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Powerful and secure infrastructures with WebSphere Application Server for z/OS

Designing Enterprise WebSphere Topologies



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Designing Enterprise WebSphere Topologies

Do you need to understand how to find the right topology for your WebSphere Application (server)? Do you want to know how to integrate your Application Server topology into the existing networking infrastructure and DMZ? Do you want to learn about deployment options, and the reality of Web component offloading? Do you want to verify that the topology you are using right now is based on the right assumptions?

In this session we cover all these areas, providing helpful answers to these questions and discussing the new integration capabilities provided by the Trust Association Interceptor and the WebSphere Plug-in running on the IBM HTTP Server on z/OS. We also discuss infrastructure support for applications needing HTTP sessions.



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Objectives

- The architectural challenge
- Generic architecture discussion
- The DMZ
- WebSphere logical elements
- Applications Topology and integration
- z/OS Compatible Implementations

plus
Examples!

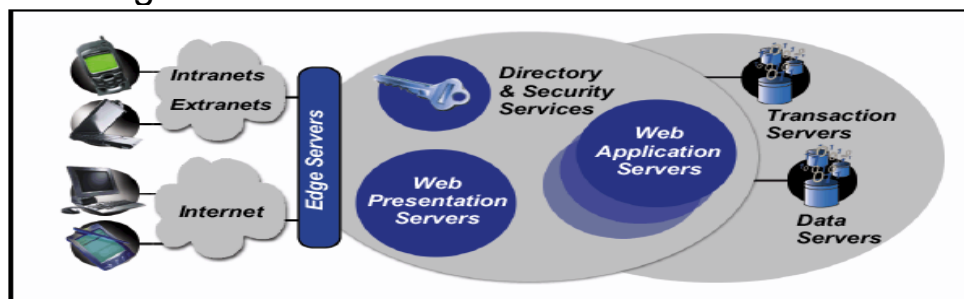


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The challenge

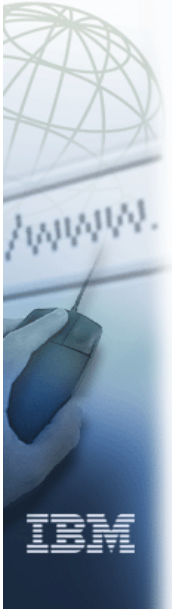
- Your Job: Designing a 'best fit' topology and to keep everybody happy?
- Given Facts:
 - ▶ Existing Infrastructure to plug into
 - ▶ Application and its topology including backend(s)
 - ▶ Quality of service requirements (characteristics)
 - ▶ Budget



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Designing Enterprise WebSphere Topologies infrastructure characteristics to consider

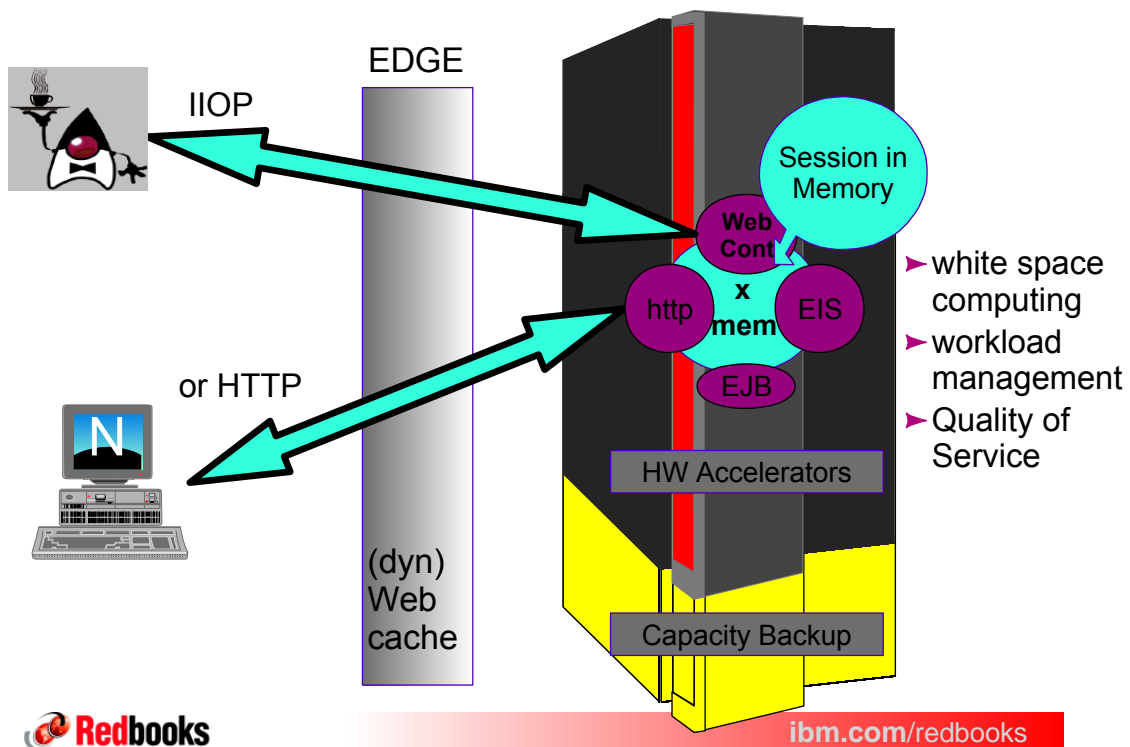


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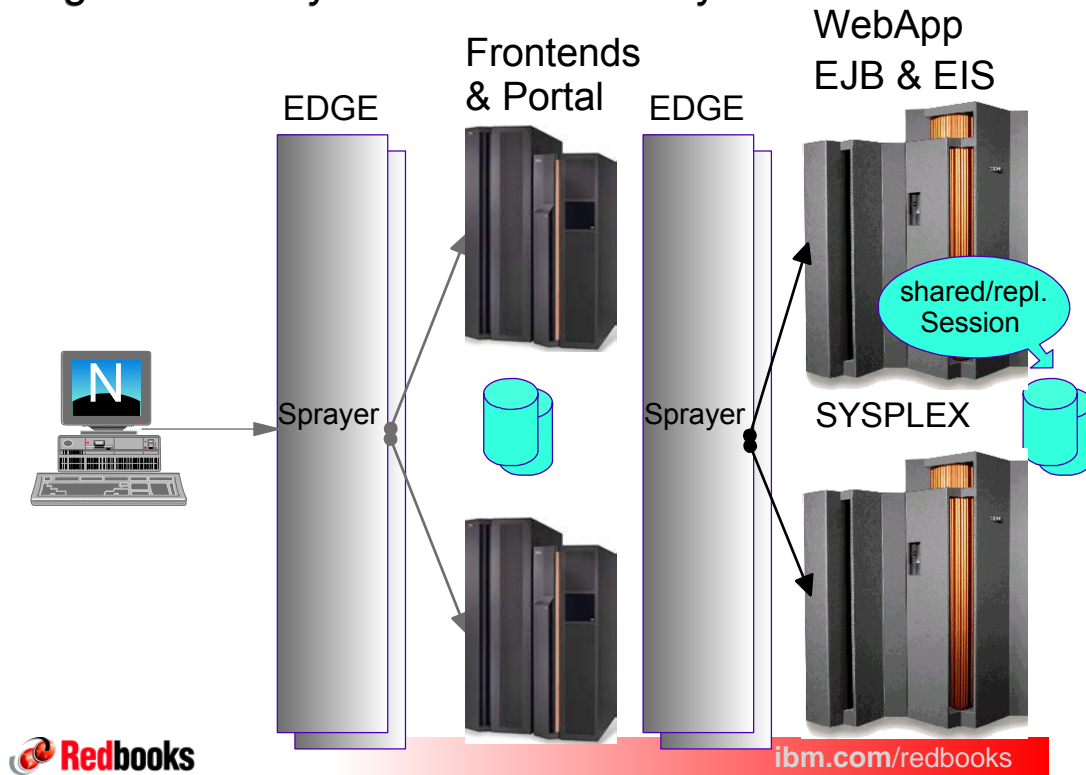
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Performance & Horizontal Scalability



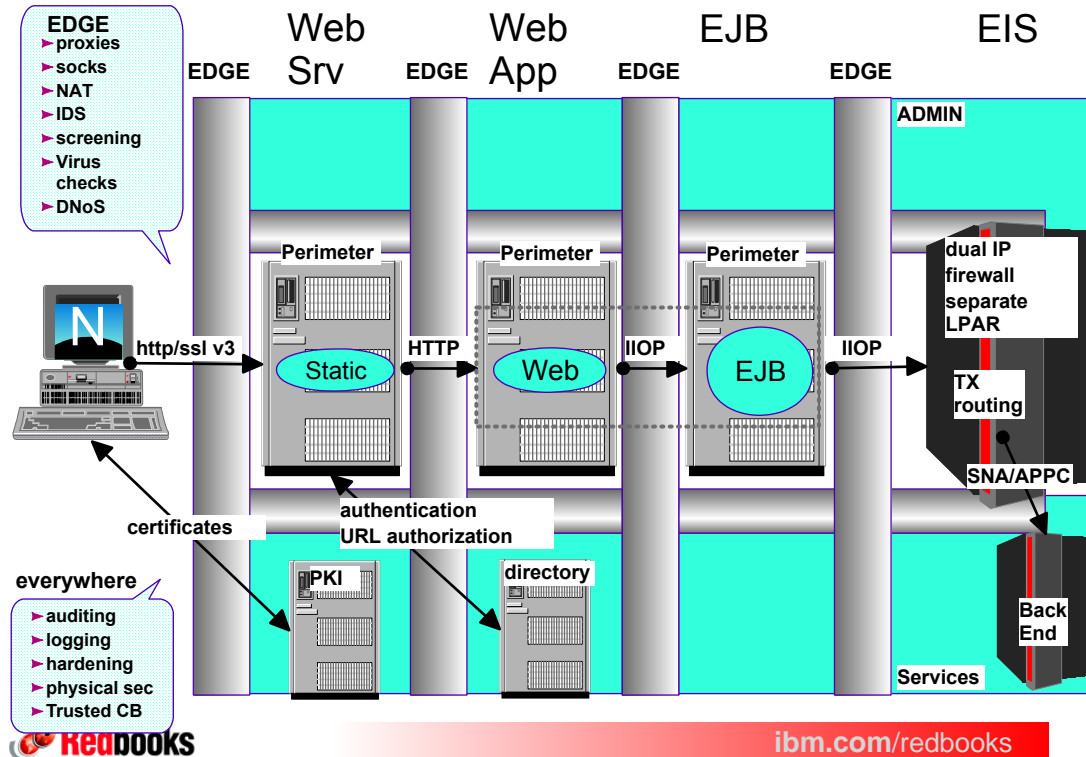
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High Availability / Vertical Scalability



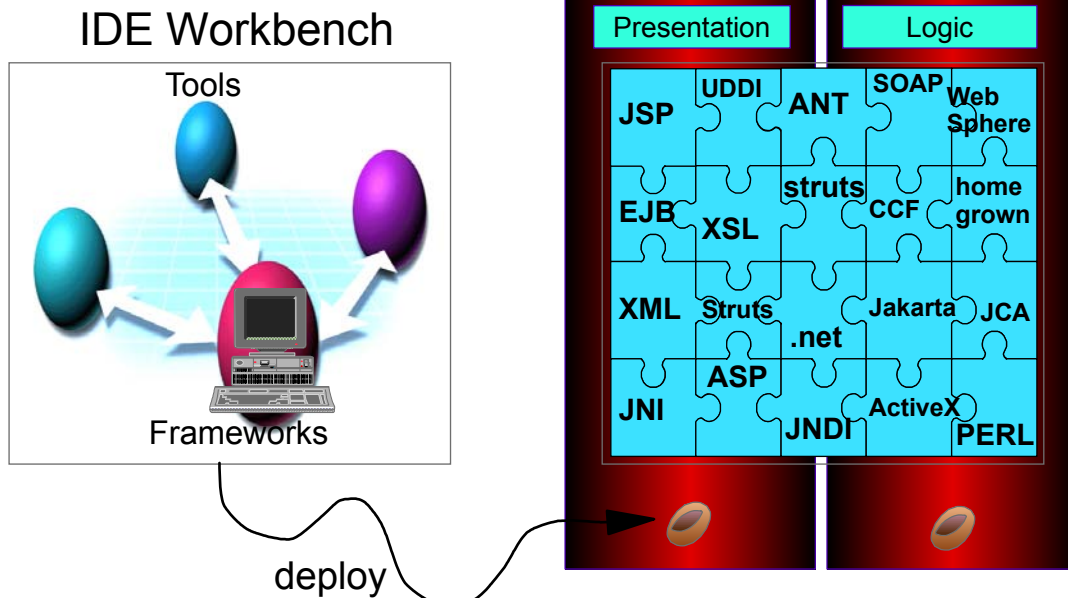
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Security



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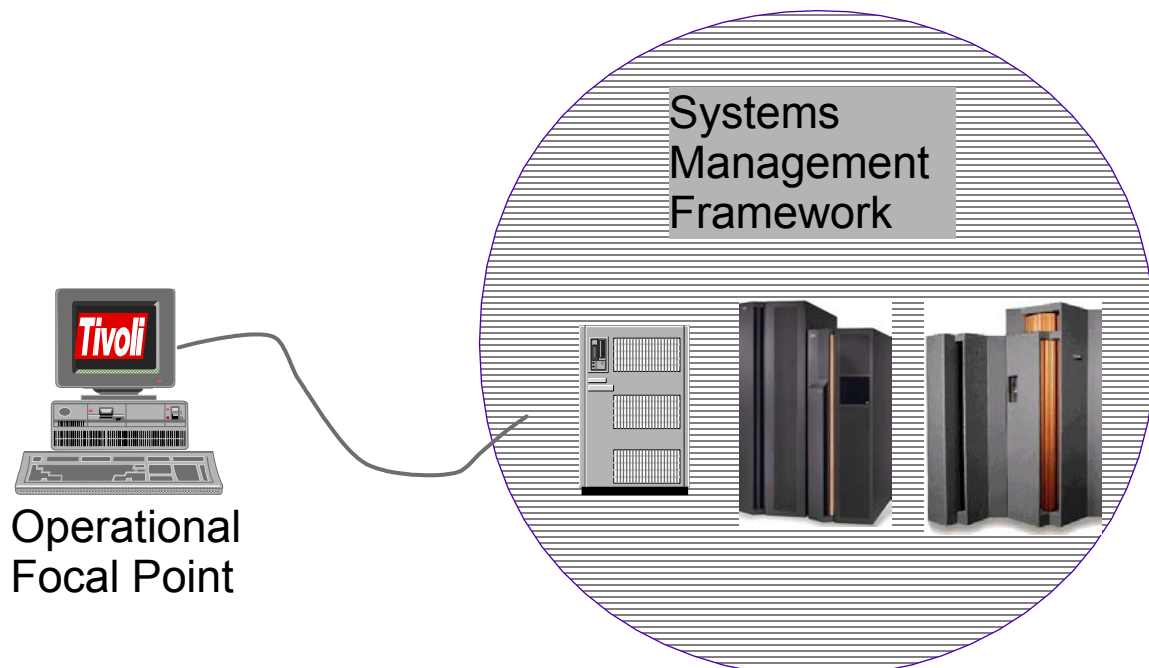
Frame works, API's & Functions



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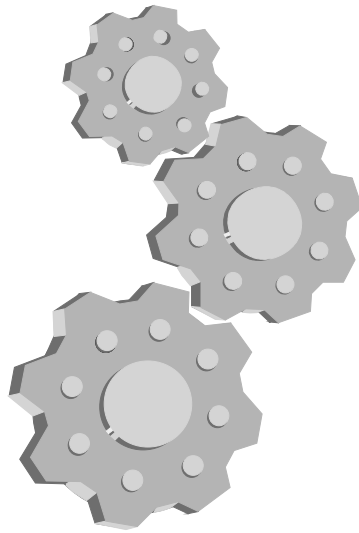
Systems & Change Management, Operation, Automation



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Functionality



- ▶ Operating System Support
 - ▶ frameworks
 - ▶ collocated applications
 - ▶ ...
- ▶ Hardware support
 - ▶ crypto
 - ▶ streaming
 - ▶ biometrics
 - ▶ ...

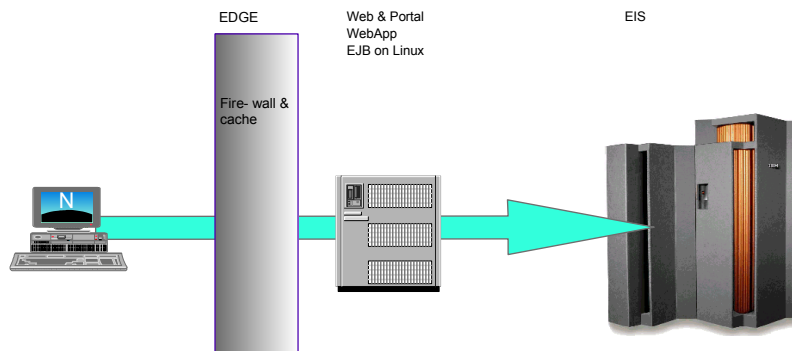


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Cost

- ▶ Typical approach
 - ▶ reduce # servers
 - ▶ reduce staff
 - ▶ reduce software cost
 - ▶ use cheap hardware



- ▶ typical mistake: long term cost not really considered



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Topologies: Realistic View

- ▶ it is a compromise, keep everybody happy
- ▶ most probably, not all expectations can be met
- ▶ its a iterative process to define a solution that fits all



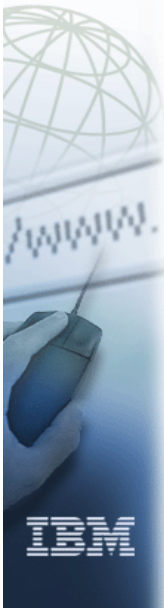
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Close to the Edge: Infrastructure Integration



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The Edge

The term “edge of network” brings to mind different concepts and various network locations for different groups. For instance, the Sun Microsystems whitepaper Efficiency Gains at the Edge of the Network states:

“The edge of the network is the gray area between edge routers and the Tier 1 Web servers of the data center. It is here that, between a packet’s arrival and its entry into the server room, intelligent networking and security functions can be implemented to optimize the flow of traffic in and out of the data center in order to achieve higher service levels at lower costs. These specialized functions include traffic management activities such as load balancing and priority processing, security measures such as firewalls and cryptography, and availability features such as redundant components and failover support.”

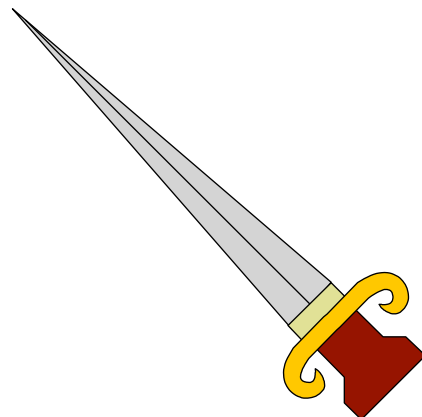


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What is the edge ?

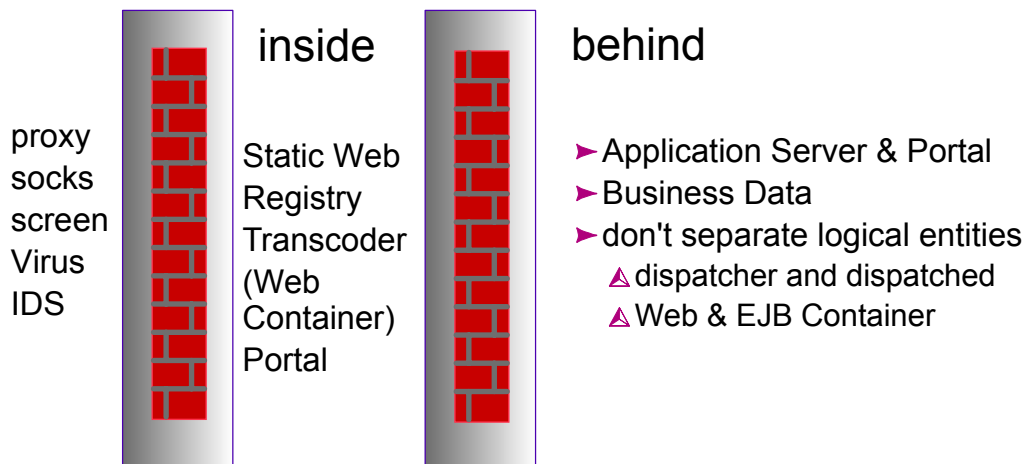
- ▶ Any Network boundary. A DMZ has an edge, too.
- ▶ Services access from outside
- ▶ Network appliances, router, bridges, switches
- ▶ Thin servers, stackables, services, infrastructure
 - ▶ Firewall(s), Between Firewalls a DMZ
 - ▶ Proxy, Socks, NAT, Virus scan, IDS
 - ▶ Caches
 - ▶ Dispatcher
 - ▶ Applications
 - ▶ Servlet Response Caching
 - ▶ QoS
 - ▶ Authentication and Access Control
 - ▶ Directories
 - ▶ Content Filter
 - ▶ Application Offload
 - ▶ Content Redistribution



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The DMZ, a realistic view



- ▶ Don't follow blindly some out of the box concepts
- ▶ Don't mix up the layers (no need to protect dispatcher & switches)
- ▶ It is a combination of services, It is a compromise
- ▶ It is exposed, expose what is exposable, It's a DoS buffer, It's a barrier
- ▶ It is a building block



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Network Topologie: Summary

In most cases the network topology is already in place

- ▶ Intranet, Extranet, Perimeter with edges
- ▶ ...where you plug-in your WebSphere topology
- ▶ ...according to some given rules set by the edge implementation

Design you WebSphere topology plugable

- ▶ flow protocols according to your edge implementation (HTTP vs IIOP)
- ▶ You might need to plug into given topology services:
 - ▶ SSL termination
 - ▶ Proxy (reverse and caching), intelligent routing (CBR)
 - ▶ Authentication & Authorization
- ▶ You need to decide if you trust in the existing topology



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Disconnect! **Security considerations**



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Define Your Security Requirements

Understand your security needs

- Identifying and prioritizing
- Design plans to provide effective, efficient solutions
- Awareness of vulnerabilities and weaknesses
- Balance security with other competing priorities
 - Technical feasibility
 - Performance
 - Cost of security solutions (implementation, training, managing, etc.)

Validate if your implementation fits your needs

- Thought experiments
- Swipe
- ethical hacking
- discussion



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How Much Security Do You Really Need?

Guidelines

- Its tempting to build a bullet-proof, stringently secured systems
 - Be sensible/practical, do whats possible and manageable
- Evaluate existing security
 - Platform security (Operating System)
 - Network and WebSphere security
- New emerging technologies
 - The Java 2 security and J2EE security
 - Must first understand the pros and cons of functions/features
- Evaluate risks tolerance level and risk management
 - Ask the question
 - What is the cost of compromised security
- Do business only with Partners and Suppliers you can trust
 - Taken proper security measures



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Apply J2EE Programing Model to Security

J2EE programming model conformance

- Simplify development and flexible deployment of web apps
- Platform neutral, separation of roles and responsibilities
- Adopt and implement industry standards and APIs
 - Declarative security and programmatic security
 - If declarative security alone does not address the security model of an application - use the supported programmatic security APIs
- Avoid elaborate business logic that makes security access decisions
- Considerations for forward and backward compatibility
- Think of portability, interpretability, extendibility and maintainability



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Keep it Simple

Simplify complexity

- Take advantage of security capabilities from the
 - Operating System
 - Network infrastructure
 - WebSphere
 - The new Java 2 and J2EE security
 - ...and use only what you really need
- Use and reuse trusted components
 - Already invested in securing the network and Operating System
- Invest in industry standards
 - Firewall technology
 - Declarative and Programmatic securities
- Don't spend a million to protect a dime



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Key Decisions

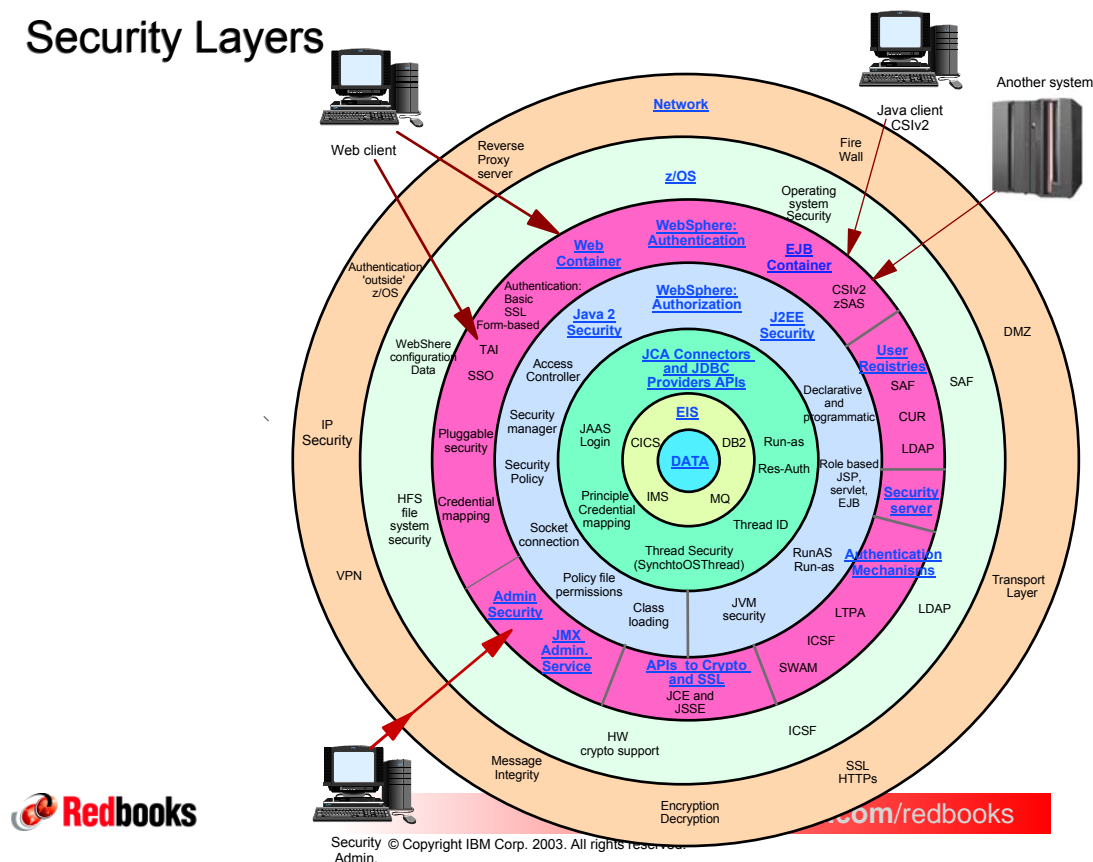
- ▶ How expensive would be a penetrated application/system?
- ▶ What topology do you live in? (how much can I spend)
 - Intranet / Internet / base /cluster
- ▶ Local/ Custom Registry/ forwardable credentials
- ▶ Where do you authenticate?
 - reverse proxy, 3rd party, local IHS, local TH
- ▶ SSO, GSO, TAI, LNA, trust
- ▶ How do you authorize?
 - local, remote, programmatic
- ▶ EJBROLES, Tivoli authorization, PDWAS
- ▶ What resources do you access?
 - Backends with end 2 end security
 - Other application servers
 - OS resources
- ▶ end-2-end, auditing, sync2, trust



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Security Layers



A quick and incomplete guidance: Security options

	Application Requirements				Target Architecture Selection						
	SSO	DMZ Integ	WAS topo	other	Reg-istry	Auth Mechan	Auth Method	Front-end	xprot SSL	other	
Internet B2B	no	yes	Base	users local avail	SAF	any	any	rev proxy WebSeal	req		
Internet B2C	no	yes	Base		CUR LDAP	any	BASIC FBL SSL3	WAS Plug-in	rec. WAS 2 Plug-in		
Intranet Simple Appl	no	no	Base	exp PW	SAF	any	eFBL				
					SAF	any	BASIC	local IHS with PWAPI	any		
					LDAP STDIM	any	basic	Webseal rev proxy	rec. WAS 2 proxy		
Intranet Simple Appl	no	no	ND	exp PW	SAF	ICSF LTPA	eFBL	lany	any		
					SAF	ICSF LTPA	BASIC	local IHS with PWAPI	any		
					LDAP STDIM	ICSF LTPA	basic	Webseal rev proxy	rec. WAS 2 proxy		

Summary

Focus on

- Understand security objectives
- Choose technologies wisely
- Getting the right people involved
 - The architects, the developers, the deployers and the administrators
- Balance security with other competing priorities
- No silver bullet
- Validate / penetrate



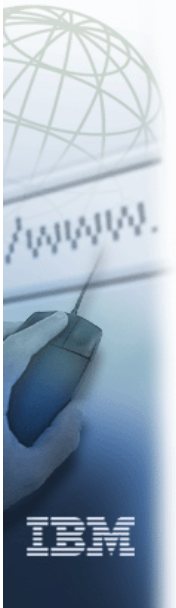
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Tearing apart: Application Topology / Tiers



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WebSphere software

**Building Multi-Tier Scenarios
for WebSphere Enterprise
Applications**

IBM

9204-6056-0

Draft Document for Review April 11, 2003 5:58 pm

Taming the Hydra: Dehydreaded Solutions for WebSphere on z/OS

- Problem determination and dental care for multi mouthed servers
- Simultaneous beginners
- Maintaining multithread

- Architecting an infrastructure for seamless 3-tier integration
- Developing, deploying, and tooling for interoperability
- Security, performance, cost, and management views

Holger Wunderlich
 Diego Cardallaguet
 Ross Heald
 Tomokuni Shimizu
 Dirk Ziesemann

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The diagram illustrates a three-tier architecture with the following components and interactions:

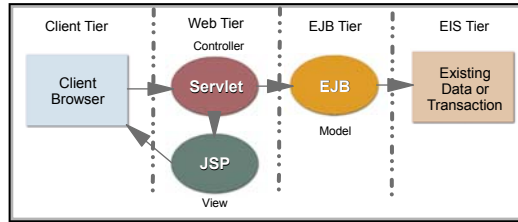
- Client Tier:** Contains the **Client Browser** (light blue rectangle).
- Web Tier:** Contains the **Servlet** (maroon oval) and **JSP** (dark green oval). The **Servlet** is labeled as the **Controller**.
- EJB Tier:** Contains the **EJB** (orange oval), which is labeled as the **Model**.
- EIS Tier:** Contains the **Existing Data or Transaction** (tan rectangle).

Interactions are shown by arrows:

- The **Client Browser** sends requests to the **Servlet**.
- The **Servlet** sends requests to the **EJB**.
- The **EJB** sends requests to the **Existing Data or Transaction**.
- The **Servlet** also interacts with the **JSP**.
- The **JSP** sends responses back to the **Client Browser**.

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Why Multiple Tiers?



- M-V-C pattern is a multi tiered J2EE architecture
- Looser coupling
 - J2EE Packaging
 - Component reuse
 - Separated, well defined responsibilities
- Different tiers have different QoS and resource requirements
 - Different tiers can be scaled separately (horizontally and vertically)
- Best practices seem to indicate a separation of containers and services is appropriate



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Hybrid or Integrated Application Runtime ?

- You have a variety of choices how to physically implement your application tiers.
- It boils down to the questions
 - ▶ Should one head for an integrated or a (semi)hybrid deployment
 - ▶ For the hybrid (multiple physical) deployment:
 - Where do I split my applications, how do I map logical to physical tiers?
 - How do I interconnect my applications components?

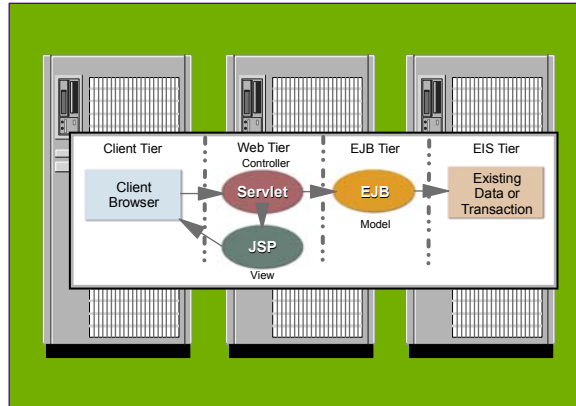


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spreading out

- If?
 - Integrated or (semi)Hybrid
 - cross memory vs network
 - simplicity vs complexity
 - flexibility, pluggability
 - cost
 - ...
- How?
 - Hybrid (true multi tier):
 - supported by the application?
 - supported by your tools?
 - inter component connection:
 - HTTP
 - IIOP
 - SOAP
 - Hipersockets
 - the connection characteristics:
 - 'session' binding
 - scalability
 - security
 - WLM support
 - performance
 - availability



- Where?
 - Physical / Logical tier mapping
 - static, dynamic
 - Web/EJB Container
 - Session Bean/Entity Bean

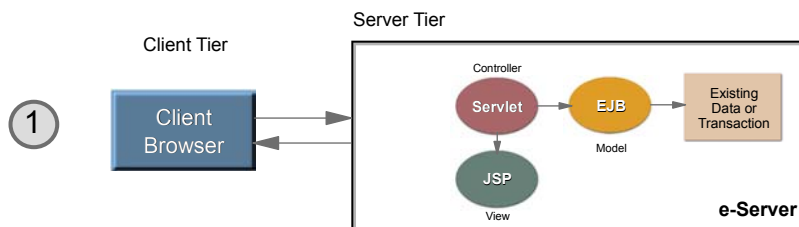


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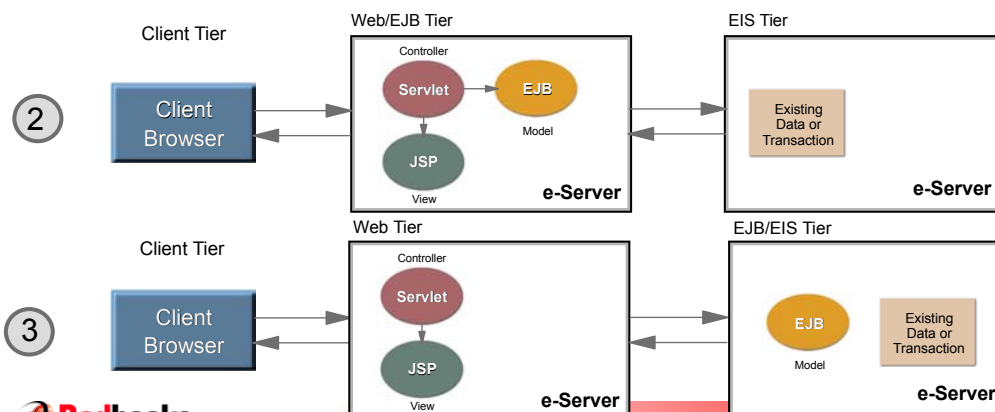
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(typical) Physical Implementations

2-Tier Physical Architecture



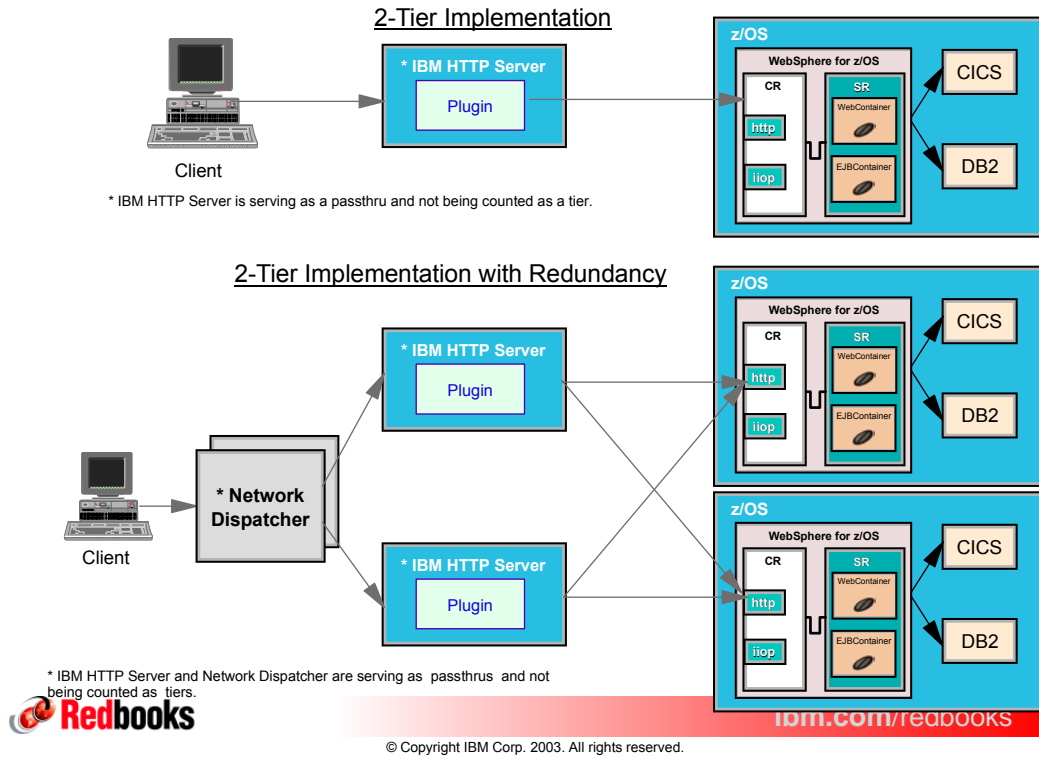
3-Tier Physical Architectures



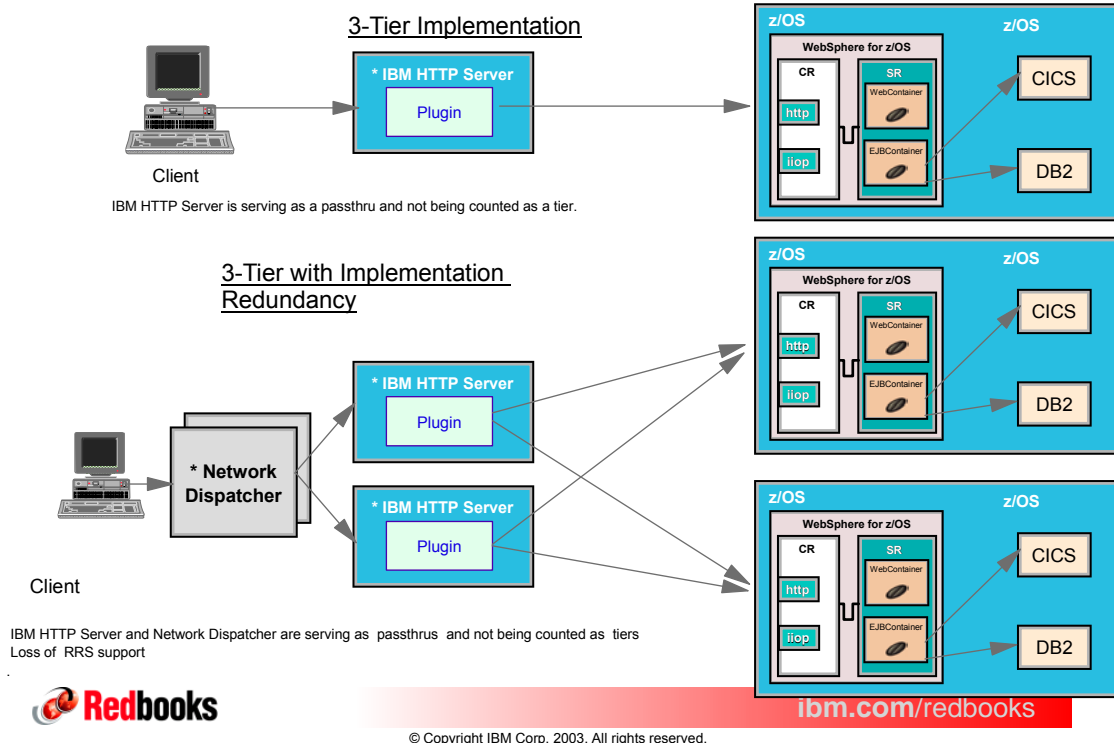
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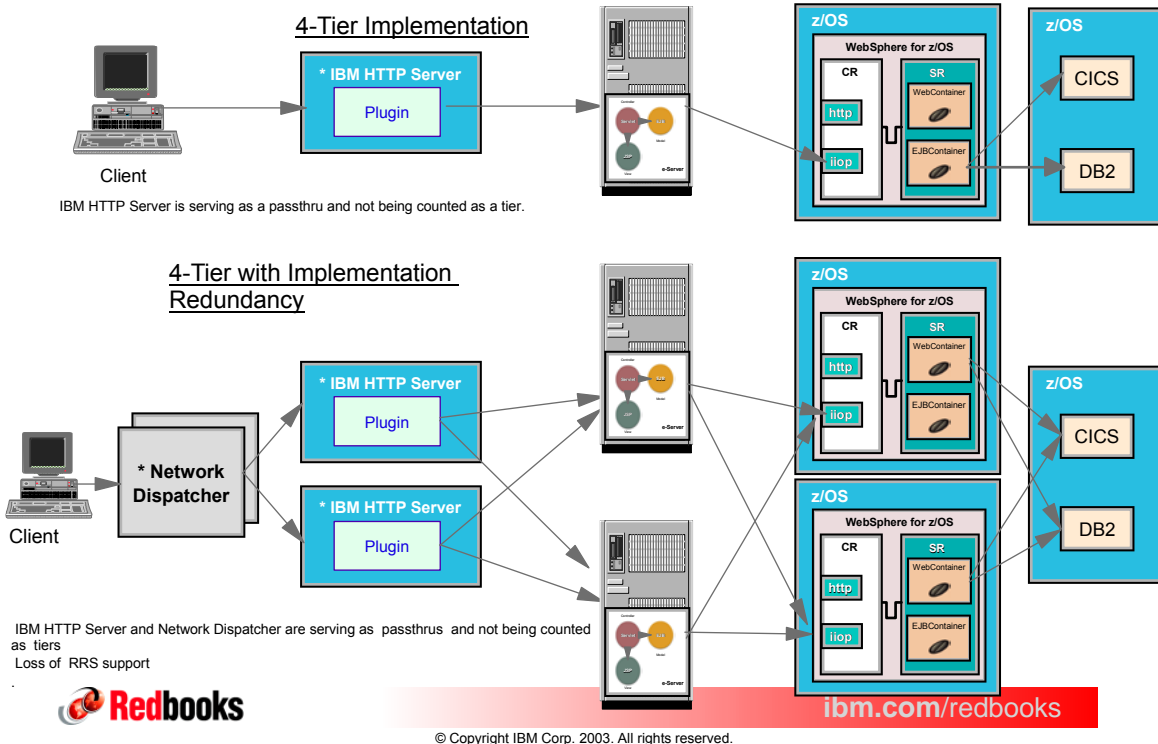
Physical 2-Tier Implementation



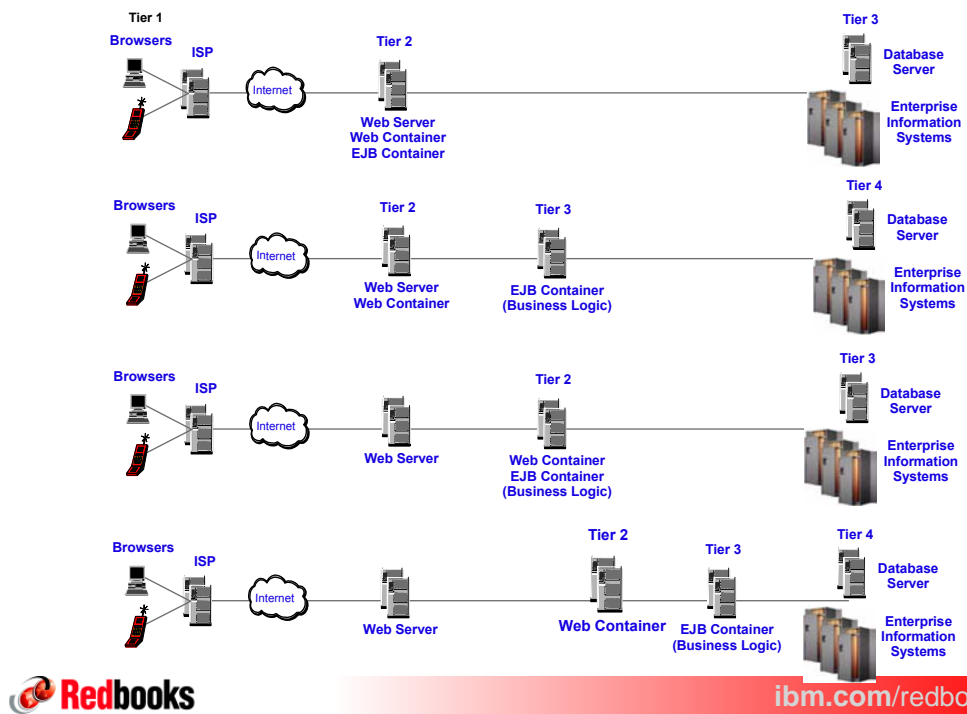
Physical 3-Tier Implementation



Physical 4-Tier Implementation

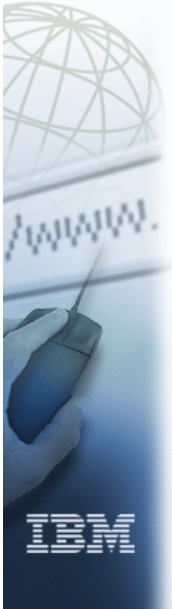


2-, 3-, and 4-tiered Infrastructures



* Not counting the client tier

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Plugable topology options for WebSphere Application Server on z/OS

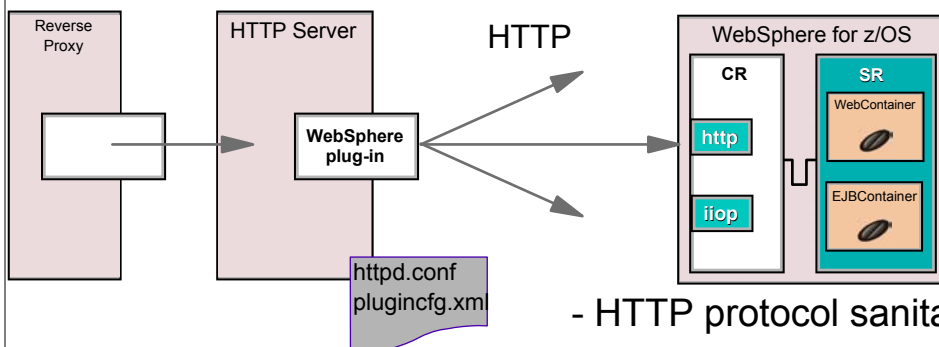


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Its (almost) all about plug-ins



WebSphere HTTP Plug-In

- ▶ IHS for z/OS
- ▶ IIS (windows only)
- ▶ IHS Http Server 1.3.X
- ▶ APACHE 1.3.X
- ▶ APACHE 2.X
- ▶ Domino 5.0.X
- ▶ IPlanet 4.X
- ▶ IPlanet/SunOne 6.X

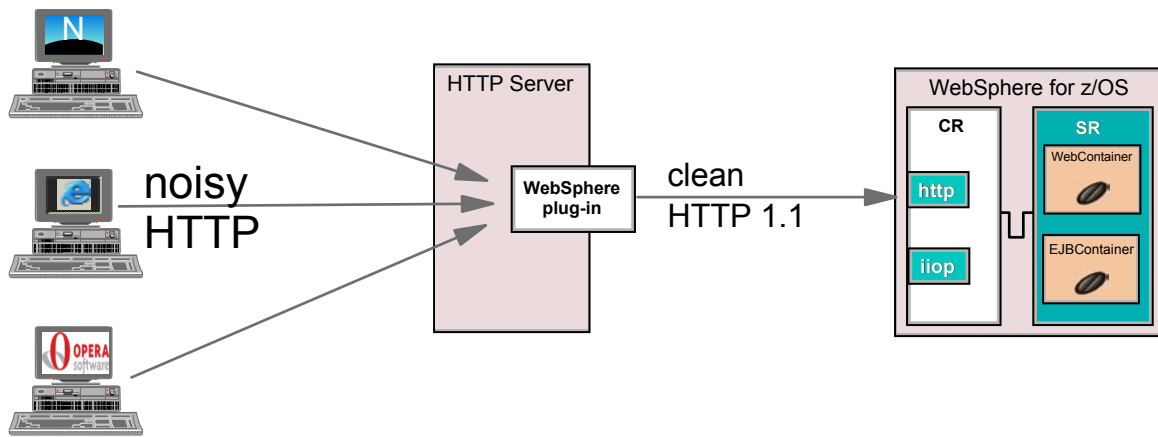
- HTTP protocol sanitation
- Workload Distribution
- SSL endpoint
- HTTP session support
- Fragment caching
- Authentication
- DMZ Integration
- Private WebSphere Headers



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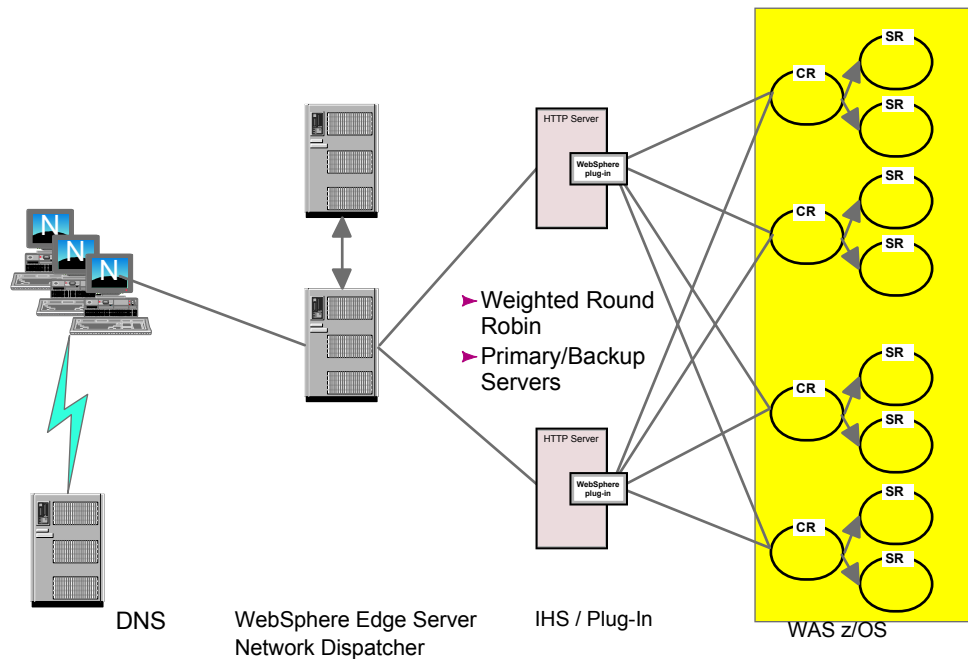
Plug-in: protocol sanitation



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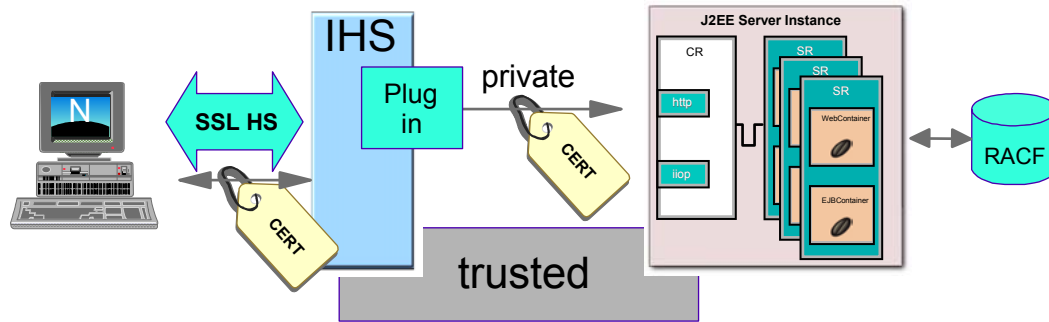
Plug-in: workload distribution and HTTP session support



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HTTPS Endpoint



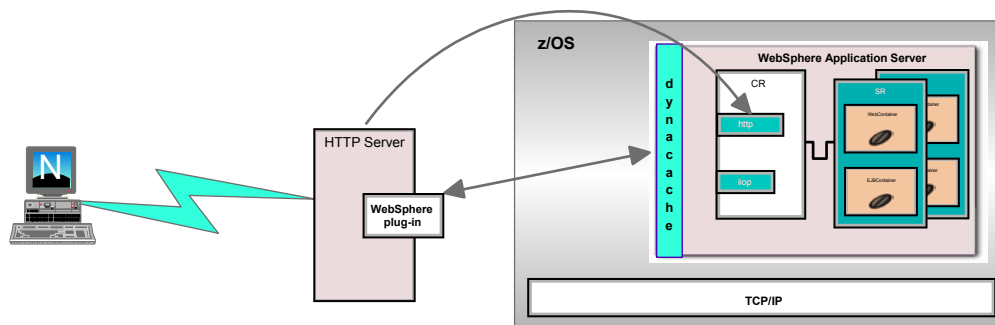
- Client Certificate returned from SSL Handshake
- Client Certificate info passed to Server Region via private headers with request
 - ▶ Certificate passed if running in BBOC_HTTP_SSL_MODE=INTERNAL / TrustedProxy=true. The Plugin will pass any needed certificate info via HTTP headers
- CB.BIND provides addition level of security/verification on HTTP SSL Transport connections and enforces that all SSL connections have a client certificate and the user ID associated with that client certificate has RACF CONTROL authority for CB.BIND.servername.
 - ▶ BBOC_HTTP_SSL_CBIND=ON/OFF / protocol_https_mutual_auth_cbind_check=true/false
 - ▶ PERMIT CB.BIND.servername CLASS(CBIND) ID(clientCertUserid) ACCESS(CONTROL)



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Fragment Caching / ESI (Edge Side Include)



Allows the plugin to cache app server responses and cut down on the number of transactions that have to go to the app server. The basic operation of the ESI processor is as follows: When a request is received by the Web server plug-in, it is sent to the ESI processor, unless the ESI processor is disabled. It is enabled by default. If a cache miss occurs, the request is forwarded to the WebSphere Application Server. If the dynamic servlet cache is enabled in the application server, and the response is edge cacheable.

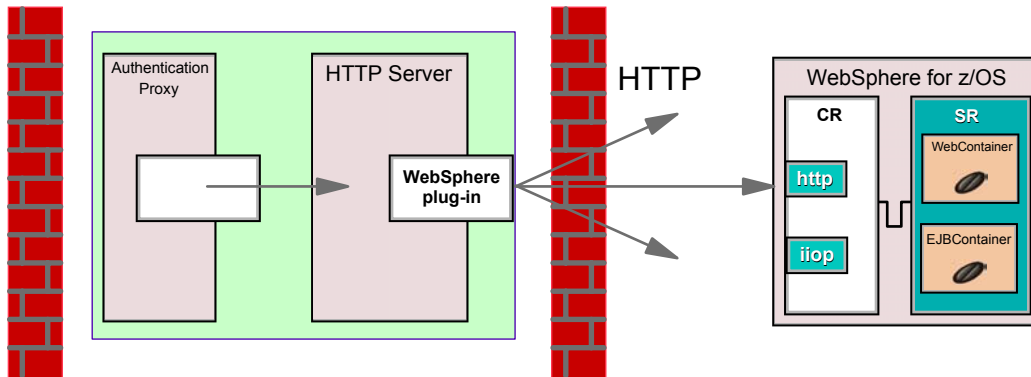
For each ESI include tag in the body of the response, a new request is processed such that each nested include results in either a cache hit or another request forwarded to the application server. When all nested includes have been processed, the page is assembled and returned to the client.



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DMZ Integration



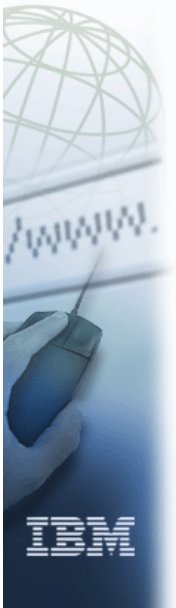
- HTTP is supported by all Firewalls
- Plug-In hosts no critical data



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Topology Elements & Examples



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Major Architectural Building Blocks

- ▶ WebServer
- ▶ WebSphere HTTP Plug-in
- ▶ Web Container / EJB Container
 - ▶ Nodes, Cells, Servers
- ▶ Firewall & Edge Stuff
- ▶ Backend
- ▶ Workload Distributor
- ▶ Remote/Local Registries
- ▶ Trust Association
- ▶ Public Key Infrastructure



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Major Architectural Decision Points

- ▶ share, replicate, copy/sync, r/o , r/w
 - ▶ proc, parm, content, conf, extendend conf (tclass.map, keyring) racf, jes, logs, websphere lpp, root, database, sessions...
- ▶ sharing is
 - ▶ costly from performance point of view (R/W)
 - ▶ adds SPOFs
 - ▶ is very good for administration
 - ▶ is difficult for rolling upgrades
 - ▶ should be designed with SLAs in mind
 - ▶ and alternate recovery options (HW, SW)



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Major Architectural Decision Points

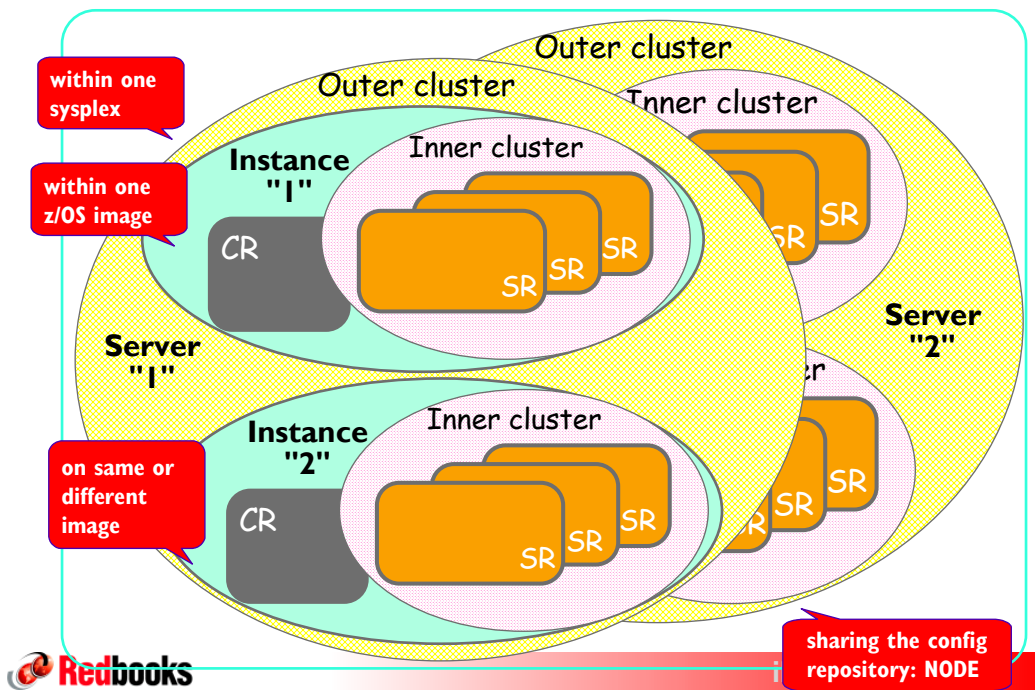
- ▶ clone/replicate/cluster servers
- ▶ horizontal or vertical scaling
- ▶ integrated or hybrid deployment
- ▶ inter component communication
- ▶ physical tier platform decision
- ▶ session awareness/intelligent spraying
- ▶ local or remote security
- ▶ systems management



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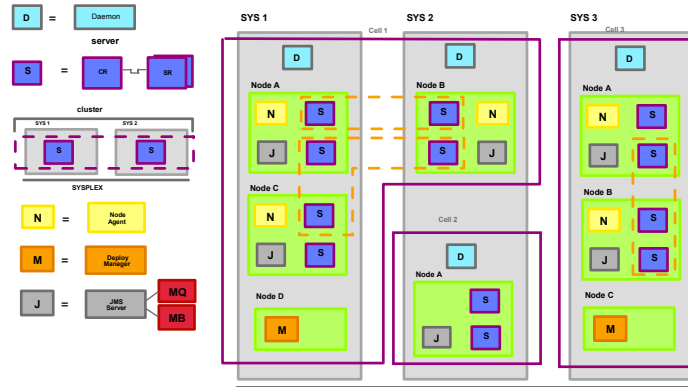
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Topology Elements WAS 4



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Topology Elements WAS 5



- A server is control region and one or multiple server regions (servants)
- A node is a logical grouping of managed servers, all located on the same machine.
- A cell is a collection of nodes that are managed by a Deployment Manager. A z/OS cell cannot span multiple sysplexes
- A cluster is a set of servers that are managed together and that participate in Work Load Management. The servers that are members of a cluster may be on different host machines, as opposed to servers that are part of a node, which must be on the same host machine. They must reside in one cell.



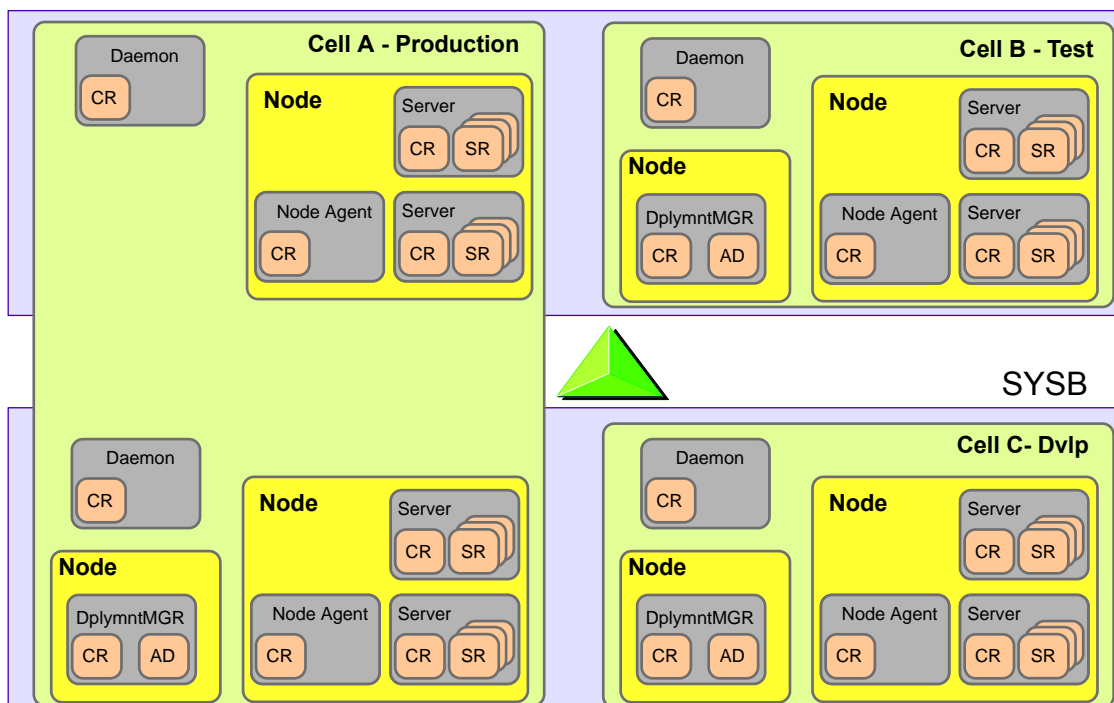
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WAS 5 z/OS topology flexibility

Basic Configuration / Network Deployment

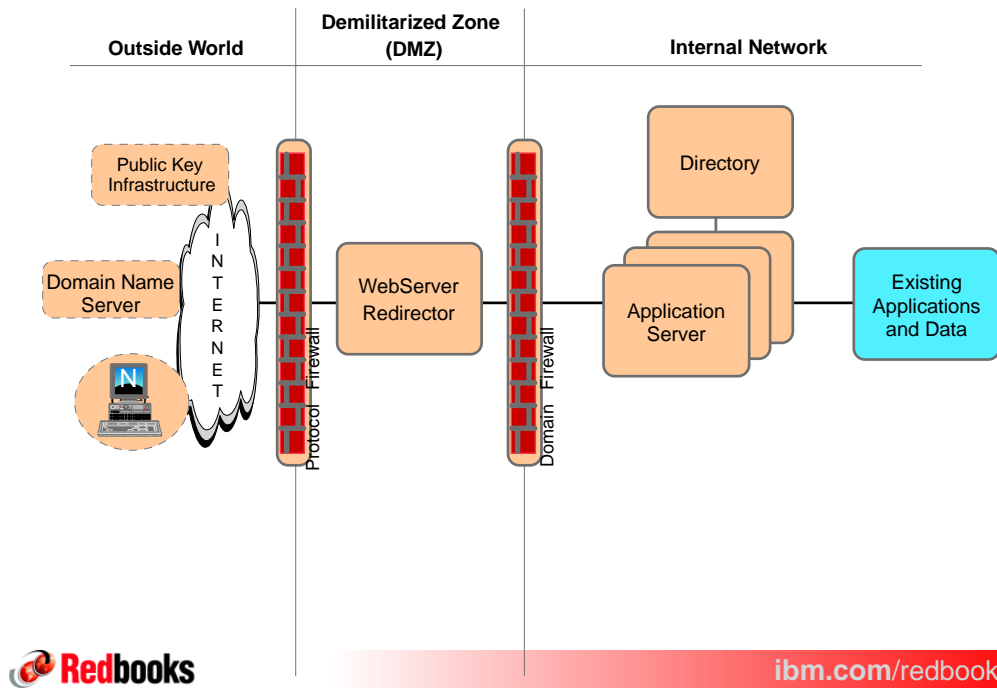
SYSA



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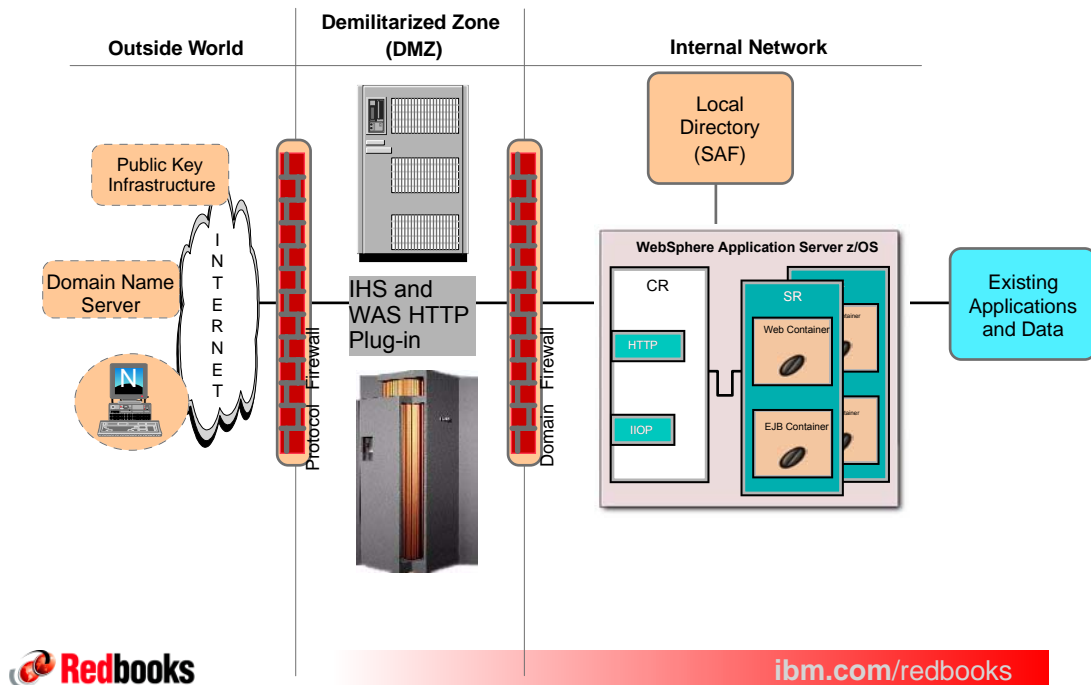
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Patterns: generic topology



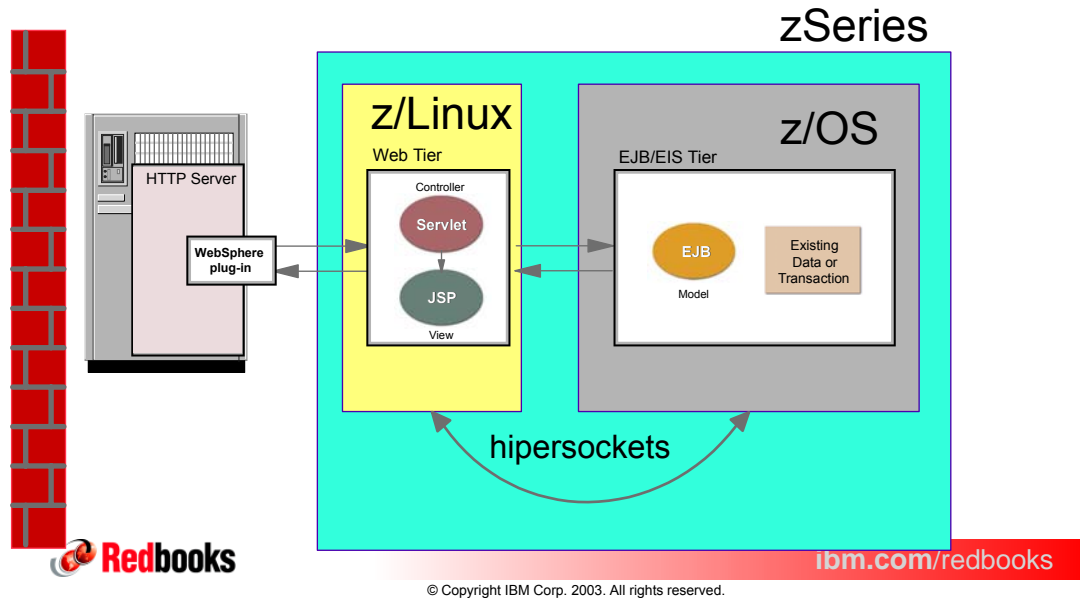
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generic topology - z/OS mapping (integrated scenario)

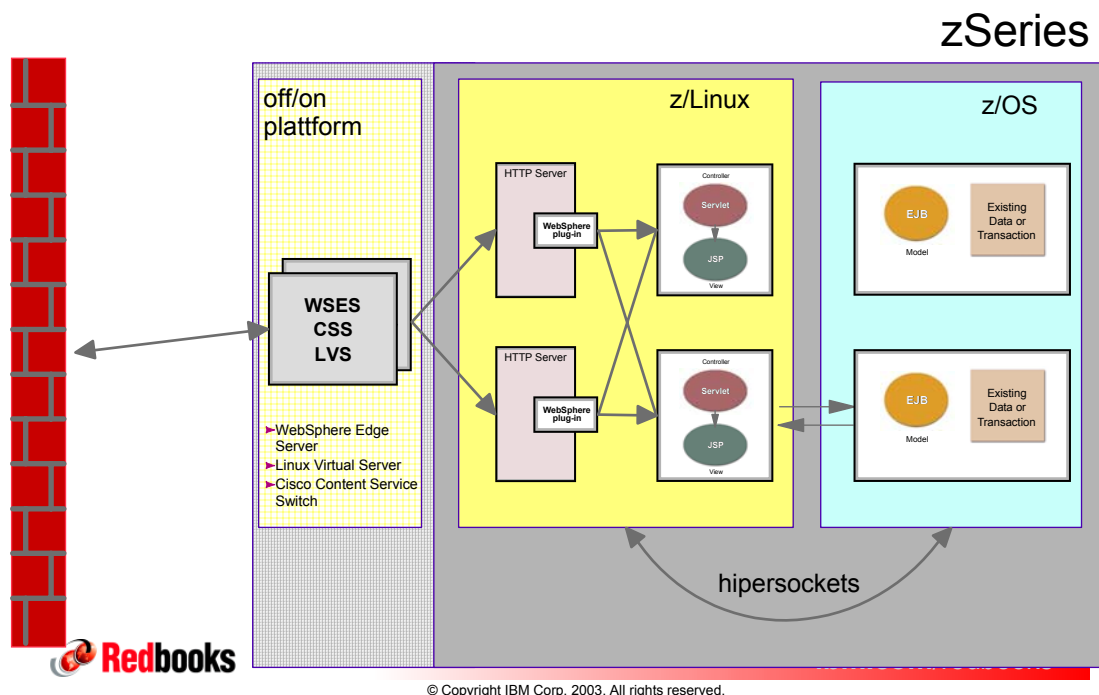


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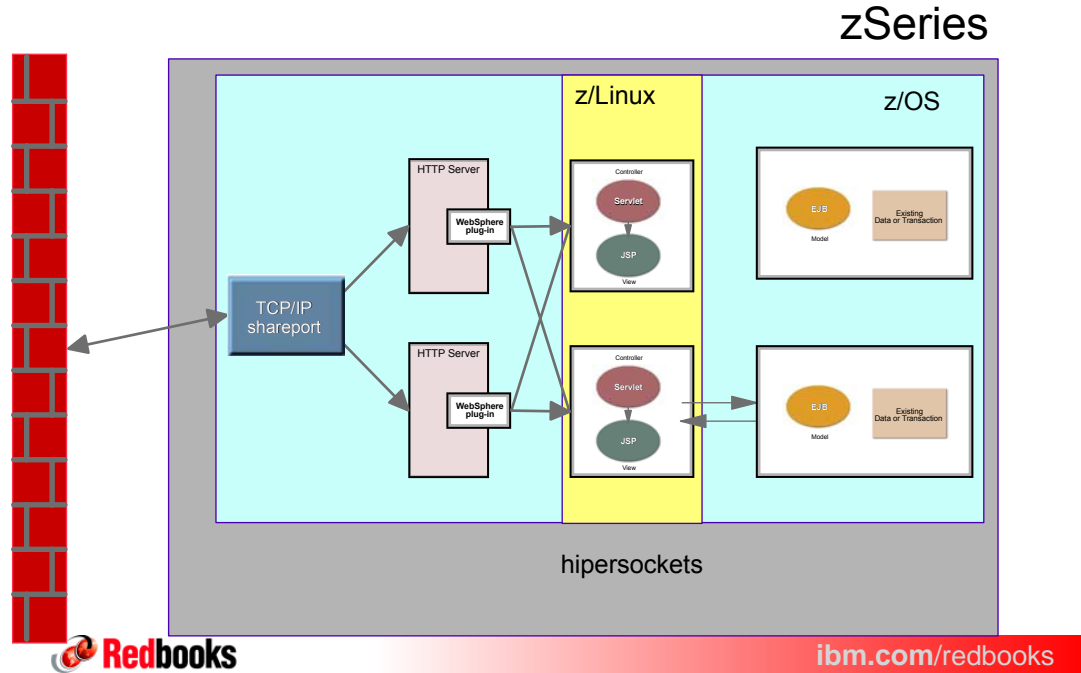
virtualized semi integrated zScenario



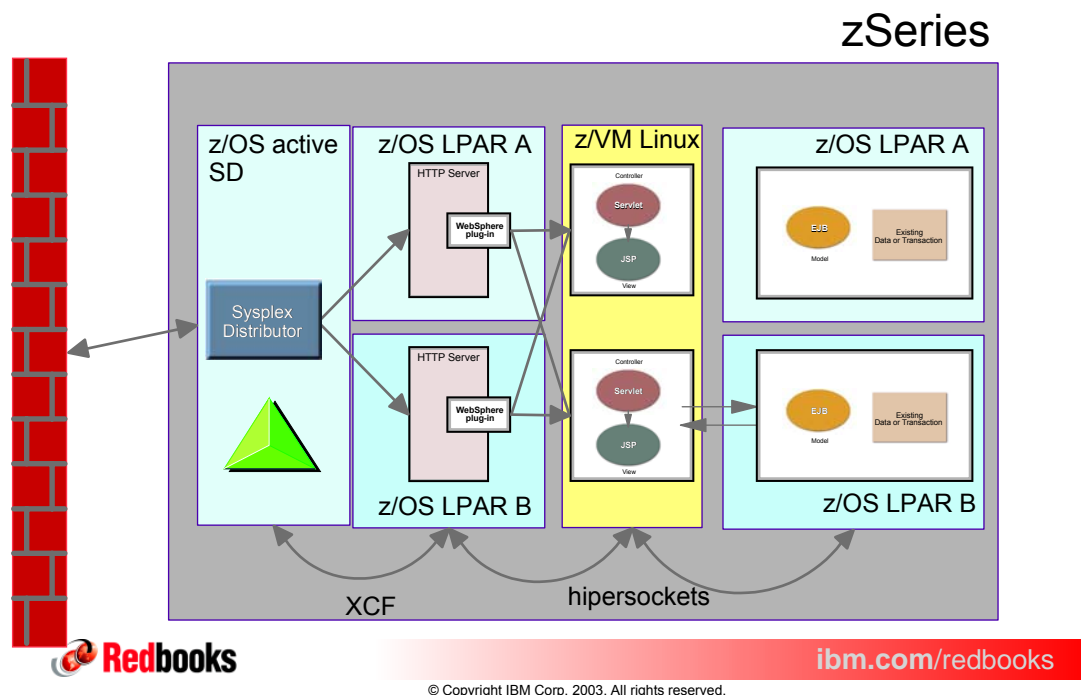
virtualized semi integrated **HA** zScenario



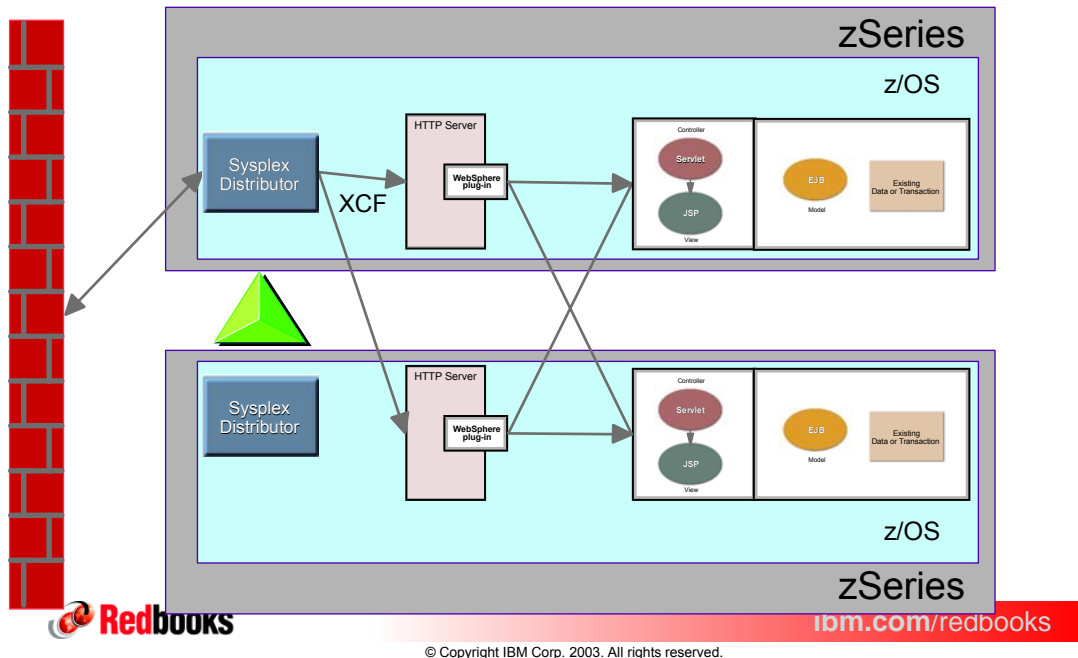
virtualized semi integrated single z/OS image zScenario



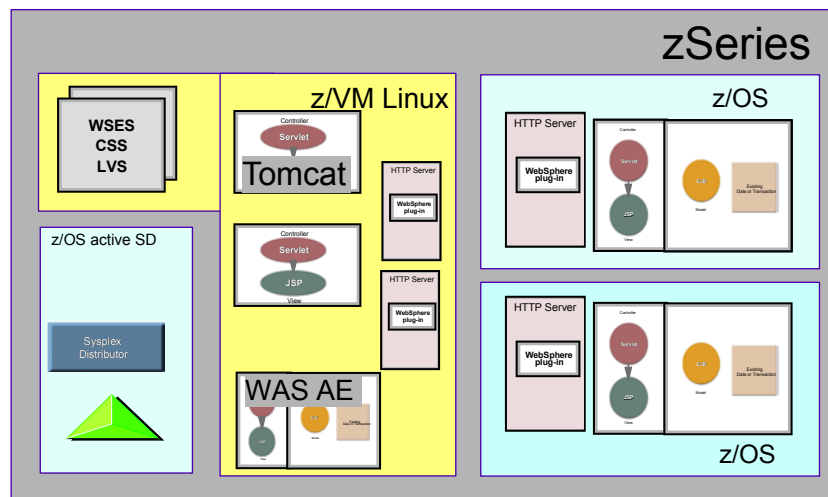
virtualized semi integrated Sysplex zScenario



fully integrated Sysplex HA zScenario

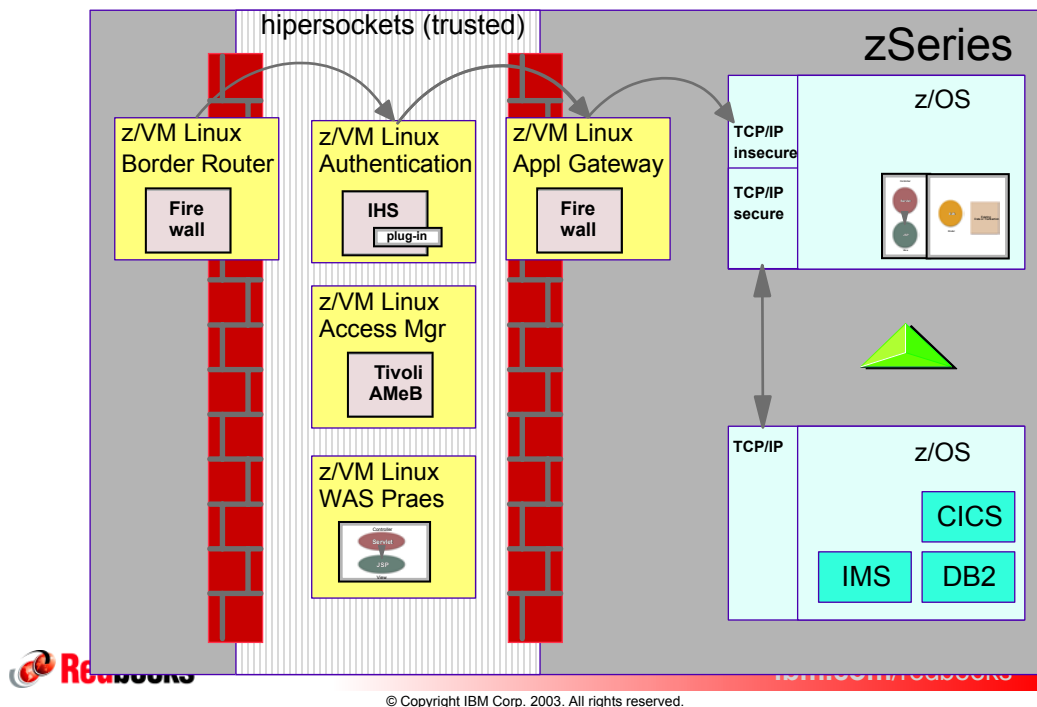


mix and match environment

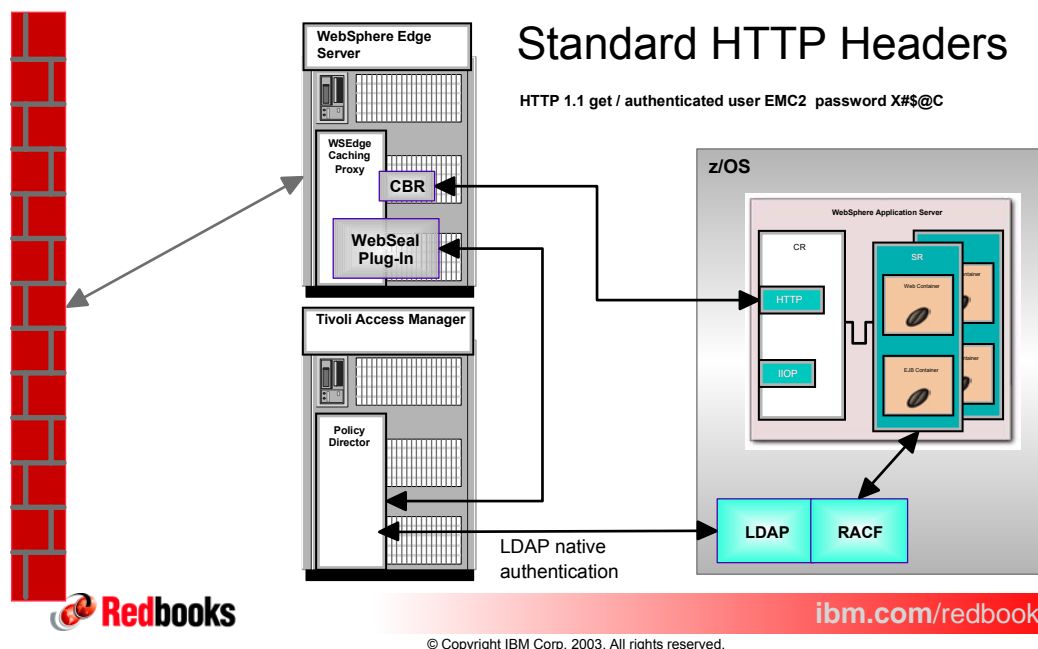


- ▶ transactional workload on z/OS
- ▶ ability to exploit other frameworks on z/Linux:
 - ▶ WebSphere AE, WebSphere V5 for Linux
 - ▶ Tomcat
 - ▶ Apache
 - ▶

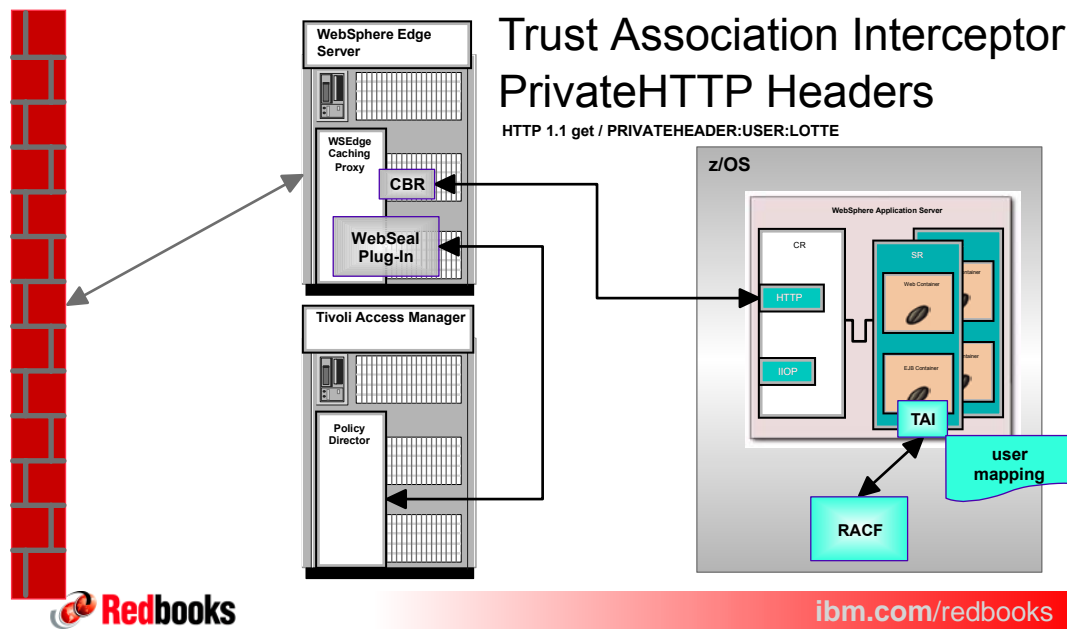
Plugins, Firewalls and DMZ



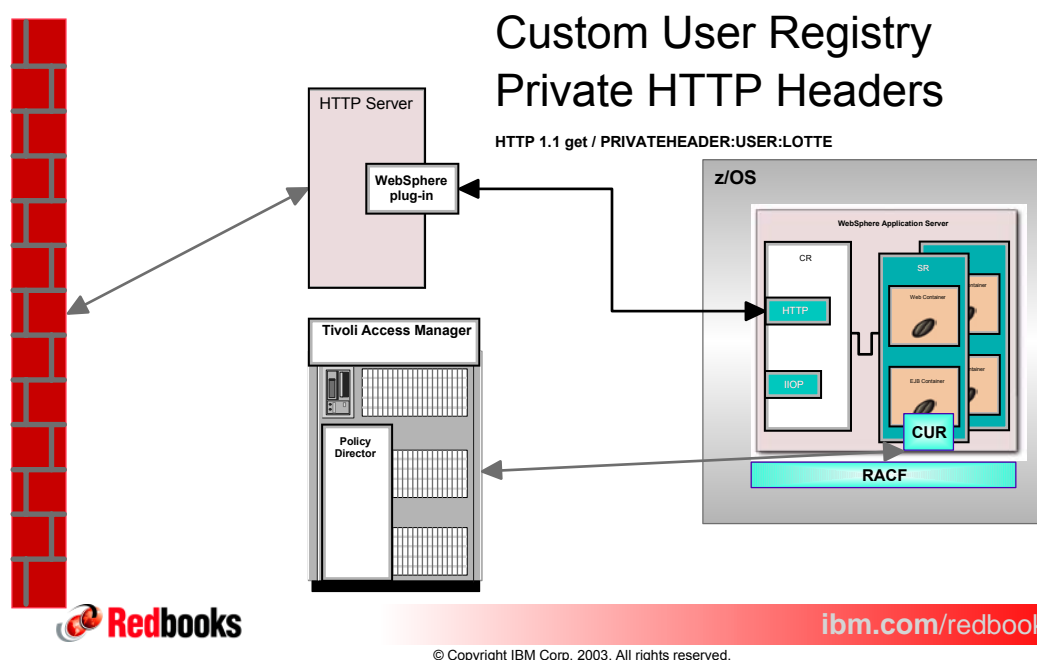
Details & Variations: Using RACF as a remote user registry



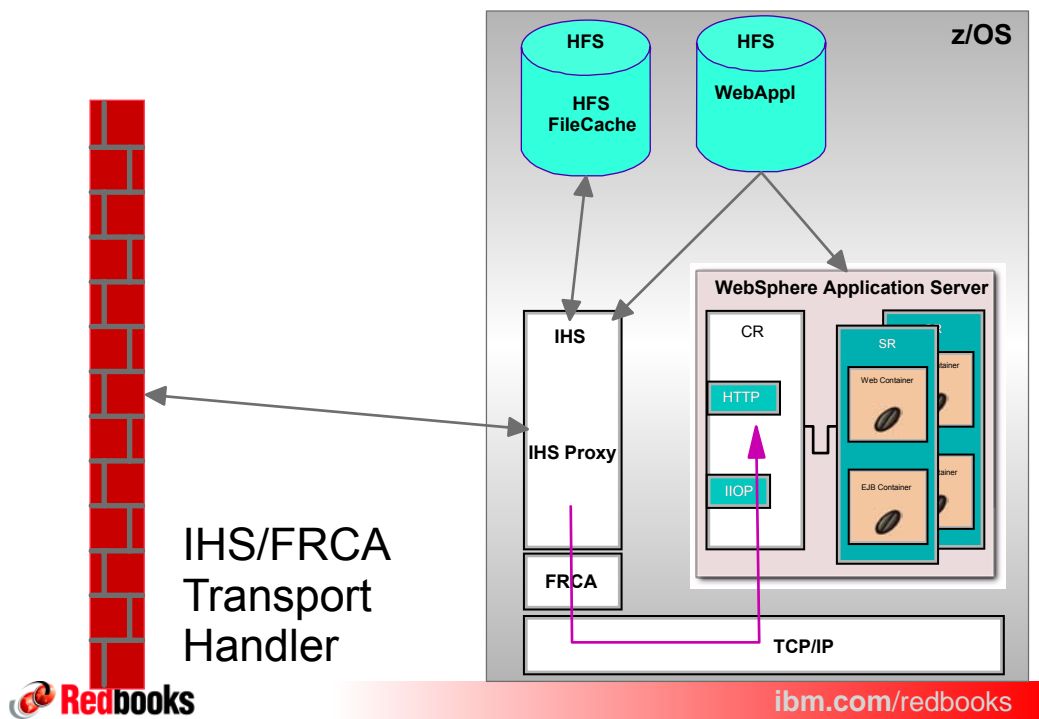
Details & Variations: Using any remote user registry / TAI



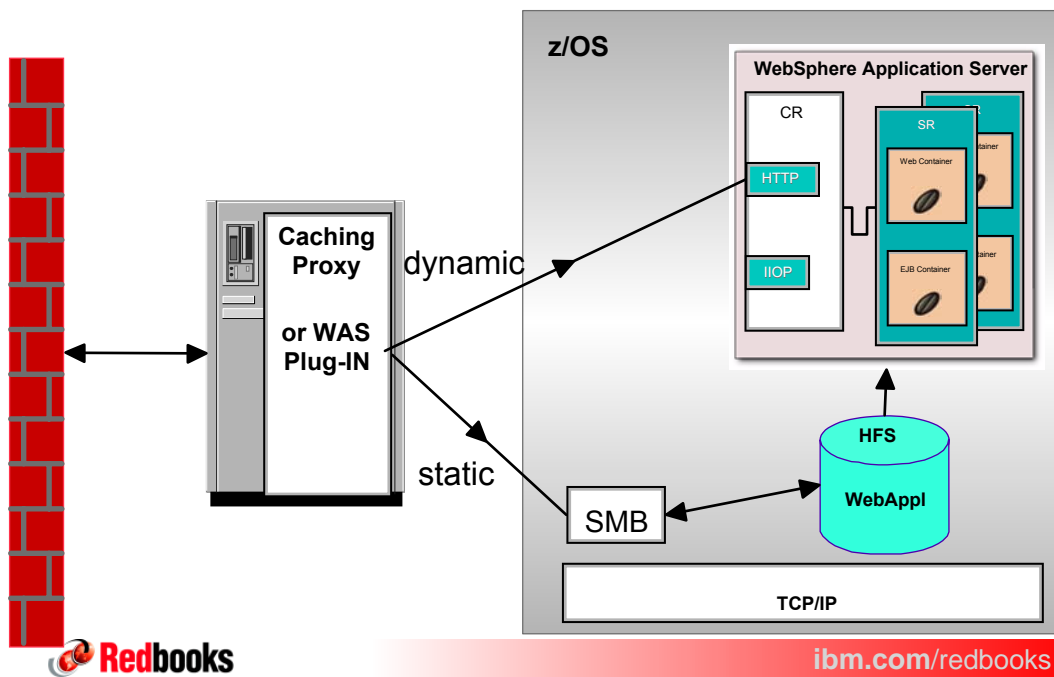
Details & Variations: Using any remote user registry / CUR



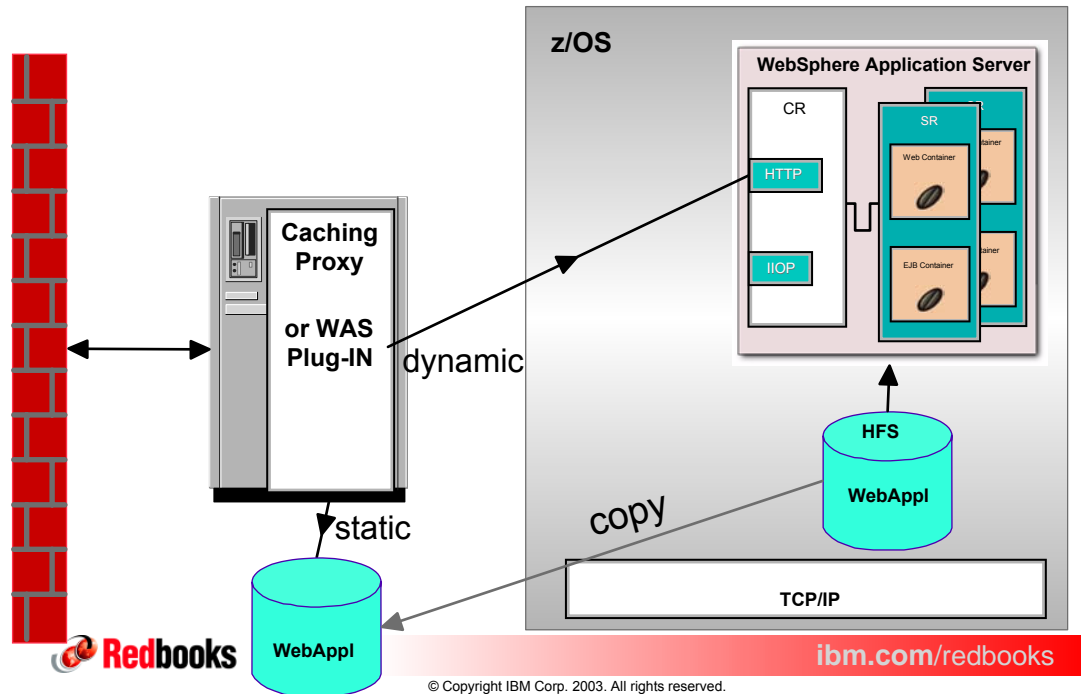
Details & Variations: on platform static file offloading



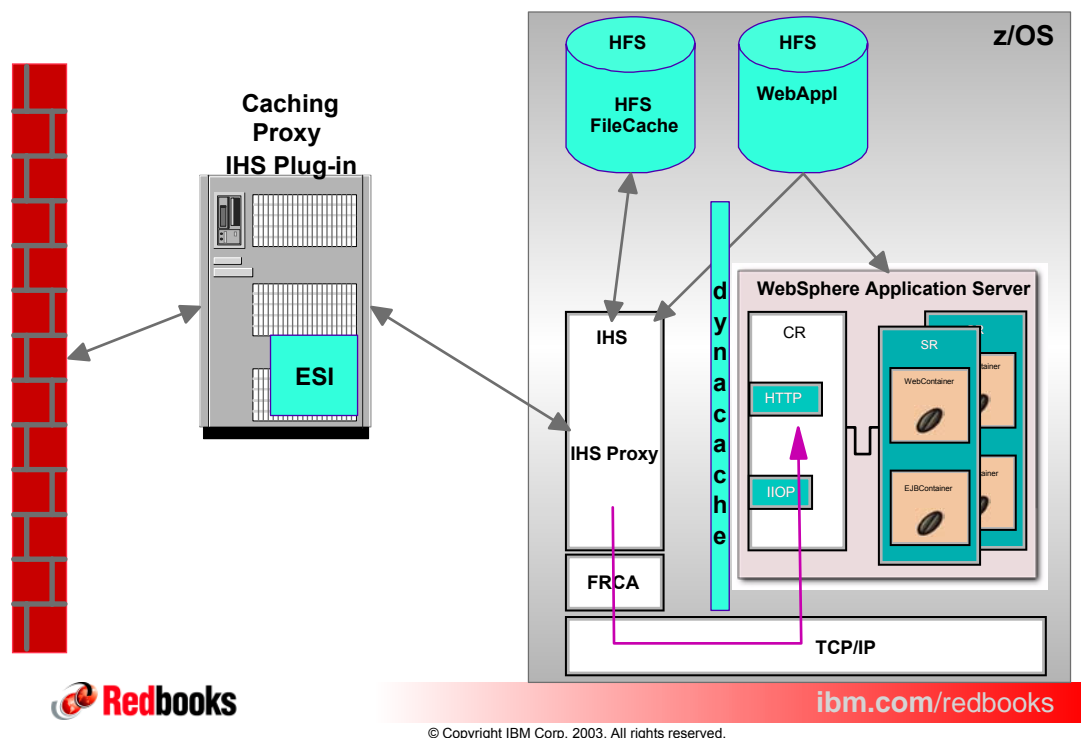
Details & Variations: off platform static file offloading / SMB



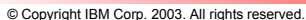
Details & Variations: off platform static file offloading / copy



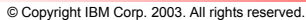
Details & Variations: on & off platform caching



```
1 http 1.1 get / authenticated user wunderl password X#$@C
```



```
http 1.1 get / authenticated user wunder! password X#$@C
```



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Patterns for z/OS, Connecting self service applications to the enterprise SG24-6827

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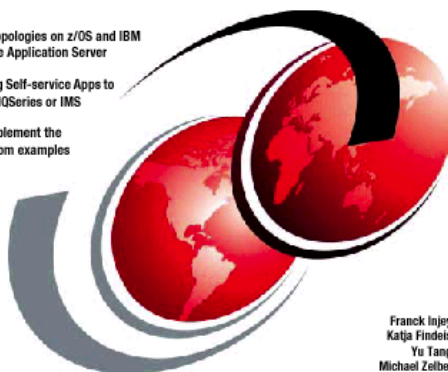
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Patterns on z/OS: Connecting Self-Service Applications to the Enterprise

Runtime topologies on z/OS and IBM WebSphere Application Server

Connecting Self-service Apps to CICS TS, MQSeries or IMS

How to implement the solution from examples



Franck Injeay
Katja Findels
Yu Tang
Michael Zeibel



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z/OS WebSphere & J2EE Security Handbook

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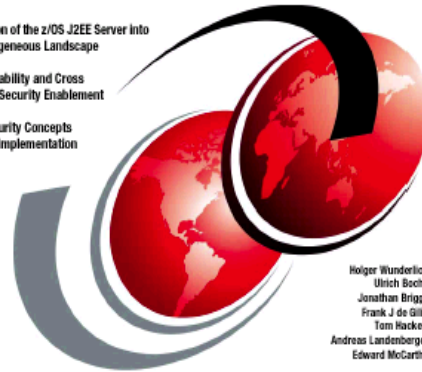
z/OS WebSphere & J2EE Security Handbook



Integration of the z/OS J2EE Server into a Heterogeneous Landscape

Interoperability and Cross Platform Security Enablement

J2EE Security Concepts and their Implementation



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Ulrich Boche
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Enabling High Availability eBusiness on zSeries SG24-6850

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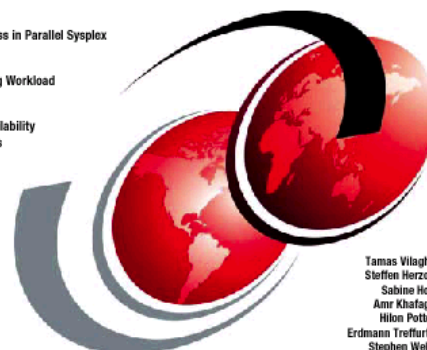
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Enabling High Availability e-Business on zSeries

e-Business in Parallel Sysplex

Balancing Workload

High Availability Scenarios



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