

Session: 510043 - WebSphere Application Server – things you didn't know it could do
Agenda Key: 27FG

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IBM Power Systems
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Deliver services faster, with higher quality
and superior economics

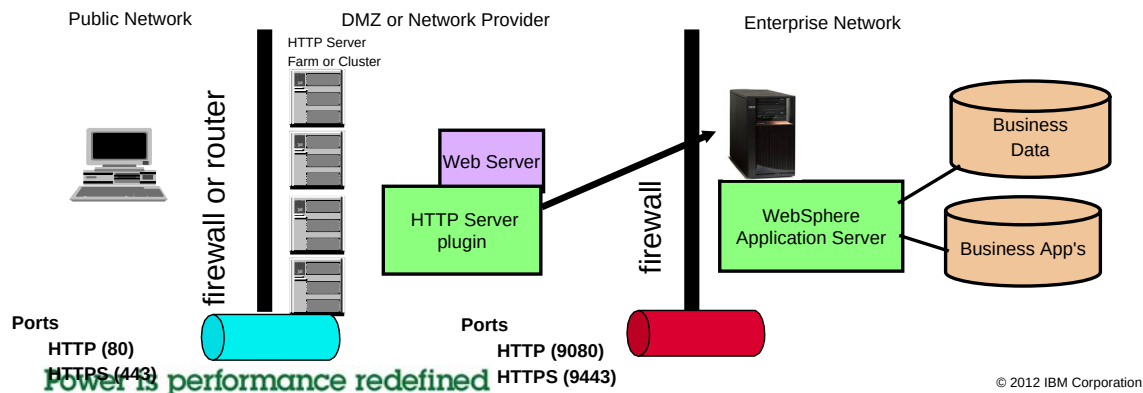
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Agenda

- **WebSphere product capabilities**
- **tools**
- **Q&A**

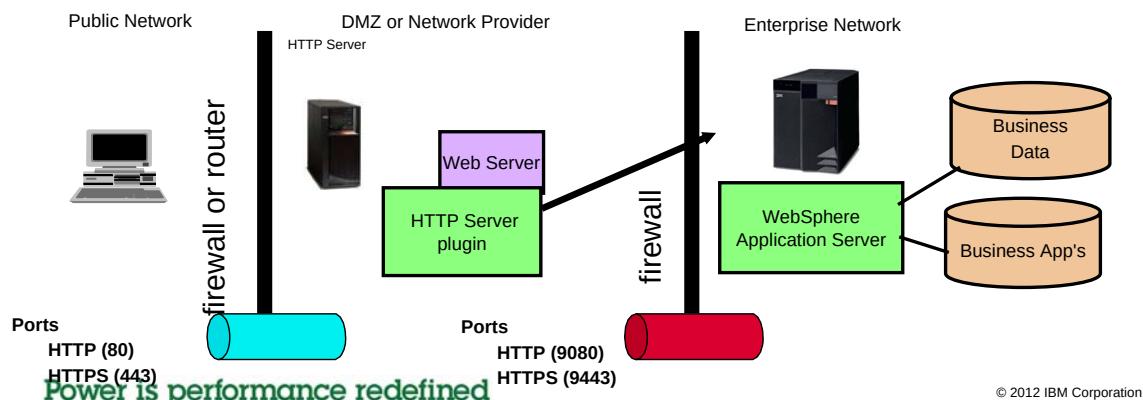
IBM Power Systems **WebSphere administration - separate the HTTP server tier I**

- Running WebSphere on the HTTP server may not be possible or practical
 - ✓ HTTP server(s) may be outside the firewall or at an ISP
 - ✓ 'multiple commodity HTTP servers' paradigm makes the cost prohibitive
- WebSphere HTTP server plug-in enables physical separation between web & application servers
 - ✓ No licensing fee for running the plugin
 - ✓ Works with WebSphere Express, Base & ND



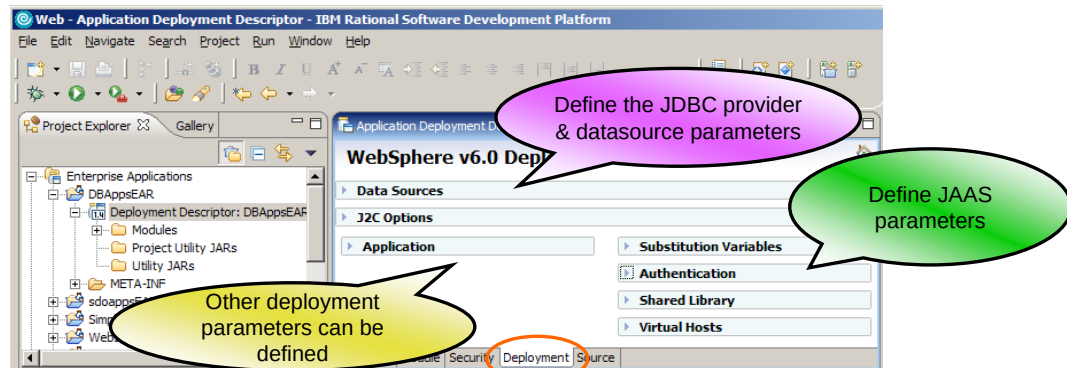
IBM Power Systems **WebSphere administration - separate the HTTP server tier II**

- Step 1 - Install the appropriate software
 - ✓ WebSphere system
 - 5733-W61 and/or 5733-W70 and/or 5733-W80
 - Options *BASE, 1 (express), 2 (base), 3 (ND)
 - ✓ HTTP Server system
 - 5761-DG1 & 5761-JV1 or 5770-DG1 & 5770-JV1
 - 5733-W61 or 5733-W70 or 5733-W80 options *BASE and 7 (plugins)
- Step 2 – Configure the servers
 - ✓ Create WebSphere HTTP server profile on HTTP server system
 - ✓ Use Web administration for IBM i to associate profile and HTTP server instance
 - ✓ WebSphere ND: run the generated shell script on the deployment manager



WebSphere Application Server – Extended Deployment Descriptor I

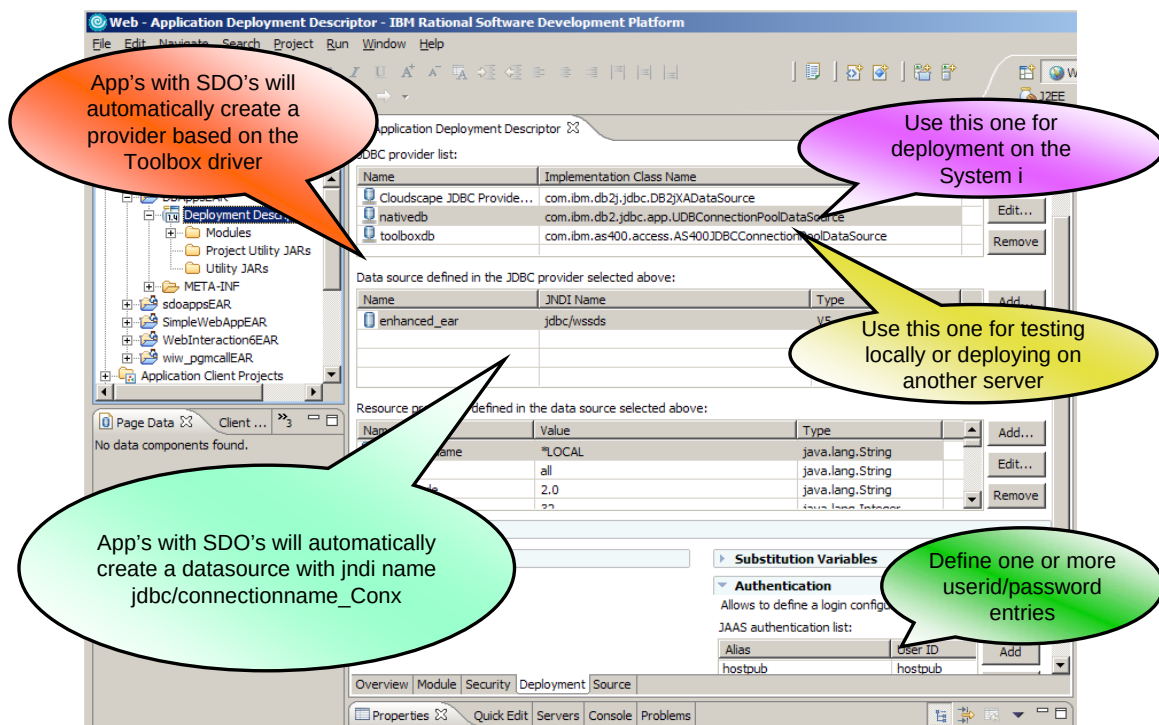
- Applications built with RAD/WDSc 6 and later can contain server deployment parameters in the exported **EAR** file
 - JDBC provider(s)
 - Datasource(s) {including JNDI names}
 - J2C authentication definitions
- Benefits: Simplifies application installation, configuration & maintenance tasks
- Caveat: This will override a server configured datasource using the same JNDI name



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WebSphere Application Server – Extended Deployment Descriptor II



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WebSphere Application Server – Extended Deployment Descriptor III

Use the application properties options to view or edit the settings

Edit the connection pool and other settings as appropriate

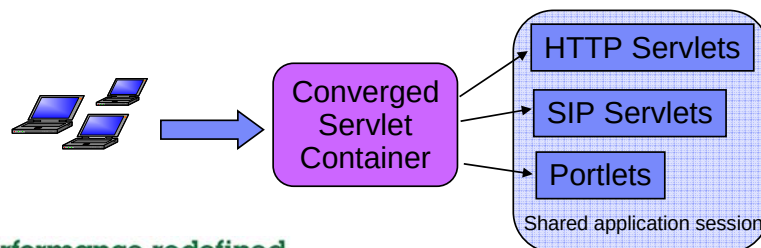
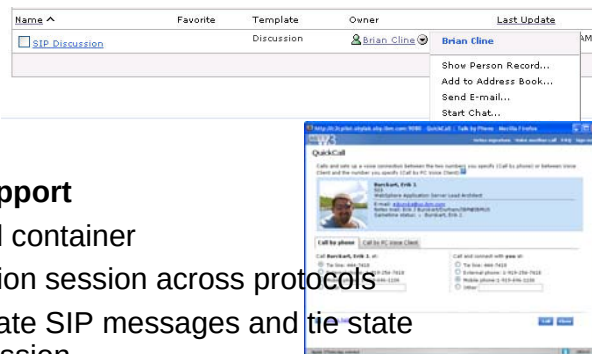
Authentication entries are defined at the server level

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Session Initiation Protocol (SIP) Servlets

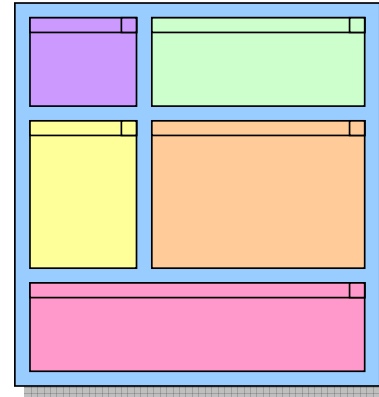
- The next generation of applications are being built on SIP
 - Chat/Instant messaging
 - VoIP is built using SIP
 - Video conferencing, video over IP
 - Collaborative applications
 - Entertainment/Gaming
- JSR 116 SIP Servlets provide SIP support
 - Provided by the first truly converged container
 - Servlets can share a single application session across protocols
 - HTTP Servlets and Portlets can create SIP messages and tie state together with a single application session
- Available in WebSphere 6.1 and later releases



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- A portlet is a unit of server-side Java code
 - Similar to a servlet and packaged in WAR files
 - Implements the Portlet specification
 - Java Specification Request (JSR) 168 defines the APIs
- What do portlets do?
 - A servlet usually returns a full-page response (an entire Web page)
 - A portlet returns a Web page *fragment* – not the entire page
 - Multiple portlets can be *aggregated* or “embedded” in a Web page
 - Portlets are components used to build *portals*
 - Web sites with very sophisticated layout and function
 - A portlet is responsible for the application function and display of one area of a Web page



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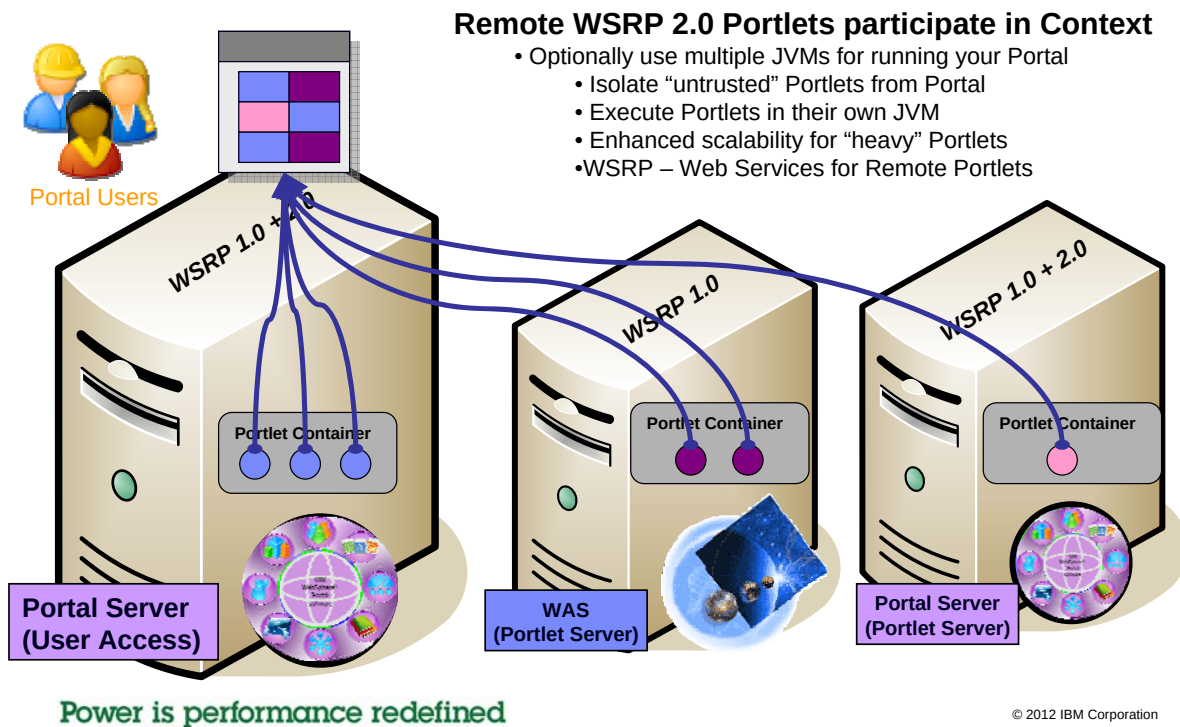
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Portlets in WebSphere Application Server

- Supported in WebSphere 6.1 and later releases, including Express
- Must adhere to the JSR 168 specification
- Some advanced WebSphere Portal Server functions are not supported:
 - Point-and-click layout control, personalization, or collaboration
- Portlets in WebSphere Application Server can be invoked by URL
 - Portlets can be directly called from the browser, a servlet, or a JSP file
 - A JSP file can be used to aggregate portlets into a single Web page
- Installed like a regular Web module (WAR or EAR file) and deployed into the converged Web container
 - The Web container has services to provide the portlet runtime environment
 - Portlets can leverage WebSphere services, such as security, data access, and dynamic caching

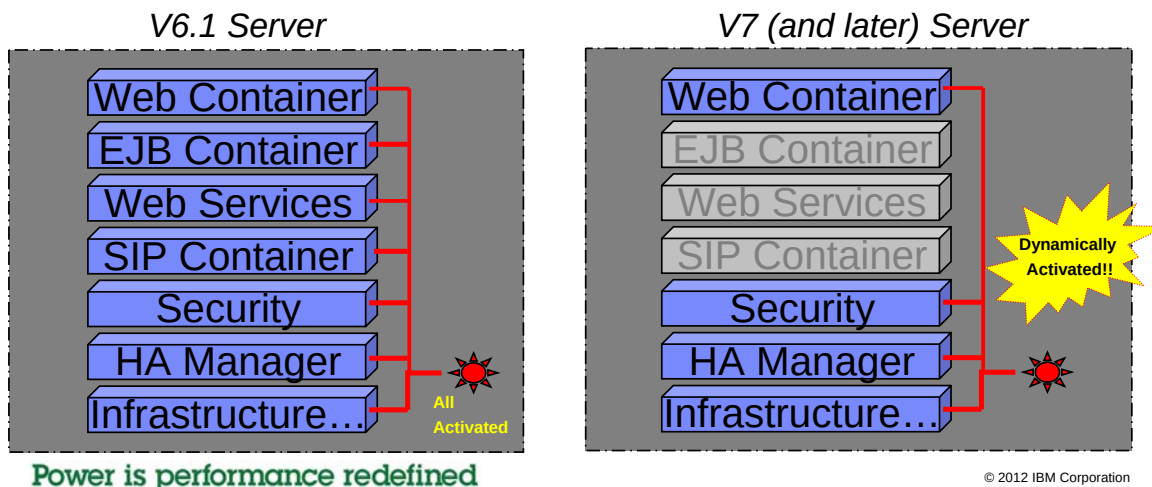
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WebSphere runtime provisioning

- Runtime provisioning enables intelligent analysis of application set and server configuration to determine the set of components to activate
- Dynamically starts application server components based on application needs
- Reduces memory footprint and server startup time
- Simple configuration – either on or off (default is off)



- Only a subset of components are started in a running server
- Reduces the amount of time it takes to start an application server
- Reduces the application server memory footprint
- Easy to activate using the administration console
- Estimated 10 to 15% improvement in startup time depending on the application set

Application servers > server1

Use this page to configure an application server. An application server is a server that provides services required to run enterprise applications.

Runtime | Configuration

General Properties

Name: server1

Node name: N612Node01

☐ Run in development mode

☒ Parallel start

☒ Start components as needed

Access to internal server classes: Allow

Container Settings

- [Session management](#)
- ☐ SIP Container Settings
- ☐ Web Container Settings
- ☐ Portlet Container Settings
- ☐ EJB Container Settings
- ☐ Container Services
- ☐ Business Process Services

Server-specific Application Settings

Classloader policy

Applications

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Selective application startup

- Applications will be started on application server start up by default
- Applications can easily be set to not start automatically
 - Avoid having to uninstall and reinstall inactive or updated applications
 - Can reduce startup time and memory footprint
- Available in WebSphere 6.1 and later releases

Integrated Solutions Console | Welcome team77admin | Help | Logout

Enterprise Applications

Enterprise Applications > DefaultApplication > Target specific application status

Use this page to view a mapping of a deployed object, such as an application or module, into a target server or cluster environment. This page displays the status of the enterprise application or module on each server or cluster.

Preferences

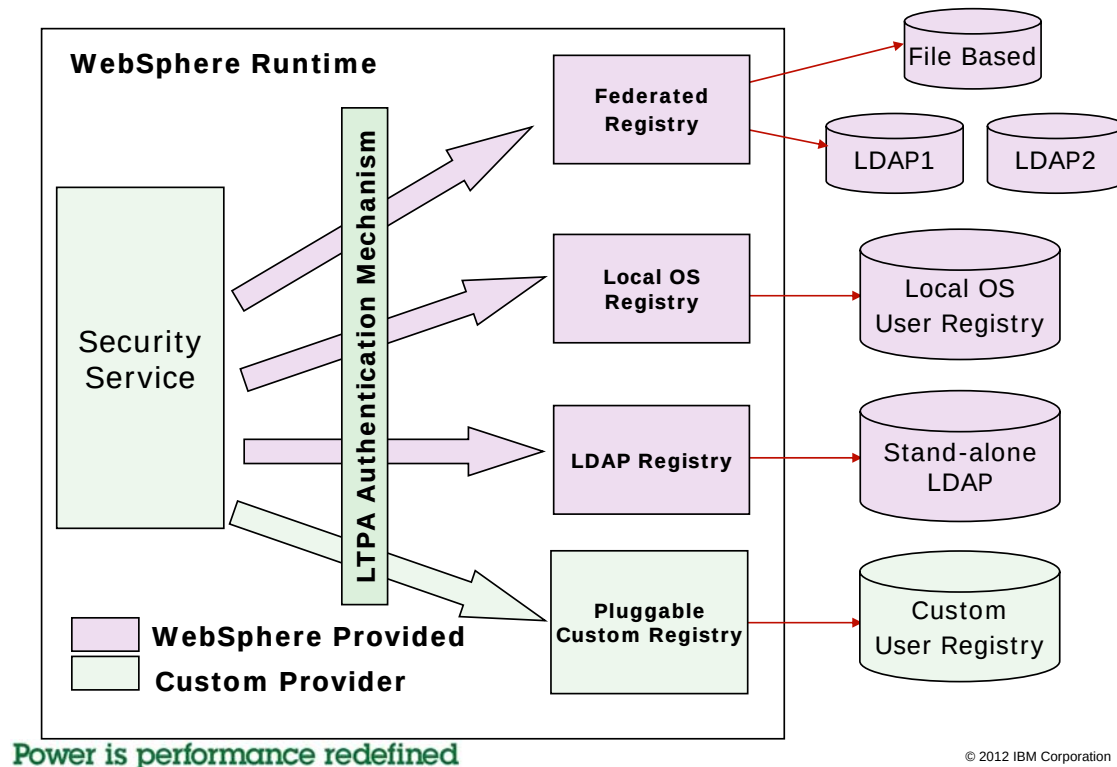
☐ Enable Auto Start ☒ Disable Auto Start

Select	Target	Node	Version	Auto Start	Application Status
☐	IHS_WAS61GW	ITCEBIZ1_was61gw	Base 6.1.0.39	Yes	⊘
☒	was61gw	ITCEBIZ1_was61gw	Base 6.1.0.39	Yes	⊕

Total 2

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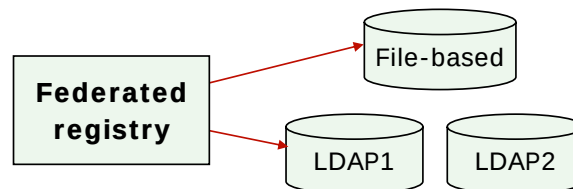
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Federated repositories

- The installation wizard and profile management tool have a default of enabling administrative security.

- The default repository type is a file-based federated repository.



- Federated repositories enables the use of multiple repositories with WebSphere Application Server.

- Can be:

- File-based
- Single LDAP
- Custom registry
- Database
- Multiple LDAPs
- Sub-tree of an LDAP.

- Defined and theoretically combined under a single realm.

- All of the user repositories that are configured under the federated repository functionality are accessible to WebSphere Application Server.

- Federation capabilities provided by the VMM (Virtual Member Manager)

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- **Prior to WAS 7, single security domain per cell**
 - One security realm, i.e., one set of users
 - Forced the proliferation of profiles and cells
- **Multiple security domains in WAS 7 and later**
 - Provide flexible security configuration under centralized management
 - Enables separation of administration and application security
 - One administrative security domain (i.e. virtual member manager, LDAP)
 - One or more application security domains (i.e. LDAP, single sign on with SPNEGO, etc.)
 - Scopes include cluster, node group, node, and application server
 - Configuration data stored in domains overrides the data from the global security configuration
 - Administrative applications continue to use the data from global security
- **Multiple security domains enable different applications**
 - To have different user populations
 - To have different security mechanism configurations

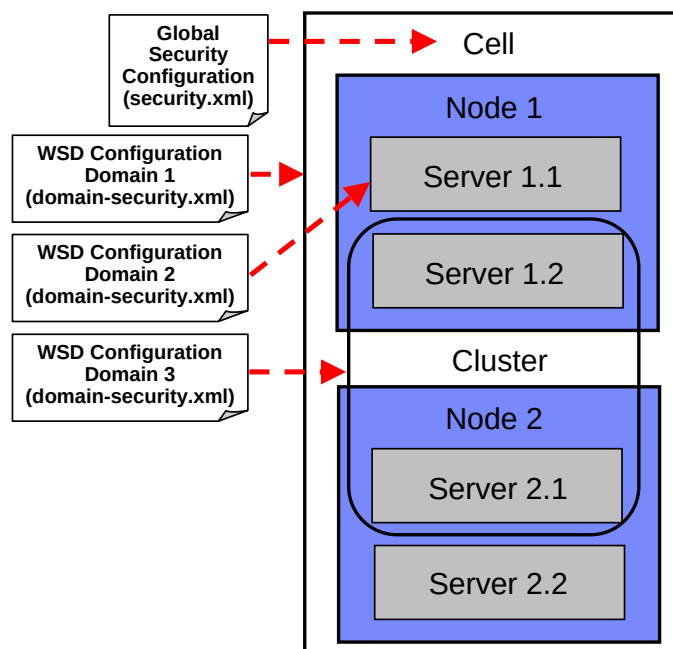
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WebSphere security domains - II



- **Global security**
 - User registry
 - Trust Association Interceptor (TAI)
 - SPNEGO
 - Authorization
 - Login configurations
 - Application security enablement
 - Java™ 2 security
 - RMI/IIOP (CSiv2 protocol)
 - Custom Properties
 - Authentication mechanisms
 - SSL
 - Web attributes (SSO)
 - Audit
- **Server security**
 - User registry
 - Trust Association Interceptor (TAI)
 - SPNEGO
 - Authorization
 - Login configurations
 - Application security enablement
 - Java 2 security
 - RMI/IIOP (CSiv2 protocol)
 - Custom Properties
 - LTPA Timeout (Lightweight Third party Authentication)



*WSD – WebSphere Security Data

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The screenshot shows the 'Security domains' configuration page for a domain named 'apps_kerb'. The page is divided into several sections:

- Name:** apps_kerb
- Description:** Domain used for Kerberos/spnego application authentication
- Assigned scopes:** A tree view showing the hierarchy of resources. Under 'Servers', the 'team07' (apps_kerb) is selected.
- Security Attributes:**
 - Application Security:** Customized - Enabled. Options: 'Use global security settings' (disabled), 'Customize for this domain' (selected), 'Enable application security' (checked).
 - Java 7 Security:** Disabled
 - User Realm:** Customized - smartblmonchland.ibm.com:389. Options: 'Use global security settings' (disabled), 'Customize for this domain' (selected). The 'Realm type' is 'Standalone LDAP registry'.
 - Trust Association:** Disabled
 - SPNEGO Web Authentication:** Customized - Enabled. Options: 'Use global security settings' (disabled), 'Customize for this domain' (selected). The 'SPNEGO Web authentication' link is highlighted.
 - RMI/IIOP Security:** Global security settings
 - JAAS Application Logins:** 6 login configurations
 - JAAS System Logins:** 45 login configurations
 - JAAS J2C Authentication Data:** 0 entries
 - Authentication Mechanism Attributes:** Customized - 120 minute LTPA timeout
 - Authorization Provider:** Built-in authorization

Create a security policy for applications on this server

Use this particular LDAP registry for authentication credentials

Enable single sign on just for application authentication

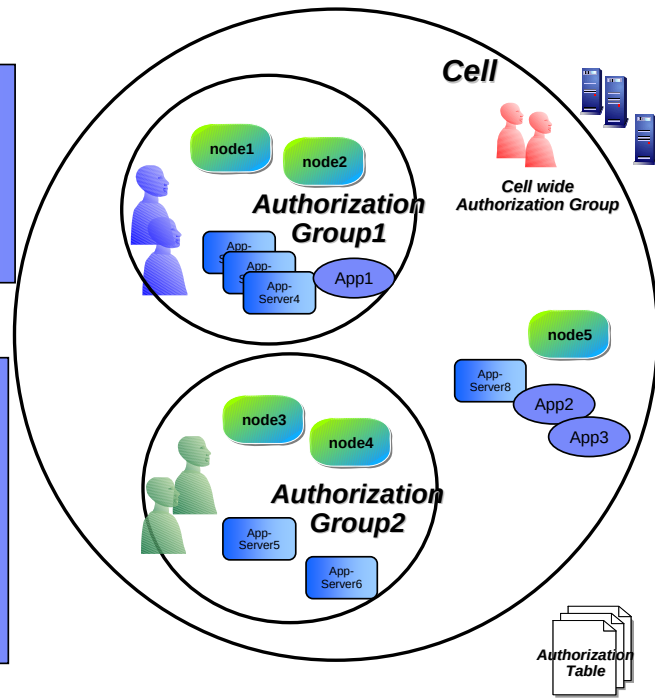
- **WebSphere Application Server V7 provides fine-grained administrative capability**
- **Users can now be defined with administrative roles on a specific set of resources**
 - Cells, Node Groups, Nodes, Clusters, Servers and Applications
- **Supported through the administrative console and a wsadmin scripting interface**
 - No support for SIB (Service Integration Bus) resources

Administrative authorization group

- Resources that require the same privileges are placed in the authorization group
- Users with specific administrative roles can be added to an authorization group

Cell wide authorization group

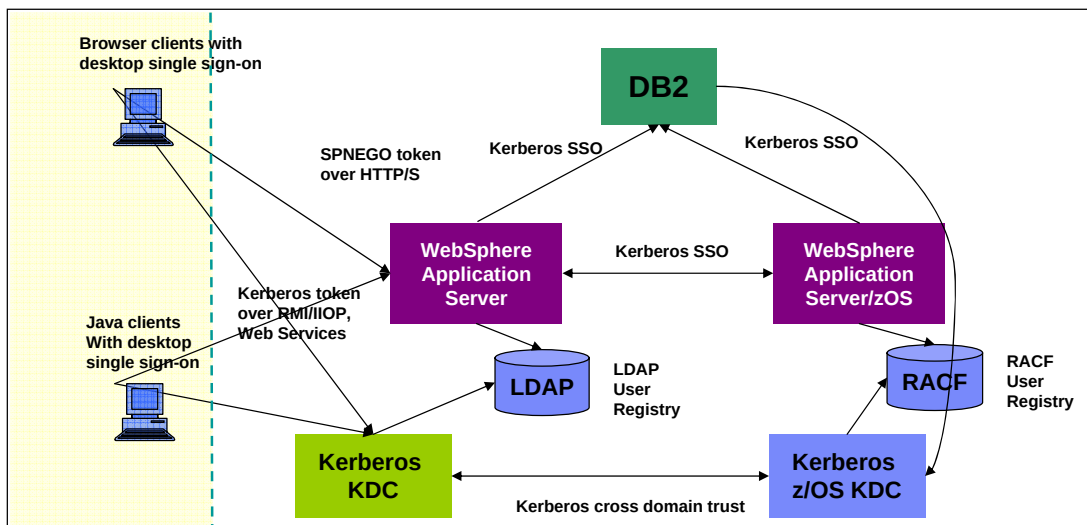
- By default there is a cell wide authorization group
- Resources that are not assigned to any other authorization group belong to this group
- Users assigned to administrator roles in the cell wide authorization group have access to all the resources within the cell



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Broader implementation of Kerberos delivers improved interoperability with other applications and environments



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- **WebSphere Application Server supports Kerberos and LTPA authentication mechanisms**
 - Server to server communication using Kerberos credential
- **Resource adapter to support Kerberos**
 - Use a client Kerberos credential to authenticate to back end resource
- **Java client support for BasicAuth and Kerberos authentication**
 - Java and admin client can use either BasicAuth or Kerberos
 - SSO for Java client using Kerberos credential cache
- **Does not support configuring Kerberos authentication at the WebSphere multiple domain level**
- **All WebSphere Application Servers have to use the same Kerberos realm**
- **Kerberos support enables SPNEGO web authentication**
 - SPNEGO provides a single sign on solution for browser based applications
 - Sign on to Active Directory domain controller
 - Domain controller grants HTTP service ticket
 - HTTP service ticket used as authentication credentials
 - Simplifies the configuration steps on the WebSphere Application Server
 - Allows fall back from SPNEGO to application login method
 - Provides dynamic reload for SPNEGO without stop and restart server
- **SPNEGO trust association interceptor is deprecated in V7 and later**

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- **The IBM Support Assistant workbench (ISA) is a free, stand-alone application that is installed on any workstation. It can also be enhanced by installing plug-in modules for the IBM products you use.**
- **Benefits of ISA include:**
 - Saves time searching product, support, and educational resources.
 - Assists in opening a problem management report (PMR)
 - Allows for easy location and installation of useful product support tools using a support tool framework.
 - Easily downloaded from
<http://www.ibm.com/software/support/isa/>

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- **Select Analyze Problem → Tools**
 - Provides support tools to identify and troubleshoot problems
 - Some tools are 'Tech Preview'
- **WebSphere and JVM based tools**
 - Database connection Pool Analyzer (tp) - Analyze JDBC data sources
 - Thread and Monitor Dump Analyzer (tp) - Analyze Javacore files
 - Log Analyzer – Analyze service log files
 - **Garbage Collector and Memory Visualizer** - Analyze verbose GC logs
 - Health Center – Analyze live JVM for performance improvements
 - Dump Analyzer – Analyze system dumps
 - Memory Analyzer (tp) – a lightweight heap dump analyzer
 - **Memory Dump Diagnostic for Java** — a full function heap dump analyzer
 - IBM Pattern Modeling and Analysis Tool for Java Garbage Collector (tp) - Analyze verbose GC logs
- **Others**



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IBM Monitoring and Diagnostic Tools for Java Garbage Collection and Memory Visualizer I

- **Analyzes verbose garbage collection statistics**
 - View data in raw, tabular or graphical format
 - Works with optthruput, optavgpause and gencon GC policies
 - Statistics are in `<user_directory>/logs/appserver/native_stderr.log`
- **Useful for analyzing garbage collection, object growth, other JVM health**

Tuning recommendation

Summary

Compact times

Pause times (not including exclusive access)

Sweep times

Mark times

Tuning recommendation

❗ The garbage collector is performing system (forced) GCs. 4 out of 16 (25%) of collections were triggered by System.gc() calls. The use of System.gc() is generally not recommended since they can cause long pauses and do not allow the garbage collection algorithms to optimise themselves. Consider inspecting your code for occurrences of System.gc().

⚠ At one point 925 objects were queued for finalization. Using finalizers is not recommended as it can slow garbage collection and cause wasted space in the heap. Consider reviewing your application for occurrences of the finalize() method. You can use the ISA Tool Add-on, IBM Monitoring and Diagnostic Tools for Java - Memory Analyzer to list objects that are only retained through finalizers.

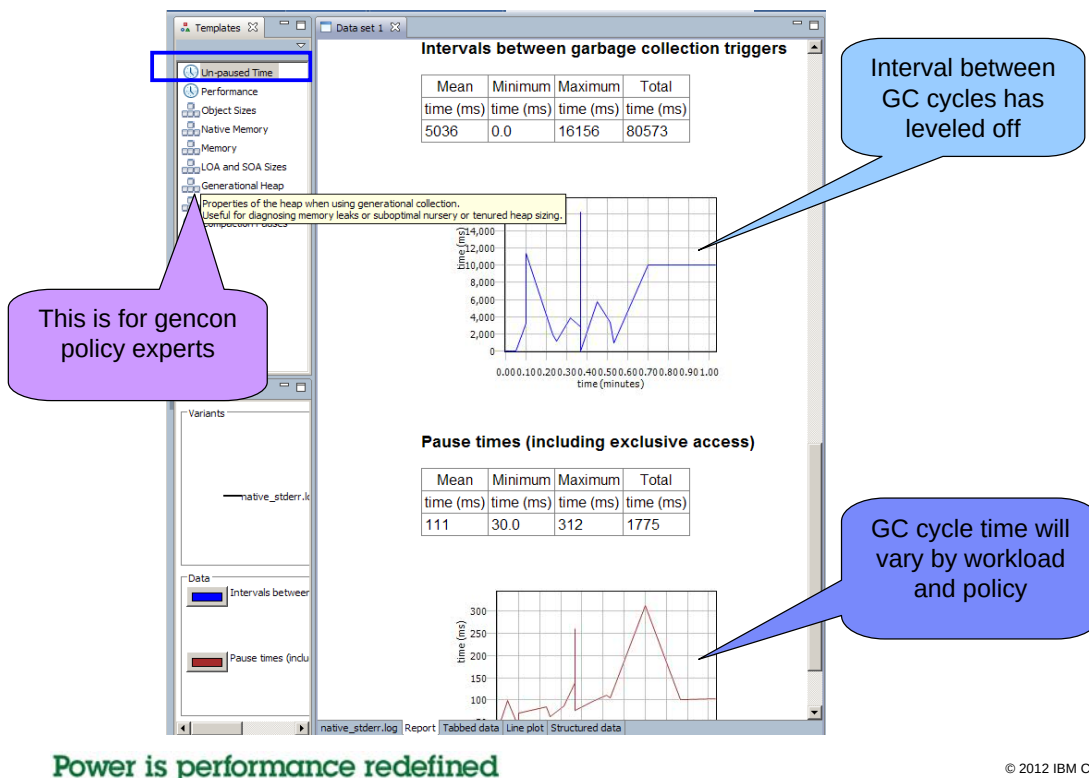
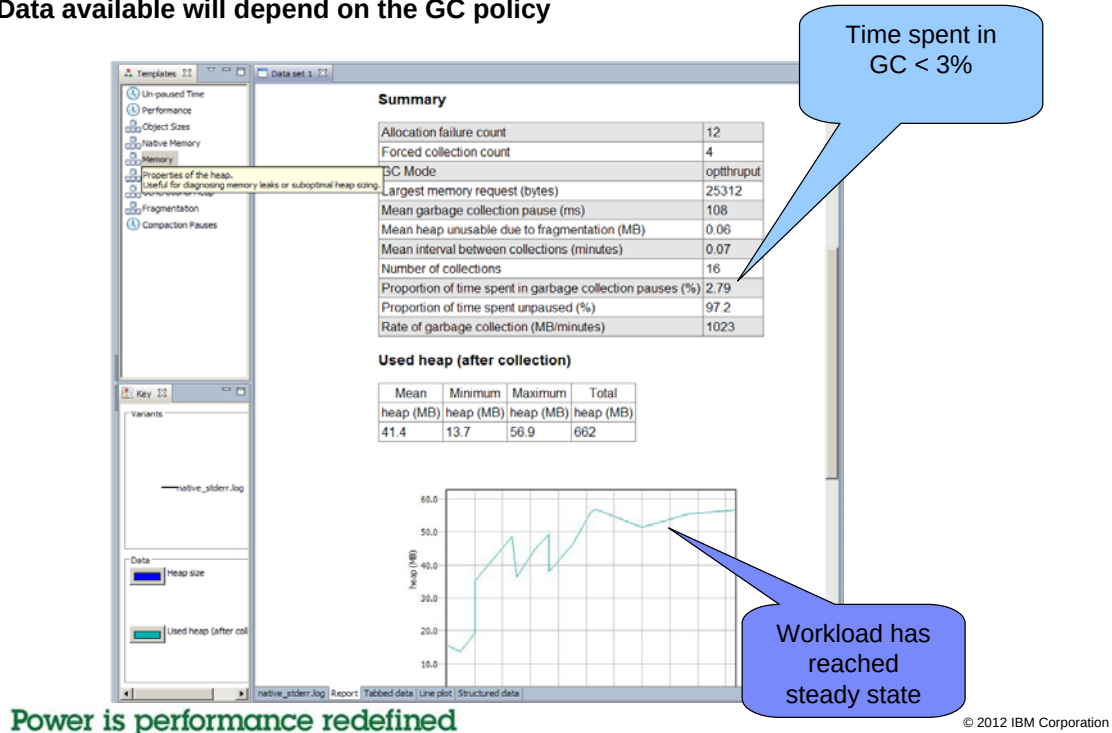
⚠ Heap usage seems to be growing over time. It increased by 12% in the last third of the log compared to the middle of the log. However, the number of collections decreased by 47%. This indicates that the rate at which your application is producing garbage seems to be slowing down. This may mean that your application will reach a steady-state at which the heap usage will no longer be increasing.

⚠ The mean occupancy is 32%. This is a bit low, so you have room to save space by lowering your heap size if needed. Lowering the heap size will probably degrade overall application performance slightly but improve pause times.

Summary

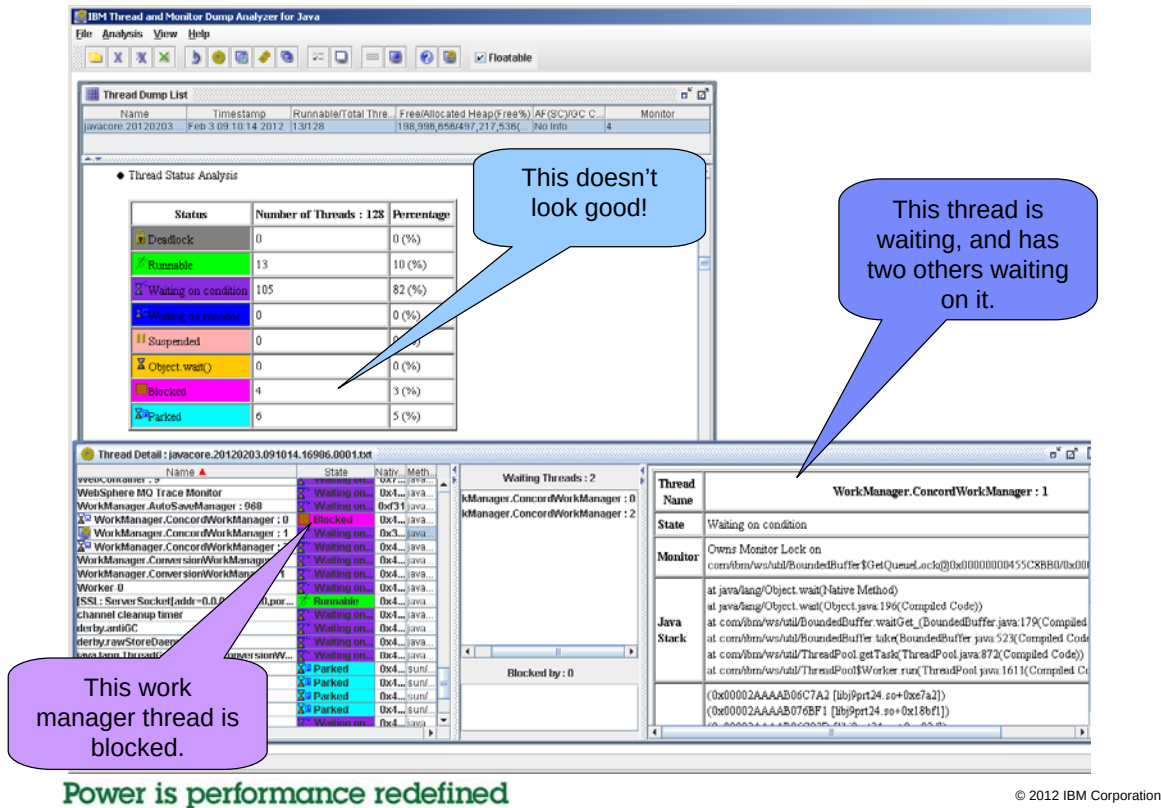
Allocation failure count	12
Forced collection count	4
GC Mode	optthruput
Largest memory request (bytes)	25312
Mean garbage collection pause (ms)	108
Mean heap unusable due to fragmentation (MB)	0.06
Mean interval between collections (minutes)	0.07
Number of collections	16
Proportion of time spent in garbage collection pauses (%)	2.79
Proportion of time spent unpaused (%)	97.2
Rate of garbage collection (MB/minutes)	1023

- Different templates can be applied to change the views
- Data available will depend on the GC policy



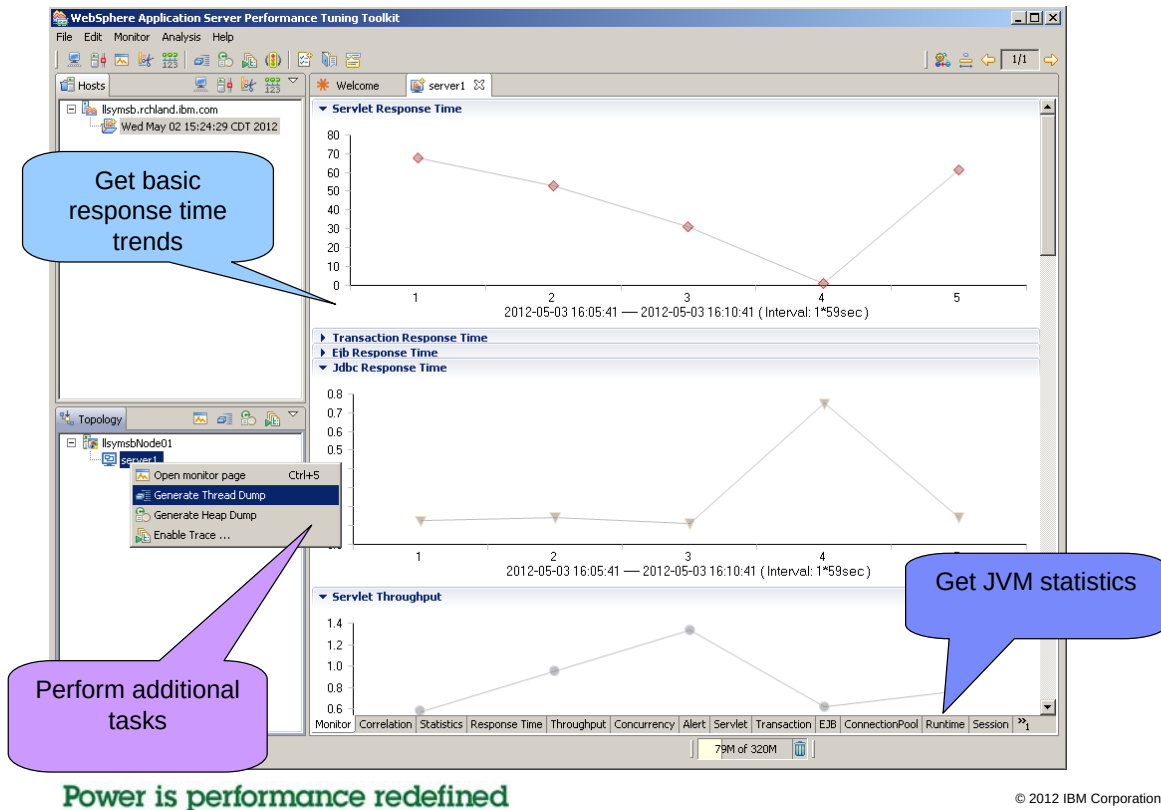
IBM Thread and Monitor Dump Analyzer for Java

IBM Power Systems



WebSphere Performance Tuning Toolkit

IBM Power Systems



```
updwashost -profileName profile [-newhost new_host]
          [-changenode -oldhost old_host] [-regenplugin] [-verbose] [-help]
```

-profileName This is a required parameter. The value profile specifies the name of the profile that you want to update. To update the host name for all profiles, specify ALL.

-newhost This is an optional parameter. The value new_host specifies the new host name to use for the profile. The default value is the current host name of the server.

-changenode This is an optional parameter. If you specify this parameter, the script changes the node name in the profile. If you specify this parameter, the -oldhost parameter is required.

If the node of the profile node is federated into a deployment manager, it is recommended that you not include this parameter, as it might break references to the node name.

-oldhost This parameter is required if the -changenode parameter is specified, and not valid otherwise. The value specifies the old host name to use when changing the node name for the profile. The value specified will be replaced in the node name with the value specified in the -newhost parameter.

-regenplugin This optional parameter calls the GenPluginCfg command after updating the host for the profile to regenerate the HTTP server plug-in configuration.

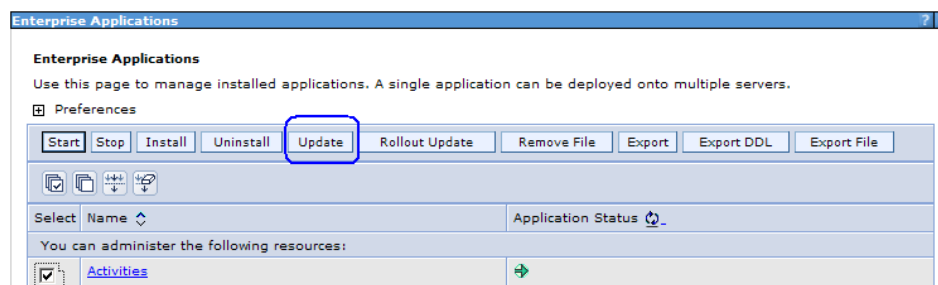
-verbose This optional parameter turns on verbose messages, which can be helpful if you need to debug the script.

-help This optional parameter displays the help message. If you specify this parameter, the script ignores all other parameters.

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- **WebSphere V6.0 and later releases minimize application downtime due to updates**
- **Updates can be made with wsadmin or administration console**
 - Replace an entire application (EAR file)
 - Replace, add, or remove a single module (WAR, EJB JAR, client JAR, or connector RAR file)
 - Replace, add, or remove a single file (servlet, JSP, HTML, image, and so forth)
 - Replace, add and remove multiple files by uploading a compressed file describing the actions to take



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- **When updating an application, the server stops only the affected application or component. In certain cases, the update can be made without stopping any components.**
- **You must manually regenerate the Web server plug-in or wait until the application server automatically refreshes it.**
- **A user's browser may have cached older versions of updated files so the changes cannot be seen.**
- **Be careful: You can overwrite updates if the development source is not in sync with changes to the deployed code.**

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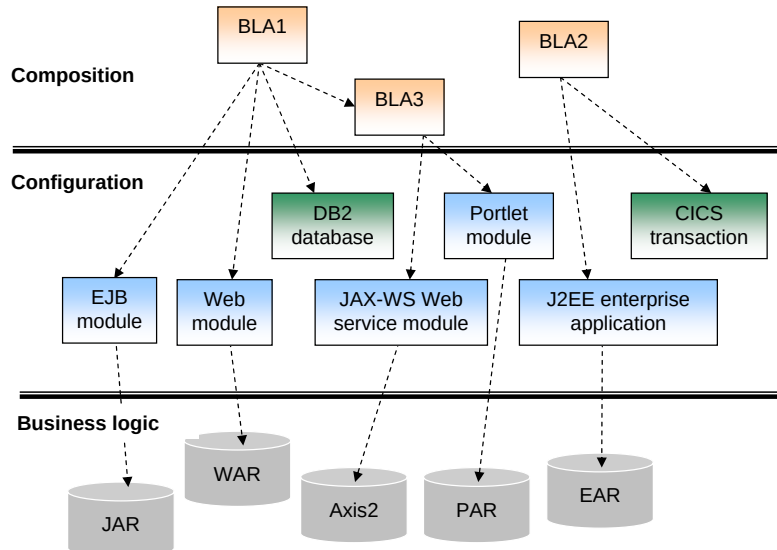
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- **Available in WebSphere 7 and later**
- **Extends the scope of an “application” beyond an EAR file**
 - Offers a logical view from the perspective of lines of business
 - May include multiple EARs, JARs, shared libraries, static content and other resources
- **Offers management for application life cycle**
 - Includes application upgrades and version control
 - Starting and stopping application components together
- **A business level application does not introduce a new programming model, runtime or packaging model**
 - **Programming model:** No new APIs are introduced
 - **Runtime model:** Business components use their existing runtime characteristics (security, class loading, isolation, and so on)
 - **Packaging model:** There is no specific unique packaging model for a business-level application

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- **Expands the notion of “Application” beyond Java EE**
- **New formats for deployable packages**
 - For example: SCA, shared lib, proxy filters, static content, SIP archives, BPEL
- **Extensible deployment logic framework**
 - Registered content handlers for each type of deployable format
- **Supports more than Application Server deployment target runtimes**
 - For example: proxy server, Web server, CE
- **Full life cycle management of applications**
 - Install, distribute, activate, monitor, update, remove

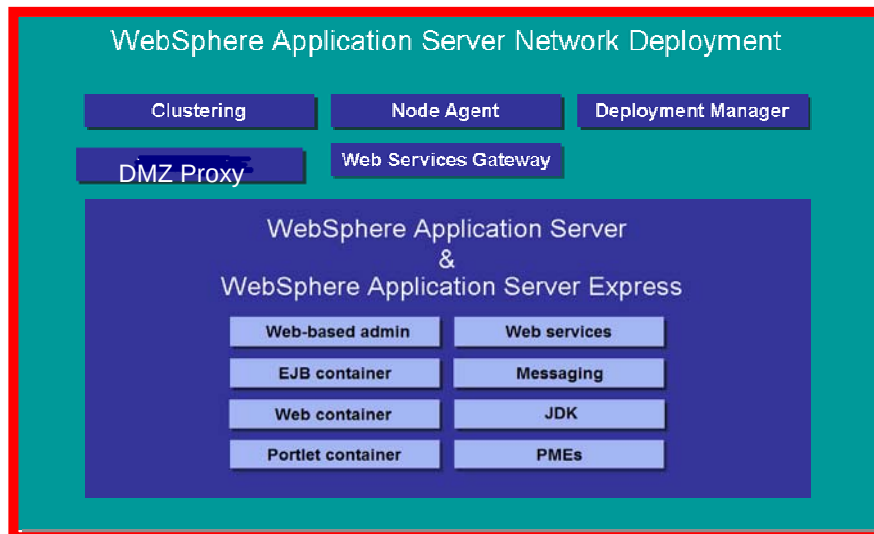


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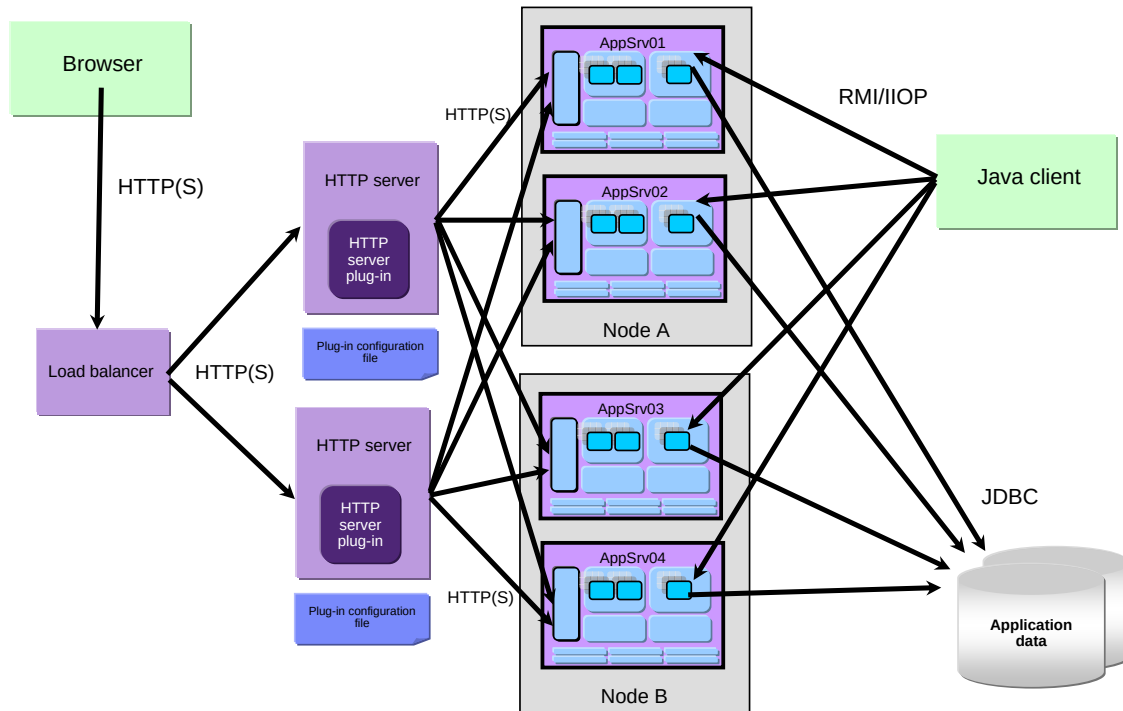
IBM Power Systems WebSphere Application Server Network Deployment product overview

- WebSphere Network Deployment on IBM i licensed via Passport Advantage 5733-W80, 5733-W70 or 5733-W61, option 3
- Provides the foundation for a highly scalable and reliable application server environment



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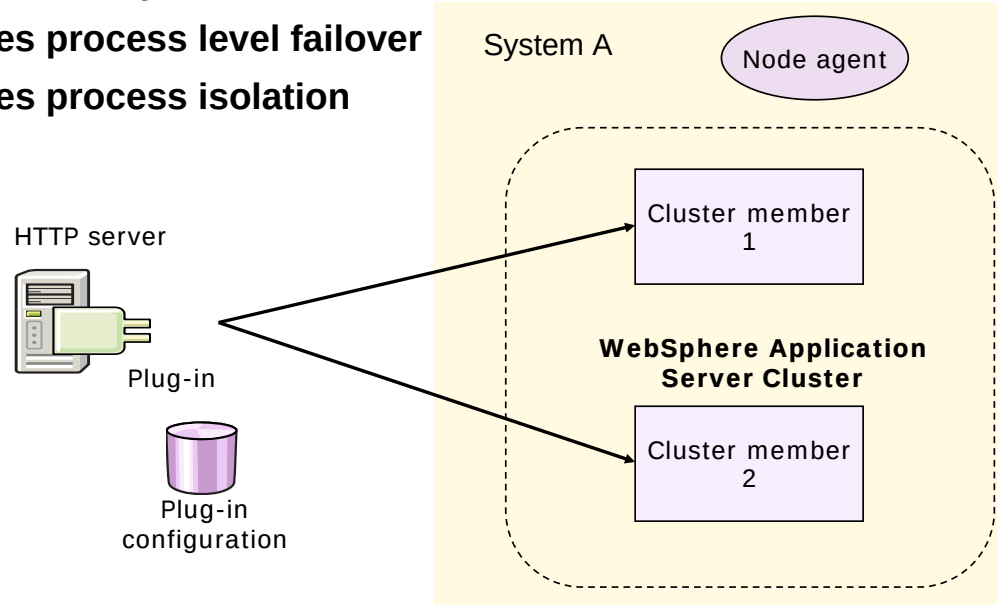
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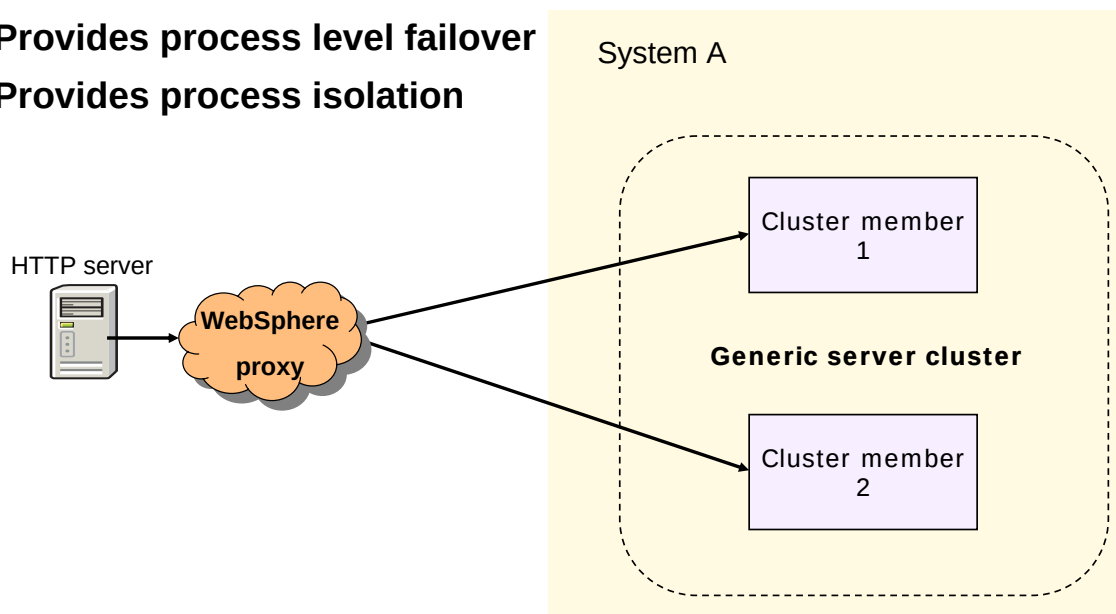
- Can provide better performance in multiple CPU systems
- Provides process level failover
- Provides process isolation



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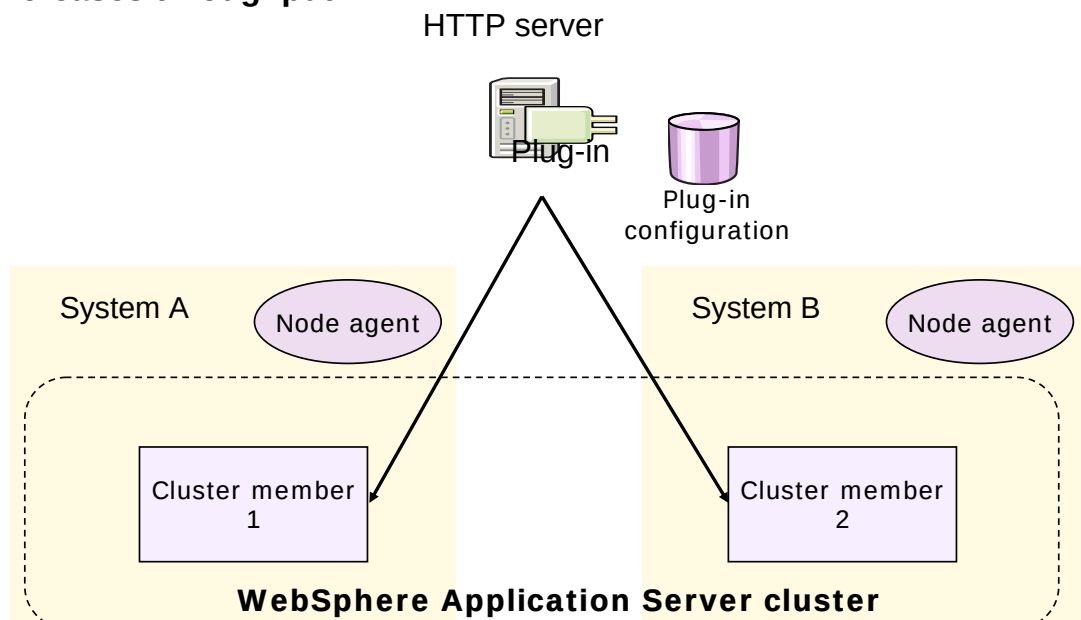
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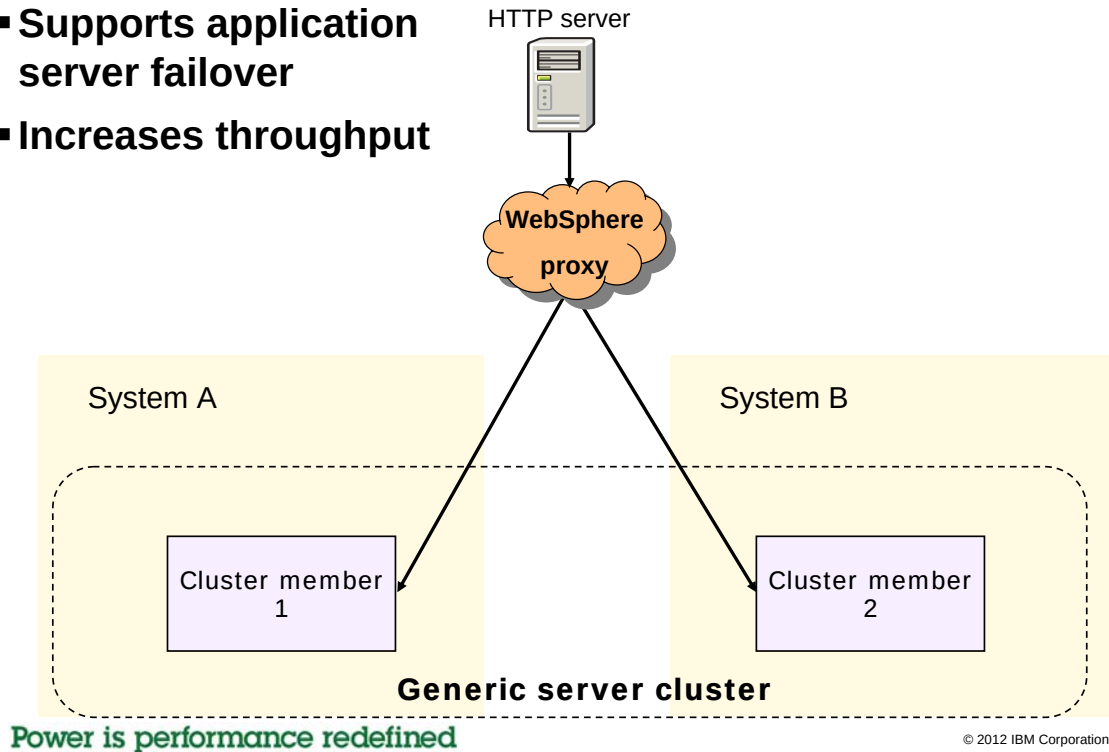
- Supports application server failover
- Increases throughput



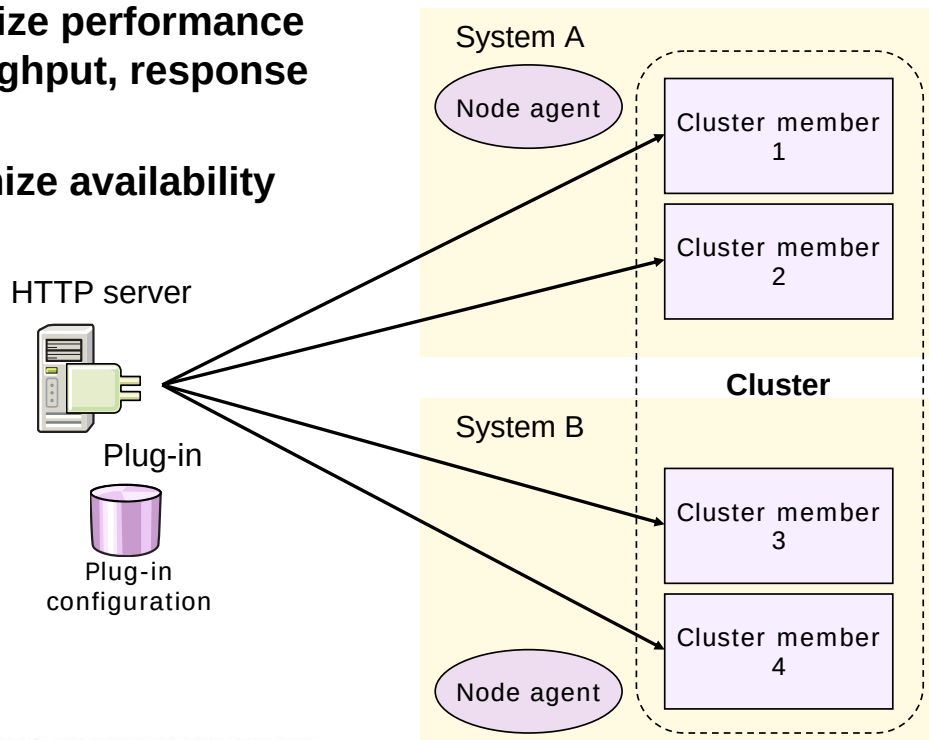
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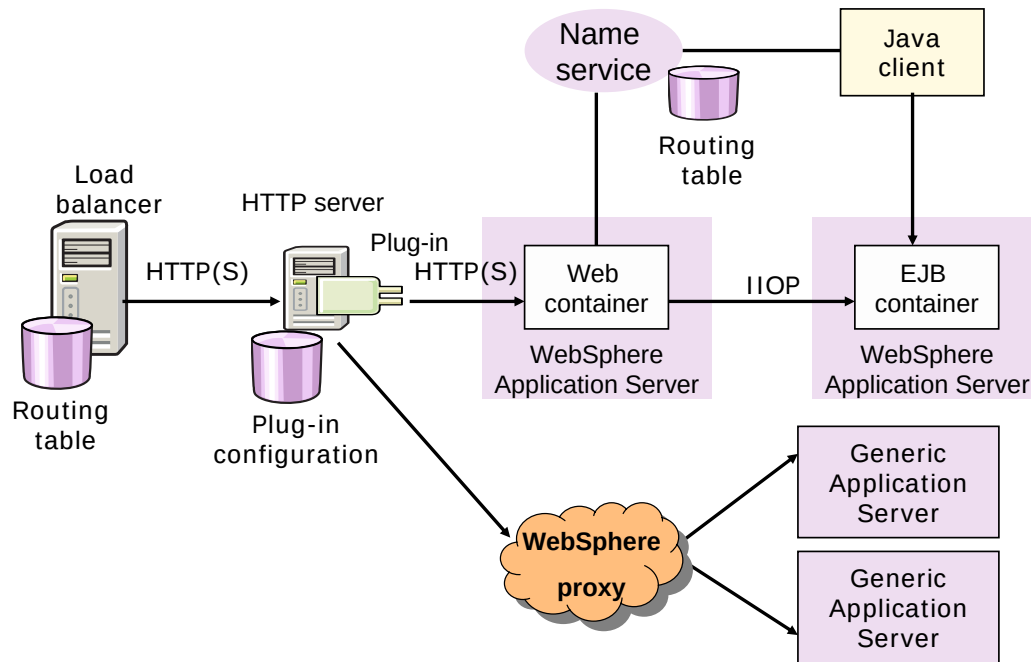
- Supports application server failover
- Increases throughput



- Optimize performance (throughput, response time)
- Maximize availability



What happens if there is a failure?



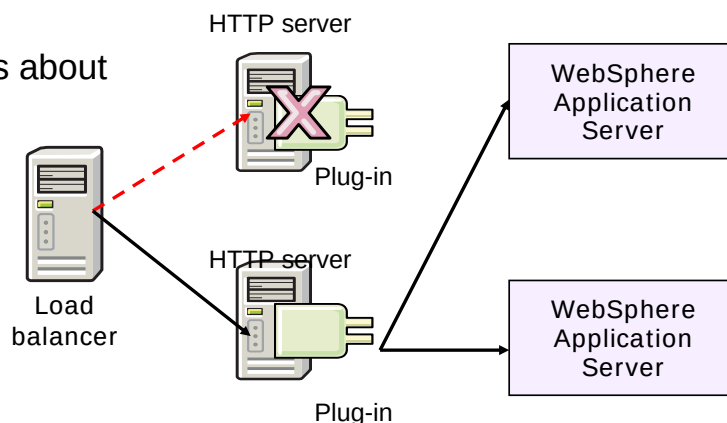
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HTTP server failover - WebSphere

- **Multiple HTTP servers provide coverage.**
- **Load Balancer can route around a failed HTTP server.**
- **One or more HTTP servers handle load before failover.**
- **HTTP plug-in**

- Every plug-in knows about all Web containers
- Session key contains address of server
- Sessions get properly routed



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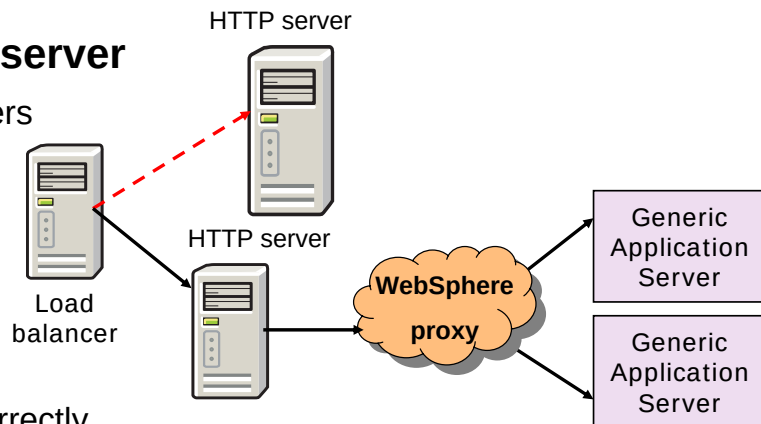
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- Multiple HTTP servers provide coverage.
- Load Balancer can route around a failed HTTP server.
- One or more HTTP servers handle load before failover.

▪ WebSphere proxy server

- Is aware of all members in the cluster
- Session key **can** contain address of server
- Sessions **can** properly get routed when setup correctly

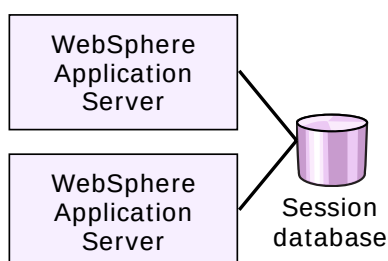
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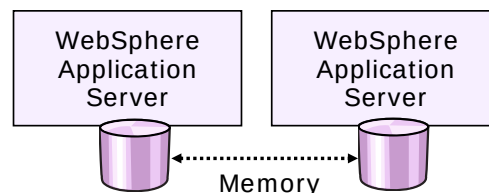
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- Session objects are cached in server memory by default, and are therefore lost if server fails
- Two methods to enable session persistence:
 - Database
 - Session objects persisted using JDBC data source
 - Can use DB2 for IBM i, independent ASP for maximizing availability
 - Memory-to-memory replication
 - Sessions copied to other server(s) using WebSphere Platform Messaging
- Session objects must be serialized to take advantage of persistence

Session database



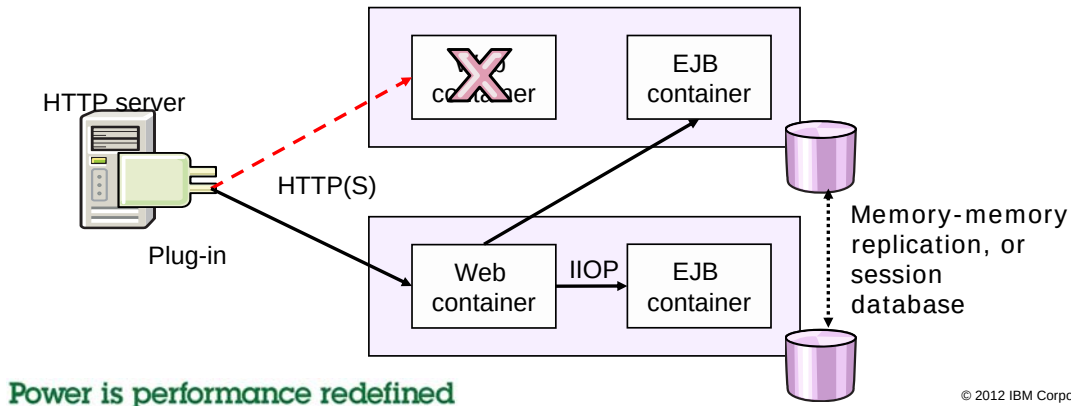
Memory-memory replication



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- **HTTP server plug-in**
 - Detects failure of Web containers
 - Marks container as unavailable
 - Tries next cluster member in the cluster
- **What about in-flight sessions?**
 - Sessions may be persisted to database
 - Sessions may be replicated in memory



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Centralized installation manager

- **Remote product installation**
 - Use deployment manager to install on remote hosts
 - No IBM agent required on remote host
- **Remote product update**
 - Download refresh packs, fix packs, and interim fixes from IBM support Web site
 - Directly from the administrative console
 - Apply maintenance to cell members
- **Key benefits**
 - Central interface for installation and maintenance process
 - Improved productivity with parallel installations
 - Reduced repetition and chance of human error

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Flexible management

- **Aims to reduce the overhead of administration**
 - Reduce management footprint
 - Consolidate management agents
 - Improve administrative scalability
- **Loosely coupled administrative model**
 - Nodes are autonomous
 - Central “job manager” queues administrative tasks for execution on individual nodes
- **Traditional cell model still available**
 - Flexible management is optional

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Flexible management components

- **Administrative agent**
 - Local agent that runs the administrative logic for all servers on a node
 - Runs a local administrative console
- **Job manager**
 - Submits management jobs to administrative agents on each node
 - Can manage multiple base servers, or multiple Network Deployment cells

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Use cases for flexible management

▪ **Good use cases for flexible management:**

- Using a job manager to administer a very large number (hundreds) of base application servers
 - Works well in a geographically distributed or high latency environment
- Using a job manager to coordinate activities across multiple deployment managers (cells)
- Using an administrative agent to manage multiple application servers running on a single system

▪ **A full flexible management environment cannot be used in a situation where any of these functions are required:**

- Clustering with workload management and failover
- Memory-to-memory data replication
- Centralized server backup and restore
- Centralized server performance monitoring

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Properties based configuration

▪ **WebSphere Application Server configuration repository consists of multiple files in XML and other formats, spread across many directories**

- Configuration objects are complex
- Can be modified from multiple sources, like wsadmin, administrative console, Java programs

▪ **Properties files, consisting of name/value pairs, are more human readable than other configuration files**

- Similar to the old XmlExport/Import commands

▪ **Use wsadmin commands to extract, apply and delete properties**

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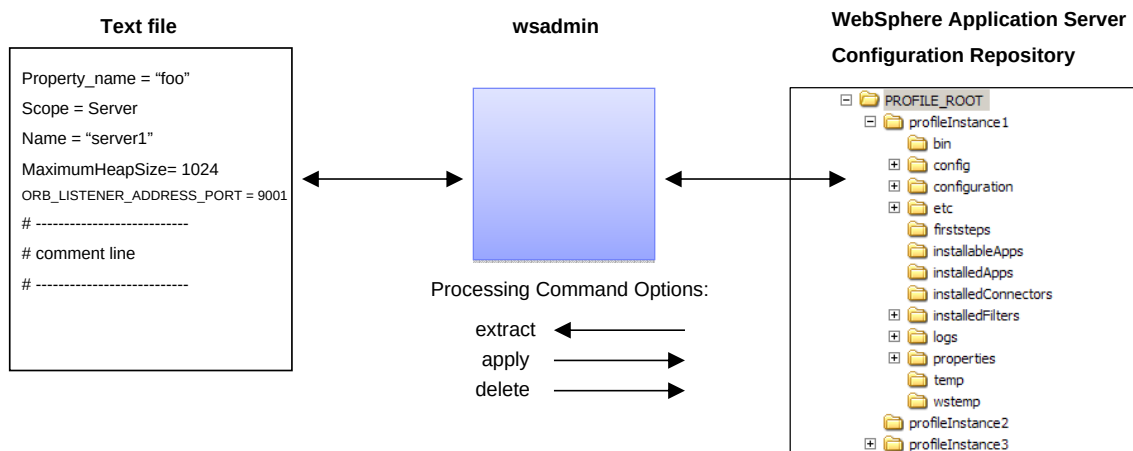
Benefits of properties based configuration

- Decouples configuration data from changes in the underlying configuration model between releases
- Makes automation easy
- Eliminates need to write complex wsadmin scripts
- Can be used in conjunction with configuration archives to replicate configuration information
- Offers a convenient configuration diff mechanism

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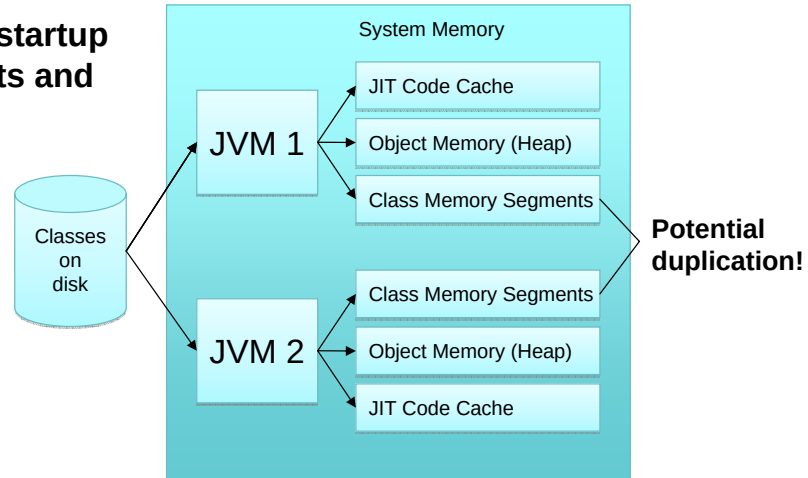
Properties file configuration example



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- The shared cache was introduced in IBM's SDK for Java 5
- Static class data was stored in an area of memory accessible by any Java Virtual Machine (JVM) on the system
- Cache was persistent beyond the lifetime of any JVM but was lost on system shutdown
- Offered significant startup speed improvements and memory savings!!



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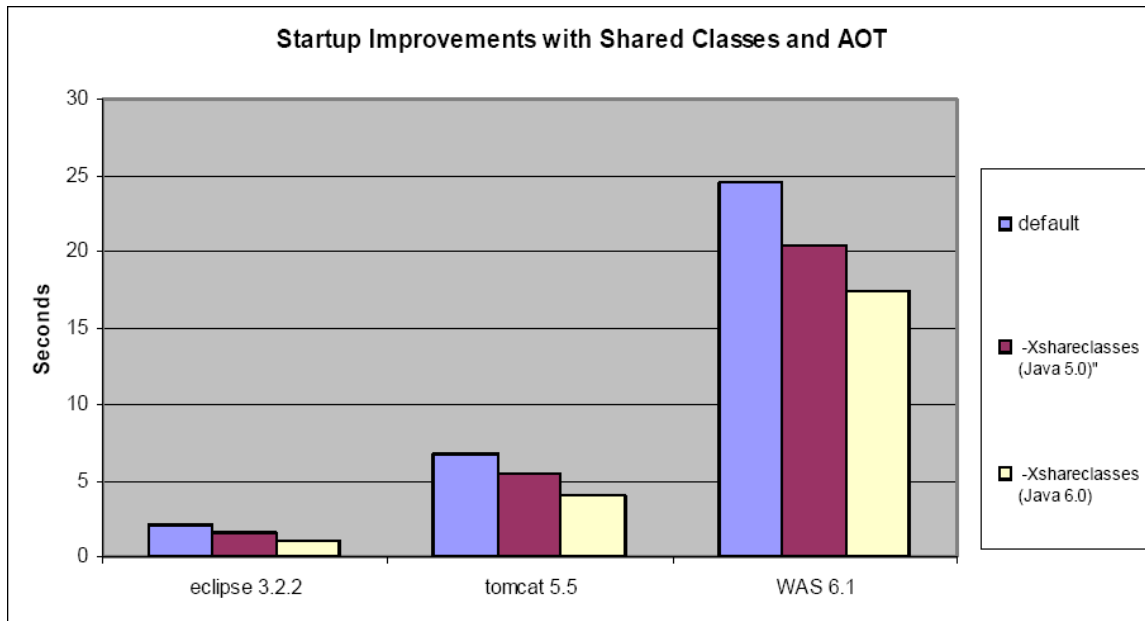
Shared data cache updates

- **Shared cache persistence**
 - Available in JDK 6, WebSphere 7 and later releases
 - Cache information can be written to a memory-mapped file
 - Initial JVM startup after a reboot no longer takes a performance hit
 - You can control persistence using command line options
 - –Xshareclasses:persistent, –Xshareclasses:nonpersistent
- **Pre-compilation of Java code**
 - Store ahead of time (AOT) compiled code generated by the just-in-time (JIT) compiler
 - Automatically update methods if they are re-compiled
 - Improves JVM startup time
 - Example: –Xscmx50M –Xscminaot5M –Xscmaxaot10M
 - Creates a 50M cache, guaranteeing at least 5M of space but no more than 10M for AOT compiled code

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Shared data cache performance



Lower is better!

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JDK 6 – compressed references

- IBM Java SE 6 introduces compressed references technology to dramatically improve memory footprint on 64-bit platforms
- Use 32-bit heap offsets to reference heap data
 - Java objects take up less space
 - Runtime internals translate between 32-bit references and 64-bit pointers
 - More Java heap space available without full overhead of 64-bit JVM
 - For Java heap sizes up to 25GB
- Allows larger heap sizes with increased efficiency
- Enabled by default, disable with -Xnocompressedrefs

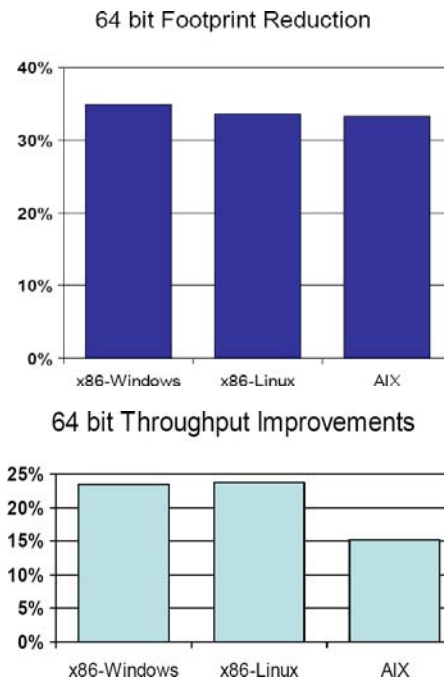
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- Access to larger heap space than 32-bit environments
- Smaller heaps than 64-bit environments
- Overall throughput improvements
- More efficient heap utilization

Get **SMALLER**,
Get **FASTER**

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Additional references

- **WebSphere information center**
 - <http://www-01.ibm.com/software/webservers/appserv/was/library/>
- **IBM education assistant**
 - <http://publib.boulder.ibm.com/infocenter/ieduasst/v1r1m0/index.jsp>
 - Available with IBM Support Assistant
- **WebSphere on IBM i**
 - <http://www-03.ibm.com/systems/i/software/websphere/index.html>
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