



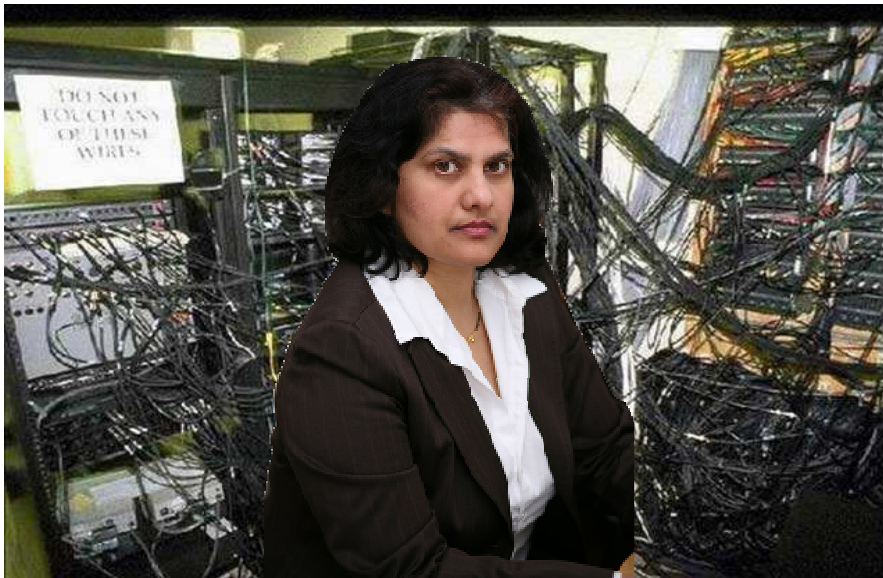
# **zEnterprise – The Ideal Platform For Smarter Computing**

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...



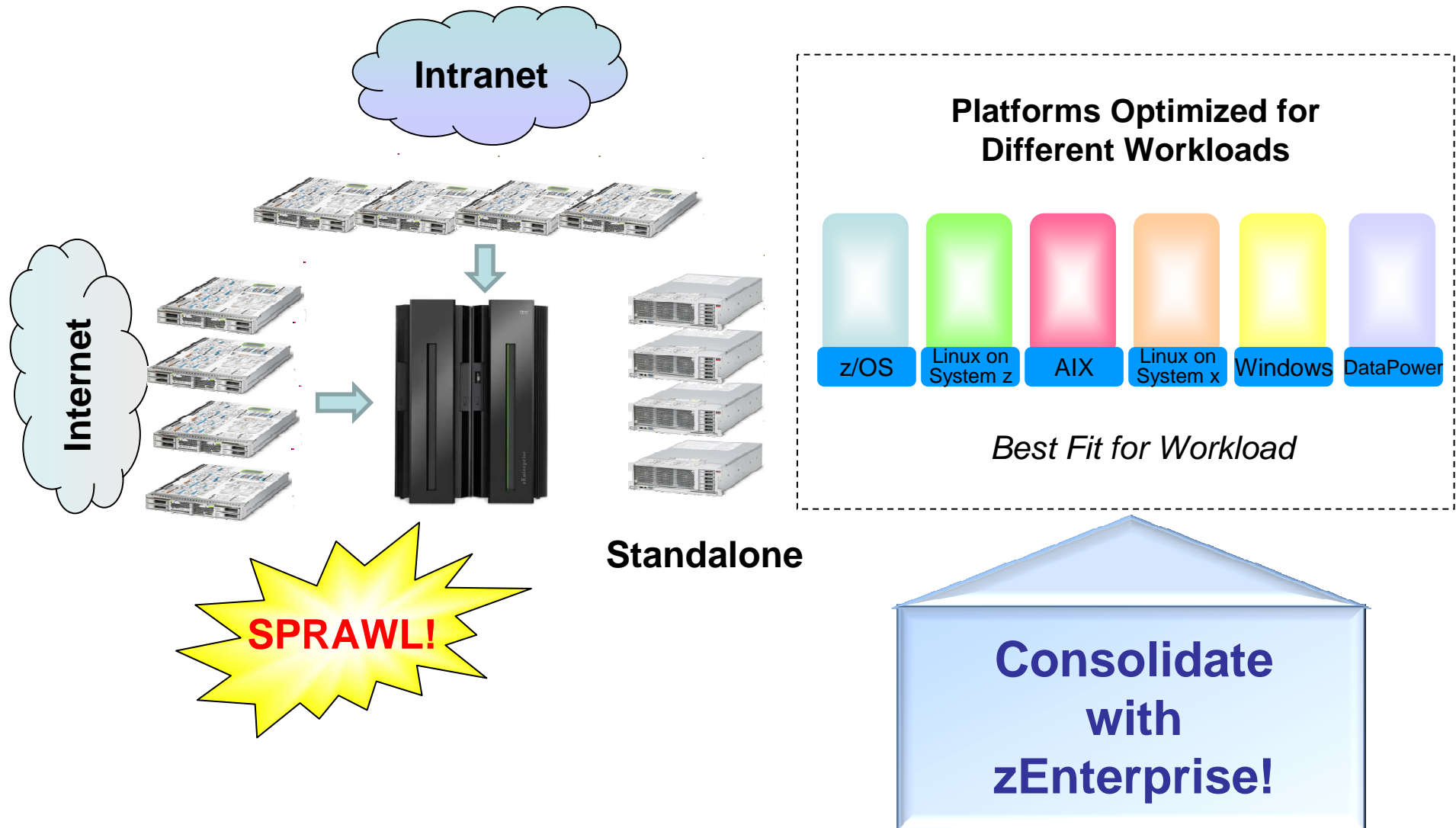
**CIO**

You can simplify by consolidating everything on a single platform!

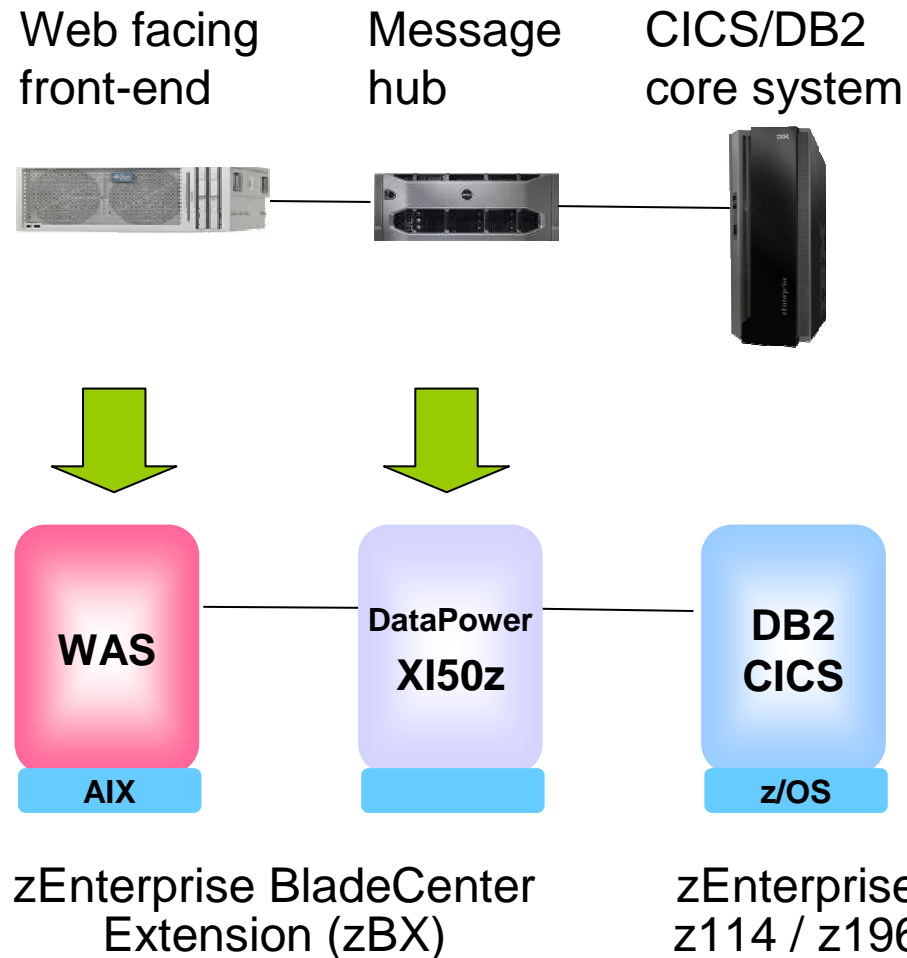


**IBM**

# Eliminate Sprawl With zEnterprise Multi-Architecture Environment



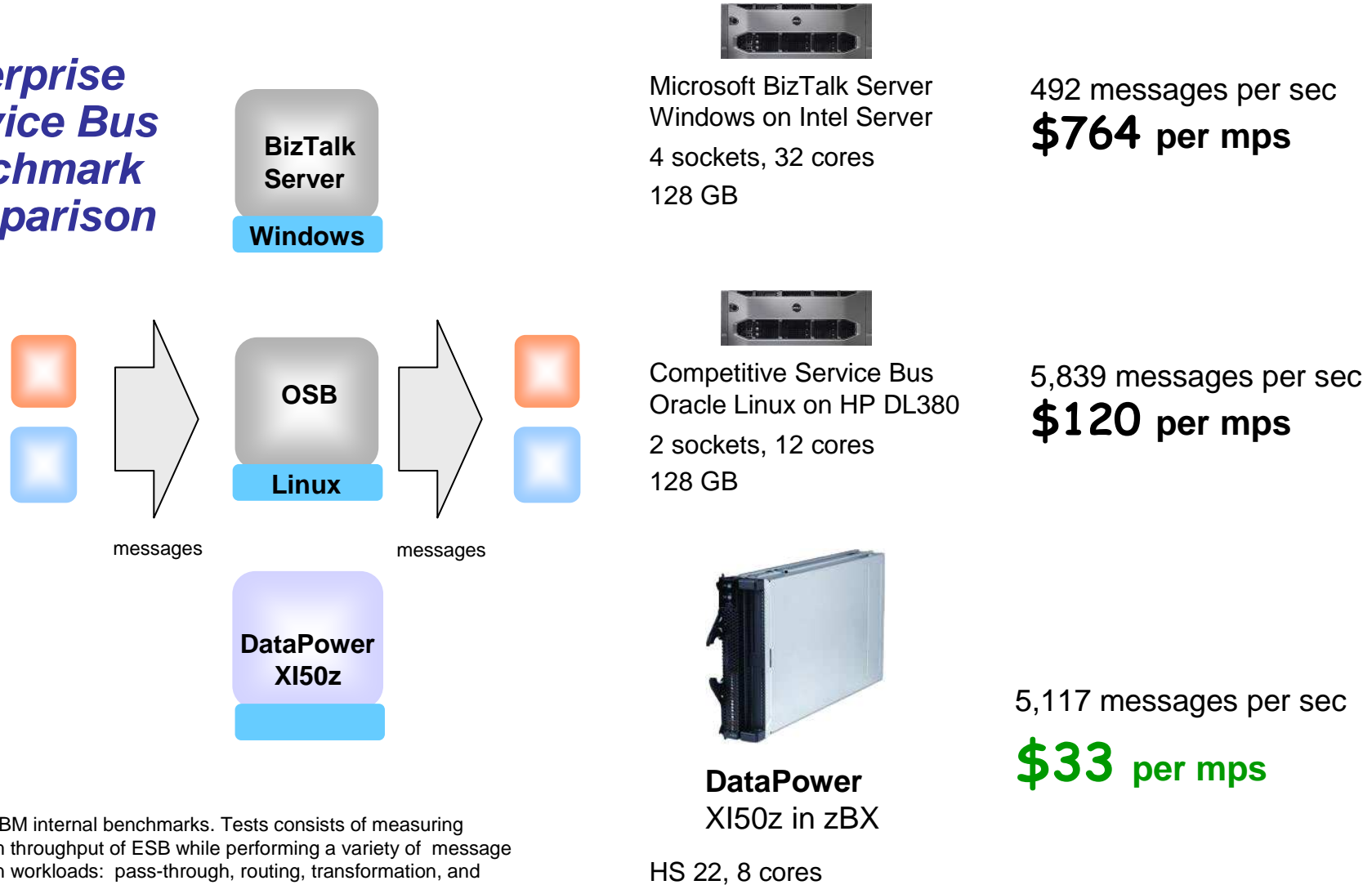
# Run Web Front End Workloads On zEnterprise Platform



- 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 and XI50z for lowest cost per workload
- Embedded pre-configured data network

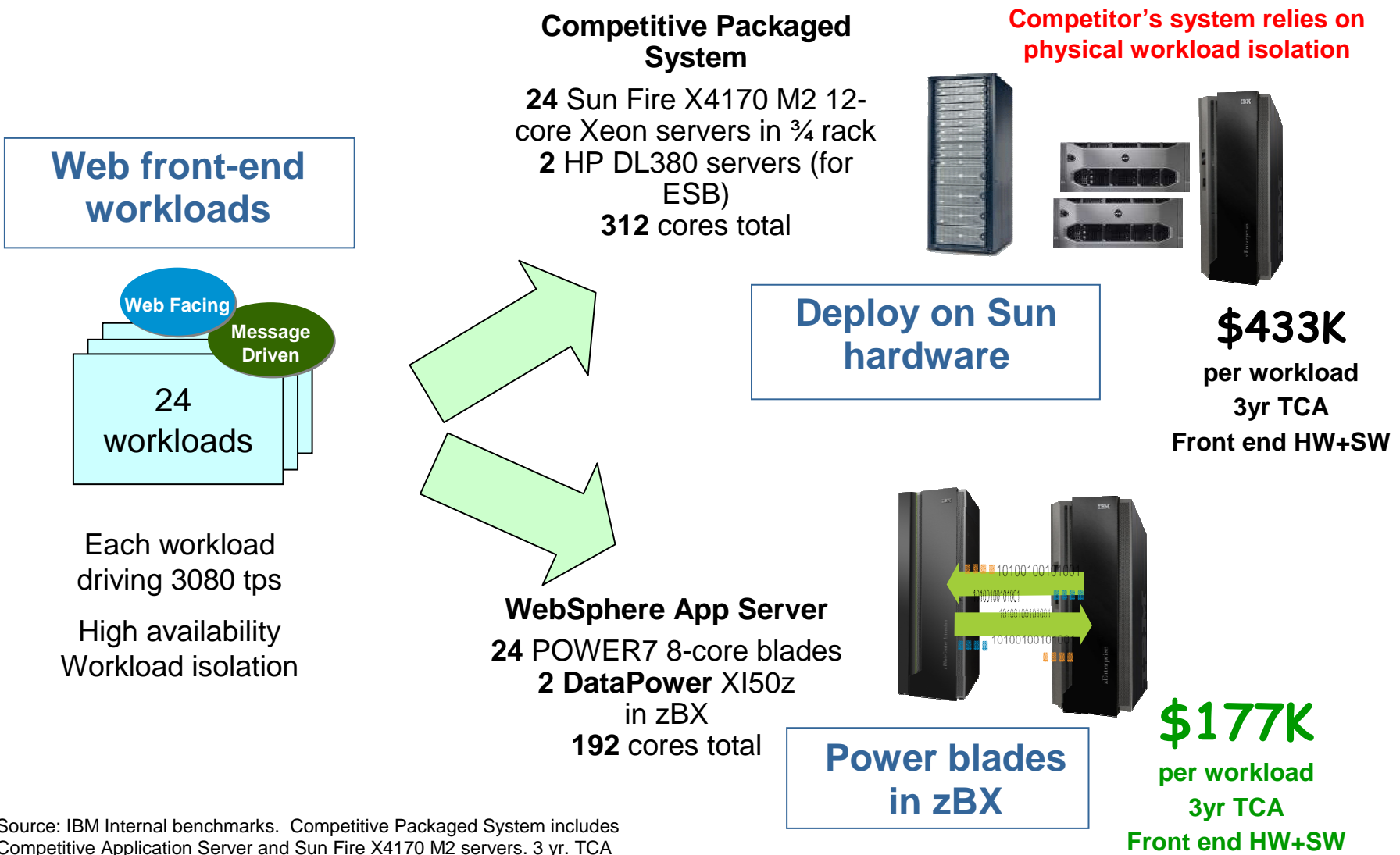
# DataPower XI50z – Built For Purpose Appliance

## Enterprise Service Bus benchmark comparison



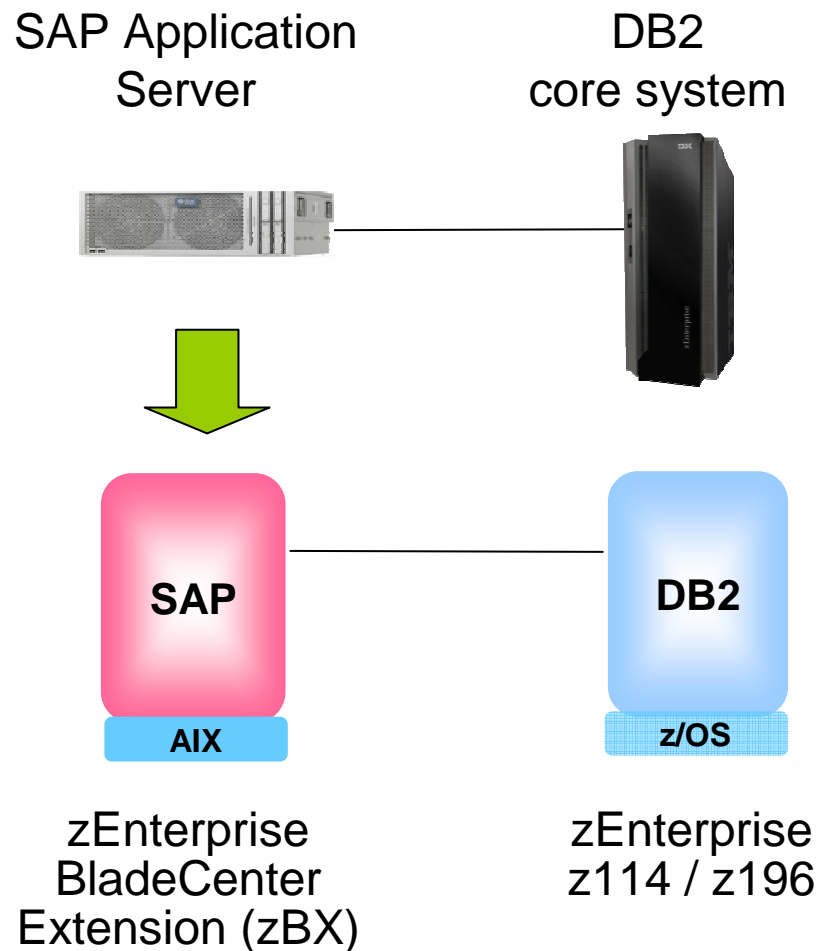
Source: IBM internal benchmarks. Tests consists of measuring maximum throughput of ESB while performing a variety of message mediation workloads: pass-through, routing, transformation, and schema validation. 3 yr. TCA includes hardware acquisition, maintenance, software acquisition and S&S. US list prices used. Prices may vary by country.

# Web Front Ends Cost 59% Less On zEnterprise



Source: IBM Internal benchmarks. Competitive Packaged System includes Competitive Application Server and Sun Fire X4170 M2 servers. 3 yr. TCA calculation includes hardware acquisition, maintenance, software acquisition and S&S. US list prices. Prices may vary by country.

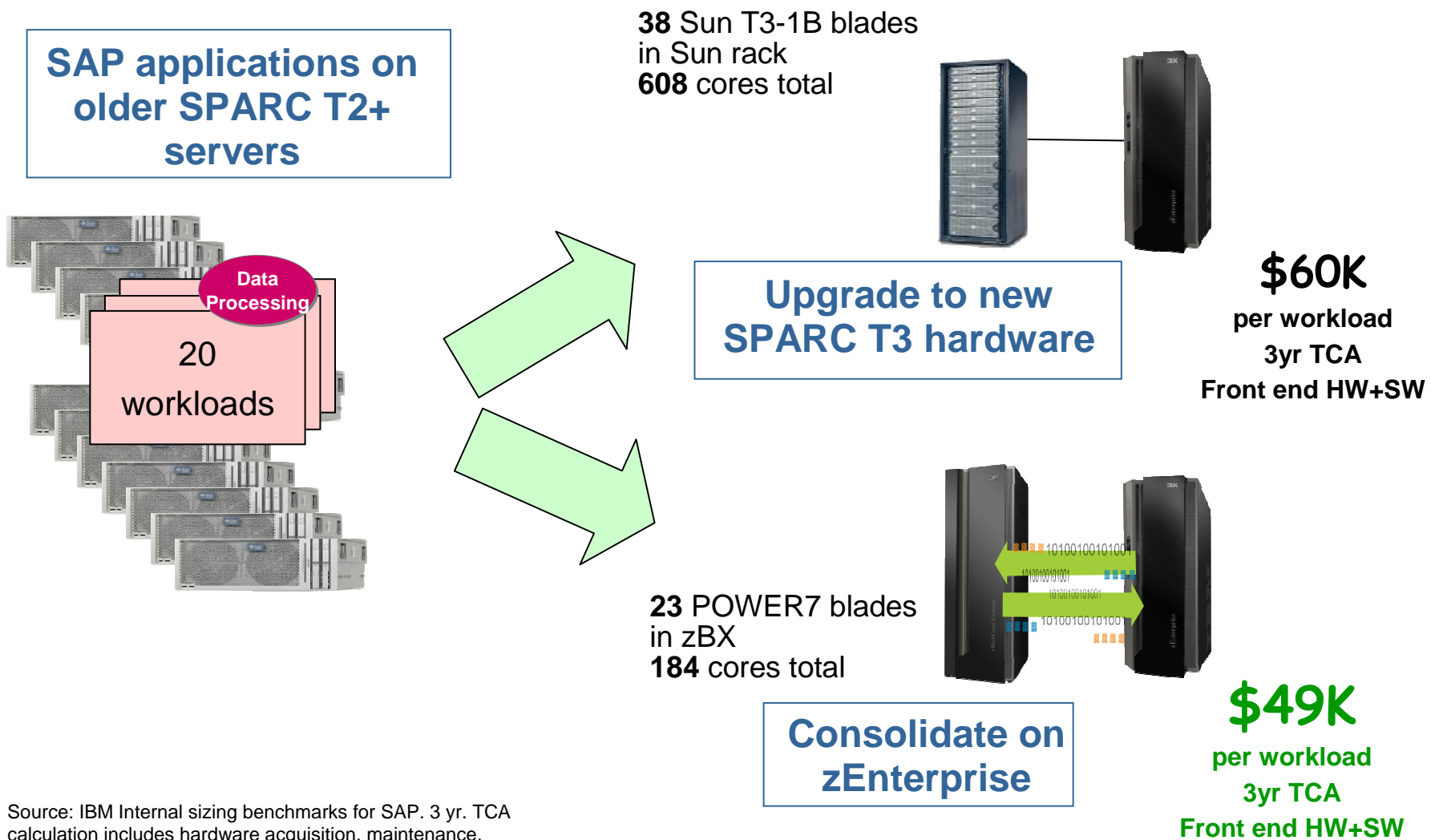
# Run SAP Front End Applications On zEnterprise Platform



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

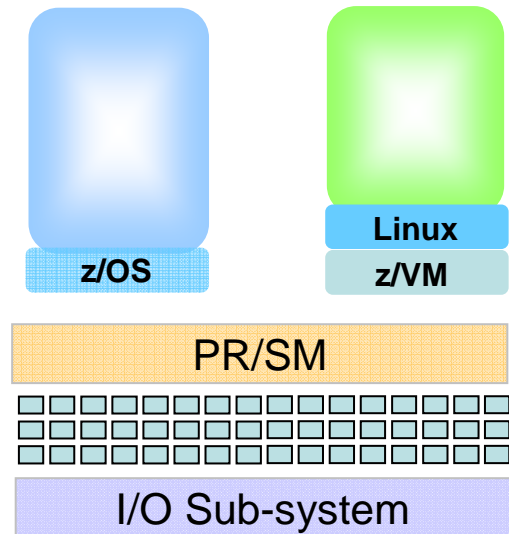


# SAP Applications Cost 18% Less On zEnterprise



Source: IBM Internal sizing benchmarks for SAP. 3 yr. TCA calculation includes hardware acquisition, maintenance, software acquisition and S&S. US list prices. Prices may vary by country.

# A Closer Look At Fit-For-Purpose Workload Assignment

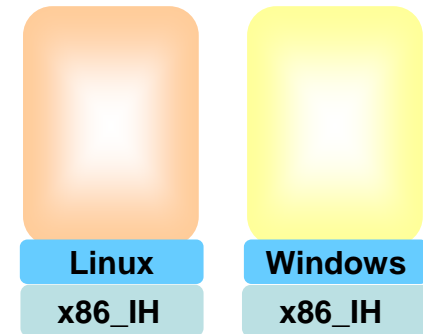


- Scale up to 80 cores in a frame (z/OS clusters with sysplex)
- Dedicated I/O sub-system
- Superior qualities of service



Power Blades

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

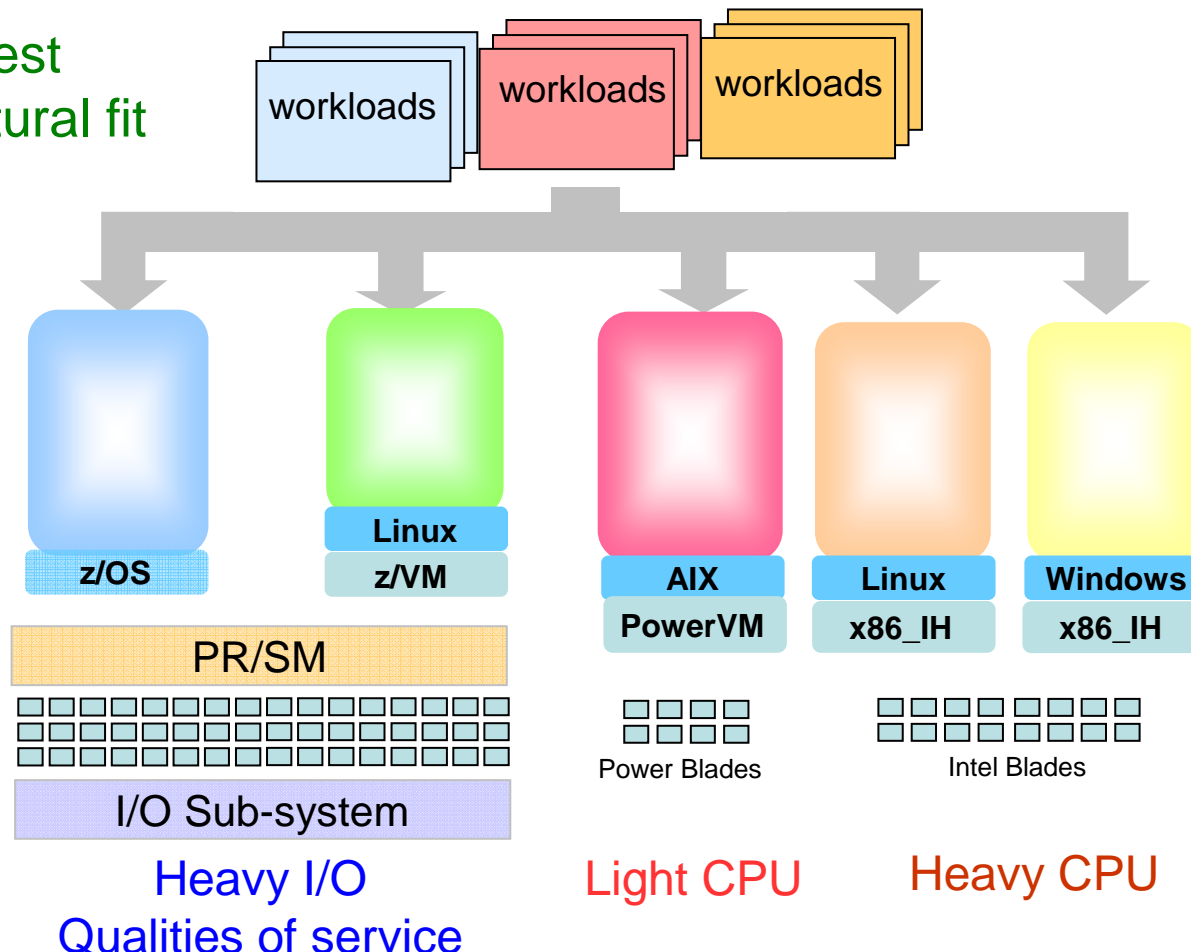


Intel Blades

- 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

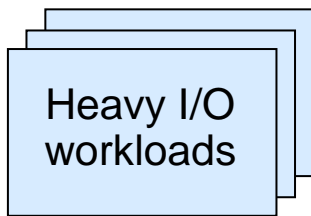
Easiest architectural fit



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



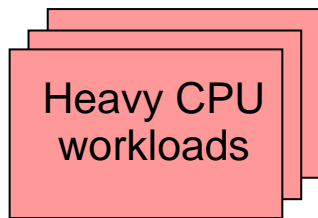
**I/O bandwidth large scale pool**

z/VM on z196 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*



- 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

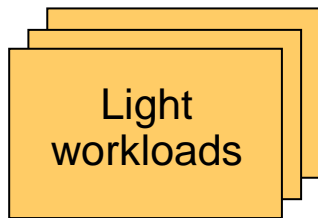


z/VM on z196 CPC  
32 IFLs  
**\$339,939** per workload

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 z196 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?

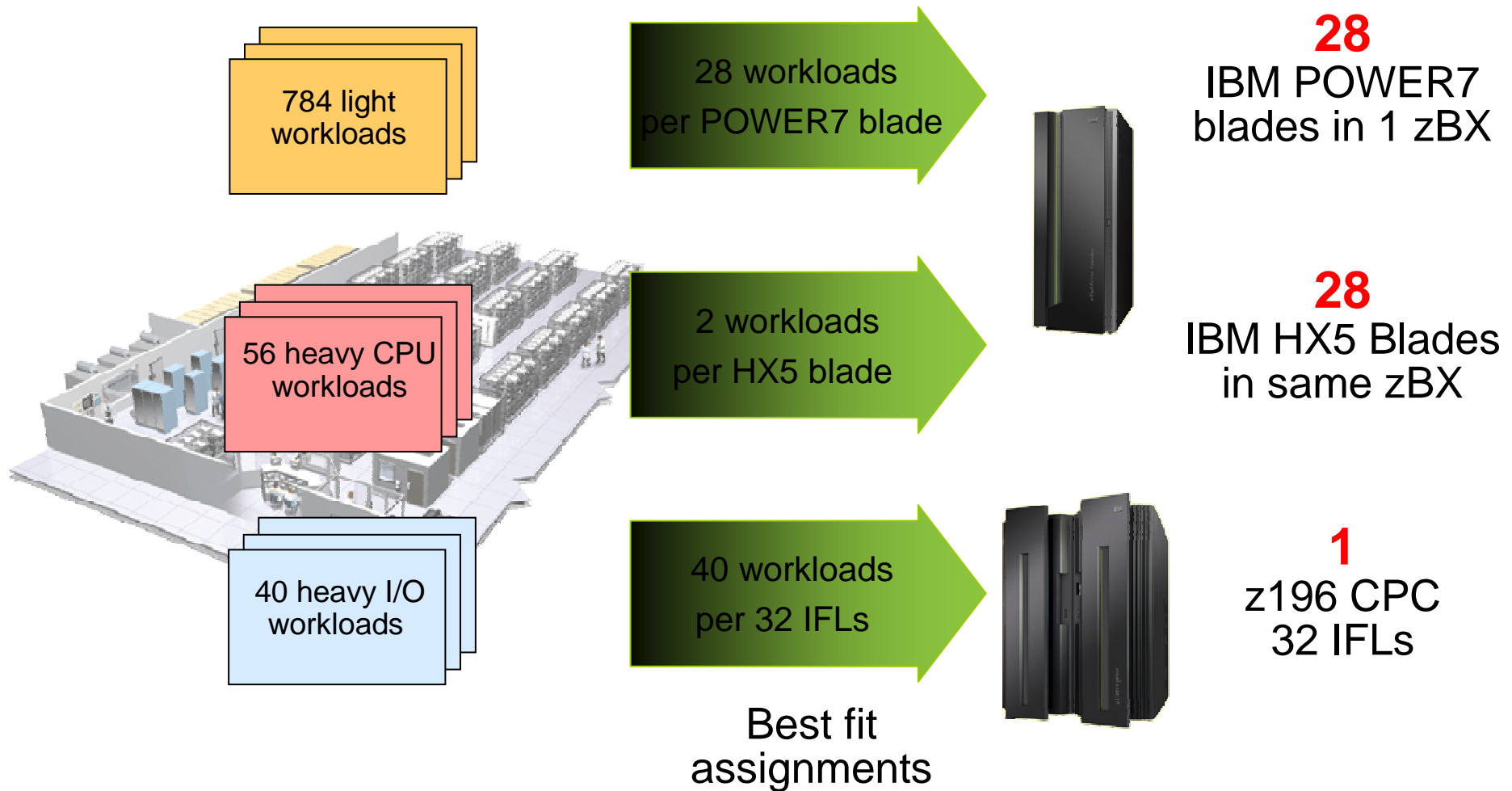
**Sun Fire X4470**



**zEnterprise**



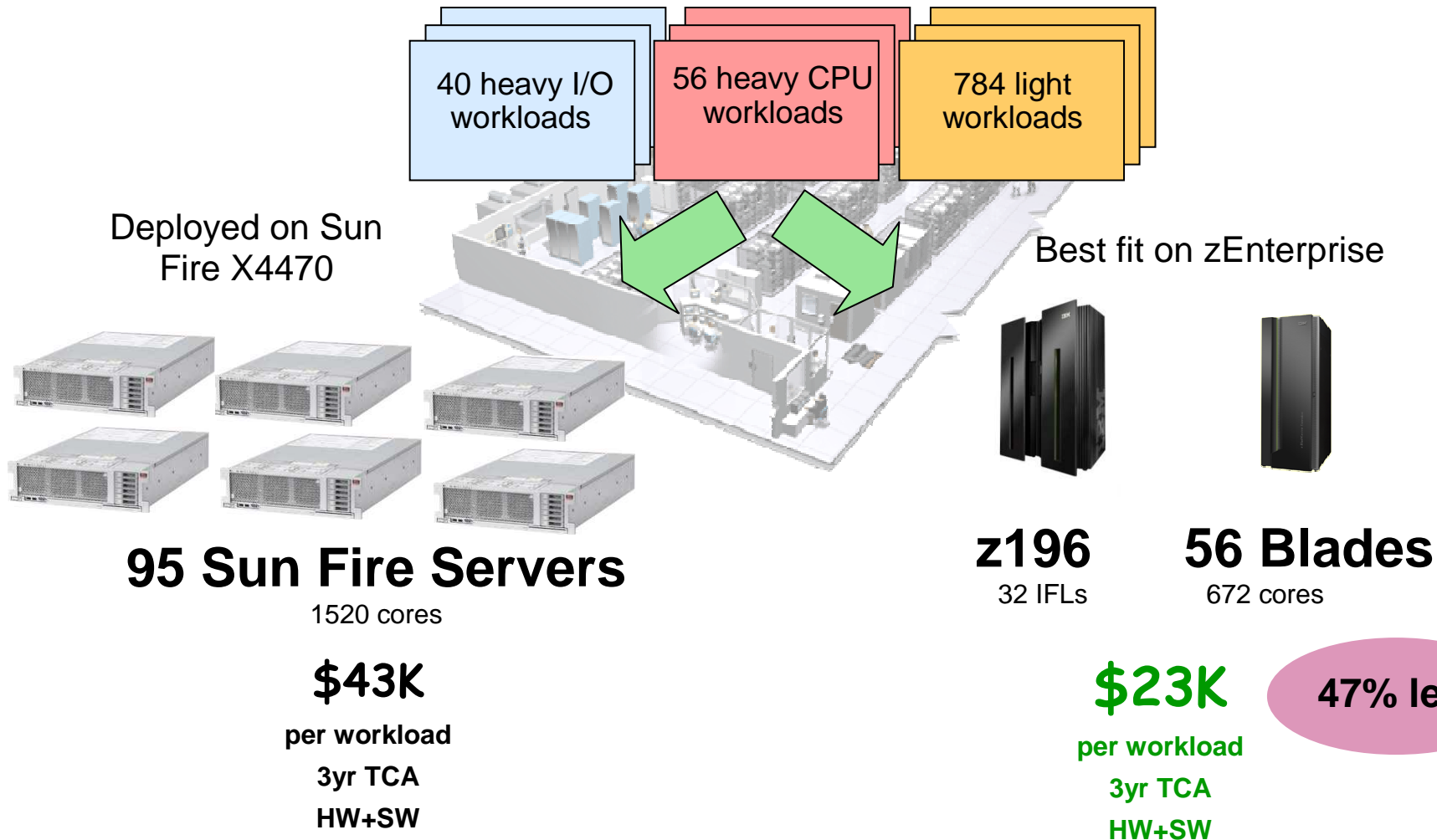
# A Best Fit Assignment Of 880 Standalone Workloads On zEnterprise



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 47% Less On zEnterprise



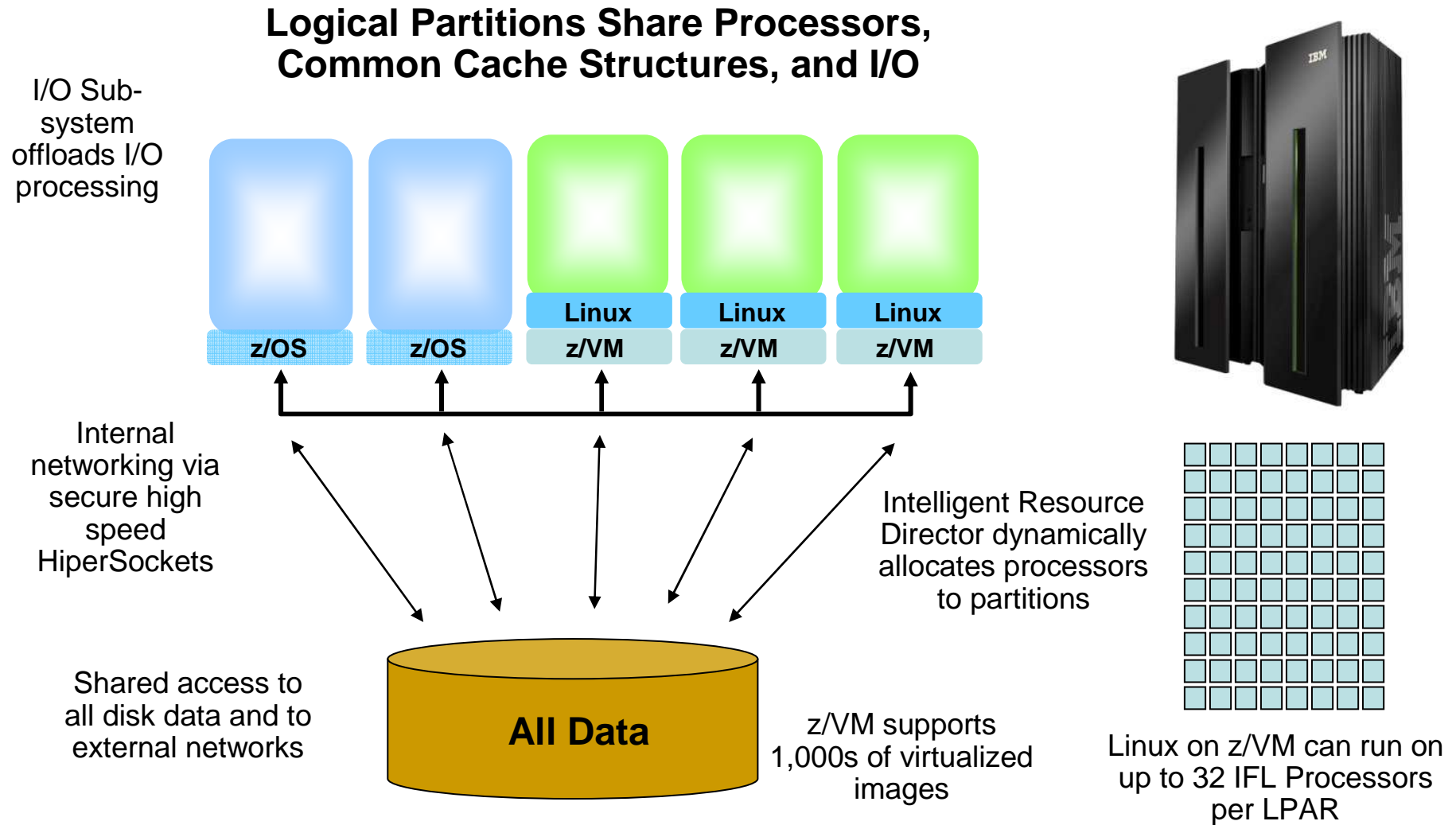
Server configurations are based on consolidation ratios derived from IBM internal studies. Projected Sun Fire X4470 2.0GHz 2ch/16co from x3550 2.66GHz 2ch/12co measurements. Prices are in US currency, prices will vary by country

# A Deeper Look At Linux On z/VM Capabilities

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- Cost benefit of Enterprise Linux Server Solution Edition pricing
  - ▶ Cost of IFLs
- Cost benefit of software pricing for IFLs
- 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



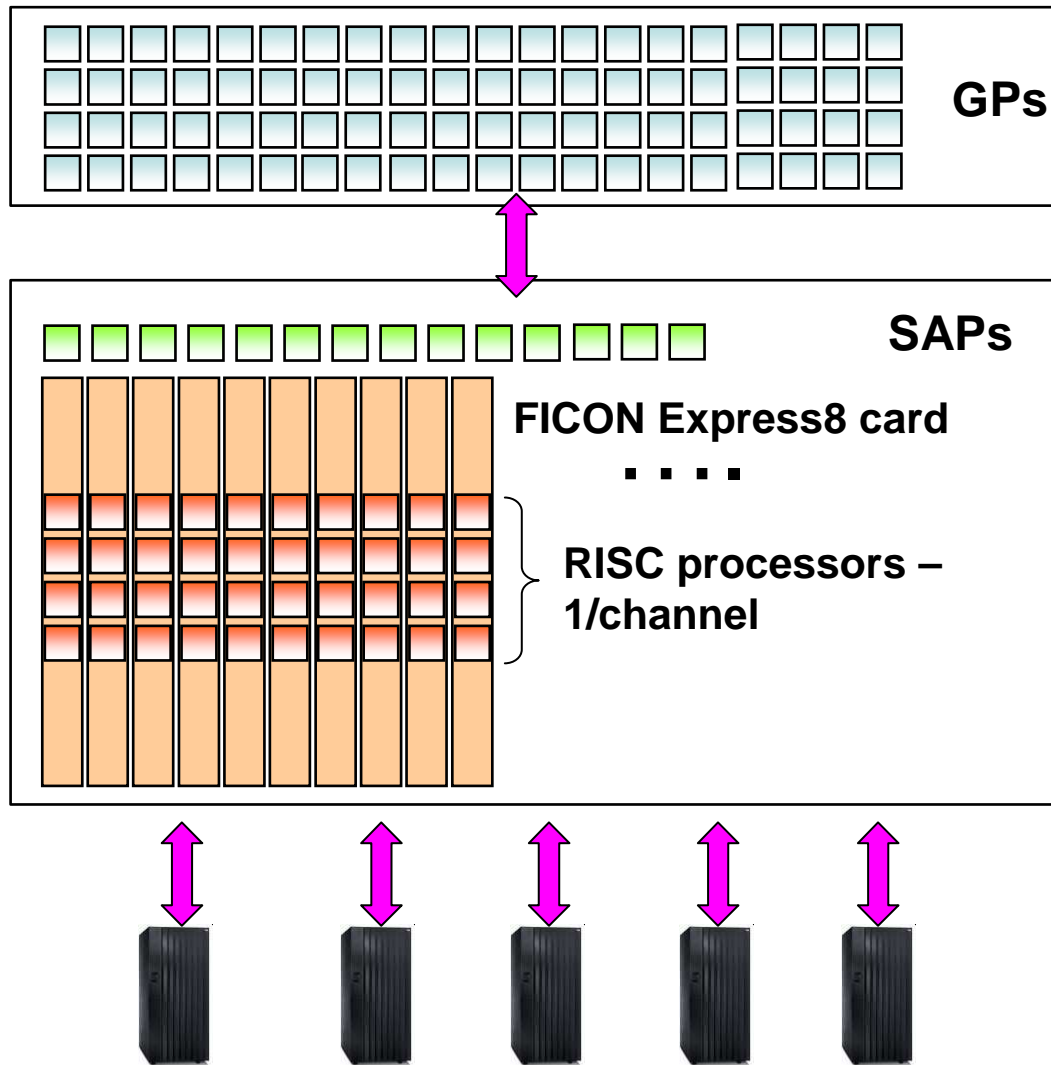
# System z Solution Editions For Linux Offer Significant Cost Reductions

## 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



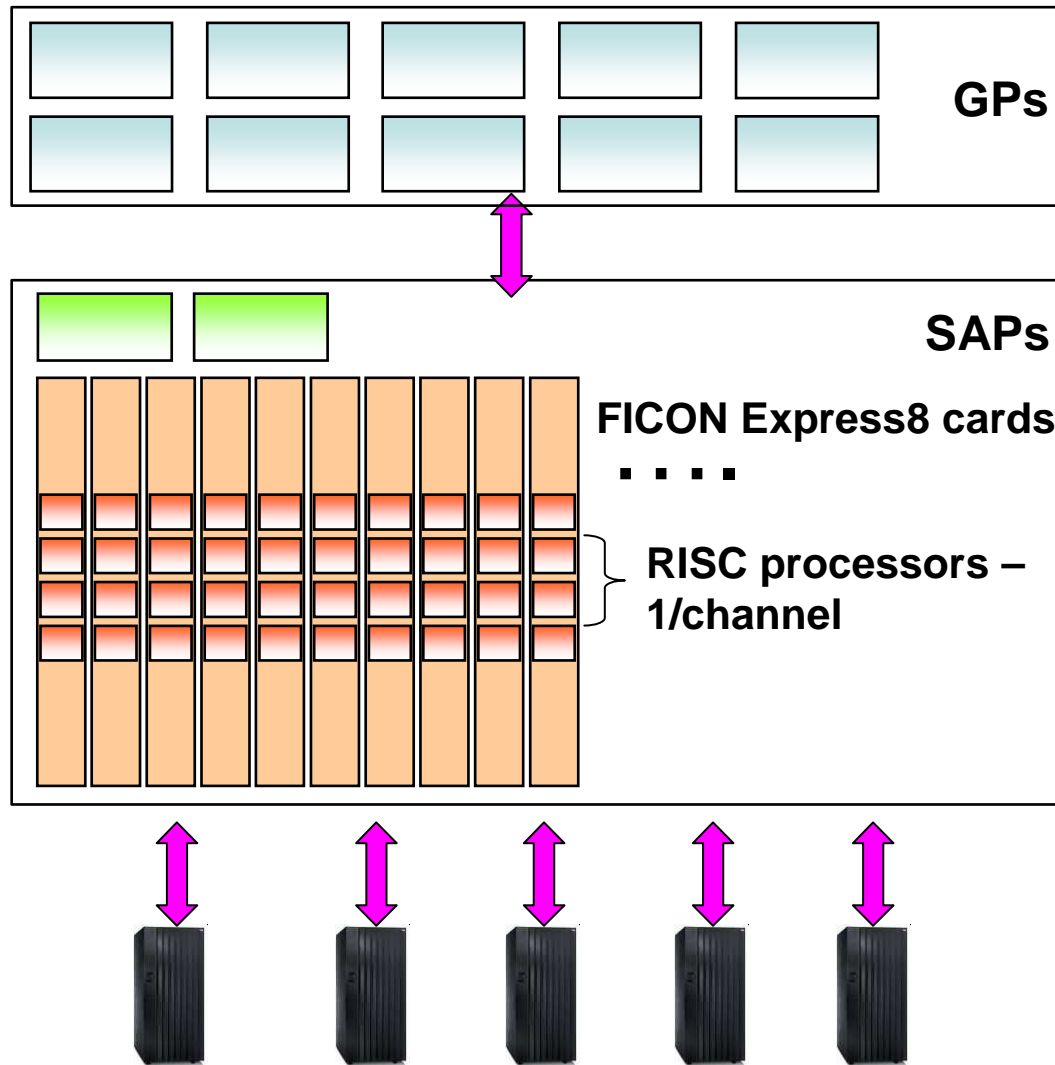
# Linux On z/VM Benefits From High I/O Bandwidth Provided By z196



- 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
  - ▶ Logical Channel Sub-systems virtualize I/O
  - ▶ Can sustain up to **2.2M IOPS\***
- Up to 84 physical FICON cards for I/O transfers
  - ▶ Up to **336 RISC channel I/O processors**
  - ▶ High Performance FICON connections (zHPF)
  
- IBM DS8800 Storage System
  - ▶ Up to **440K IOPS capability** with zHPF
- Benefits both z/OS and z/VM workloads

\* Recommend 70% max utilization – 1.5M IOPS

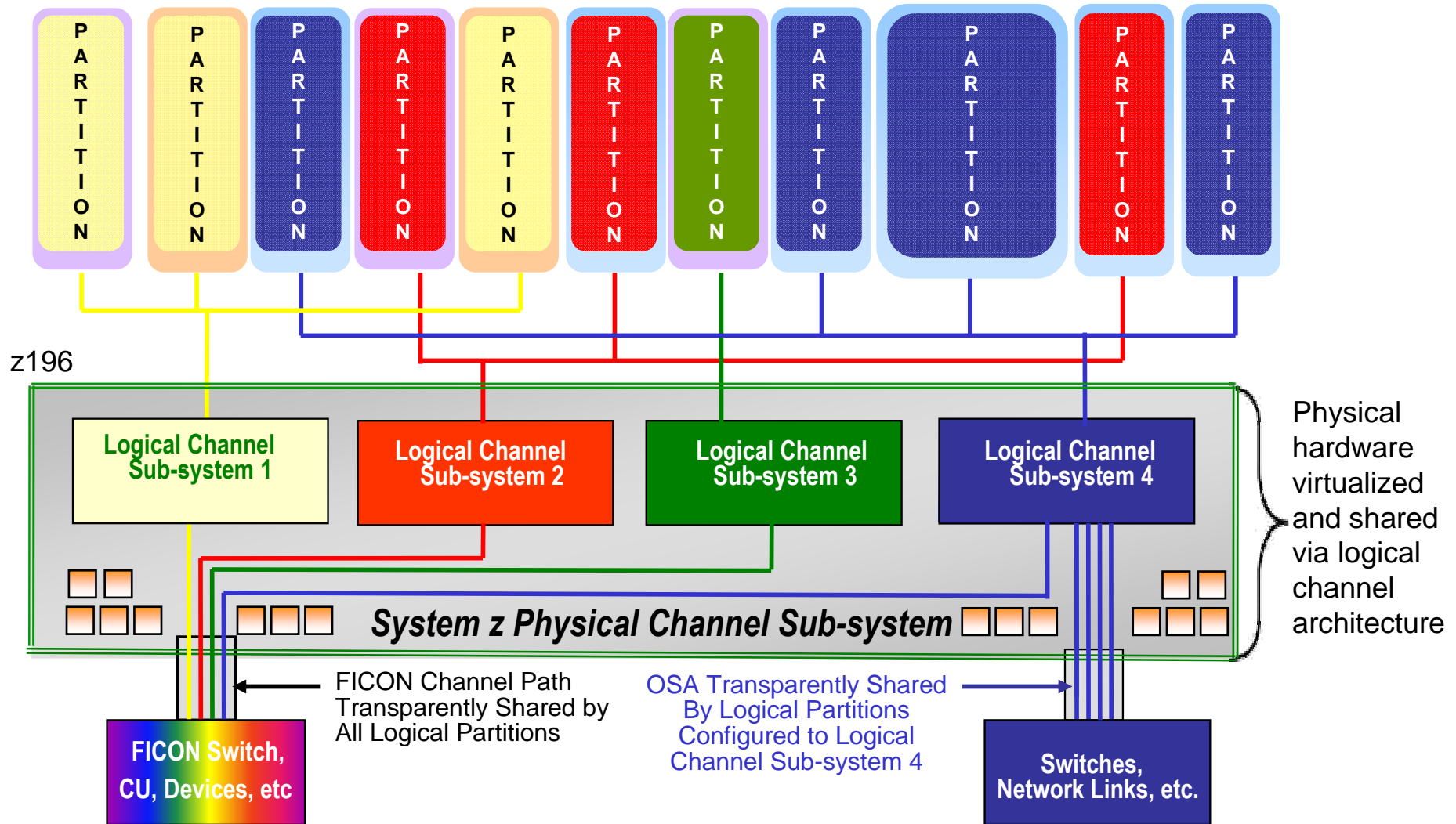
# Linux On z/VM Also Benefits From High I/O Bandwidth Provided By z114



- Up to 10 General Purpose (GP) or Specialty Engine processors
  - ▶ Execute business logic
- Up to 2 System Assist Processors (SAP) to manage I/O requests
  - ▶ Can sustain up to **230K IOPS\***
- Up to 64 physical FICON cards for I/O transfers
  - ▶ Up to **128 RISC channel I/O processors**

\* Recommend 70% max utilization – 161K IOPS

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



# z/VM Security For Linux Workloads

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- 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



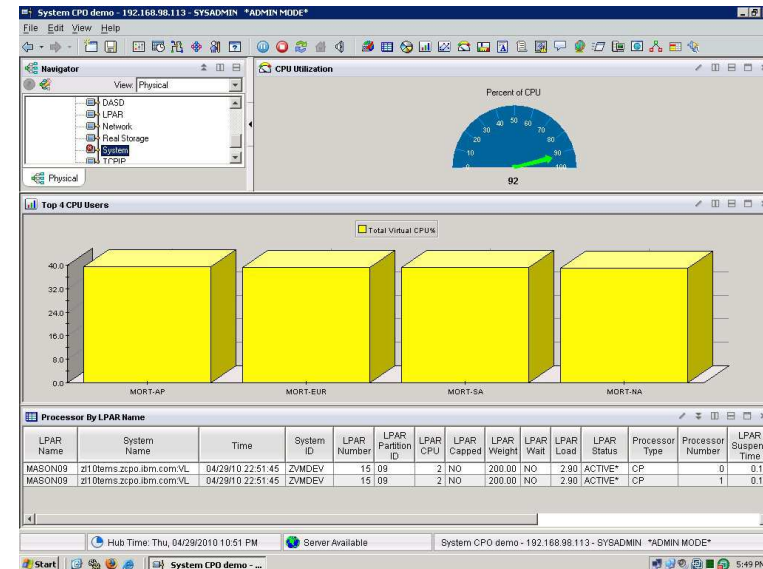
# Linux On z/VM Workloads Inherit System z Qualities Of Service

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- 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

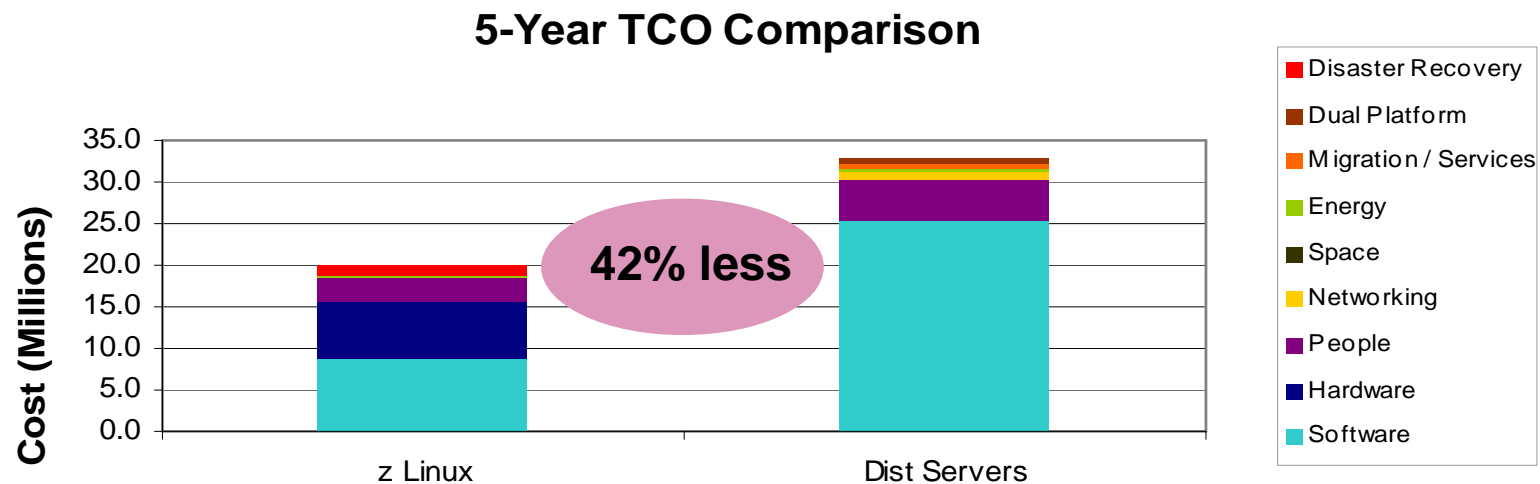


**VMware can't recognize and take advantage of additional physical processors without bringing down and rebooting the system**

Note: Assumes available processors on installed books

# Large Pharmaceutical Company Virtualizes Key Application On Linux Under z/VM

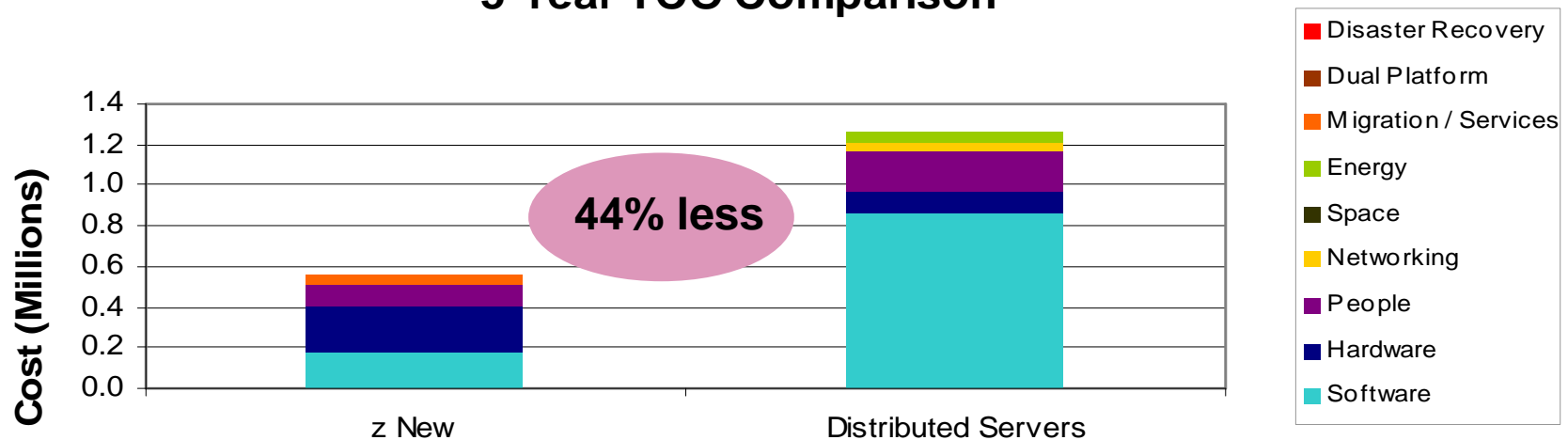
- z/VM offers lower cost and higher DR resiliency than VMware
  - ▶ WebSphere based mission critical workload
  - ▶ DR required. System z simplifies DR.
  - ▶ Cost effective scaling required - 4X user growth by 2014
  - ▶ 3 MIPS per user on a z10 IFL
  - ▶ 1 IFL to 7 Nehalem core ratio by 2014 (60 IFLs : 424 x86 cores)
- Correct virtualization environment for the given requirements



# Large Technology Company Virtualizes Manufacturing Application On Linux Under z/VM

- z/VM offers 7 to 1\* footprint reduction over x86 Virtualization
  - ▶ 100 Low CPU, High I/O mission critical workloads
  - ▶ Continuous operation required
  - ▶ Once-a-year scheduled maintenance
    - Any downtime very painful
  - ▶ Consolidate to 2 IFLs or 56 Nehalem cores
  - ▶ Distributed hypervisor costs exceed entire System z incremental costs

### 5-Year TCO Comparison



\*IFLs added to existing z footprint.

# Case in Point: A Real Life Case Study On Disaster Recovery

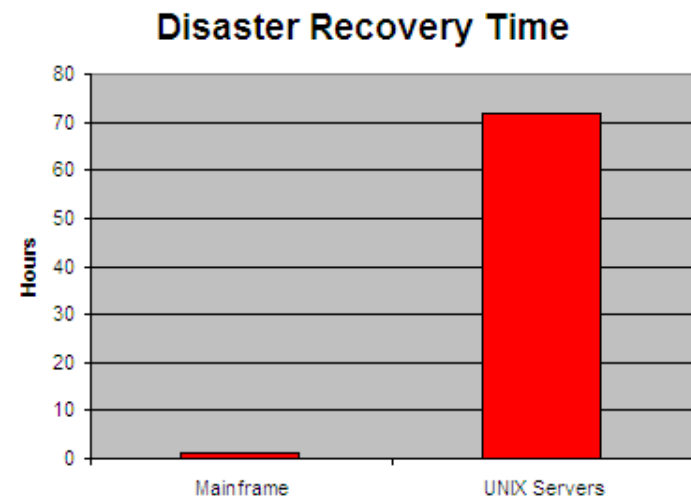
**The Customer:** A major US specialty retailer has two data centers across the continent, with critical business applications running on 5 z9s and 200+ UNIX servers. The company runs disaster recovery test twice annually to ensure business continuity.

## Disaster Recovery Test Result:

- Mainframe recover within **1 hour**
- UNIX servers failed to recover after **3 days!**

## What is the potential impact to customer?

- Assuming 3 days of business outage
- WW average of similar companies:
  - \$32B annual revenue => **\$260M revenue loss**
  - \$1.5B annual profit => **\$13M direct profit loss**
- ITG estimation of hourly impact for retailer  
\$1.11M/hour, with assumption of 12 hours per day for business operation  
**impact** => **\$39M business**



# BNZ Replaced Solaris With Linux On System z – Reduced HW And Achieved Systematic DR Plan

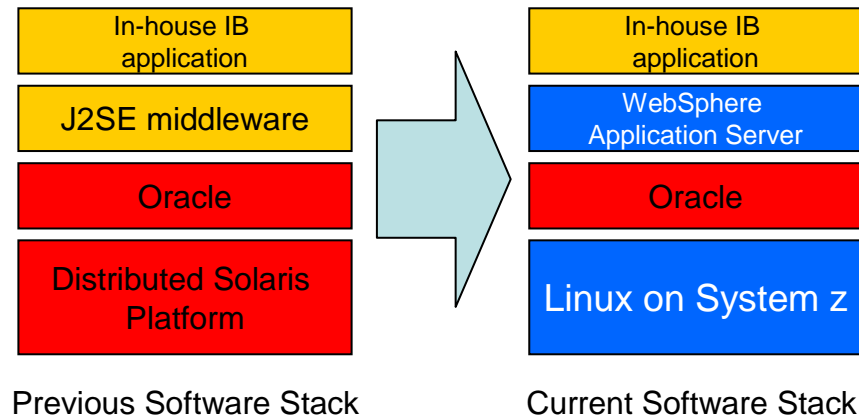


Bank of New Zealand

Transformed their Internet Banking (IB) front end application from a distributed Solaris platform to Linux on System z

### Result

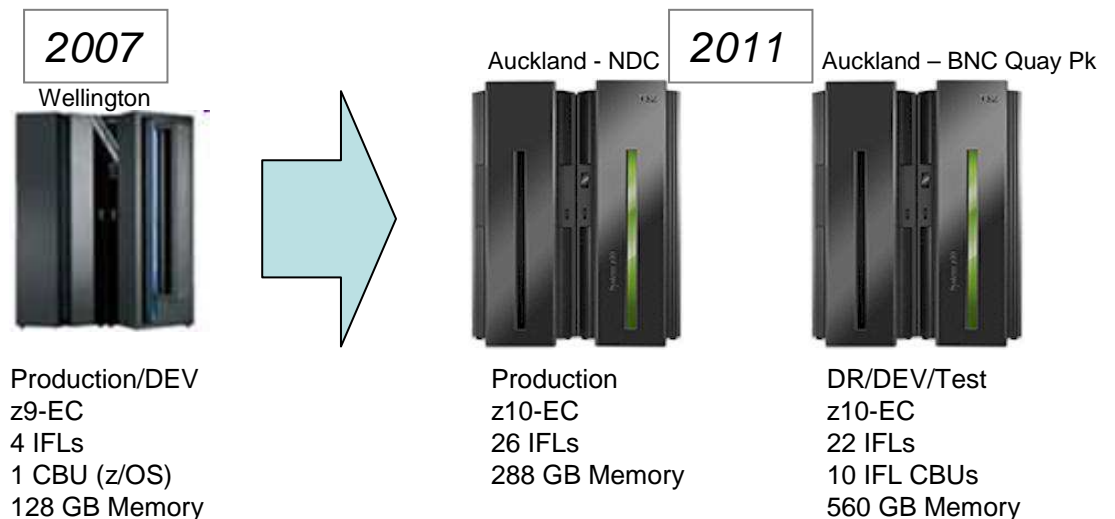
- *Physical x86 servers reduced by 75%*
- *Linux on System z yielded lowest costs for software priced per core*



Implemented a second z10 EC mainframe at a separate site to support DR / Dev / Test

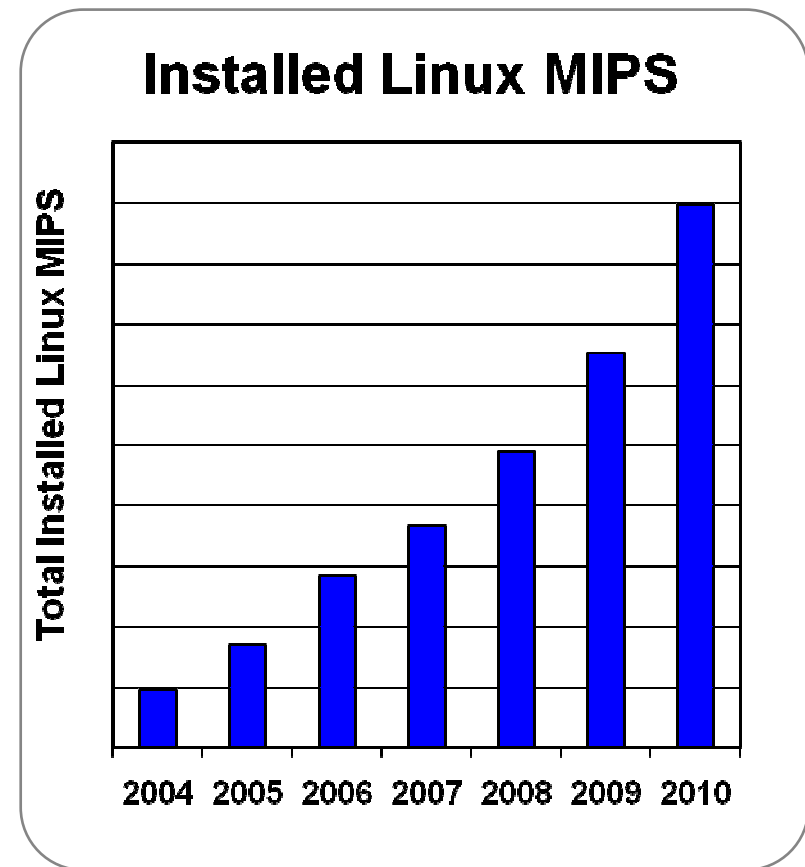
### Result

- *“Simple, consistent and reliable DR” plan in place protecting data and workloads*



# 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



<sup>1</sup> Based on YE 2004 to YE 2010

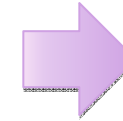
# Blue Cross Blue Shield Of Minnesota Saves Up To 50% By Reducing Their Hardware Footprint



- 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.”*

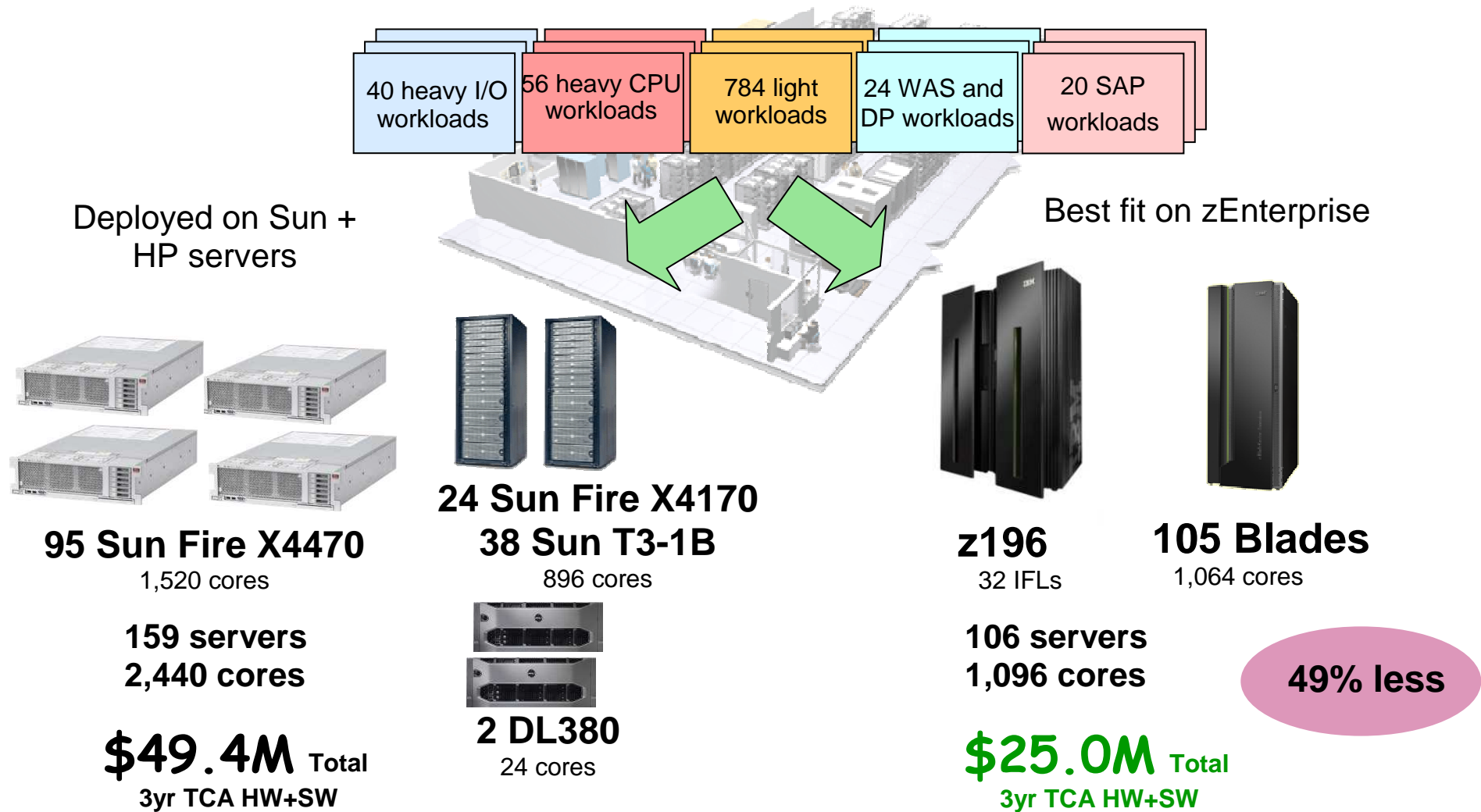
*— Ted Mansk, Director of Infrastructure Engineering and Databases at BCBSM*



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

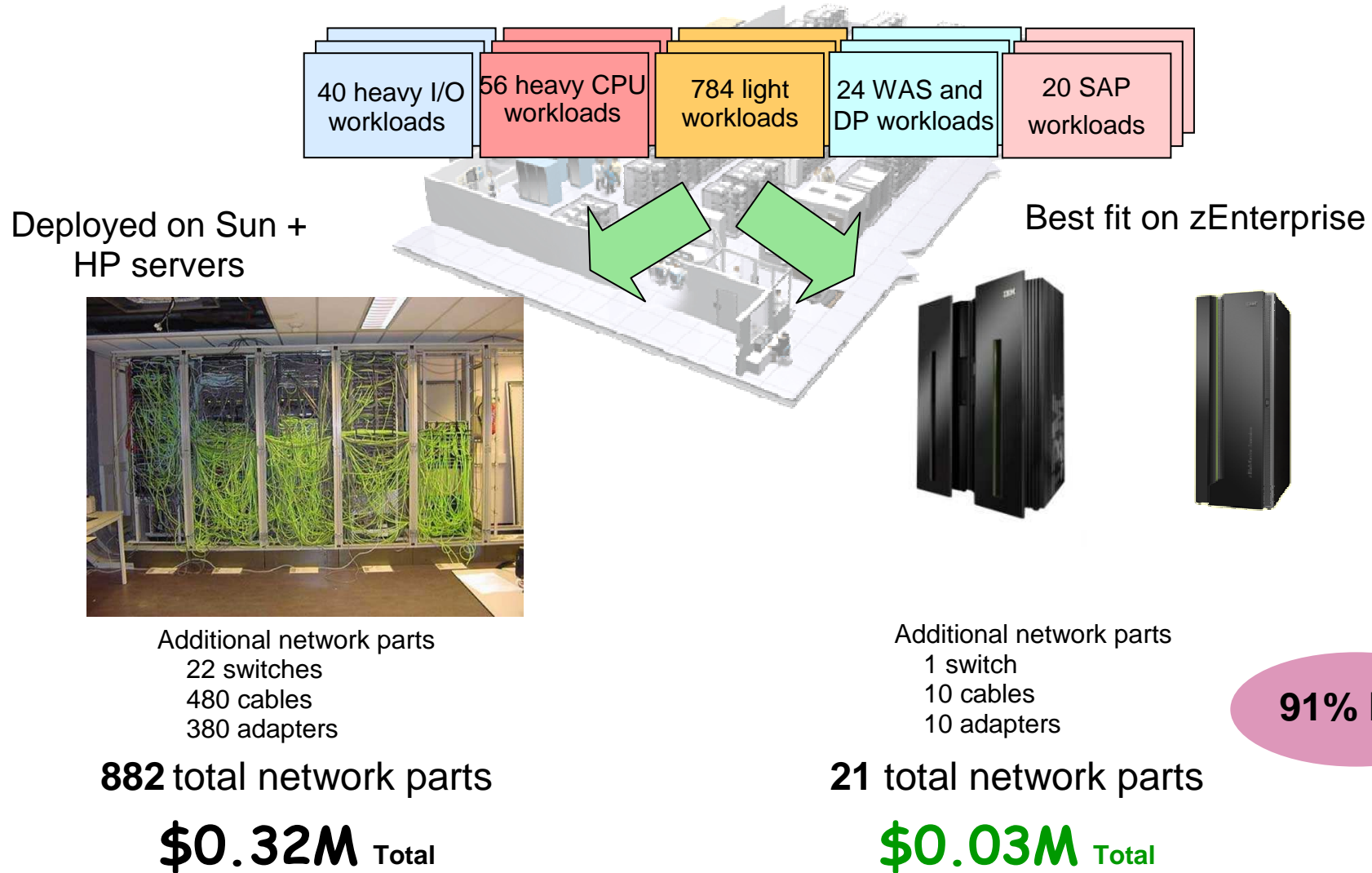


# Compare Server Hardware And Software Cost Of Acquisition



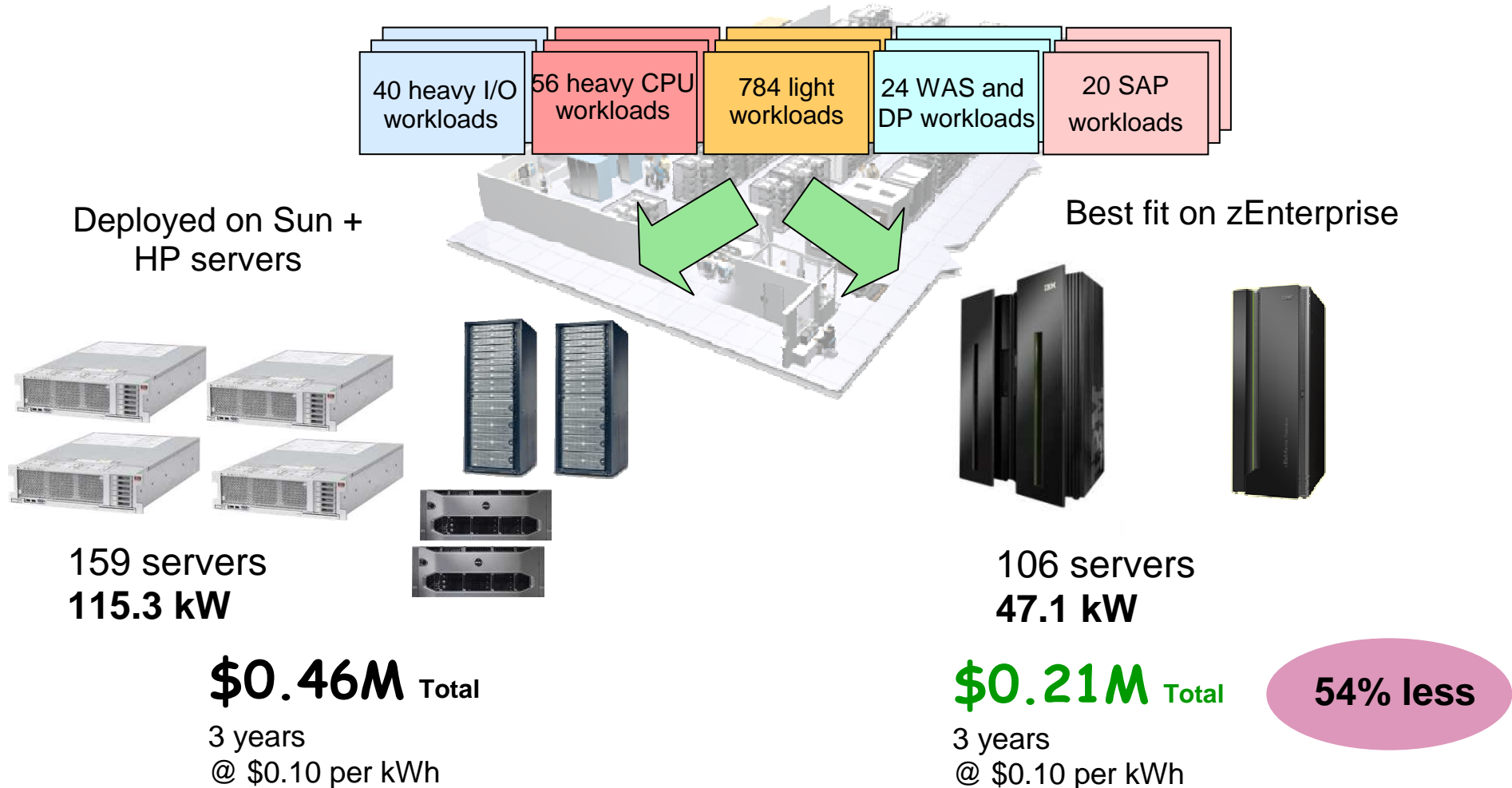
Server configurations are based on consolidation ratios derived from IBM internal studies. Prices are in US currency, prices will vary by country

# Compare Network Cost Of Acquisition



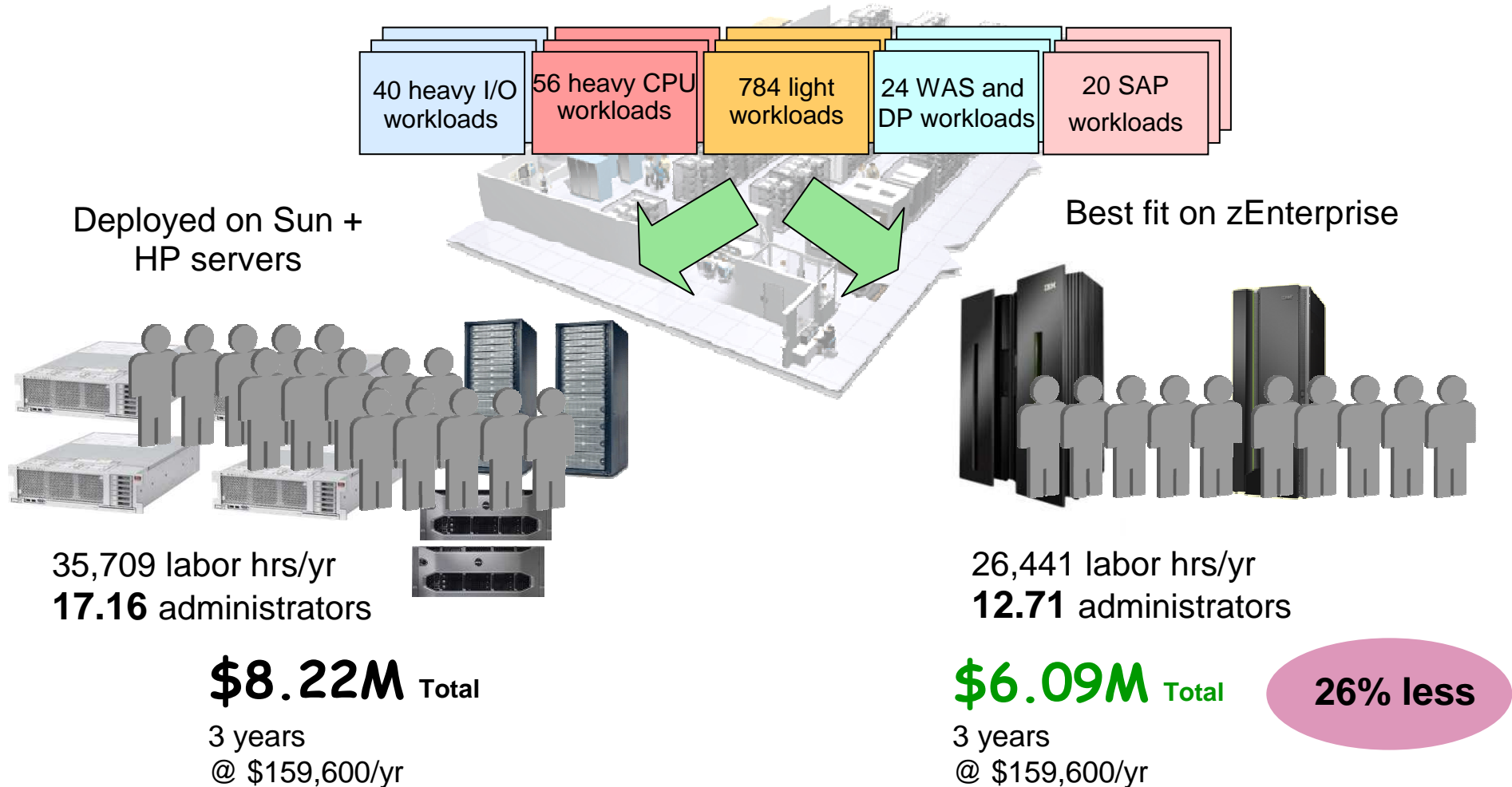
Network configuration is based on IBM internal studies.  
 Prices are in US currency, prices will vary by country

# Compare Power Consumption



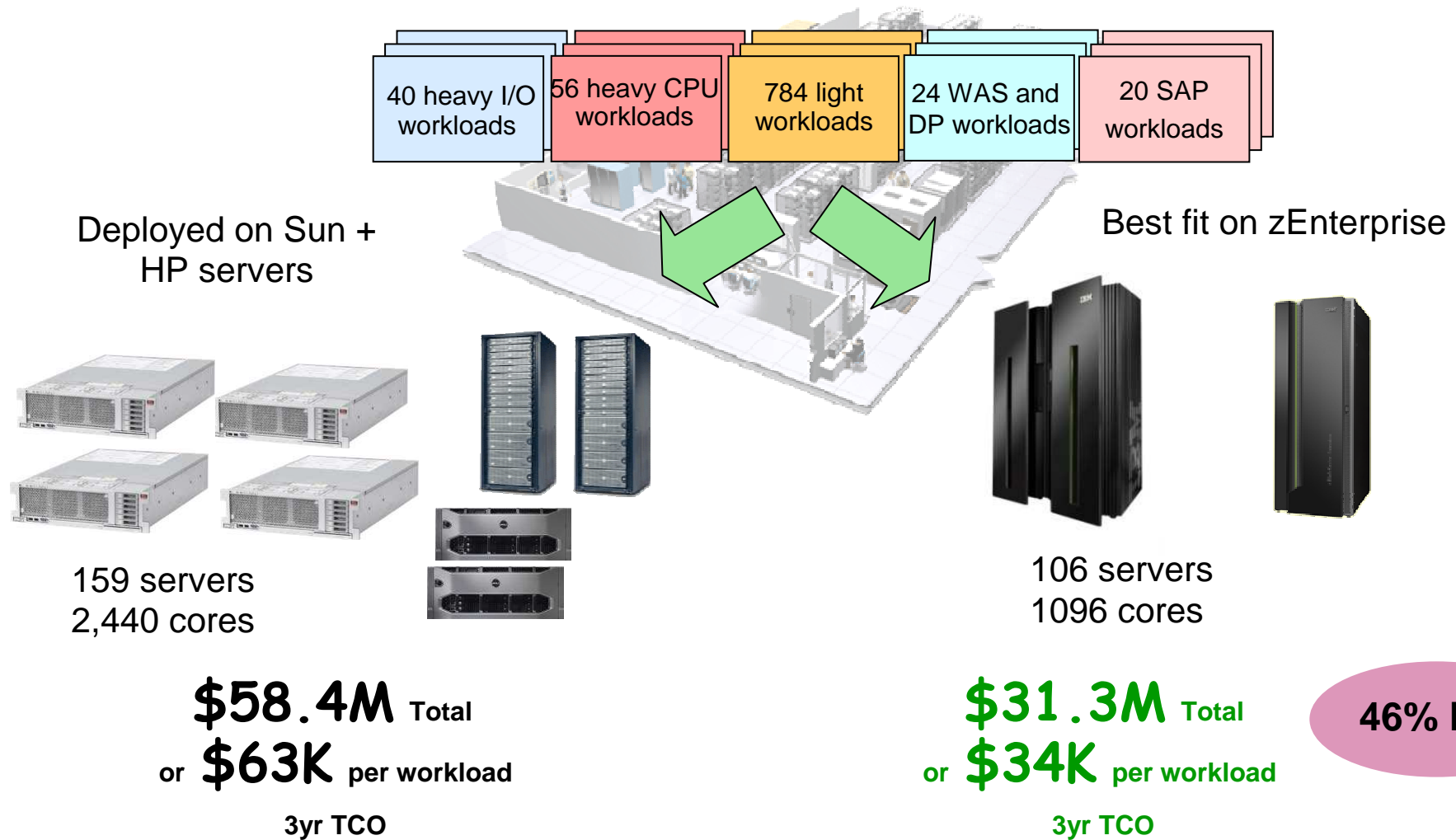
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# Compare Server Infrastructure Labor Costs



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

