

zEnterprise Economics

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Abstract



Abstract: The economics of mainframe computing are often poorly understood – and yet multi-million dollar platform decisions are made based on hearsay, anecdote and inaccurate accounting systems. For any platform decision, the needs of a company's stakeholders are best served by a strong understanding of the true costs and the potential 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.

The introduction of IBM's zEnterprise unifies hardware and software that's optimized to enable hybrid computing. I will conclude by examining the potential of such a system to save more money especially in its ability to optimize hardware, software, labor and facilities costs.

Agenda

I. Mainframe TCO Characteristics

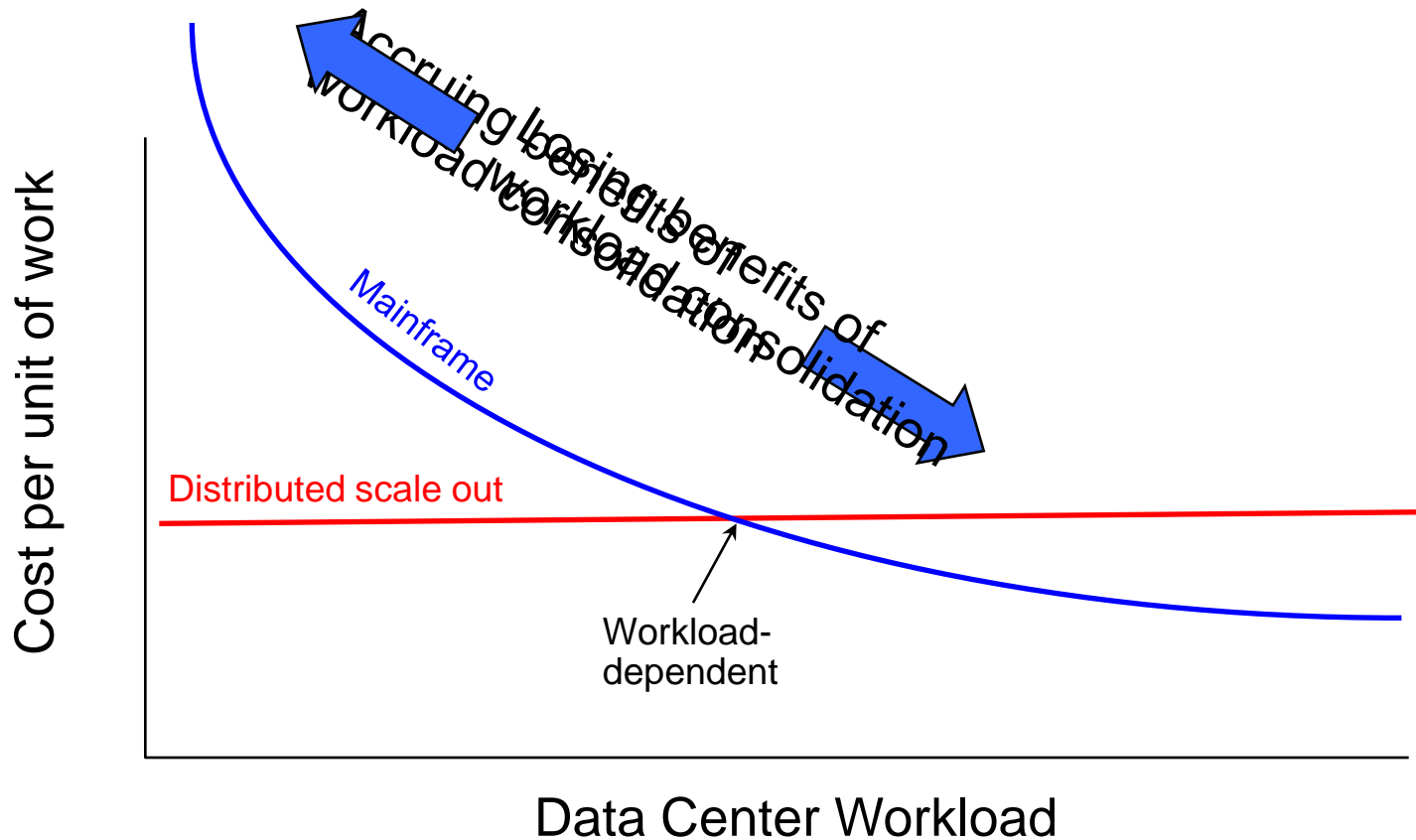
II. zEnterprise Economics

- Cost Per Workload Examples
- Why zBX is better than do-it-yourself

I. MAINFRAME TCO CHARACTERISTICS

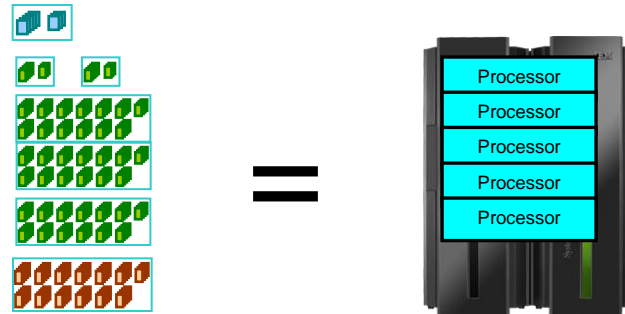
Mainframe Economics

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

■ Kookmin Bank

- ▶ IBM System z9 and DB2
- ▶ TCS BaNCS
- ▶ 15,353 Transactions/second
- ▶ 50 Million Accounts
- ▶ IBM benchmark for customer

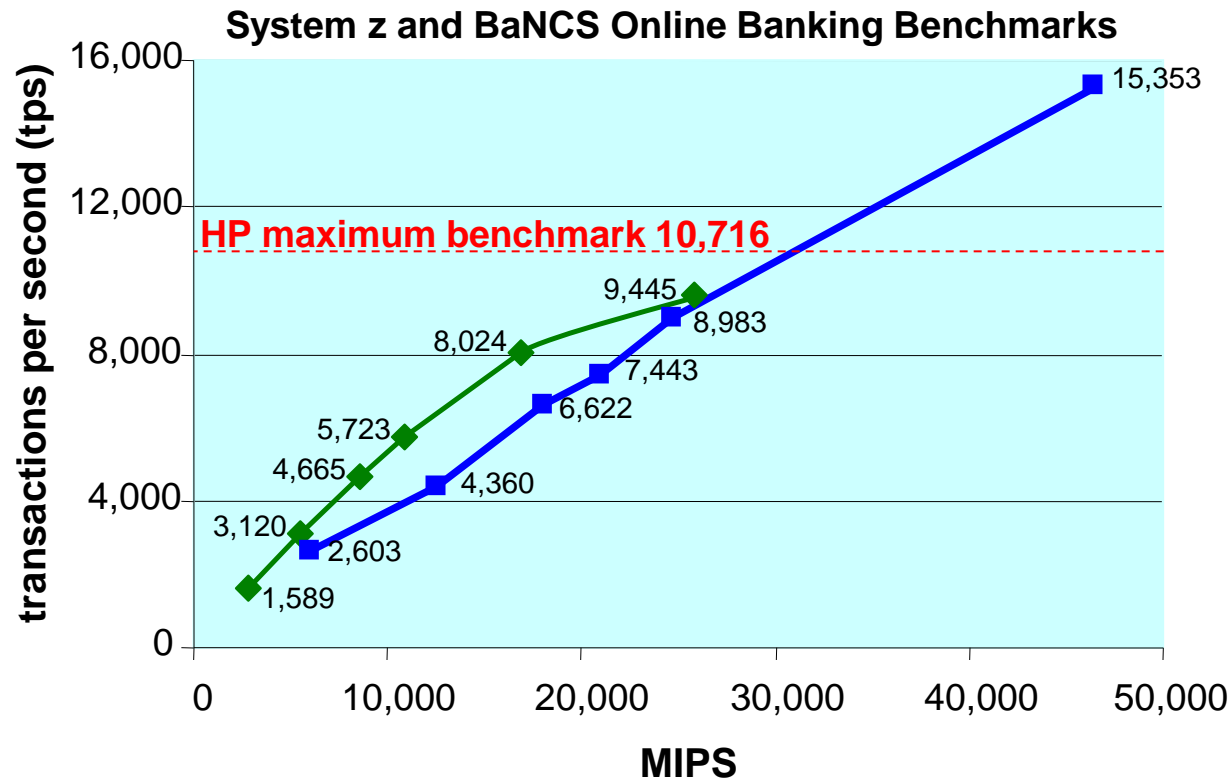
• Bank of China **

- IBM System z9 and DB2
- TCS BaNCS
- 9,445*** Transactions/second
- 380 Million Accounts
- IBM benchmark for customer

• State Bank of India*

- HP Itanium Superdome
- TCS BaNCS
- 10,716 Transactions/second
- 500 Million Accounts
- Largest banking benchmark performance claimed by HP

System z can process over 55M transactions/hour, and 380M accounts



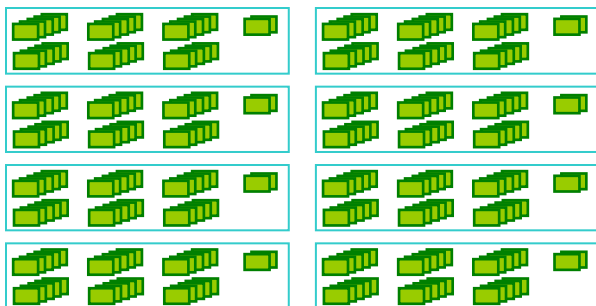
* SOURCE: Clement Report; <http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA1-4027ENW.pdf> Feb 2010

** SOURCE: <http://www.enterprisenetworksandservers.com/monthly/art.php?2976> Source: InfoSizing FNS BANCS Scalability on IBM System z – Report Date: September 20, 2006

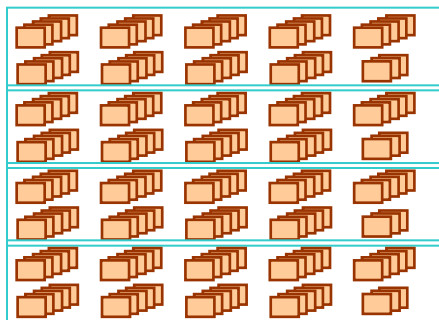
*** Standard benchmark configuration reached 8,024 tps, a modified prototype reached 9,445 tps

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

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



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



TCS BaNCS
1x z196-742



42 processors
(31,675 MIPS)



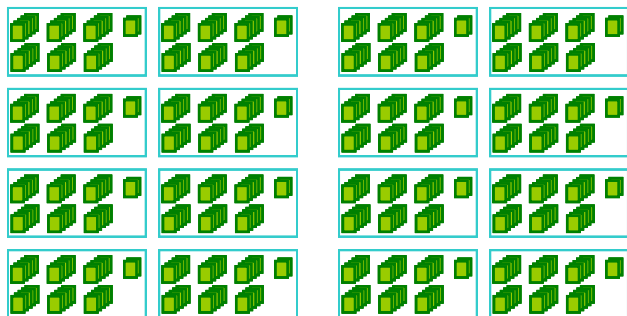
448 processors
(1,834,300 Performance Units)

57.6 PUs per MIPS

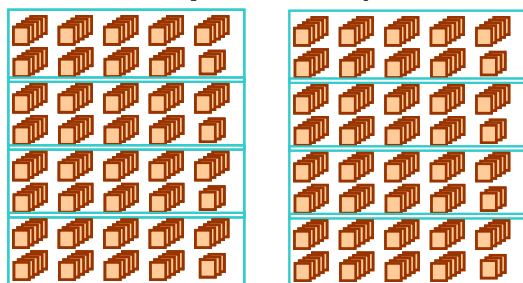
Note: Both platforms scaled to the same performance rating (10,716 tps)

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

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



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



TCS BaNCs
1x z196-756



56 processors
(40,313 MIPS)



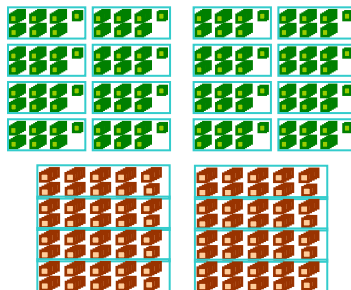
996 processors
(3,143,360 Performance Units)

92.2 PUs per MIPS

NOTE: Double Distributed Servers, add 1,000 MIPS to System z for Dev/QA

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

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



HP Superdome Servers

IBM z196

Servers

24 (996 cores)

1 (56 cores)

OS, Database

HP-UX, Oracle

z/OS, DB2

Energy (kWh)

3,045K

283K

5 Year TCO

\$195M

\$104M 47% Less

Scalability Not Demonstrated

Excellent Scalability

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

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

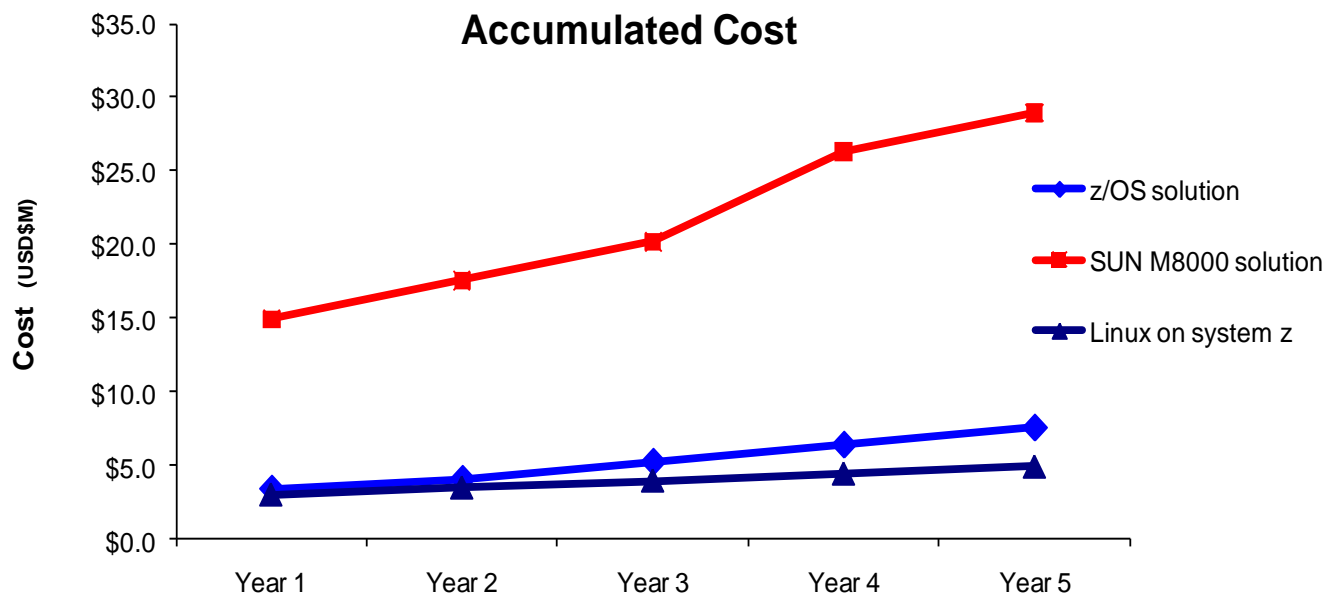
Bank Study Shows WebSphere Process Server On Sun Costs 5.8X More Than System z



- Currently 3 distributed Sun servers running WebSphere workload
- Compare running same workload on IBM System z10 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



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

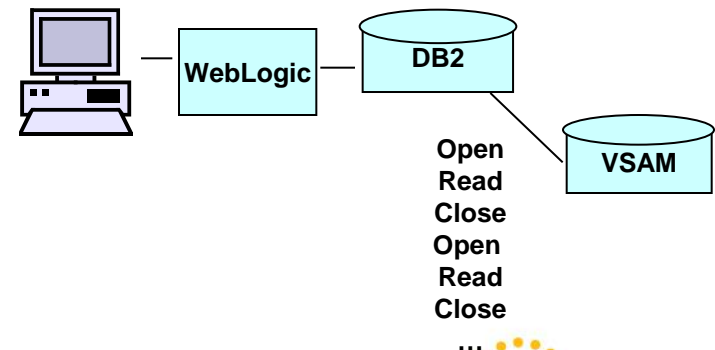
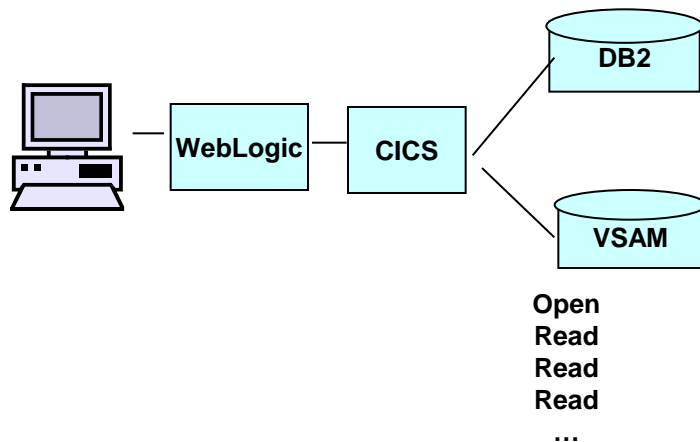
Summary of 50+ Customers

Cost Ratios (z vs Distributed)

	z	Distributed	z vs distributed (%)	
Offload	5-Year TCO	\$15,887,900	\$29,722,129	53.45%
	Annual Operating Cost	3,077,367	3,279,856	93.83%
	Software	11,890,104	13,195,104	90.11%
	Hardware	4,764,944	6,634,717	71.82%
	System Support Labor	2,919,475	4,782,074	61.05%
	Electricity	37,891	301,037	12.59%
	Space	58,678	192,260	30.52%
	Migration	299,217	5,319,530	5.62%
	DR	810,202	3,839,836	21.10%
	Average MIPS	3,536		
	Average Perf Unit 1		710,575	
	Average Perf Unit 2		158,491	
New Workload	5-Year TCO	\$20,445,706	\$30,538,414	66.95%
	Annual Operating Cost	1,691,004	2,836,208	59.62%
	Software	5,139,694	21,660,900	23.73%
	Hardware	12,112,243	4,116,146	294.26%
	System Support Labor	8,549,789	2,494,671	342.72%
	Electricity	18,167	216,998	8.37%
	Space	3,996	240,972	1.66%
	Migration	0	0	
	DR	49,293	33,945	145.21%
	Average MIPS	6,623		
	Average Perf Unit 1		461,745	
	Average Perf Unit 2		85,260	
Consolidation	5-Year TCO	\$7,985,234	\$19,608,108	40.72%
	Annual Operating Cost	499,990	1,220,597	40.96%
	Software	2,229,249	10,376,382	21.48%
	Hardware	4,709,050	5,088,461	92.54%
	System Support Labor	1,193,340	4,465,305	26.72%
	Electricity	28,264	186,200	15.18%
	Space	39,825	248,231	16.04%
	Migration	283,966	0	
	DR	493,901	603,079	81.90%
	Average MIPS	3,662		
	Average Perf Unit 1		596,991	
	Average Perf Unit 2		156,531	

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



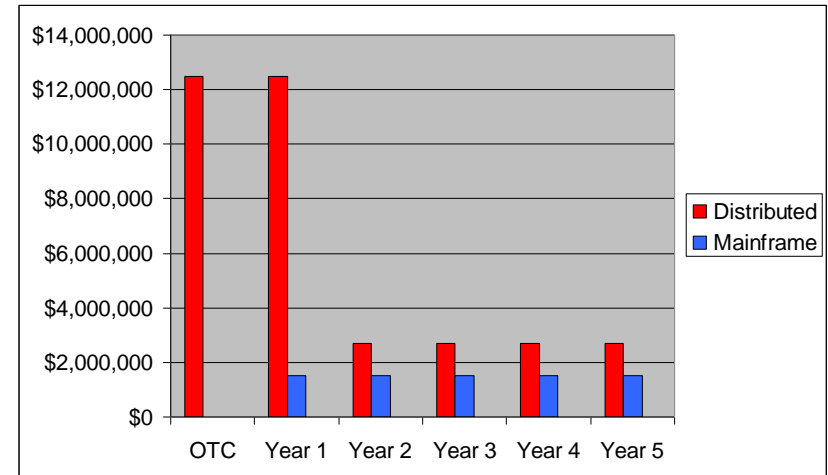
Government Agency Data Expansion



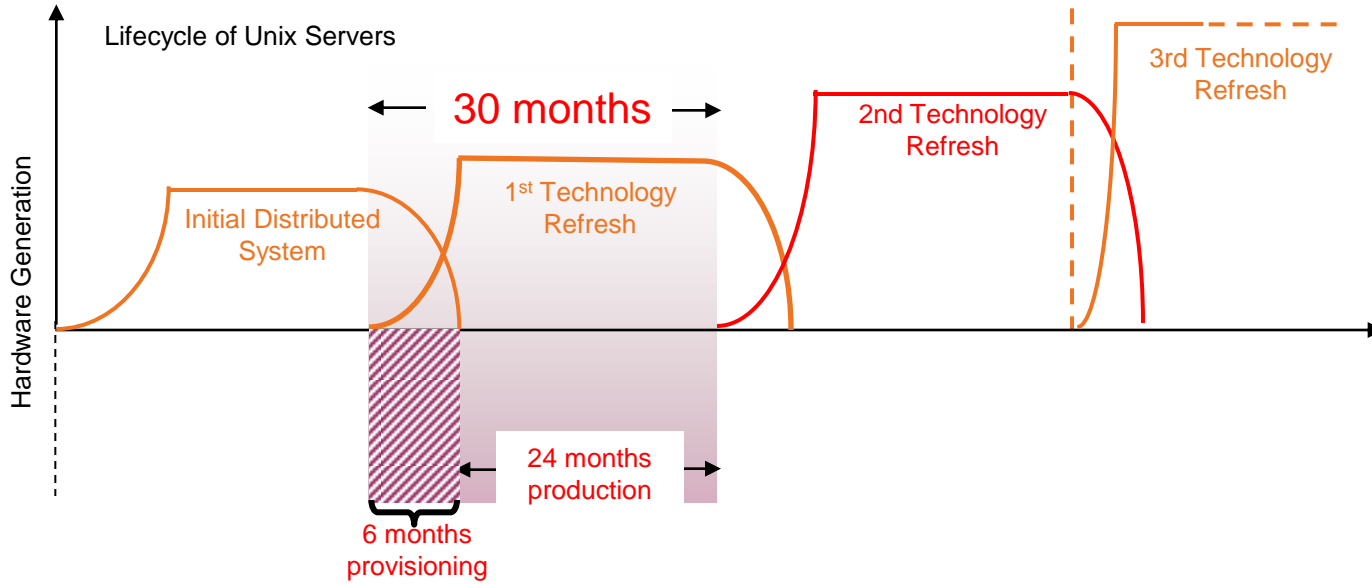
- Customer concerns
 - Mainframe too expensive
 - Wanted to move applications from mainframe to Bull (p5 based) servers
- Lesson Learned
 - Most data in IMS and DB2 on z
 - Infeasible to move IMS on z to Oracle on UNIX
 - Database expansion from IMS hierarchical to Oracle RDB
 - 2x-3x expansion of database
 - 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

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

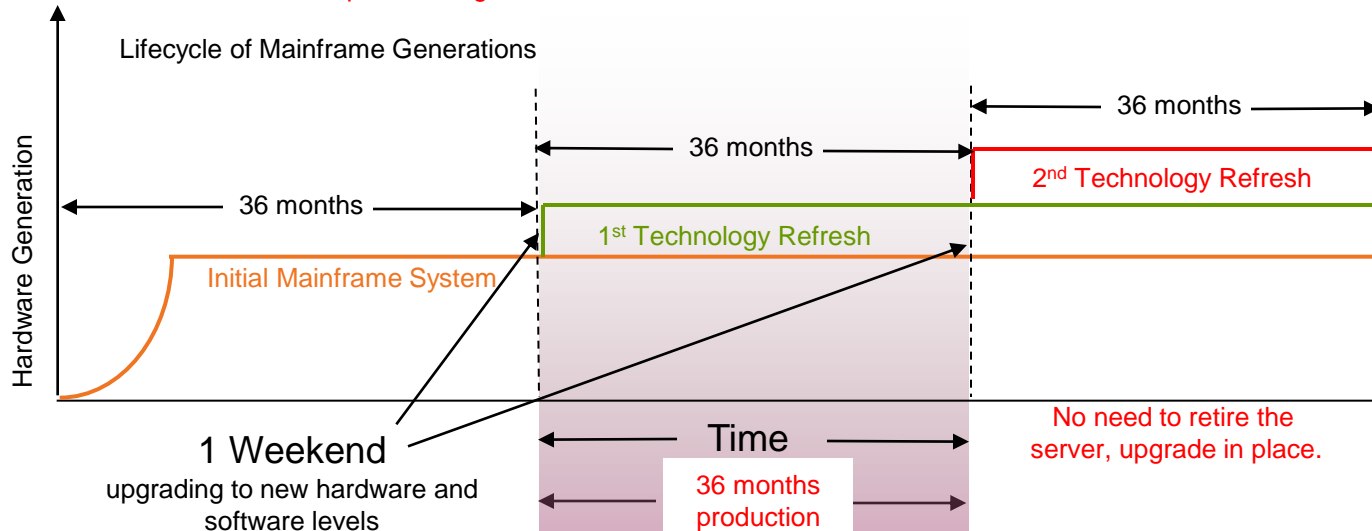


Large Financial Services Customer



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



Weekend upgrades performed by IBM; capacity on demand pricing.

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

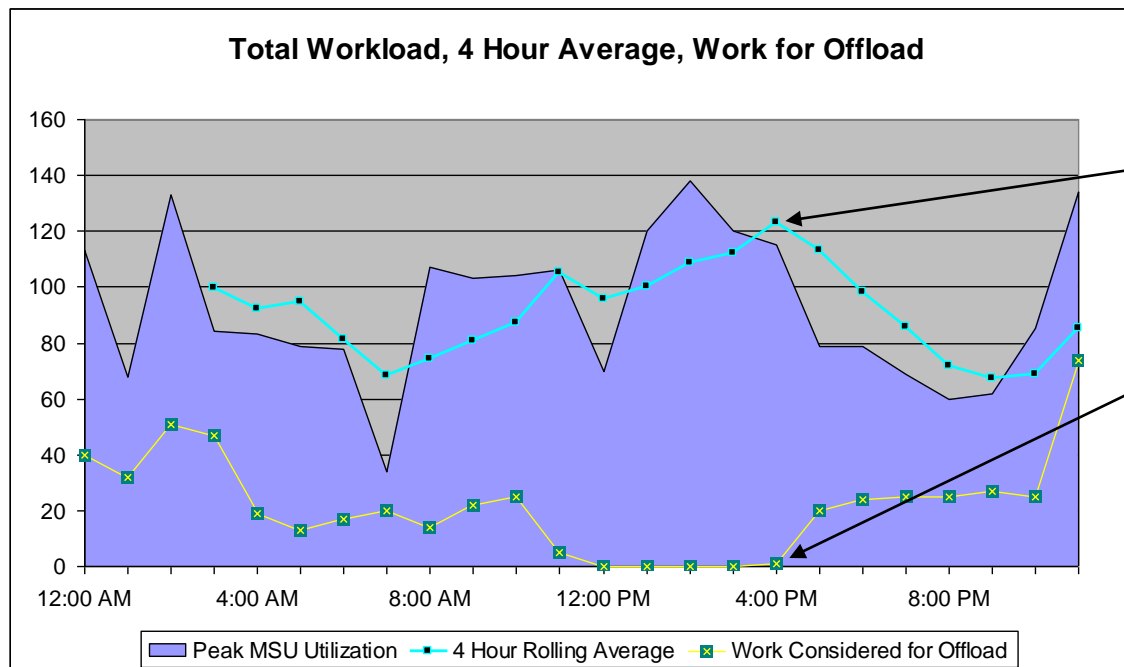
No more power



- 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

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”**



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€**

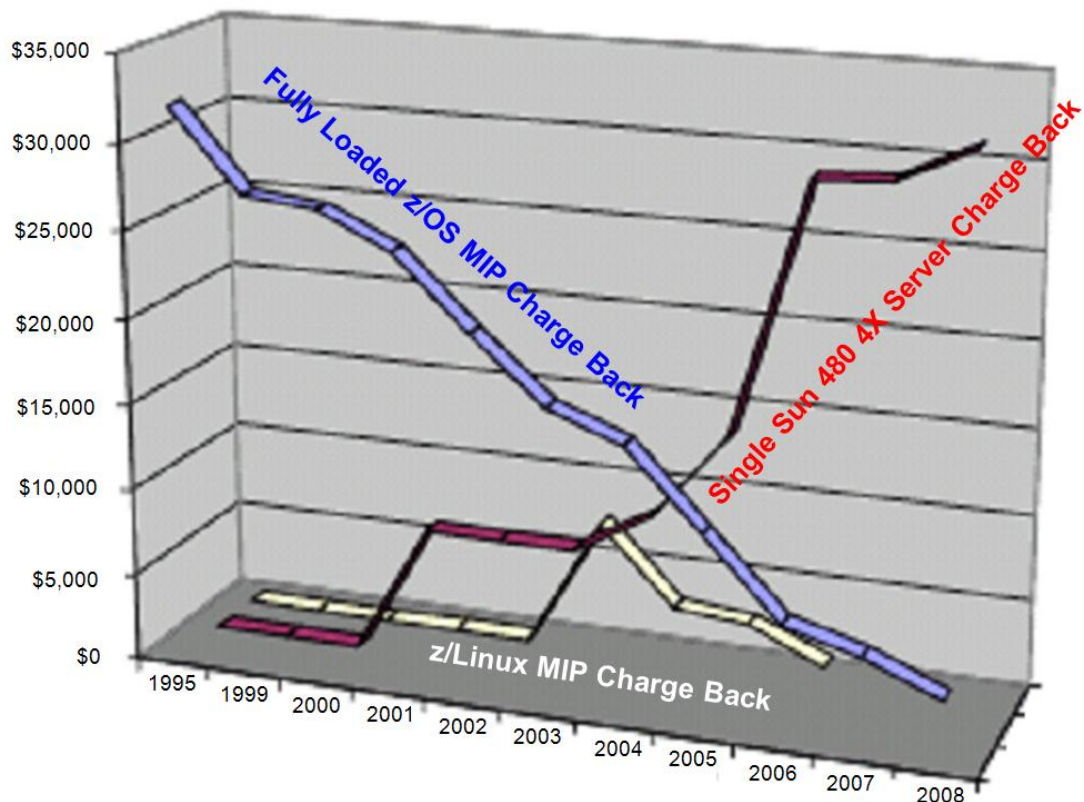
Why So Many Distributed Servers?

- 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 may stress 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
 - And dual environments during migration

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

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



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



- If \$/MIPS costs are 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
 - Costs evaluated over five-year period
- **48 out of 50 IBM Eagle studies concluded that System z offered better TCO than a distributed alternative**
 - Average cost of growing on System z was **41% less** than the distributed alternative

II. ZENTERPRISE ECONOMICS

Smarter Computing

Strategies to achieve breakthrough reductions in cost of IT

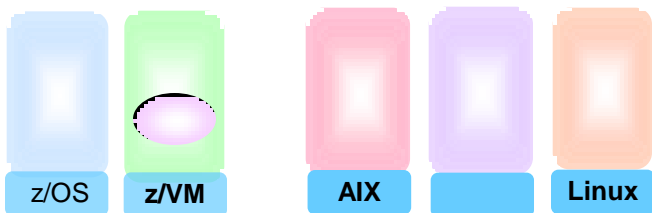
**New metric
for the age
of Smarter
Computing**

**COST PER
WORKLOAD**

**Accurately allocating cost in a
virtualized environment**

Smarter Computing With zEnterprise Delivers Breakthrough Economics

Platforms Optimized For
Different Workloads



Best fit for workload

Consistent Structured
Management



Consistent structured practices

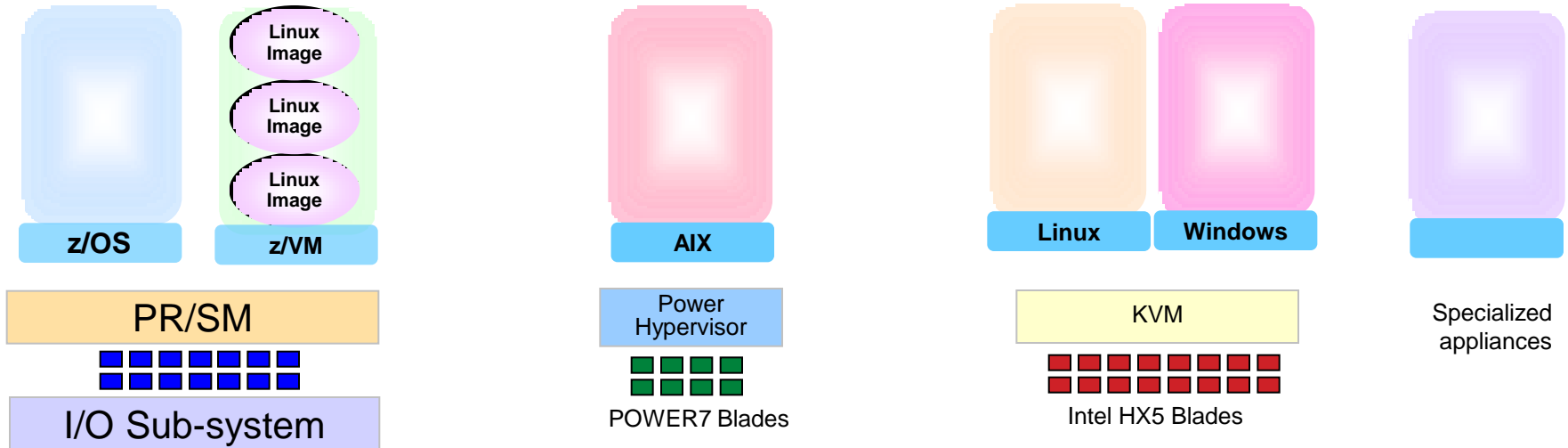
**Lowest Cost Of
Acquisition Per
Workload**



**Lowest Cost Of
Operation Per
Workload**

Lowest Cost Per Workload

zEnterprise 114 – Environments Optimized For Different Workloads



- Scales to 14 cores in a frame (Up to 10 IFLs or 5 GPs + 5 specialty)
- Parallel Sysplex
- Dedicated I/O Sub System
- Superior qualities of service

- Scales to 8 cores per blade
- Fast processing threads
- Floating point accelerators

- Scales to 16 cores per blade
- Commodity I/O
- Lower qualities of service

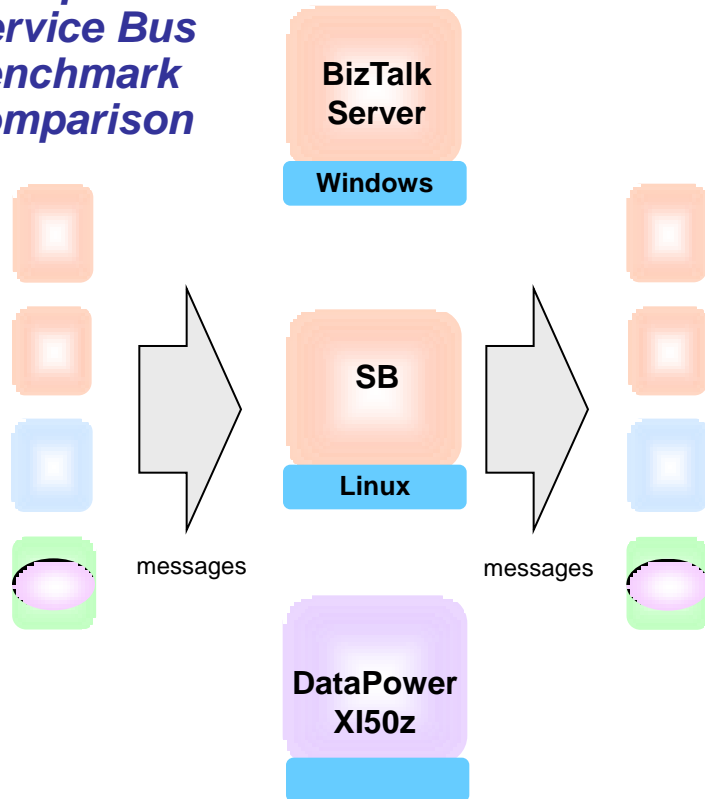
← Structured Management →

zEnterprise Workload Optimizations

- **Optimizations to deliver lowest cost per workload for**
 - **Service Oriented Architecture workloads**
 - **Web processing front-ends**
 - **Transactional core workloads**
 - **Private clouds**

Optimized For SOA Environments

Enterprise Service Bus benchmark comparison



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

DataPower
XI50z in zBX

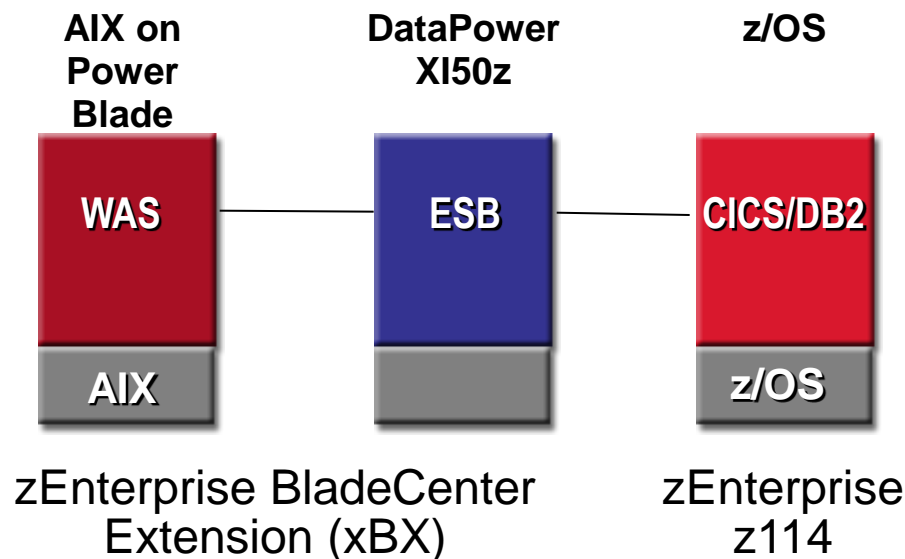
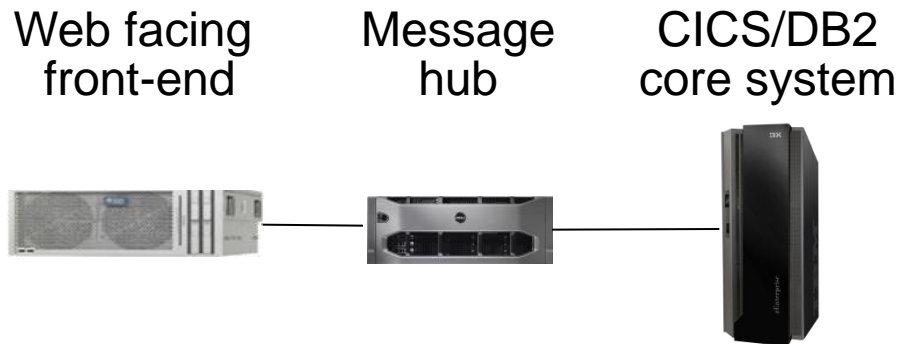
HS 22, 8 cores

5,117 messages per sec
\$33 per mps

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

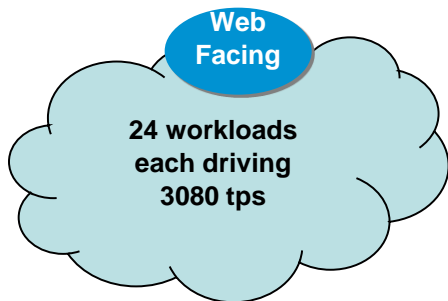


- Extends mission critical quality of service to hybrid environments
- Virtualization for workload isolation
- Run as ensemble of virtual servers
- Unified management of virtual machines
- Manage ensemble as a single workload with service goals
- Assign best fit to Power blade for lowest cost per workload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

Web Front-Ends Cost 59% Less On zEnterprise



24 mission critical web facing applications



High availability
Workload isolation

Competitive Packaged System

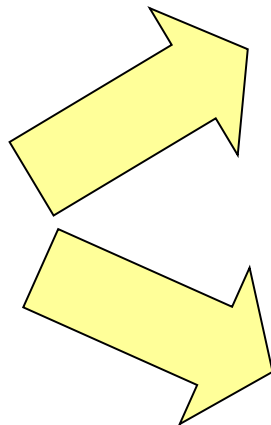
24 Sun Fire X4170 M2
12-core Xeon servers
in ¾ rack
2 HP DL380 servers
(for ESB)
312 cores total



Competitive system relies on physical workload isolation

Sun Fire Servers

\$433K
Per workload
3yr TCA
Front-end
HW+SW



WebSphere App Server

24 POWER7
8-core blades
2 DataPower XI50z
in zBX
192 cores total



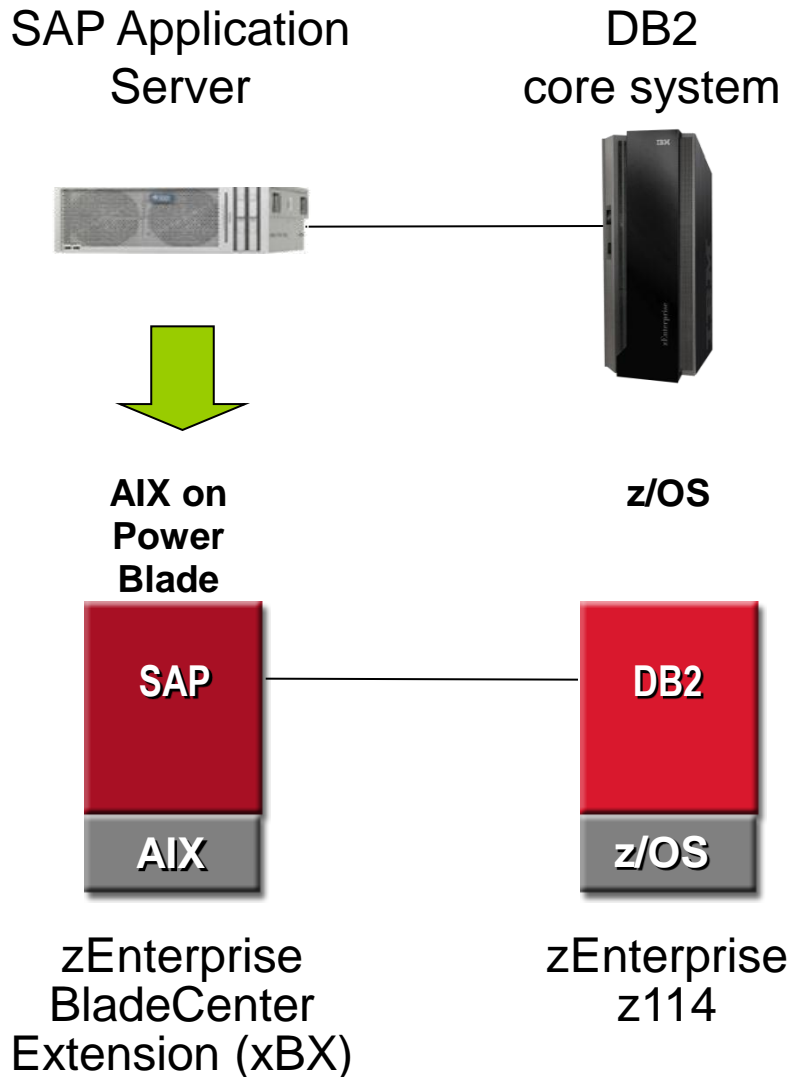
Power Blades in zBX

\$177K
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.



Collapse SAP Front-End Applications Onto zEnterprise Platform

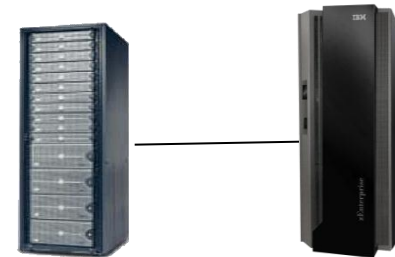


- Run as ensemble of virtual servers
- Unified management of virtual machines
- Manage ensemble as a single workload with service goals
- Assign best fit to Power blade for lowest cost per workload
- Embedded pre-configured data network

SAP Applications Cost 20% Less On zEnterprise

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

38 SPARC T3-1B blades in SUN rack
608 cores total



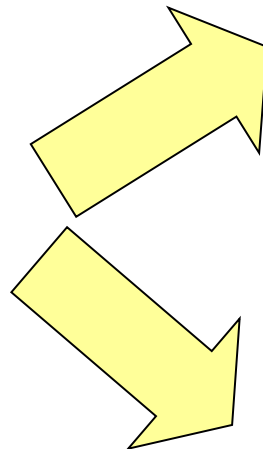
T3-1B

Upgrade to new SPARC T3 hardware

\$60K
Per workload
3yr TCA
Front-end infrastructure



20 SPARC T5440
32 core servers
538,120 total SAPs
640 cores total



23 POWER7 blades in zBX
184 cores total



zBX

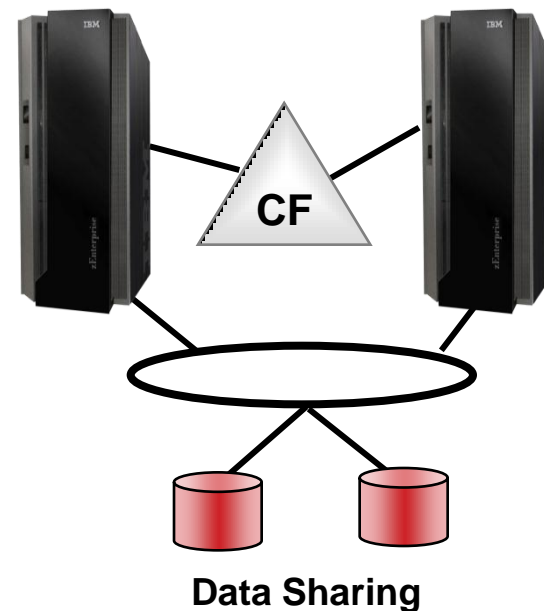
Power Blades in zBX

\$49K
Per workload
3yr TCA
Front-end infrastructure

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.

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



Moving Transaction Processing Workloads Off z/OS Rarely Reduces Cost

Typical Eagle TCO Study For A Financial Services Customer

System z Sysplex



2,760 MIPS

- Hardware: \$1,408,185
- Software: \$49,687,845
- Labor: Baseline
- Power and cooling: \$31,339
- Space: \$79,385
- Disaster recovery: \$1,250,000
- Total: **\$52,456,754** 5yr TCO

4 HP Proliant DL 980 G7 servers



256 cores total

- Hardware: \$1,594,801
- Software: \$80,617,966
- Labor: \$8,250,000 (additional)
- Power and cooling: \$43,756
- Space: \$79,385
- Disaster Recovery: \$4,210,728
- Migration Labor: \$24,000,000
- Parallel Mainframe costs: \$31,474,052
- Total: **\$150,270,688** 5yr TCO

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



Cost of IT service per business unit produced

Industry	Measure	Avg IT Cost of		MF Biased	Server Biased	%Improve
		Goods				
Airlines	Per Passenger Mile	\$ 0.007	\$ 0.0061	\$ 0.0076	-20%	
Automotive	Per Vehicle	\$ 333	\$ 275	\$ 370	-26%	
Chemicals	Per Patent	\$ 57,717	\$ 55,800	\$ 59,552	-6%	
Consulting	Per Consultant	\$ 53,060	\$ 48,900	\$ 62,344	-22%	
Hospitals	Per Bed per Day	\$ 64.30	\$ 54.4000	\$ 71.7000	-24%	
Railroads	Per Ton Mile	\$ 0.0014	\$ 0.0012	\$ 0.0018	-29%	
Retail	Per Store (Door)	\$ 494,818	\$ 421,346	\$ 560,300	-25%	
Web Sites	Per Search	\$ 0.042	\$ 0.046	\$ 0.041	12%	
Trucking	Per Road Mile	\$ 0.177	\$ 0.1550	\$ 0.1940	-20%	
Armed Service	Per Person	\$ 8,036.00	\$ 6,871.00	\$ 9,839	-30%	
Utilities	Per MegaWatt Hour	\$ 2.63	\$ 2.21	\$ 2.94	-25%	
Oil & Gas	Per Barrel of Oil	\$ 2.10	\$ 1.78	\$ 2.32	-23%	

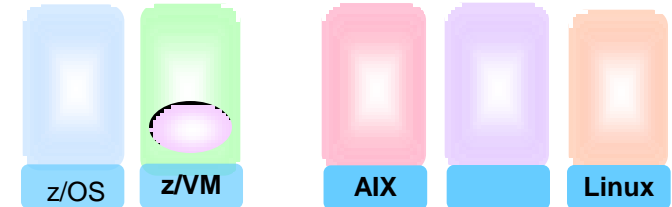
Companies with mainframe-biased IT have an average of 19.8% lower IT cost per business product

Source: Rubin Worldwide, July 2010



Optimized For Private Clouds

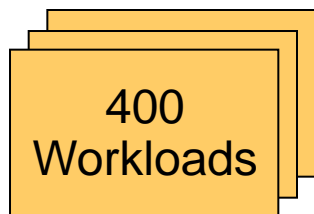
- Large scale virtualization
 - ▶ Elastic growth
 - ▶ Workload management
- Fit for purpose strategy
 - ▶ Multi-architecture minimizes migration costs
 - ▶ Assign workloads to best fit environment
- Integrated Service Management
 - ▶ zManager
 - ▶ Tivoli Application Management for zEnterprise
 - ▶ Tivoli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



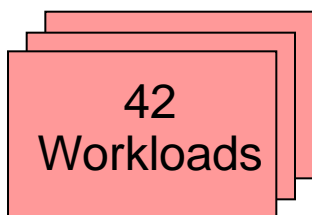
Public vs. Private Cloud: Which Costs Less For Delivering Mixed Workloads?

Which option provides the lowest TCO over 3 years?

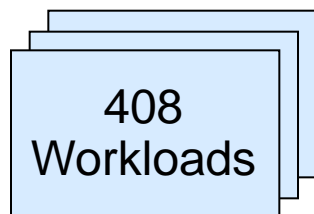
Light Intel workloads



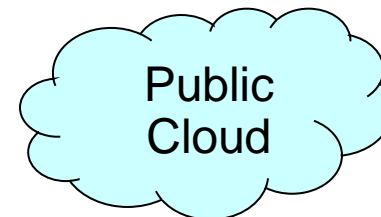
Heavy Unix workloads



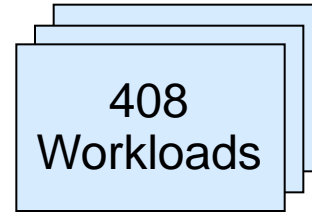
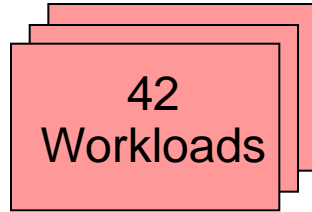
Light workloads with heavy I/O



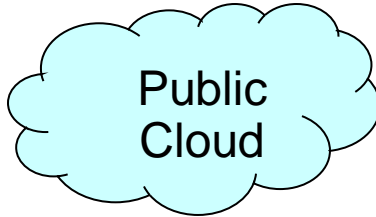
850 workloads



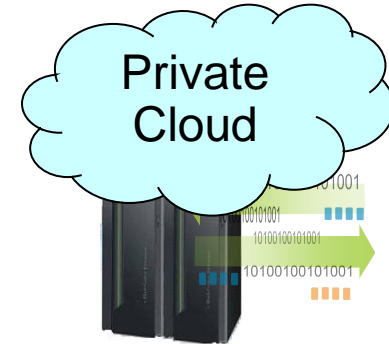
Compare Cost Of Acquisition For 3 Years



Deployed on public cloud



Optimized on zEnterprise



**850
Compute
Instances**

\$56.2M TCA (3 years)

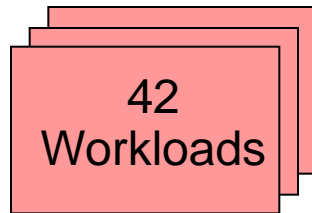
zEnterprise (z196)

32 IFL's, 7 Intel blades, 13 Power blades
192 cores

\$10.8M TCA (3 years)

81% less

Compare Labor Costs For 3 Years



Deployed on public cloud

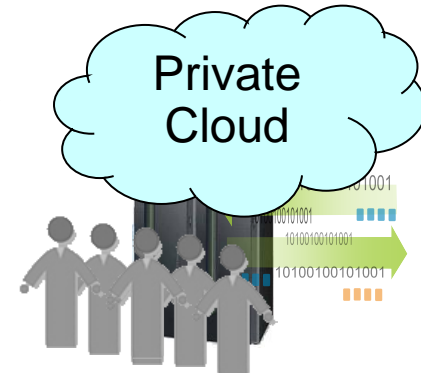


23,929 labor hours/yr
11.5 administrators

\$5.51M

3 years @ \$159,600/yr

Optimized on zEnterprise



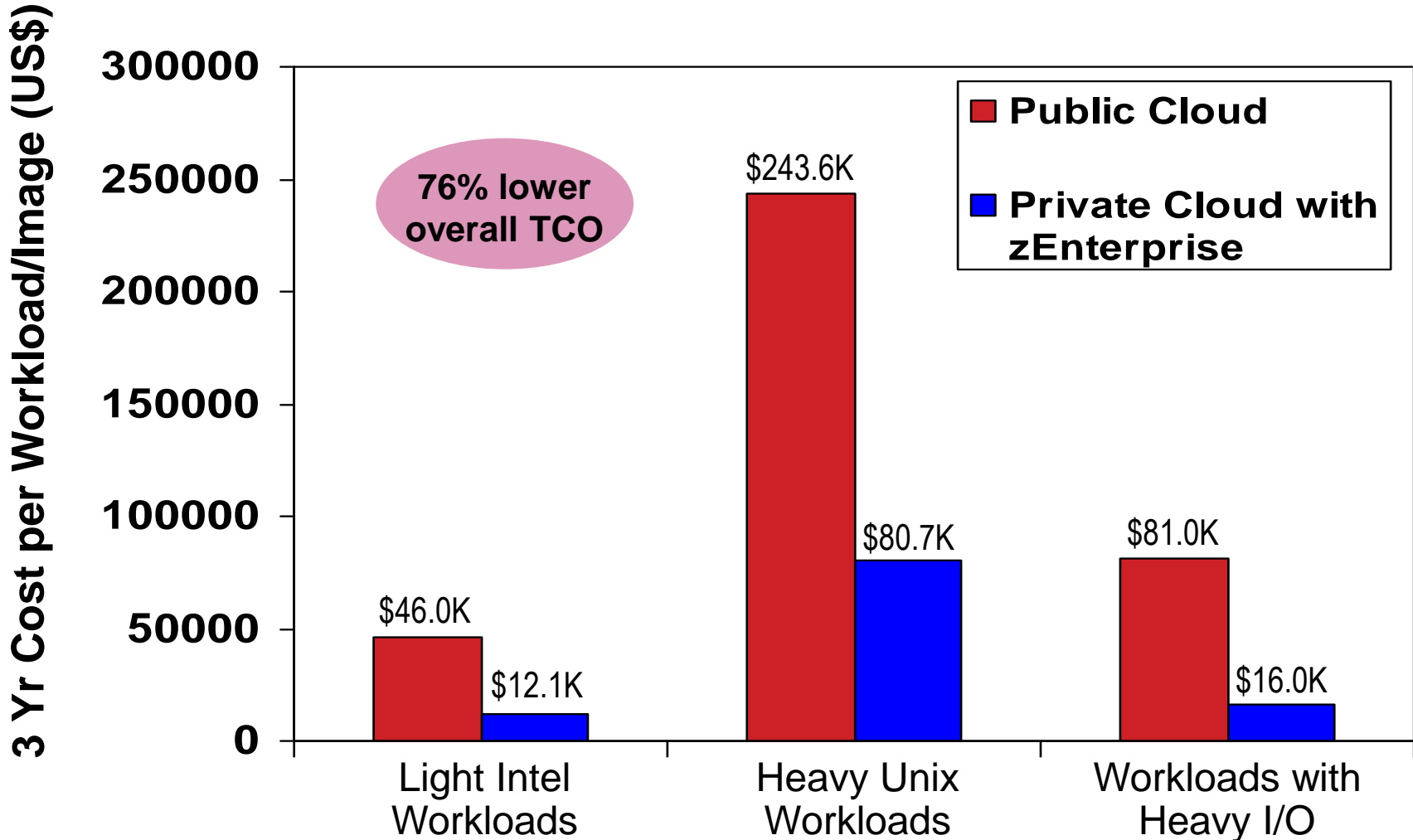
17,470 labor hours/yr
8.4 administrators

\$4.02M

3 years @ \$159,600/yr

27% less

Private Cloud On zEnterprise Dramatically Reduces Costs



Source: IBM internal study. zEnterprise configurations needed to support the three workload types were derived from IBM benchmarks. 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.

Financial Charge Back May Not Be Optimized For Accuracy

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

Which system
costs less for
future
growth?

Calculate
cost per
workload

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 **SHARE**
in Orlando
2011

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

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

A Note On Support Staff Annual Costs

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**

\$0.79 per claim

\$0.12 per claim

Mainframe support staff has 6.6x better productivity

IBM System z CICS/DB2



Total MIPS 11,302

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

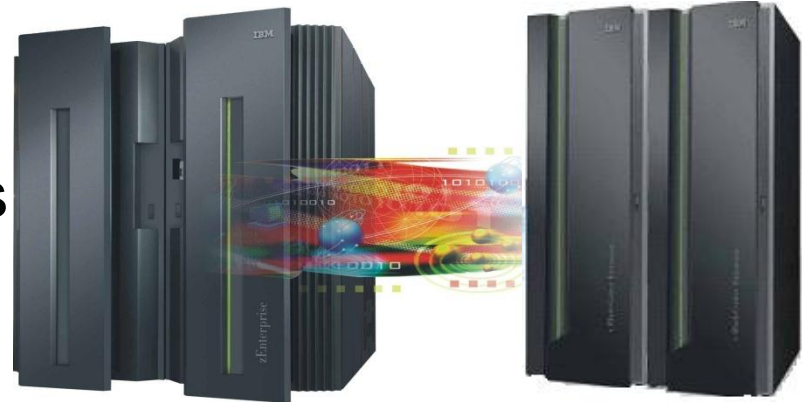
Claims per year **4,056,000**

zEnterprise Economics

- **Optimizations to deliver lowest cost per workload for**
 - **Service Oriented Architecture workloads**
 - **Web processing front-ends**
 - **Transactional core workloads**
 - **Private clouds**
- **Charge back accounting must report accurate costs per workload**

Summary

- Cost per workload is the key metric for the new 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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