

## J2EE Overview

MSIS 531 – Spring 2006

## Learning Goals

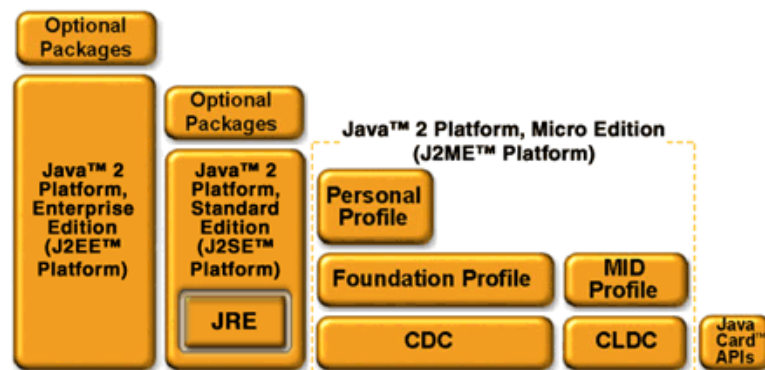
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- Introduction to J2EE
- Discuss the key technologies within J2EE that we'll consider:
  - Servlets
  - JSP/JSF
  - EJB
  - JDBC
- Brief mention of related technologies
- J2EE applications and packaging

## The Java 2 Platform

- Platform introduced June, 1999
- J2SE – Java 2 Standard Edition
  - Java for the desktop / workstation
  - <http://java.sun.com/j2se>
- J2ME – Java 2 Micro Edition
  - Java for the consumer device
  - <http://java.sun.com/j2me>
- J2EE - Java 2 Enterprise Edition
  - Java for the server
  - <http://java.sun.com/j2ee>

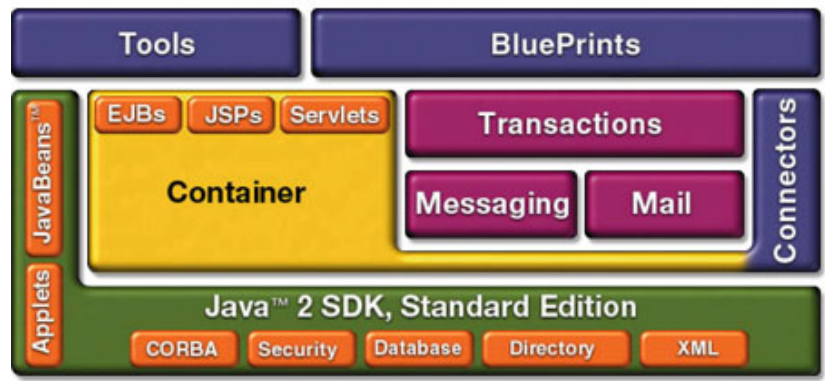
## The Java 2 Platform



## J2EE Technologies

- Java Servlets
- JSP
- EJB
- JMS
- JDBC
- JNDI
- JTA / JTS
- JavaMail
- JAAS
- XML
- ...

## J2EE Components



## Java Servlets

- Our primary user interface for MSIS531 will be the web browser
  - Most Java courses start from the command line
  - We'll do a couple of examples from there, then use the web for everything else
- Servlets are the Java technology for extending and enhancing web servers
  - Component-based, platform-independent method for building web-based applications
  - Access to all Java APIs
- As we will see, a servlet is just a Java class with special attributes to produce HTML as output

## JSP – JavaServer Pages

- JavaServer Pages technology uses XML-like tags and scriptlets written in Java to encapsulate the logic that generates the content for the page
- Any and all formatting (HTML or XML) tags are passed directly back to the response page
- Separates page logic design and display
- We'll use JavaServer Faces, the follow-on technology to JSP; more on this next time
- Behind the scenes, JSP/JSF pages are converted to servlets

## EJB – Enterprise Java Beans

- Enterprise JavaBeans™ is the server-side J2EE component architecture
  - Enables rapid, simplified development of distributed, transactional, secure and portable Java applications.
  - EJBs are components that are deployed into containers
  - The container provides services:
    - Loading / Initialization
    - Transactions
    - Persistence
    - Communication with EJB clients
    - Enterprise Naming Context (JNDI name space)

## The Spring Framework – EJB “lite” (?)

- EJB downside: complex technology stack
  - Get it all, even if not used
  - May be required to implement unused portions
  - Spring was developed (in part) out of frustration w/EJB
    - Lightweight “container” for Java objects
    - Abstraction of data access
    - Full transaction support
    - MVC web framework
    - Simplified access to other J2EE APIs
    - Support for AOP
  - An amazing technology

## JMS – Java Message Service

- JMS provides a reliable, flexible service for the asynchronous exchange of critical business data and events.
  - API adds a common provider framework for developing portable, message based applications
- Useful for:
  - Loosely-coupled systems
  - Publish / Subscribe metaphor
  - Integration with other messaging systems

## JDBC – Data Access API

- Java's answer to ODBC
- JDBC is an API that lets you access virtually any tabular data source from a Java program
  - Cross-DBMS connectivity to a wide range of SQL databases
    - We'll use MySQL for MSIS531, but all of the big vendors (including Microsoft) support JDBC access
  - Access to other tabular data sources, such as spreadsheets or flat files
- We'll begin by implementing a JDBC solution
  - Discover both benefits and shortcomings

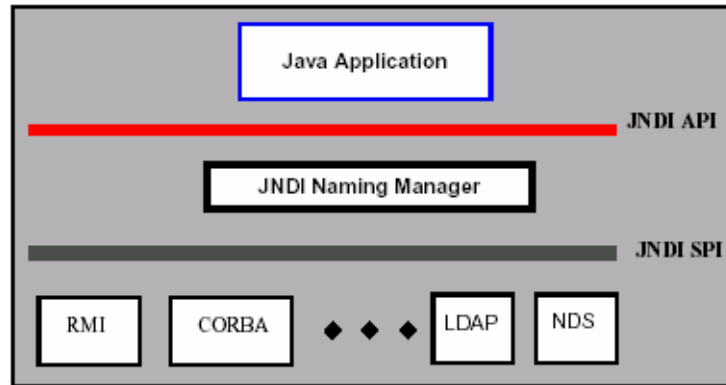
## JDBC shortcomings & Hibernate

- Big issue for Java programmers: mismatch between Java objects and RDBMS tables
  - Ideal outcome: persist an object without concern for underlying implementation, SQL, etc.
- Enter Hibernate: so-called ORM (Object/Relational Mapping) tool
  - Uses XML descriptors as a “glue” layer between classes and tables
  - Support for:
    - Transactions (CRUD)
    - Persistence
    - Lifecycle management

## JNDI – Java Naming and Directory Interface

- JNDI provides naming and directory functionality
- Designed using Java's object model
- Purposes:
  - Java applications can store and retrieve named Java objects of any type
  - JNDI provides methods for performing standard directory operations, such as associating attributes with objects and searching for objects using their attributes
  - Allows applications to take advantage of information in a variety of existing naming and directory services, such as LDAP, NDS, DNS, and NIS(YP)

## JNDI - Layers



## JTA / JTS – Transactions

- The Java Transaction API (JTA) and the Java Transaction Service (JTS) allow J2EE application servers to take the burden of transaction management off of the component developer
- Developers can define the transactional properties of Enterprise JavaBeans™ technology based components during design or deployment using declarative statements in the deployment descriptor
- The application server takes over the transaction management responsibilities

## JavaMail

- The JavaMail API provides a set of abstract classes that model a mail system
- The API provides a platform independent and protocol independent framework to build Java technology-based mail and messaging applications
- J2EE contains JAF – JavaBeans Activation Framework since it is required by JavaMail
- Support offered for common mail protocols:
  - IMAP
  - POP
  - SMTP
  - MIME

## JAAS – Java Authentication and Authorization Service

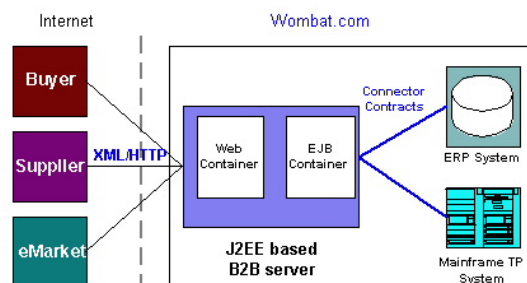
- JAAS provides:
  - *Authentication* of users, to reliably and securely determine who is currently executing Java code, regardless of whether the code is running as an application, an applet, a bean, or a servlet; and
  - *Authorization* of users to ensure they have the access control rights (permissions) required to do the actions performed.
- Sample authentication modules using:
  - Java™ Naming and Directory Interface (JNDI)
  - Unix Operating Environment
  - Windows NT
  - Kerberos, Keystore, etc.

## J2EE and XML

- The J2EE tech stack includes support for a wide (and ever-increasing) range of XML technologies
  - J2EE includes JAXP 1.1 support, as well as Servlet Filters and XML JSP documents
  - The Java API for XML Processing ("JAXP") supports processing of XML documents using DOM, SAX, and XSLT
  - Wide range of open source solutions also available
- We'll look in detail at XML support in the web services section
  - Development goal: "bolt on" XML support without worrying too much about implementation details

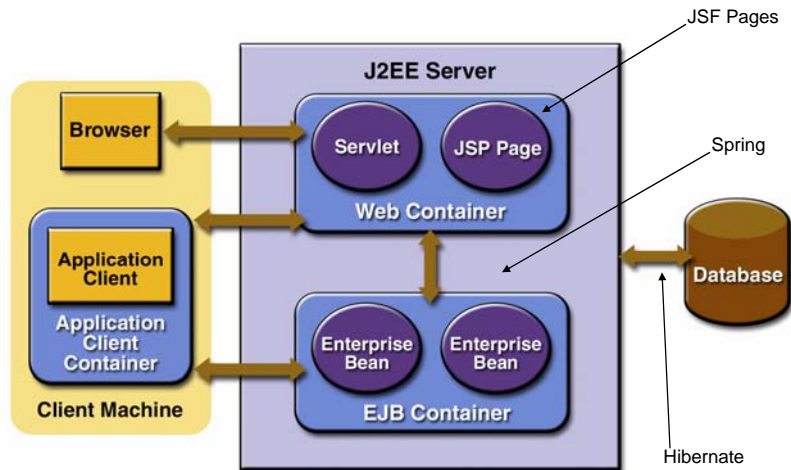
## J2EE Connectors

- The J2EE Connector architecture defines a standard architecture for connecting the J2EE platform to heterogeneous EISs (Enterprise Information Systems)
  - EIS examples: ERP, mainframe transaction processing, database systems, legacy applications not written in Java



## J2EE Applications

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## J2EE Deployment

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- JAR – Java ARchive
  - Java class file
  - EJBs
- WAR - Web ARchive
  - Servlets
  - JSPs
- EAR - Enterprise ARchive
  - Contains other JARs and WARs to form an entire application
- Deployment descriptors
  - XML
  - Required for JARs, WARs, EARs

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