

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

WebSphere Application Server V5 for z/OS Overview



Redbooks

International Technical Support Organization

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Agenda

WebSphere for z/OS V5

- Overview
- Tools
- Prereqs



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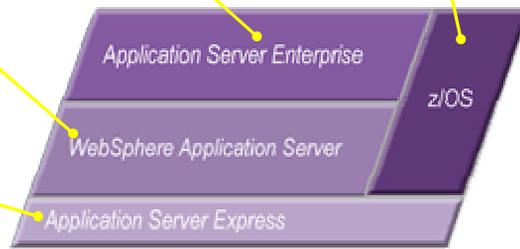
WebSphere Application Server v5

New! A **next generation** application server providing extended J2EE application optimization and integration capabilities for composing and choreographing adaptable applications based on a progressive Web services-oriented architecture.

A J2EE-certified Web services application server specifically optimized to the unique **QoS of z/OS**.

The **core** Web services J2EE 1.3 certified application server enabling industry-leading QoS and flexible deployment options.

An easily approachable "**on ramp**" to e-business, providing fast and productive development, deployment of dynamic Web applications.



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Java implementations and Levels

- **Java implementations**
- The following Java implementations are included in WebSphere v5.0:
- Bean Scripting Framework 2.3
- Data Access Beans 4.0
- Gryphon 1.1
- Java 2 SDK
- IBM - 1.3.1
- Java 2 Runtime Environment (JRE) 1.3
- Java Authentication and Authorization Service (JAAS) 1.0
- Java Command Language (JACL) 1.2.6
- Jakarta Ant 1.4.1
- Jakarta Commons 1.0
- Jakarta ORO 2.0.5
- Jasper 4.0
- Java 2 SDK - IBM 1.3.1
- Java Cryptography Extension (JCE) 1.2.1
- Java Secure Socket Extension (JSSE) 1.0.2
- JavaBeans Activation Framework (JAF) 1.0.2
- JavaHelp 1.1.1
- JavaMail 1.2
- JClass 4.5K
- JCUP Parser .10k
- JDOM 0.7
- JROM 0.6
- JRAS 1.0
- Jython 2.1
- Meta-Object Facility 5.0
- Rhino: JavaScript 1.5.2
- RMI/IIOP 1.3.1
- SOAP-Sec 1.0
- SOAP 2.3
- Struts 1.0.2
- Tmx4j 2.1
- Tiles 1.0
- UDDI4J 1.0.3, 2.0
- UDDI4J-WSDL 2.1
- WSDL4J 1.0
- WSIF 1.2
- XML 4J (Xerces) 4.0.8
- XSL (Xalan) 2.3.2
- PetStore 1.3.1



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WebSphere for z/OS V5.0 – JCA Connectors

- IMS 7.1 /8.0 IMS Connect 1.2 /2.0
 - APPC based connector - RRS enabled
 - Local (OTMA based) - RRS enabled
 - Remote (TCPIP based) - 1PC capable
 - Will supersede APPC based connector once 2PC capable
- CICS CTG 5.0.1
 - Local (EXCI based) - 2PC capable
 - Remote (TCPIP based) - 1PC capable
 - Remote (ECL based) - 1PC capable
- JDBC to DL/I and VSAM
- WebSphere will support any fully compliant JCA 1.0 Connector
- DB2
 - Local 2PC capable
 - High performance RRS Enabled
- XA Transaction Coordination
 - New in V5
 - RRS and XA resources in a single transaction

Notes: WAS zOS will continue unique zOS connector support

- RRS enablement
- ThreadIdentity



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WebSphere V5 for z/OS Improvements

- **WAS for z/OS V5 fully conforms to the family programming model**
 - Will lead to smoother movement of applications from prototype to production
 - In WAS for z/OS V6 the code base will be the same as distributed
- **WAS for z/OS V5 is simpler to install**
 - Many pre-reqs – including DB2 – have been relaxed
- **WAS for z/OS V5 is simpler to manage**
 - Alignment with distributed systems management model and tools
 - No z/OS-specific learning curve for distributed WebSphere customers
- **WAS for z/OS V5 has lower entry-level software costs**
 - Value unit pricing may mean lower initial outlay for PoCs
 - Non-DB2 accounts do not need to purchase a DB2 license
- **WAS for z/OS V5 has more modest hardware requirements**
 - Less LPA utilization means less memory, lower memory costs
 - Smaller installation image means smaller DASD requirements, lower storage costs



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WebSphere for z/OS V5.0 – FootPrint

- Multiple Nodes on a system
 - Test and Production within the same LPAR
- Reduce number of server processes
- Reduce memory requirement - work in progress
 - Component Broker (MOFW) Removed from the product
 - LPA footprint reduced to about 30MB (from 160MB+)
 - Private area footprint in the Control Region reduced to 20-30MB (from 80MB+)
 - Private area footprint in the Server Region reduced to 100MB (from 300MB+)



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WebSphere for z/OS V5.0 - Software Prerequisites

- OS/390 R10 and higher
 - Sysplex, WLM, RRS, RACF, USS
- JDK 1.3.1
- LDAP dependency eliminated - optional for security
- Shared HFS not required
- DB/2 V7
 - Optional DB2-less configuration - faster install and config
 - Based on config files in the HFS
 - Single system scoped, no sysplex QOS
- JMS Integral Provider in the WebSphere Base
 - MQ 5.3.x Queue Manager
 - JMS Broker (Pub/Sub)
 - JMS Client
- Full MQ QOS available for the JMS Integral Provider - optional



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ASCII JVM?

NO

- Under WebSphere Application Server 5.0 for z/OS, the file.encoding property for the JVM is automatically set to ISO8859_1. The effect of this change is as follows:
- When InputStreamReader, OutputStreamWriter, and other classes that perform character set translation are used, the HFS files that are read or written must be in ASCII unless an alternate character set is specified when using the "Reader" or "Writer" class.
- Properties files are assumed to be in ASCII.

...but we finally got rid of the nasty EBCDIC related deployment problems!



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The Components you might need

- IBM HTTP Server z/OS or other
- Workstation with WebBrowser
- Workstation with decent W2k/XP for WSAD, AAT
- WebSphere Application Server 5.01 distributed
- NFS or SMB
- GUI FTP client, FTP server
- Telnet client
- EBCDIC editor on PC
- ASCII Editor on z
- ...



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Terminology Definitions



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V5 Terminology – Terms to Describe

- Machine and/or System and/or LPAR
- Server
- Node
- Cell
- Base Application Server
- Servers in Network Deployment Environment
 - Deployment Manager
 - Node Agent
 - Application Server
 - JMS Server
- Cluster and Cluster Member
- Managed Server
- Control Process and Servant Process
- Daemon



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V5 Terminology

- Machine and/or System and/or LPAR
 - Runs an operating system instance
 - A physical machine (Windows, Linux/Intel, Solaris, HP/UX)
 - A logical partition – LPAR (z/OS, AIX)
- Server
 - A process which provides function(s), for example
 - Web container
 - EJB container
 - JMS services
 - Naming services
 - Configuration management
 - Operational management
 - Java runtime running in a single machine:
 - A single JVM (Dist)
 - Multiple JVMs (z/OS)
 - Control process
 - Multiple Servant processes
 - Defined through a set of XML configuration files



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V5 Terminology

- Node
 - Grouping of servers for configuration and operational management
 - Cannot span the scope of a machine/LPAR
 - OK for multiple nodes in the same machine/LPAR
 - multiple nodes in one cell in one machine is not good
- Cell
 - Network of multiple nodes
 - Single point of administration
 - Cannot span the scope of a Sysplex (z/OS)
- Base Application Server
 - A single, stand alone server for deploying J2EE applications
 - Contains a Web container, EJB Container, Naming services
 - May contain JMS services
 - Contains the Administrative Application



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V5 Terminology

- Servers in Network Deployment Environment
 - **Deployment manager**
 - Manages a distributed topology
 - Contains the Administrative Application for a cell
 - Manages files in a central configuration repository
 - Communicates with Node Agents
 - **Node Agent**
 - Manages servers which are part of the node
 - Manages configuration files for the node
 - Communicates w/Deployment Manager & Application Servers on node
 - **Application Server**
 - Server for deploying J2EE applications
 - Contains a Web container, EJB Container, Naming services
 - **JMS Server**
 - Server for Embedded JMS



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V5 Terminology

- Cluster
 - Set of application servers with the same applications installed
 - Grouped logically for workload management and failover
 - Cannot span cell boundaries
 - Can span multiple nodes within a cell
- Cluster Member
 - An application server which is part of a cluster
- Managed Server
 - Server managed by Deployment Manager & Node Agent
 - JMS Server
 - Application Server
 - Cluster Member

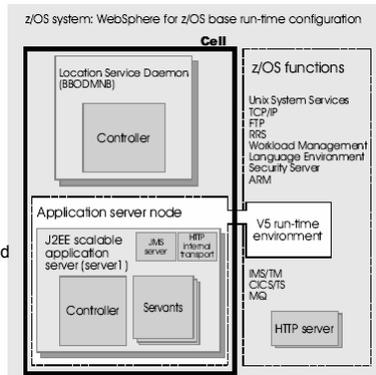


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V5 Terminology – z/OS Only

- Control Process
 - z/OS Server contains one of these
 - An instance of a JVM
 - Performs system level work for the z/OS server
 - Routes requests to Servant Processes
- Servant Process
 - z/OS Server contains 1 to many of these
 - They are dynamically allocated as needed
 - Each is an instance of a JVM
 - Performs application level work for the z/OS server
- Daemon
 - IIOp location server
 - Listens to a well known IIOp port assignment exported in indirect IORs
 - Knows current IIOp port assignments for all servers
 - Provides location forwarding for IIOp requests
 - Must be running at all times



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V5 Terminology - z/OS V4→V5

Version 5	Version 4
Cell	Node (sort of)
Cluster	Server
Cluster Member	Server Instance
Node Agent & Deployment Manager	System Management Server (sort of)
Control Process	Control Region
Servant Process	Server Region



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Topology Element Definitions

- ▶ Elements
 - ▶ sysplex contains cells
 - ▶ cells contain nodes and clusters
 - ▶ nodes contain servers
 - ▶ clusters contain servers
 - ▶ clusters may span nodes
 - ▶ server can only be in one cluster
 - ▶ server can be either clustered or unclustered
- ▶ Names
 - ▶ cell names must be unique
 - ▶ node names in same cell must be unique
 - ▶ server names in same node must be unique
 - ▶ cluster names in same cell must be unique



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Section

Topology

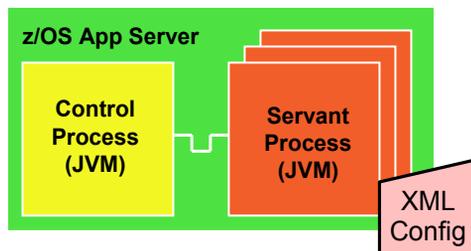
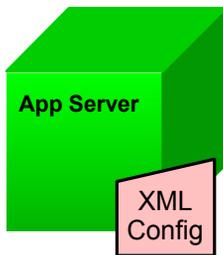


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V5 Topology – Base Application Server

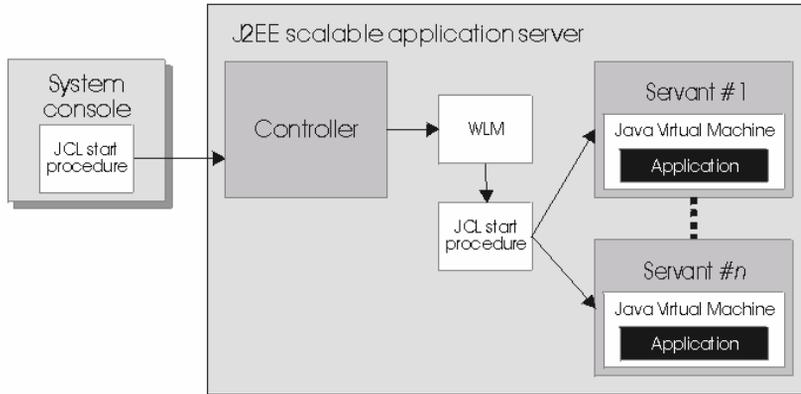
- A Base Application Server



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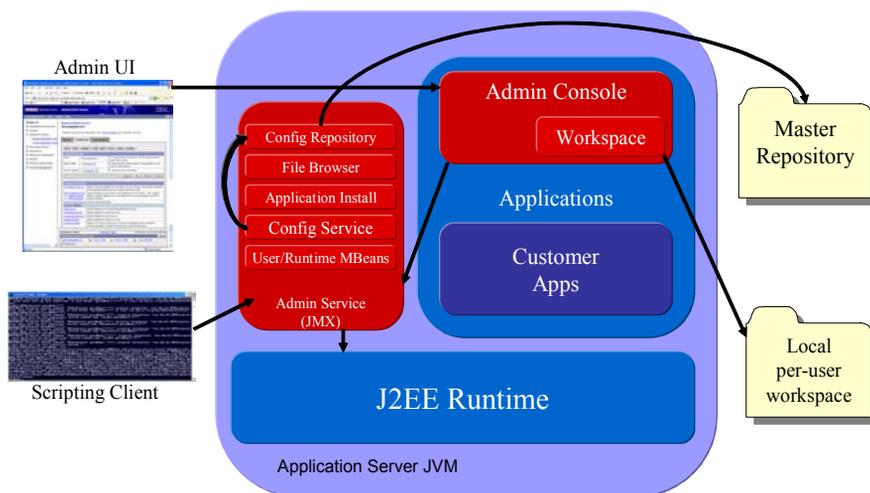
z/OS Implementation



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WebSphere V5.0 – Base Runtime Configuration

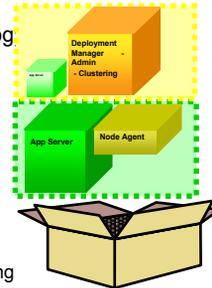


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WebSphere Application Server Network Deployment (ND)

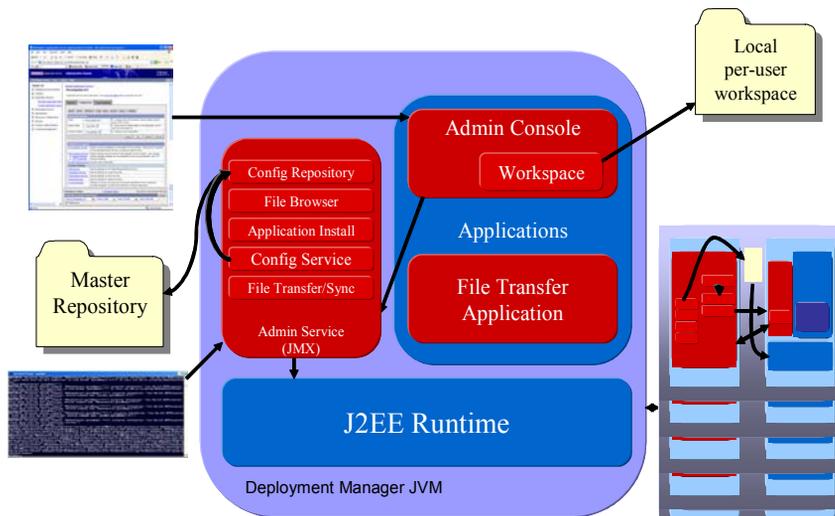
- Targets multiple servers, multiple nodes environment
 - Focus is on scalability, availability, and performance
 - Clustering and failover support
 - Web server plugin supports static weighted load distribution
- Distributed Administration
 - Browser based administration console for the entire topology
 - XML-based repository
- Ships with some Edge Components on "DMZ CD"
 - Network Dispatcher
 - Switch Consultants for CISCO and Nortel switches
 - Site Selector for scaling Network Dispatcher
 - Caching Proxy
 - Reverse Proxy, Content Based Routing,...
 - Dynamic content caching: integration with WAS servlet caching
- Enhanced Web Services functions
 - UDDI Registry - for private UDDI registry
 - Web Services Gateway



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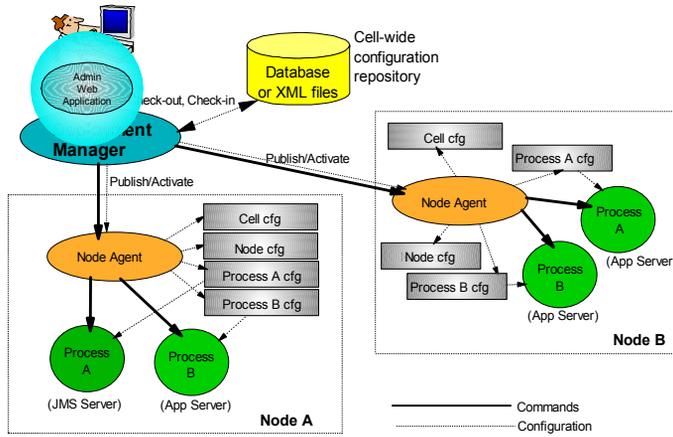
WebSphere V5.0 – Network Deployment Manager



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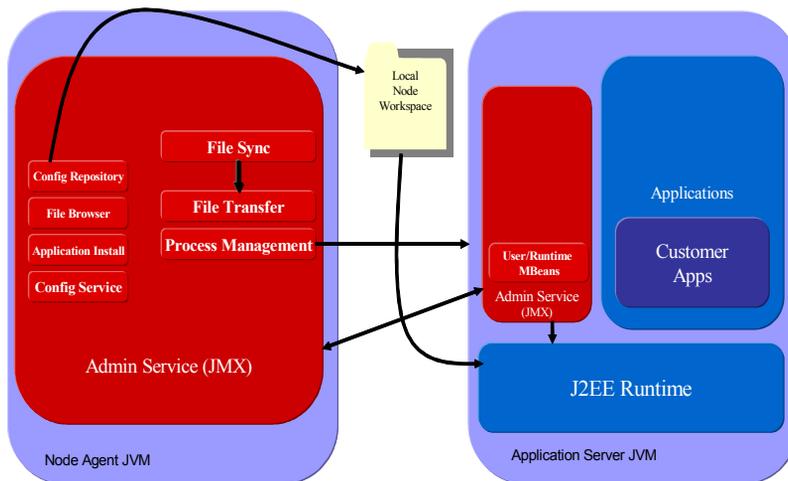
ND deployment manager



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WebSphere V5.0 – Network Deployed Node

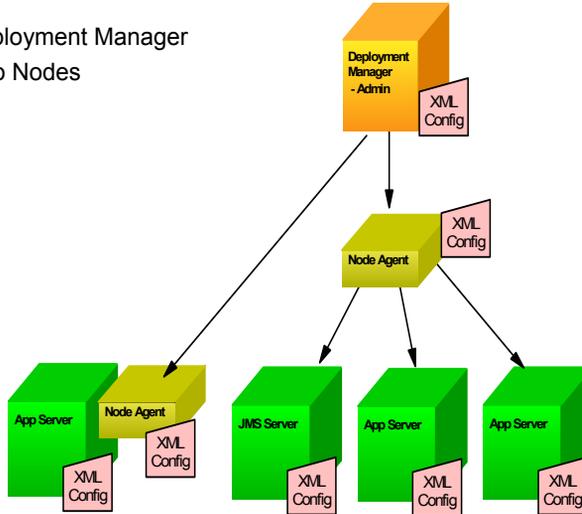


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V5 Topology – Network Deployment

- Deployment Manager
- Two Nodes

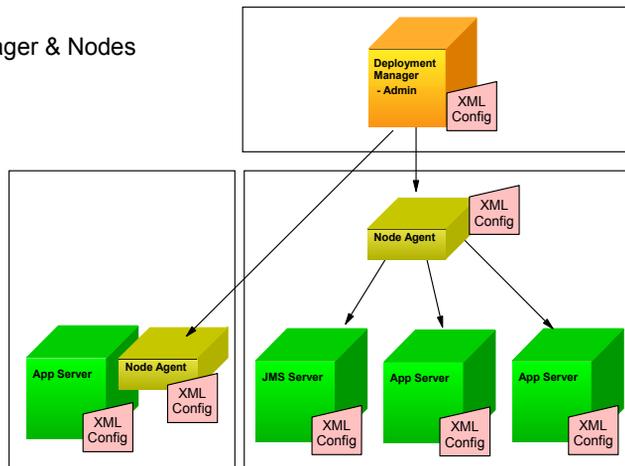


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V5 Topology – Network Deployment

- Deployment Manager
- Two Nodes
- Deployment Manager & Nodes on own machines

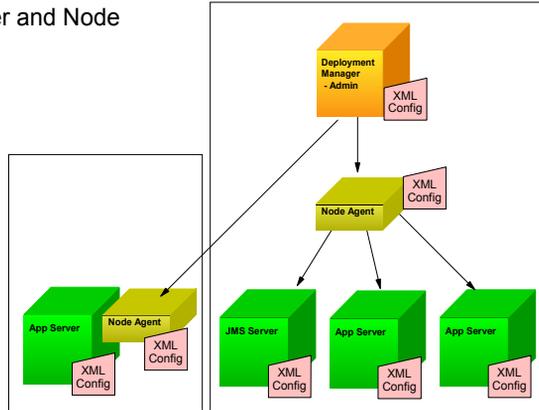


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V5 Topology – Network Deployment

- Deployment Manager
- Two Nodes
- Deployment Manager and Node on same machine

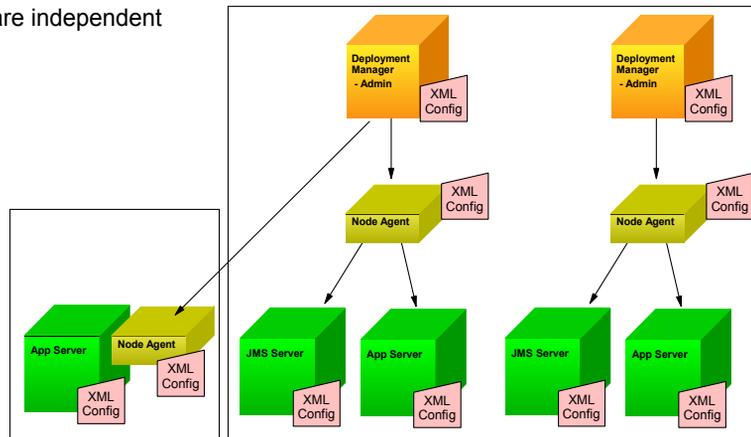


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V5 Topology – Network Deployment

- Multiple Cells on same machine
- Two Deployment Managers
- Cells are independent

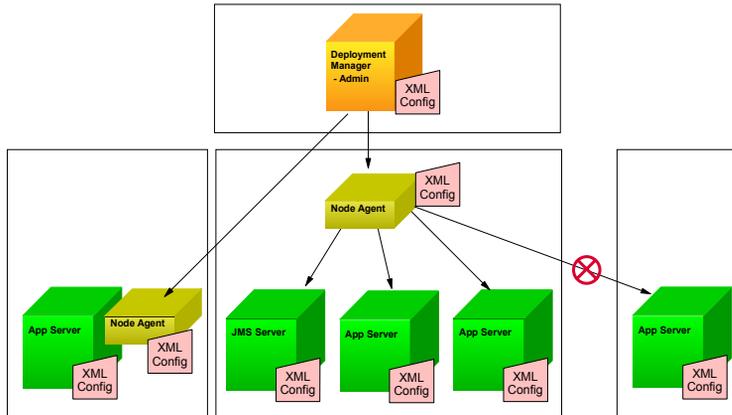


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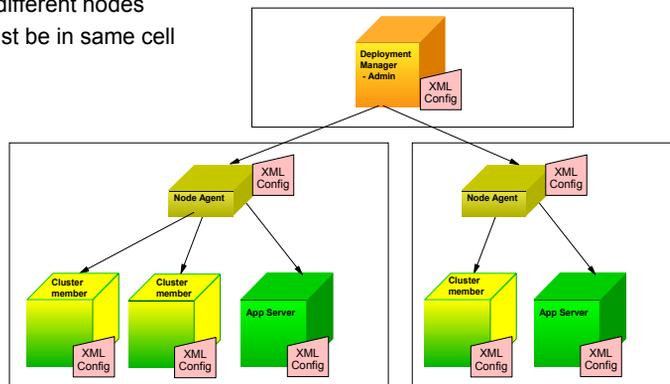
V5 Topology – Network Deployment

- **INVALID CONFIGURATION**
- Nodes cannot span machine boundaries

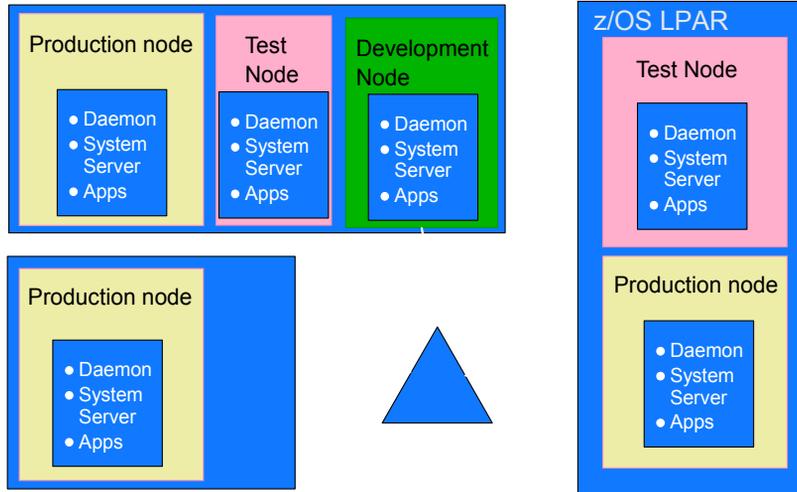


V5 Topology – Cluster

- Cluster members can be:
 - In the same node
 - In different nodes
 - Must be in same cell



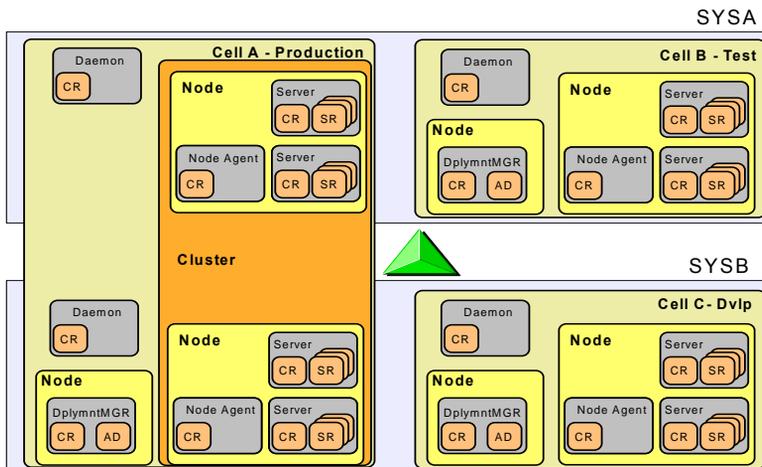
Logical view of nodes in a sysplex



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Cells & Nodes in a z/900 environment



It is not recommended to have multiple nodes in one cell in one operating system



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Section

JMS Systems Management Connectors

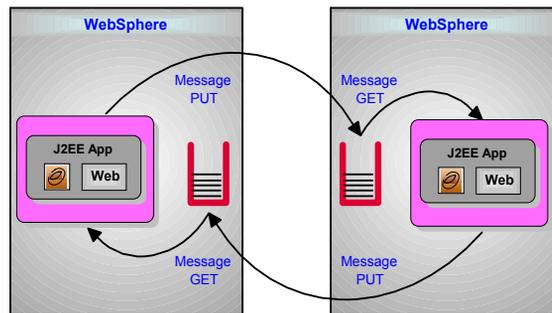
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WebSphere V5 - Integral JMS Message Provider



- WebSphere 5.0 includes a JMS implementation
 - installed as part of the application server installation
 - fully integrated with the Application server's administration and runtime



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WebSphere V5.0 – Security

- **CSlv2 J2EE 1.3 compliant**
 - Basic Authentication (userid, password)
 - Digital Certificates over SSL
 - Kerberos tickets
 - Asserted identity
 - Interoperable with any CSlv2 compliant vendor
- **Java 2 Security**
 - Java class and method based permission
- **Extensible and Pluggable**
 - Custom User Registry
 - Pluggable Authentication based on JAAS - requires mapping to SAF identity on z/OS
- **Auditability Enhancements for z/OS**
 - SAF SMF audit records will contain original principal in X500 name field



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Systems Management

- Match family wide System Management function and topology
 - WebSphere managed resources instrumented as JMX MBeans
 - JMX Connectors provide choice of access protocol (IIOP / HTTP(s))
- Common WebSphere Admin Model/Process/Console
 - Support install of applications directly from WSAD
- Consolidated configuration files
 - All configuration data stored in XML files on HFS
 - JVM configuration, Server Environment
- wsadmin can be used to manage and deploy applications, supports Java Command Language (JACL) with is a Java implementation of TCL. TCL (pronounced tickle') stands for "tool command language"



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Systems Management

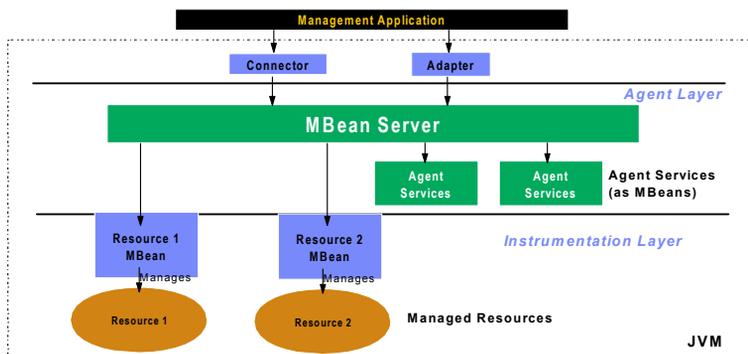
- zOS-specific Manual Configuration
 - Generates checklists for manual
 - Base Application Configuration
 - root hfs mount configuration
 - zOS file locations
 - RACF definitions/file permissions
 - server procs
 - Integral JMS Provider
 - MQ specific configurations
 - zparm and xparm
 - bootstrap, log and page dataset definitions
 - security options
 - RACF definitions for server access to queues.
 - Deployment Manager
 - node agent procs
 - RACF defintions



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WebSphere V5.0 – JMX Based Admin and Monitoring



- Provides a standard and scalable management architecture for WAS
- Integrates existing management solutions through **adapters**
- Supports multiple communication protocols through **connectors**
- Supports alerts and user defined MBeans

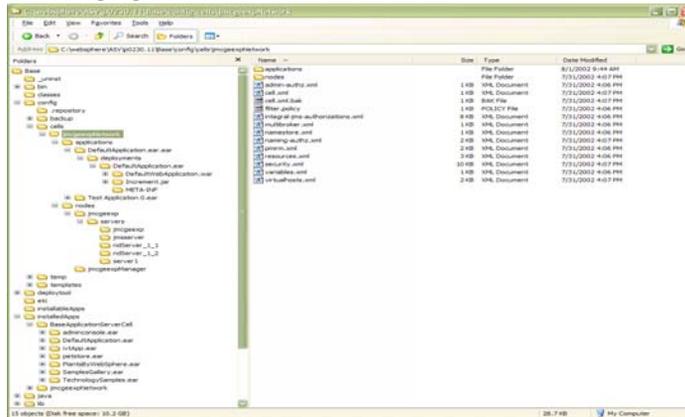


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WebSphere V5.0 – Scalable Web Based Admin

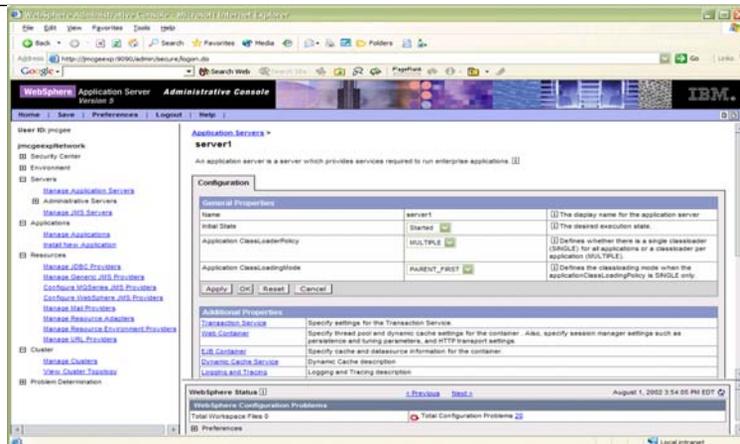
- - Servers load directly from local files (fault tolerant)
- - all application and naming data available locally
- - WebSphere manages cluster synchronization
- - Messaging between servers via JMX



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WebSphere V5.0 – Scalable Web Based Admin



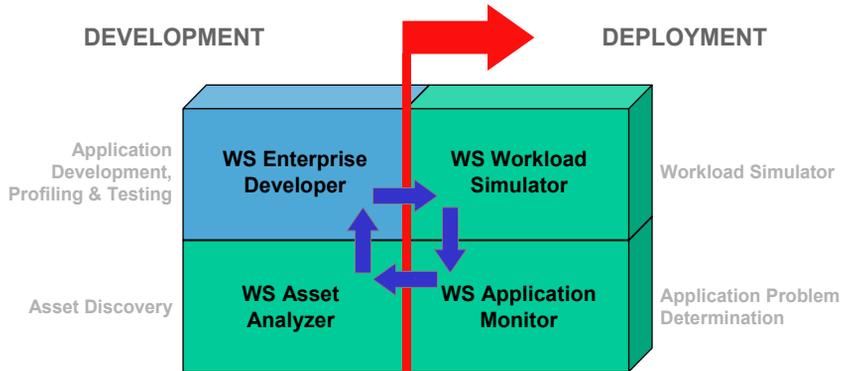
- Multi-user locally scoped changes
- Access to both configuration and runtime state
- Role based security (admin, monitor, configurator, operator)
- 100% compatible command scripting through BSF



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WebSphere V5 for z/OS - Tools For the AD Lifecycle



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More Monitoring WebSphere

- RMF I and III
- SMF Records
- Performance Monitoring (diagnosis of performance problems)
 - ➔ WebSphere Studio Application Monitor
 - Provides instrumentation data for WebSphere Applications
 - Does not require modification of the application
 - Gets information from runtime via SMF and JVMP
 - ➔ Wily Introscope
 - Provides instrumentation data for WebSphere Applications
 - "Power Pack" allows performance data to be gathered without modification of application
 - Applications can be instrumented for detailed data gathering
- Application Monitoring (monitor application and take action when out of norm)
 - ➔ Tivoli Application Monitor for WebSphere
 - Monitoring information similar to WSAM, plus additional information
 - Able to raise events that allow other Tivoli components to take appropriate action

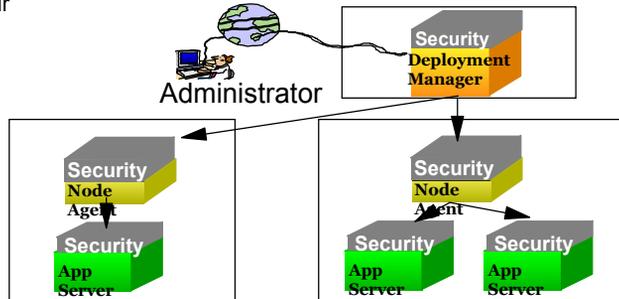


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WebSphere V5.0 – Topology & Failover

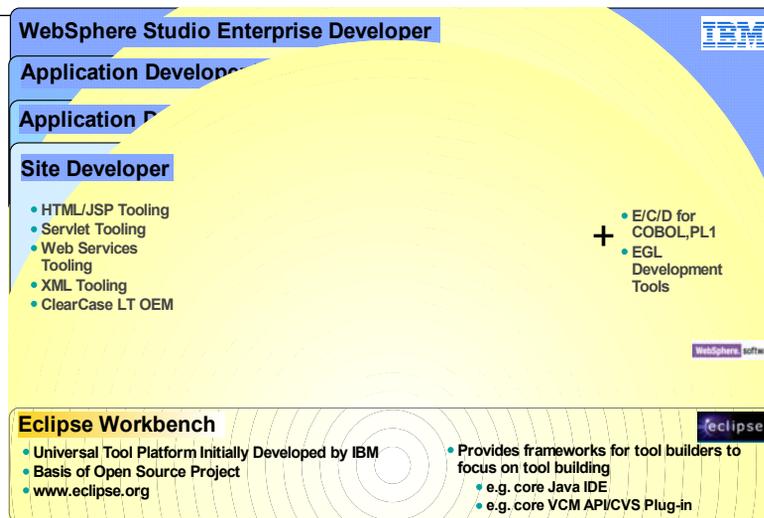
- Deployment Manager Failure
 - ▶ Unable to broadcast global config changes
 - ▶ No changes available to the central configuration
 - ▶ Node agents and servers can still start
- Node Agent Failure
 - ▶ Local configuration may not reflect global configuration
 - ▶ Application servers can run, but node agent must be up for restart
 - ▶ Alternative routing to WLM application server in case of recovery can not occur



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WebSphere Studio – A Comprehensive Platform



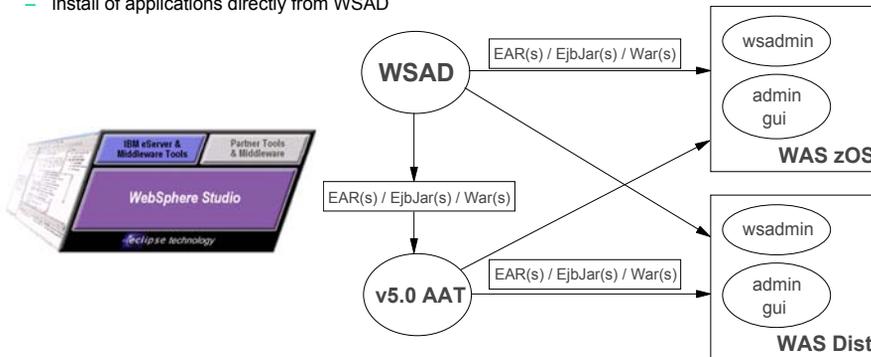
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WebSphere for z/OS V5.0 – Develop and Deploy

WebSphere for z/OS Specific Tools have been eliminated, a single WebSphere mechanism for creating J2EE Artifacts that are installed in the WebSphere Foundation Server

- The expectation is the applications will be unit and function tested on a development platform and system/QA testing would be done on z/OS
- Application code produced is the same for all WebSphere servers, but different resource managers will require different connector code
- install of applications directly from WSAD



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Future

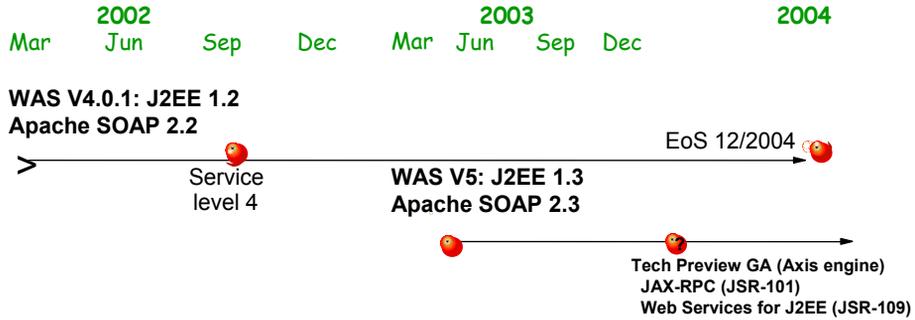
- WebSphere Application Server for z/OS, V5.0.2 will provide the following benefits to our customers:
 - Unleashes Interoperable and Secure Web Services
 - Establishes an open environment allowing customers to prepare for J2EE 1.4, which is based on JDK 1.4
 - Makes enhanced Web Services and XML performance possible
 - Offers enhanced monitoring capabilities
 - Third generation support across all Web services standards needed to transform and integrate business designs and business processes, while helping to ensure business continuity for better integration with key partners, suppliers and customers



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zWAS outlook



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Some Reference Material

- zWAS customers
- WAS 5 Enterprise
- JAVA levels for zWAS
- J2EE 1.3 API levels
- Techdocs site



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WAS for z/OS Reference Accounts

- **Royal Bank of Canada**
 - Internet Banking application to open a new account
 - Modest throughput, but very high profile
- **State of Washington**
 - Entirely new web-based court scheduling and document management system
 - Currently 100 Tx/day now, full production will average 12,000 - 15,000 Tx/day
- **Toyota**
 - Parts inventory system; increase access and usability, provide tighter integration with existing systems
 - Global prototype handling over 25,000 Tx/day (9 hour shift)
- **Zurich Insurance**
 - Customer search, claim organization, policy search, claim assignment, two maintenance apps
 - Managing 10,000-15,000 Tx/day
 - Advanced Claim Technology, mid-2003, will approach 1M Tx/day



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WAS Enterprise 5.0

- Focus is on extending the J2EE Programming Model
 - To enable implementation of sophisticated application functions
 - To provide performance advantages
- Functions provided in WAS Enterprise 5.0
 - WebSphere Workflow
 - Synchronous / Asynchronous runtime support
 - Dynamic Access Intent and Application Profiling
 - As opposed to static Access Intent
 - Extended Unit of Work
 - Activity Sessions,
 - Last Participant Support
 - Dynamic Query Capabilities
 - Extends static and standard EJB QL
 - Container Managed Messaging
 - Business Process Beans
 - Asynchronous Beans
 - Scheduler
 - Startup Beans



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Java Levels

WebSphere Application Server 3.5 for z/OS and OS/390	WebSphere Application Server 4.x for Distributed Platforms	WebSphere Application Server 4.0.1 for Z/OS and OS/390	WebSphere Application Server 5.0 for Distributed Platforms	WebSphere Application Server 5.0 for z/OS
SDK 1.3.1	SDK 1.2.2	SDK 1.3.1	SDK 1.3.1	SDK 1.3.1
Servlet 2.1, 2.2	Servlet 2.2	Servlet 2.2	Servlet 2.2, 2.3	Servlet 2.2, 2.3
JSP 0.91, 1.0, 1.1	JSP 1.1	JSP 1.1	JSP 1.2	JSP 1.1, 1.2
Not Supported	J2EE 1.2.1, partial 1.3	J2EE 1.2	J2EE 1.3	J2EE 1.2, 1.3
JDBC 1.2 (Type 1, 2 and 4 for DB2)	JDBC 2.04	JDBC 2.0 (Type 2 and Type 4 for DB2)	JDBC 2.0	JDBC 2.0
Not supported	EJB 1.1	EJB 1.1	EJB 1.1, 2.0	EJB 1.1, 2.0
Not supported	JNDI 1.2	JNDI 1.2	JNDI 1.2; also included in J2SE 1.3 standards	JNDI 1.2; also included in J2SE 1.3 standards
Not supported	JTA 1.0	JTA 1.0	JTA 1.0	JTA 1.0
Not supported	RMI/IIOP 1.0	RMI/IIOP 1.0	RMI/IIOP 1.0; also included in J2SE 1.3 standards	RMI/IIOP 1.0; also included in J2SE 1.3 standards
Not supported	JMS 1.0.1	JMS 1.0	JMS 1.0.2	JMS 1.0.2
Not supported	JavaMail 1.1	JavaMail 1.1	JavaMail 1.2	JavaMail 1.2
Not supported	JAF 1.0	JAF 1.0	JAF 1.0	JAF 1.0



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J2EE 1.3 Compliance and additional APIs

J2EE	1.3	Fully certified and part of Sun's JCEE list
EJB	2.0	EJB 2.0 and EJB 1.1 support
JDK	1.3	JDK 1.3.1
Servlet	2.3	Servlet 2.3
JSP	1.2	JSP 1.2
JTS/JTA	1.0	w/distributed transactions
JMS	1.0.2	With Native Provider, and MQ plug-in
JDBC	2.0	2PC across heterogeneous databases
JNDI	1.2	JNDI 1.2 for EJB lookup and CosNaming
RMI/IIOP	1.0	Fully supported
JavaMail/JAF	1.2	Plus Domino support
SSL Security	2.0	JSSE and JCE
XML JAXP	1.0	XML in EJBs
IIOP	1.2	J-IDL/CORBA
JCA	1.0	Bean and container managed
HTTP	1.1	Yes, plus across multiple Web servers
SOAP	2.2.2	Soap support for WebServices.
SOAP-SEC	1.0	Tech preview
XML4J	4.0	XML support
XSL	2.3	XSL parser



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Techdocs

- with a URL such as the following: <http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100339>
 - FLASH10243 Classify the Application Control Region in WLM OMVS rules after Service level W500104 (JH)
 - FLASH10245 Cautions when creating an ND configuration with WebSphere for z/OS Ver. 5 SL W500104 (JH)
 - WP100339 Introduction to WebSphere for z/OS Version 5 (DB - available)
 - WP100367 WSC Sample WebSphere ND configuration on z/OS (DB - coming soon)
 - PRS752 Performance Summary Report for SMF 120 records from WAS V.5 for z/OS (JH)
 - PRS708 WebSphere for z/OS Version 5 - "Gen 5" Wildfire Workshop Presentations (DB)
 - TD101242 How-to set up the Tivoli Performance Viewer with WebSphere V.5.0.1 for z/OS (JH)
 - TD101087 Directing SYSPRINT Output to an HFS File in WebSphere for z/OS (ML)
 - TD101072 Using DB2 for z/OS in WebSphere for z/OS Version 5 (MC)
 - TD101073 Using the WebSphere for z/OS V5 Customization Dialogues (JH)
 - TD101074 Enabling JCE & JSSE Security in WebSphere for z/OS Ver. 5 (MC)
 - TD101075 WebSphere Version 5 for z/OS: 10 Steps for an Easy Installation (JH)
 - TD101115 RACF Tools for WebSphere for z/OS Ver.5 (JH)
 - TD101118 RACF Tips for customizing WebSphere for z/OS Ver.5 (JH)
 - TD101116 How to manage operator message routing in WebSphere for z/OS V5 (JH)
 - TD101121 How to Update the CFRM Policy to include the WAS error logstream (JH, RA, MC)
 - TD101124 How to use WLM Dynamic Application Environments with WebSphere for z/OS V5 (JH)
 - TD101128 RACF Backout Tool for WebSphere for z/OS Version 5 (JH)
 - TD101150 Enabling Global Security in WebSphere V5 for z/OS (MK)
 - TD101151 How to Classify Transactions in WebSphere for z/OS V5 (JH)
 - TD101152 How to Manage the Number of Servant Regions with WebSphere for z/OS V5 and Workload Manager (JH)
 - TD101198 Application Problem Isolation using the WSAD Distributed Debugger with WAS 5.0 for z/OS (LW)
 - TD101199 Enabling the WSAD Application Profiler in a WAS 5.0 for z/OS Environment (LW)
 - TD101216 Tracing and Analyzing Java Garbage Collection in WebSphere for z/OS V5 (JH)
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- FQ102864 How big should my /tmp directory for WebSphere V5 for z/OS? (JH)
 - FQ102865 How do I turn on SMF 120 recording for WebSphere V5 for z/OS? (JH)
 - FQ102895 SRVE0079E: Servlet host not found with WebSphere Version 5 (JH)



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