Enterprise Computing: J2EE Containers, Packaging, Web Services and the J2EE APIs

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J2EE Containers

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The component-based and platform-independent J2EE architecture makes J2EE applications easy to write because business logic is organized into reusable components.

In addition, the J2EE server provides underlying services in the form of a container for every component type. Because you do not have to develop these services yourself, you are free to concentrate on solving the business problem at hand.

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Before a Web, enterprise bean, or application client component can be executed, it must be assembled into a J2EE application and deployed into its container.

The assembly process involves specifying container settings for each component in the J2EE application and for the J2EE application itself.

Container settings

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Here are some of the highlights:

- The J2EE security model lets you configure a Web component or enterprise bean so that system resources are accessed only by authorized users.

- The J2EE transaction model lets you specify relationships among methods that make up a single transaction so that all methods in one transaction are treated as a single unit.

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- JNDI lookup services provide a unified interface to multiple naming and directory services in the enterprise so that application components can access naming and directory services.

- The J2EE remote connectivity model manages low-level communications between clients and enterprise beans. After an enterprise bean is created, a client invokes methods on it as if it were in the same virtual machine.

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For example, an enterprise bean can have security settings that allow it a certain level of access to database data in one production environment and another level of database access in another production environment.

Other container roles

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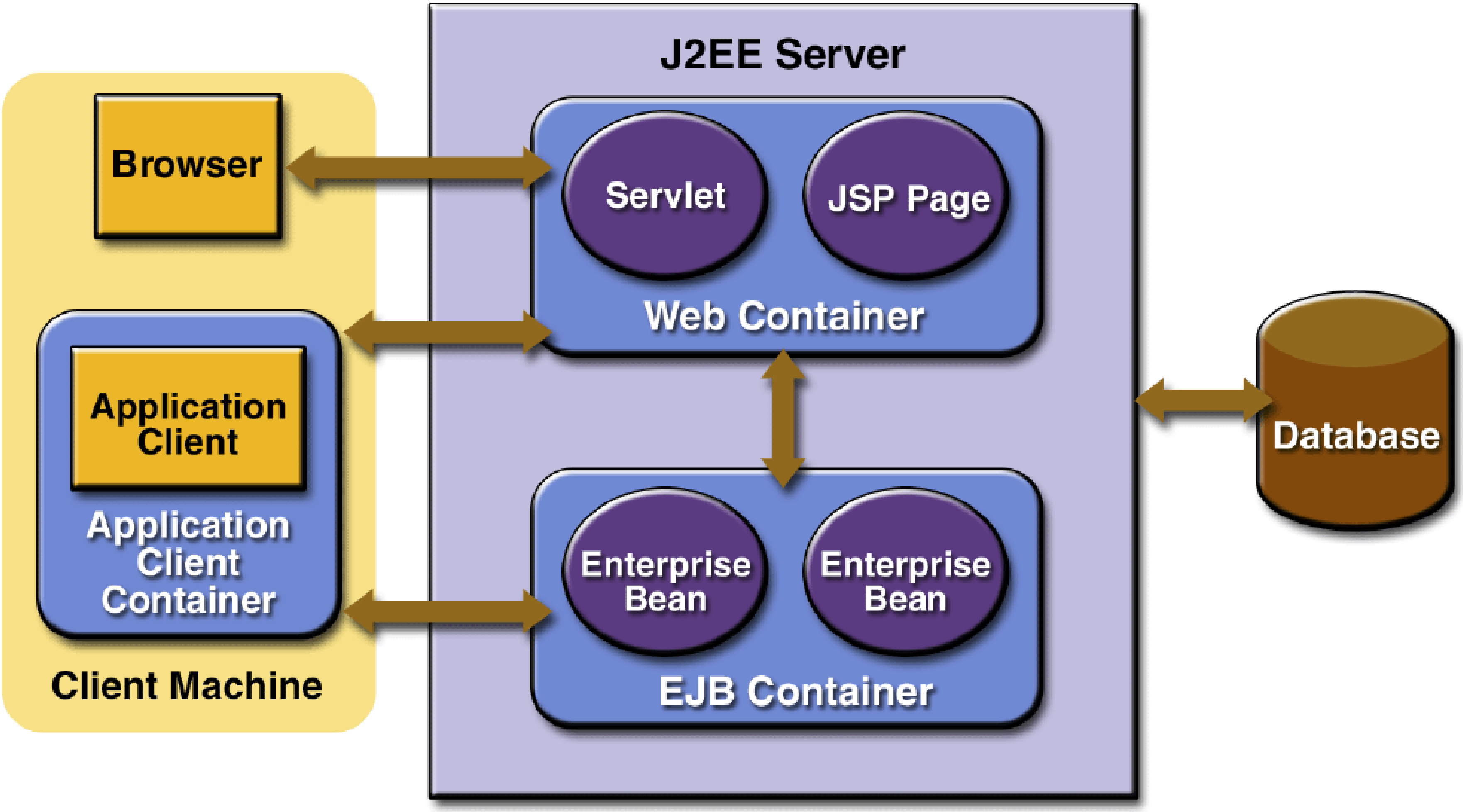
Although data persistence is a non-configurable service, the J2EE architecture lets you override container-managed persistence by including the appropriate code in your enterprise bean implementation when you want more control than the default container-managed persistence provides.

J2EE Server and Containers



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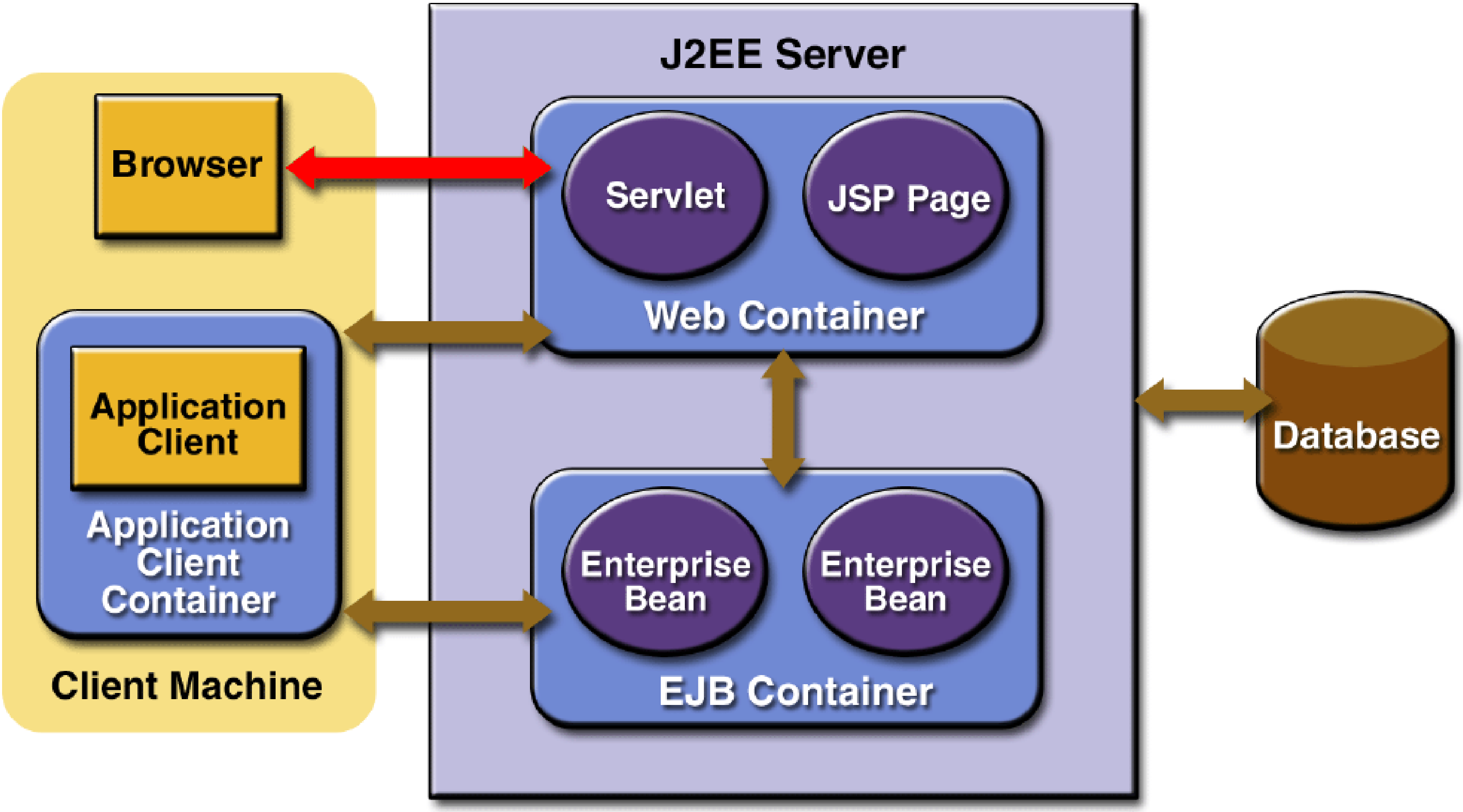

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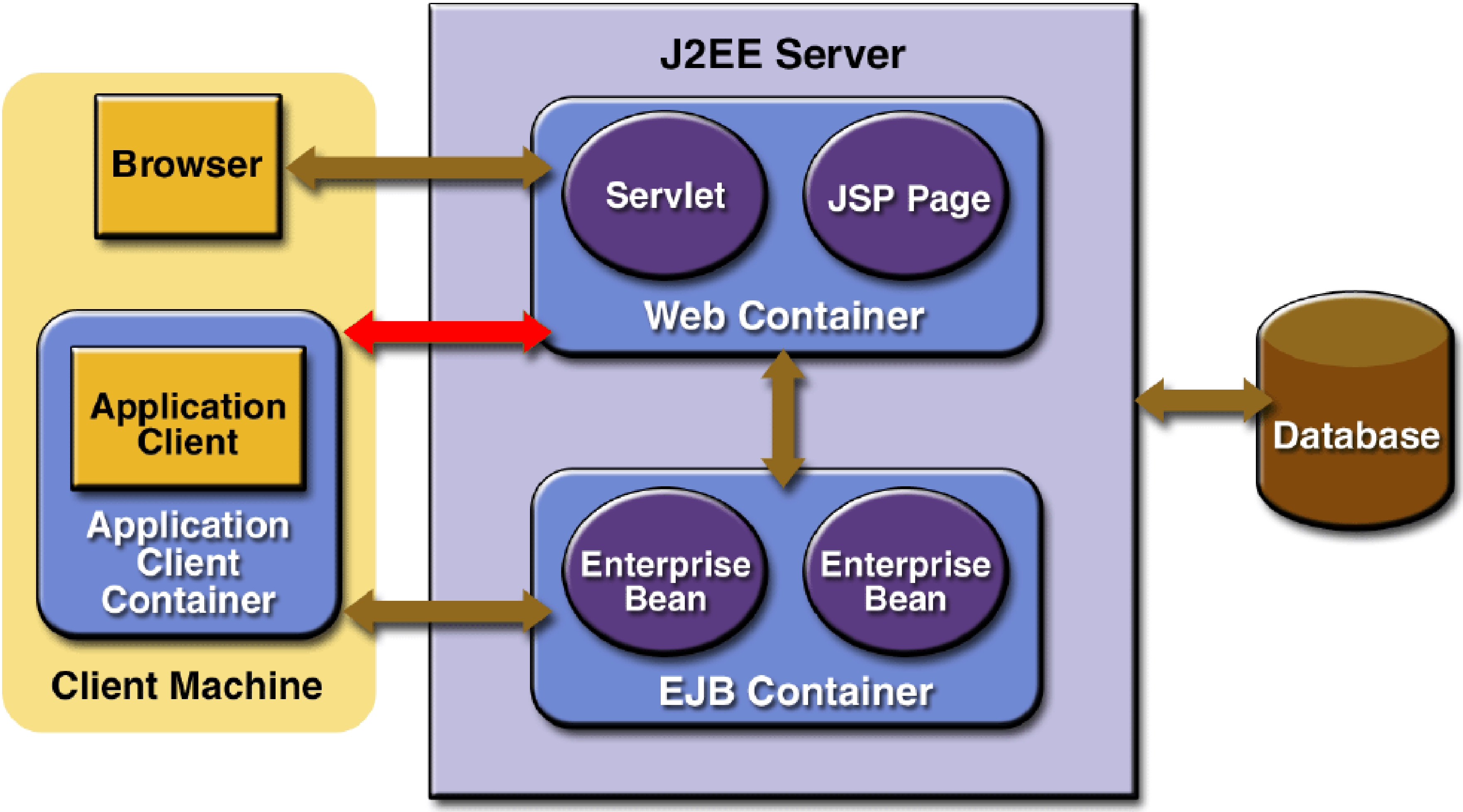

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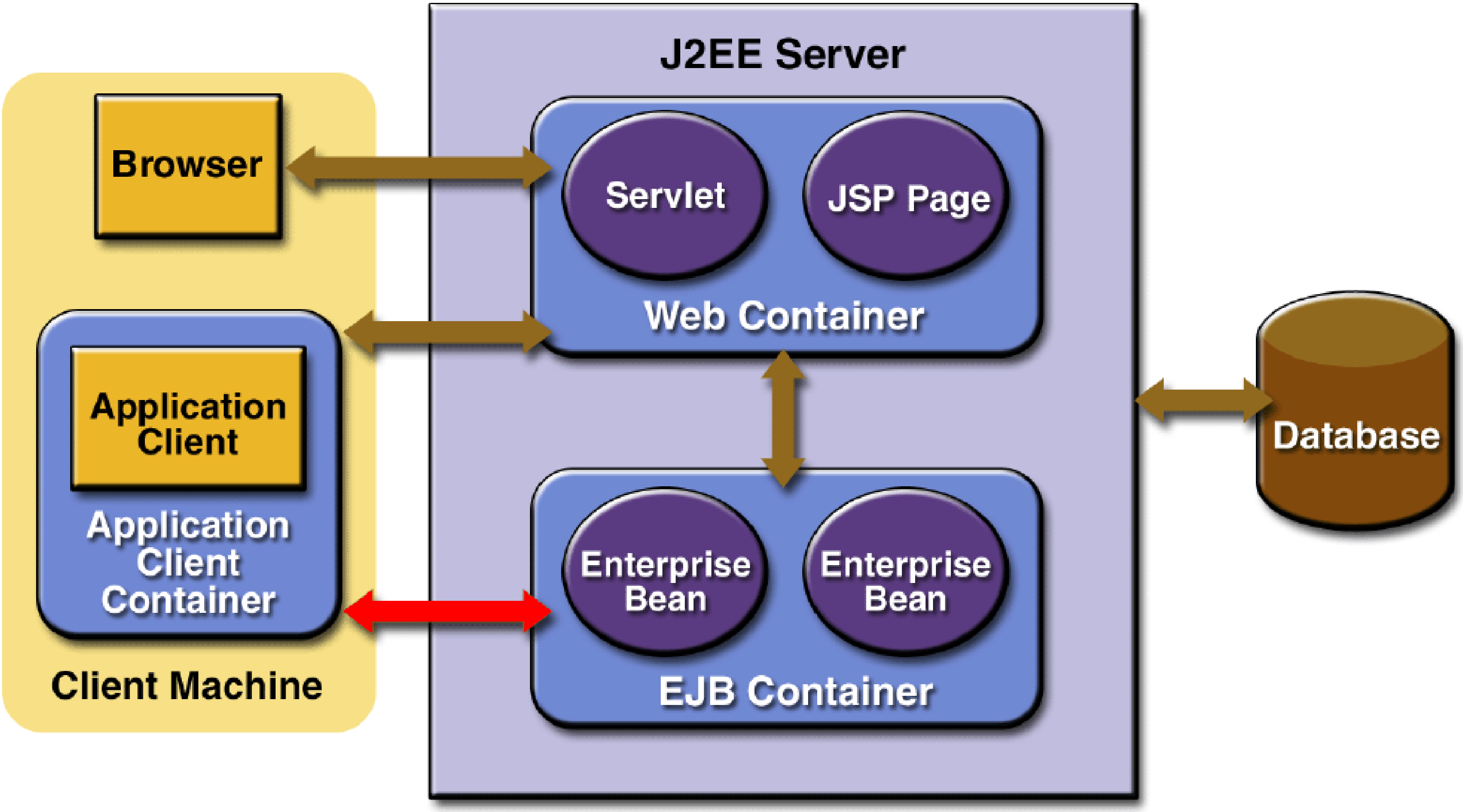

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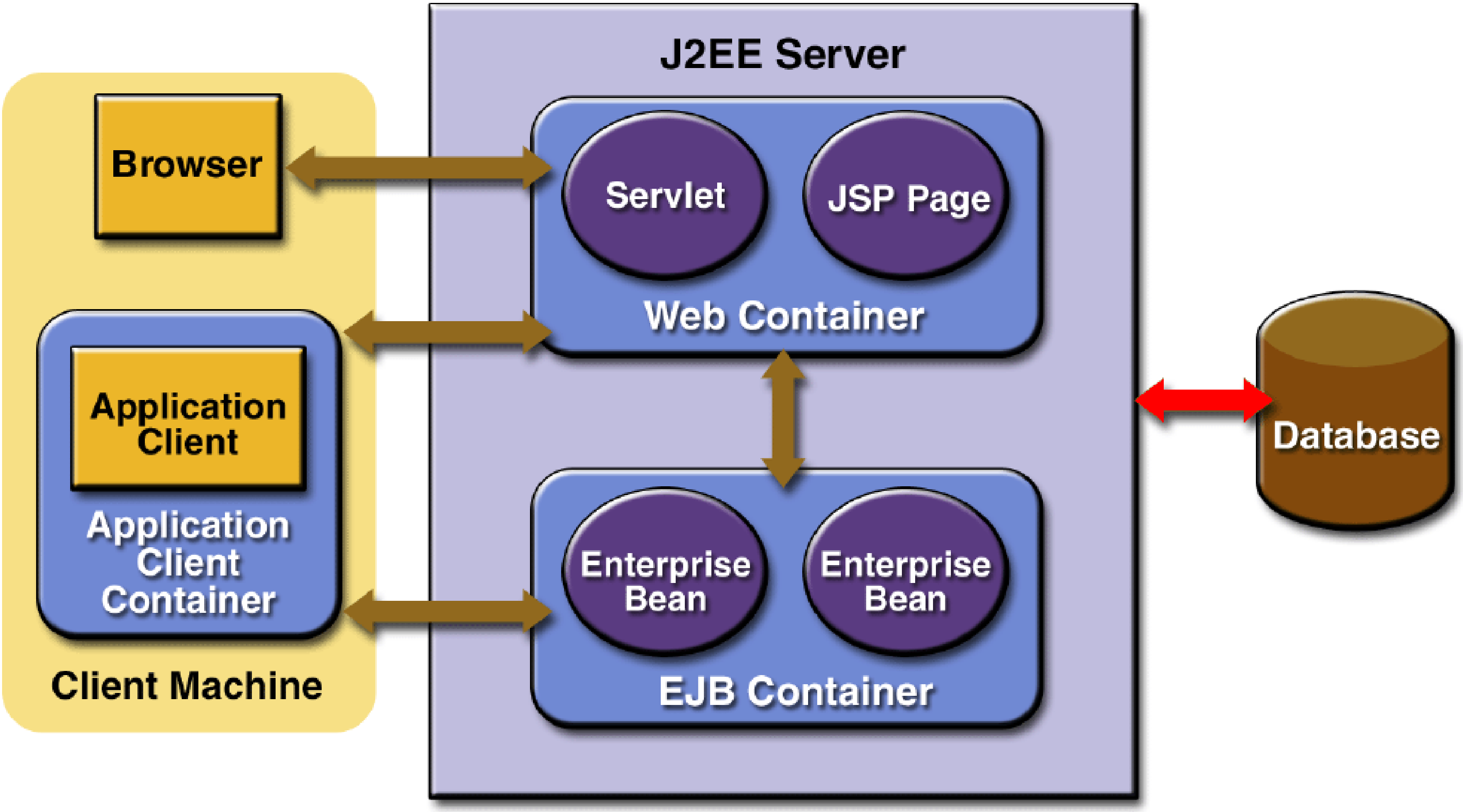

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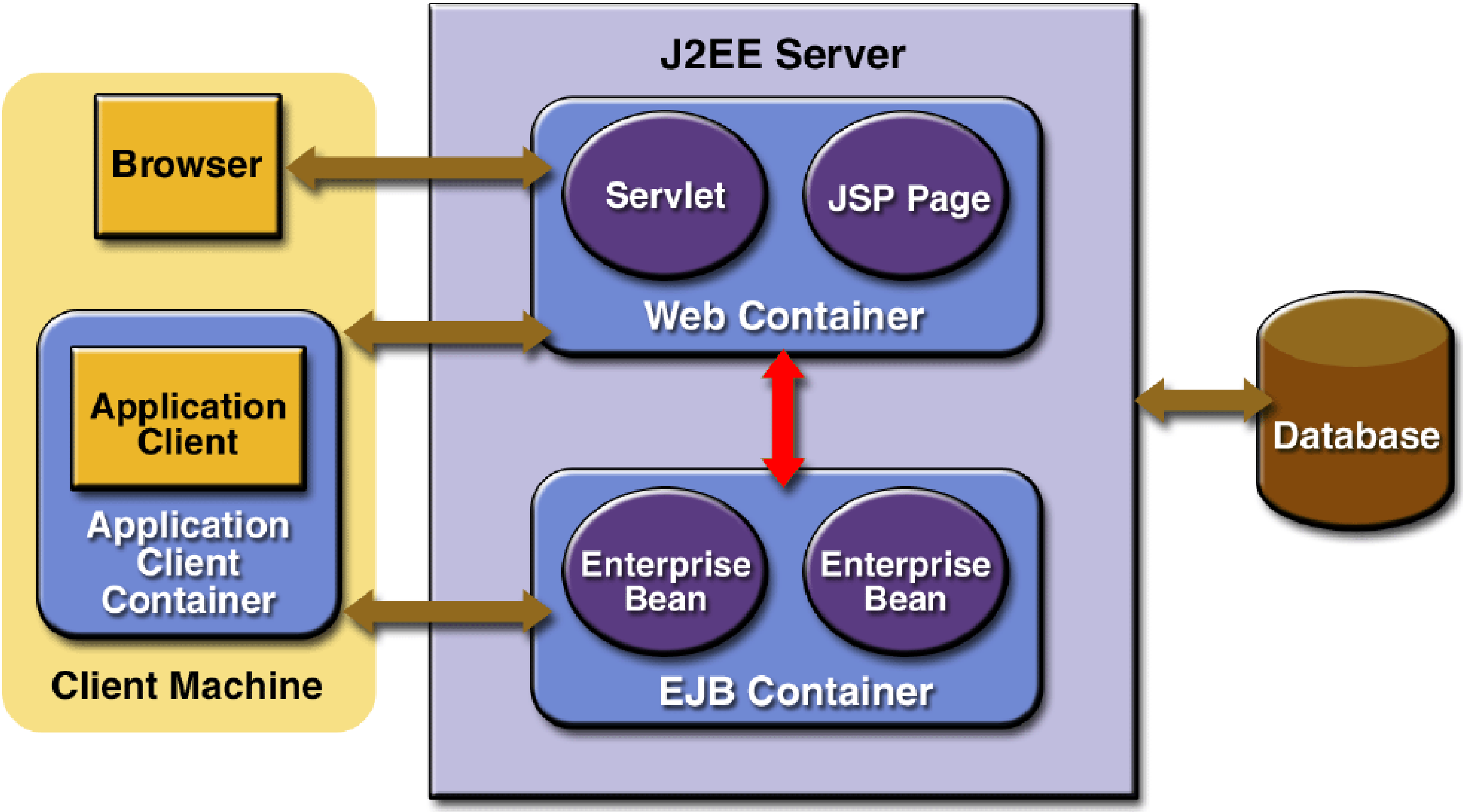

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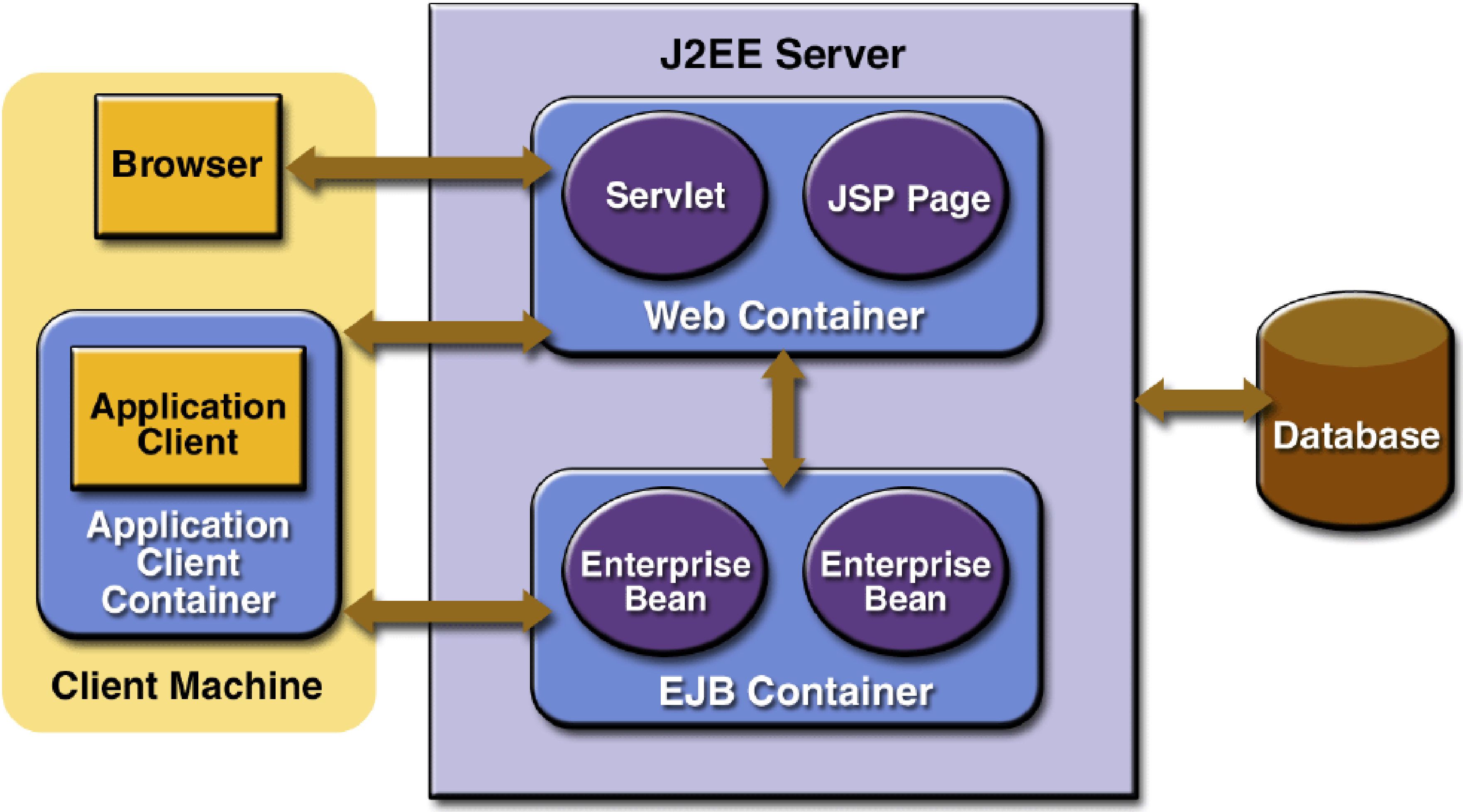

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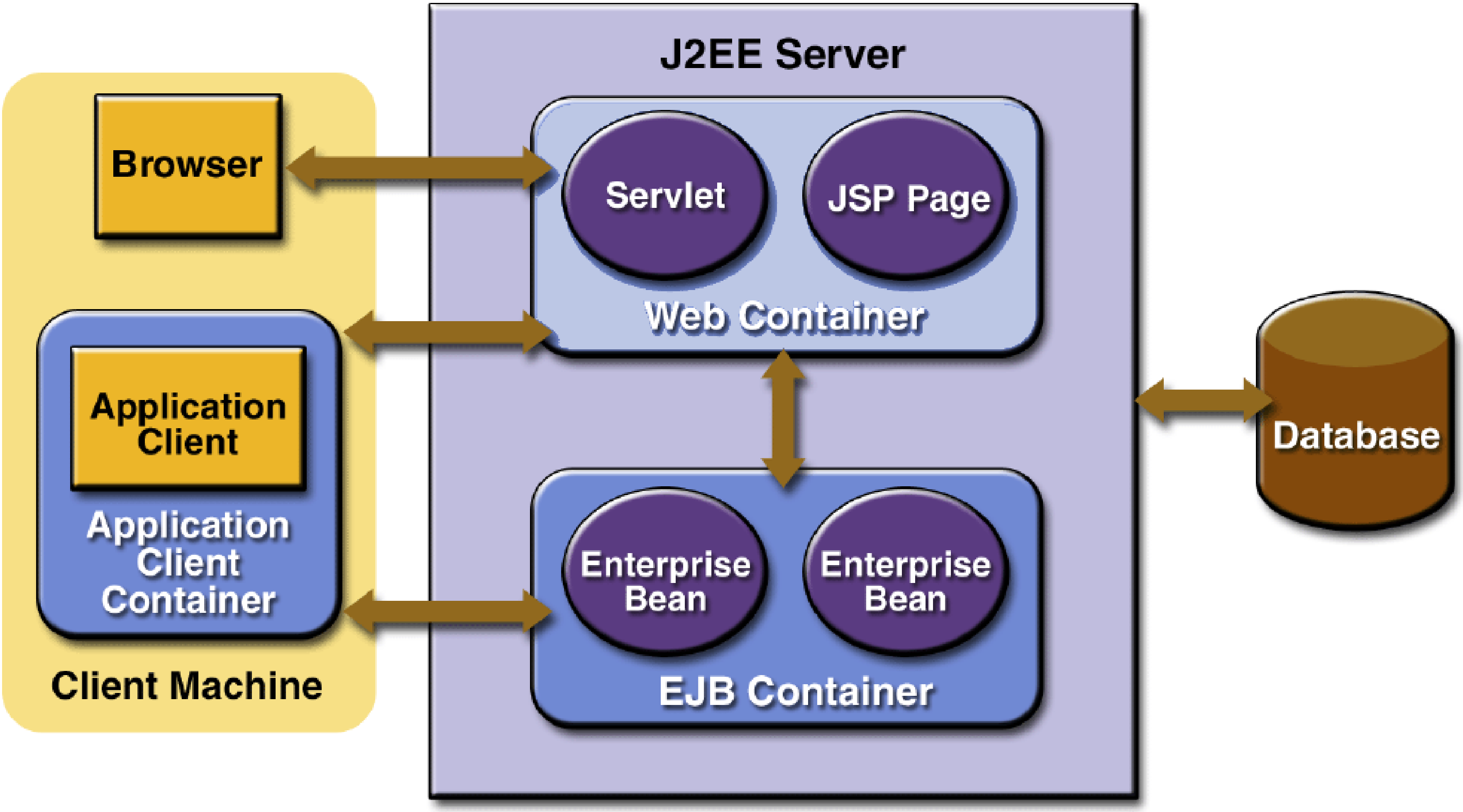

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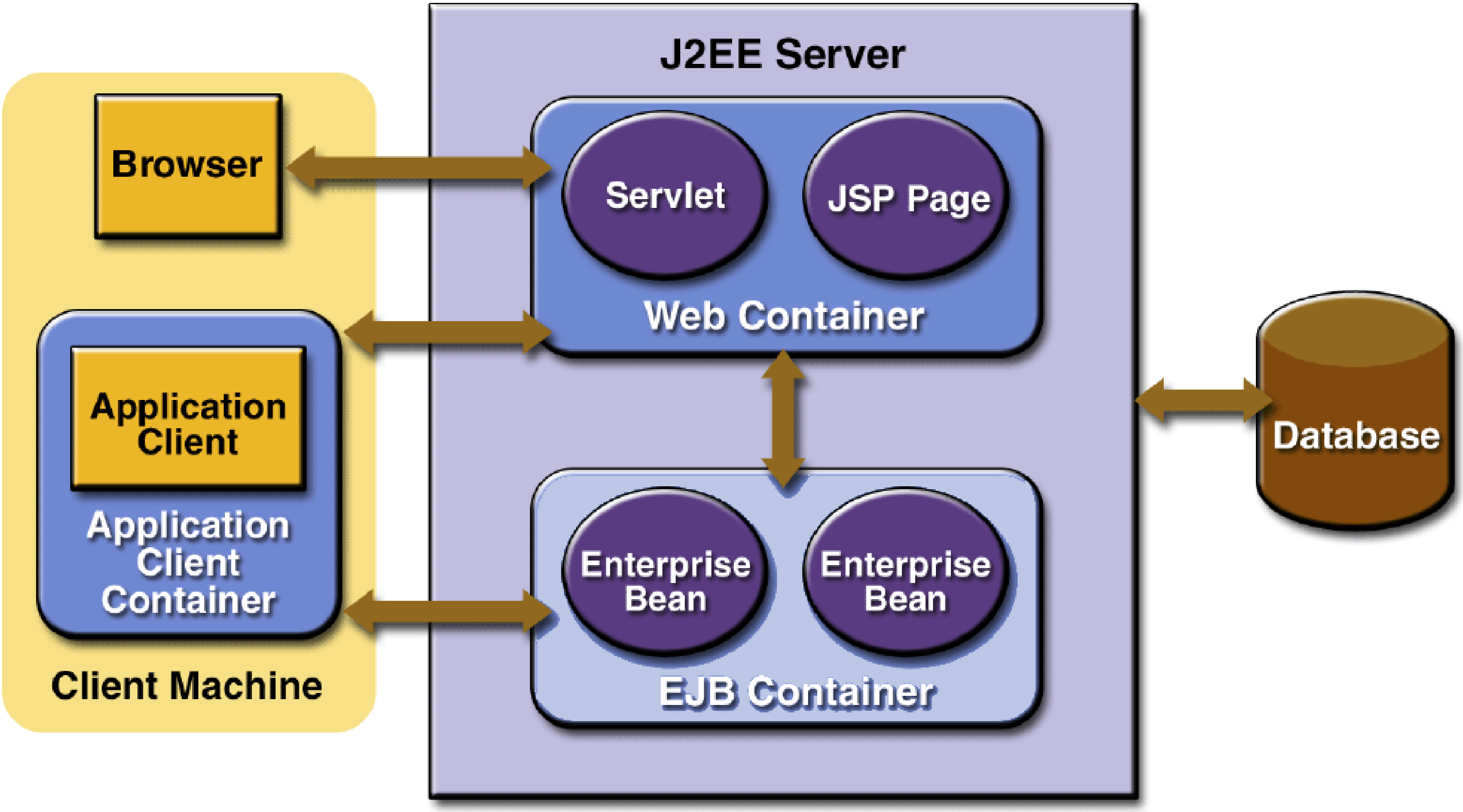

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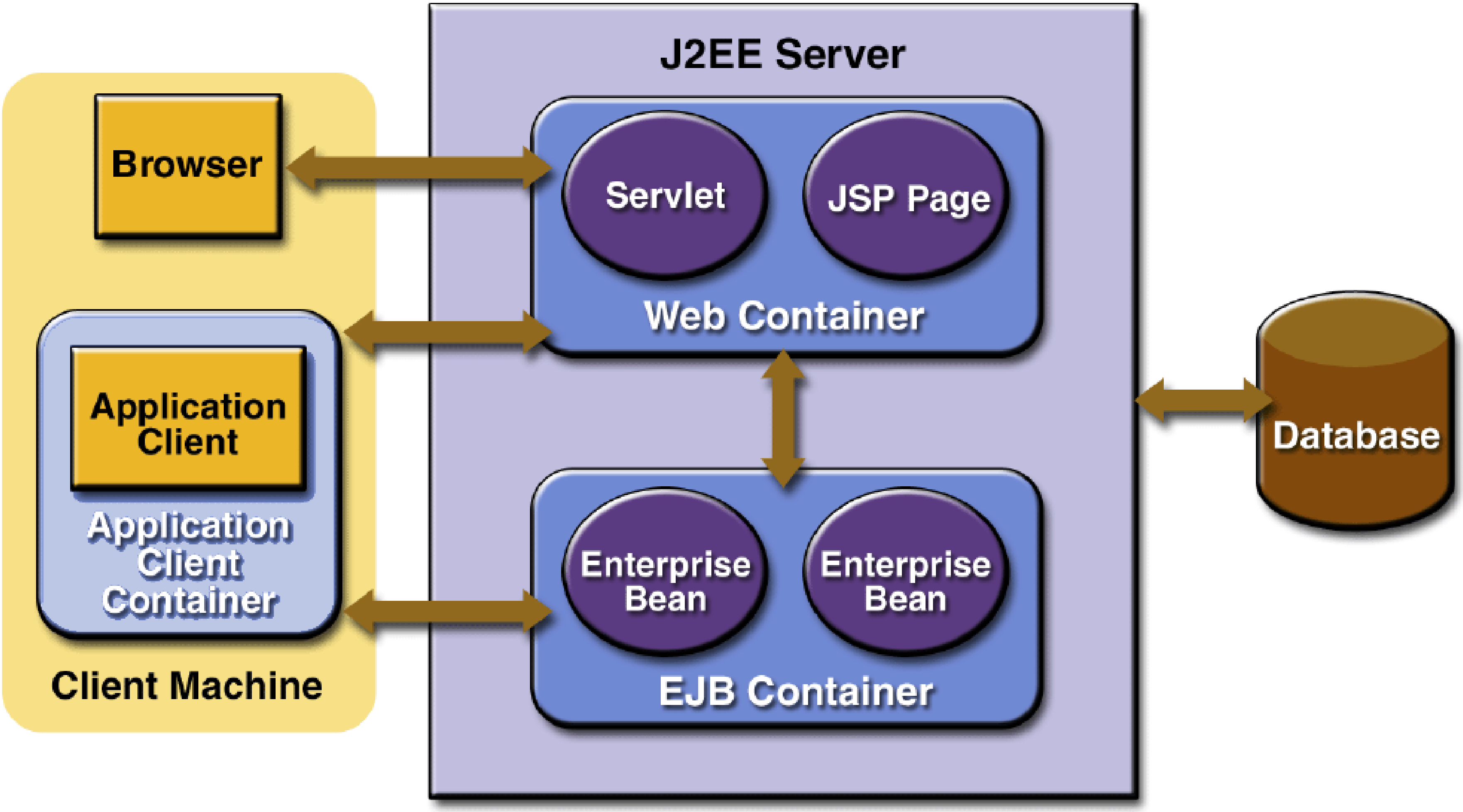

Container Types

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Enterprise JavaBeans (EJB) container Manages the execution of enterprise beans for J2EE applications. Enterprise beans and their container run on the J2EE server.

Web container Manages the execution of JSP page and servlet components for J2EE applications. Web components and their container run on the J2EE server.

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Applet container Manages the execution of applets. Consists of a Web browser and Java Plug-in running on the client together.

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The EAR file contains J2EE modules. Using EAR files and modules makes it possible to assemble a number of different J2EE applications using some of the same components.

No extra coding is needed; it is just a matter of assembling various J2EE modules into J2EE EAR files.

J2EE modules

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An enterprise bean module deployment descriptor, for example, declares transaction attributes and security authorizations for an enterprise bean.

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A J2EE module without an application deployment descriptor can be deployed as a stand-alone module.

Types of J2EE modules

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- Web modules contain JSP files, class files for servlets, GIF and HTML files, and a Web deployment descriptor. Web modules are packaged as JAR files with a `.war` (Web ARchive) extension.

- Resource adapter modules contain all Java interfaces, classes, native libraries, and other documentation, along with the resource adapter deployment descriptor. Together, these implement the Connector architecture for a particular EIS. Resource adapter modules are packages as JAR files with a `.rar` (Resource adapter ARchive) extension.

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- Application client modules contain class files and an application client deployment descriptor. Application client modules are packaged as JAR files with a `.jar` extension.

Web Services Support

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The J2EE platform provides the XML APIs and tools you need to quickly design, develop, test, and deploy Web services and clients that fully interoperate with other Web services and clients running on Java-based or non-Java-based platforms.

Web Services and J2EE XML APIs

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No low-level programming is needed because the XML API implementations do the work of translating the application data to and from an XML-based data stream that is sent over the standardized XML-based transport protocols.

XML and data transport

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This does not necessarily mean the data being transported includes XML tags because the transported data can itself be plain text, XML data, or any kind of binary data such as audio, video, maps, program files, CAD documents or the like.

Extensible Markup Language

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When XML data is exchanged between parties, the parties are free to create their own tags to describe the data, set up schemas to specify which tags can be used in a particular kind of XML document, and use XML style sheets to manage the display and handling of the data.

A first XML example

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- One company might put the XML pricing information through a program to translate the XML to HTML so it can post the price lists to its Intranet.

- A partner company might put the XML pricing information through a tool to create a marketing presentation.

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- Another company might read the XML pricing information into an application for processing.

HTTP-SOAP Transport Protocol

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HTTP is a familiar request and response standard for sending messages over the Internet, and SOAP is an XML-based protocol that follows the HTTP request and response model.

The SOAP portion of a transported message handles the following:

- Defines an XML-based envelope to describe what is in the message and how to process the message.

- Includes XML-based encoding rules to express instances of application-defined data types within the message.

- Defines an XML-based convention for representing the request to the remote service and the resulting response.

WSDL Standard Format

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The J2EE platform provides a tool for generating the WSDL for a Web service that uses remote procedure calls to communicate with clients.

UDDI and ebXML Standard Formats

Other XML-based standards such as Universal Description, Discovery, and Integration (UDDI) and ebXML (Electronic Business XML) make it possible for businesses to publish information on the Internet about their products and Web services where the information can be readily and globally accessed by clients who want to do business.

J2EE APIs—Enterprise JavaBeans

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There are three kinds of enterprise beans: session beans, entity beans, and message-driven beans.

Enterprise beans and databases

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Also, if you choose to have a session bean access the database, you have to use the JDBC API.

J2EE APIs—Java Servlet Technology

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Although servlets can respond to any type of request, they are commonly used to extend the applications hosted by Web servers.

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A JSP page is a text-based document that contains two types of text: static template data, which can be expressed in any text-based format such as HTML, WML, and XML, and JSP elements, which determine how the page constructs dynamic content.

J2EE APIs—Java Message Service

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It enables distributed communication that is loosely coupled, reliable, and asynchronous.

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Using JNDI, a J2EE application can store and retrieve any type of named Java object.

JNDI—naming environments

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A naming environment allows a component to be customized without the need to access or change the component's source code.

A container implements the component's environment and provides it to the component as a JNDI naming context.

JNDI and legacy applications

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This allows J2EE applications to coexist with legacy applications and systems.

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An auto commit means that any other applications viewing data will see the updated data after each database read or write operation.

However, if your application performs two separate database access operations that depend on each other, you will want to use the JTA API to demarcate where the entire transaction, including both operations, begins, rolls back, and commits.

J2EE APIs—JavaMail API

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The J2EE platform includes JavaMail with a service provider that allows application components to send Internet mail.

J2EE APIs—JavaBeans Activation Framework

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It provides standard services to determine the type of an arbitrary piece of data, encapsulate access to it, discover the operations available on it, and create the appropriate JavaBeans component to perform those operations.

J2EE APIs—Java API for XML Processing

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JAXP enables applications to parse and transform XML documents independent of a particular XML processing implementation.

JAXP also provides namespace support, which lets you work with schemas that might otherwise have naming conflicts.

J2EE APIs—Java API for XML Registries

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By using JAXR, developers can learn a single API and get access to both of these important registry technologies.

J2EE APIs—Java API for XML-Based RPC

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JAX-RPC also supports WSDL so you can import and export WSDL documents.

With JAX-RPC and a WSDL, you can easily interoperate with clients and services running on Java-based or non-Java-based systems such as Microsoft's .NET platform.

JAX-RPC and authentication

JAX-RPC relies on the HTTP transport protocol. Taking that a step further, JAX-RPC lets you create service applications that combine HTTP with a Java technology version of the Secure Socket Layer (SSL) and Transport Layer Security (TLS) protocols to establish basic or mutual authentication.

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SSL and TLS ensure message integrity by providing data encryption with client and server authentication capabilities.

J2EE Connector Architecture

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A resource adapter is a software component that allows J2EE application components to access and interact with the underlying resource manager.

Because a resource adapter is specific to its resource manager, there is typically a different resource adapter for each type of database or enterprise information system.

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JAX-RPC and the J2EE Connector Architecture are complementary technologies for enterprise application integration (EAI) and end-to-end business integration.

The J2EE Connector Architecture also provides a performance-oriented, secure, scalable, and message-based transactional integration of J2EE-based Web services with existing EISs that can be either synchronous or asynchronous.

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Existing applications and EISs integrated through the J2EE Connector Architecture into the J2EE platform can be exposed as XML-based Web services using JAX-RPC and J2EE component models.

Simplified Systems Integration

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Such a marketplace encourages vendors to compete, not by trying to lock customers into their technologies but by trying to outdo each other by providing products and services that benefit customers, such as better performance, better tools, or better customer support.

Systems integration with the J2EE APIs

- Unified application model across tiers with enterprise beans
- Simplified response and request mechanism with JSP pages and servlets
- XML-based data interchange integration with JAXP
- Simplified interoperability with the J2EE Connector Architecture
- Easy database connectivity with JDBC
- Enterprise application integration with message-driven beans, JMS, JTA, and JNDI