The New zEnterprise – A Smarter System For A Smarter Planet

Deploying Web Applications

zEnterprise Offers A Choice Of Platforms For Deploying Web Applications

WebSphere on x86 blade in zBX

WebSphere on Power blades in zBX

Groups of Applications With Different Requirements

WebSphere for Linux on z

WebSphere for z/OS

Power and x86 Blades

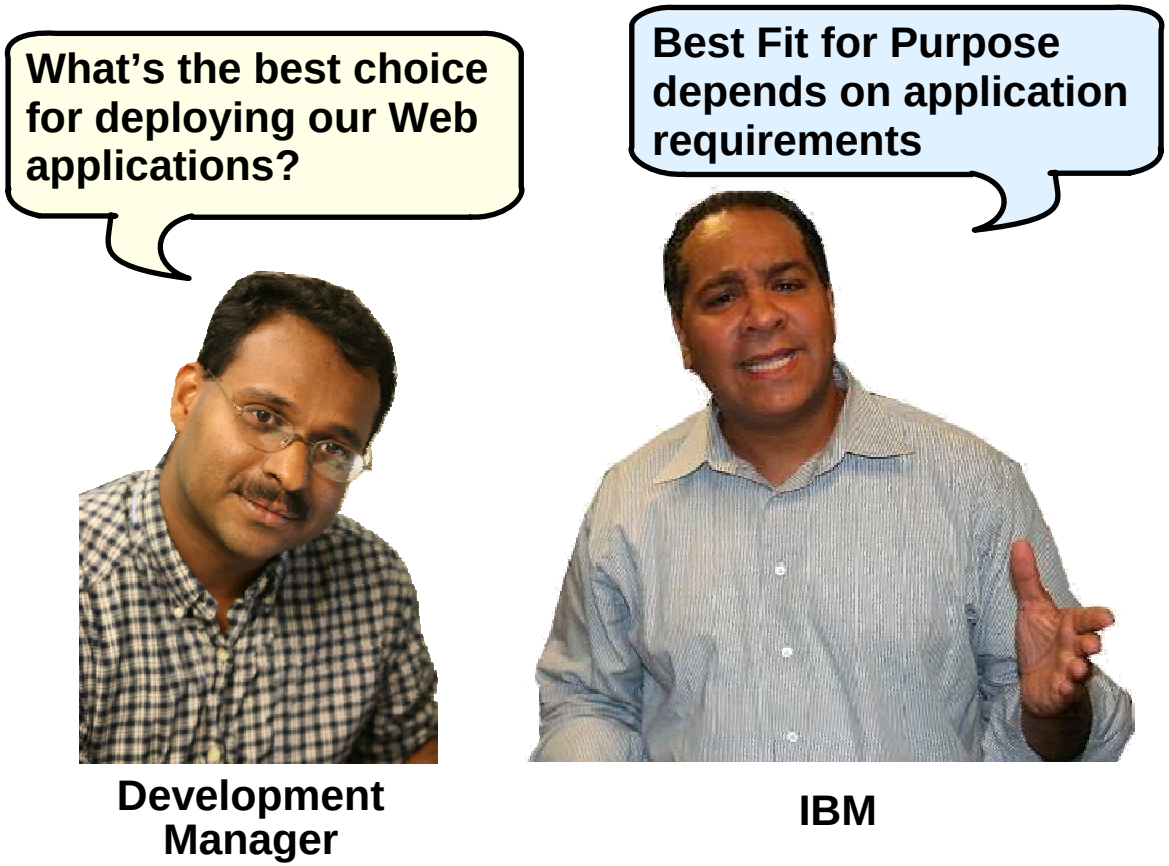
- Access to back-end data and transactions via secure, private network
- Blades managed by Unified Resource Manager

Linux on z

- Optimized access to z/OS via hipersockets
- Resource management via z/VM
- Uses IFLs for lower costs

WebSphere for z/OS

- Best integration with local back-end data access
- Advanced workload management
- Highest security
- Large scale clustering, high availability, and disaster recovery

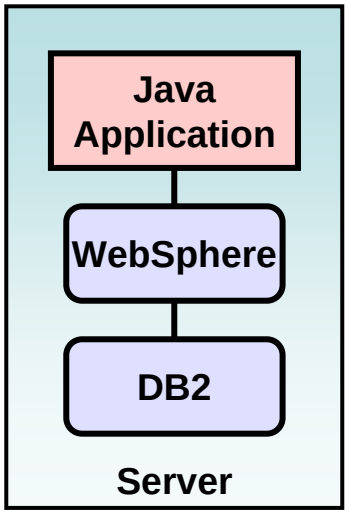

What's the best choice for deploying our Web applications?
Best Fit for Purpose depends on application requirements
Development Manager
IBM

1. Low cost application with basic Quality of Service (QoS) requirements
2. A transactional application with higher quality of service requirements
3. A mission-critical application requiring continuous availability and disaster recovery

Scenario #1: Simple Java Application

A Java application reads and updates a modest database on the same server

- Low cost is a key requirement
- No back-end access is needed
- Basic security and QoS requirements
- Application, Application Server and Database are co-located on the same server in all cases



Which is the best zEnterprise deployment option?

Results Of Benchmark And 3 Year Cost Study For Simple Application

Self-contained WebSphere Application with DB2

WebSphere and DB2 on x86 Blade in zBX

x86 Blade running 4 cores
675 transactions/second
$428 per TPS

WebSphere and DB2 on Power Blade in zBX

PS701 running 4 cores
2,425 transactions/second
$106 per TPS

Lowest Cost Solution

WebSphere and DB2 for Linux on z

Linux on z running on 4 IFLs
2,275 transactions/second
$317 per TPS

WebSphere and DB2 for z/OS

z/OS running on 2 zAAPs and 2 GP cores
1,005 transactions/second
$763* per TPS

* Price based on 2009 Solution Edition for WebSphere on System z10. z196 pricing is not available yet.

Which Is The Best Fit For Purpose?

- The application requirements can be satisfied easily with any of the platforms
- The main requirement is lowest cost, and for this case costs vary widely

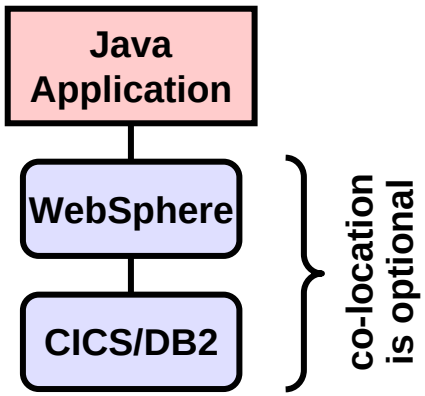
⇨ The Power Blade solution offers lowest cost and good Qualities of Service

WebSphere and DB2 on zBX Power blade

Scenario #2: Application Interfacing With Mission-Critical Transactions

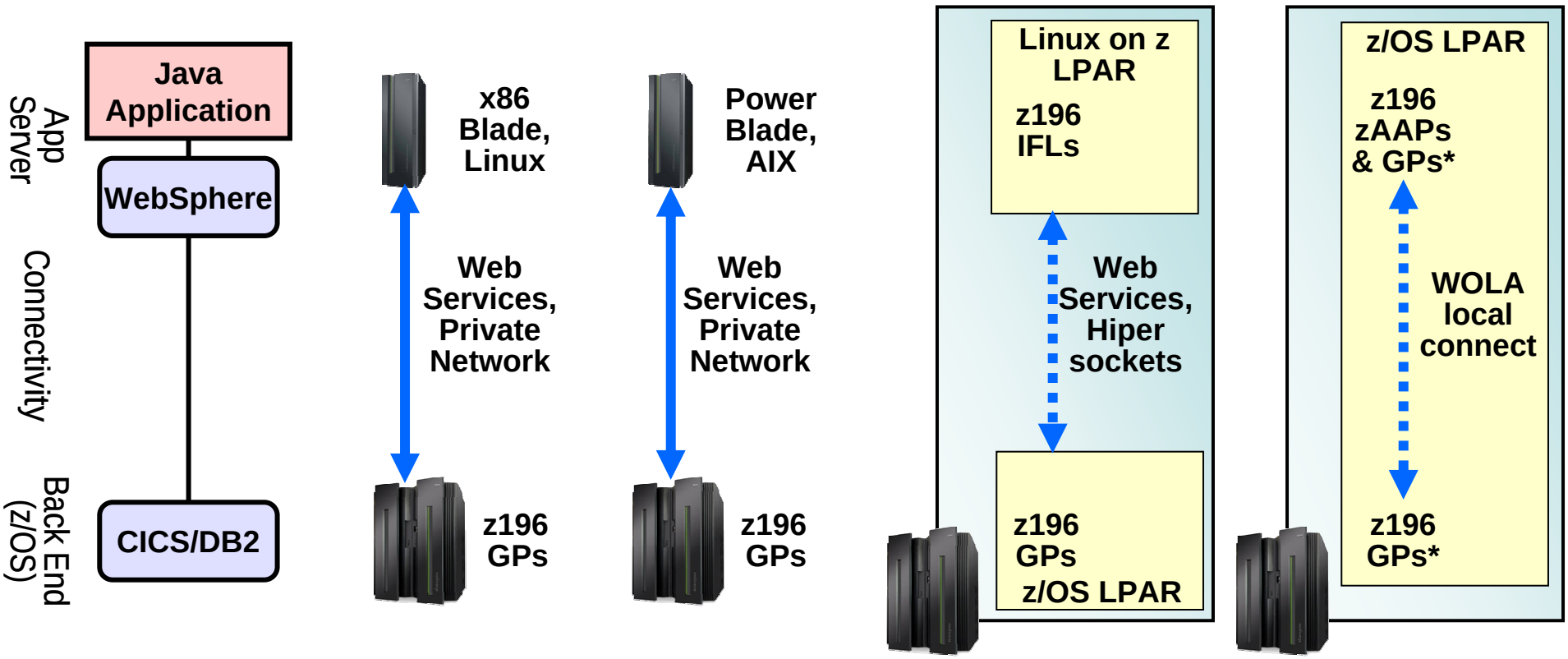
A Java application provides a Web interface to business data and transactions hosted by DB2 and CICS on a zEnterprise

- Higher QoS requirements
  - Transaction integrity
  - Typical security requirements
- Solution cost is important, but is second to meeting QoS requirements



Which is the best zEnterprise deployment option?

Let's Compare Four Deployment Options



* Shared GP processor pool

Results Of Benchmark And 3 Year Cost Study For Bank Transaction Application

Banking transaction application on WebSphere with CICS/DB2

WebSphere on x86 Blade in zBX

WAS on 5 cores on x86 Blade in zBX
Incremental CICS on 2 added GPs
1,950 transactions per second
$3,346 per TPS **Low Cost Solution**

WebSphere on Power Blade in zBX

WAS on 5 Power cores on PS701 blade in zBX
Incremental CICS on 2 added GPs
1,975 transactions per second
$3,330 per TPS **Low Cost Solution**

WebSphere for Linux on z

WAS on 4 Added IFLs, Solution Edition Pricing
Incremental CICS on 2 added GPs
2,035 transactions per second
$3,498 per TPS **Low Cost Solution**

WebSphere for z/OS

Incremental WAS z/OS and CICS
on 12 added cores (4 GPs, 8 zAAPs*)
2,480 transactions/second
$4,012 per TPS ← **1.21x Power Blade cost**

* Existing workload (435 MSUs) uses 4 GPs, allowing 8 zAAPs total.

Similar costs invite other considerations

Results Of Benchmark And 3 Year Cost Study For Bank Transaction Application

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WebSphere for Linux on z

WAS on 4 Added IFLs, Solution Edition Pricing
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2,035 transactions per second
$3,498 per TPS **Low Cost Solution**

WebSphere for z/OS

WAS z/OS and CICS on 12 cores (4 GPs, 8 zAAPs*)
2,480 transactions/second
$3,868 per TPS ← **1.16x Power Blade cost**

* Existing workload (435 MSUs) uses 4 GPs, allowing 8 zAAPs total.

IBM CONFIDENTIAL **Similar costs invite other considerations**

- This chart intentionally blank.

- It’s purpose is to keep this presentation in sync with the recording and script.

Considerations Of The Power Blade/zBX Solution

- Lowest cost
- Unified Resource Manager provides centralized system monitoring and management

WebSphere on zBX Power blade

- Connect to z196 using a high-speed private network
  - Software security between the Power blade and the z196 is not required

Advantages Of The x86 Blade/zBX Solution

- Low cost
- Unified Resource Manager provides centralized system monitoring and management

WebSphere on zBX x86 Blade

- Connect to z196 using a high-speed private network
  - Software security between the x86 blade and the z196 is not required

Linux On System z Is Great For Consolidation

- Low cost
- Linux on z leverages System z reliability
- Both WebSphere and commercial applications work well on Linux on z
- Very good security
  - Virtual network cannot be hacked like a real network

WebSphere for Linux on z


What about new mission-critical applications? We need absolute 24x7 availability for them.
WebSphere for z/OS is the best choice for vital applications!
Development Manager
IBM

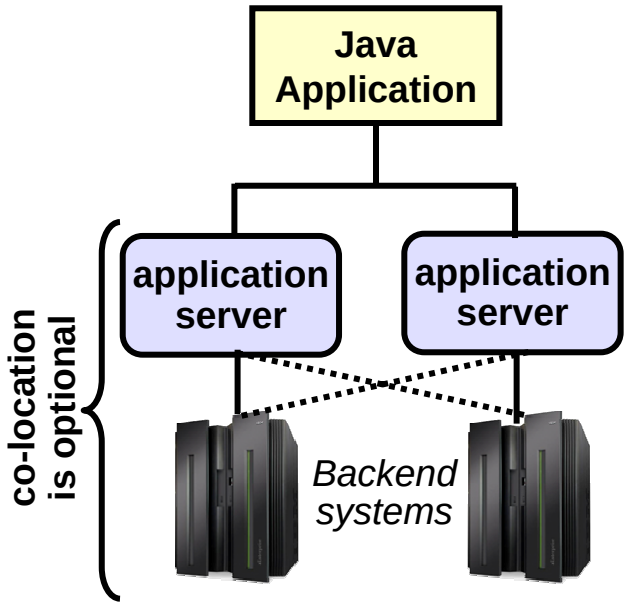
Quality Of Service Advantages From WebSphere For z/OS May Be Worth The Extra Cost

WebSphere for z/OS

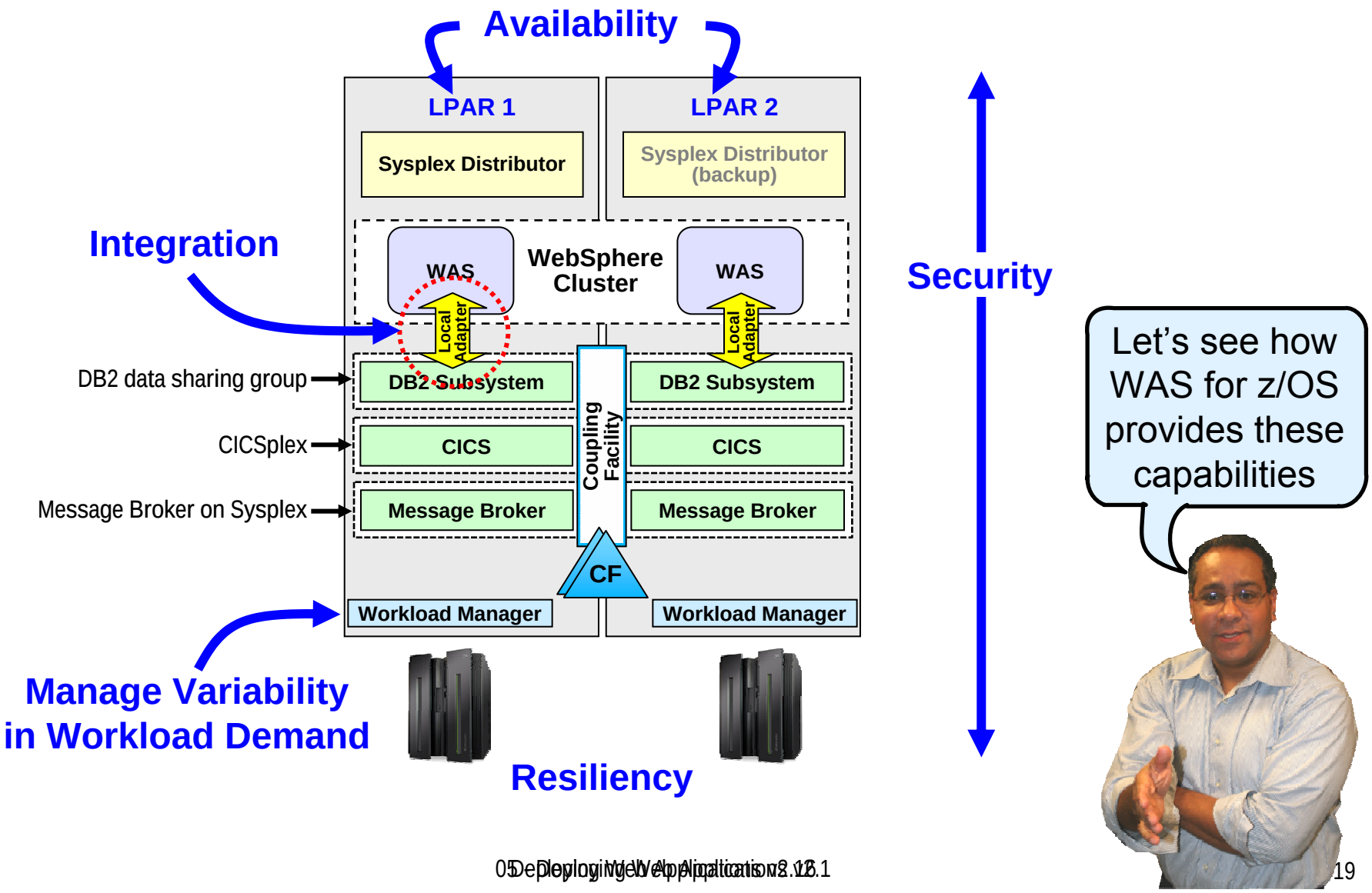
- Advanced Workload Management
  - On other platforms, you need WebSphere Virtual Enterprise at extra cost
- Co-location benefits: running WebSphere in the same LPAR with back-end systems
  - WOLA communications between WebSphere and CICS significantly reduces CICS MSU cost compared to hybrid and distributed solutions using Web services
  - Local JDBC Type 2 and WOLA communications give faster response time compared to hybrid and distributed solutions
  - Robust, high-speed two-phase commit between WAS and CICS
- Leverages System z High Availability and security features to provide the most secure, robust and reliable solution
  - Disaster Recovery options are also available
- These and other advantages come at extra cost
  - In the previous study, the cost was **1.21x** the lowest-cost solution

Scenario 3: Multi-tier Application – Connect To Backend Systems, HA With DR

- Requirement: Mission-critical Java applications with back-end support for
  - Database read/update from one or more databases
  - Invoke back-end transactions
- Substantial QoS requirements:
  - Transaction Integrity and Security
  - High Availability and Disaster Recovery
  - Workload Management to ensure Service Level Agreements are met
- Solution cost is important, but second to QoS requirements

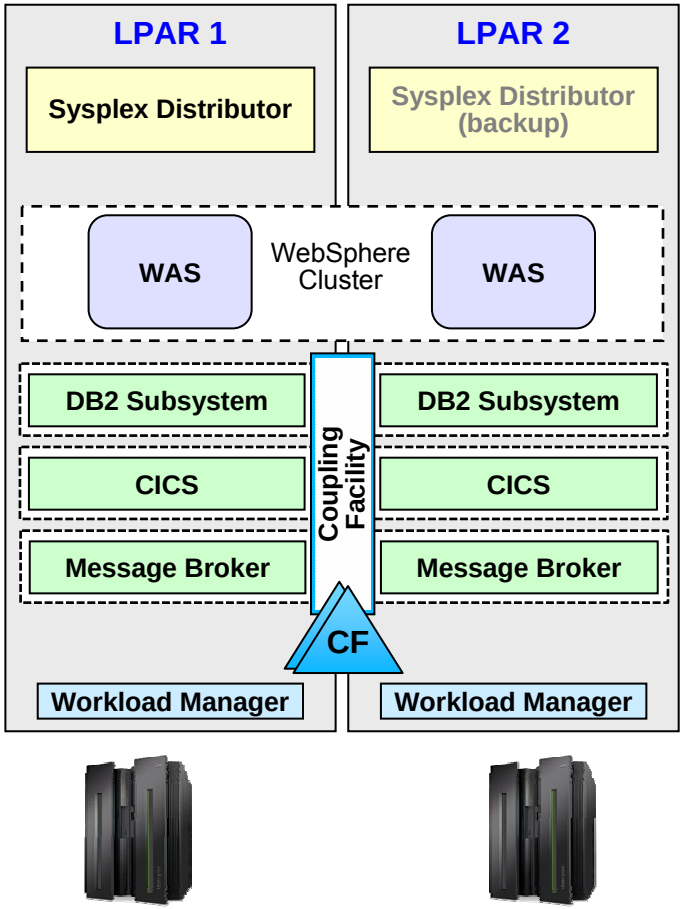


WebSphere For z/OS Can Be Deployed In A Parallel Sysplex Configuration



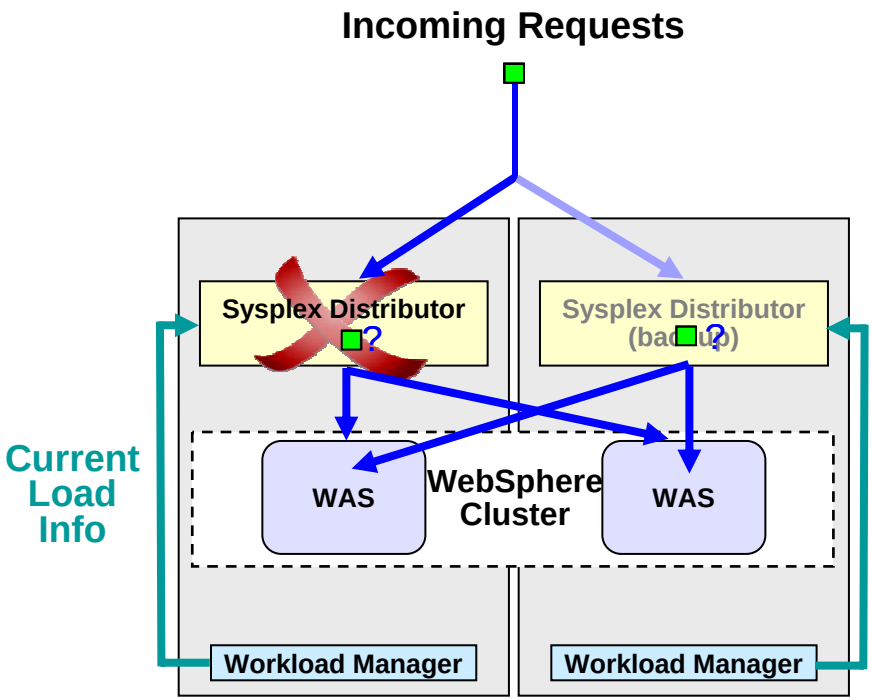
Parallel Sysplex Is The Key Enabler For High Availability

- **Parallel Sysplex** links two or more cooperating hosts in an Active/Active configuration
- **Coupling Facility** provides memory shared between hosts for
  - Locks
  - Cache
  - Data lists
- **Clusters** group cooperating middleware instances across the Sysplex
  - If one instance fails, another takes the load
  - Incoming transactions intelligently distributed to WAS instances in the cluster for load balancing
  - DB2 clusters implement data sharing
  - CICSplex shares customer workload
  - MQ uses Sysplex to provide high availability for message-driven applications

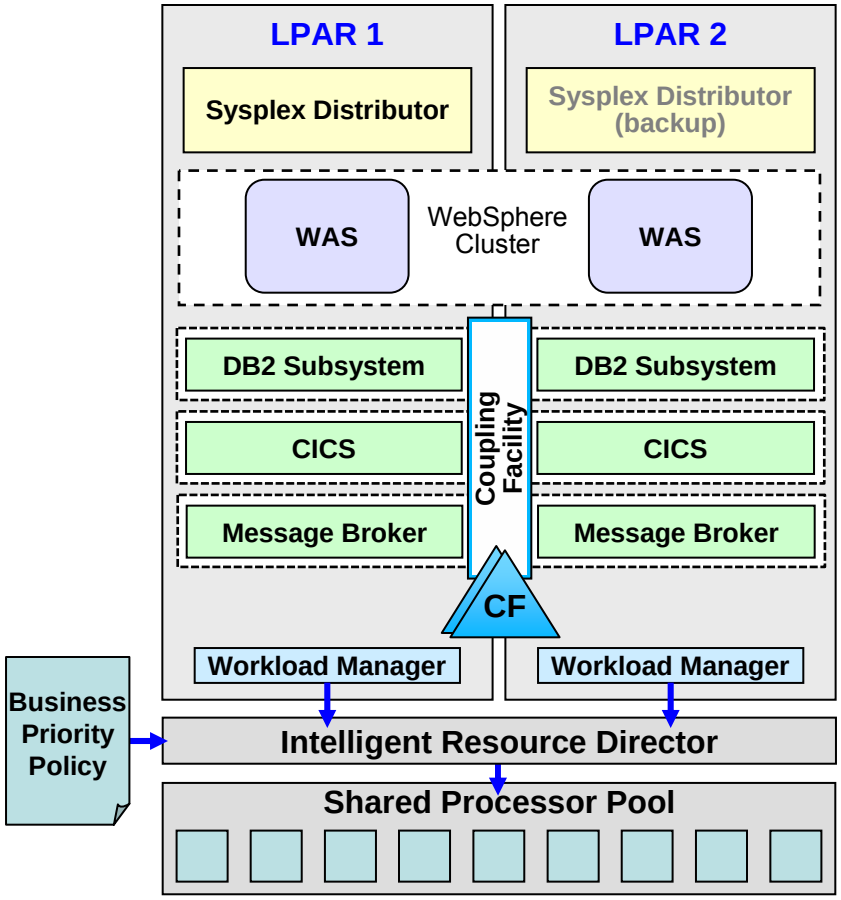


Sysplex Distributor Sends Incoming Requests To Best Available Server

- Sysplex Distributor is an intelligent router
  - Receives incoming requests
  - Determines which potential target LPAR is the best
  - Redirects the request to that LPAR
- It uses current load information from Workload Manager to support dynamic load balancing among WebSphere instances
- In the event of a failure in the LPAR or TCP stack, Sysplex Distributor functions **automatically** move to a backup TCP/IP stack
- All of this is transparent to the user and the applications

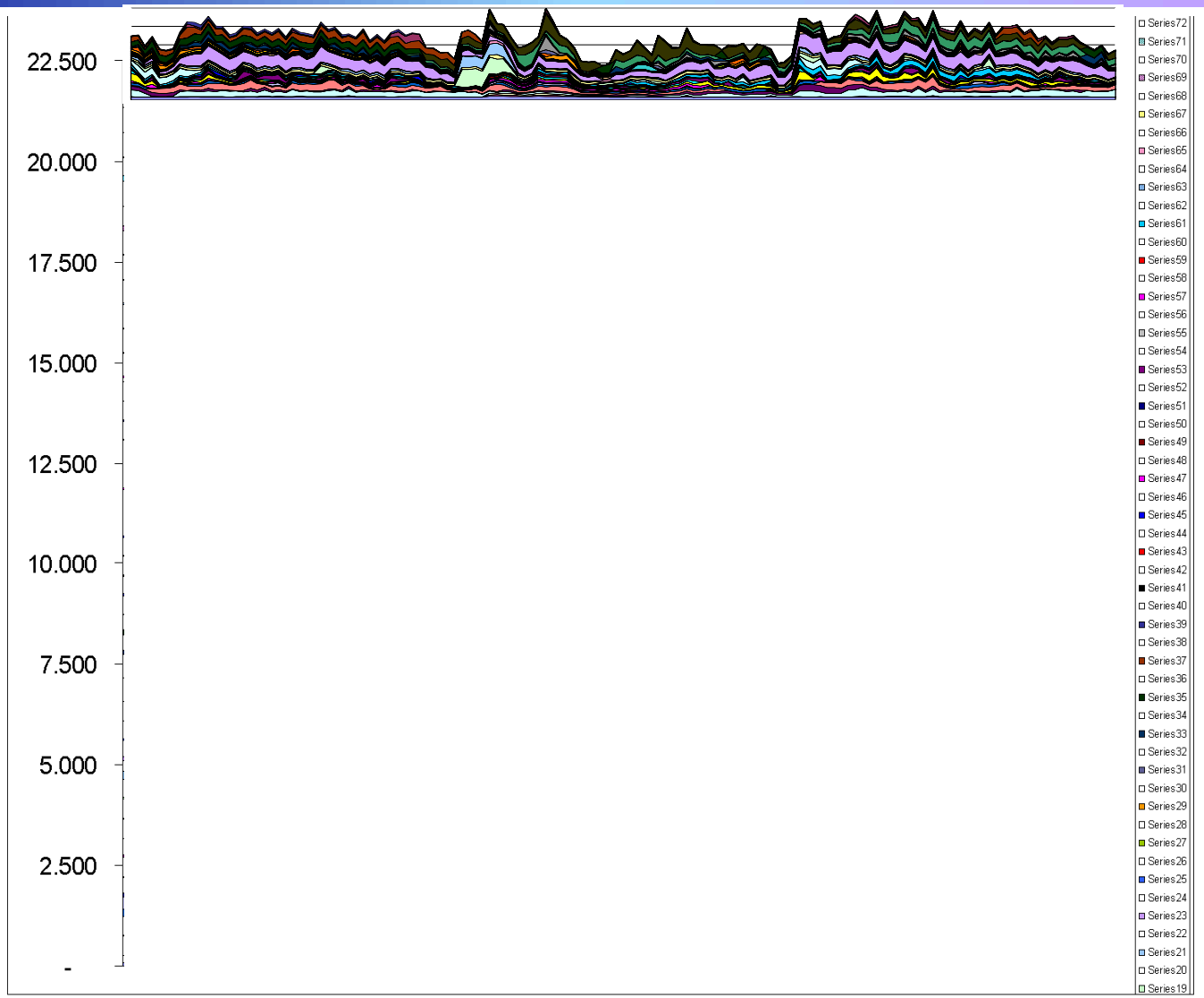


Mixed Workloads Share Pooled Processing Resources

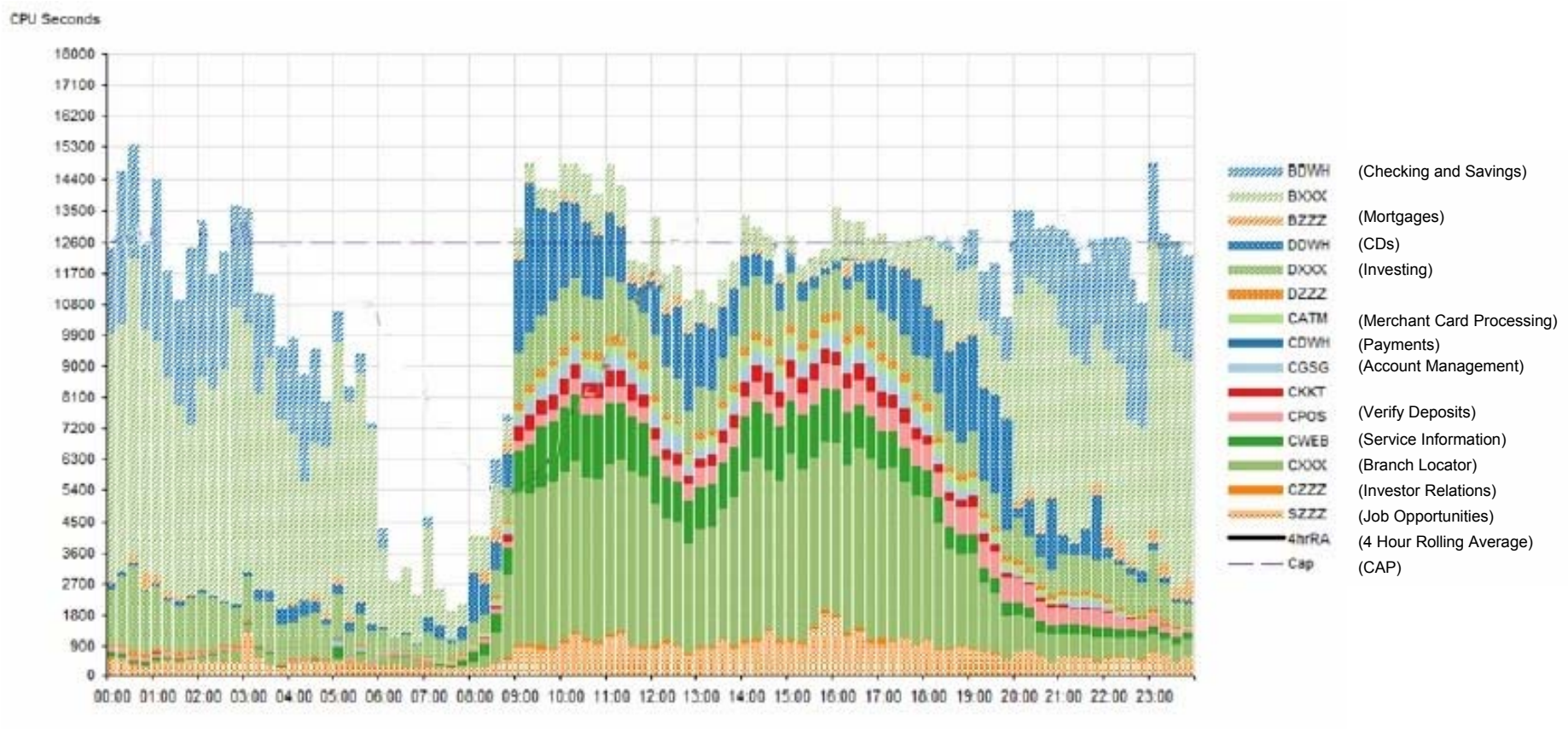


Workloads with light, medium, and heavy variation share the same pool of processors

Sharing Processors Eliminates Wasted Resources Of Distributed Servers

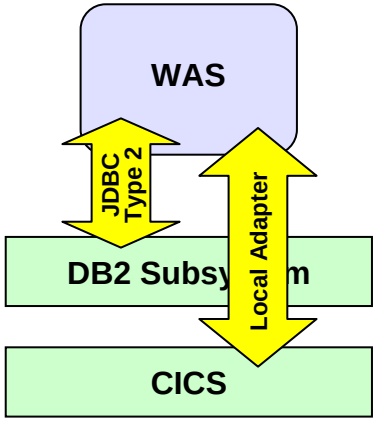


zEnterprise Shared Processors Achieve Competitive Costs Per Workload



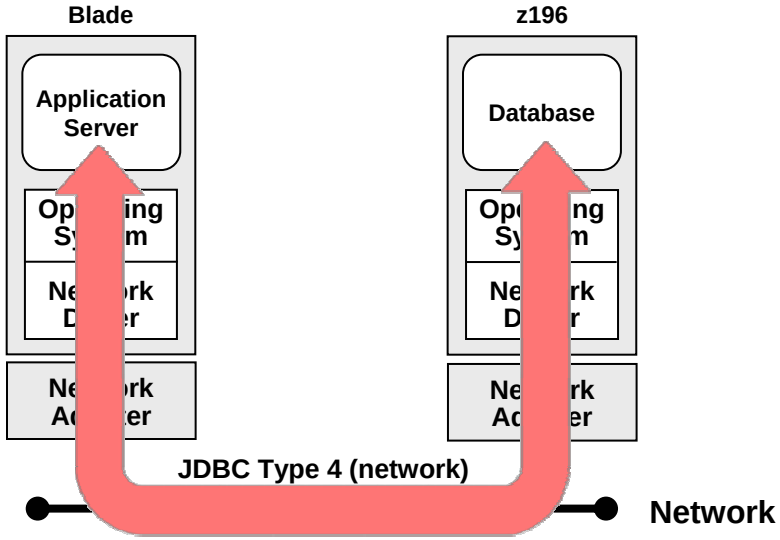
Webplex Co-locates Applications With Backend Systems For Efficiency and Security

WAS on z/OS



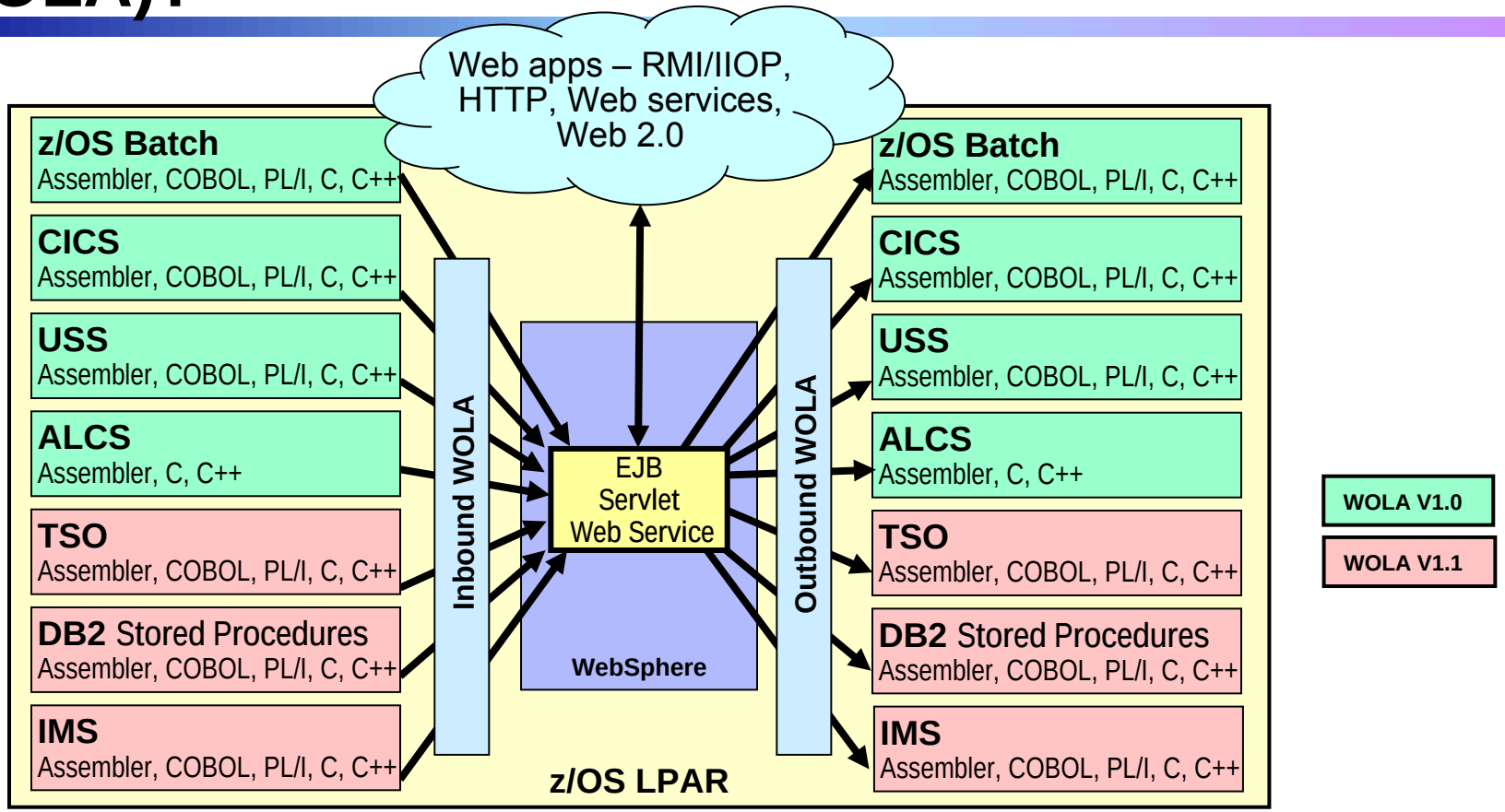
- Data can be shared in memory between WAS, DB2, and CICS by co-locating in same LPAR
  - Local adapters provide direct, cross-memory access
  - Optimal performance, faster response time
  - Security - data stays in same physical host

Hybrid Design



- Hybrid design separates applications from data and transactions
  - Accumulates network latency
  - Web services overhead – XML Parsing, serializing and deserializing Java objects, etc

What Are WebSphere Optimized Local Adapters (WOLA)?



WOLA supports fast, **bi-directional,** local calls between z/OS native apps and WebSphere apps for

- Global transactions, security propagation, WLM context passing
- 1-phase and 2-phase commit from WAS to CICS
- WOLA v2 improves CICS Transactions support

A Secure Foundation

- **zEnterprise has the highest commercial common criteria ratings**
  - PR/SM rated at EAL 5
- **Workload Isolation**
  - zEnterprise Hypervisor maintains strict isolation between workloads
  - Hardware coded storage protect keys protects system and user workloads
  - Architecture design makes typical buffer overflows and virus payloads inoperable

- **Integrated access control throughout the stack**
  - RACF enforces access control and logs security events
- **Secure cryptographic encoding**
  - On-chip crypto hardware assist
  - Optional high speed cryptographic processors
  - Support for Advanced Encryption Standard (AES) 192 and 256, SHA-384 and SHA-512

z/OS Provides Essential Network Security For Applications

- Communication Server for z/OS ensures that
  1. The partner is who it claims to be (endpoint authentication)
  2. Data came from the intended partner (data origin authentication)
  3. Data was not changed since it was sent via digital signatures (data integrity)
  4. Only the intended receiver can understand the data via encryption (data confidentiality)

- Data integrity and confidentiality are accelerated by zEnterprise cryptographic hardware

z/OS Provides Advanced Network Security

- Communications Server for z/OS provides the first line of defense against **network attacks**
  - Intrusion detection services
  - Dynamic defensive filtering protect from denial of service attacks
  - IPSec can encrypt data end-to-end, or across any portion, as controlled by a policy document
  - IPSec VPN offers system-to-system security, transparently to applications
  - SSL/TLS provides application-to-application security
- Communications Server for z/OS supports **memory-to-memory hipersocket connections** for internal communications
- z/OS HTTPS conforms 100% to the standard, but adds:
  - Ability to store keys in SAF (RACF) or file stores
  - Use of crypto hardware accelerator to speed up the encryption and decryption processes

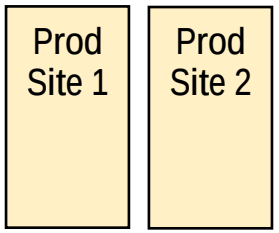
Deploy Web Application Without Disaster Recovery On zEnterprise vs. SPARC Servers

Existing Mainframes
Parallel Sysplex

Prod Site 1 Prod Site 2

Existing configuration, per site:
zEnterprise system with
5 GP, 4,616 MIPS workload

Add 1 LPAR to each z10
for New Web Applications



8,382 MIPS
Additional workload
per site, WAS + DB2
(16,762 MIPS total)

Incremental upgrade, per site:

6 zAAPs	5,261 MIPS WAS (85% zAAP eligible)
1 zIIP	877 MIPS DB2 (40% zIIP eligible)
3 GP	2,244 MIPS (WAS+DB2 ineligible)
40 GB	memory

Or: Add 11 SPARC Enterprise T5440
Servers, 1.4 GHz, 2 chip / 16 core
619,376 Performance Units per site
(22 servers, 1,238,753 Performance Units total)

Prod, Site 1 Prod, Site 2

App Server (8) Database (3) App Server (8) Database (3)

3 year cost of acquisition $13.79M

SPARC costs 23% more!

3 year cost of acquisition $16.98M

USA List Price Comparison (both IBM and Oracle)

Deploy Web Application On Mainframe vs. SPARC: Incremental Cost Breakdown

Mainframe Incremental Hardware

OTC		ANNUAL	
3+3* GPs, 4,710 new MIPS 6+6* zAAPs 1+1* zIIPs 50+50* GB Memory	$6,732,000 $1,200,000 $200,000 $150,000	GP Maint zAAP Maint zIIP Maint (Maint charged years 2, 3 only)	$421,872 $240,000 $40,000
TOTAL	$8,282,000	TOTAL (per yr, yr 2, 3) $701,872	

Mainframe Incremental Software

OTC		ANNUAL	
WebSphere for z/OS	$435,880	z/OS MLCx12 DB2 MLCx12 QMF MLCx12 WS for z/OS S&S	$636,192 $345,168 $155,664 $87,040
TOTAL	$435,880	TOTAL (per yr, 3yrs)	$1,224,064

Distributed Incremental Hardware

OTC		ANNUAL	
11+11* SPARC Enterprise T5440 1.4GHz 2ch/16co	$886,490	Server Maintenance (years 2,3)	$156,574
TOTAL	$886,490	TOTAL (per yr, yr 2,3)	$156,574

Distributed Incremental Software

OTC		ANNUAL	
Oracle EE WebLogic EE	$4,560,000 $6,400,000	Oracle EE S&S WebLogic EE S&S	$1,003,200 $1,408,000
TOTAL	$10,960,000	TOTAL (per yr, yr 2,3)	$2,411,200

* The “n+n” notation means n units added at each site

All dollar figures and MIPS are total for both sites

Deploy Web Application With Disaster Recovery On zEnterprise vs. SPARC

Existing zEnterprise, Site 1

Existing zEnterprise, Site 2

Existing configuration, per site:
zEnterprise system with
5 GP, 4,609 MIPS workload
5 "dark" GPs capacity backup

Add 1 LPAR to each z10 for New Web Applications

Prod Site 1 | Prod Site 2

8,795 MIPS
Additional workload per site, WAS + DB2
(17,590 MIPS total)

Incremental upgrade, per site:

6 zAAPs	5,261 MIPS WAS (85% zAAP eligible)
1 zIIP	877 MIPS DB2 (40% zIIP eligible)
3 GP	2,244 MIPS (WAS+DB2 ineligible)
40 GB	memory

...And Add Disaster Recovery

DR Site 1 | DR Site 2

Capacity Backup upgrade, per site:
6 backup ("dark") zAAPs
1 backup ("dark") zIIP
3 backup ("dark") GPs
40 GB memory

3 year cost of acquisition $14.73M

SPARC costs 106% more!

3 year cost of acquisition $30.41M

Or: Add 20 SPARC Enterprise T5440 Servers, 1.4 GHz, 2 chip / 16 core 1,180,532 Performance Units for Site 1

...And add 20 more servers for Site 2

Prod+DR, Site 1

App Server (15) Database (5)

Prod+DR, Site 2

App Server (15) Database (5)

USA List Price Comparison (both IBM and Oracle)

Deploy Web Application With DR On Mainframe vs. SPARC: Incremental Cost Breakdown

Mainframe Incremental Hardware

OTC		ANNUAL	
3+3* live GPs, 4,710 new MIPS	$7,065,000	GP Maint	$442,574
3+3* dark GPs	$141,247	zAAP Maint	$200,000
6+6* live zAAPs	$1,000,000	zIIP Maint	$40,000
6+6* dark zAAPs	$20,000		
1+1* live zIIPs	$200,000		
1+1* dark zIIPs	$4,000		
Memory 80+80GB	$240,000		
TOTAL	$8,667,600	TOTAL $682,574 (year 2, 3)	

Mainframe Incremental Software

OTC		ANNUAL	
WAS for z/OS	$451,264	WAS S&S	$90,112
		DB2 MLCx12	$361,080
		z/OS MLCx12	$665,520
		QMF MLCx12	$162,840
		MQ MLCx12	$219,480
TOTAL	$ 451,264	TOTAL (per year)	$1,449,032

Distributed Incremental Hardware

OTC		ANNUAL	
20+20* SPARC Enterprise T5440 1.4GHz 2ch/16co	$1,611,800	Server Maintenance (years 2,3)	$284,680
TOTAL	$1,611,800	TOTAL	$284,680 (year 2,3)

Distributed Incremental Software

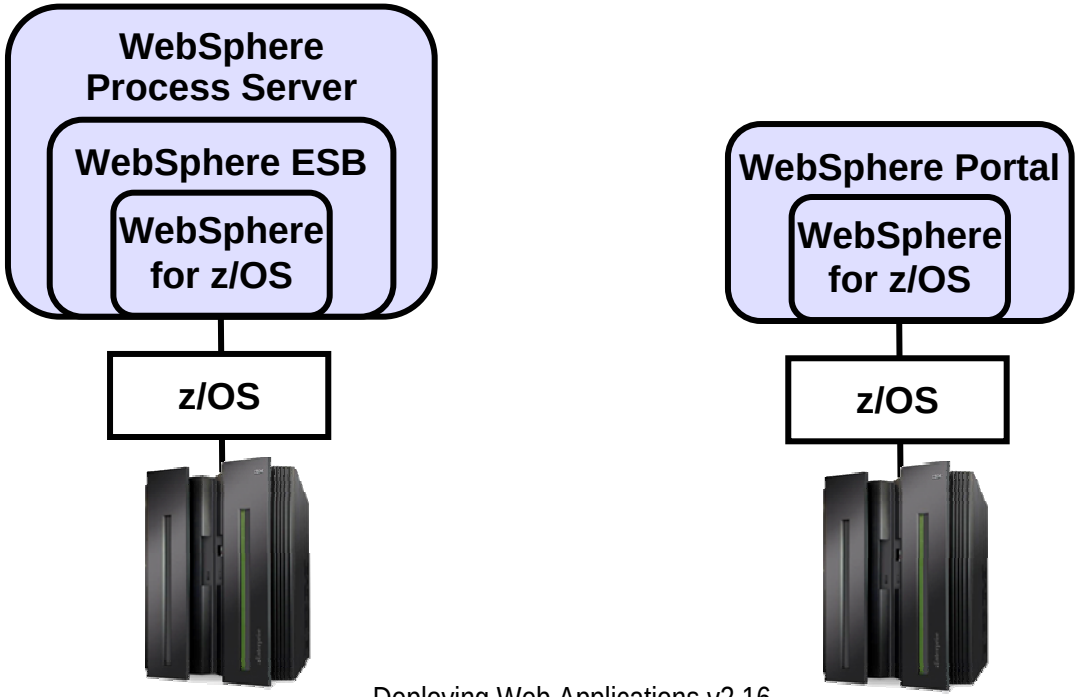
OTC		ANNUAL	
Oracle EE	$7,600,000	Oracle EE S&S	$1,672,000
WebLogic EE	$12,000,000	WebLogic EE S&S	$2,640,000
TOTAL	$19,600,000	TOTAL (yr 2-3)	$4,312,000

* The “n+n” notation means n units added at each site

All dollar figures and MIPS are total for both sites

WebSphere Application Server For z/OS Is The Ideal Web Infrastructure

- WebSphere Application Server (WAS) for z/OS is also the foundation for
  - WebSphere Process Server for z/OS
  - WebSphere Enterprise Service Bus for z/OS
  - WebSphere Portal for z/OS



We are building SOA and use XML, but we use many other data formats – from COBOL copybook to industry-specific formats

Development Manager

DataPower appliances provide any-to-any data transformations – with full integration with System z!

IBM

DataPower XI50B Advanced Data Integration Appliance Reduces Mainframe Processing

- An SOA appliance in a blade form
  - **Any-to-Any data transformation at wire speed**
    - between XML, COBOL copybooks, text, industry standards, or custom formats
  - Built-in **XML parsing** and **transformation**
    - Convert between XML schemas
  - **Content-based routing**
  - Creates **bridges between messaging protocols**
    - MQ, WebSphere JMS, third-party JMS, FTP, HTTP
  - **Direct-to-database access** for DB2, Oracle, and Sybase
    - Use XML to directly insert, modify, query, and retrieve database info
  - **Advanced security capabilities** based on industry standards
  - Data validation,
  - Field-level security
  - Web services management
  - Access control

WebSphere DataPower XI50B

System z With WebSphere DataPower XI50B Is A Powerful Synergy

- Higher performance with DataPower hardware acceleration, reduces CPU usage
- Enables Web services for z backend systems
  - IMS, COBOL via copybook, DB2 (and other databases), CICS
- z/OS Sysplex Distributor performs load distribution to multiple DataPower blades
- XI50B Complementary High Availability features
  - Dual power supplies
  - Active/passive failover support
  - No spinning media
  - Self-healing capability
- Remote SAF/RACF and Crypto security integration

In the first half of 2011, IBM intends to offer a WebSphere DataPower appliance for IBM zEnterprise System on zBX model 002

Summary: Deployment Options For WebSphere on zEnterprise

- Power and x86 blades in a zBX offer the lowest-cost solution for simple Web applications, while benefiting from Unified Resource Management
- WebSphere for z/OS provides the most secure and reliable deployment platform, with the best Qualities of Service available and automated Disaster Recovery
- WebSphere DataPower offloads data transformation and message routing, provides security, and will soon be available for zEnterprise

The Best Fit for Purpose depends on application requirements – zEnterprise gives you four choices for optimal WebSphere deployment!