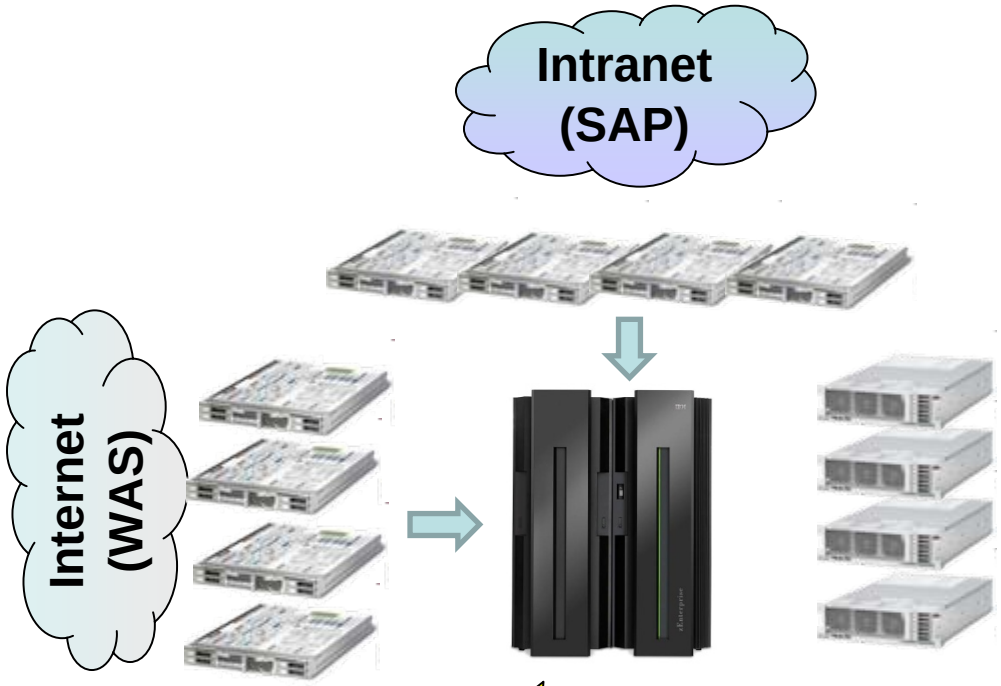
zEnterprise – The Ideal Platform For Smarter Computing

Consolidating Server Infrastructure

Address Sprawl With zEnterprise Multi-Architecture Environment



SPRAWL!

Standalone

Platforms Optimized for Different Workloads

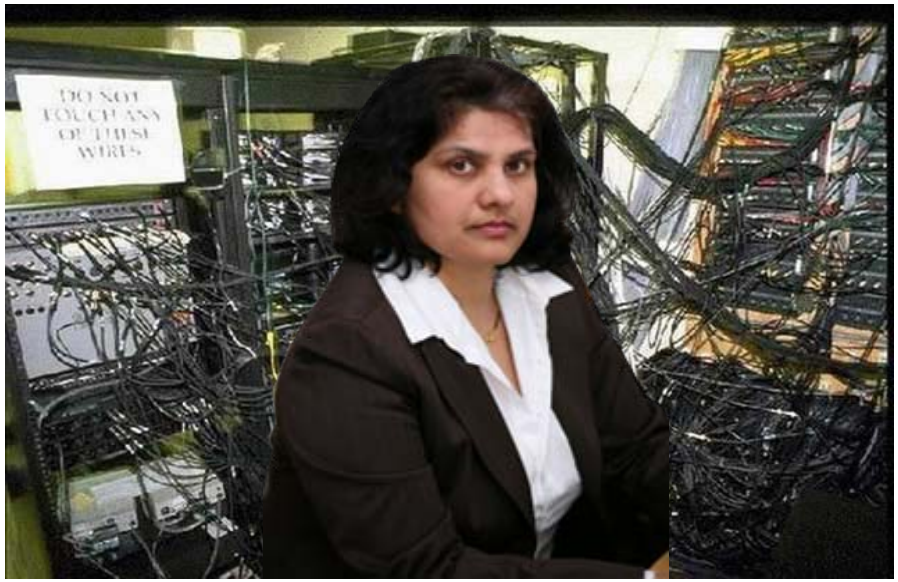
z/OS | Linux on System z | AIX | Linux on System x | Windows | XI50z

Best Fit for Workload

Consolidate with zEnterprise!

Simplifying Hardware Infrastructure Dramatically Reduces The Cost Per Workload

Our front end infrastructure is too complex…

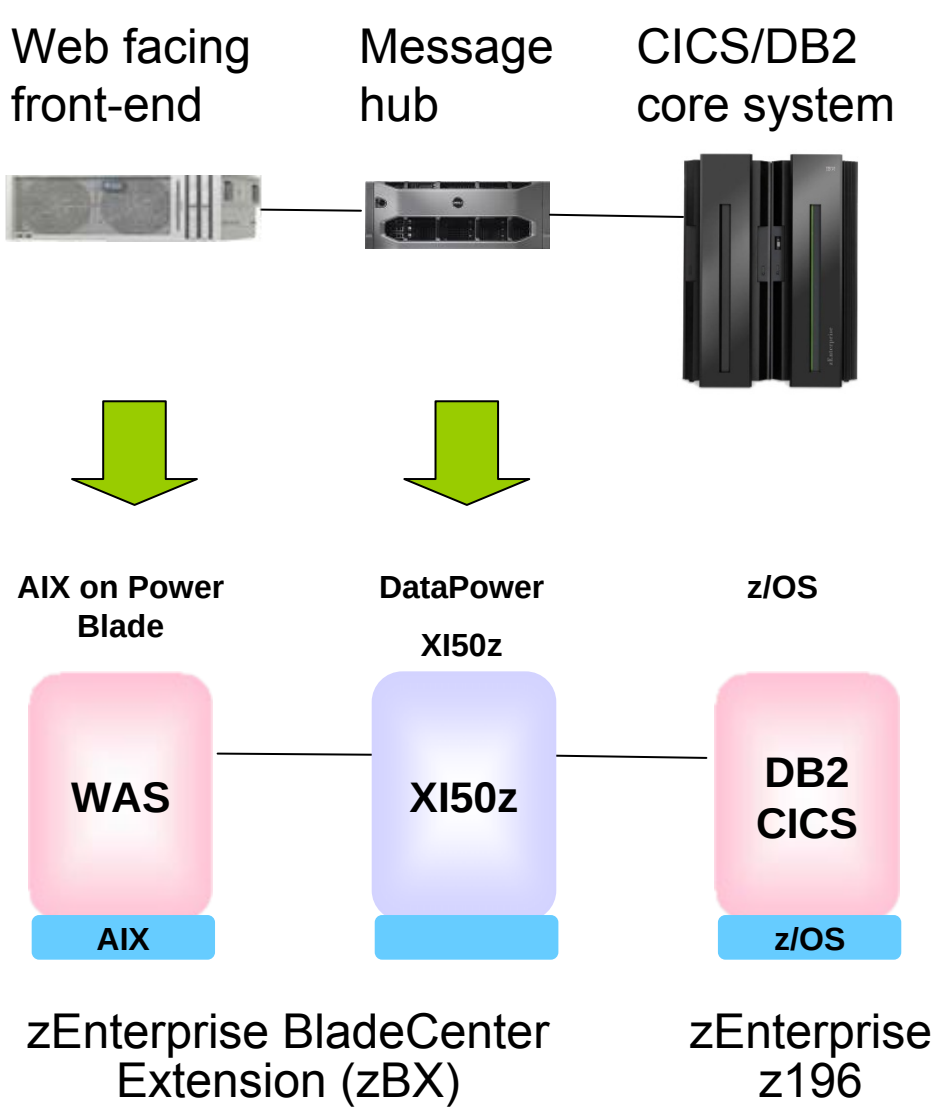


CIO

You can simplify by consolidating everything onto a single platform!

IBM

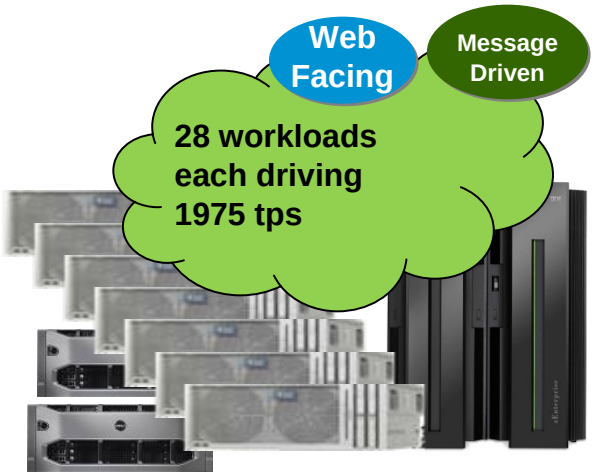
Collapse Web Front End Workloads On To zEnterprise Platform



- Run as ensemble of virtual servers
- Unified management of virtual machines
- Manage ensemble as a single workload with service goals
- Dynamic adjustment of CPU resources drives 10% higher utilization
- Assign best fit to Power blade and XI50z for lowest cost per workload
- Embedded pre-configured data network

Web Front Ends Cost 58% Less On zEnterprise

28 front end WebSphere applications



Competitive App Server
57 SPARC T3-1B blades in SUN racks
2 HP DL380 servers (for ESB)
936 cores total

Deploy on new SPARC T3 hardware

$11.7M
3yr TCA HW+SW

WebSphere App Server
28 POWER7 blades
2 DataPower XI50z in zBX
240 cores total

Power Blades in zBX

$4.9M
3yr TCA HW+SW

Web Front Ends Cost 58% Less On zEnterprise

Competitive App Server
57 SPARC T3-1B blades
in SUN racks
2 HP DL380 servers
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936 cores total

Deploy on new SPARC T3 hardware

$11.7M
3yr TCA HW+SW

WebSphere App Server
28 POWER7 blades
2 DataPower XI50z
in zBX
224 cores total

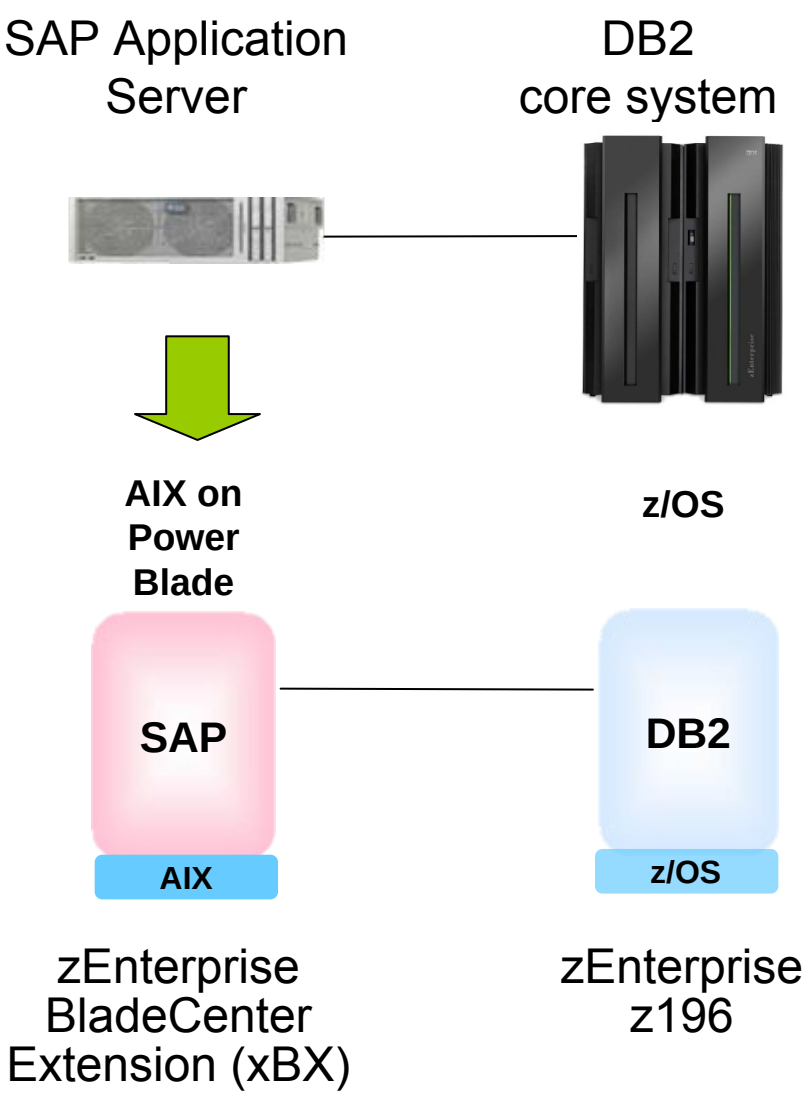
Power Blades in zBX

$4.9M
3yr TCA HW+SW

Why?

- WAS on PS701 delivers 1.84x processing capacity
  - Competitive Application Server cannot effectively utilize the threads available in T3 blade
- DataPower better price/performance
- Need to over provision SPARC T3 since no zManager

Collapse SAP Front End Applications On To zEnterprise Platform



- Run as ensemble of virtual servers
- Unified management of virtual machines
- Manage ensemble as a single workload with service goals
- Dynamic adjustment of CPU resources drives 10% higher utilization
- 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

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

Deploy on new SPARC T3 hardware

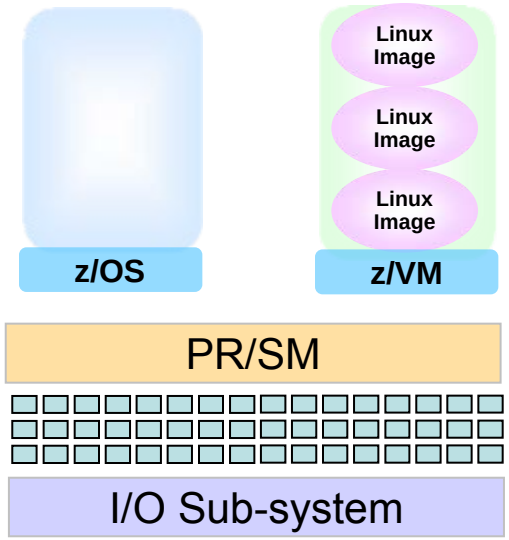
$1.2M
3yr TCA HW+SW

23 POWER7 blades in zBX
184 cores total

Power Blades in zBX

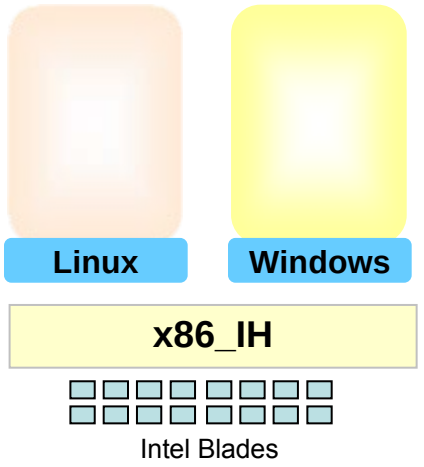
$0.97M
3yr TCA HW+SW

zEnterprise - Environments Optimized For Different Workloads



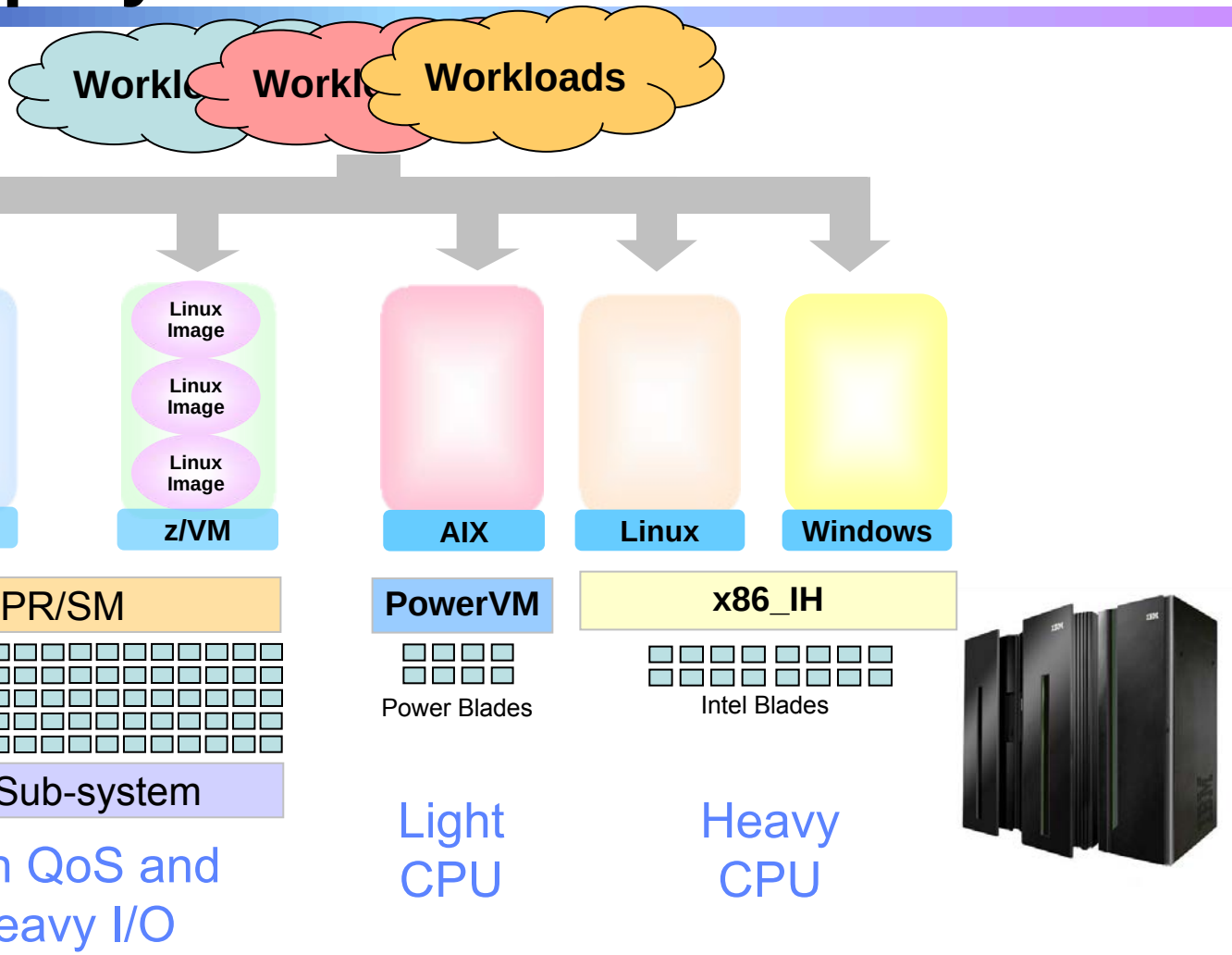
- Scale up to 80 cores in a frame (z/OS clusters with sysplex)
- Dedicated I/O Sub System
- Superior qualities of service

- Scales to 8 cores per blade
- 4 fast processing threads per core
- Floating point accelerators



- Scales to 16 cores per blade
- 2 Fast processing threads per core
- Commodity I/O
- Modest qualities of service

Workload Characteristics Influence The Optimal Deployment Decision



Deploy or consolidate workloads on the environment best suited for each workload to yield lowest cost

Deploying Workloads With Heavy I/O Requirements

Benchmark to determine which platform provides the lowest TCA over 3 years

Workloads

- **IBM WebSphere ND**
- **Monitoring software**
- **On 4 core "Older" Intel**

Online banking workloads, each driving **22** transactions per second, with **1 MB I/O per transaction**

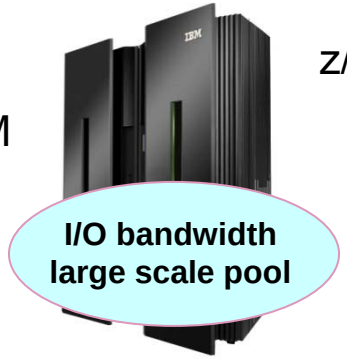
1 workloads per Intel blade

Virtualized on Intel
16 core HX5 Blade
$380,046 per workload

1 workloads per POWER7 blade

PowerVM on PS701
8 core POWER7 Blade
$204,036 per workload

40 workloads per 32-way z/VM



z/VM on zEnterprise CPC
32 IFLs
$84,985 per workload

Consolidation ratios derived from IBM internal studies. HX5 2.13GHz 2ch/16co performance projected from x3550 2.66GHz 2ch/12co measurements. zBX with x blades is a statement of direction only. Results may vary based on customer workload profiles/characteristics. Prices will vary by country.

Deploying Large CPU Intensive Workloads

Benchmark to determine which platform provides the lowest TCA over 3 years

Workloads

- **IBM WebSphere ND**
- **Monitoring software**
- **On 8 core Nehalem servers**

Online banking workloads, each driving **460** transactions per second with light I/O

2 workloads per Intel blade

Scale to 16 cores

Virtualized on Intel 16 core HX5 Blade

$190,023 per workload

1 workloads per POWER7 blade

PowerVM on PS701 8 core POWER7 Blade

$204,036 per workload

10 workloads per 32-way z/VM

z/VM on zEnterprise CPC 32 IFLs

$339,939 per workload

Consolidation ratios derived from IBM internal studies. HX5 2.13GHz 2ch/16co performance projected from x3550 2.66GHz 2ch/12co measurements. zBX with x blades is a statement of direction only. Results may vary based on customer workload profiles/characteristics. Prices will vary by country.

Deploying Workloads With Light CPU Requirements

Benchmark to determine which platform provides the lowest TCA over 3 years

Workloads

- **IBM WebSphere ND**
- **Monitoring software**
- **On 4 core "Older" Intel**

Online banking workloads, each driving **22** transactions per second with light I/O

47 workloads per Intel blade

Virtualized on Intel 16 core HX5 Blade **$8,086** per workload

28 workloads per POWER7 blade

Fast low cost threads

PowerVM on PS701 8 core POWER7 Blade **$7,287** per workload

155 workloads per 32-way z/VM

z/VM on zEnterprise CPC 32 IFLs **$21,932** per workload

Consolidation ratios derived from IBM internal studies. HX5 2.13GHz 2ch/16co performance projected from x3550 2.66GHz 2ch/12co measurements. zBX with x blades is a statement of direction only. Results may vary based on customer workload profiles/characteristics. Prices will vary by country.

Case Study – Consolidate 880 Standalone Workloads On zEnterprise

- Distributed workload profile is a mix of
  - **784 light weight**
  - **56 heavy weight (cpu intensive)**
  - **40 heavy I/O**

- What is the most cost effective way to consolidate/deploy all these workloads?

Sun Fire X4470

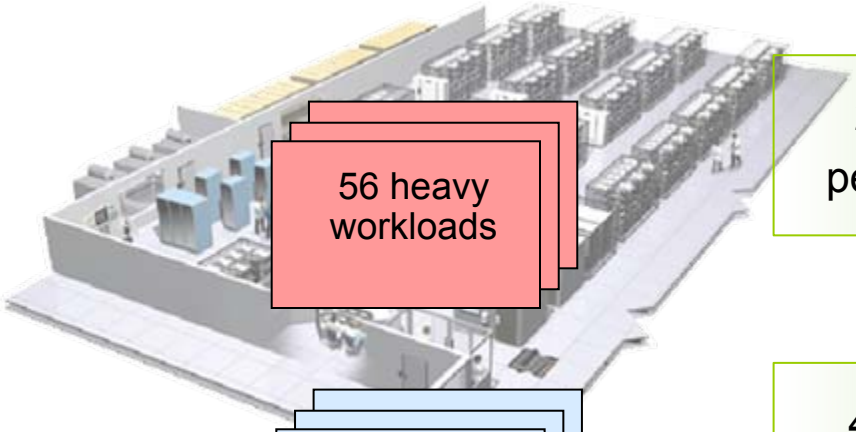
zEnterprise

What Does It Cost To Deploy 880 Workloads On zEnterprise?

784 light workloads

28 workloads per POWER7 blade

28 IBM POWER7 blades in 1 zBX



56 heavy workloads

2 workloads per HX5 blade

28 IBM HX5 Blades in same zBX

40 heavy I/O workloads

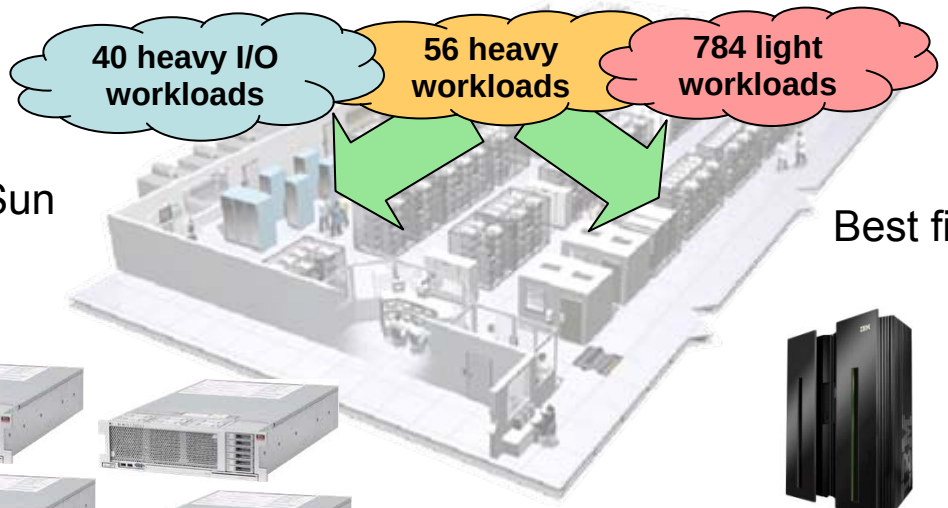
40 workloads per 32 IFLs

1 zEnterprise CPCs 32 IFLs

Best fit assignments

Server configurations are based on consolidation ratios derived from IBM internal studies. Projected Sun Fire X4470 2.0GHz 2ch/16co from x3550 2.66GHz 2ch/12co measurements. Prices are in US currency, prices will vary by country

Standalone Workloads Cost 48% Less On zEnterprise



Deployed on Sun Fire X4470

95 Sun Fire Servers

1140 cores

$37.8 TCA (3 years)

Best fit on zEnterprise

z196

32 IFLs

56 Blades

672 cores

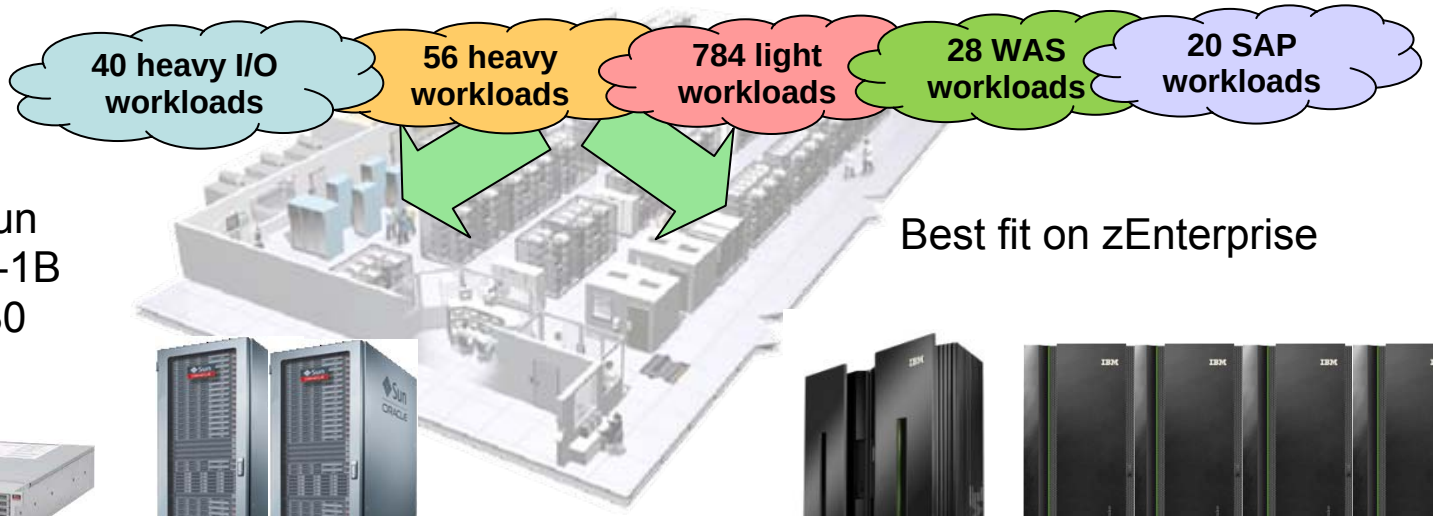
$19.8M TCA (3 years)

48% less

Server configurations are based on consolidation ratios derived from IBM internal studies. Projected Sun Fire X4470 2.0GHz 2ch/16co from x3550 2.66GHz 2ch/12co measurements. Prices are in US currency, prices will vary by country

Deploying the hybrid and standalone workloads on zEnterprise saves a lot!

Compare Server Cost Of Acquisition



Deployed on Sun Fire X4470 + T3-1B Blades + DL380

95 Sun Fire
1,140 cores

192 Servers
2,684 cores

$40.7 TCA (3 years)

95 T3-1B
1,520 cores

2 DL380
24 cores

Best fit on zEnterprise

z196
32 IFLs

109 Blades
1,096 cores

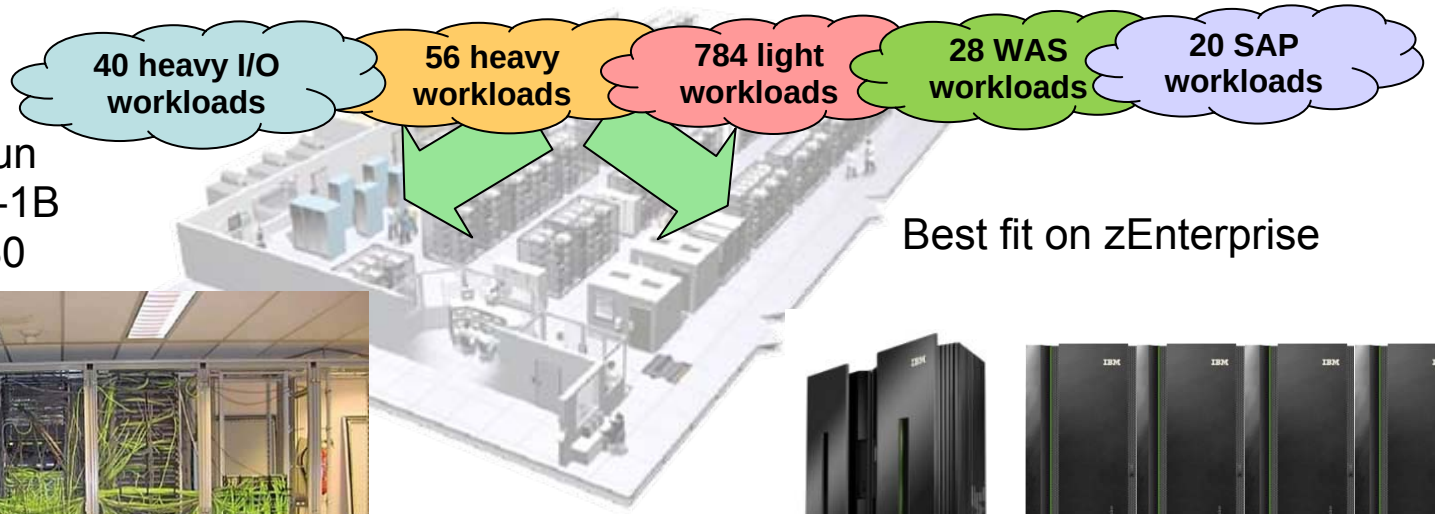
110 Servers
1,128 cores

$25.7M TCA (3 years)

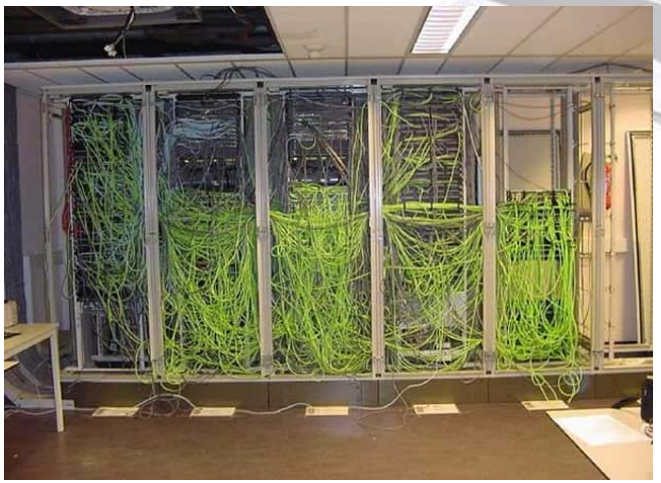
Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency, prices will vary by country

37% less

Compare Network Cost of Acquisition



Deployed on Sun Fire X4470 + T3-1B Blades + DL380



Additional network parts
- 23 switches
- 506 cables
- 420 adapters

949 total network parts

$0.35M

Best fit on zEnterprise

Additional network parts
- 1 switch
- 10 cables
- 10 adapters

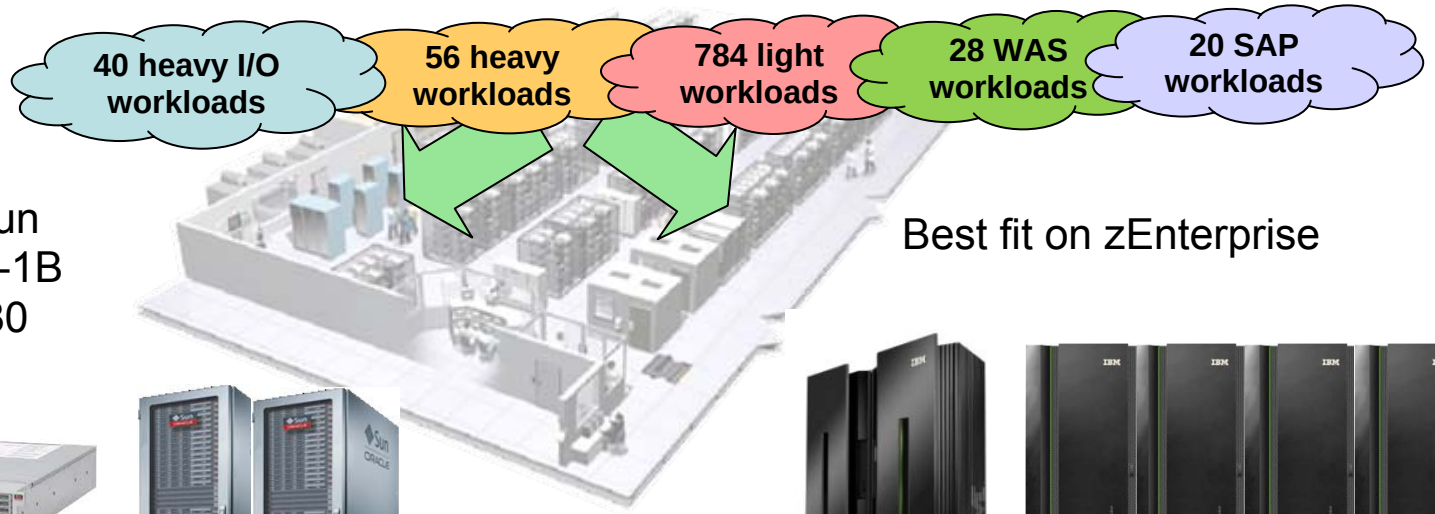
21 total network parts

$0.03M

87% less

Network configuration is based on IBM internal studies.
Prices are in US currency, prices will vary by country

Compare Power Consumption



Deployed on Sun Fire X4470 + T3-1B Blades + DL380

192 Servers
2,684 Cores
128.6 kW
$0.47M
3 years @ $0.10 per kWh

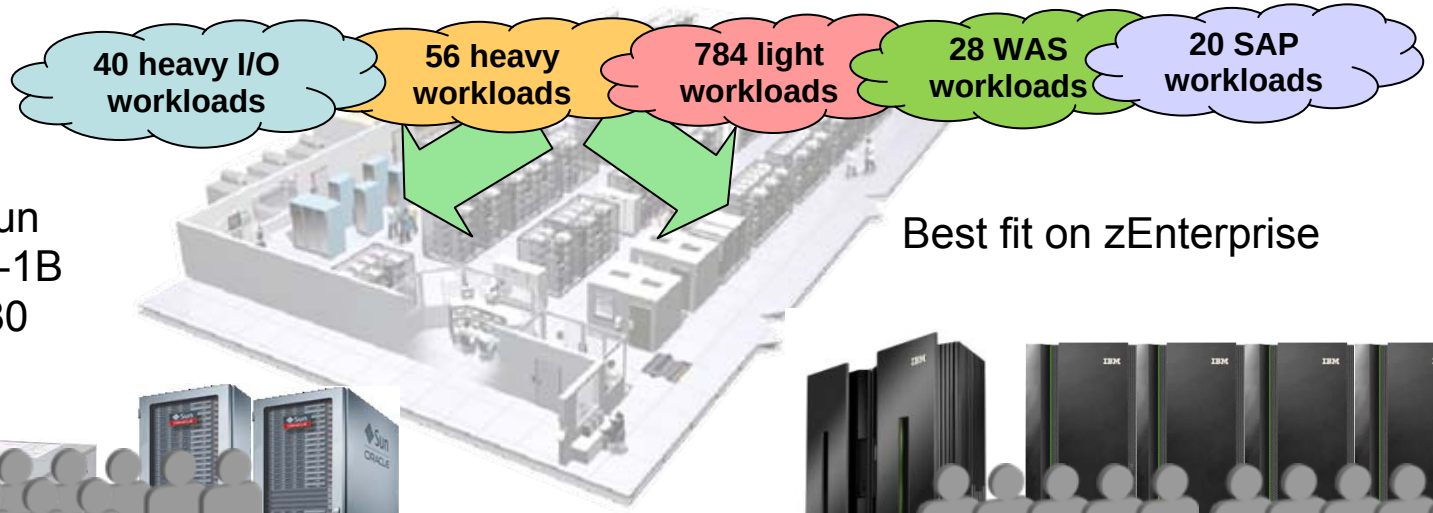
Best fit on zEnterprise

110 Servers
1,128 Cores
48.3 kW
$0.21M
3 years @ $0.10 per kWh

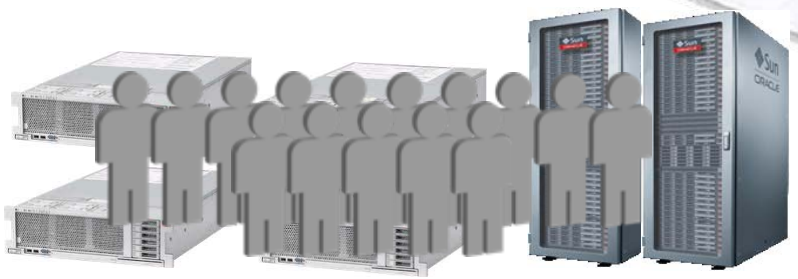
Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency, prices will vary by country

55% less

Compare Server Infrastructure Labor Costs



Deployed on Sun Fire X4470 + T3-1B Blades + DL380



36,880 labor hours/yr

17.73 administrators

$8.49M

3 years @ $159,000/yr

Best fit on zEnterprise

26,529 labor hours/yr

12.76 administrators

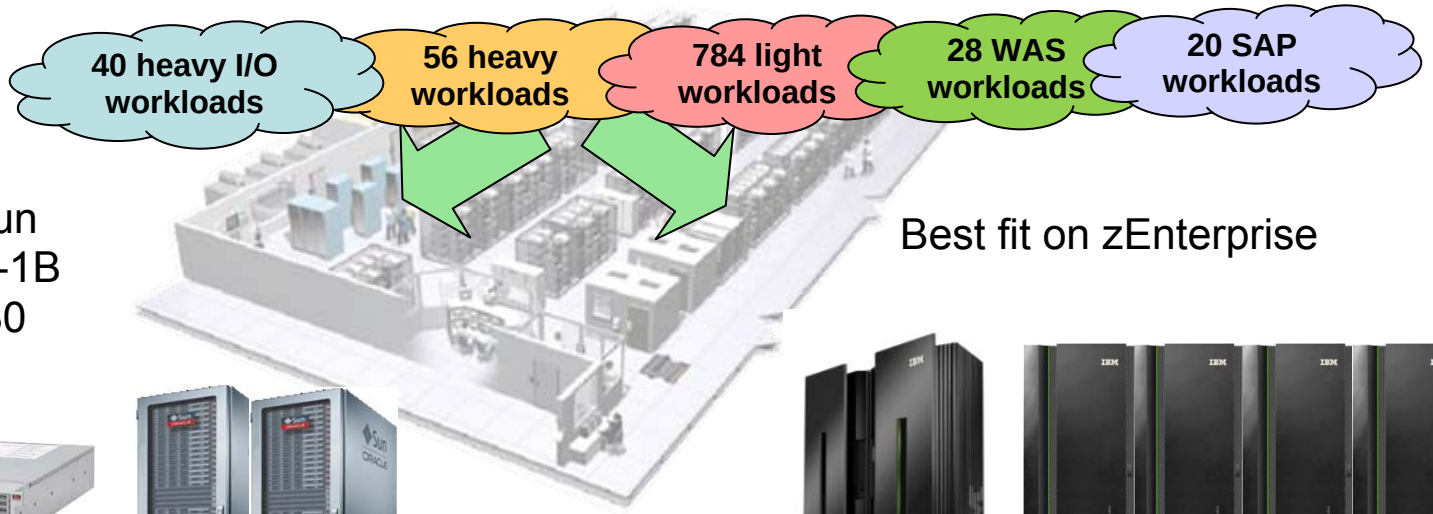
$6.11M

3 years @ $159,000/yr

28% less

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

Compare Total Cost Of Ownership



Deployed on Sun Fire X4470 + T3-1B Blades + DL380

192 Servers
2,684 Cores

$47.11M TCO (3 years)

Best fit on zEnterprise

110 Servers
1,128 Cores

$26.15M TCO (3 years)

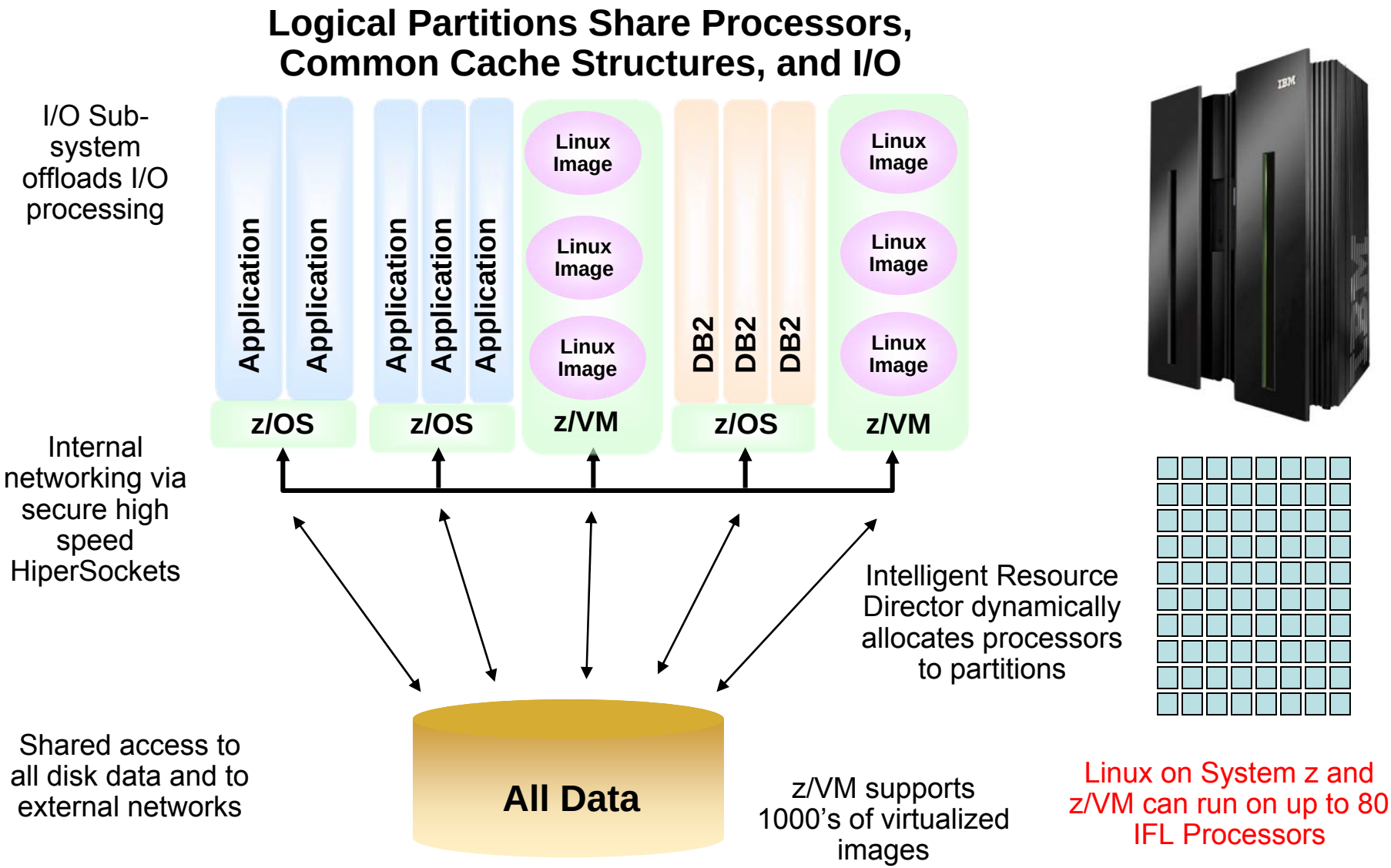
Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency, prices will vary by country

44% less

Linux On z196 Achieves Lowest TCA For Heavy Processing And I/O Workloads

- Larger scale of shared processor pools (32 cores vs. 16 cores)
- Statistical benefit of sharing a larger pool of processors
- Software priced per core
- Cost benefit of Enterprise Linux Server Solution Edition pricing
- Dedicated I/O Sub-system offloads I/O processing
- Greater I/O bandwidth
- Virtualization of I/O processing resources
- Rock solid security

z196 Is Designed For Large Scale Virtualization And Consolidation



z/VM On System z – Optimized For Large Scale Virtualization

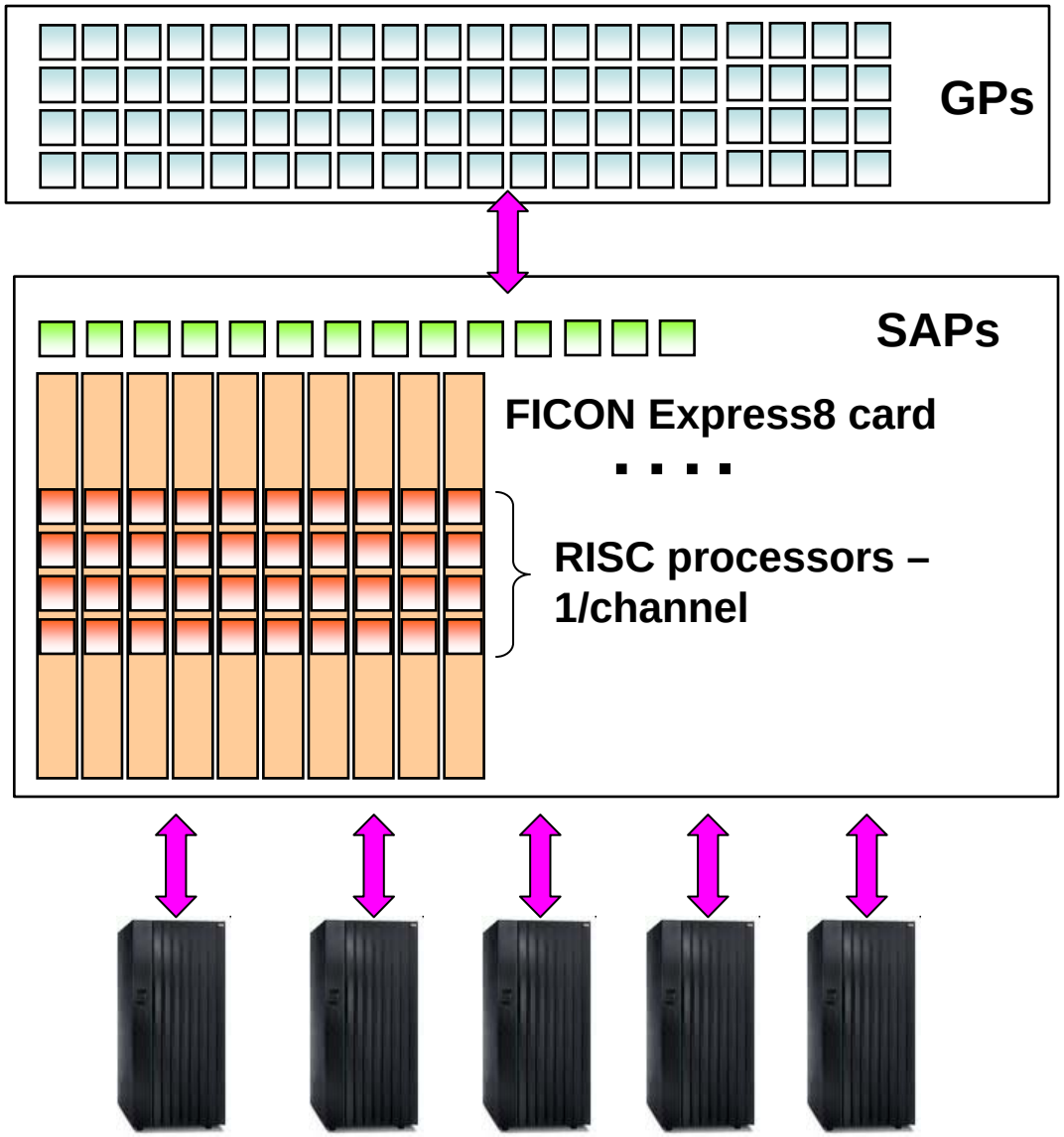
- Large scale virtualization yields pooling benefits
  - Shared processor pool
  - Lower headroom requirement to accommodate variations in workload demand
- On System z, up to 32 IFL processor cores can be supported by a single z/VM LPAR
  - Large scale virtualization platform can support hundreds of virtual machines
- zBX blades are limited to 8-16 cores (currently)

System z Solution Editions For Linux Saves Lots Of $

Transforming the economics of large scale integration at a special packaged price!

- System z Solution Edition for Enterprise Linux
  - Integrated Facility for Linux (IFL) processors, memory and z/VM added to an existing mainframe
  - Hardware and software maintenance for three or five years
- Enterprise Linux Server
  - Standalone System zEnterprise server with IFLs, memory, I/O connectivity, and z/VM
  - Hardware and software maintenance for three or five years
- Linux on System z available from distribution partners
  - Novell SUSE and Red Hat

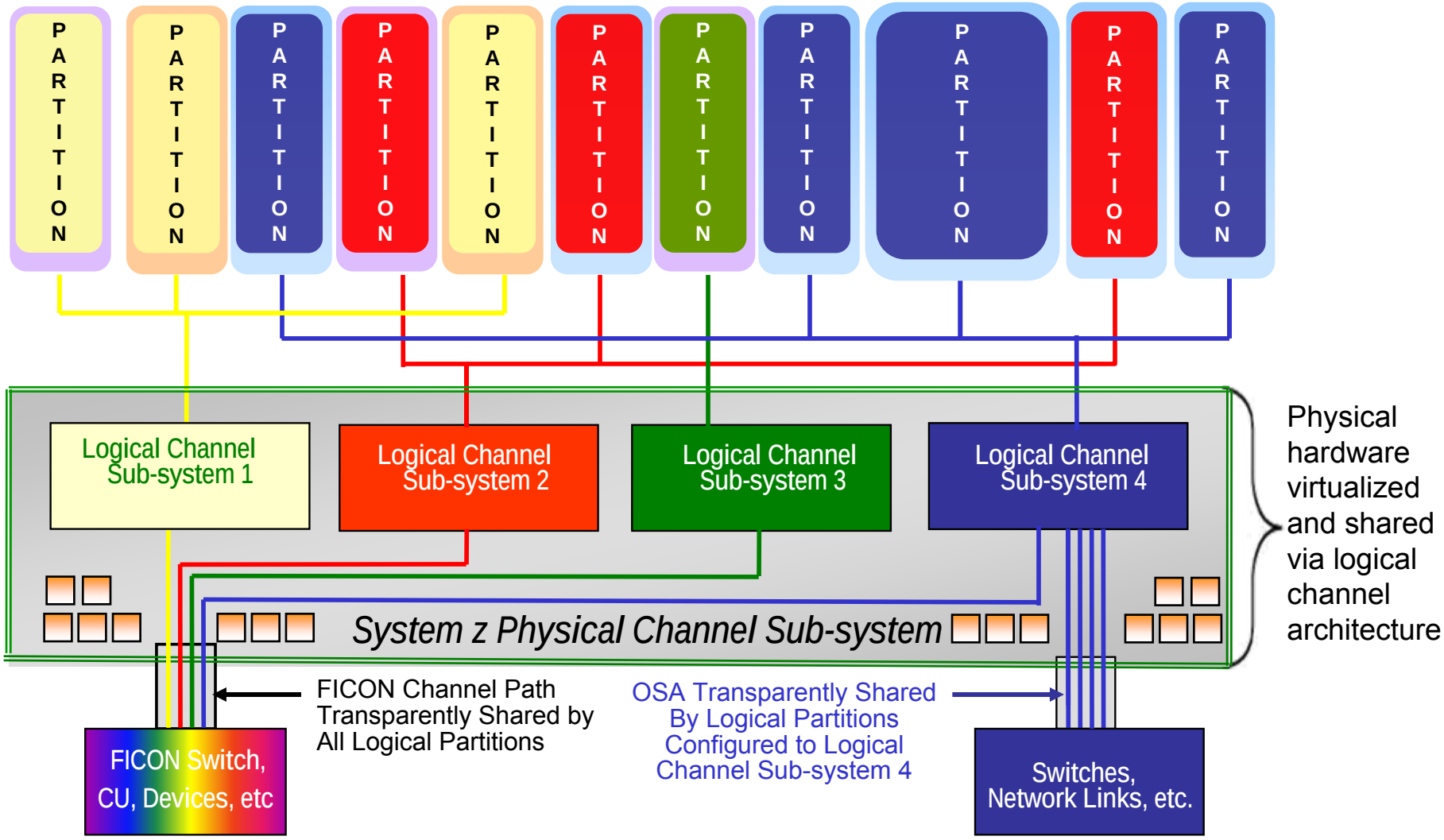
z196 – Optimized For High I/O Bandwidth



- Up to 80 General Purpose (GP) or Specialty Engine processors
  - Execute business logic
- Up to 14 System Assist Processors (SAP) to manage I/O requests
  - Can sustain up to **2.2M IOPS**[1]
- Logical Channel Sub-system virtualizes I/O
  - Up to 1024 logical channels
- Up to 84 physical FICON cards for I/O transfers
  - Up to **336 RISC channel I/O processors**
  - High Performance FICON connections (zHPF)
  - Add/Remove/Replace while system is running
- IBM DS8800 Storage System
  - Up to **440K IOPS capability** with zHPF
  - Easy Tier dynamically moves hot data from HDD to SSD drives
- Benefits both z/OS and z/VM workloads

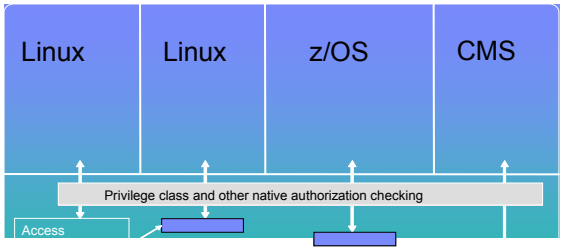
[1]Recommend 70% max SAP Utilization – 1.5M IOPS

Physical I/O Adapters And Channels Are Virtualized And Shared By The Consolidated Workloads



z/VM Security For Virtualization

- Operates without interference/harm from guest virtual machines
- Virtual machines cannot circumvent system security features
- Protects virtual machines from each other
- Ensures that a user only has access to resources specifically permitted
- Tracks who is accessing all system resources
- LPAR certified Common Criteria EAL5
- z/VM certified at Common Criteria EAL4+
- HiperSockets for highly secure internal networking
- Access to System z Crypto features
  - CPACF, CryptoExpress3

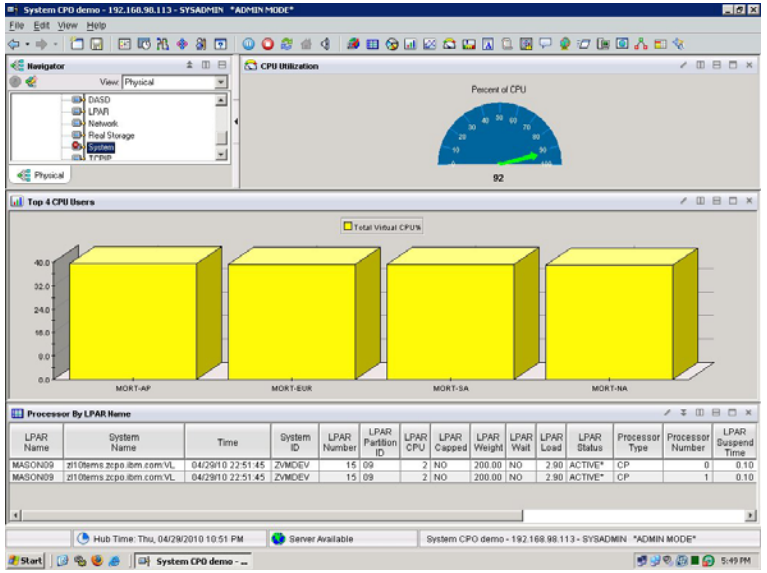


Linux On System z Workloads Inherit System z Qualities Of Service

- Reliability, availability, serviceability characteristics of System z
- Site failover for disaster recovery
- Capacity on demand upgrades
- Add physical processors to Linux environment without disruption

DEMO: Dynamically Add New Processor To z/VM LPAR To Handle Increased Risk Analysis Workload

1. A customer has in-house Risk Analysis program running on Linux on System z
2. Increased workload to all 4 Linux guests is causing z/VM LPAR utilization of 90%+
3. Customer determines this is a long term trend - additional physical capacity needed
4. New capacity made available to LPAR as new Logical CPU, available for work
   - Without disruption in service

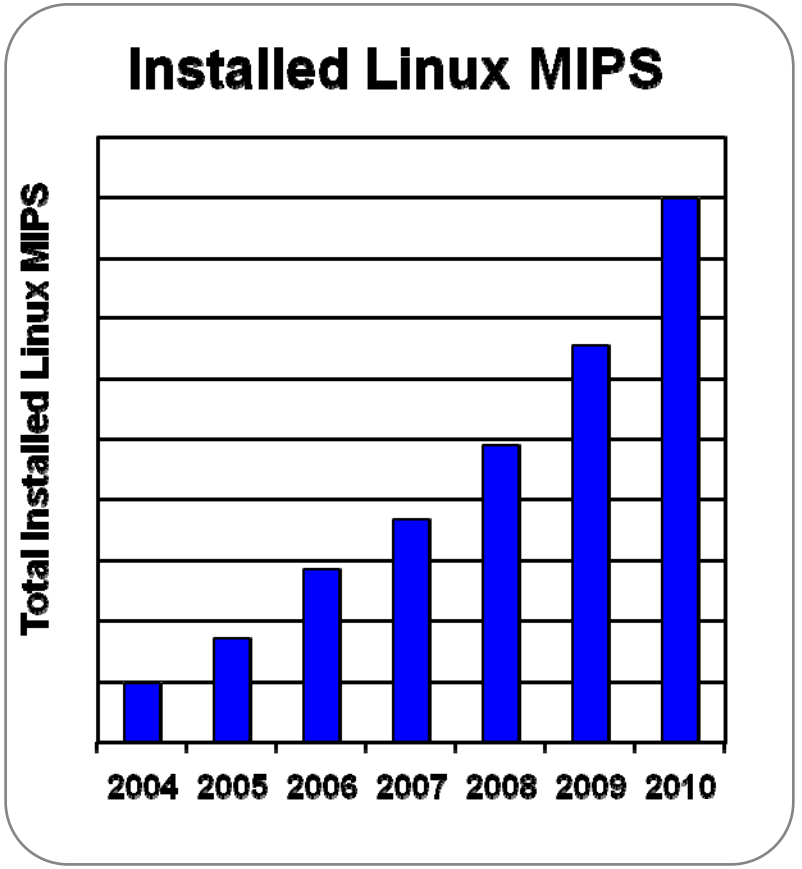


VMware can't recognize and take advantage of additional physical processors without bringing down and rebooting the system

Note: Assumes available processors on installed books

Client Adoption Drives Linux Success
Installed Linux MIPS At 45% CAGR[1]

- The momentum continues:
  - **Shipped IFL MIPS increased 84% from YE08 to YE10**
- Linux is 18% of the System z customer install base (MIPS)
- Over 80% of the top 100 System z clients are running Linux on the mainframe
- More than 3,100 applications available for Linux on System z



[1] Based on YE 2004 to YE 2010

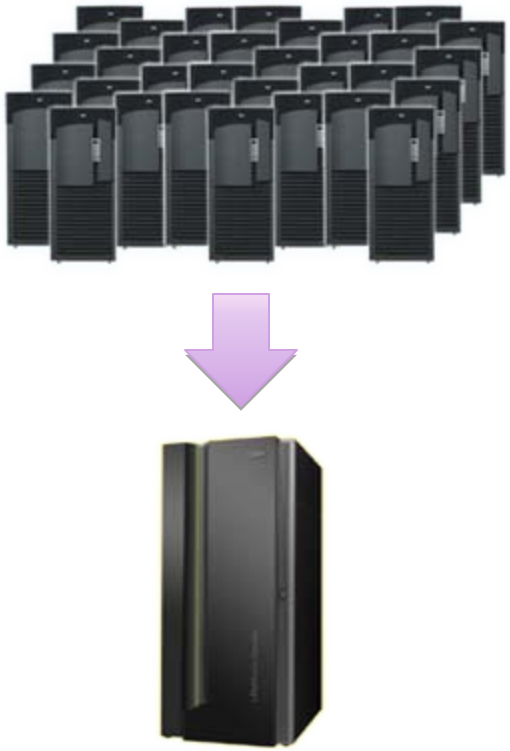
Blue Cross Blue Shield Of Minnesota Saves Up To 50% By Reducing Their Hardware Footprint

BlueCross BlueShield of Minnesota

- Lead time for server provisioning reduced to 99%
- IT deploys new Linux Virtual Servers for test and dev within 20 mins
- Not a single incidence of unplanned downtime or underperformance
- With Linux on IBM System z, BCBSM can achieve near-continuous availability by reducing the need for planned downtime

Business Problem:
The Microsoft Windows and Intel processor-based server landscape at Blue Cross and Blue Shield of Minnesota (BCBSM) was inflexible and costly to operate and maintain.

Solution:
- IBM consolidated 140 HP Intel-architecture servers to a single IBM System z with six Integrated Facility for Linux (IFL) engines.
- Key applications now run in SUSE Linux Enterprise virtual servers, while IBM DB2 databases run on z/OS on the same physical machine

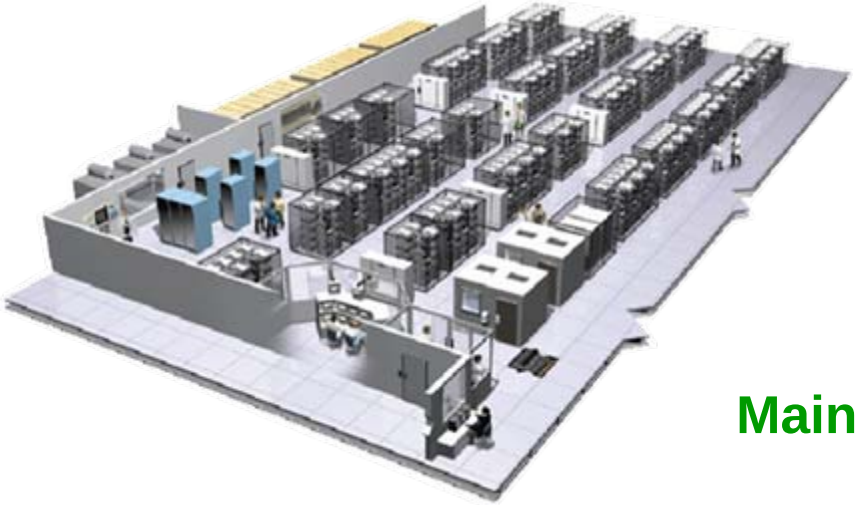


"Even without factoring in the maintenance and support costs—which would be considerable for a large estate of physical servers—we found that running a virtualized Linux environment on System z would be somewhere between 30 and 50 percent less expensive than a distributed architecture."

— Ted Mansk, Director of Infrastructure Engineering and Databases at BCBSM

Consolidating Hardware Infrastructure With zEnterprise Results In Big Savings

$$$$$$$$



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Mainframe workloads
+
Distributed workloads
deployed on
zEnterprise with
Best Fit for Cost