System z – A Smart System For A Smarter Planet

Deploying Web Applications

Service Oriented Finance Needs A New Web site

Our business is changing, and we need a new Web site

Service Oriented Finance CEO

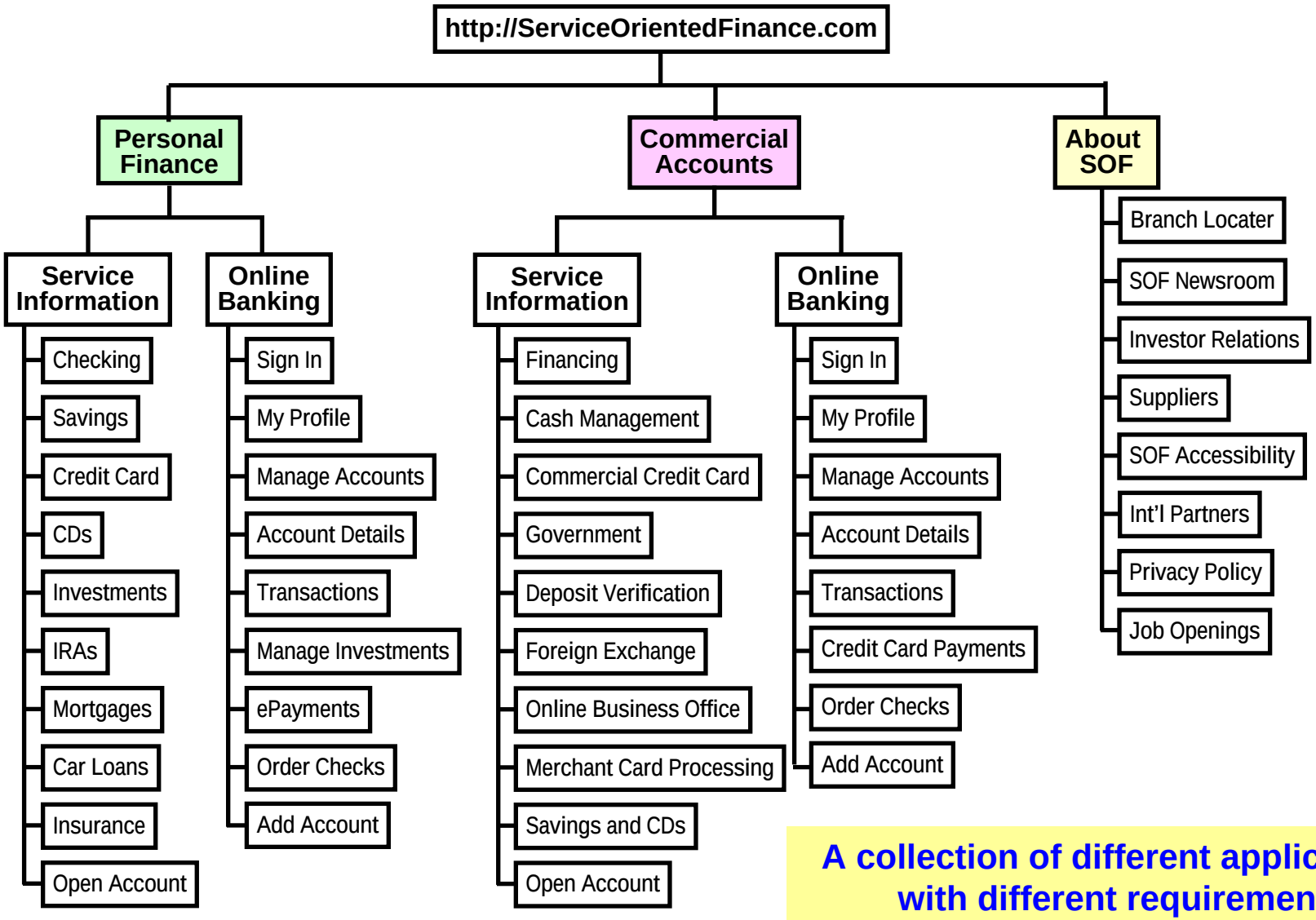
It's a big project. We need to think hard about how to build it.

Service Oriented Finance CIO

Be sure to choose a solution that's fit for purpose!

IBM

New SOF Web Site Will Need To Provide A Number Of Services To Different Constituencies



A collection of different applications with different requirements

Attributes For Classifying Application Requirements

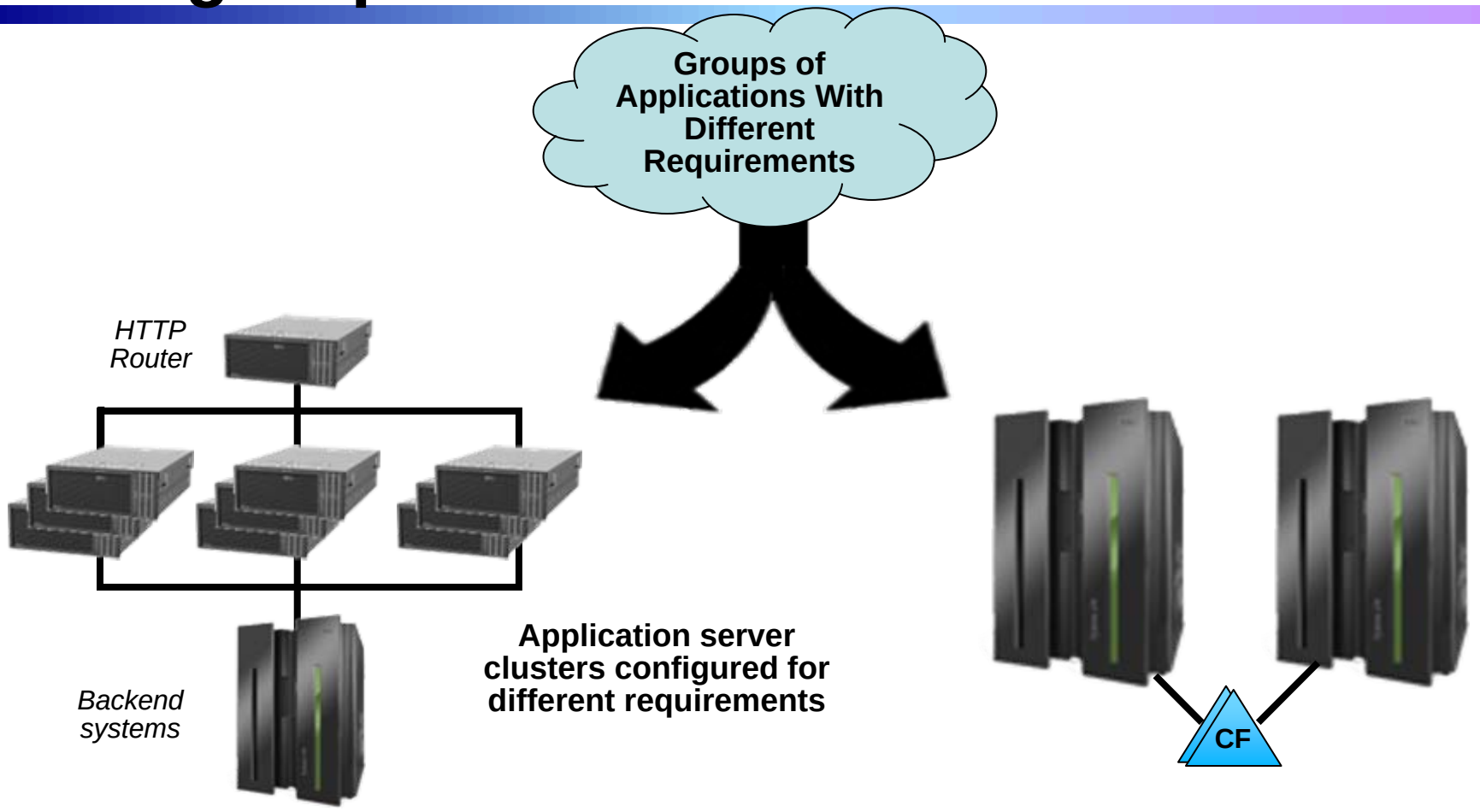
- **Availability**
  - High availability applications rarely go down
- **Variability**
  - Large variations in workload demand
- **Resiliency**
  - Application continues to perform despite IT site failure
- **Integration**
  - Applications that integrate with Backend Systems must have optimal response time and security
- **Security**
  - Site must resist attacks
  - Applications must preserve data confidentiality
- **Price Performance**
  - System must be competitive in cost

Each Application On The Web Site Will Have Different Levels Of Requirements

		Availability	Variability	Resiliency	Integration	Security
Personal Banking	Checking and Savings	H	H	H	L	H
	Mortgages	H	M	H	L	H
	CDs	M	M	H	L	M
	Investing	H	M	H	L	M
Commercial Banking	Merchant Card Processing	H	H	H	H	H
	Payments	H	H	L	H	H
	Account Management	H	M	H	H	M
	Verify Deposits	M	M	H	H	H
About SOF	Service Information	M	L	L	L	L
	Branch Locator	L	L	H		
	Investor Relations	H	H	L		
	Job Opportunities	L	L	L		

Price performance is critical for entire solution

Design Options For The SOF Web Site



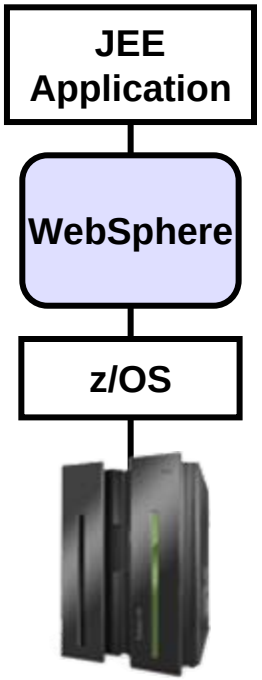
Distributed Application Server Clusters

"WebPlex": WebSphere for z/OS and backend co-located on a System z Sysplex

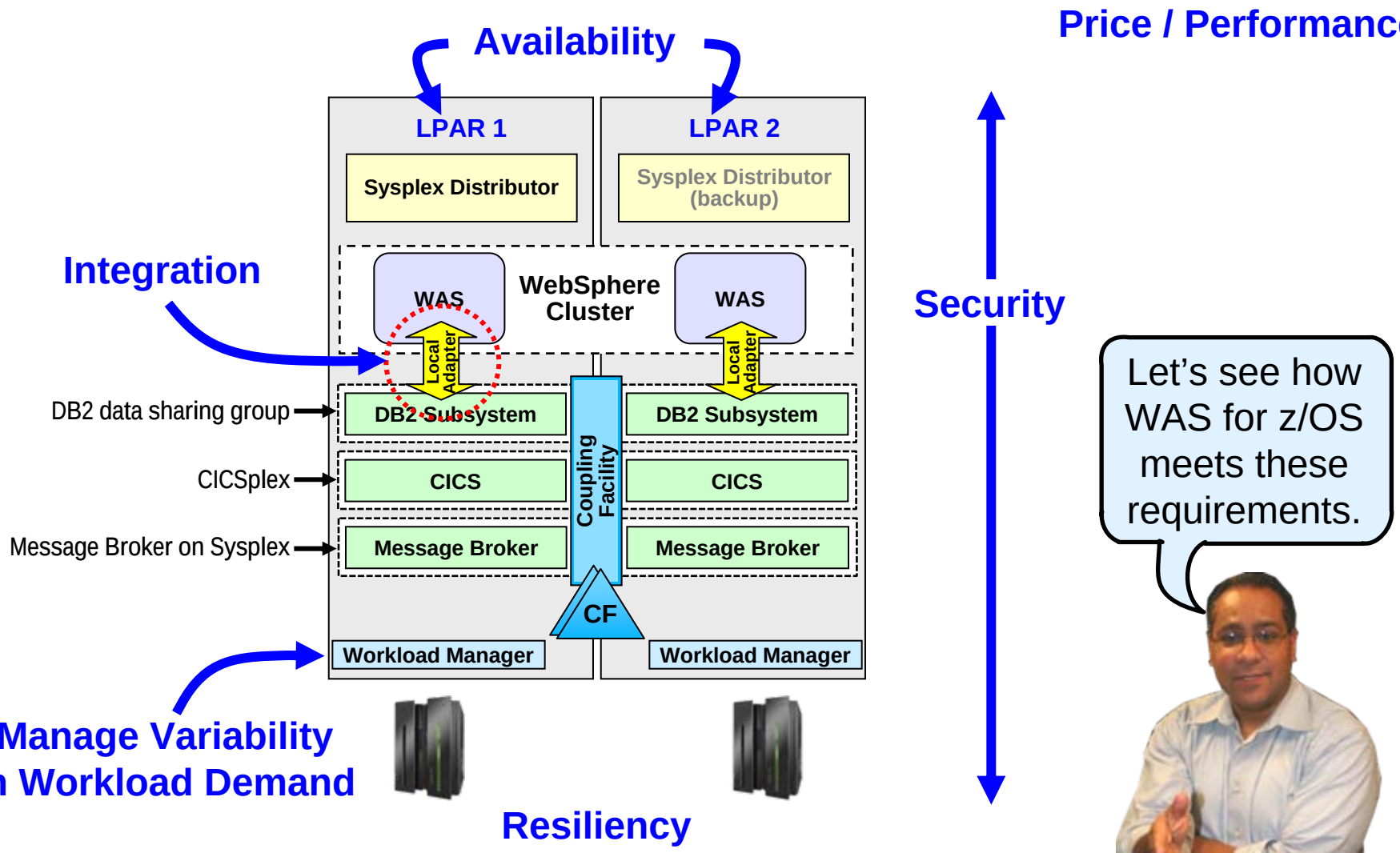
Which Platform Is Best Fit For Purpose?

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

- JEE applications are portable among all WebSphere platforms without recompilation
  - WebSphere supports standard JEE Interface and Web standards
- WebSphere for z/OS is optimized to exploit z/OS and System z capabilities
  - Advanced capabilities not available on other platforms, including Sysplex clustering
- 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

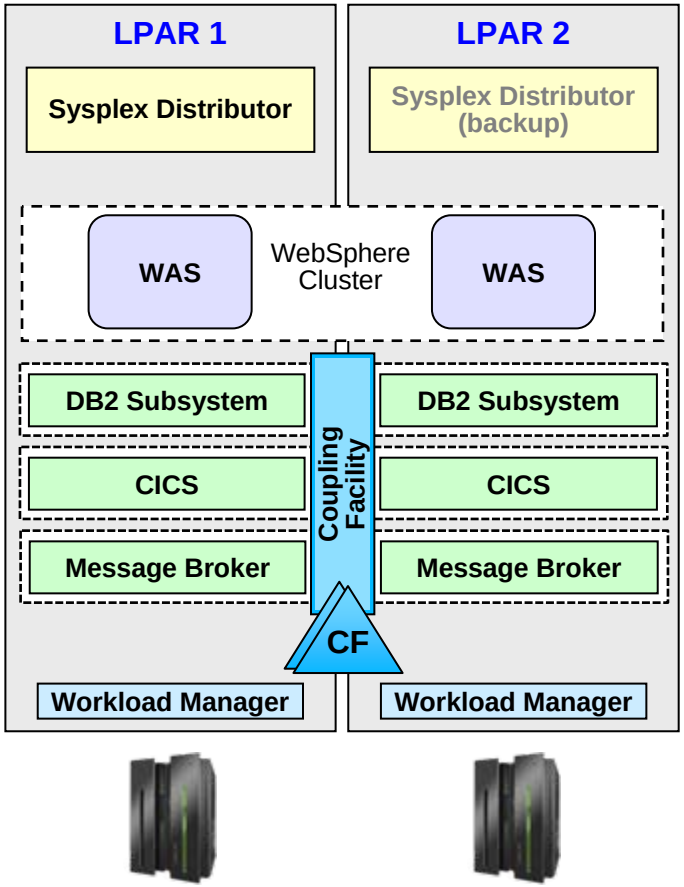


WebSphere for z/OS Can Be Deployed In A Parallel Sysplex Configuration



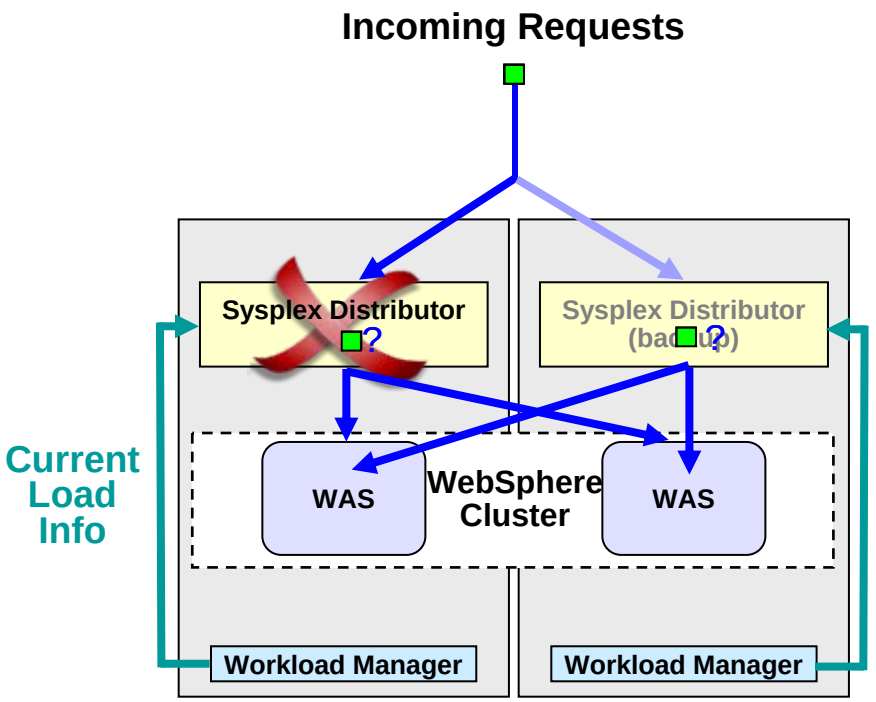
Parallel Sysplex Is The Key Enabler For High Availability

- **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 true data sharing
  - CICSplex shares customer workload
  - MQ uses Sysplex to provide high availability for message-driven applications



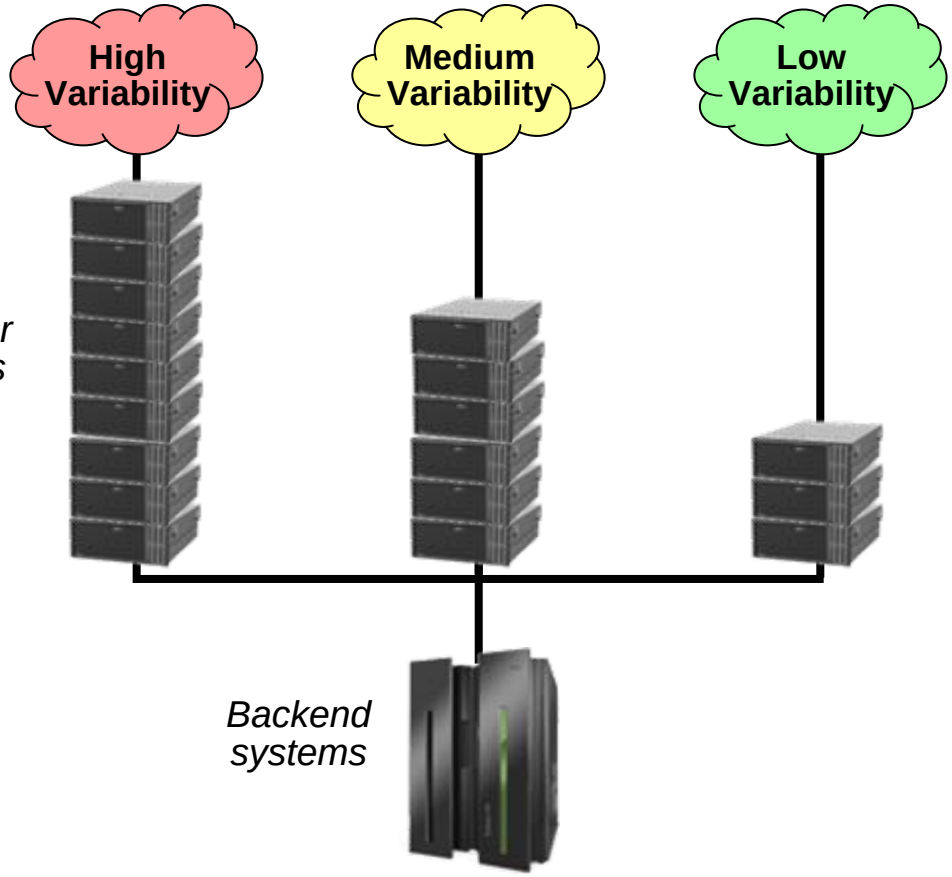
Sysplex Distributor Sends Incoming Requests To Best Available Server

- 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



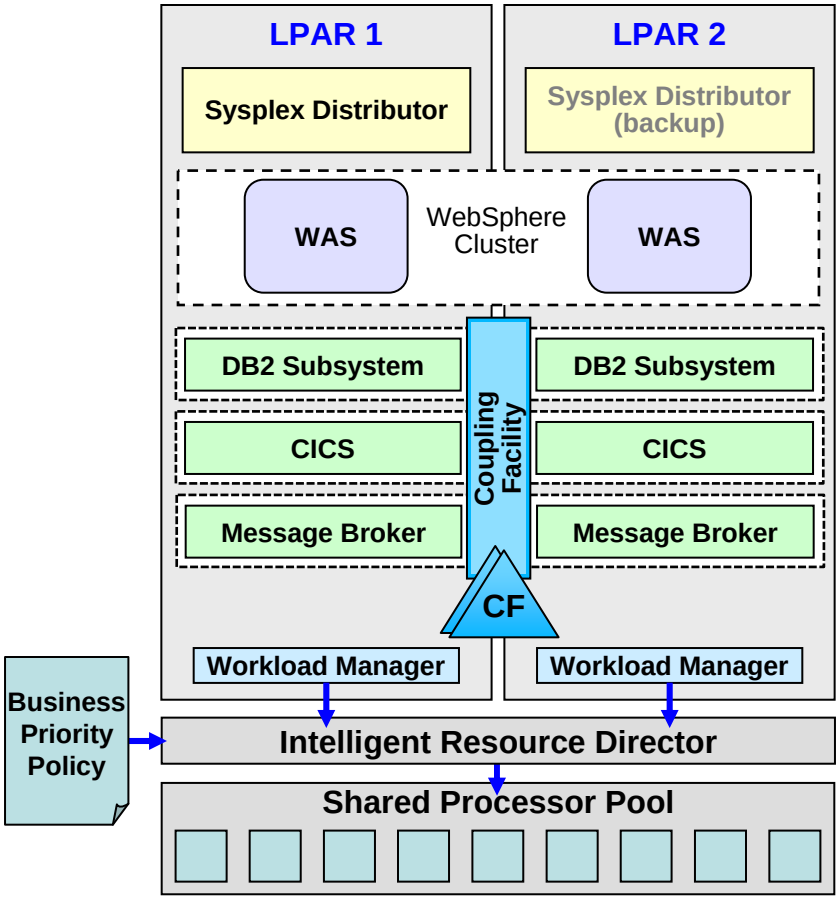
Distributed Solutions Must Over-Provision For High-Variability Workloads

Application Server Clusters configured for different requirements



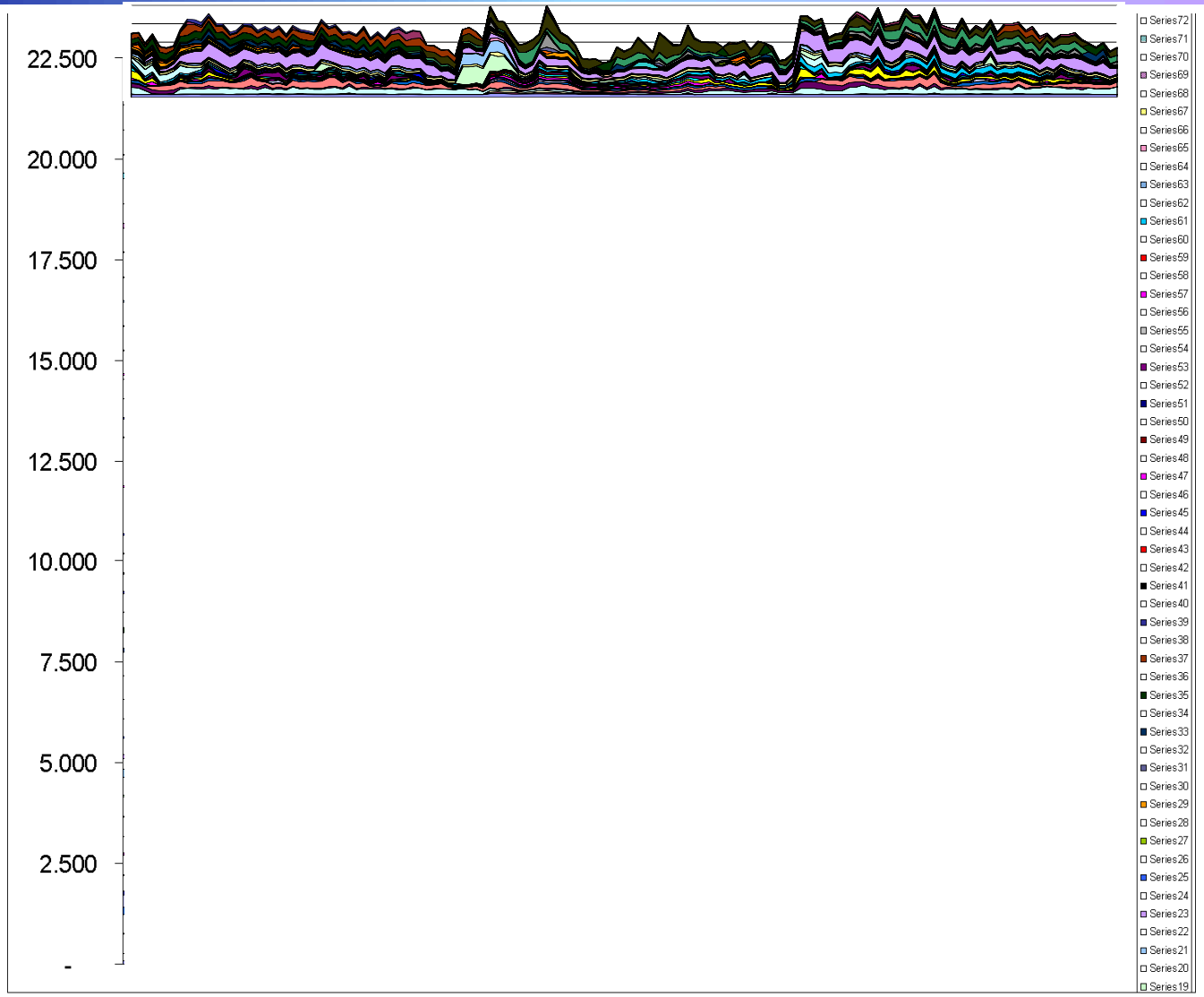
Distributed Application Server Cluster (e.g., Oracle, Weblogic on Sun SPARC)

Mixed Workloads Share Pooled Processing Resources

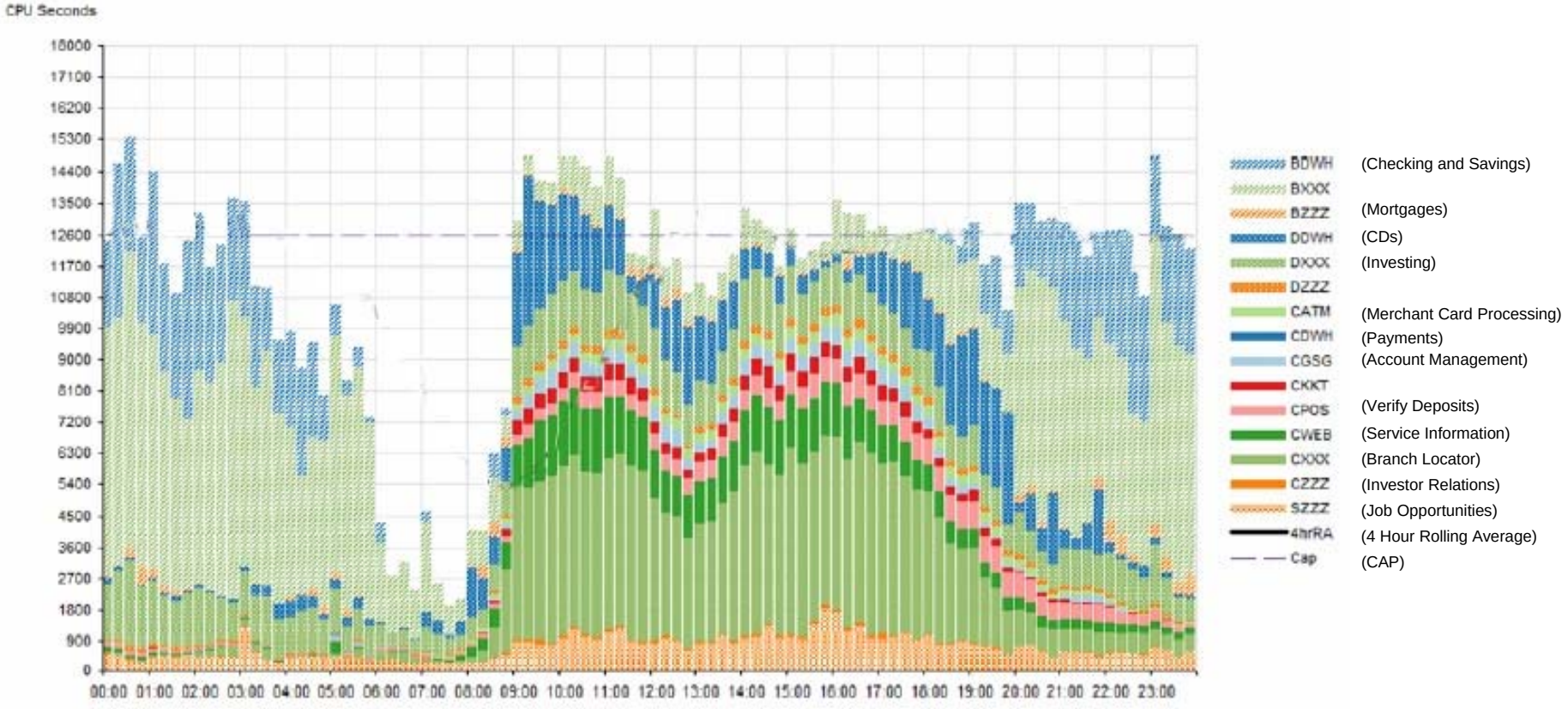


Workloads with light, medium, and heavy variation
Share the same pool of processors.

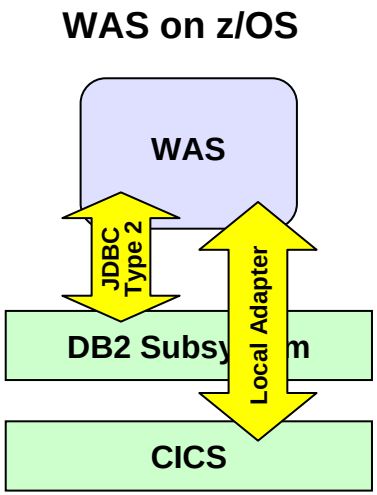
Sharing Processors Eliminates The Wasted Resources Of Distributed Servers



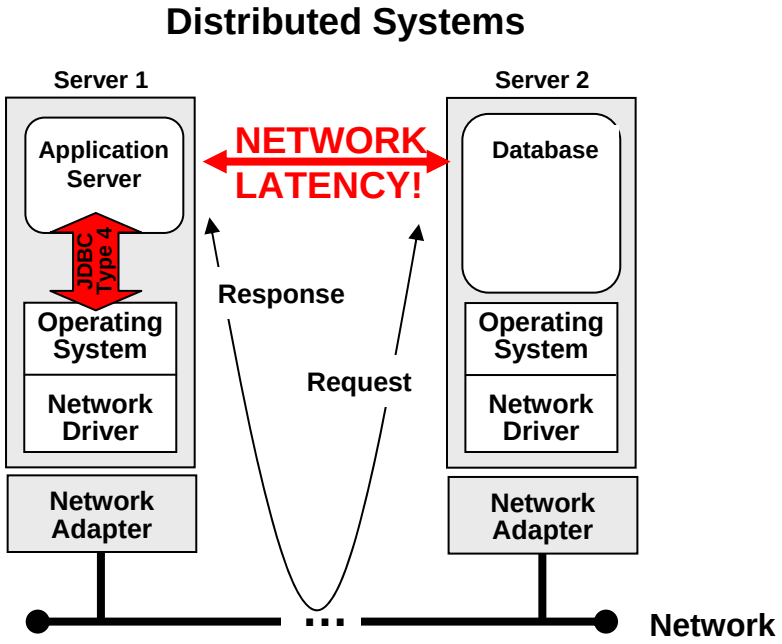
System z Shared Processors Achieve Competitive Costs Per Workload



Sysplex Enables Efficient Co-location of Applications with Backend Systems



- 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



- Distributed design separates applications from data and transactions
  - Accumulates network latency
  - Exposes risk to sensitive data via physical network

A Secure Foundation

- **System z has the highest commercial common criteria ratings**
  - PR/SM rated at EAL 5
- **Workload Isolation**
  - System z 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 System z 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

DEMO: The New SOF Site

We got a prototype done quickly with some applications working.

Service Oriented Finance Development Manager

Ok, let's see it!

Service Oriented Finance CIO

This is great! But what about the cost?

Service Oriented Finance CIO

Hosting your Web site on System z costs less!

IBM

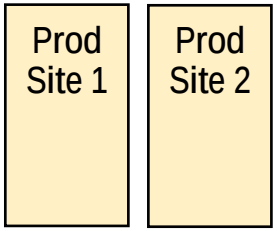
Deploy Web Application On Mainframe vs. SPARC Servers (Without Disaster Recovery)

Existing Mainframes
Parallel Sysplex

Prod Site 1 Prod Site 2

Existing z10s:
6+6 GP, 4,609 MIPS per site

Add 1 LPAR to each z10
for New Web Applications



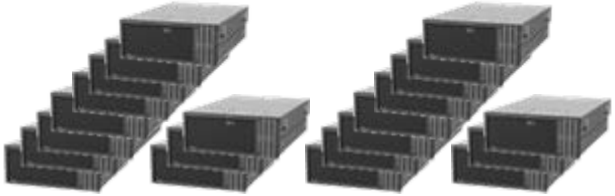
17,588 MIPS additional workload (8,848 MIPS per site)

Incremental:
6+6 zAAP 11,040 MIPS WAS (85%)
1+1 zIIP 1,840 MIPS DB2 (40%)
3+3 GP 4,708 GP MIPS (WAS+DB2 ineligible)
40+40 GB memory

3 year cost of acquisition $14.93M

Or Add 16+6 SPARC Enterprise T5440 Servers, 1.4 GHz, 2 chip / 16 core
1,238,753 Performance Units total

Prod, Site 1 Prod, Site 2



619,376 Performance Units required

619,376 Performance Units required

3 year cost of acquisition $16.98M

USA List Price Comparison (both IBM and Oracle)

Deploy WebSphere Process Management Application With DR On Mainframe vs. SPARC

Existing Mainframe Site 1

Existing Mainframe Site 2

Existing z10:
6+6 GP, 4,609 MIPS per site
6+6 dark GPs

Add 1 LPAR to each z10 for New Web Applications

Prod Site 1 | Prod Site 2

17,588 MIPS additional workload (8,848 MIPS per site)

Incremental:
6+6 zAAP 11,040 MIPS WAS (85%)
1+1 zIIP 1,840 MIPS DB2 (40%)
3+3 GP 4,708 GP MIPS (WAS+DB2 ineligible)
40+40 GB memory
New WAS+DB2 licenses

And Add Disaster Recovery

DR Site 1 | DR Site 2

Capacity Backup:
6+6 dark zAAP
1+1 dark zIIP
3+3 dark GP
40+40 GB memory

3 year cost of acquisition $15.83M

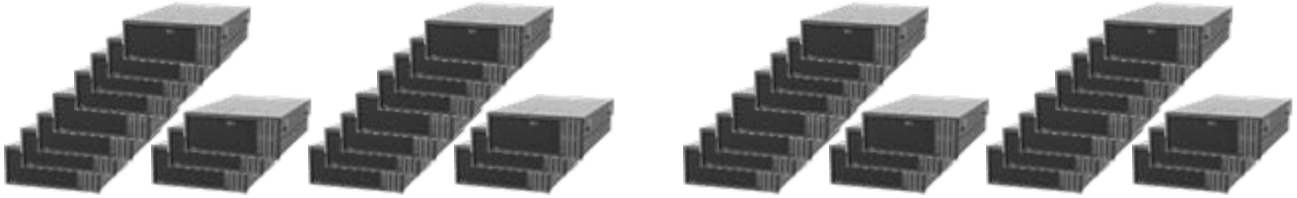
SPARC costs 115% more!

3 year cost of acquisition $33.96M

Or Add 16+6 SPARC Enterprise T5440 Servers, 1.4 GHz, 2 chip / 16 core
1,238,753 Performance Units total

...And same for Dev, QA, Disaster Recovery

Prod, Site 1 | Prod, Site 2 | DR, Site 1 | DR, Site 2



619,376 Performance Units required (Prod, Site 1)

619,376 Performance Units required (Prod, Site 2)

619,376 Performance Units required (DR, Site 1)

619,376 Performance Units required (DR, Site 2)

USA List Price Comparison (both IBM and Oracle)

Why Does A “WebPlex” Solution Cost Less On System z?

- Efficient utilization of shared resources
  - Distributed solutions experience core proliferation, requiring more software licenses
- Lower price specialty processors (zAAP, zIIP)
- Very favorable Disaster Recovery pricing
- System management and labor costs are much higher for distributed servers (but this is not included in this cost study)

Which Platform Is Best Fit For Purpose?

	WebSphere for z/OS	Distributed System
Availability	**Most reliable platform**	**Less reliable**
Variability	**Managed workloads, shared processors**	**Over-provision for peak demand**
Backend Integration	**Co-located and Secure**	**Network Latency; Exposed wires**
Resiliency	**Systematic Disaster Recovery**	**Individualized Disaster Recovery**
Security	**Best**	**Typical**
Price/Performance	**Lower Cost**	**Higher Cost**