Java EE – An Introduction to Java Enterprise Edition

Agenda

- What is Java EE?
- Why Java EE?
- Java EE
  - Deliverables (what and why?)
  - Basic Architecture
  - Components and Containers
  - Roles
  - Lifecycle

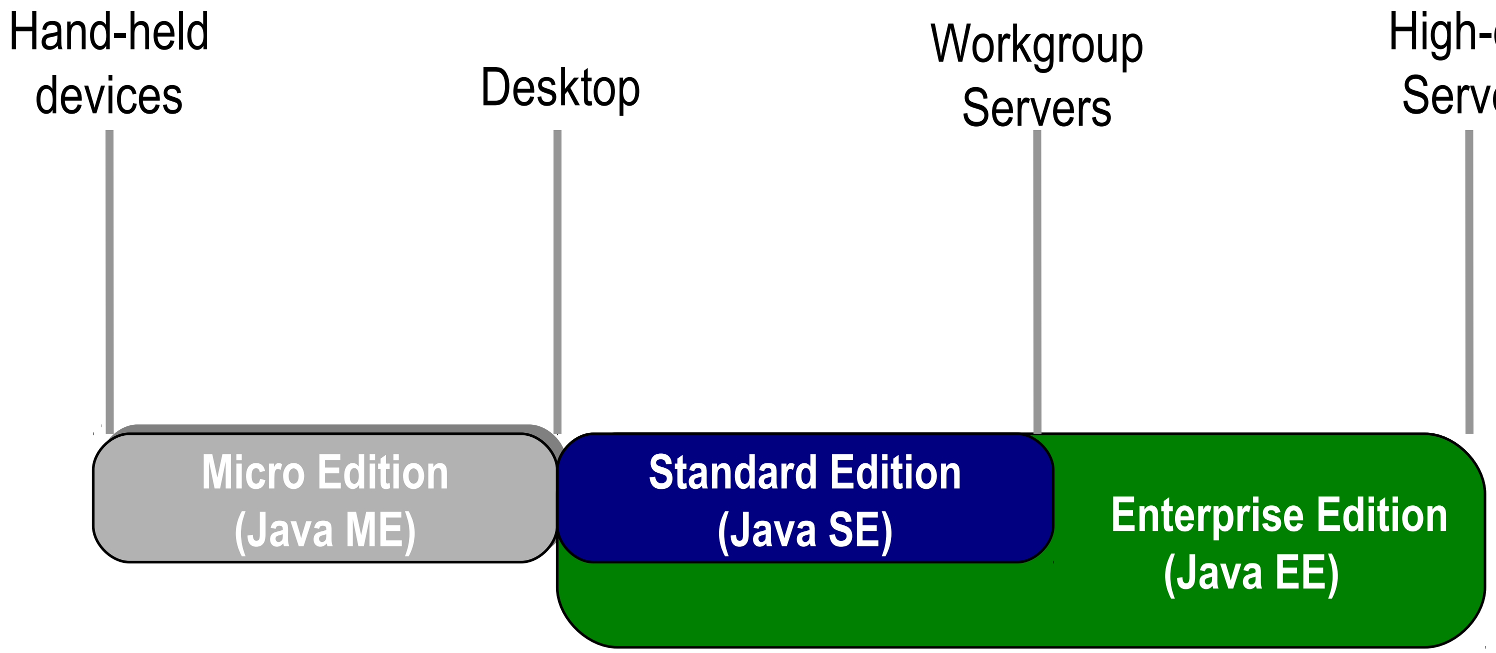
Overview

- A collection of enterprise technologies
- Provides a component based approach to the design, development, assembly and deployment of enterprise applications
- Enables solutions for developing, deploying and managing n-tier server-centric enterprise applications
- An open industry standard (initiative led by Sun Microsystems(now Oracle))

Mission

- To provide a platform-independent, portable, multi-user, secure, and standard enterprise-class platform for server side deployments written in the Java Language
- Implement a standardized execution environment for distributed enterprise applications

The Java Platform



Java EE Bundle

- APIs and technology specification
  - A collection / integration of various enterprise APIs
- Development and Deployment platform
  - A unified platform for server-side development
- Reference Implementation
  - Implements the Java EE specification & demonstrates its viability
- Compatibility tests
  - Certifies a Java EE product, confirms application portability
- Java EE Blueprints
  - Programming model, patterns, guidelines, best practices

Why Java EE?

Platform value for developers

- Can use any Java EE implementation for development and deployment
- Vast amount of Java EE community resources
- Can use off-the-shelf 3rd party components

Why Java EE?

Platform value to vendors

- Vendors work together on specifications and then compete in implementations
  - In the areas of Scalability, Performance, Reliability, and so on
- Freedom to innovate while maintaining the portability of applications

Why Java EE?

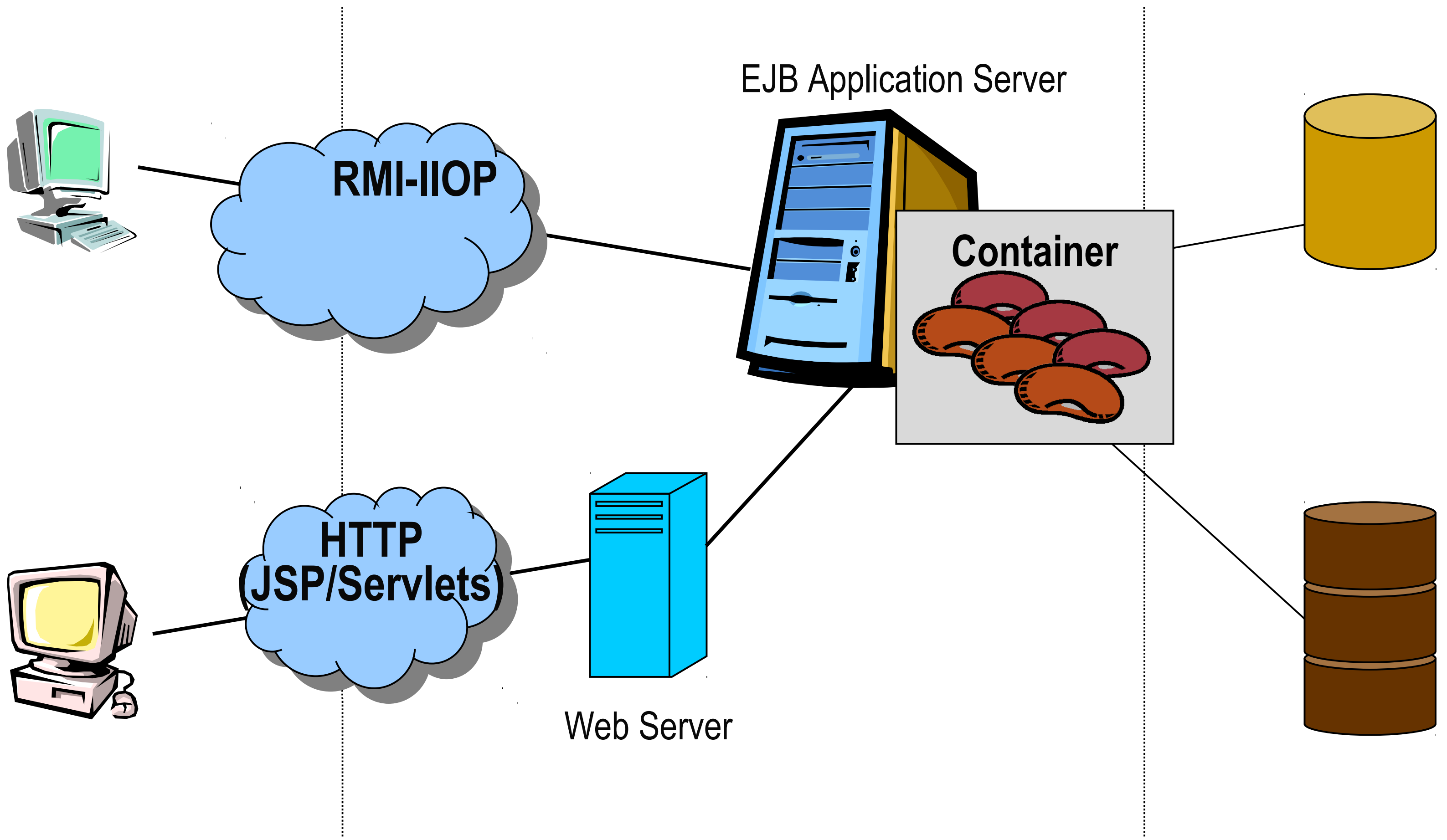
Platform value to Business customers

- Application portability
- Many implementation choices are possible based on various requirements
  - Price (free to high-end), scalability (single CPU to clustered model), reliability, performance, tools & more
- Best of breed of applications and platforms
- Large developer pool

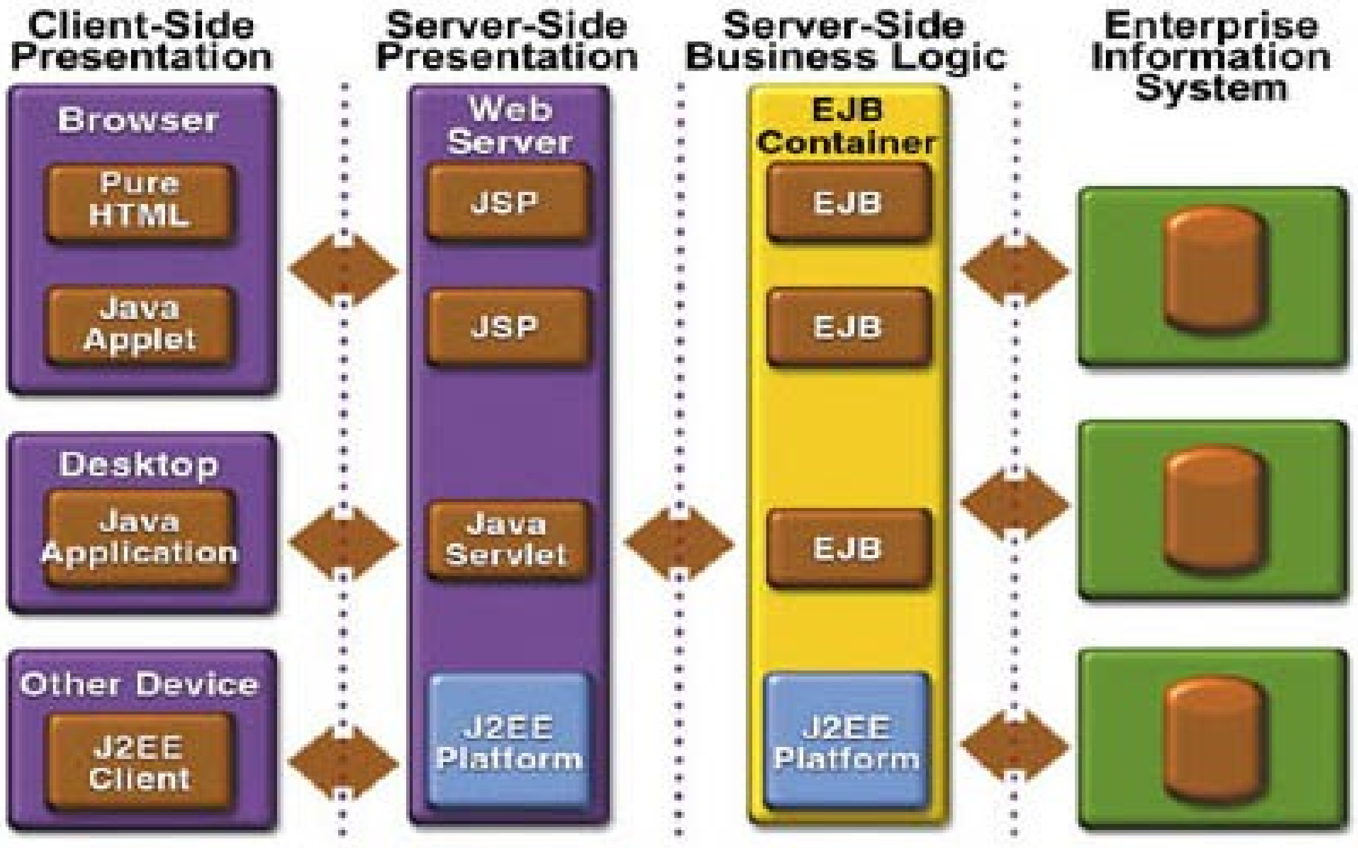
Evolution of Distributed Transactional Computing

- Overview of technologies leading to distributed computing
  - 1 tier, 2 tier, 3 tier, n tier architecture
- Application Servers
  - Proprietary
  - Open standard

N-tier J2EE Architecture

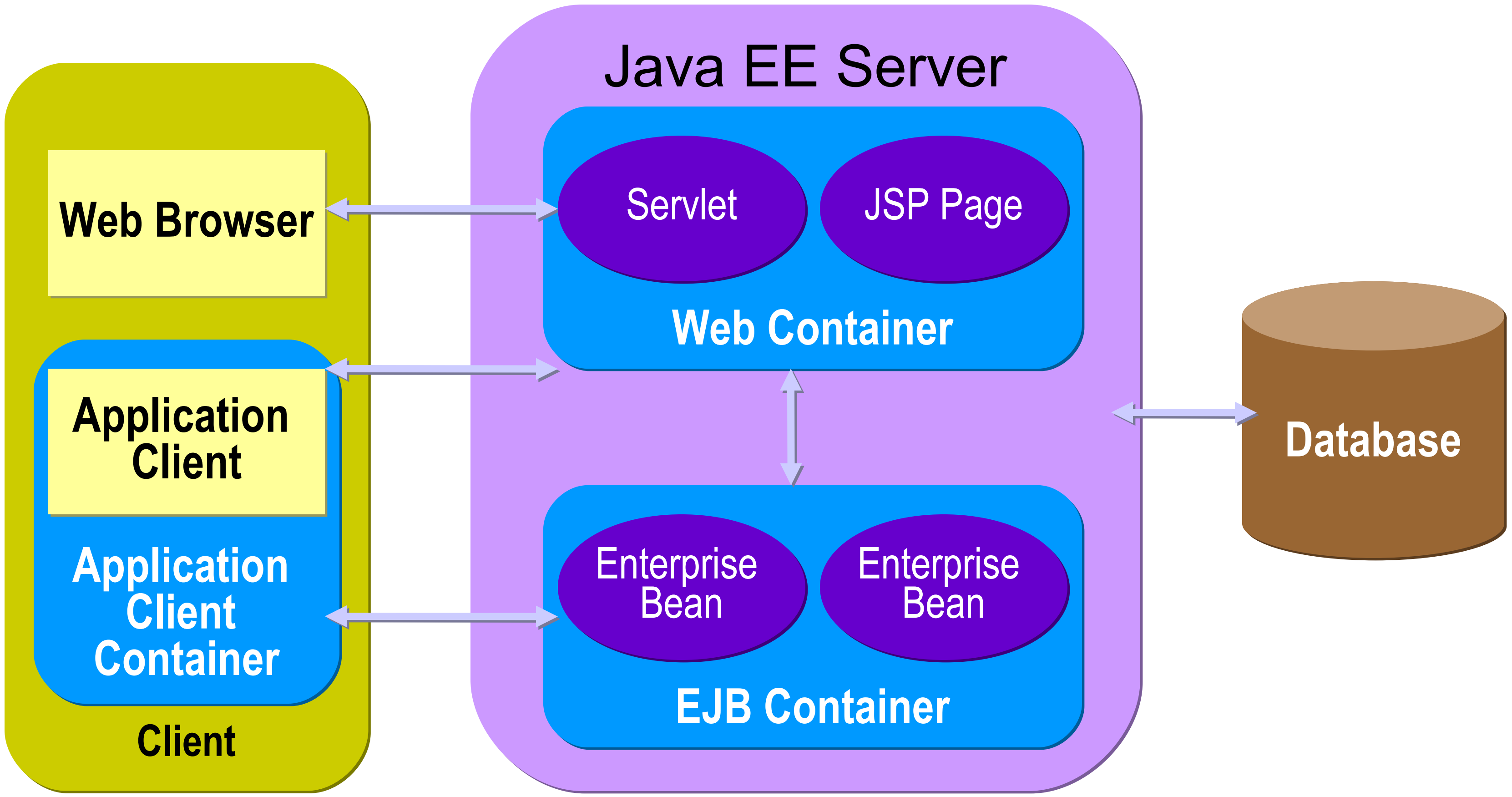


Java EE Architecture – Tiers and Components View



Client Tier Web Tier Business Tier Data Tier

Java EE Server and Containers



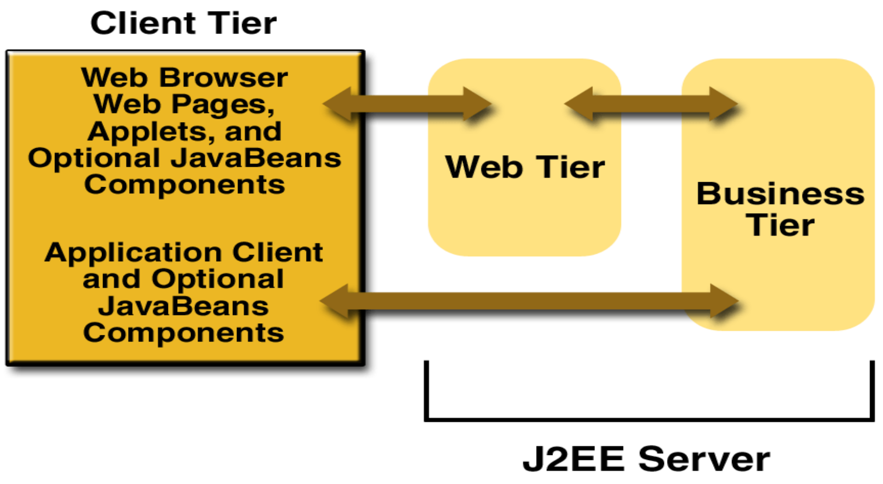
Java EE Components

- The Java EE platform uses a multi-tiered distributed application model
- The Java EE application components parts comprise:
  - Client-tier components (run on the client machine).
  - Web-tier components (run on the Java EE server).
  - Business-tier components (run on the Java EE server).
  - Enterprise information system (EIS)-tier software (runs on the EIS server).

☝ Essentially considered to be *three-tiered application*, because of being distributed over client, J2EE server and the database.

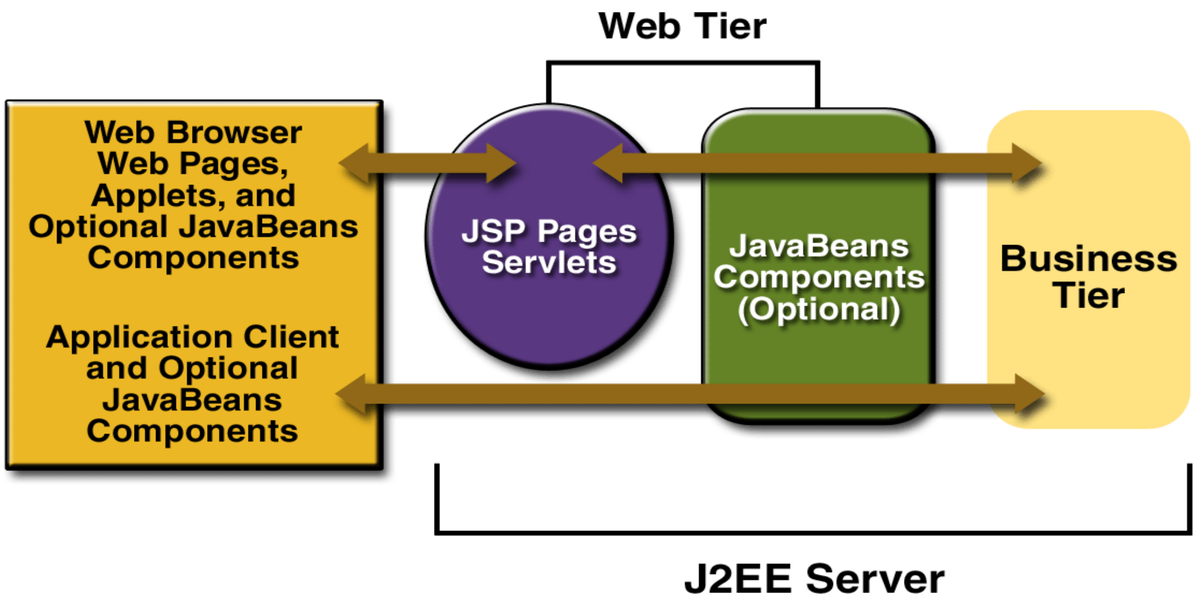
Java EE Components: Client Tier

- Client
  - Web clients (web-browser, web pages, applets)
  - Application client (application user interface built using Swing or AWT, or a command line interface)
  - CORBA IIOP complaint clients


Client Tier
Web Browser Web Pages, Applets, and Optional JavaBeans Components
Application Client and Optional JavaBeans Components
Web Tier
Business Tier
J2EE Server

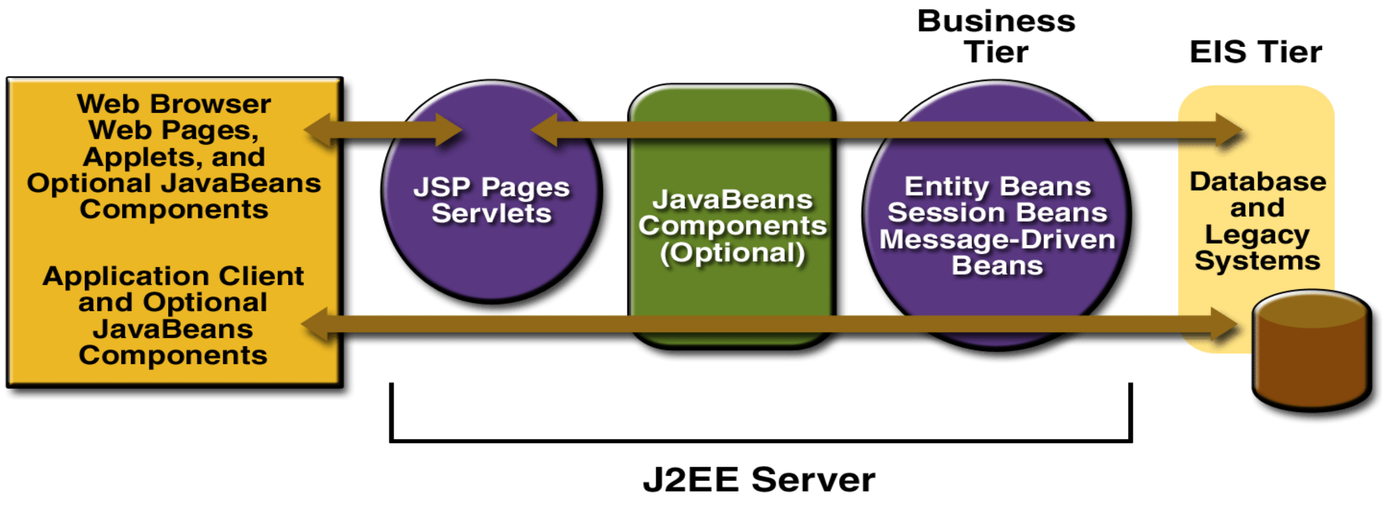
Java EE Components: Web-tier

- Web components
  - Servlets or JSP pages
  - Java Beans (optional)


Web Tier
Web Browser Web Pages, Applets, and Optional JavaBeans Components
Application Client and Optional JavaBeans Components
JSP Pages Servlets
JavaBeans Components (Optional)
Business Tier
J2EE Server

Java EE Components: Business tier

- Business Components
  - Enterprise Beans handle the application logic
    - Separates business process (session beans) and data component (entity beans)
  - Applications requiring messaging facility use JMS


Business Tier
EIS Tier
Web Browser Web Pages, Applets, and Optional JavaBeans Components
Application Client and Optional JavaBeans Components
JSP Pages Servlets
JavaBeans Components (Optional)
Entity Beans Session Beans Message-Driven Beans
Database and Legacy Systems
J2EE Server

Java EE Components: Data tier

- **Application Database Server**
  - Any relational database (eg Oracle, MS SQL, etc)
- **Enterprise Information System (EIS)**
  - Includes enterprise systems like ERP, mainframe transaction processing, database systems and other legacy information systems
  - J2EE applications often rely on this tier to store the enterprise's business critical data

Container Services

- Security
- Transaction Management
- Naming and directory
- Remote connectivity
- Lifecycle management
- Persistence
- Concurrency
- Resource Pooling

Container Types

- The deployment process installs Java EE application components in the Java EE containers
  - EJB container
  - Web container
  - Application client container / Applet container
- The Java EE server provides EJB and Web containers and is the operating run-time environment

Java EE Technologies

- Component Technology
  - Applet, application clients, Enterprise beans, web components (JSP / Servlets)
- Service Technology
  - JDBC, JNDI, JTS, Connector Architecture, Web Services etc
- Communication Technology
  - RMI-IIOP
  - Internet protocols (HTTP, SSL, TCP/IP)
  - Messaging (JMS, Java Mail)

Java EE APIs (Bundled)

Java SE

- Java SDK
  - Java Standard APIs

Java EE

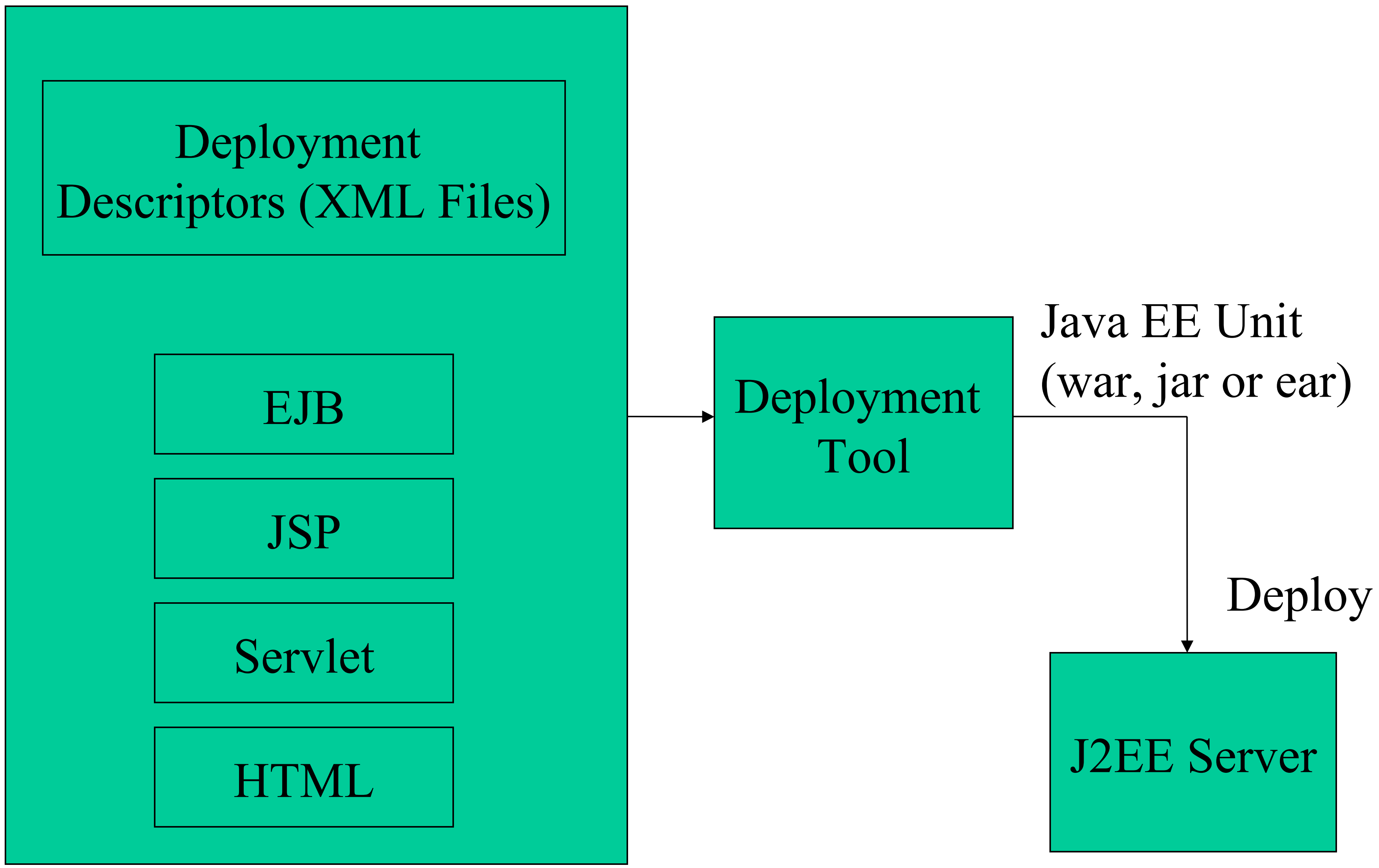
- Enterprise JavaBeans (EJB)
  - Aritecture for building server-side components
- Java Remote Method Invocation (RMI) & RMI-IIOP
  - Method invocation across Java virtual machines. Can also integrate with other clients comfirming CORBA IIOP specification
- Java Naming and Directory Interface (JNDI)
  - Naming service for locating resources over the network
- Java Database Connectivity (JDBC)
  - Java interface to relational database
- Java Servlets & Java Server Pages (JSP)
  - Technology allowing dymanic web content generation
- Java Activation Framework (JAF)
- J2EE Connector Architecture

Java EE APIs (Bundled) contd …

- Java Messaging Service (JMS)
  - Enables asynchronous communication, including point-to-point and publish/subscribe messing
- Java IDL
  - Java technology based CORBA ORB implementing a subset of CORBA specification
- Java Mail
  - Mailing APIs
- Java API for XML Parsing (JAXP)
  - XML parsing and manipulation. Used to describe EJB components, file scripts
- Java Transaction API (JTA) and Java Transaction Service (JTS)
  - Used to manage transactions
- Java Authentication and Authorization Service (JAAS)
  - Security services API
- Others (performance specific, not mandated by the specification)
  - Load balancing, data caching, transparent fail over, etc

Java EE Application Assembly and Deployment

- Applications are packaged into one or more standard units for deployment to any Java EE platform-compliant system
- Each unit contains
  - a functional component or components (enterprise bean, JSP page, servlet, applet, etc.),
  - a standard deployment descriptor that describes its content,
  - J2EE declarations which have been specified by the application developer and assembler.
- Once the unit is produced, is ready for deployment


Deployment Descriptors (XML Files)
EJB
JSP
Servlet
HTML
Deployment Tool
Java EE Unit (war, jar or ear)
Deploy
J2EE Server

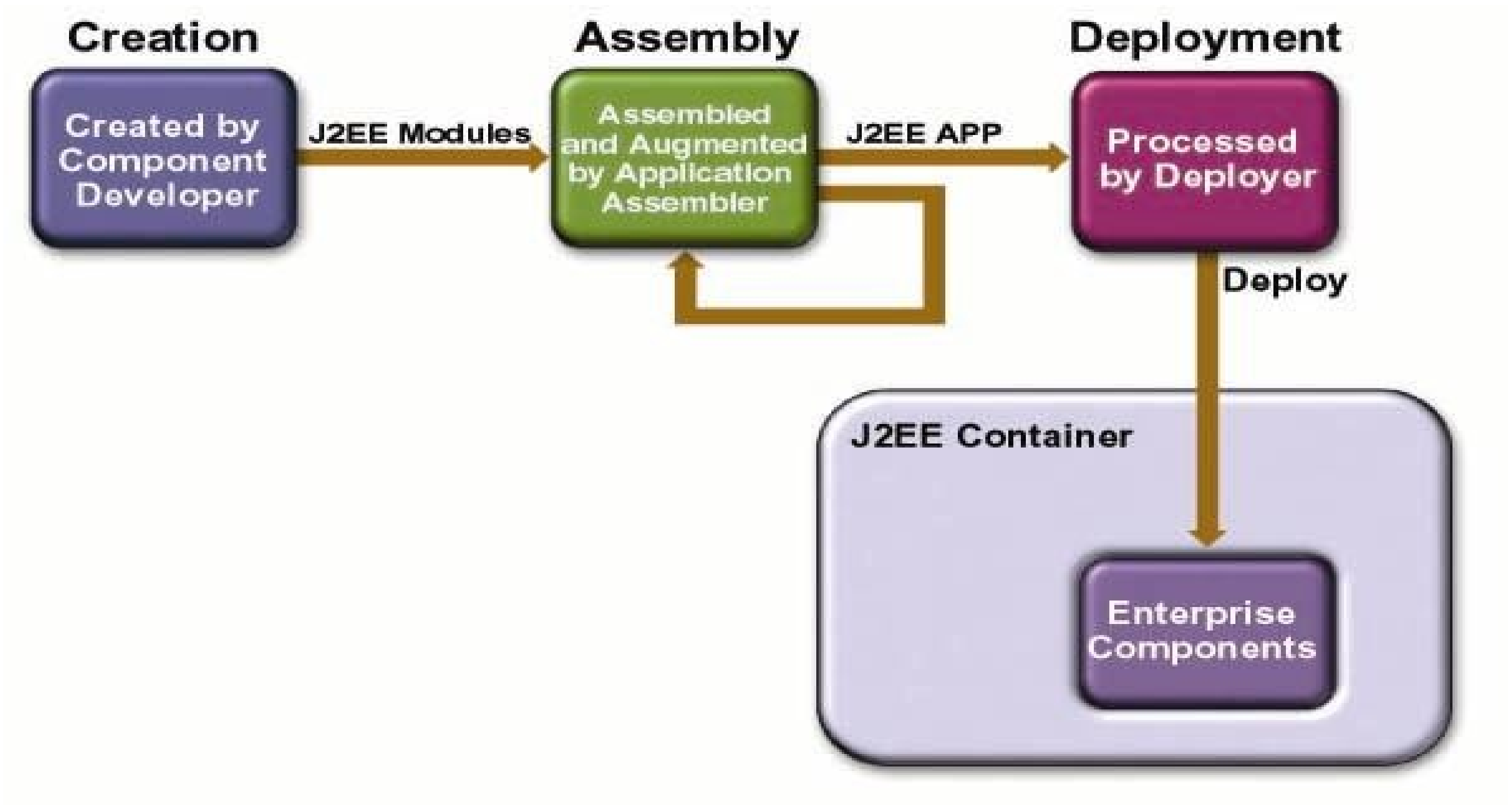
Java EE Roles

- Java EE product provider
  - One who designs and makes available the Java EE platform, APIs and other features defined in the Java EE specification
- Component Provider
  - One who provides web components, enterprise beans, applets or application clients for use in J2EE applications.
- Application Assembler
  - One who gets the components and assembles it into an application

Java EE Roles (continued…)

- Application Deplorer and Administrator
  - One who configures and deploys the J2EE application, administers and monitors the deployment
- Tool provider
  - One who creates development, assembly and packaging tools used by component providers, assemblers and deplorers

Java EE Lifecycle



Java EE Application Anatomies

- 4-tier Java EE applications
  - HTML client, JSP/Servlets, EJB, JDBC/Connector
- 3-tier Java EE applications
  - HTML client, JSP/Servlets, JDBC
- 3-tier Java EE applications
  - EJB standalone applications, EJB, JDBC/Connector
- B2B Enterprise applications
  - Java EE platform to Java EE platform through the exchange of JMS or XML-based message

References

- Java EE Tutorial, Sun Microsystems (now Oracle)
- Simplified guide to the Java EE Platform, Enterprise Edition, Sun Microsystems (now Oracle)
- Sun TechDays Conference 2000-2001 slides,
  - Sun Microsystems
- Mastering Enterprise JavaBeans, 3rd Edition
  - By Ed Roman