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How to Build an E-Commerce Application using *J2EE*™

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Code Camp Engineer

Sun microsystems

Code Camp **Agenda**

- **J2EE™ & Blueprints**
  - Application Architecture and J2EE
  - Blueprints E-Commerce Application Design
- **Enterprise JavaBeans™ (EJB™)**
  - Designing and implementing the Business Model:
    - **Entity** Beans, **Stateless** and **Stateful Session** Beans
- **Servlets , Java ServerPages™ (JSP™)**
  - Designing and architecting the "View" or Presentation logic
- **Assembling and Deploying** the J2EE™ Application:
  - **Transactions** JTS™ and JTA™
    - Describe how the sample application uses the transaction capabilities of the J2EE™ platform to simplify component development.
  - **Security** How to use J2EE™ security to safeguard your e-commerce application

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Download Code Camps

- **All slides with notes are on your CD**
- **You can download this and other Code Camps :**
  - EJB, Java Performance, J2ME, JINI, JMS, JSP, XML

http://www.sun.com/developer/evangcentral

  - under Events: Developer Code Camps
- **ALSO**
  - You can also ask questions there
  - Listen to audiocasts

J2EE™ & Blueprints **Agenda**

- *Application Architecture and J2EE*
- Sun BluePrints™ Design Guidelines
- Architecture of the sample application

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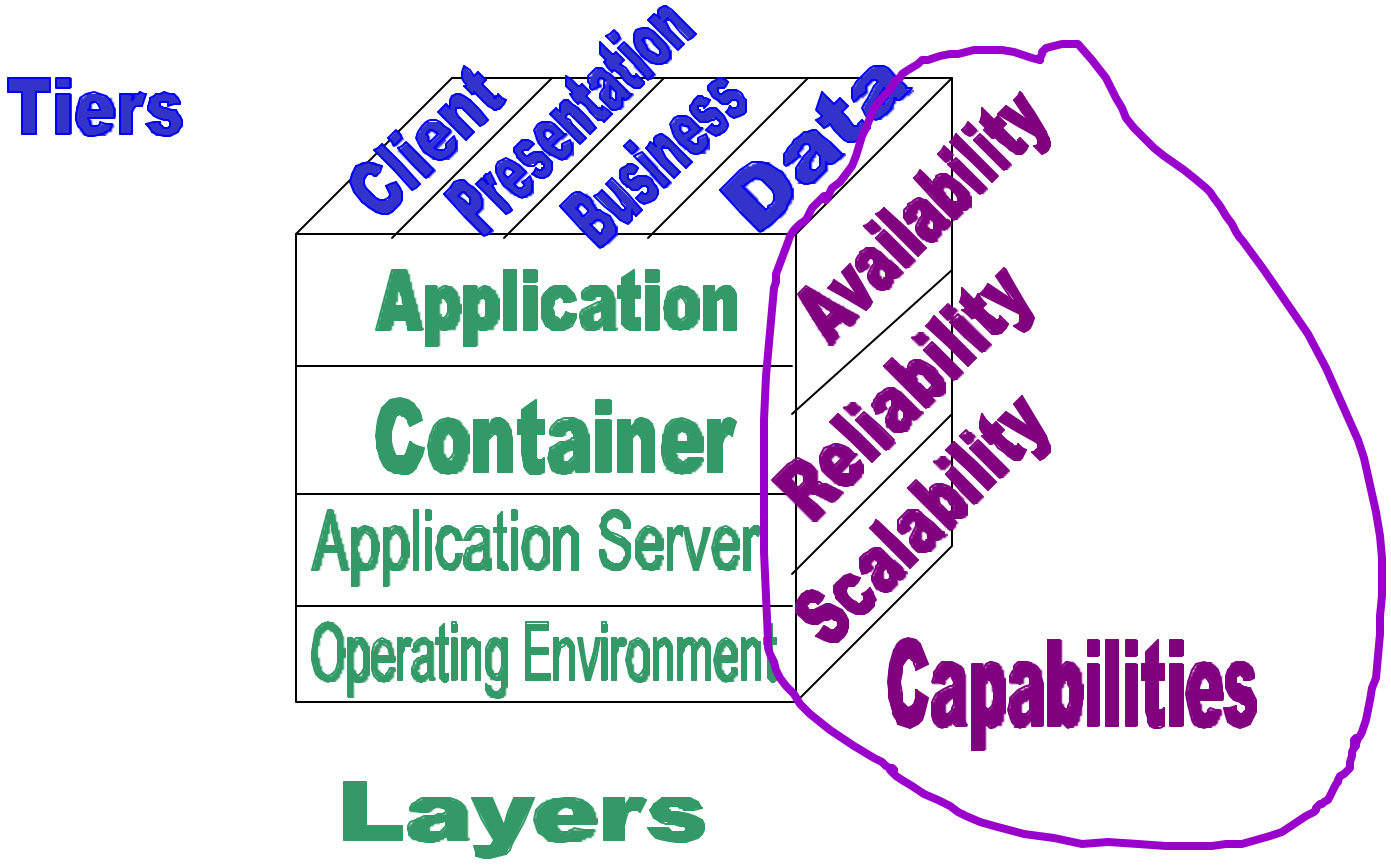
Architecture and the Cube



Architecting your application Using **Tiers** and **Layers affect** the application **Capabilities**

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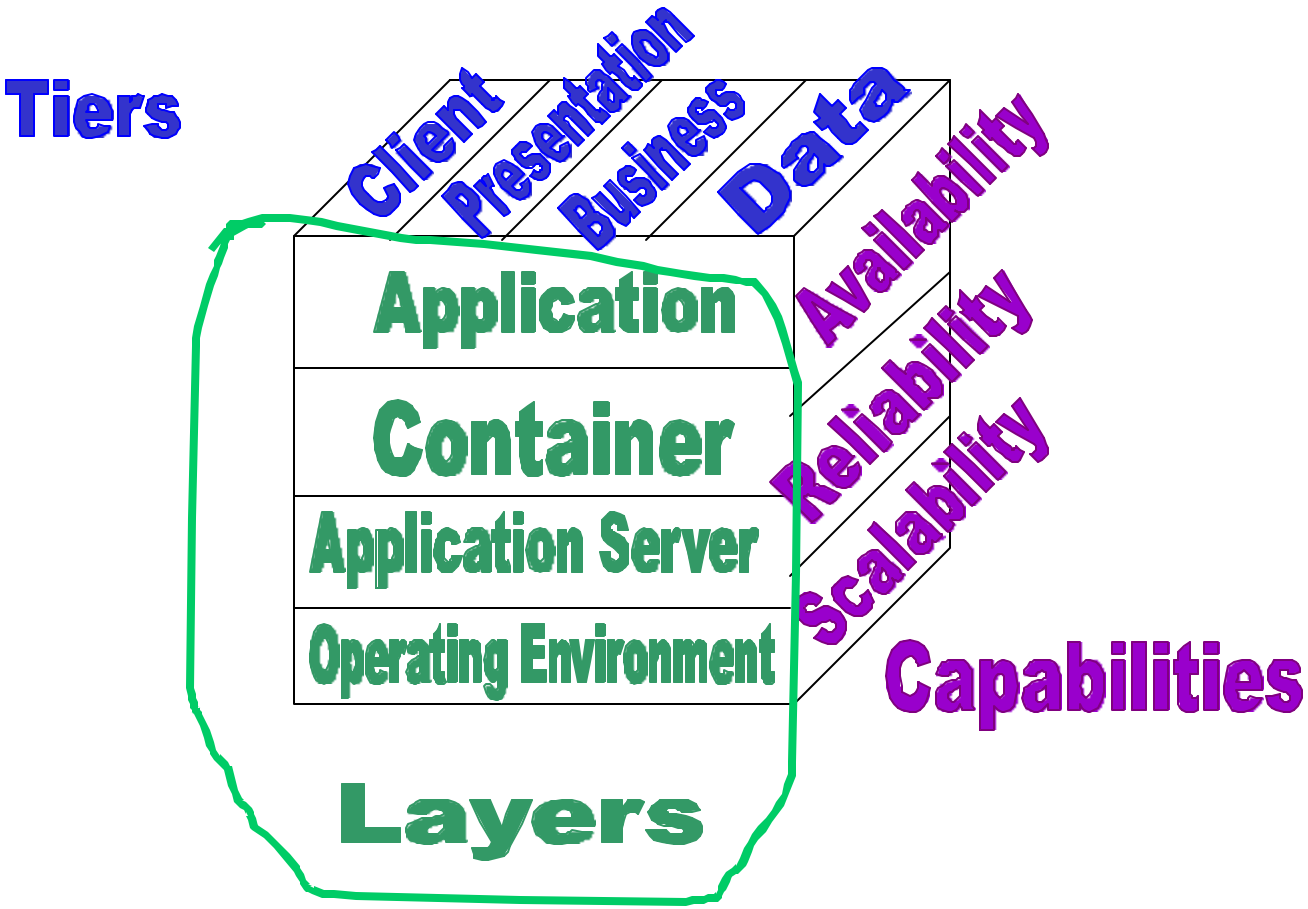
Capabilities = Non-Functional System Requirements

- **Availability**: service is **accessible**
- **Reliability**: **consistency** of application and transactions
- **Capacity**: can serve **# users**
- **Extensibility**: can **add functionality**
- **Flexibility**: can **support changes**
- **Performance**: good **response time**
- **Scalability: can** support **increased load**

Example Architecture Requirements

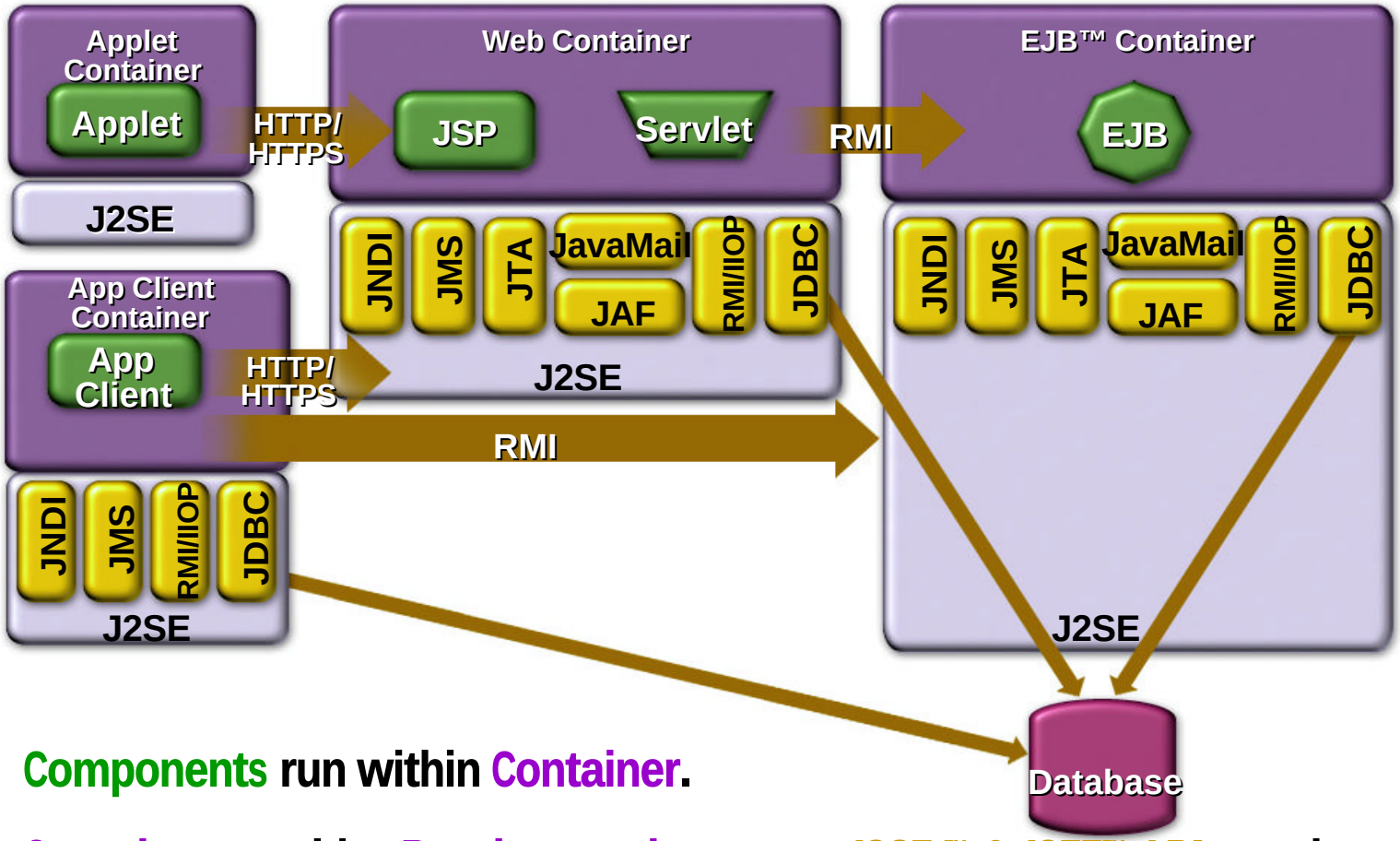
- **E-Commerce Apps:**
  - Many Clients,
  - **lots of reading**,
  - **less updating**,
  - low contention
  - **Need High performance and scalability for Reading data**
- **Insurance Intranet App:**
  - Fewer Clients, **Low concurrency**
  - High transaction isolation level, **Need Higher Consistency**
  - **Reliability of Updates** to DB **more important** than performance for Reading data

The Relationships between the Elements of Architecture



Architecting your application Using **Tiers** and **Layers affect** the application **Capabilities**

J2EE™ Platform Specification



Components run within Container.

Container provides Runtime environment, J2SE ™ & J2EE™ APIs, and remote communication

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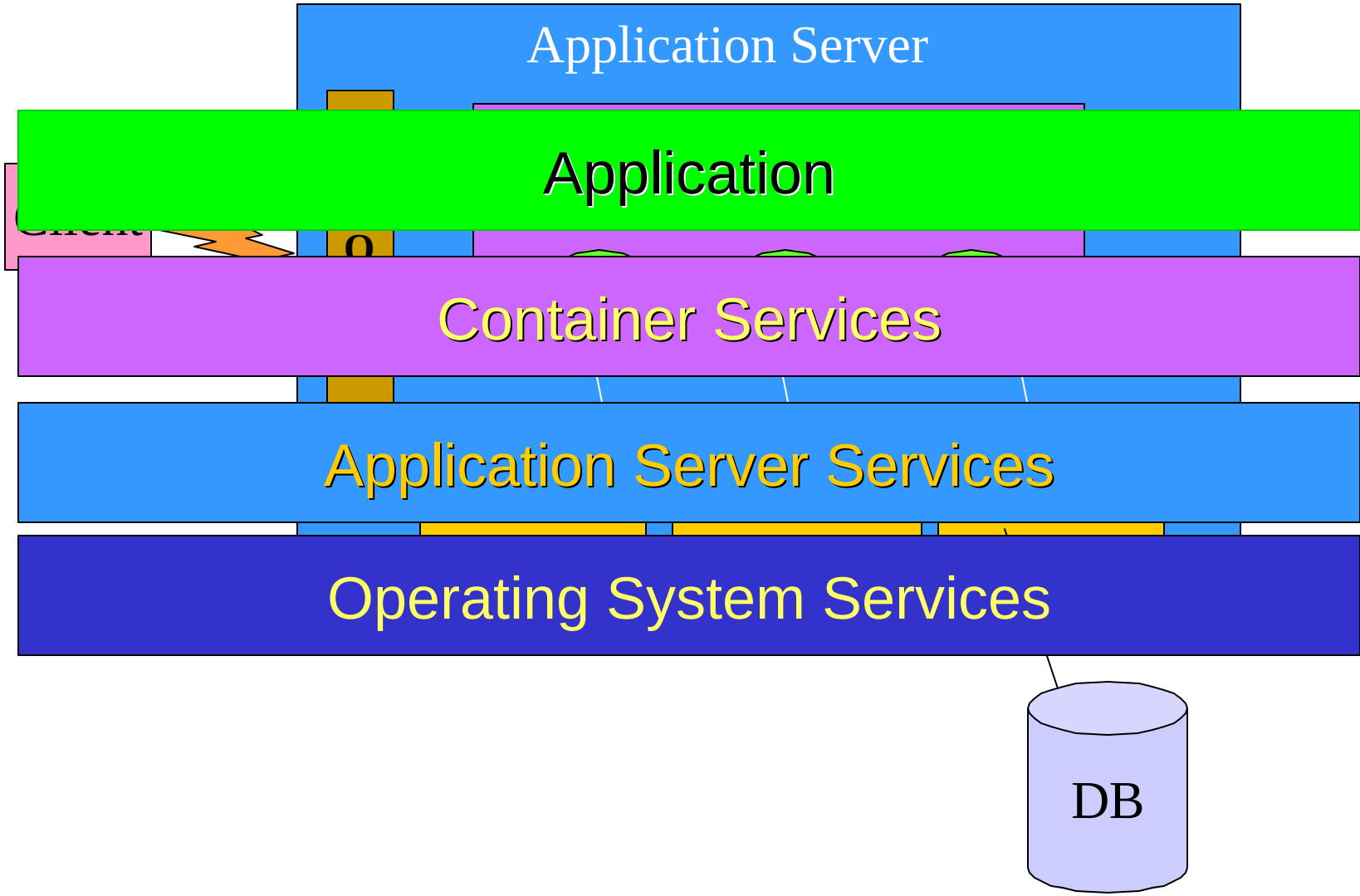
Layers of Services: The Application Server provides services to the Container, which in turn provides services to the EJB.



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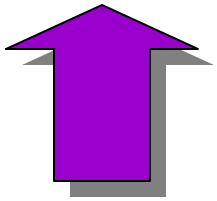
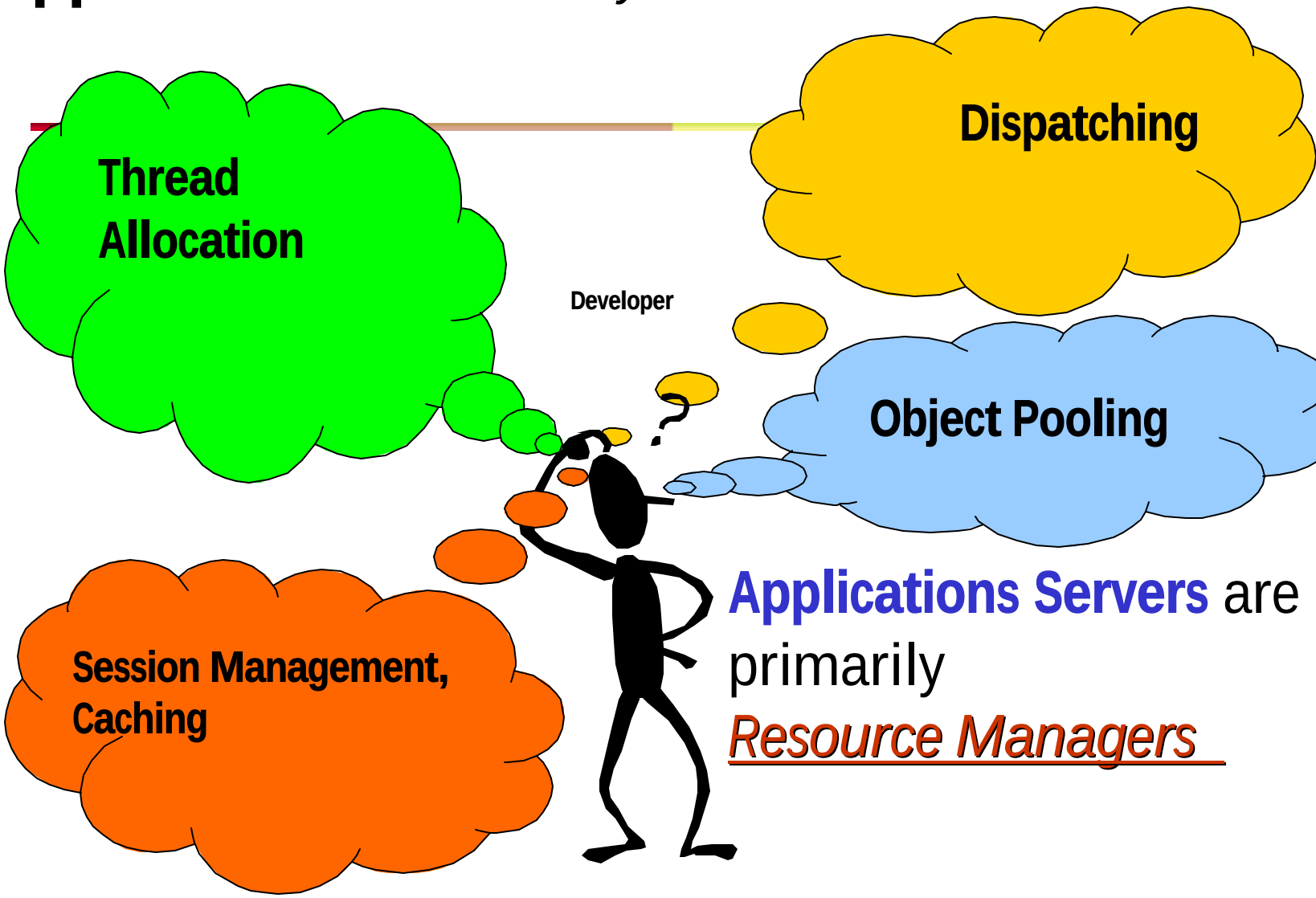
Layers

- Layers are abstractions of underlying implementation
- Each Layer hides implementation details of layer below
- The Container provides components services of the layers below
- Advantages:
  - Easier development, maintenance for high performance, scalability
  - Does not require developer to know complex details of distributed protocols, concurrency, transactions, load balancing, security, resource pooling and sharing…



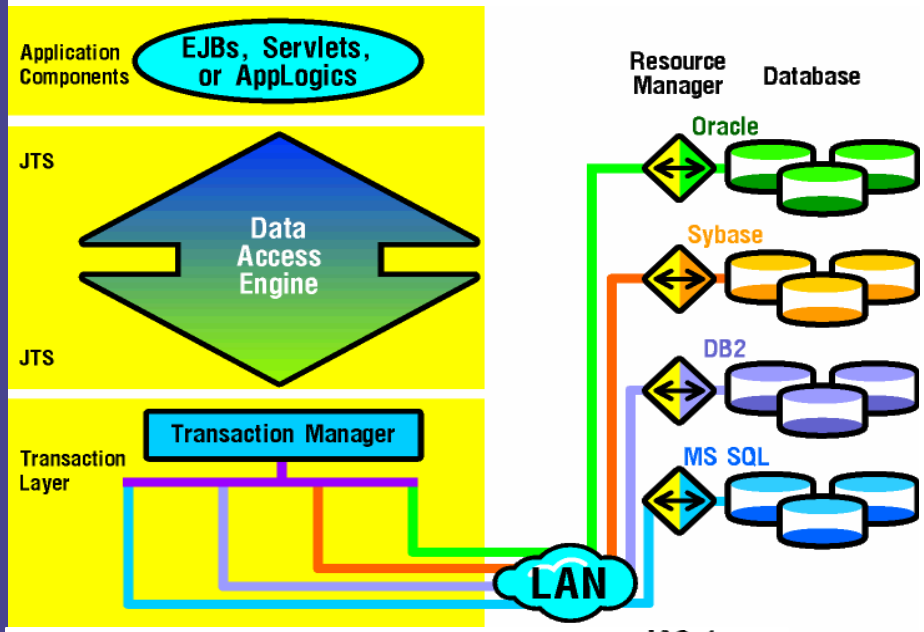
Application Server *: Key Services*

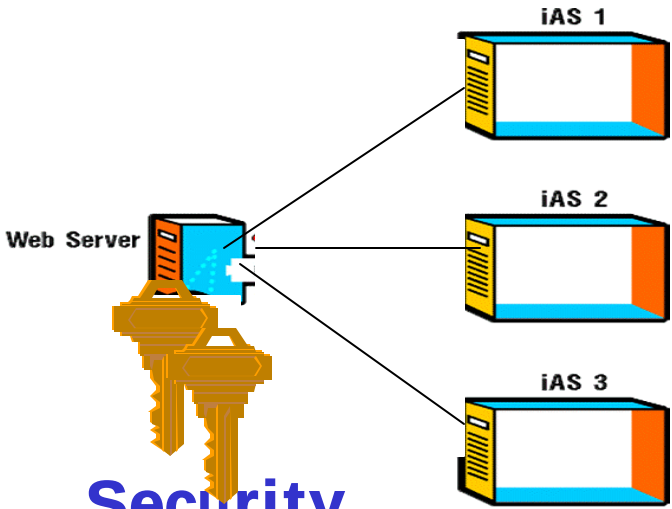


Applications Servers are primarily *Resource Managers*

Applications Servers Manage: dispatching, thread allocation, pools, caches, load balancing, clusters

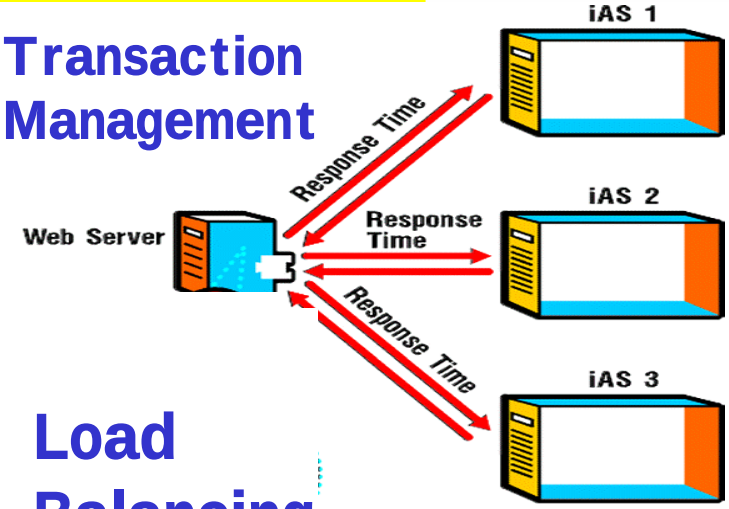
What features might you look for in an Application Server?



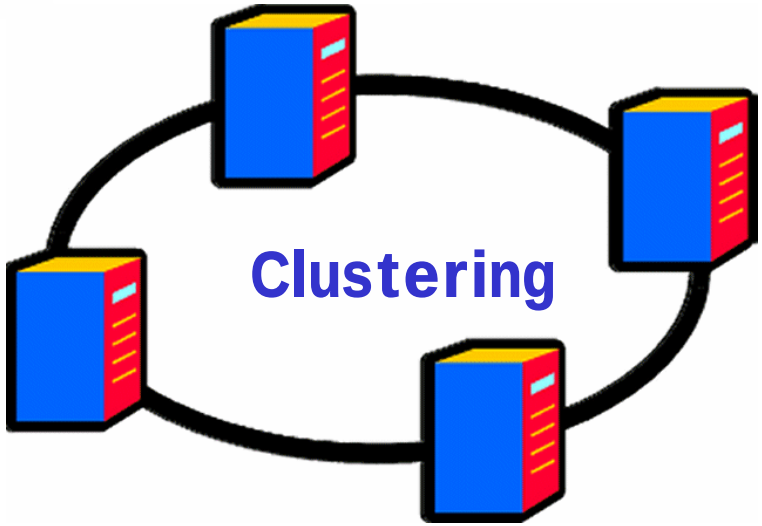


Security

Transaction Management



Load Balancing



Clustering

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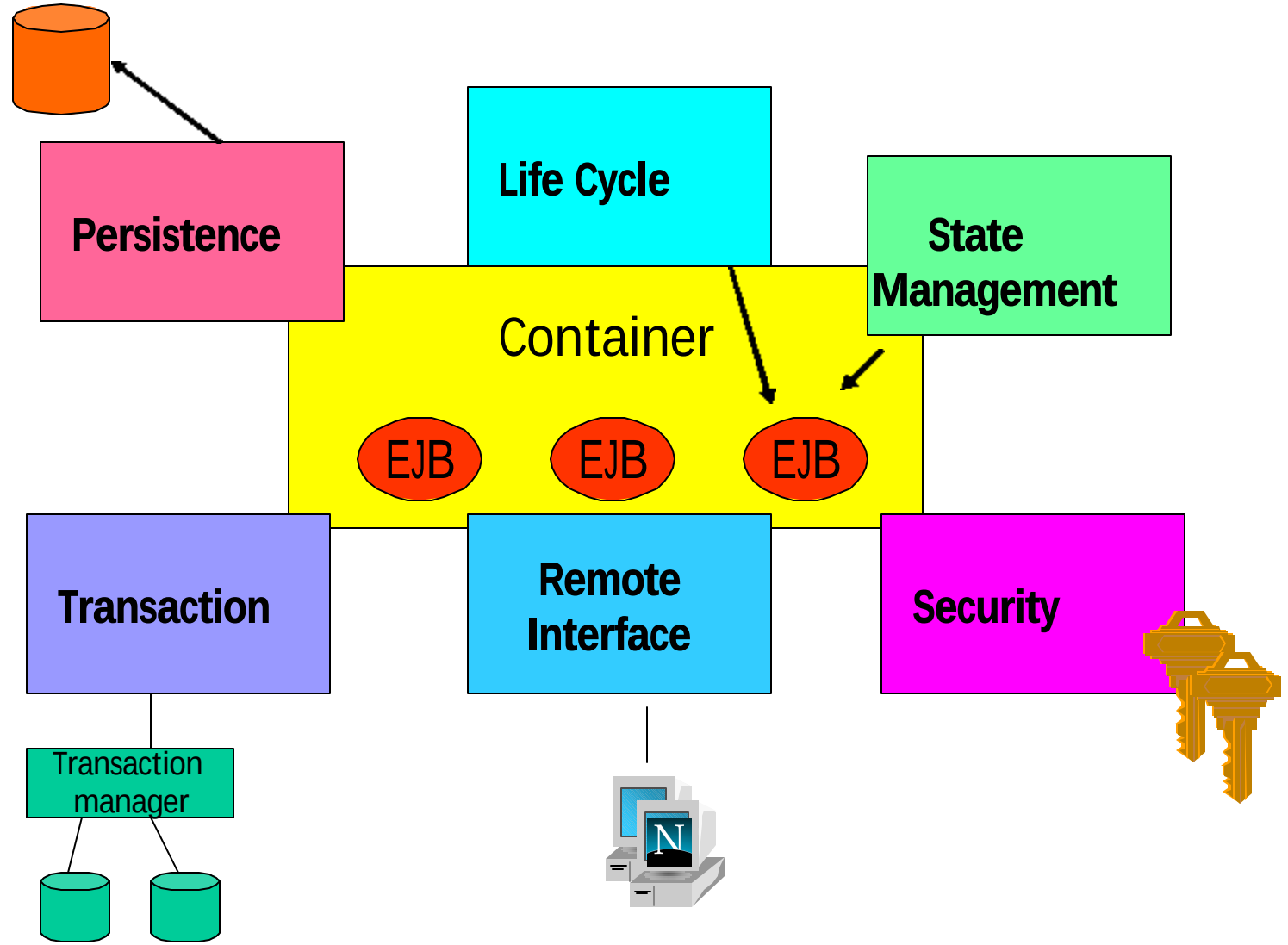
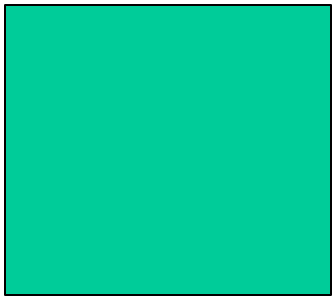
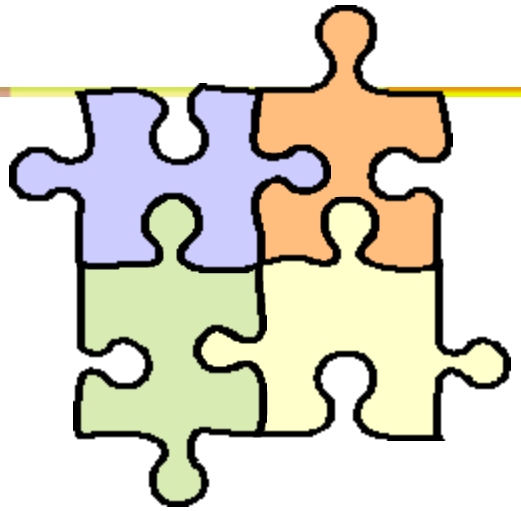
EJB Container Services



Components





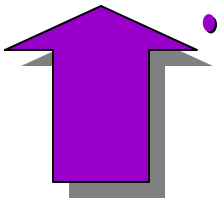
Monolithic:

1 binary file

Recompiled & linked for any changes

Components:

- **plug-gable Parts**.
- **Implementation separated from Interface**, only Interface published
- **hides implementation details**
- **Better design, easier updates**
- **Better Flexibility, Extensibility**



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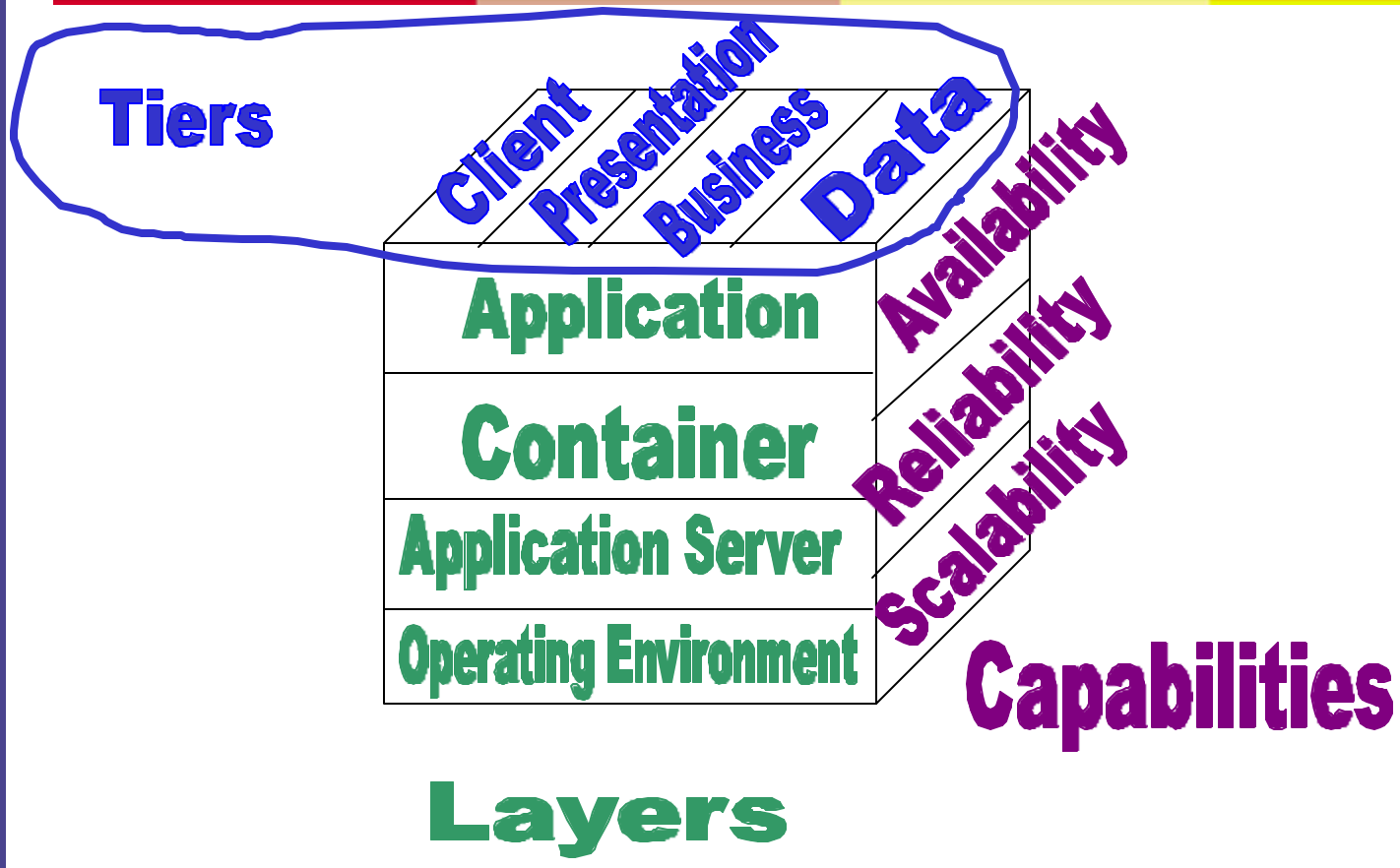
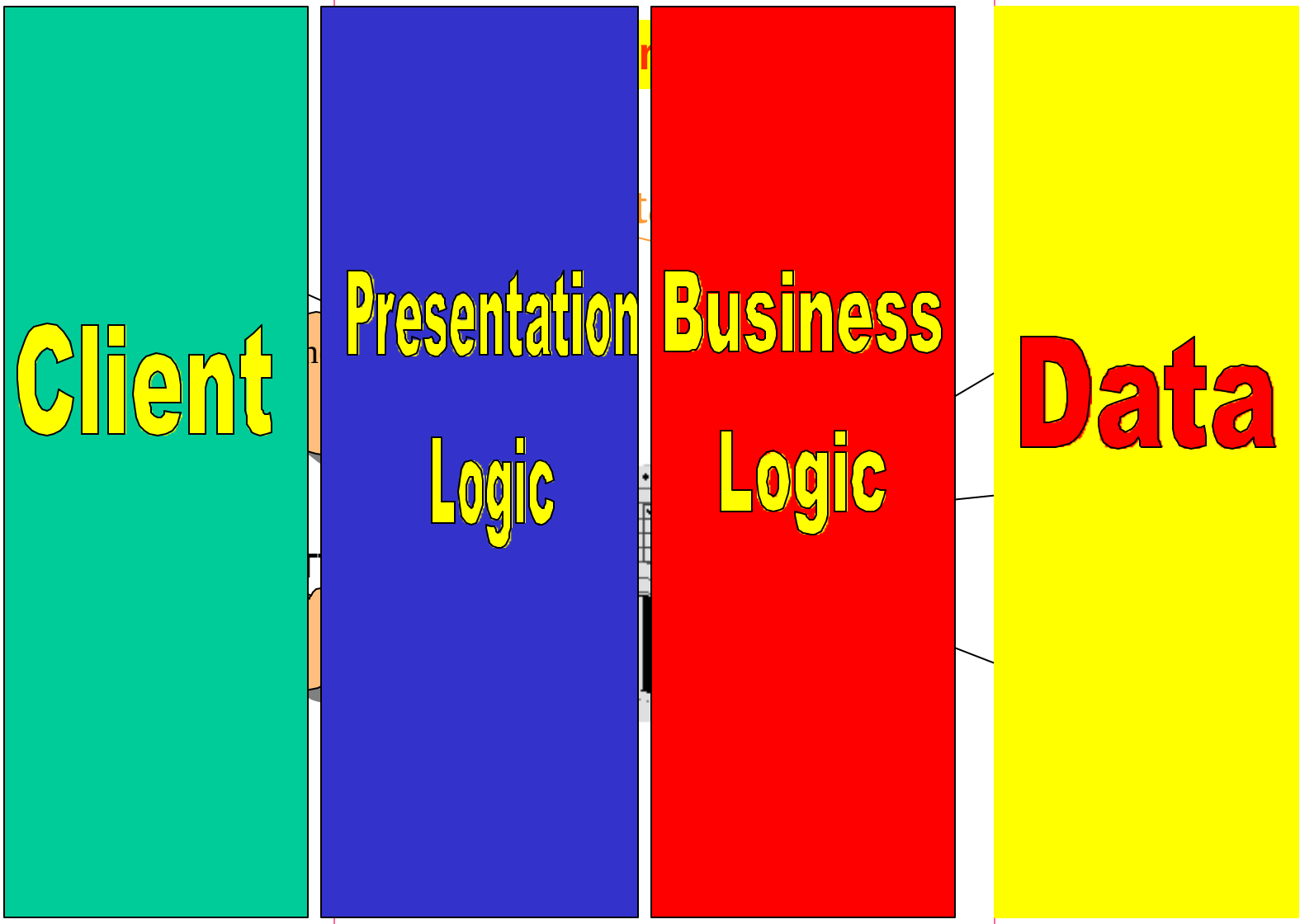
Architecture and the Cube



n-tier Architecture with J2EE™



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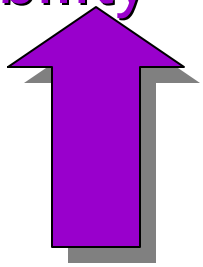
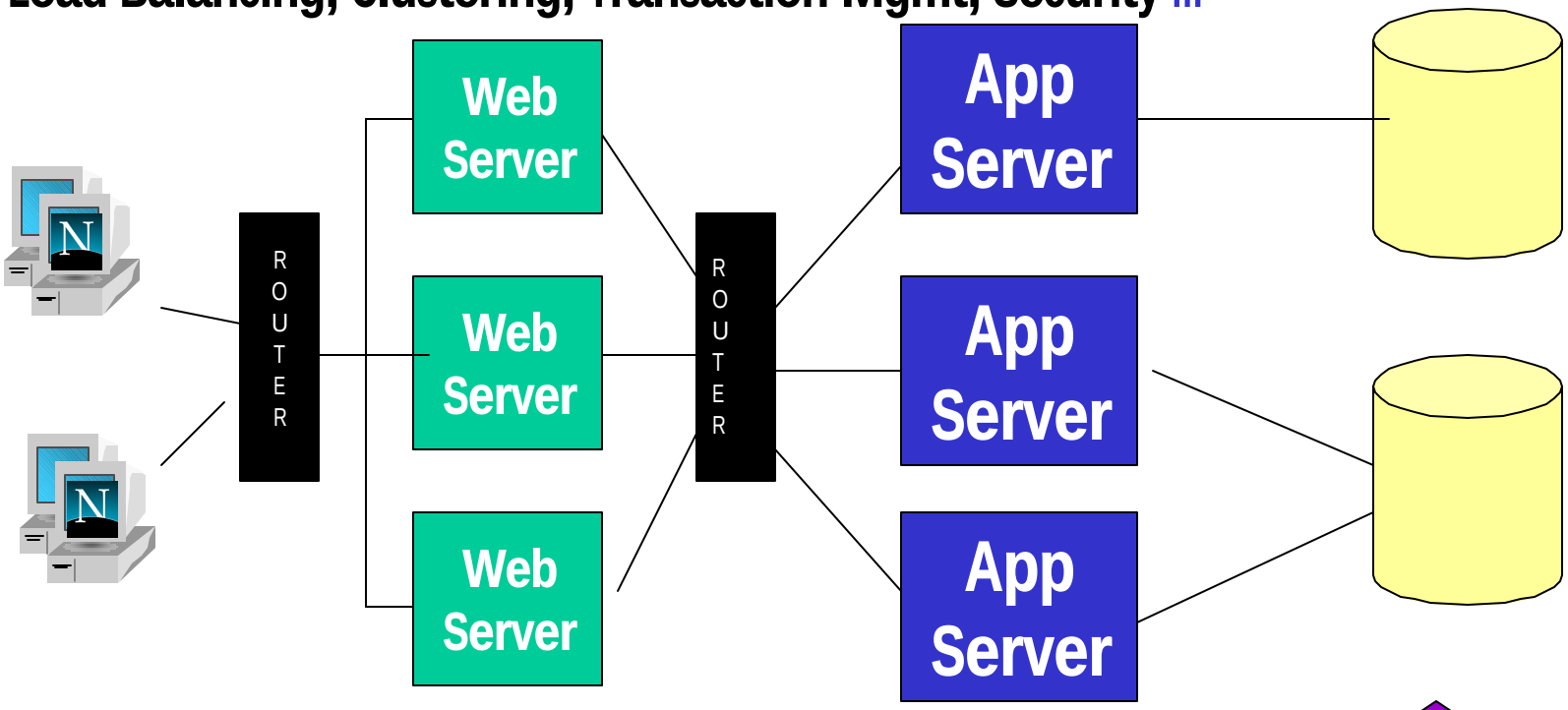
Tiers

- **Tiers separate functionality**
  - Presentation Logic, Business Logic, Data Schema
- **Advantages:**
  - One tier can be changed **without changing the rest= easier updates**
  - **Lower deployment** and **maintenance** costs.
  - Capabilities go up: Flexibility , Extensibility



Capabilities
Non-Functional Requirements

With Good Architecture, Layering, Tiers,
Load Balancing, Clustering, Transaction Mgmt, Security ...



Reliability, Availability, Extensibility,
Flexibility, Scalability, Goes up

Why J2EE™?

- Gives you the **Advantages** of a **Standardized Layered, Tier** Architecture:
- **Simplifies** the complexity of a **building n-tier applications**.
- **Standardizes** an **API** between **components** and application server **container**.
- **J2EE™ Application Server and Containers provide the framework Services**

Agenda J2EE™ & Blueprints

- J2EE Architecture
- *Sun BluePrints ™ Design Guidelines*
- *Architecture of the sample application*

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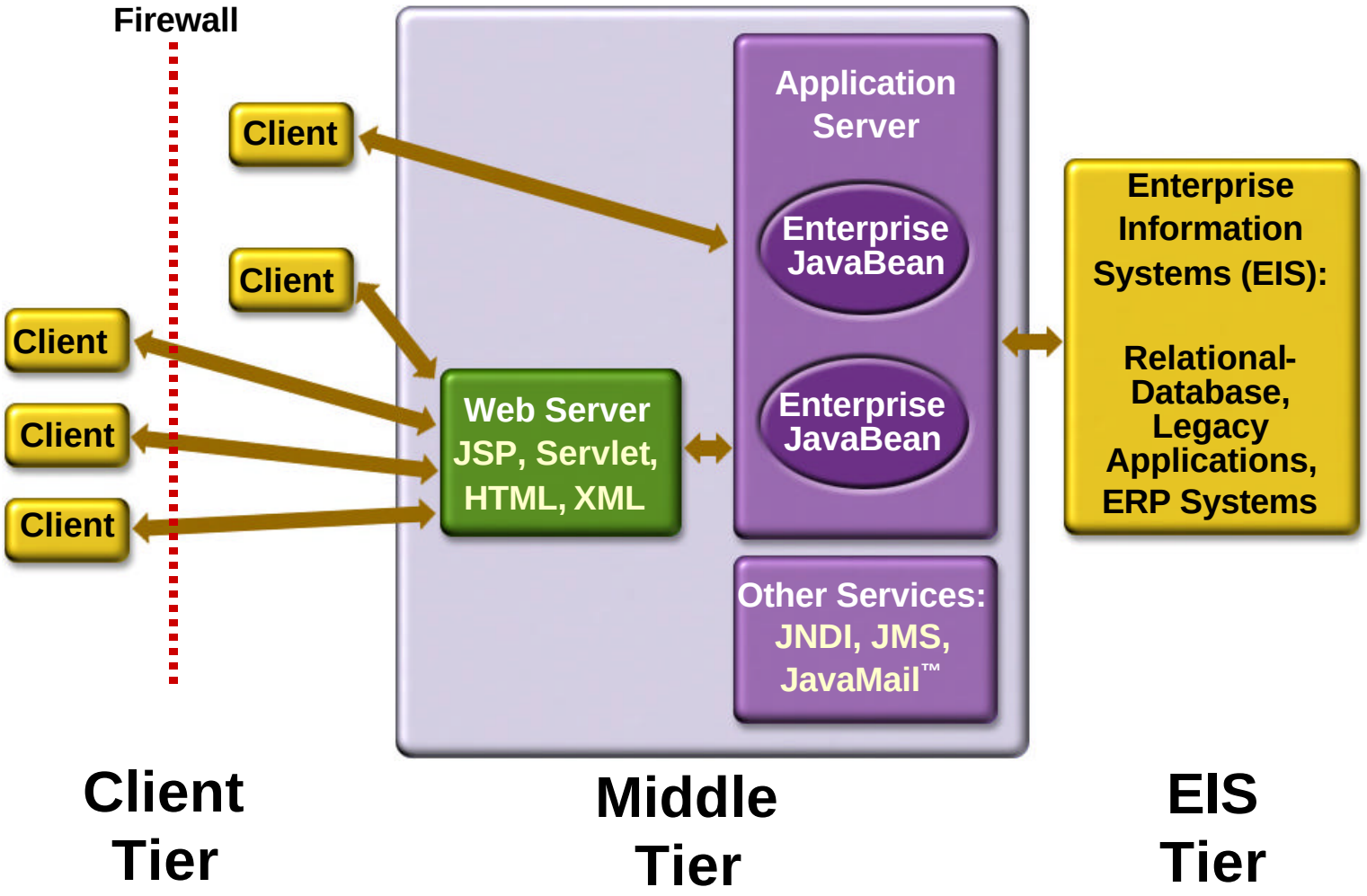
The J2EE™ Platform Has a **Rich Set of APIs**



Why J2EE™ Blueprints

Rich APIs → **More than one way** of doing things

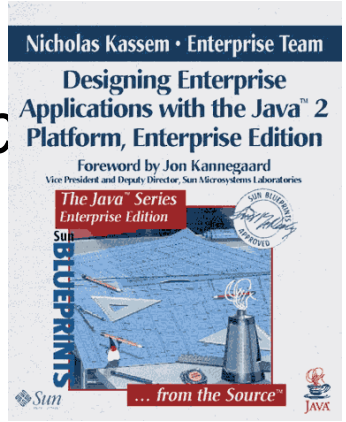
Similar Problems → Need to **leverage time-tested solutions**

Don't reinvent the wheel

Blue Prints → Provides **Answers**, Examples of **Best Practices**

J2EE™ Blueprints

- **Guidelines** and **Best practices** **for** designing *n-tier* enterprise applications with **J2EE™**
- **J2EE™ blueprints include:**
  - Book, *Designing Enterprise Applic*



  - Application (**source code**)–
    - "Java Pet Store"

    FREE:
    - **http://java.sun.com/j2ee**

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Blueprints

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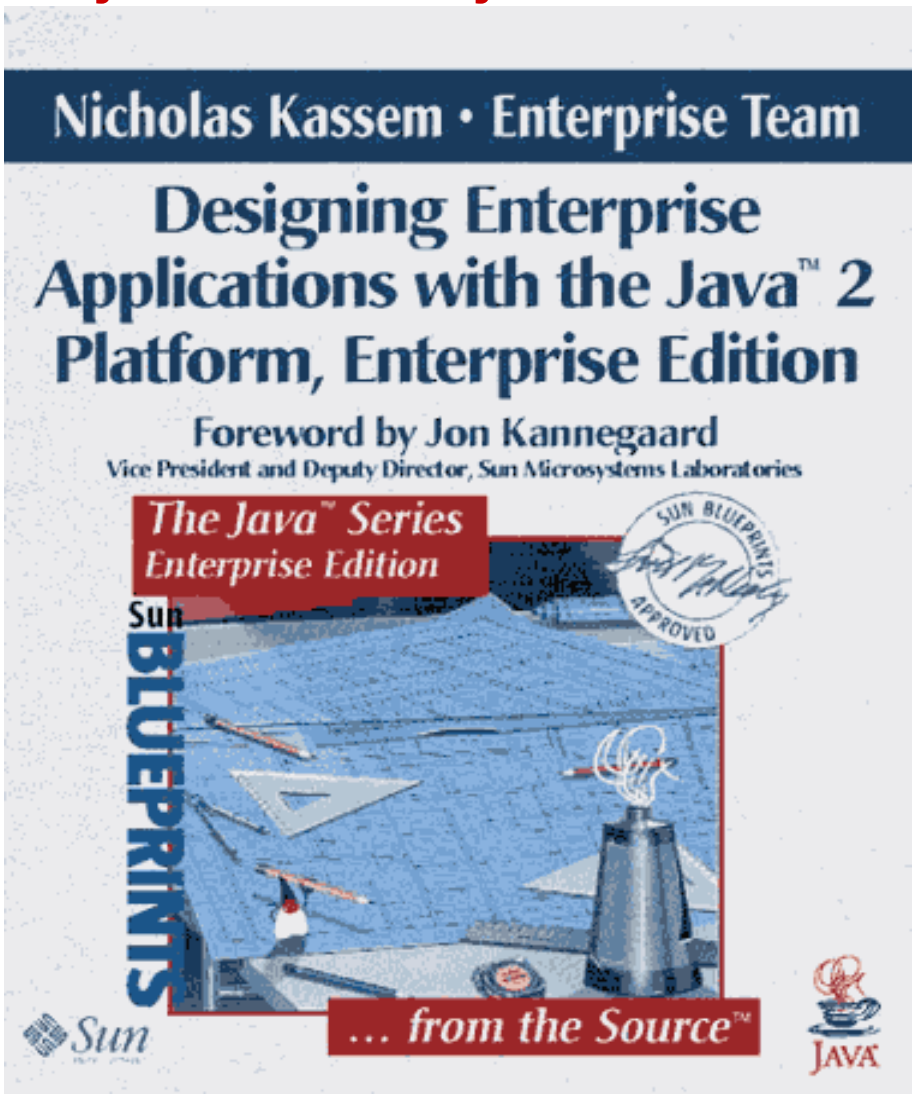

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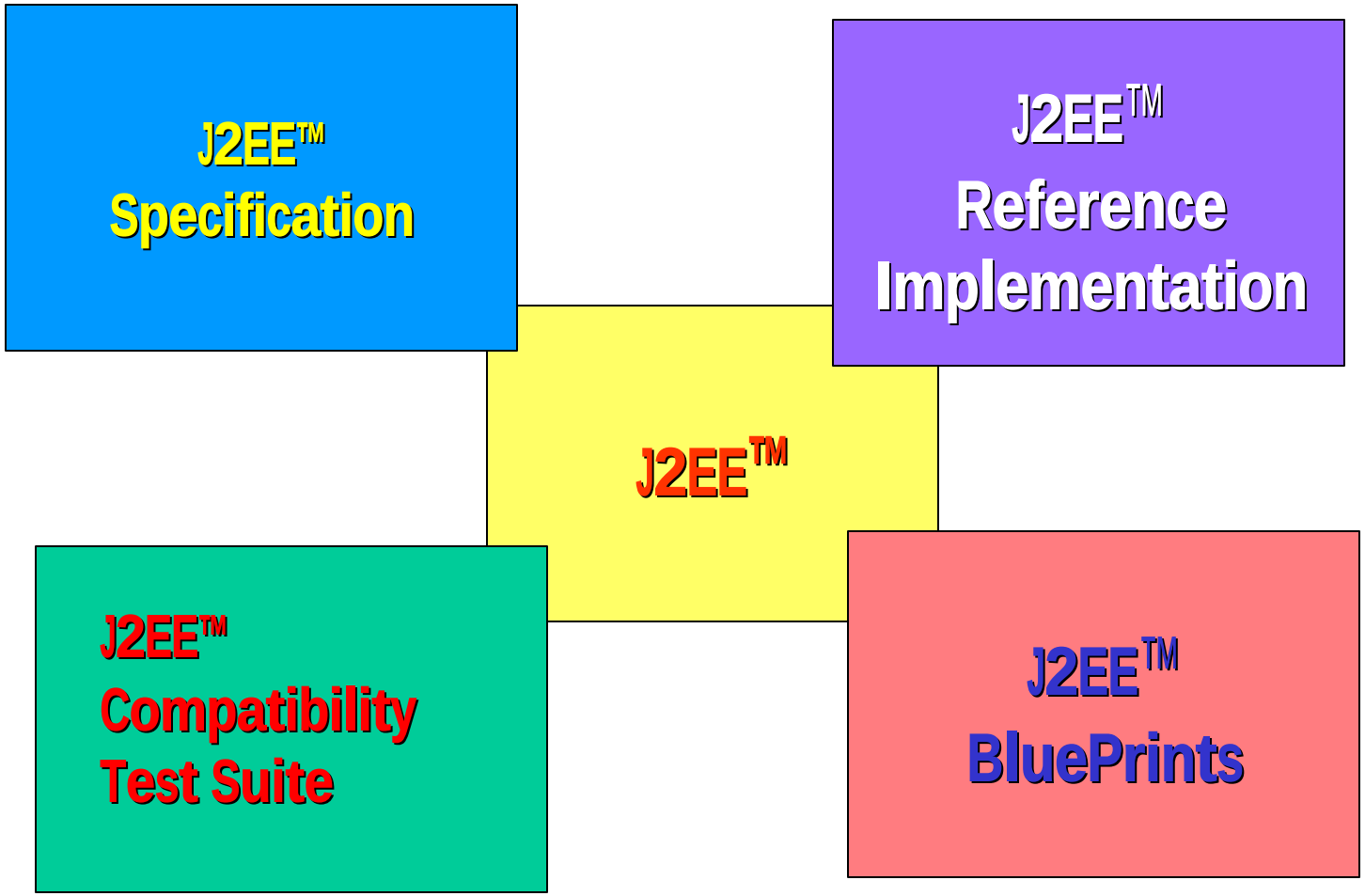
J2EE™ Deliverables



“Java™ Pet Store”Demo

Some Key BluePrints™ Questions -Issues Faced by Developers

- **When to use Servlets** verses **JavaServer Pages™**?
- **Where to store client session state**: client-tier, web-tier or EJB™ tier?
- **Access Data Base Resources** via **EJB™** or directly from JSP™ JavaBean ?
- **When to use EJB™** components?
- **When to use Session Beans** and when to use **Entity Beans**?

Design of Sample Application
Blueprints Choices:

Blueprints Choices:

Client tier

- **HTML Clients** for End-User Web Access
- **XML** for **Data externalization (Order procurement)**

Web Server tier

- JavaServer Pages™ (**JSP**)
  for **dynamic content generation**

Application Server tier

- **EJB**™ for **business logic**

J2EE™ Blueprints Guidelines

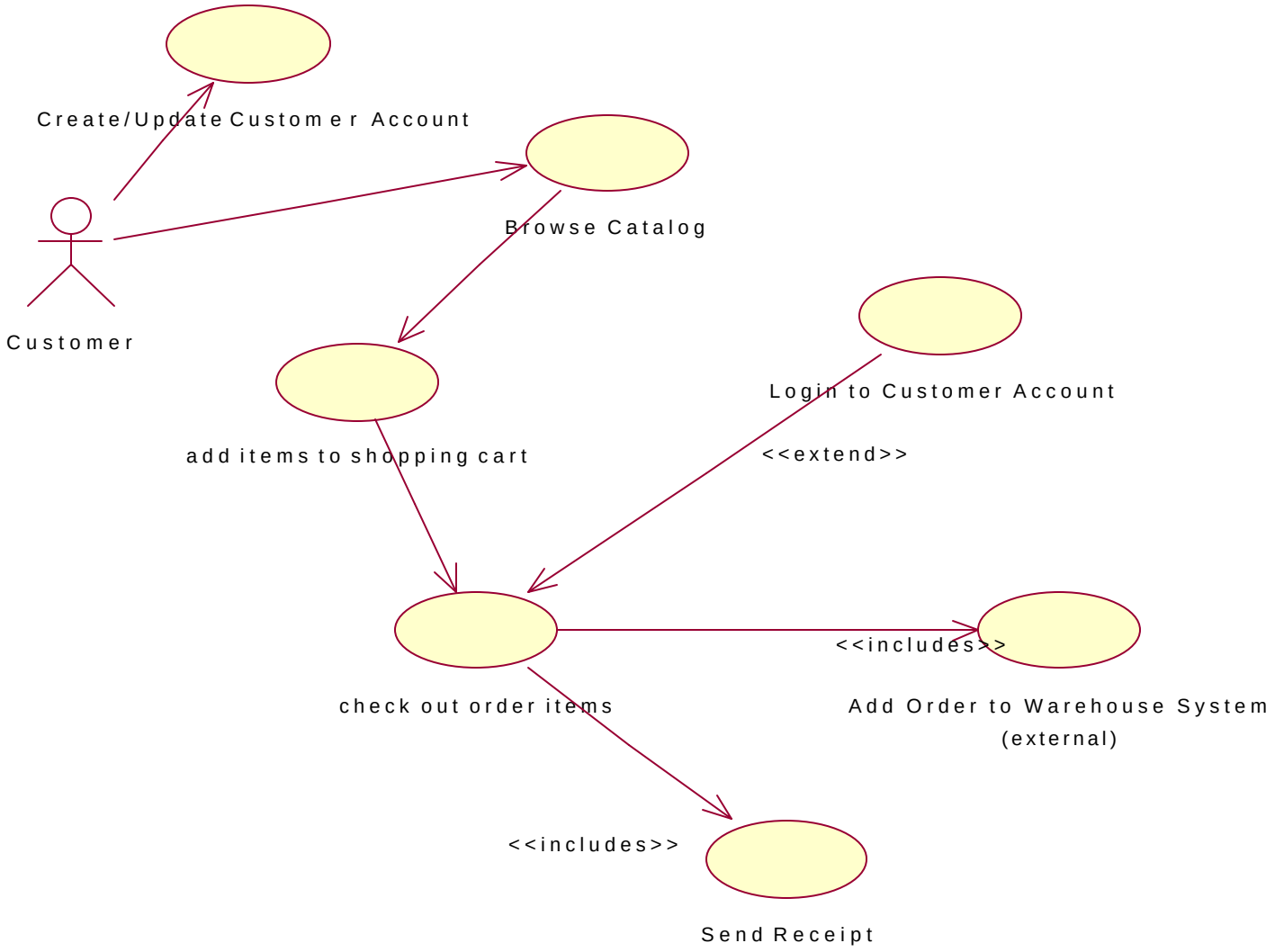
Process for developing an application from **requirements, to design, to implementation**

1. **Scenarios or Use Cases**
2. partitioning of functionality into modules
3. Application architecture using Model-View-Controller:
    1. assignment of functionality to tiers:
        1. Design of the Model
        2. Design of the View
        3. Design of the Controller
    2. object decomposition within tiers

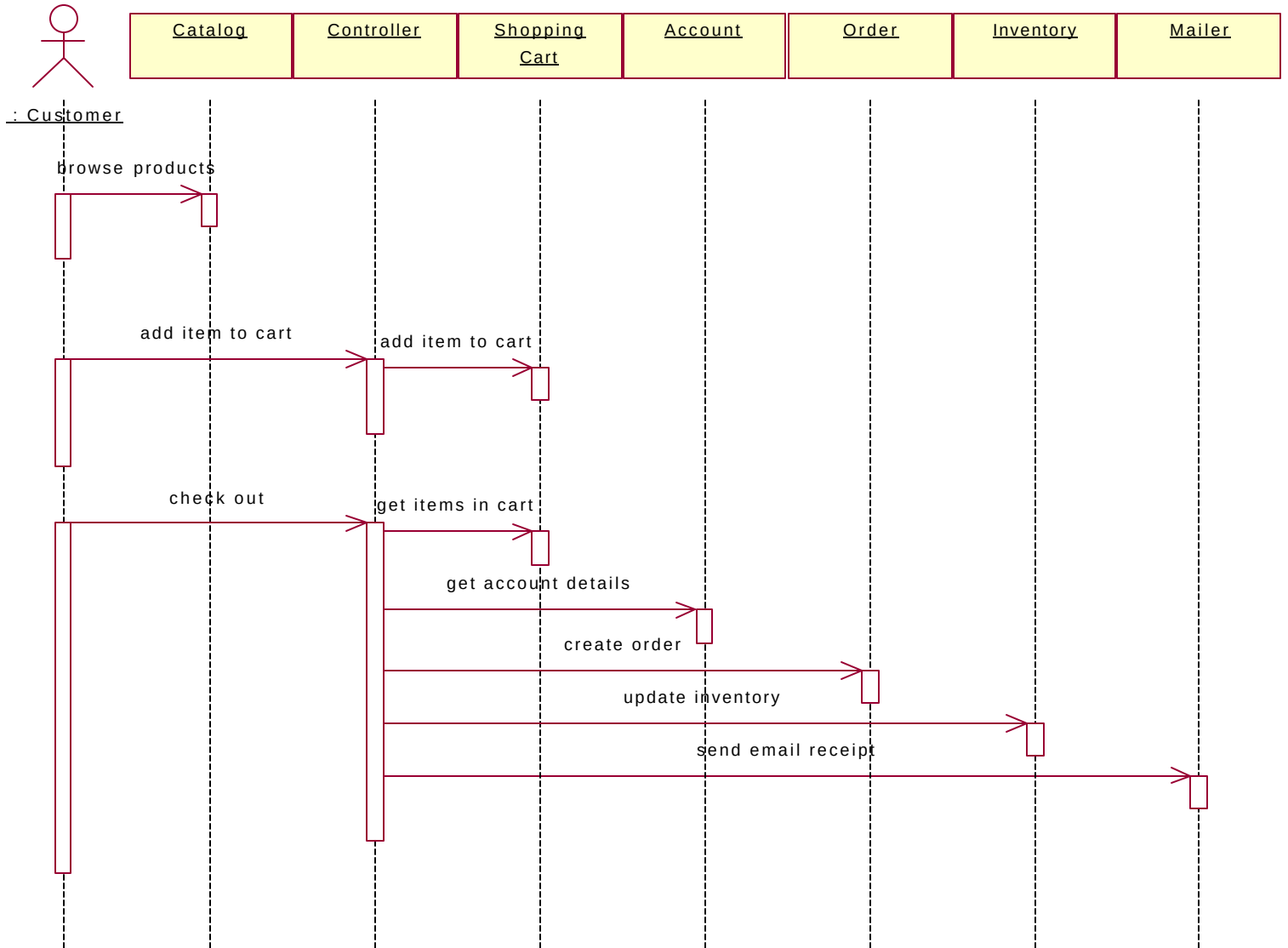
1) Sample Application – Shopping Scenario

1. Web-based **browsing** of a product **catalog**
2. Creation and maintenance of a **shopping cart**
3. User **account** creation/ Login
4. **Placing orders**
5. Secure order processing
    1. B2B transactions
    2. **Externalisation of order data** (expressed in XML)
    3. **Order confirmation** using e-mail

1) Use Case Shopping Scenario



Shopping Scenario Sequence Diagram



J2EE™ Blueprints

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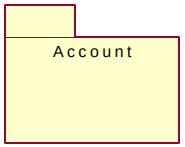
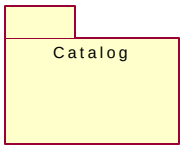
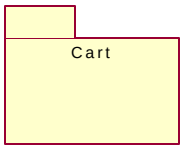
2) Divide the Application Into Modules Based on Services (Functionality)



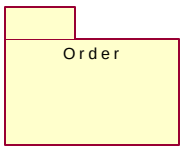
User Account Module: tracks user account information



Product Catalog Module: provides search for products, and product details

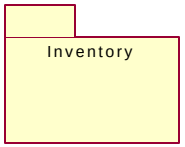


Shopping Cart Module: allows user to save selected items for the session.

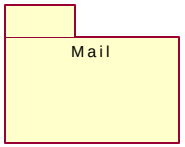


Order Processing Module: performs order Processing when user buys the items in the cart.

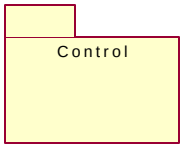
2) Divide the Application Into Modules Based on Services



Inventory Module: maintains information on the number of each type of product in stock.

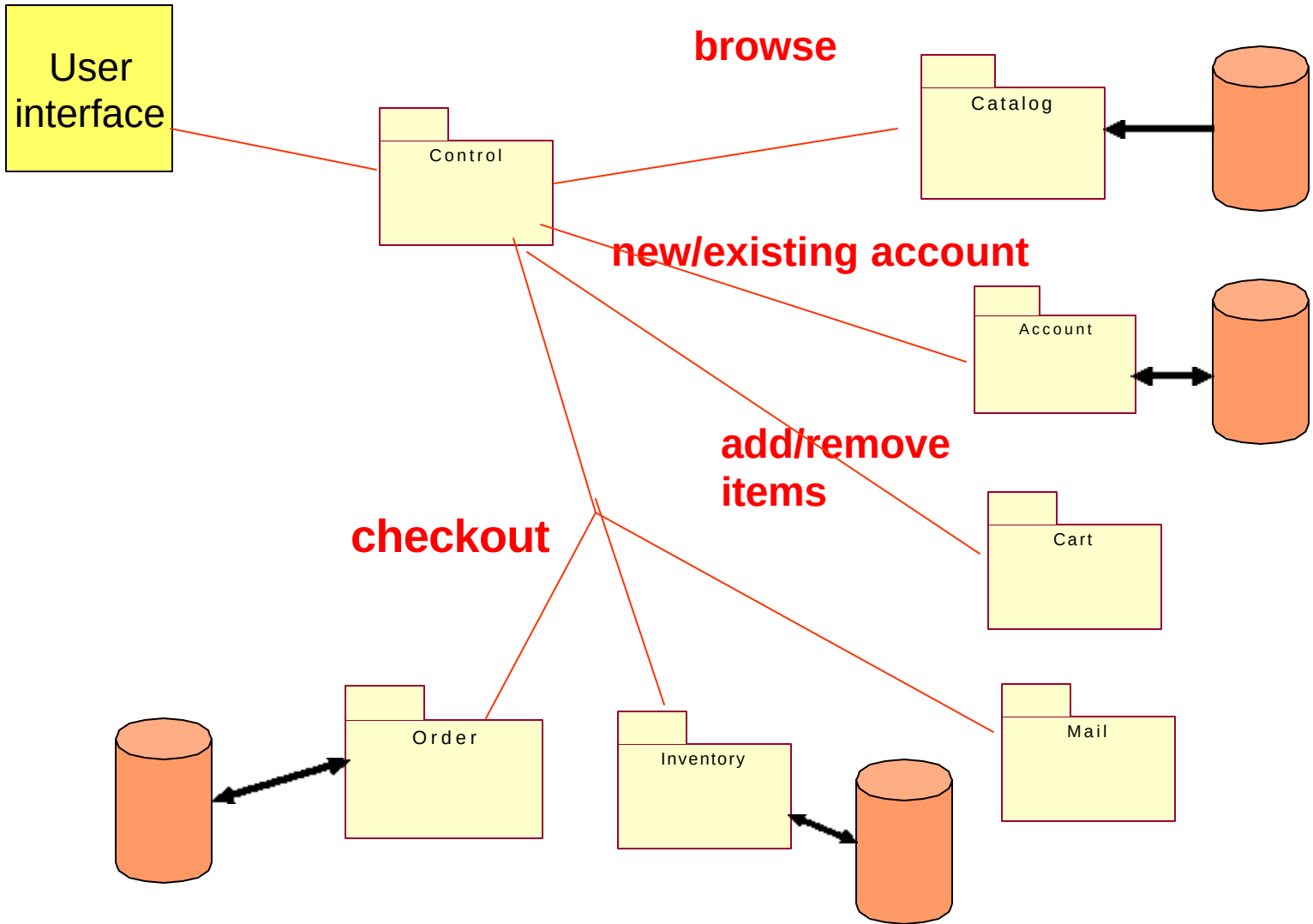


Messaging Module: sends confirmation receipt messages.



Control Module: control interactions between user (browse, add items, check out) and business objects.

Interrelationship of the modules



J2EE™ Blueprints

Process for developing an application from **requirements, to design, to implementation**

1. Scenarios or Use Cases
2. partitioning of functionality into modules
3. **Application architecture using Model-View-Controller**:
    1. **assignment of functionality to tiers**:
        1. Design of the **Model**
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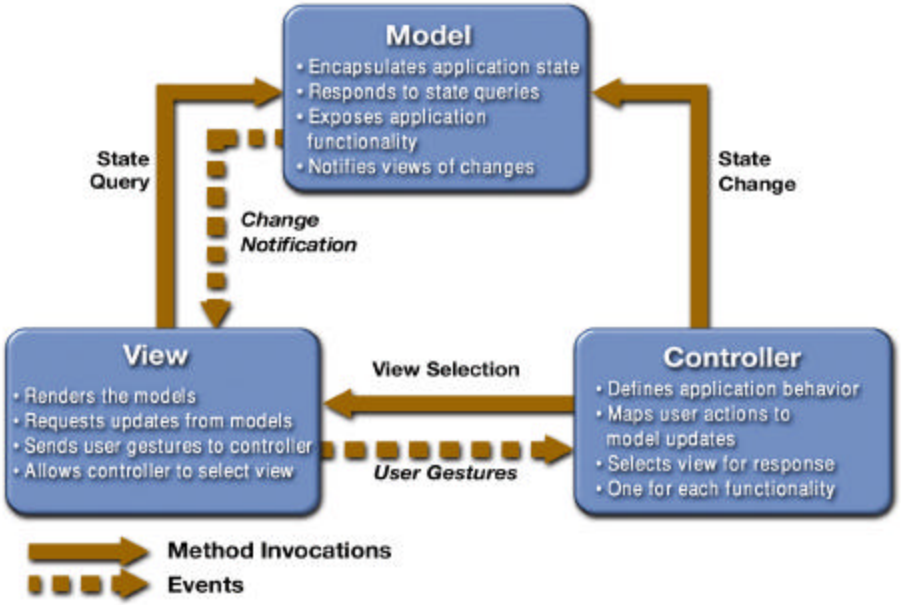
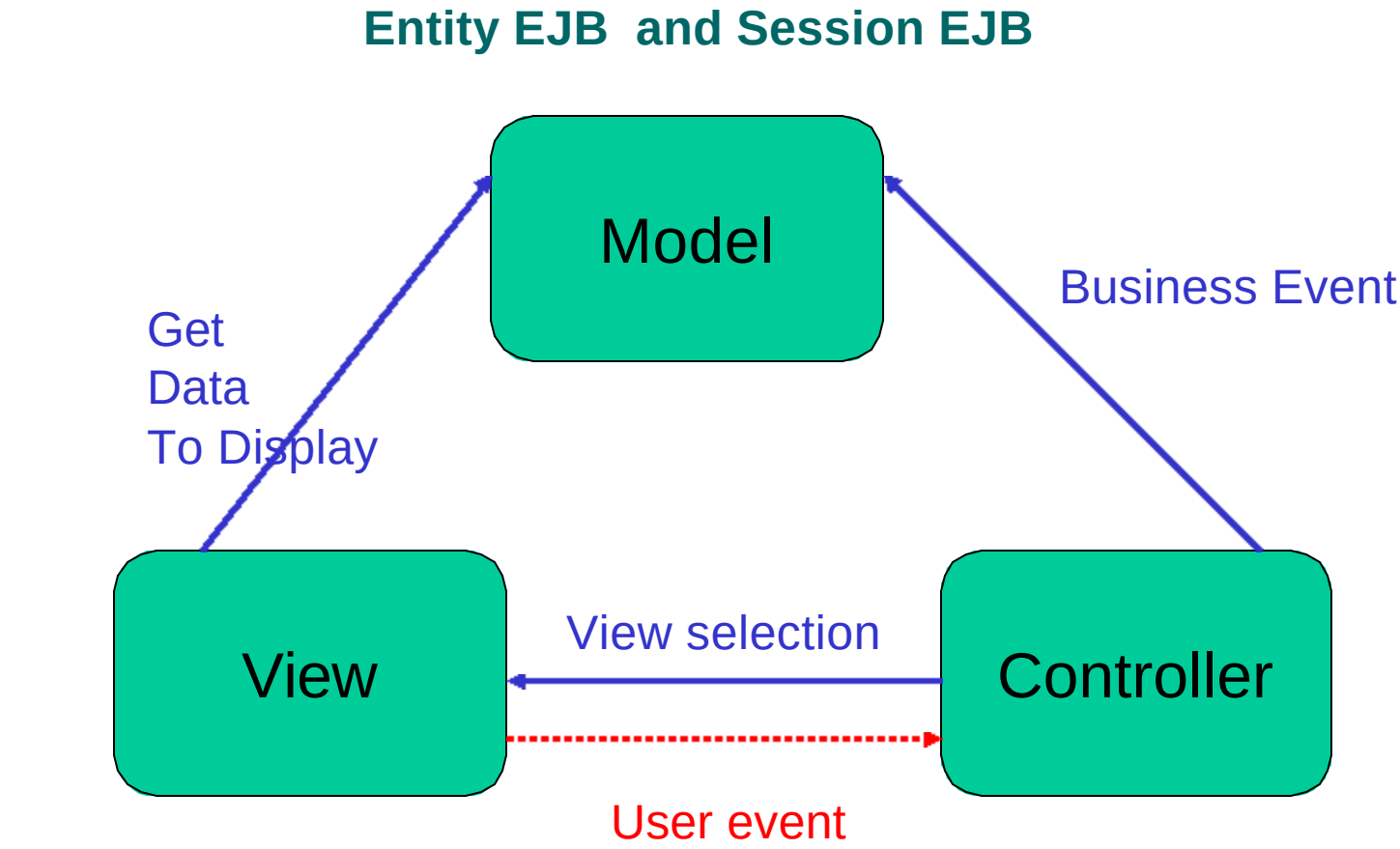
        3. Design of the **Controller**
    2. object decomposition within tiers

Divide Application Objects into 3 categories:

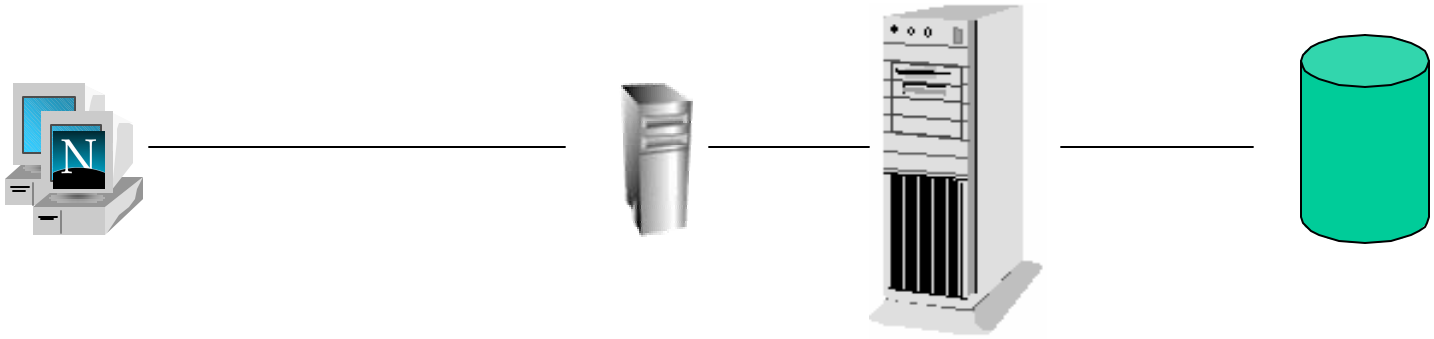
- Model View Controller (MVC) UI Pattern
  - **Model** represents the application **business data and rules**
  - **View** is a **screen representation of model**, **presents the user interface**
  - **Controller mediates** their **interactions**



Model View Controller Design Pattern



Assignment of Functionality to Tiers

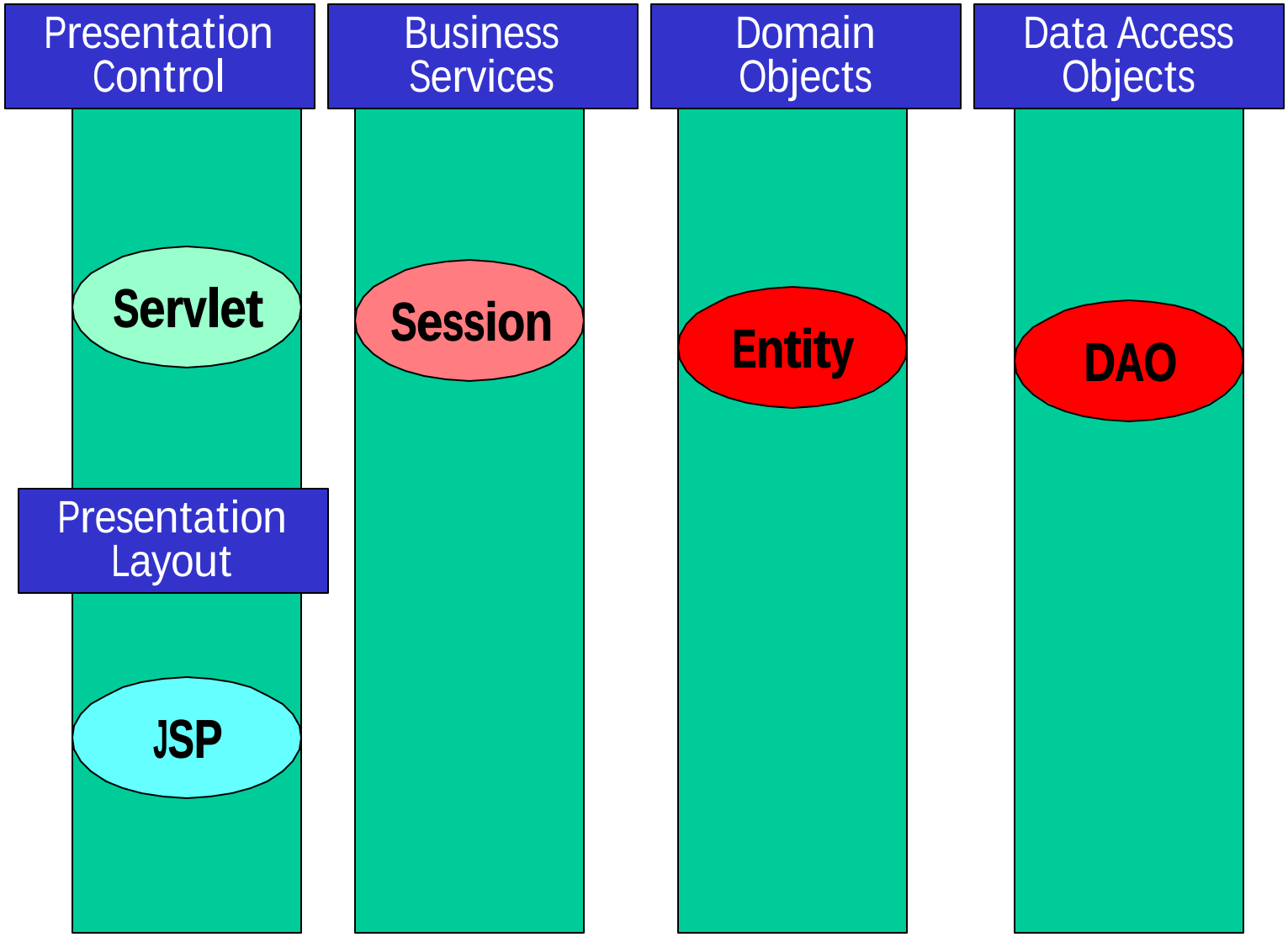


Presentation	Business Logic	Data
Presentation Logic	Application Requests	Business Services	Domain Objects	Persistence
View	Controller	Model

MVC With J2EE™ Technology

- Build **View** in the **Web**-tier
  - Use **JSP**™ components for **presentation layout**
  - Custom tags and **JavaBeans**™ components for **presentation logic**
- Build **Controller** in the **Web / EJB**™ tier
  - **Servlet** for **dispatching**
  - **Session** bean for **control within business objects**
- Build **Model** in the EJB™ tier
  - **Session** beans for **Business Services**: Process and Rules
  - **Entity** beans to maintain **model data**

Assignment of Functionality to Tiers or Vertical Layering



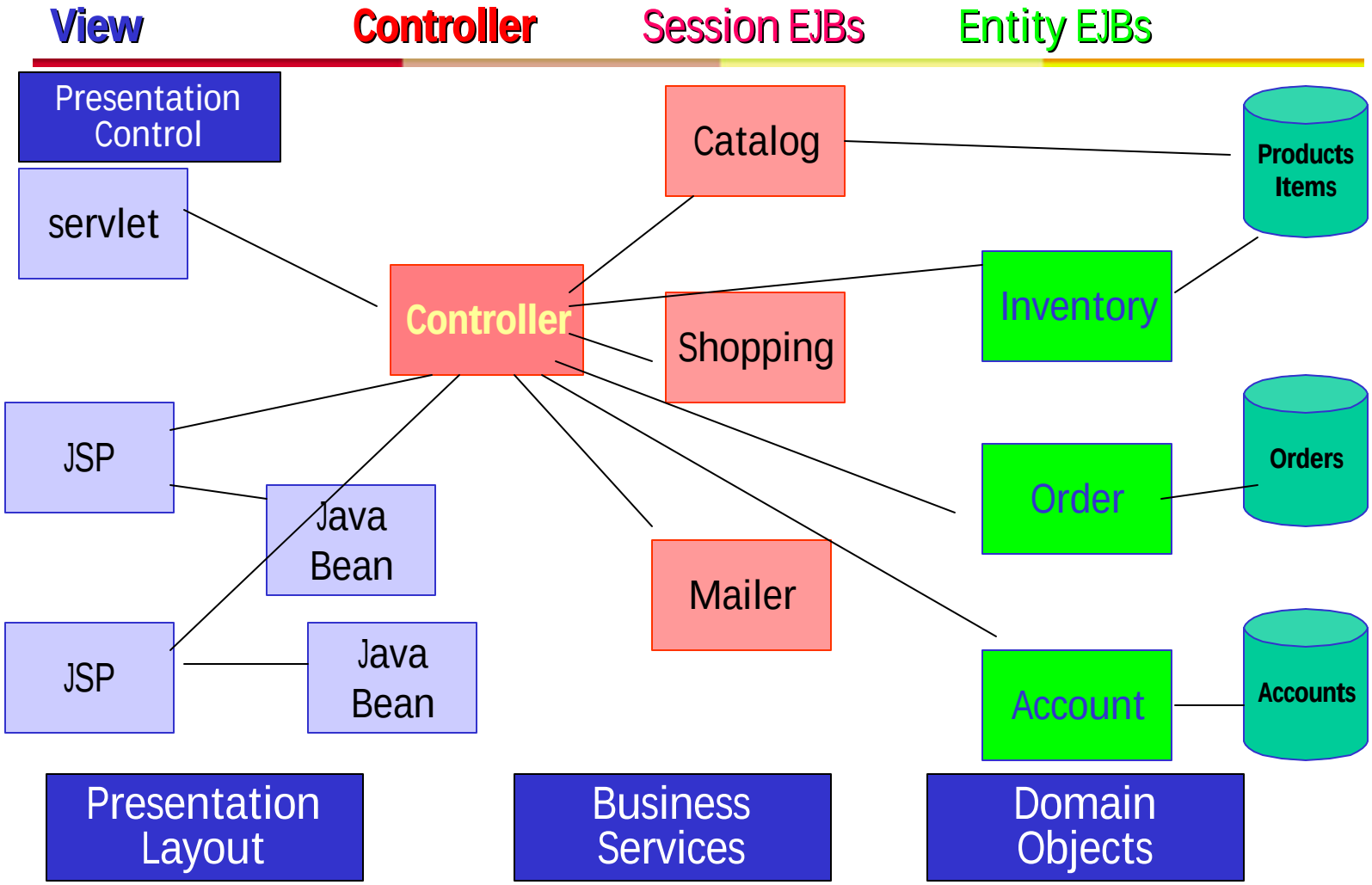
What are Domain Objects?

- Domain Objects **model the real world entities, nouns** in business problem
- Also known as **Data Model, business object model**
- **Example**
  - User Account,
  - Order,
  - Product,
  - Inventory

What are Business Services?

- **Business Services** **Model the** **verbs** in application
- **Business processes** are the **services in the use cases**
- **Example**
  - **Browse** Catalog
  - **Add** **item** to Cart
  - **Purchase** items

Sample Application Architecture **Vertical Layering**



Summary

- **We went over:**
  - Advantages of **horizontal layers**
  - Advantages of **Vertical Tiers**
  - **Affect of Layers and Tiers on Capabilities.**
  - the **process of architecting** the sample application
  - the **Model View Controller** Design Pattern