



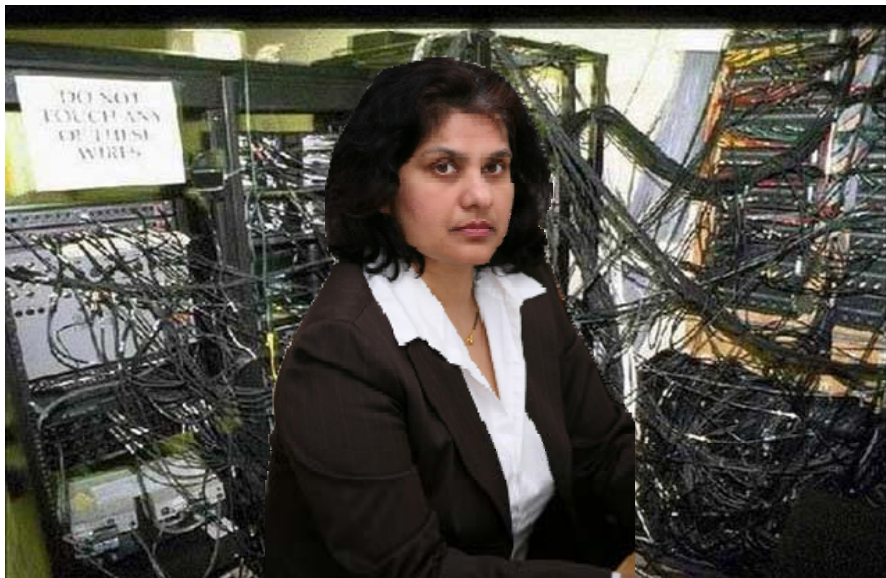
zEnterprise – The Ideal Platform For Smarter Computing

Consolidating Server Infrastructure

A Quick Look At The Problem Of Sprawl

Simplifying Hardware Infrastructure Dramatically Reduces The Cost Per Workload

Our front end infrastructure is too complex...



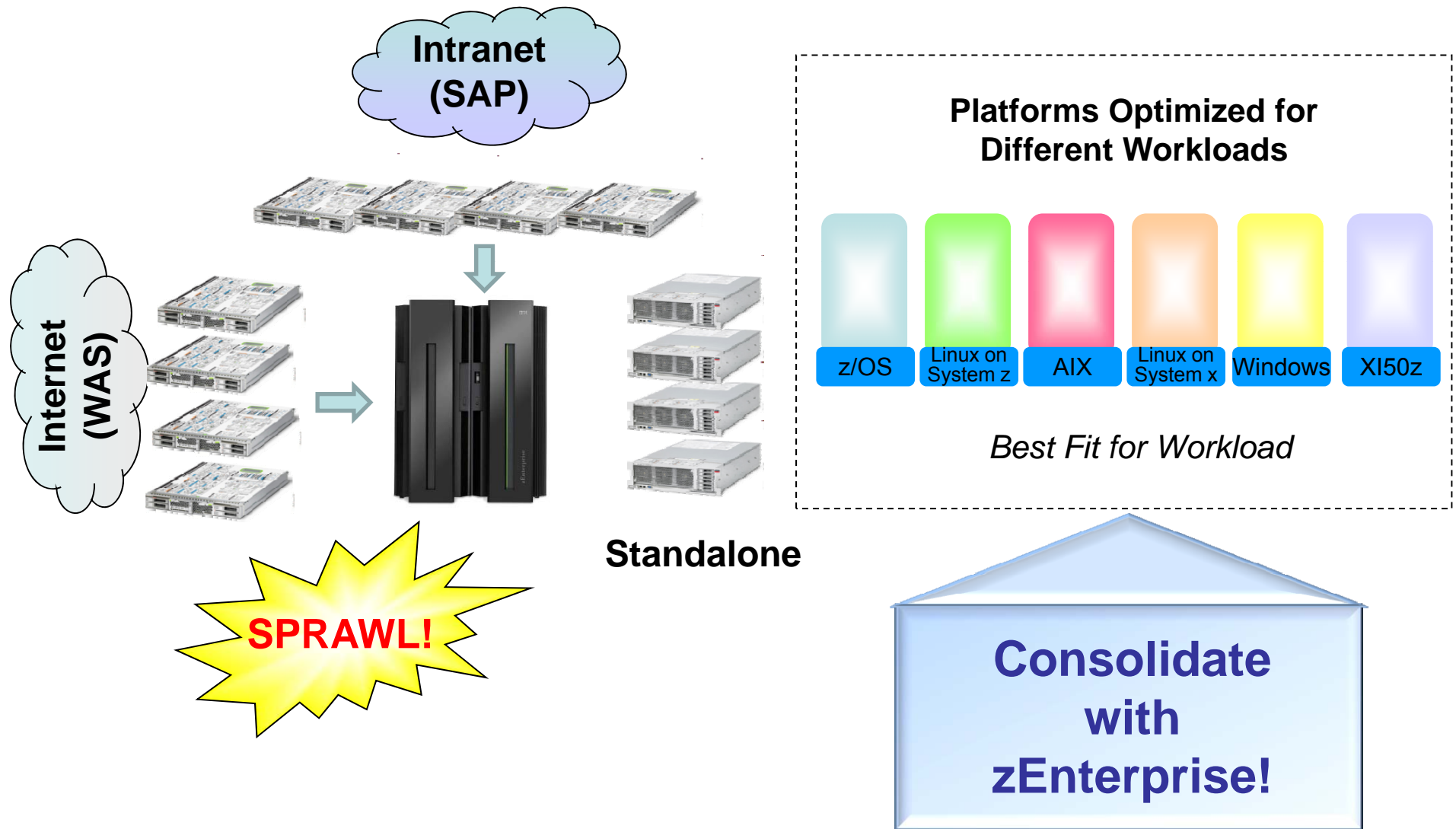
CIO

You can simplify by consolidating everything on a single platform!

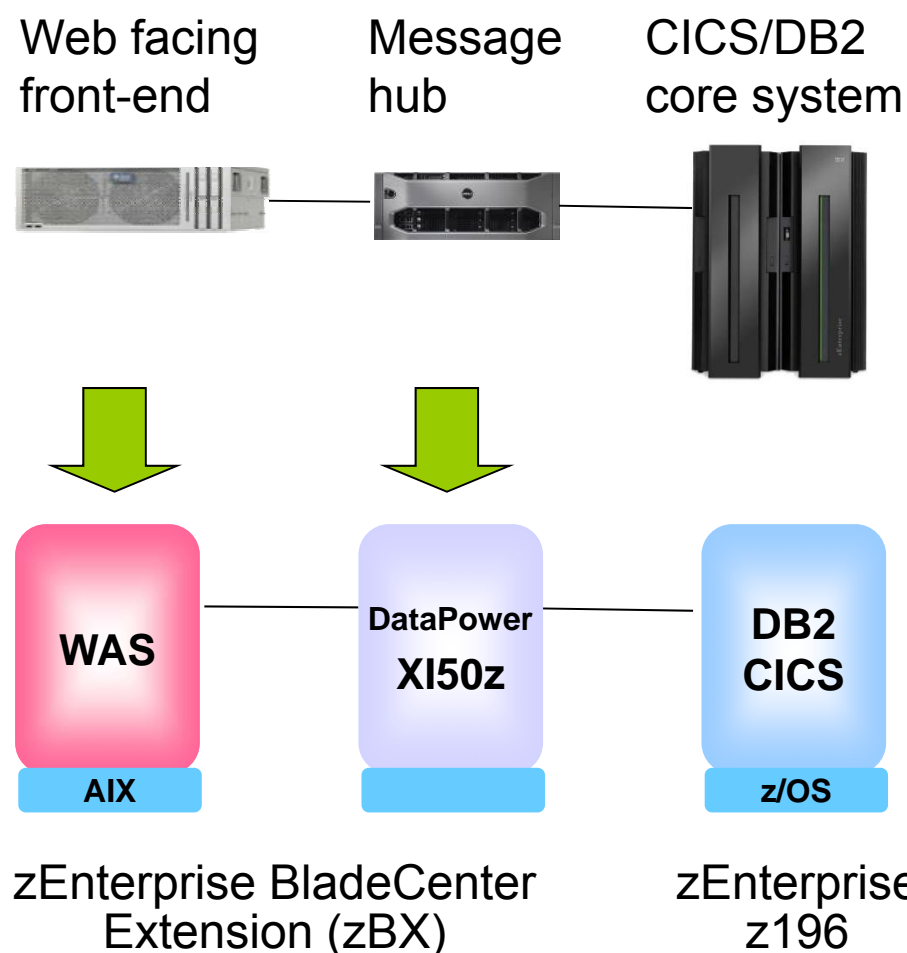


IBM

Eliminate Sprawl With zEnterprise Multi-Architecture Environment

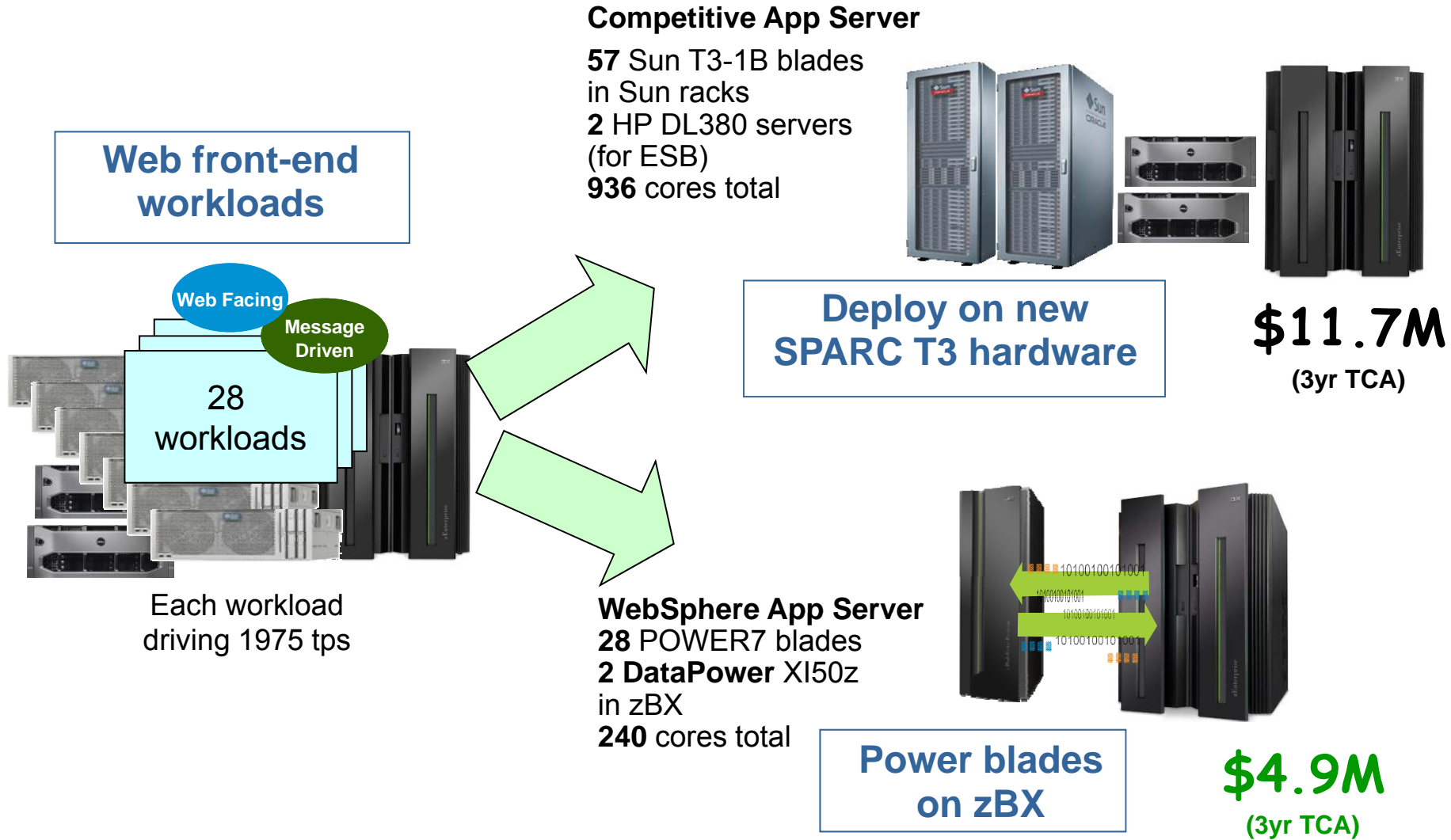


Run Web Front End Workloads On zEnterprise Platform



- 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



Web Front Ends Cost 58% Less On zEnterprise

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

Competitive App Server

57 Sun 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)

WebSphere App Server

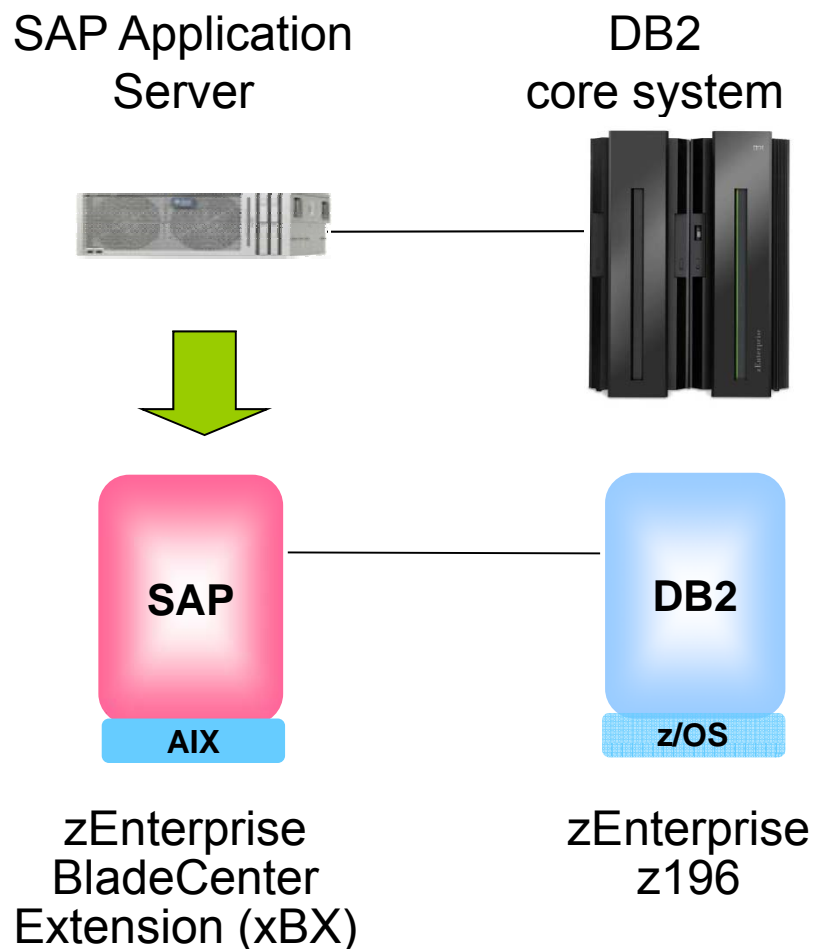
28 POWER7 blades
2 DataPower XI50z
in zBX
240 cores total



Power blades
on zBX

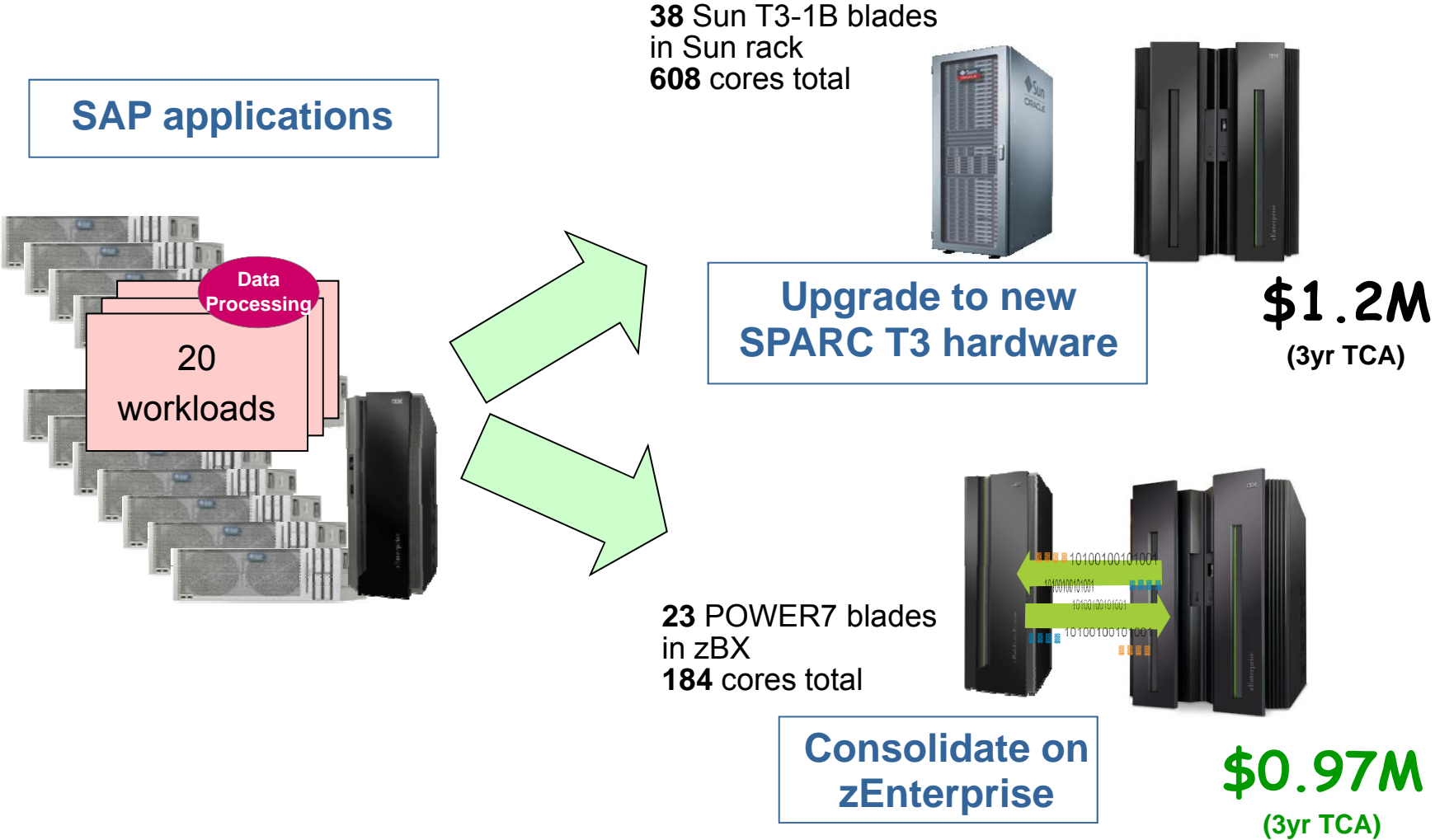
\$4.9M
(3yr TCA)

Run SAP Front End Applications On zEnterprise Platform

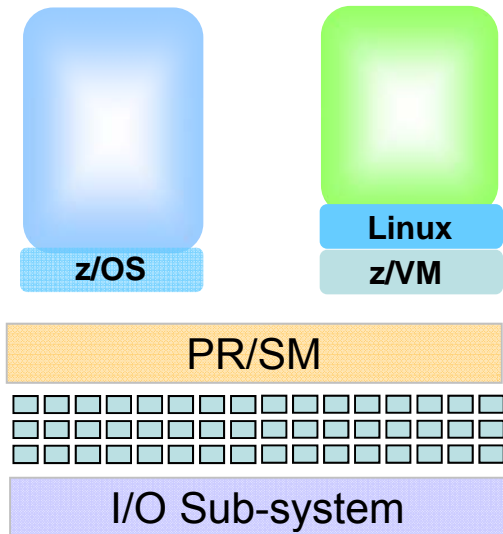


- Run as ensemble of virtual servers
- Unified management of virtual machines
- Manage ensemble as a single workload with service goals
- Dynamic adjustment of CPU resources drives 10% higher utilization
- Assign best fit to Power blade for lowest cost per workload
- Embedded pre-configured data network

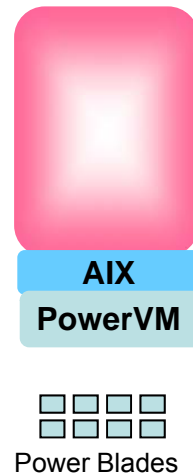
SAP Applications Cost 20% Less On zEnterprise



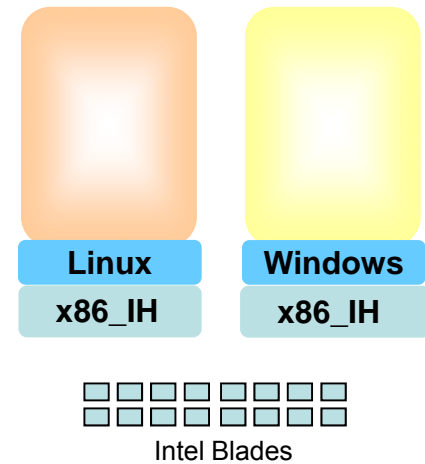
A Closer Look At Fit-For-Purpose Workload Assignment



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



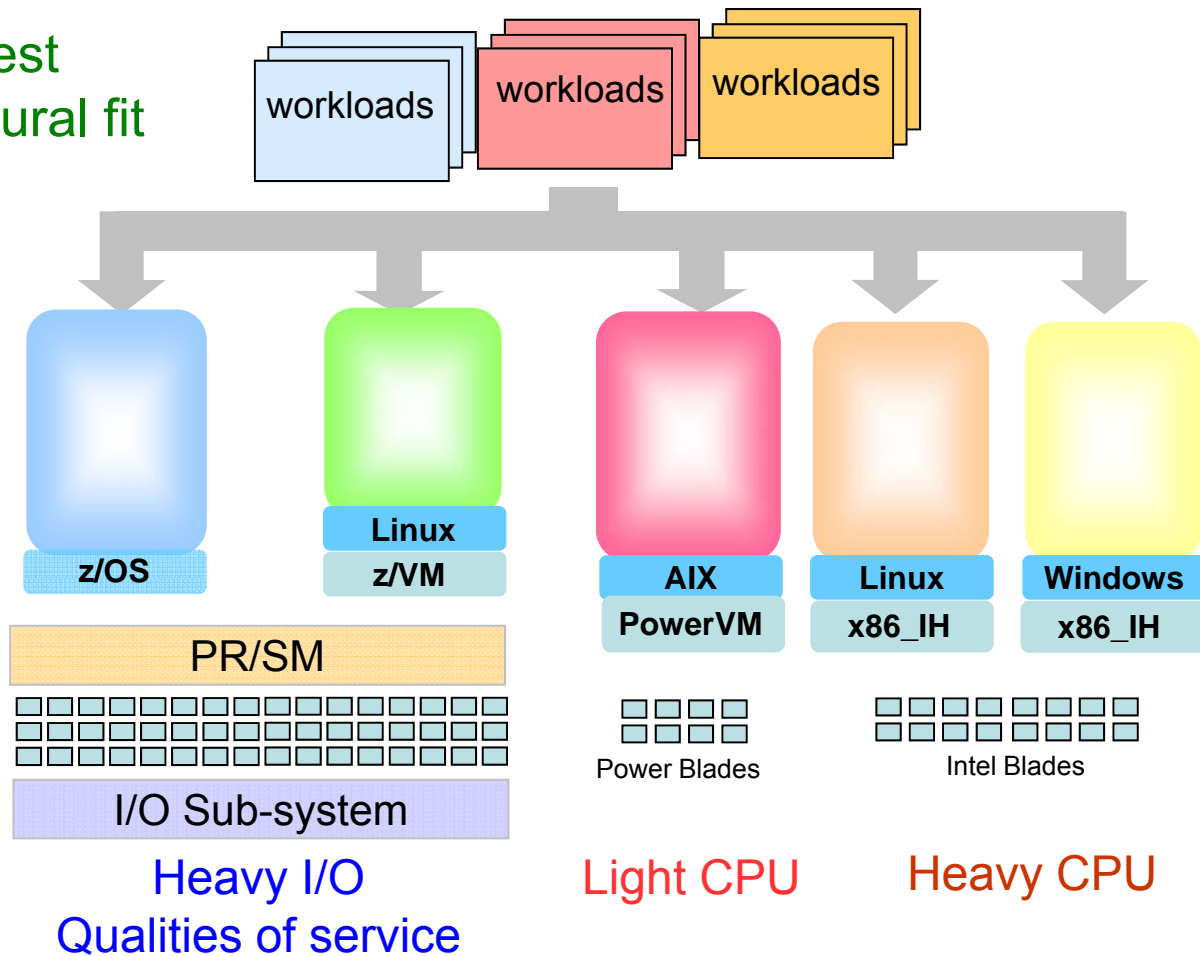
- Scales to 8 cores per blade
- 4 fast processing threads per core
- Floating point accelerators



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

Workload Characteristics Influence The Best Fit Deployment Decision

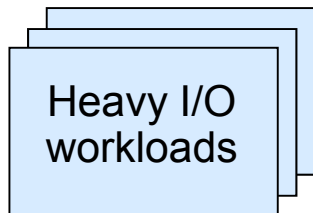
Easiest architectural fit



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

Deploying Stand Alone Workloads With Heavy I/O Requirements

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



- 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 workload per Intel blade



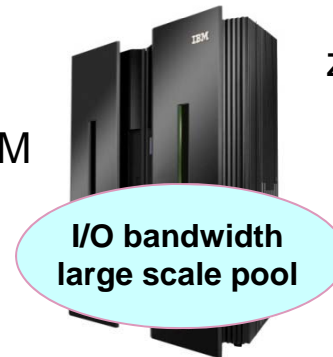
Virtualized on Intel
16 core HX5 Blade
\$380,046 per workload

1 workload per POWER7 blade



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

40 workloads per 32-way z/VM



I/O bandwidth large scale pool

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

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 Stand Alone Workloads With Heavy CPU Requirements

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

Heavy CPU 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
Best Fit

1 workload per POWER7 blade



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

10 workloads per 32-way z/VM

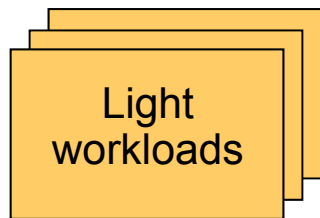


z/VM on zEnterprise CPC
32 IFLs
\$339,939 per workload

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 Stand Alone Workloads With Light CPU Requirements

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



- 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 workload per POWER7 blade



Fast low cost threads

PowerVM on PS701 8 core POWER7 Blade
\$7,287 per workload
Best Fit

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
 - 56 heavy CPU
 - 40 heavy I/O
- What is the most cost effective way to consolidate/deploy all these workloads?

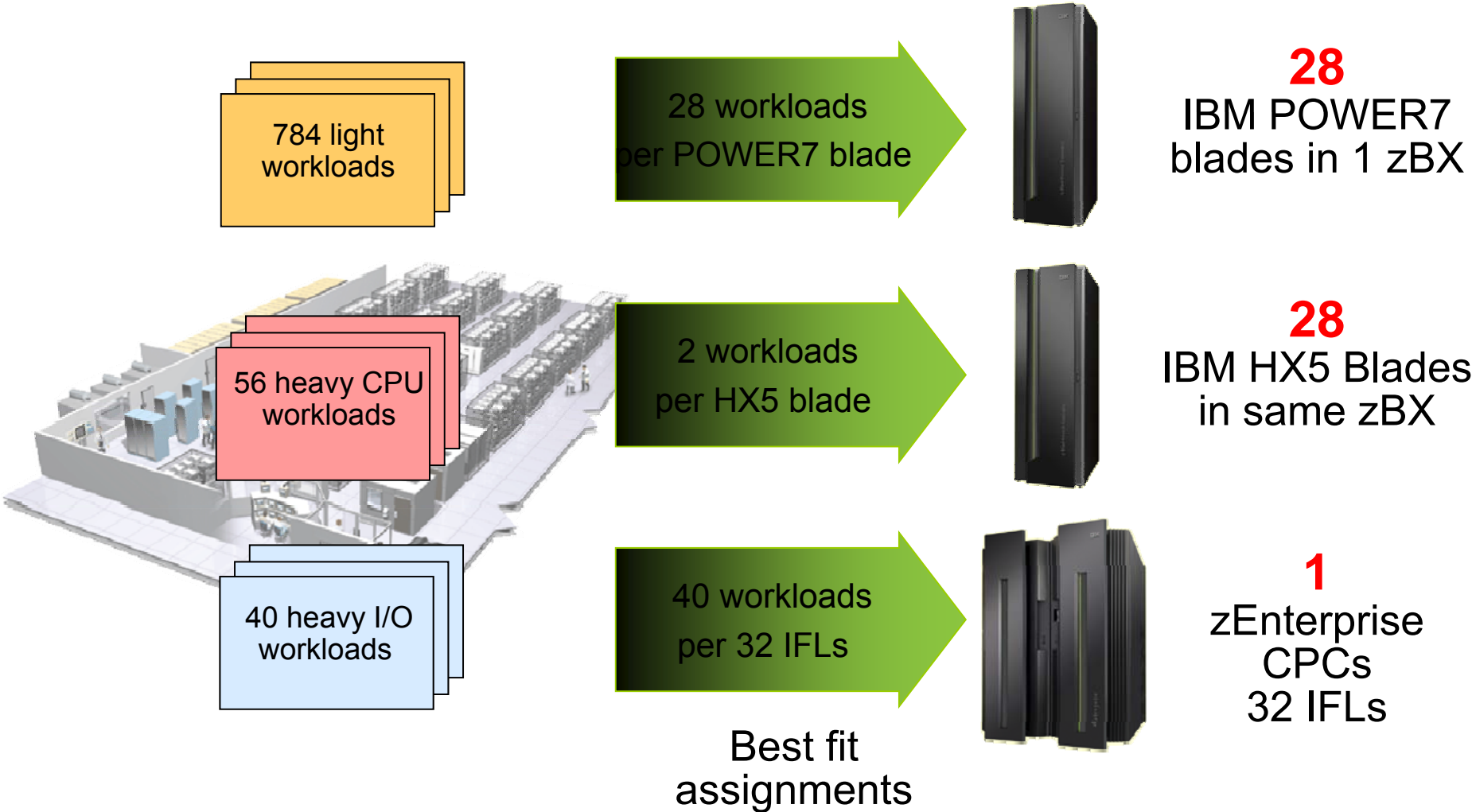
Sun Fire X4470



zEnterprise

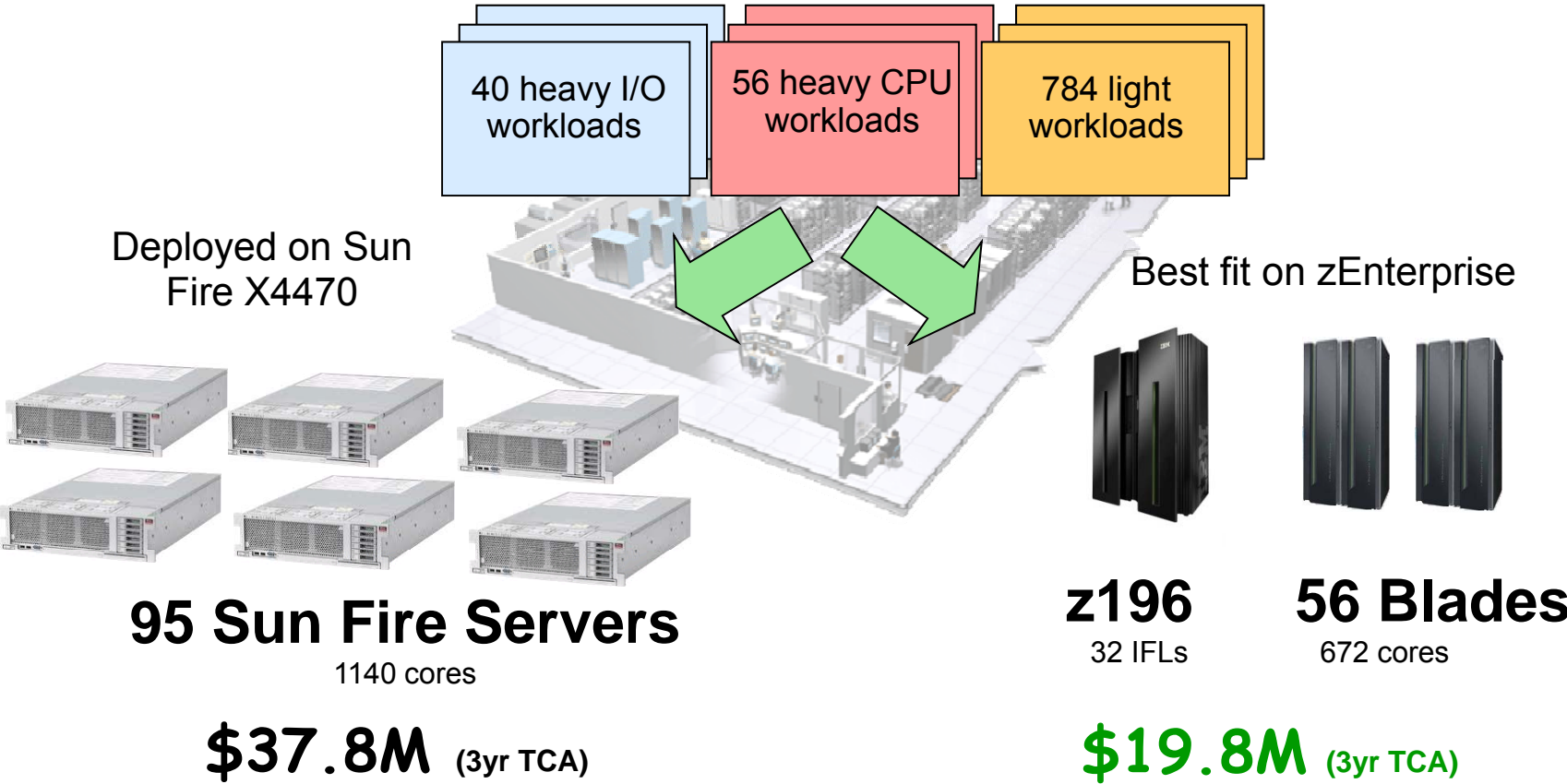


A Best Fit Assignment Of 880 Standalone Workloads On zEnterprise



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



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

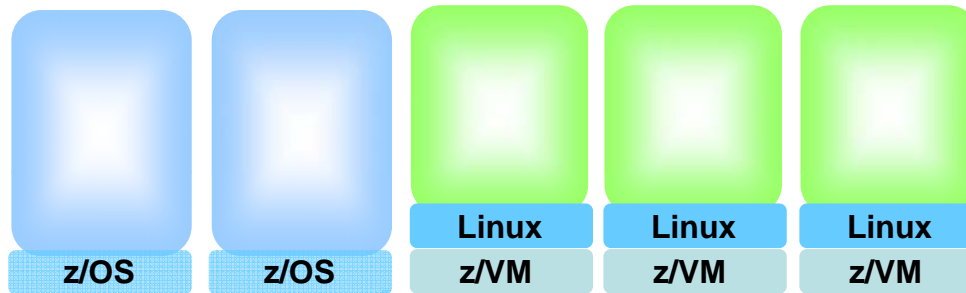
A Deeper Look At Linux On z/VM Capabilities

- Cost benefit of Enterprise Linux Server Solution Edition pricing
 - ▶ Cost of IFL's
- Cost benefit of software pricing for IFL's
- Dedicated I/O Sub-system offloads I/O processing
- Greater I/O bandwidth
- Virtualization of I/O processing resources
- Superior Reliability, Serviceability, and Security
- Achieves lowest TCA for heavy I/O workloads

Linux On z/VM Is Designed For Efficient Virtualization And Consolidation

Logical Partitions Share Processors, Common Cache Structures, and I/O

I/O Sub-system offloads I/O processing



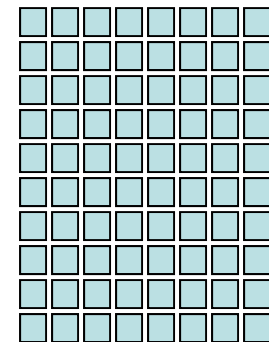
Internal networking via secure high speed HiperSockets

Intelligent Resource Director dynamically allocates processors to partitions

Shared access to all disk data and to external networks



z/VM supports 1000's of virtualized images



Linux on z/VM can run on up to 32 IFL Processors per LPAR

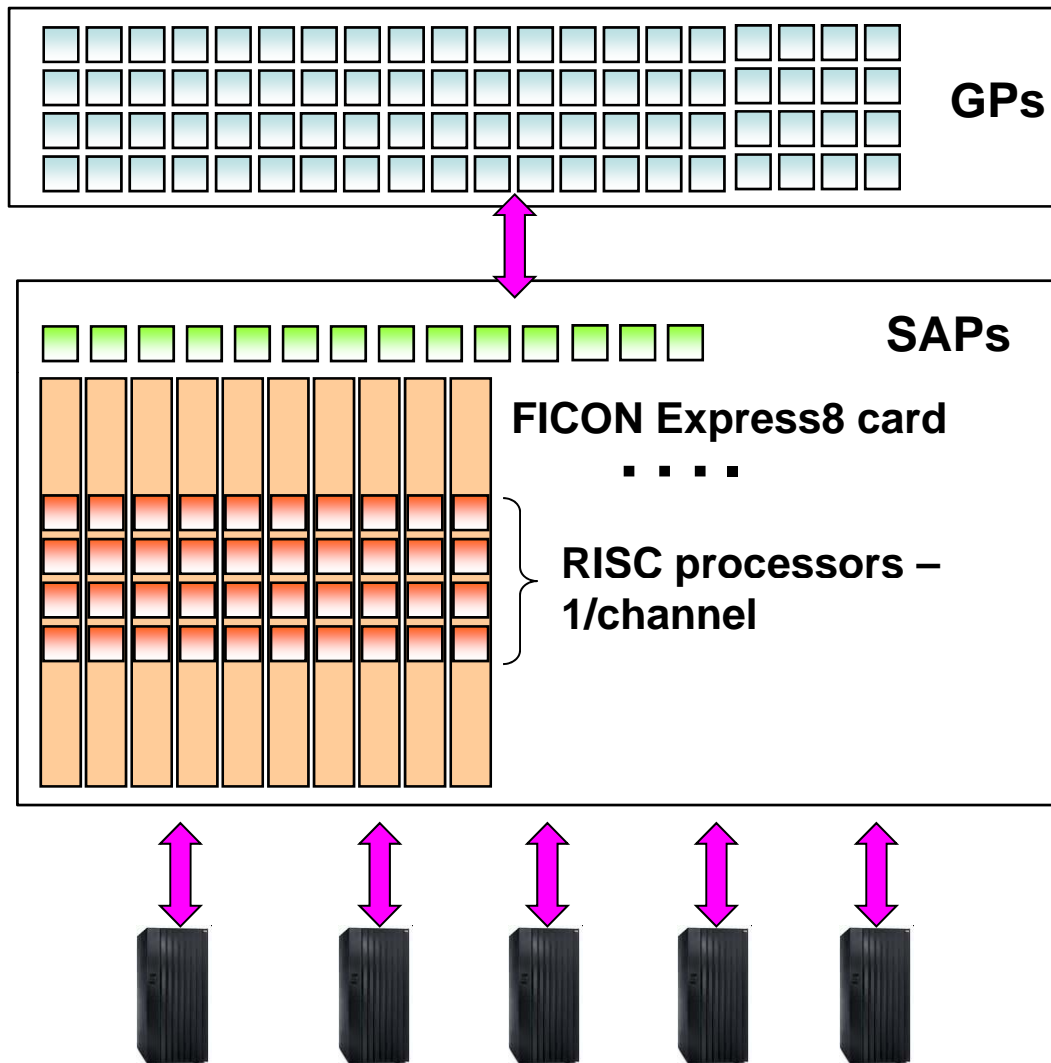
System z Solution Editions For Linux Offer Significant Cost Reductions

Special Package Prices

- System z Solution Edition for Enterprise Linux
 - ▶ **Add** Integrated Facility for Linux (IFL) processors, memory and z/VM 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



Linux On z/VM Benefits From High I/O Bandwidth Provided By z196



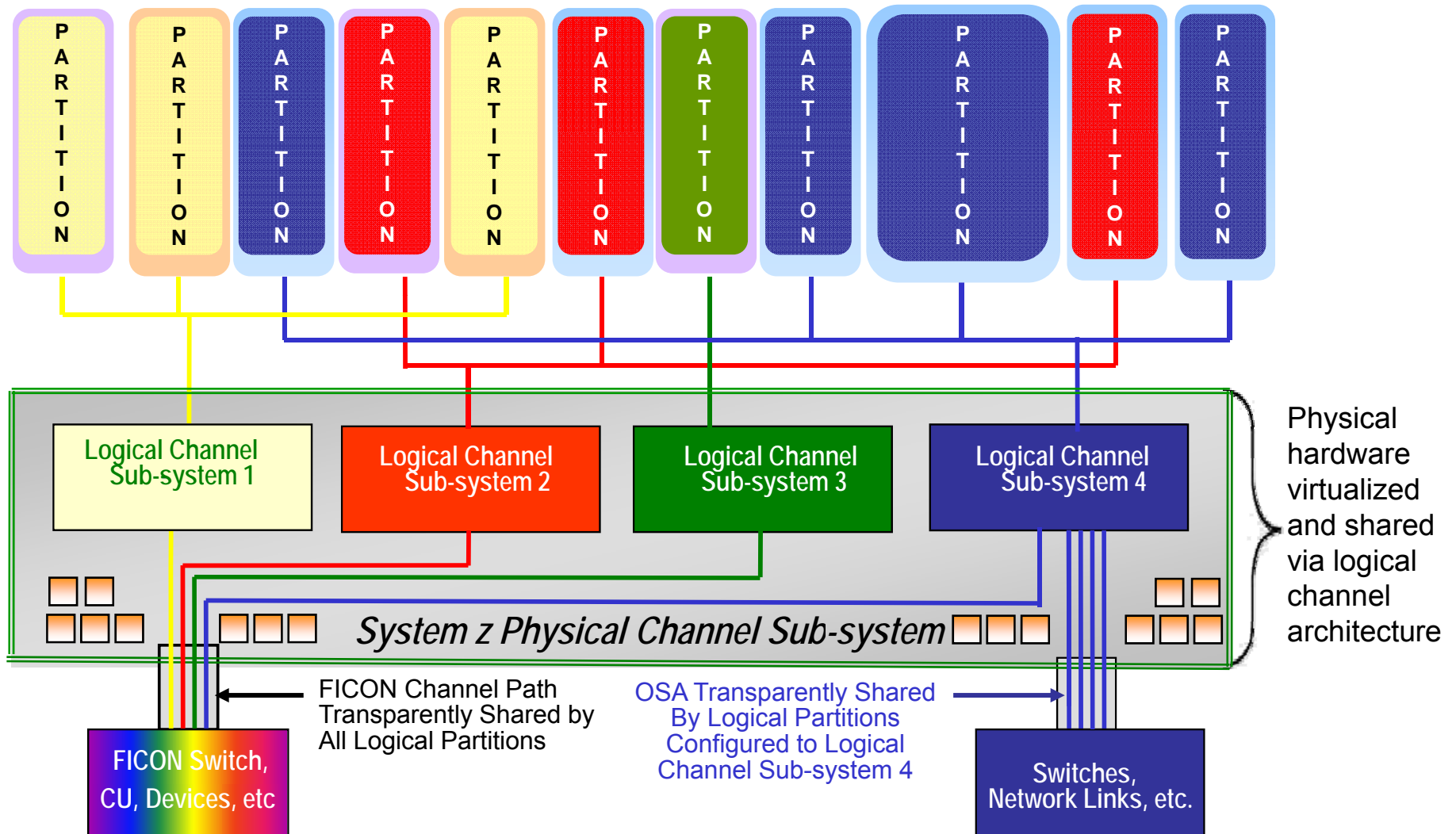
- Up to 80 General Purpose (GP) or Specialty Engine processors
 - ▶ Execute business logic

- Up to 14 System Assist Processors (SAP) to manage I/O requests
 - ▶ Can sustain up to **2.2M IOPS¹**
- 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

¹Recommend 70% max SAP Utilization – 1.5M IOPS

Linux On z/VM Benefits From Virtualized Logical Channel Sub System – Sharing And Failover



z/VM Security For Linux Workloads

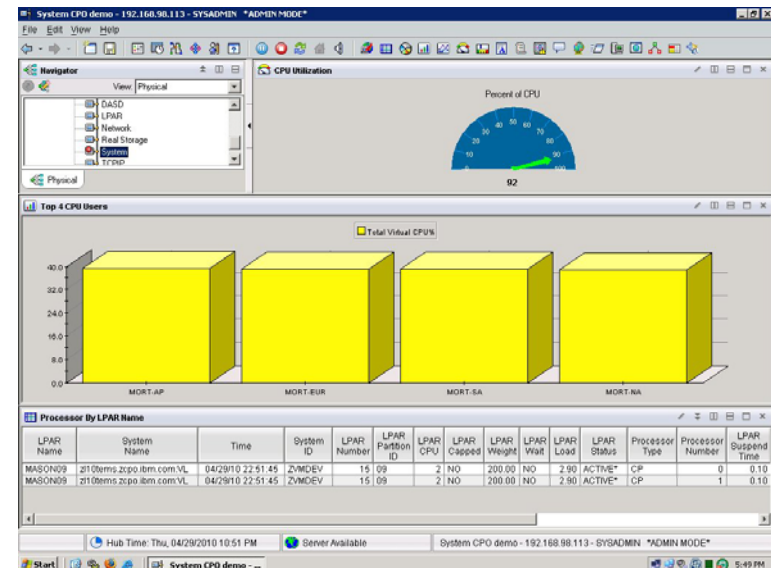
- Protects Linux virtual machines from each other
 - ▶ Operates without interference/harm from guest virtual machines
 - ▶ Virtual machines cannot circumvent system security features
 - ▶ z/VM certified at Common Criteria EAL4+
 - ▶ LPAR certified Common Criteria EAL5
- RACF Ensures that a user only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

Linux On z/VM 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 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

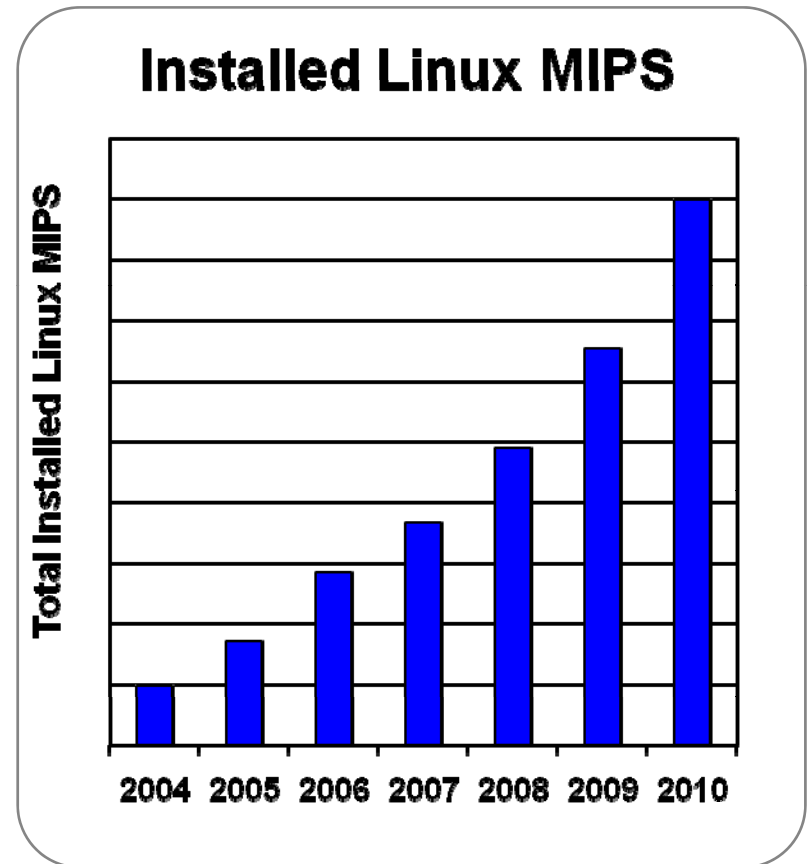


VMware can't recognize and take advantage of additional physical processors without bringing down and rebooting the system

Note: Assumes available processors on installed books

Installed MIPS For Linux on z/VM Are Growing At 45% CAGR

- 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



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



- 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



140 Windows Servers
Inflexible and costly to maintain
Business Problem:



6 IFL processors for
SUSE applications
DB2 for z/OS

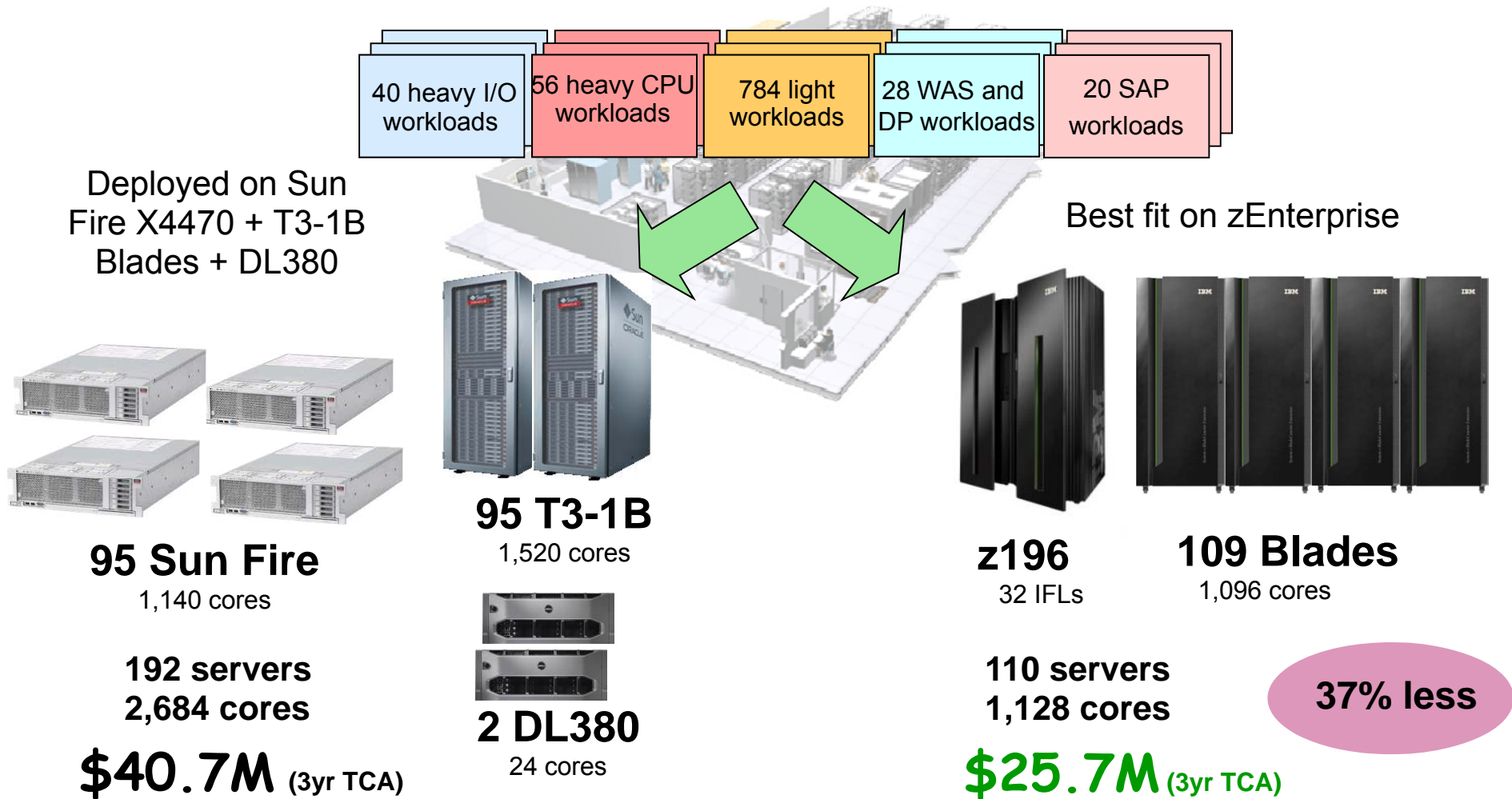
*“We found that running a virtualized Linux environment on System z would be somewhere between **30 and 50 percent less expensive** than a distributed architecture.”*

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

We've looked at hybrid and standalone workloads. Let's put it all together to see how much money zEnterprise can save!

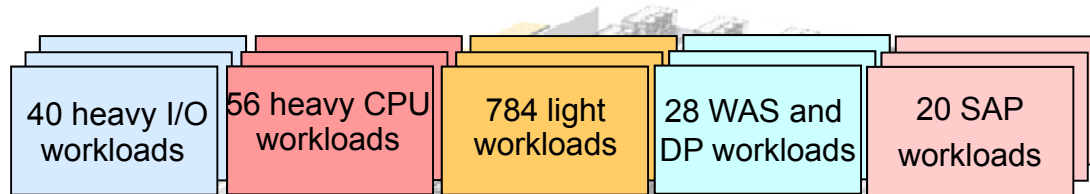


Compare Server Hardware And Software Cost Of Acquisition

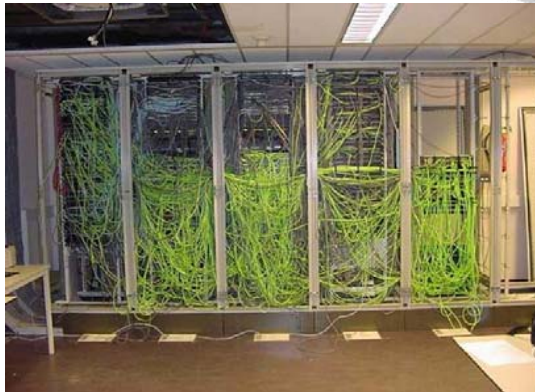


Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency, prices will vary by country

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



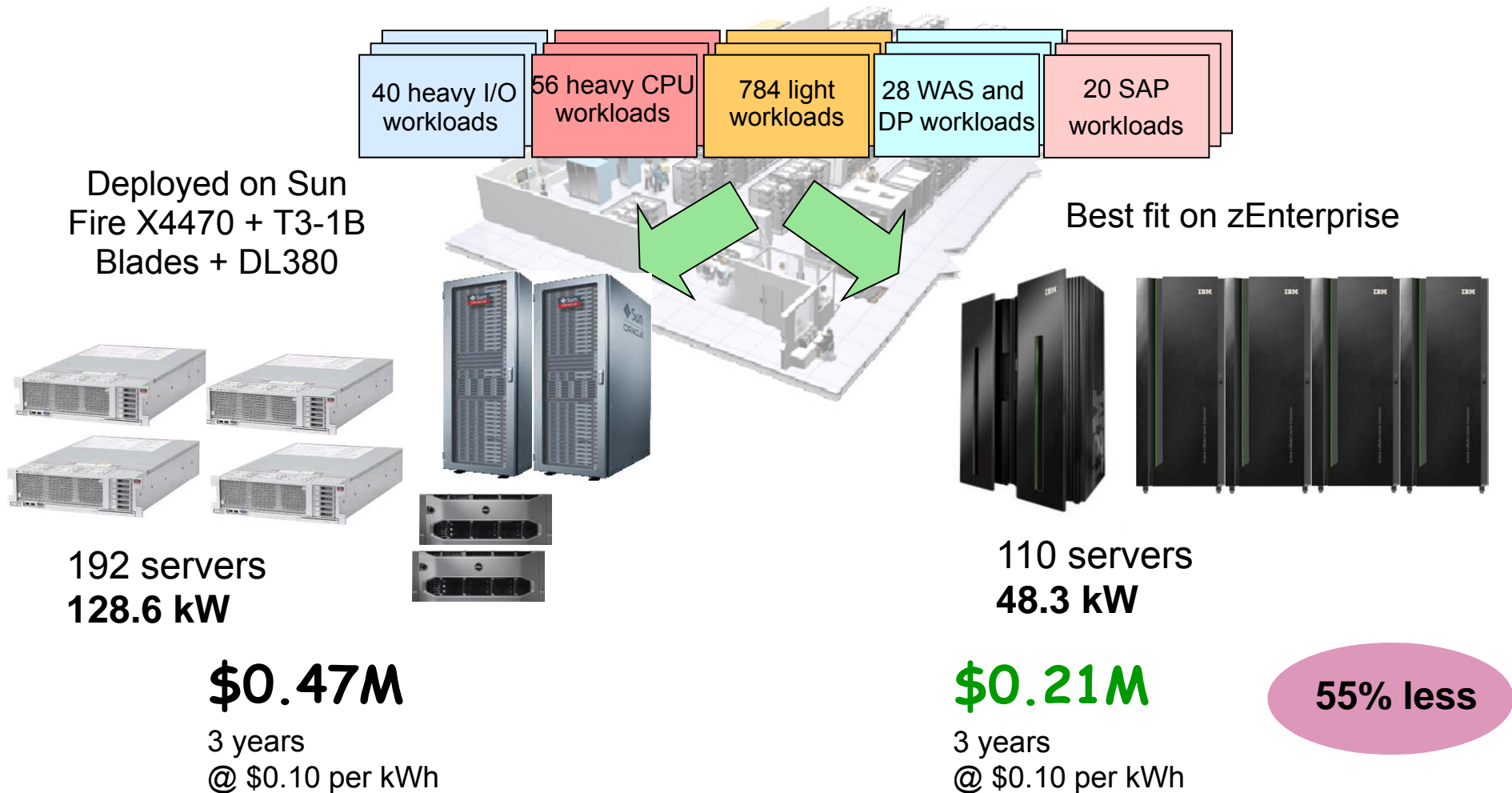
Additional network parts
1 switch
10 cables
10 adapters

21 total network parts

\$0.03M

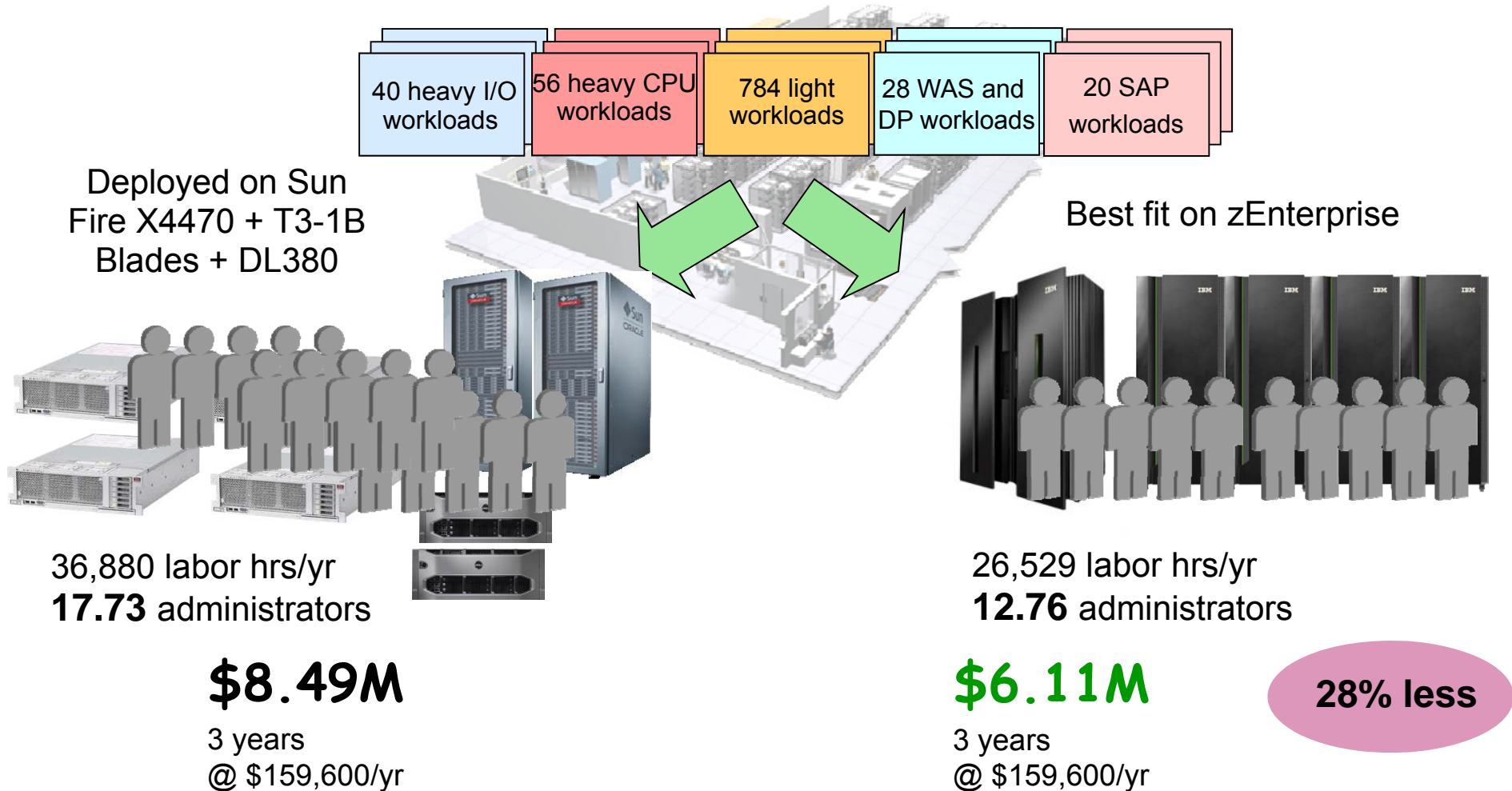
87% less

Compare Power Consumption



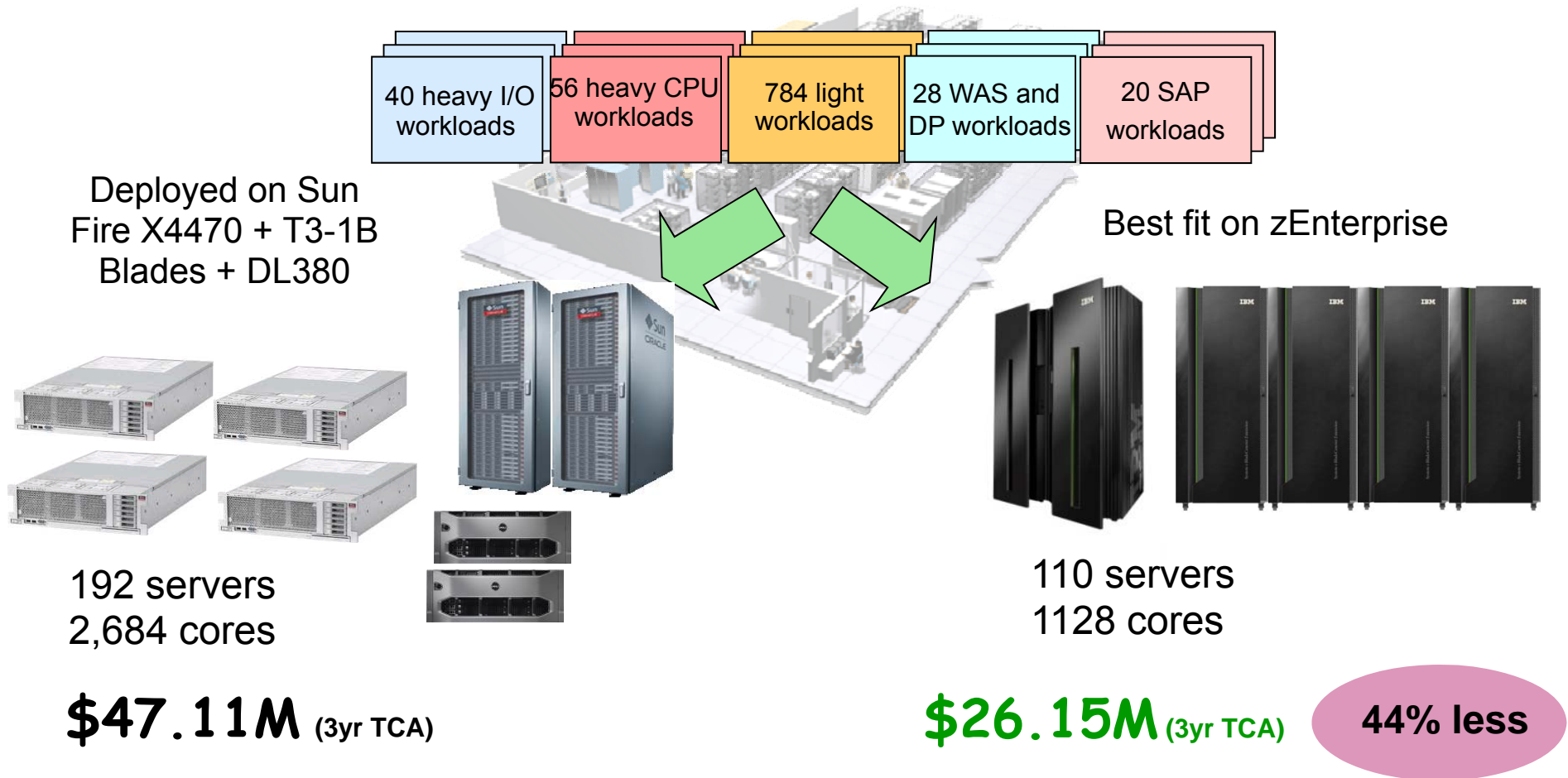
Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency, prices will vary by country

Compare Server Infrastructure Labor Costs



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



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

