16	$0.10	$0.18	44%
Railroads	Per Ton Mile	$0.0014	$0.0012	$0.0018	33%
Armed Service	Per Person	$8,036	$6,871	$9,839	30%
Automotive	Per Vehicle	$333	$275	$370	26%
Retail	Per Store (Door)	$494,818	$421,346	$560,300	25%
Utilities	Per MegaWatt Hour	$2.63	$2.21	$2.94	25%
Hospitals	Per Bed per Day	$64.30	$54.4	$71.7	24%
Oil & Gas	Per Barrel of Oil	$2.10	$1.78	$2.32	23%
Consulting	Per Consultant	$53,060	$48,900	$62,344	22%
Trucking	Per Road Mile	$0.177	$0.155	$0.194	20%
Airlines	Per Passenger Mile	$0.007	$0.0061	$0.0076	20%
Chemicals	Per Patent	$57,717	$55,800	$59,552	6%
Web Sites	Per Search	$0.042	$0.046	$0.041	-12%

BARCLAYS **"System z provides 98% of the work, 2% of the floor space and 7% of the IT cost."**

44 From Rubin Worldwide analysis of customer data and Gartner Research IT costs

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Optimized For Private Clouds

- **Large scale virtualization**
  - ▶Elastic growth
  - ▶Workload management
- **Fit for purpose strategy**
  - ▶Multi-architecture minimizes migration costs
  - ▶Assign workloads to best fit environment
- **Integrated Service Management**
  - ▶zManager
  - ▶Tivoli Application Management for zEnterprise
  - ▶Tivoli Asset and Financial Management for zEnterprise
  - ▶Tivoli Application Resilience for zEnterprise
  - ▶Tivoli Security for zEnterprise
- **Achieves lowest overall cost per workload**

z/OS   z/VM   AIX   Linux

Complete your sessions evaluation online at SHARE.org/AnaheimEval
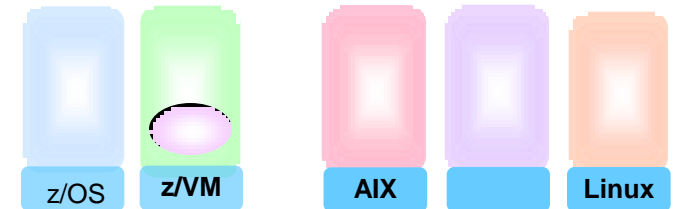
Public vs. Private Cloud: Which Costs Less For Delivering Mixed Workloads?

Which option provides the lowest TCO over 3 years?

Light Intel workloads
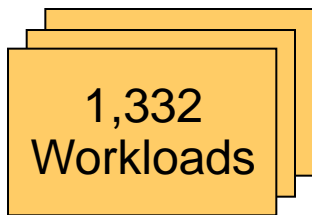
1,332 Workloads

Heavy Unix workloads
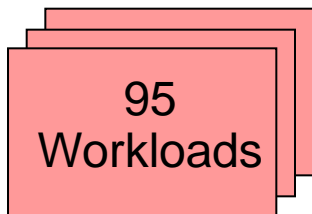
95 Workloads

Light workloads with heavy I/O

68 Workloads

Public Cloud

Private Cloud
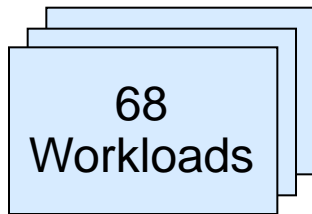
1,495 workloads

zEnterprise (z196)

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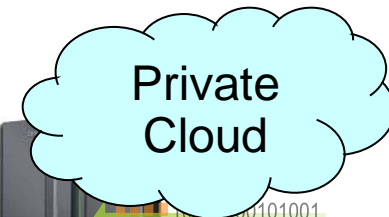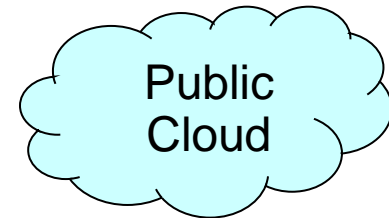
Compare Cost Of Acquisition For 3 Years

| 1,332 Workloads | 95 Workloads | 68 Workloads |

Deployed on public cloud

Optimized on zEnterprise

Public Cloud

Private Cloud
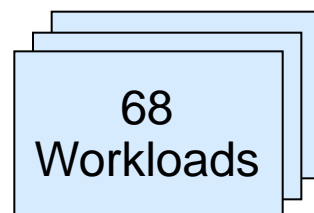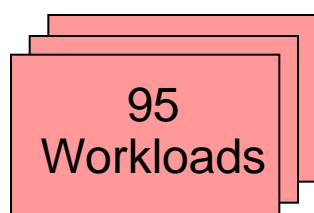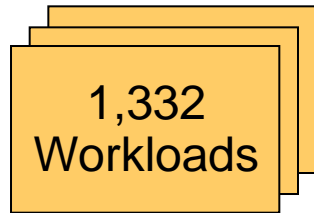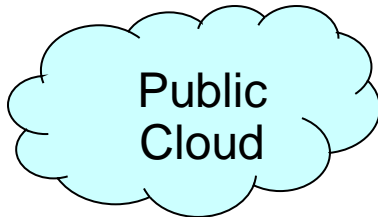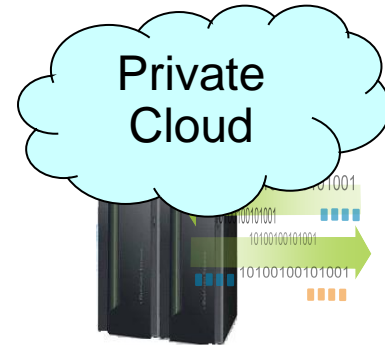
1,495 Compute Instances

$99.2M TCA (3 years)

zEnterprise (z196)
32 IFL's, 28 Intel blades, 28 Power blades
704 cores

$20.6M TCA (3 years)

79% less

Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency and will vary by country

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Compare Labor Costs For 3 Years

1,332 Workloads

95 Workloads

68 Workloads

Deployed on public cloud

Optimized on zEnterprise
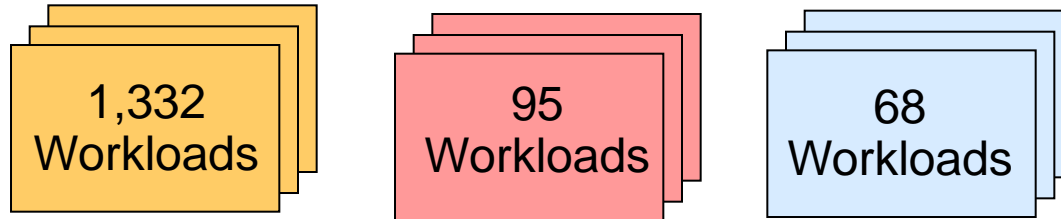
Public Cloud

Private Cloud

42,086 labor hours/yr
20.23 administrators

31,146 labor hours/yr
14.97 administrators

$9.7M
3 years @ $159,600/yr

$7.2M
3 years @ $159,600/yr

26% less

Server configurations are based on consolidation ratios derived from IBM
internal studies. Prices are in US currency and will vary by country

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Private Cloud On zEnterprise Dramatically Reduces Costs
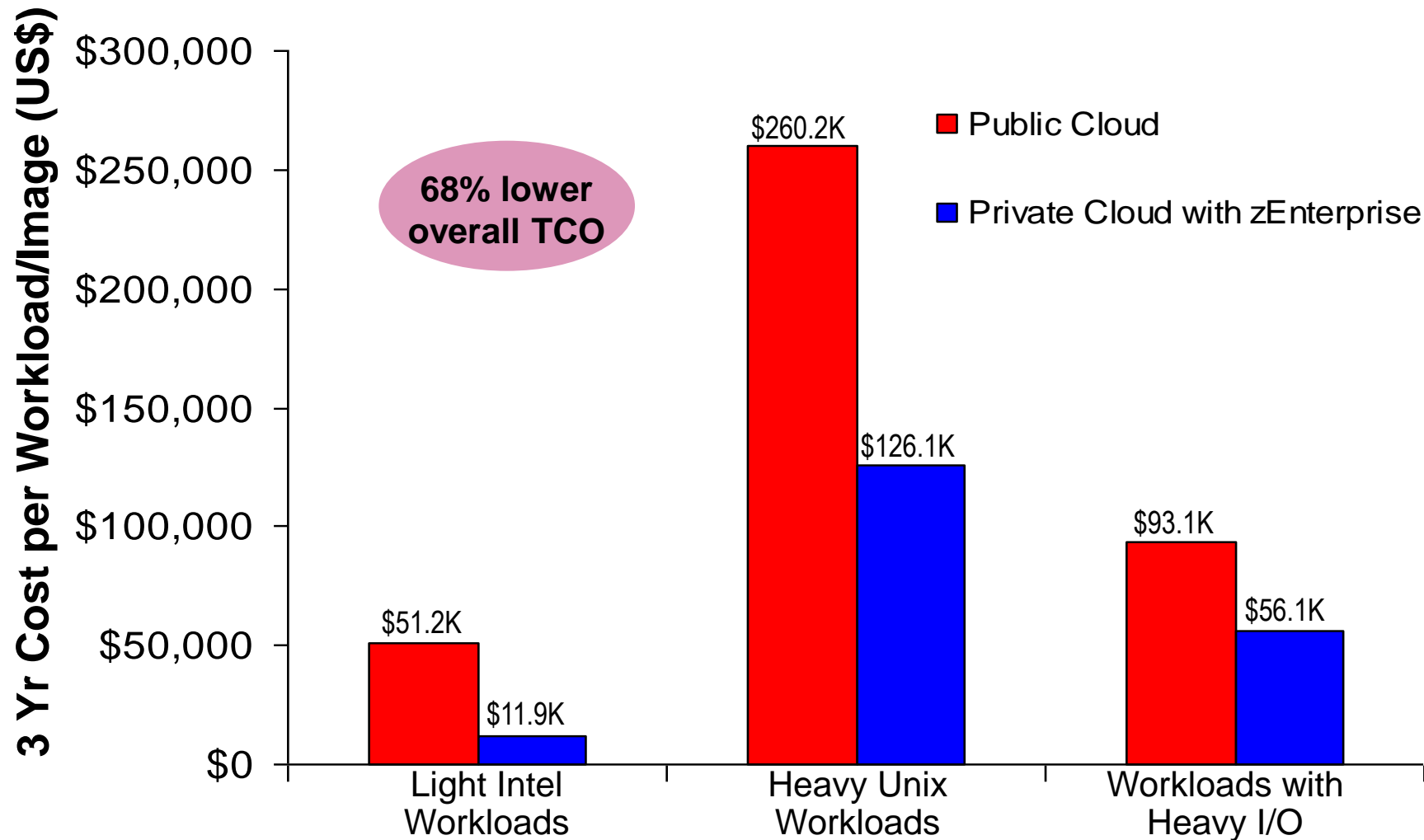
Source: IBM internal study. zEnterprise configurations needed to support the three workload types were derived from IBM comparisons. Public cloud sizing needed to support the three workload types was calculated based on compute capacity of public cloud services. 3 yr TCO for public cloud based on pricing info available by the service provider. 3 yr TCO for zEnterprise includes hardware acquisition, maintenance, software acquisition, S&S and labor. US pricing and will vary by country.

zEnterprise Economics

- Charge back accounting must report accurate costs per workload

- Optimizations deliver lowest cost per workload for:

  - Service Oriented Architecture workloads

  - Web processing front-ends

  - Transactional core workloads

  - Private clouds

Summary

- ## Cost per workload is the key metric for IT economics

    - ### Mainframe cost per work goes down as workload increases

- ## Fit for purpose reduces cost of acquisition per workload

- ## zEnterprise's integrated management reduces cost of labor per workload

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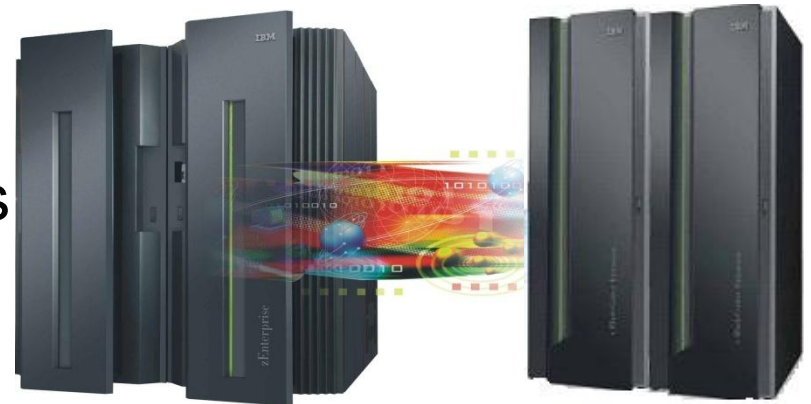
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Thank you!
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