Technical Overview of GlassFish v2

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GlassFish v2

Overview of new features in the release

Learn about all the new features added in this release of GlassFish Application Server.

GlassFish v2 Overview: Agenda

- Project GlassFish™
- What Is New in GlassFish v2
  - Clustering, availability, and memory replication
  - Web Services Interop. Technology (WSIT)
  - Support for Java™ Business Interface (JBI)
  - Other enhancements

GlassFish v2 Overview: Agenda

Project GlassFish

What Is New in GlassFish v2

- Clustering, availability, and memory replication
- Web Services Interop. Technology (WSIT)
- Support for Java Business Interface (JBI)
- Other enhancements

What Is Project GlassFish?

- Project for developing Java Platform, Enterprise Edition (Java EE platform) Application Server
  - https://glassfish.dev.java.net
- Free for development, deployment, and redistribution
- Open Source
  - OSI License—CDDL, GPL v2
- Community at java.net
  - Sources, bug database, discussions/forums at java.net
  - Roadmaps, Architectural documents
  - Code contributions: Sun Microsystems,Oracle, and others

GlassFish v2 Overview: Agenda

Project GlassFish

What Is New in GlassFish v2

- Clustering, availability, and memory replication
- Web Services Interop. Technology (WSIT)
- Support for Java Business Interface (JBI)
- Other enhancements

What Is New in GlassFish v2?

Last year at the 2006 JavaOne^{SM} conference we unveiled GlassFish v1

- First Java EE platform 5 compliant Application Server
- Ease of development with use of annotations and POJO-based programming
- Web Services management
- Self Management and Self Healing
- Single instance offering

What Is New in GlassFish v2? (Cont.)

This year we bring you GlassFish v2

- First Java EE platform 5 compliant Application Server for the **enterprise**
- Support for Clustering and Light-weight Session failover
- Web Services Interoperability Technology (WSIT)
- Support for Java Business Integration (JBI)
- Other enhancements

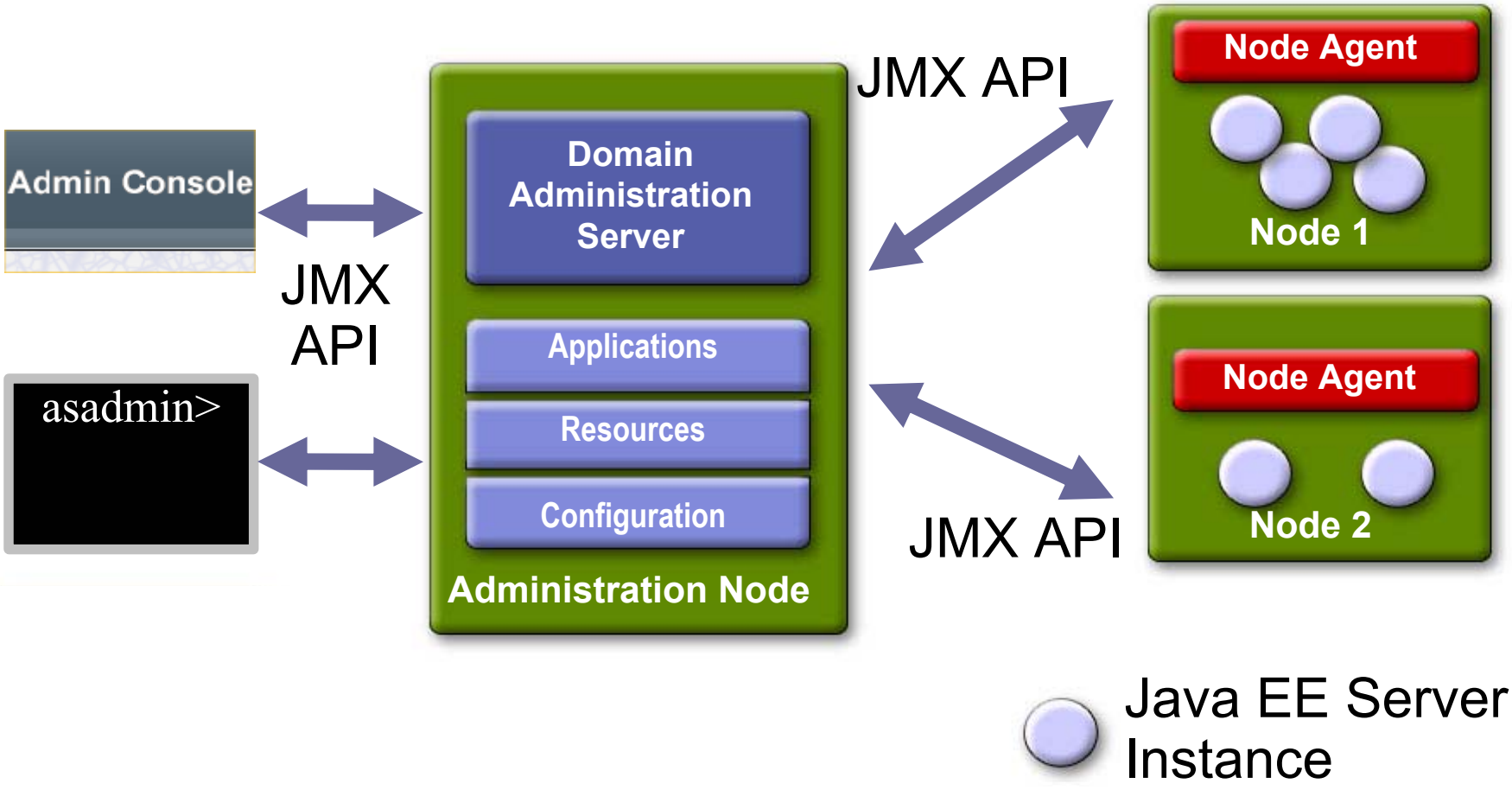
GlassFish v2 Overview: Agenda

Project GlassFish

What Is New in GlassFish v2

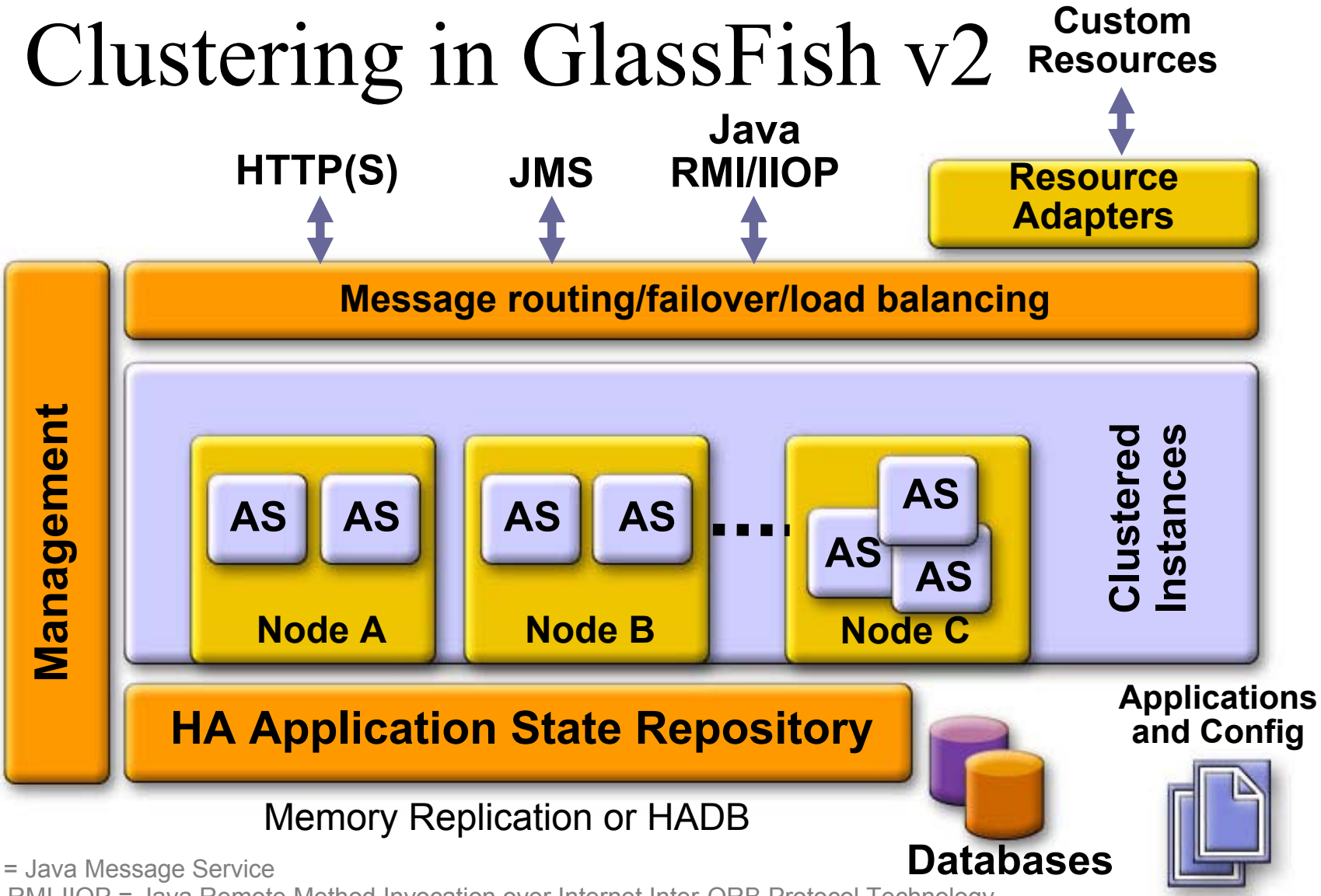
- **Clustering, availability, and memory replication**
- Web Services Interop. Technology (WSIT)
- Support for Java Business Interface (JBI)
- Other enhancements

Clustering in GlassFish v2



JMX = Java Management Extensions

Clustering in GlassFish v2



JMS = Java Message Service
Java RMI-IIOP = Java Remote Method Invocation over Internet Inter-ORB Protocol Technology

Memory Replication

Problem domain and scope

- Needed: an open-source, lighter-weight alternative to HADB
  - HADB provides high availability for:
    - Http session state
    - Stateful Enterprise JavaBeans™ (EJB™) technology session state
    - Single sign-on state
  - HADB: still available; still right solution for some problems
    - Enables proven “5–nines” availability
    - More complex to administer
    - Not (currently) open source

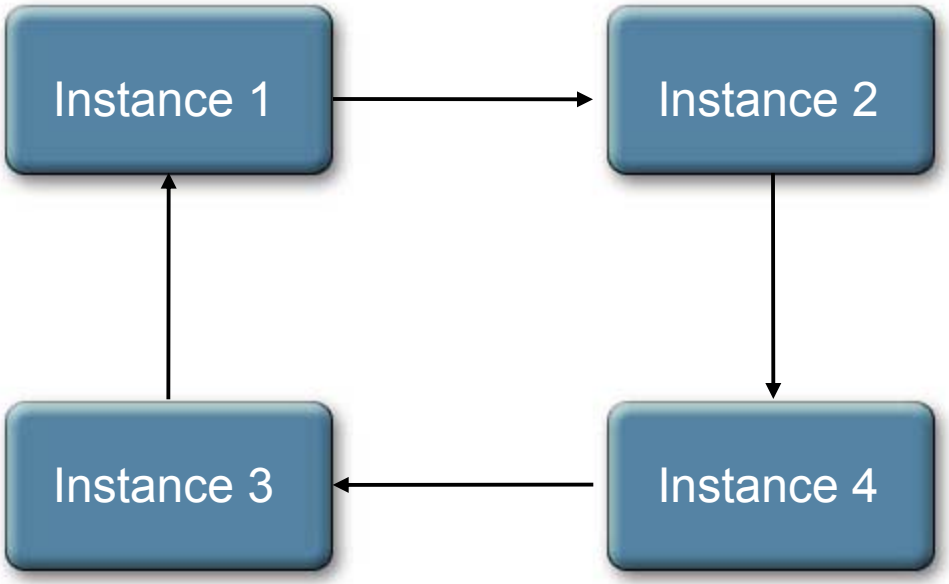
Memory Replication

Problem domain and scope

- Memory replication
  - Provide high availability for:
    - Http session state
    - Single Sign On state
    - Stateful (EJB technology) Session bean state
  - Be feature compatible with current HADB-based availability

Memory Replication

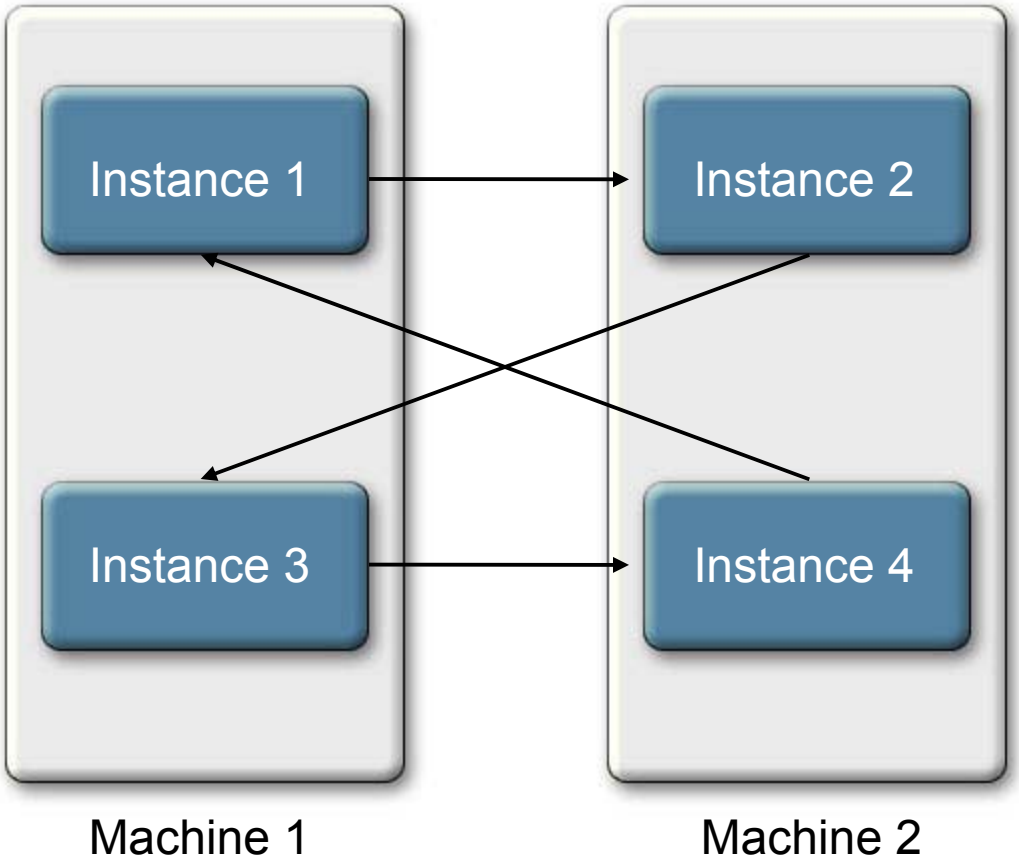
Typical cluster topology



Memory Replication

Typical cluster topology

Example: Maximize Availability on 4 node cluster on 2 machines

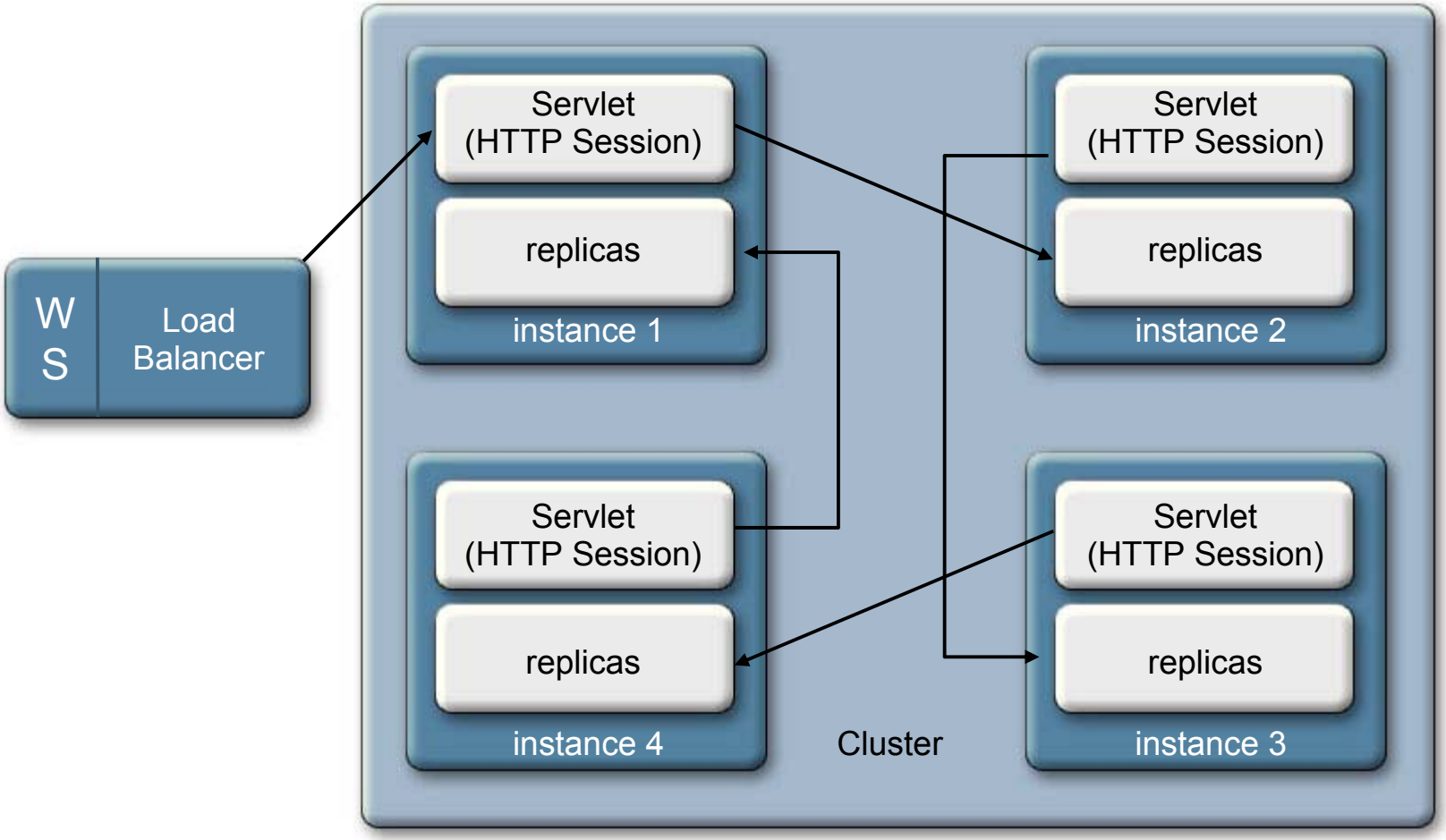


Memory Replication

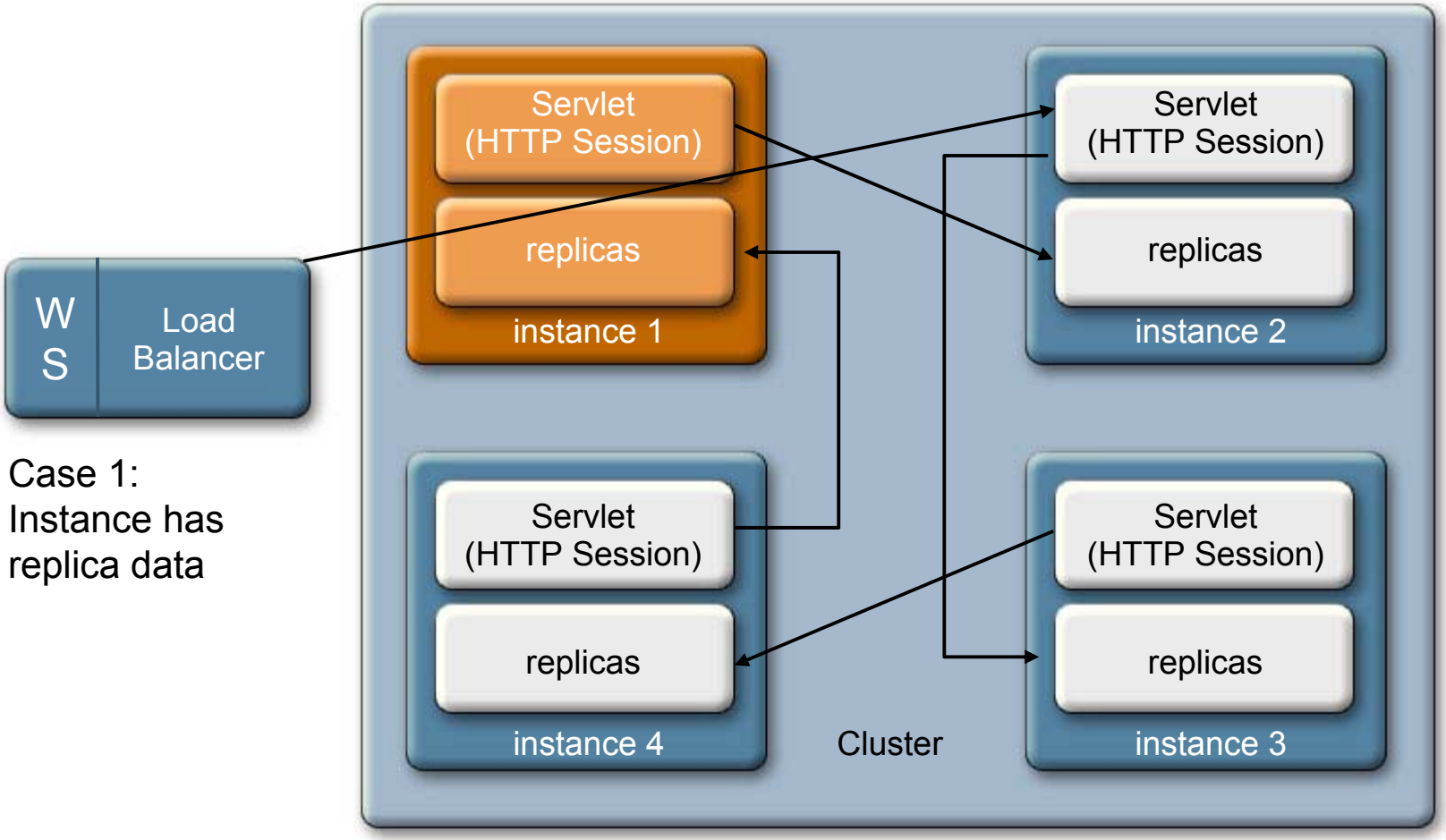
Typical failover scenario

- Location transparency: fail over request can go to any instance in the cluster
- 2 Cases: Failover request lands on
  - Case 1: instance with replica data: ownership taken, processing continues
  - Case 2: instance without replica data
    - instance sends Self-Addressed-Stamped-Envelope (SASE) broadcast request
    - instance with replica data transfers data back to requestor and deletes its copy after an ack
    - JXTA™ technology makes this easy (propagation communication channels are scoped within the “group” (i.e., the cluster members)

HTTP Session State Failover

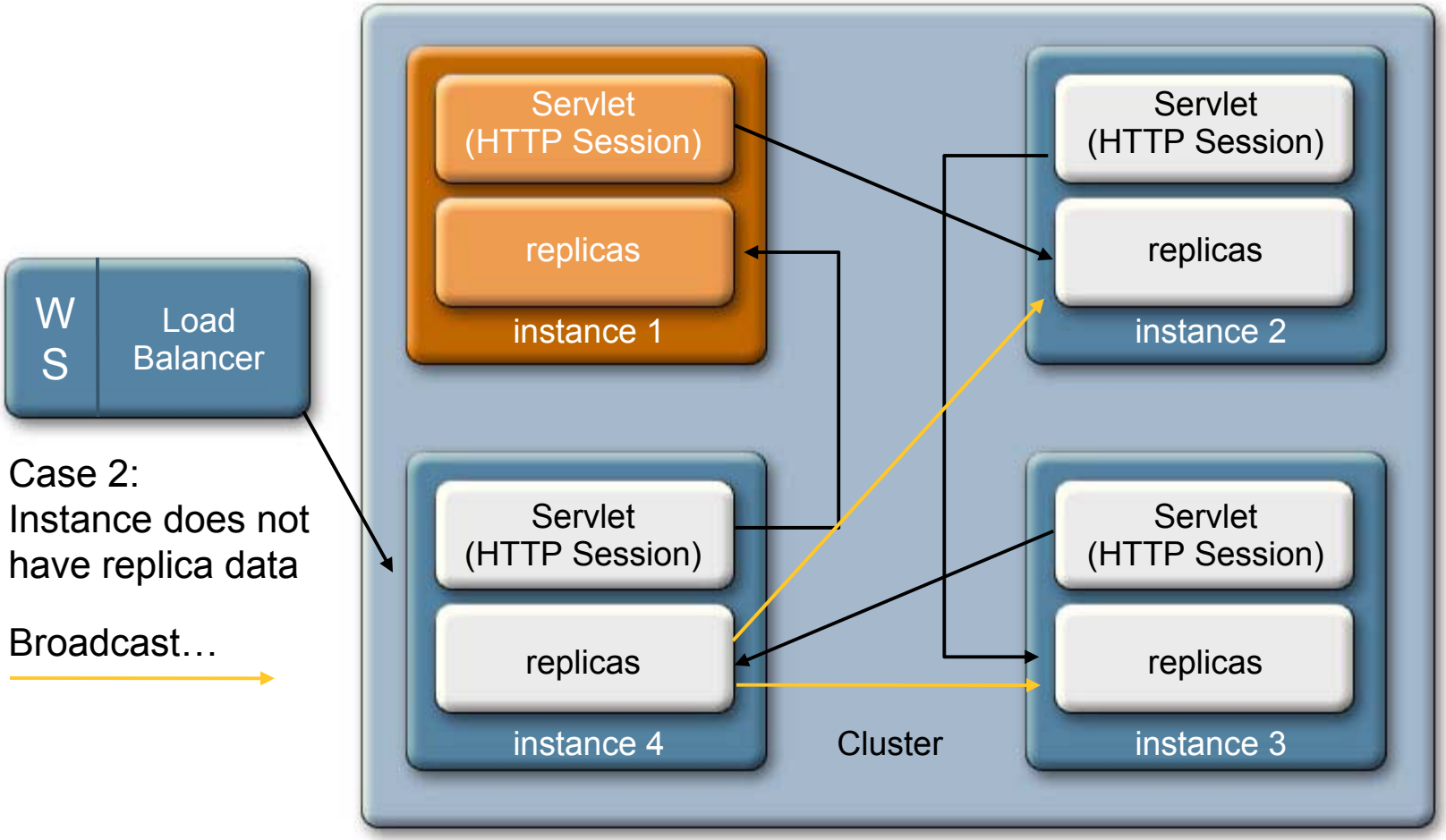


HTTP Session State Failover

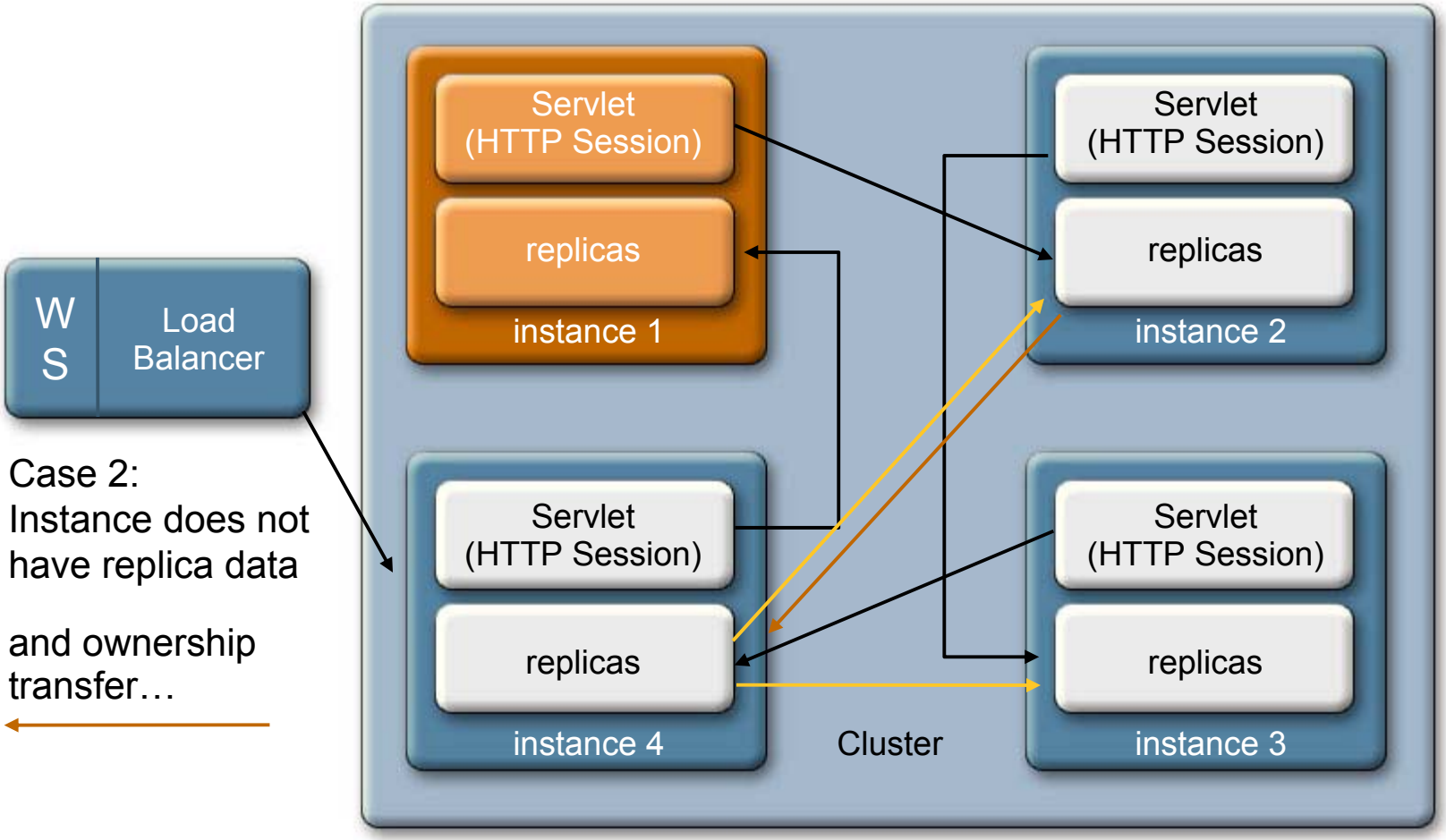


Case 1:
Instance has
replica data

HTTP Session State Failover



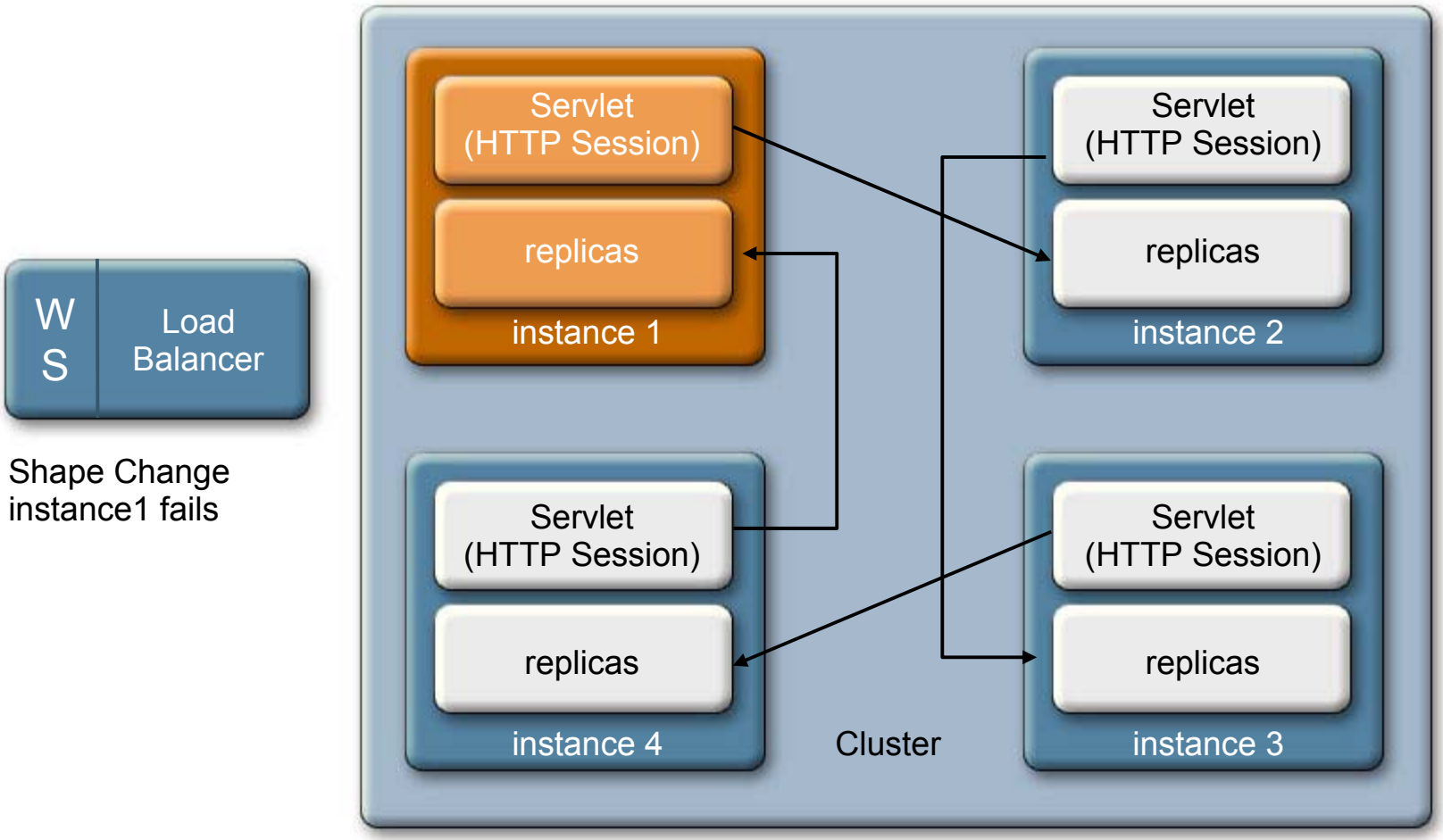
HTTP Session State Failover



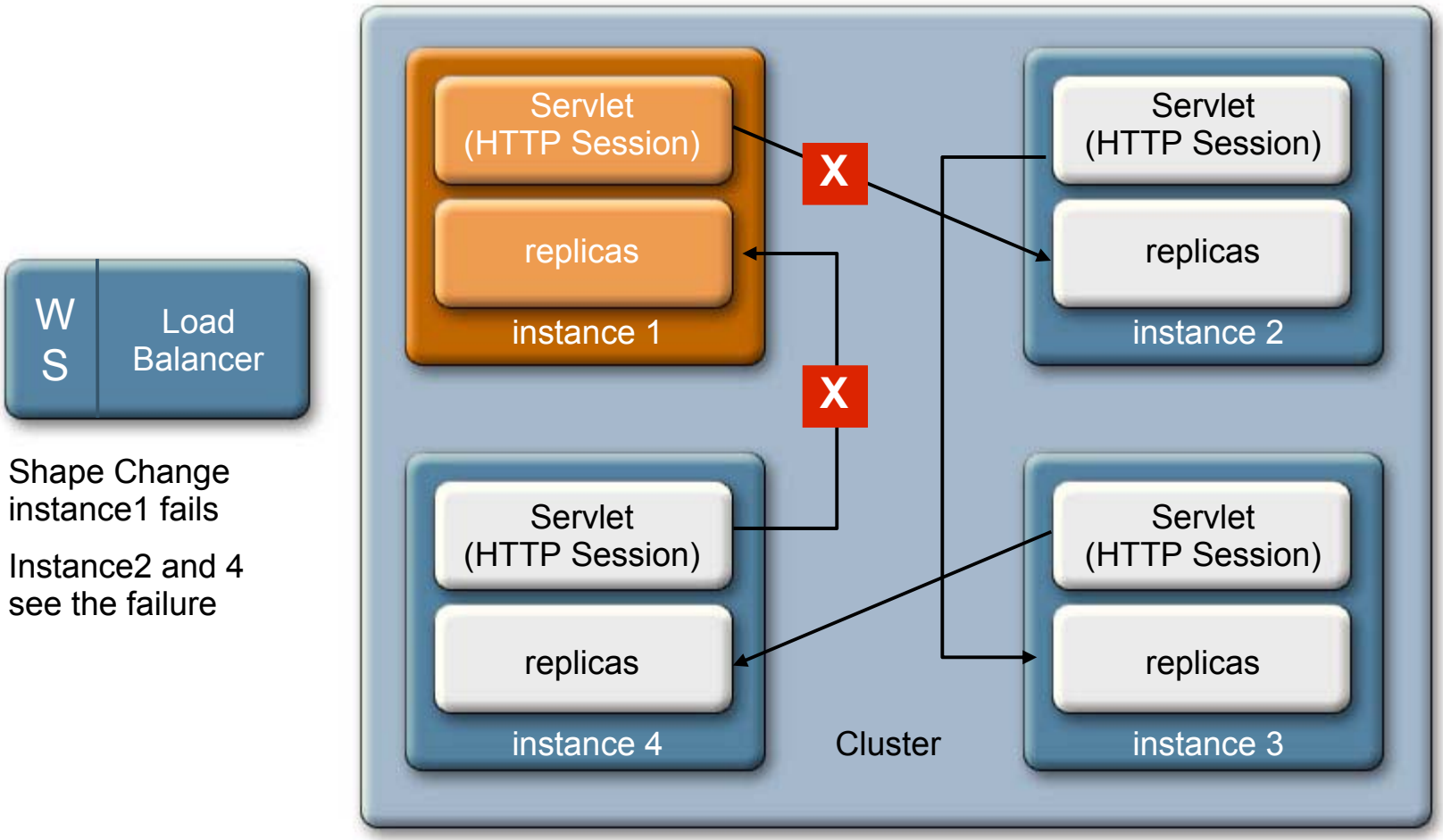
Case 2:
Instance does not have replica data

and ownership transfer…

Cluster Dynamic Shape Change



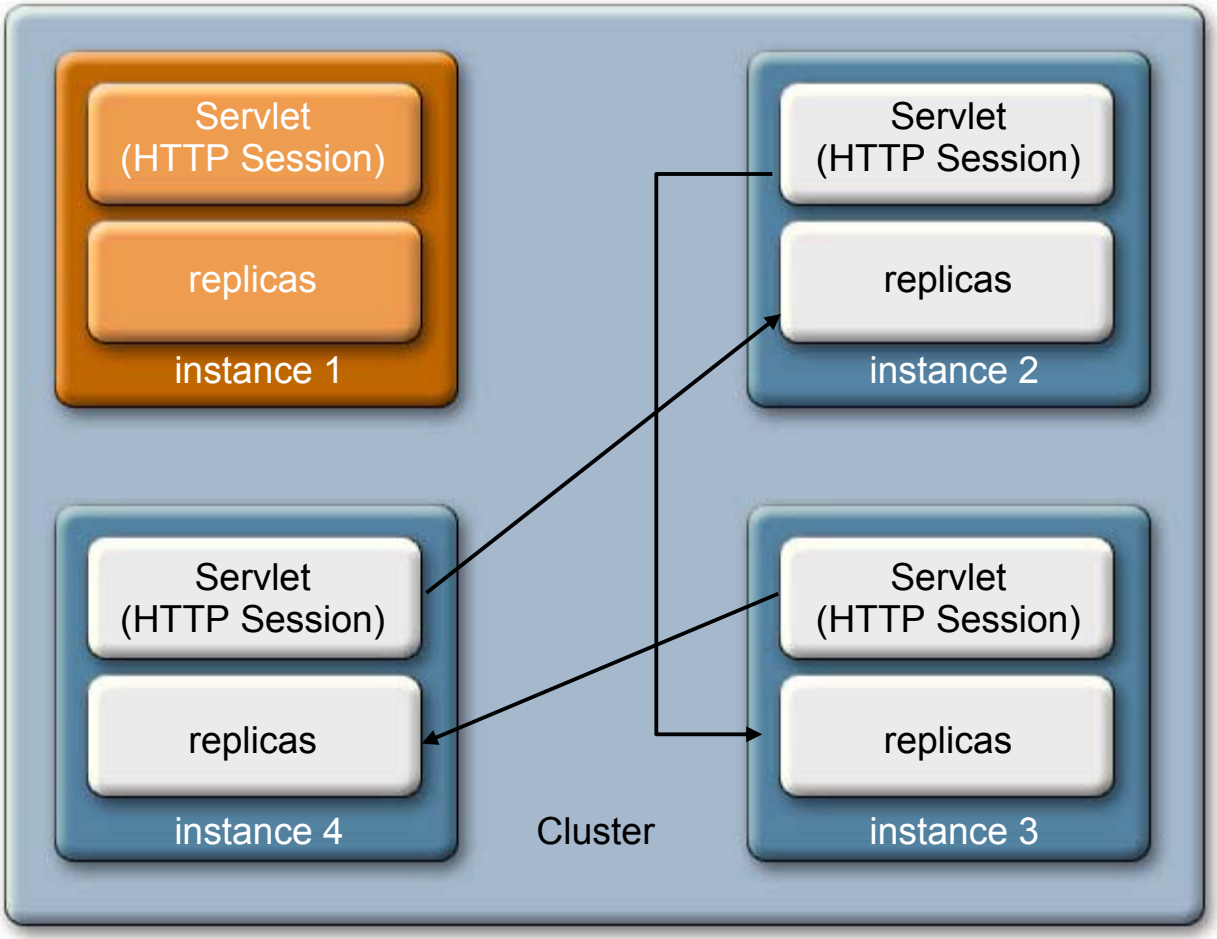
Cluster Dynamic Shape Change



Shape Change
instance1 fails

Instance2 and 4
see the failure

Cluster Dynamic Shape Change



W S Load Balancer

Shape Change
instance1 fails

Instance2 and 4 see the failure

Instance4 selects Instance2 as new partner—new connections established

the reverse happens when an instance joins or re-joins the cluster

Memory Replication Configuration

Our hope was to say…

- "This page left intentionally blank" ;-)
  - Meaning "zero configuration required"
- We came close to that goal…

Memory Replication Configuration

Out of the box…

- Create a domain
  - Use the ‘cluster’ admin profile—defaults for replication are handled
    - Enables GMS—heartbeat enabled
    - persistence-type = “replicated”
- Create a cluster and instances
- Deploy your application with availability-enabled=true
- That’s it

Memory Replication Configuration

Beyond “out of the box” admin cluster profile

- Increase heap size
  - Default is 512MB for cluster admin profile
    - To accommodate cluster demos on laptops, etc.
    - Too small for serious replication
  - Increase to 1GB recommended
    - <jvm-options>-Xmx1000m</jvm-options>
      <jvm-options>-Xms1000m</jvm-options>

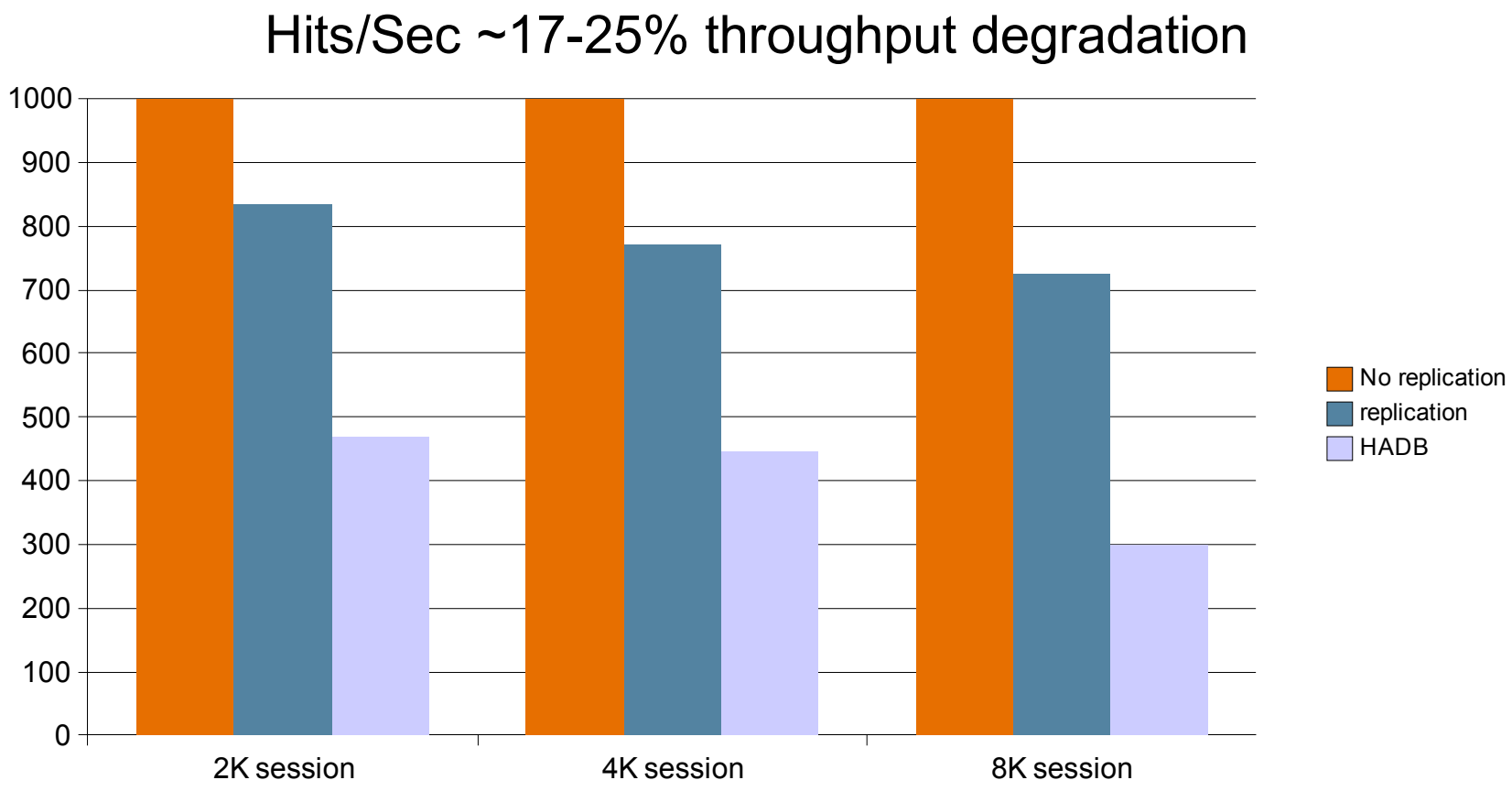
Memory Replication Configuration

Making your app distributable

- <distributable/> element
  - Required in web.xml
    - Indicates you believe your application is ready to run in a cluster
- Serializable objects required
  - HTTP Session state
  - EJB technology Stateful Session Bean state

Memory Replication Performance

Cost of replication



Memory Replication Implementation

Based on JXTA technology and Project Shoal/GMS

- JXTA technology—yes, that JXTA technology
  - Previously known mainly as peer-to-peer technology
  - Streamlined to handle the high volume and throughput requirements of memory replication
    - Benefited from collaboration with Grizzly Project
  - JXTA technology group and member abstractions mapped well with App Server cluster and instances
    - Simplified API's made near zero-config story possible

Memory Replication Implementation

Based on JXTA technology and Project Shoal/GMS

- GMS (Group Management Service)
  - Provides dynamic membership information about a cluster and its member instances
  - Cluster shape change events—
    - Members joining
    - Members shutting down vs. failing
  - Memory Replication takes appropriate action in response to these events providing continuous and high availability
- GMS itself is also based on JXTA technology

Group Management Service (GMS)

- Pluggable Runtime Clustering Framework
- Based on Project Shoal—https://shoal.dev.java.net
- Provides support for:
  - Cluster Membership change notifications and cluster state
  - Cluster-wide or member-to-member Messaging
  - Recovery Oriented Computing
  - Distributed Cache

Group Management Service (GMS) (Cont.)

- Provides SPI for plugging in group communication providers
- Default provider is based on Sun's JXTA technology platform (http://www.jxta.org/)
- Used in Appserver for:
  - Automatic Transaction recovery
  - Timer migrations
  - Cluster health
  - In-memory replication module
  - IIOP failover load-balancer

GlassFish v2 Overview: Agenda

Project GlassFish

What Is New in GlassFish v2

- Clustering, availability, and memory replication
- **Web Services Interop. Technology (WSIT)**
- Support for Java Business Interface (JBI)
- Other enhancements

Web Services Interoperability Technologies (WSIT)

a.k.a. Project Tango

- Enable interoperability between the Java platform and .NET 3.0 (i.e., Windows Communication Foundation, WCF, a.k.a. Indigo)
- Implemented as plugins to the Java API for XML Web Services (JAX-WS) RI to provide advanced web services features like:
  - Bootstrapping, optimizing communication, reliable messaging, atomic transactions, security, and trust
- Please attend Session TS-4865—"Takes Two to Tango: Java Web Services and .NET Interoperability" for more information

https://wsit.dev.java.net

Web Services Interoperability Technologies (WSIT)(Cont.)

- Bootstrapping
  - Using a URL to access a web service
  - Retrieving its WSDL file
  - Using the WSDL file to create a web service client that can access and consume a web service
  - WS-MetadataExchange WSDL, WS-Transfer
- Optimizing communication
  - Wire format optimization (MTOM/XOP)
  - Security optimization (WS-SecureConversation)

Web Services Interoperability Technologies (WSIT)(Cont.)

- Reliable messaging
  - Recovery from messages lost or misordered in transit
  - WS-ReliableMessaging
- Atomic transactions
  - All operations in TX boundary succeed or rollback
  - WS-Coordination and WS-AtomicTransactions

Web Services Interoperability Technologies (WSIT)(Cont.)

- Security and trust
  - WS-Security
    - Web Services previously only point-to-point via SSL
    - Now end-to-end by encrypting/signing message before transport
  - WS-Trust
    - Establish and broker trust relationships
    - Issuing, renewing, validating security tokens used by WS-Security

GlassFish v2 Overview: Agenda

Project GlassFish

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- Clustering and session-failover
- Web Services Interop. Technology (WSIT)
- **Support for Java Business Interface (JBI)**
- Other enhancements

Support for Java Business Integration (JBI)

- Java Business Integration—Java Specification Request (JSR) 208
- JBI runtime (Open ESB) and system components are bundled and integrated in GlassFish v2
  - https://open-esb.dev.java.net
- JBI administration GUI will be part of the admin GUI of the Appserver
- Command Line Interface (CLI) enhanced for running JBI commands

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- **Other enhancements**

Other Enhancements

Usage Profiles

Update Center

Security Enhancements

Web Container Enhancements

New Admin Console

Performance Improvements

Specification Updates

Other Enhancements

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Specification Updates

Usage Profiles

- Out-of-the-box support for usage profiles
- Developer/administrator chooses profile at the time of domain creation
- Improve user experience based on the profile chosen
- GlassFish v2 will support:
  - Developer profile
  - Cluster profile
  - Enterprise profile

Usage Profiles

	Developer	Cluster	Enterprise
Security KeyStore	JKS	JKS	NSS
Security Manager	Disabled	Disabled	Enabled
JVM™ software	Client	Client	JDK™
HTTP access log	Disabled	Disabled	Enabled
GMS Heartbeat	Disabled	Enabled	Enabled
Cluster creation	Not Allowed	Allowed	Allowed
Session Repl.	Not Allowed	Allowed	Allowed

JKS = Java Key Store | JDK = Java Development Kit | JVM = Java Virtual Machine
The terms “Java Virtual Machine” and “JVM” mean a Virtual Machine for the Java™ platform.

Other Enhancements

Usage Profiles

Update Center

Security Enhancements

Web Container Enhancements

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Specification Updates

Update Center

- Enables the installation of additional components
  - Runtime or non-runtime components
- Update center functionality is implemented across two tiers
  - Server side (web server hosting update center content and corresponding catalog)
  - Client side (Part of core GlassFish v2 installation)
    - Update Center client application connects to predefined Update Center server URL
    - Downloads available catalog file and uses catalog information to show components available for installation or update
    - Invoke Update Center client—asupdate script, Windows taskbar icon, etc.

Other Enhancements

Usage Profiles

Update Center

Security Enhancements

Web Container Enhancements

New Admin Console

Performance Improvements

Specification Updates

Security Enhancements

- Support for JSR 196 (Java Authentication Service Provider Interface for Containers)
- ECC (Elliptic Curve Cryptography) support
- Support for JKS (Java Key Store) format
- Support for “assign-groups” in Security Realm
  - Ability to grant permission based on authentication but independent of identity
- Support for JDBCRealm
  - Authenticate users and define their security roles based on information from a relational database accessed via Java DataBase Connectivity (JDBC™) APIs

Other Enhancements

Usage Profiles

Update Center

Security Enhancements

Web Container Enhancements

New Admin Console

Performance Improvements

Specification Updates

Web Container Enhancements

- Asynchronous Request Processing (ARP) and Comet programming framework
- Non-blocking SSL
- Apache AJP protocol
- In-memory (JSR 199) style JavaServer Pages™ (JSP™) compilations
- All webcontainer aspects are now dynamically reconfigurable
- Alternate docroots for virtual servers and web applications
- Numerous webcontainer startup and request processing optimizations

Other Enhancements

Usage Profiles

Update Center

Security Enhancements

Web Container Enhancements

New Admin Console

Performance Improvements

Specification Updates

New Admin Console

- Admin console re-implemented using JSF Templating, JavaServer™ Faces technology for creating Pages and Components
- jMaki Charting
- Ajax (breadcrumbs, tree, restart)
- Support for Cluster Management
- One-step Deployment with Server-side Browsing
- Integrated JBI Administration

Other Enhancements

Usage Profiles

Update Center

Security Enhancements

Web Container Enhancements

New Admin Console

Performance Improvements

Specification Updates

Performance Improvements

- Startup time for instance
- Asynchrony in Web Services implementation
- EJB container
- Improvements in the ORB
- JMS provider improvements
- Web container

Other Enhancements

Usage Profiles

Update Center

Security Enhancements

Web Container Enhancements

New Admin Console

Specification Updates

Specification Updates

- JSR 196 (Authentication SPI)
- JSR 208 (JBI)
- JavaServer Faces 1.2 MR
- JSP MR
- JavaServer Pages Standard Tag Library (JSTL) MR
- Servlet MR
- JAX-WS MR
- Java Architecture for XML Binding (JAXB) MR

References

- https://glassfish.dev.java.net (Project GlassFish)
- http://wiki.glassfish.java.net (GlassFish Wiki)
- dev@glassfish.dev.java.net (Developers)
- users@glassfish.dev.java.net (Users)

- https://wsit.dev.java.net (WSIT)
- https://open-esb.dev.java.net (Open ESB)
- https://shoal.dev.java.net (Shoal)
- http://www.jxta.org/ (JXTA)

Q&A

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