Understanding and Designing with EJB

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Based on j2eetutorial documentation.

http://java.sun.com/j2ee/tutorial/1_3-fcs/index.html

Review

- Request/Response Model
- Distributed Objects: stubs and skeleton providing location transparency
- Naming and Lookup: registry and binding
- Server-side technology: servlets (project1)
- Web applications: can be written entirely using Java Server Pages (static and dynamic content and data access can be provided); JSP is wrapper on servlet technology.
- Concept of initial context:The starting point for resolution of names for naming and directory operations.
- Data base access: using Java Data Base Connectivity

When to use EJB

- For large scale applications: where resources and data are distributed.
- When the application is run on servers at many locations.
- Where scalability is critical.
- Where transactions are required to ensure data integrity
- When a variety of clients need to handled.

Types of Enterprise Bean: Session

- **Session bean**: represents a single client inside the J2EE server. Session represents an interactive session. When a client terminates the session bean terminates/is no longer associated with the client.
- Stateful session bean: maintains a conversational state for the duration of a session. Ex: items reviewed in a session at some sites
- Stateless session bean: does not maintain a conversational state. Ex: computing a formula for a given value

Types of Enterprise Bean: Entity

- An entity bean represents a business object in a persistent storage mechanism. Ex: customers, orders, and products.
- Each entity bean typically has an underlying table in a relational database (business data), and each instance of the bean corresponds to a row in that table.
- Transactional and recoverable on a server crash.

Types of Enterprise Bean: Message-Driven

- A message driven bean is an enterprise bean that allows J2EE applications to process messages asynchronously.
- It acts as a JMS listener, which is similar to an event listener except that it receives messages instead of events.
- The messages can be sent by any J2EE component: an application client, another enterprise bean, or a web component, or a non-J2EE system using JMS.
- Retain no data or conversational state.

Contents of an Enterprise Bean

- Interfaces: The remote and home interface for remote access. Local and local home accesses for local access.
- Enterprise bean class: Implements the methods defined in the above interfaces.
- Deployment descriptor: An XML file that specifies information about the bean such as its type, transaction attributes, etc.
- Helper classes: non-bean classes needed by the enterprise bean class such as utility and exception classes.

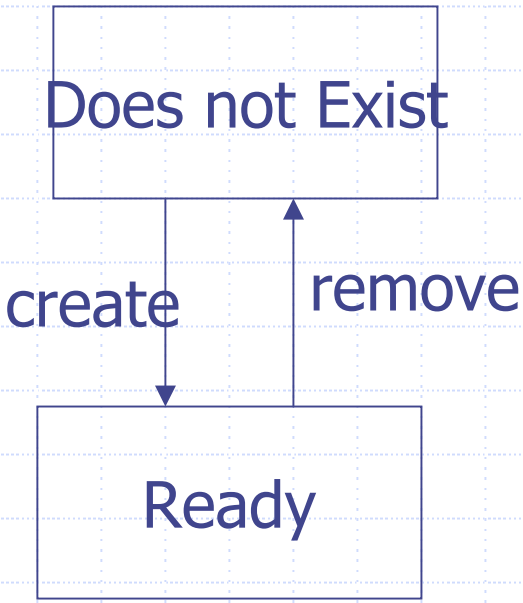
Naming Conventions

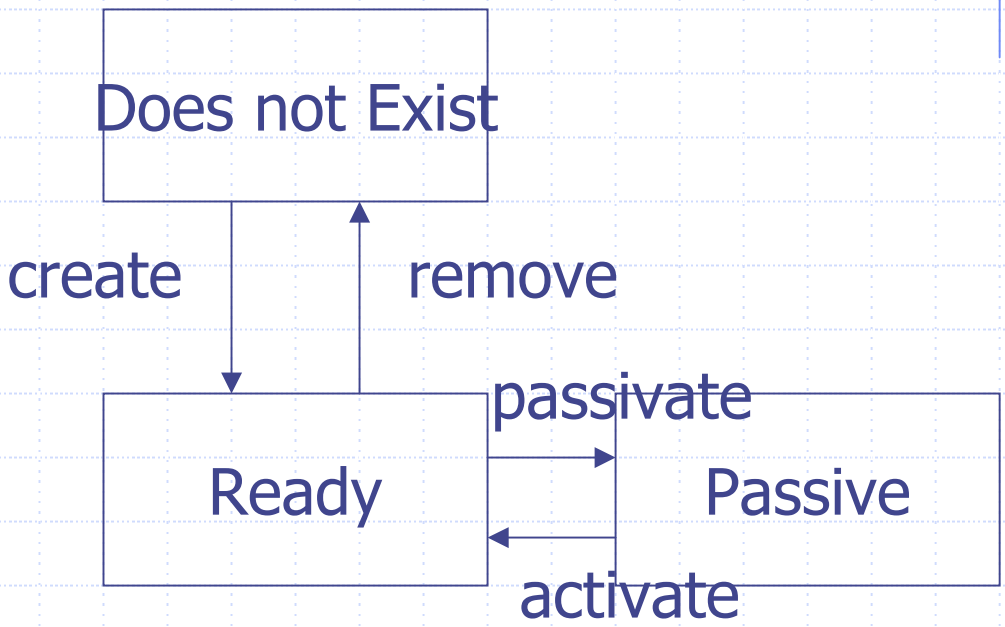
Item	Syntax	Example
Enterprise Bean Name (DD)	**<name>EJB**	**AccountEJB**
EJB JAR display name (DD)	**<name>EJB**	**AccountJAR**
Enterprise bean class	**<name>Bean**	**AccountBean**
Home interface	**<name>Home**	**AccountHome**
Remote interface	**<name>**	**Account**
Local home interface	**Local<name>Home**	**LocalAccountHome**
Local interface	**Local<name>**	**LocalAccount**
Abstract Schema (DD)	**<name>**	**Account**

The life cycles of enterprise beans

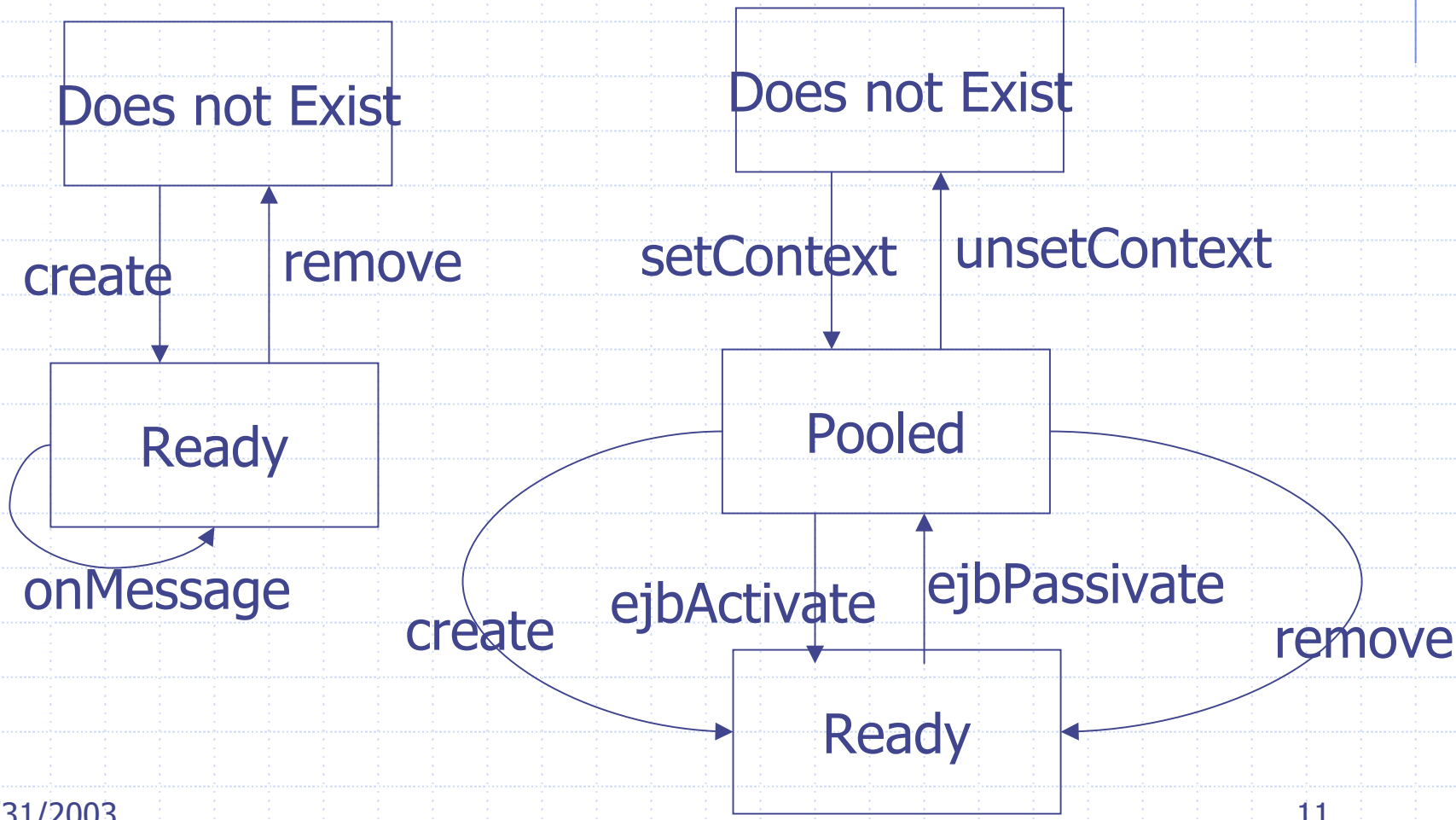
- An enterprise bean goes through various stages during its lifetime. Each type has different life cycle.

Session bean





Entity and Message-driven Bean Lifecycle



Designing an application

- Start with Remote interface methods.
- For completion write the Home interface.
- Implement these methods in a (session) bean class.
- Update build.xml “ant” file and compile using ant <target>
- Use the deploy tool to deploy the application on your j2EE server and set up the configuration.
- Write a client (preferably a web client) to test your enterprise application.
- Lets go through converter application. Your assignment is to make it a more meaningful and useful converter.

MidTerm Review

- Web application design: n-tier design from word problem. Represent using block diagram, use case and class diagram. Stepwise explanation; project 1
- J2EE Application model: application model
- Enterprise beans: Session, entity and message-driven beans: characteristics and life cycle
- Enterprise integration: Ch.1-5 of your text

Session Bean

- Home interface
- Remote interface
- Bean class
- Deployment descriptor
- Can be stateless (ex: converter) or stateful (ex: cart)
- Stateless: container can maintain a pool of instances of session bean and reuse them for many client requests.
- Stateful: instance pooling can be done but what to with the state? Activate and passivate the instances by storing and restoring them from secondary memory.

Cart Stateful Session Bean

- One or more ejbCreate methods (void methods) providing flexibility of instantiating the bean with various starting states.
- Business methods: addBook, removeBook, getContents
- Data (state): string customerId, string CustomerName, Vector contents

Client calls + bean and container response

- Client gets naming context.
- Client looks up the remote object interface.
- Narrows it to IIOP object and then casts it to CartHome to set “home” variable.
- Creates bean:

Cart shoppingCart = home.create(“Bina”, “1234”);

- EJB container instantiates the enterprise bean.
- EJB container then calls the appropriate ejbCreate method in CartBean. Observe ejbCreate verifies the ID using an IDVerifier object.
- After successful creation and initialization of the bean the client can invoke business methods as follows:

Cart Business Method calls

shoppingCart.addBook("J2EE in 21 days");

shoppingCart.removeBook("Java 2: inside information");

booklist = shoppingCart.getContents();

Now the client can print out the vector booklist.

Other Features

- Stored in the enterprise bean's deployment descriptor, an environment entry is a name-value pair that allows you to customize the bean's business logic without changing its source code.
- A enterprise bean that calculates discounts, may have an environment variable named ***discount percent***.
- Before deploying the **bean's application** one can use the deploy tool to assign the proper value for discount percent.
- Look at CheckerBean example.

Entity Bean

- Data is at the heart of most business applications.
- In J2EE applications, entity beans represent the business objects that need persistence (need to be stored in a database.)
- You have choice of bean-managed persistence (BMP) and container-managed persistence (CMP).
- In BMP you write the code for database access calls. This may be additional responsibility but it gives control to the bean developer.

Entity Bean with BMP: Example: SavingsAccount

- The state of the SavingsAccountEJB is stored in the savingsAccount table of a relational database.
- savingsAccount table could be created by a SQL statement as shown below:

```
CREATE TABLE savingsAccount
(id VARCHAR(3) CONSTRAINT
   pk_savingsaccount PRIMARY KEY,
firstname VARCHAR(24),
lastname VARCHAR(24),
balance NUMERIC(10,2));
```

SavingsAccountEJB

This contains:

- Remote interface (SavingsAccount)
- Home interface (SavingsAccountHome)
- Entity bean class (SavingsAccountBean)
- Utility class: InsufficientBalanceException
- And a client to test it: SavingsAccountClient

Entity Bean class

- Implements EntityBean interface
- Zero or more ejbCreate and ejbPostCreate methods
- Finder methods
- Business methods
- Home methods

Entity Bean Methods

- ejbCreate inserts the entity state into the database; initializes the instance variables and returns the primary key.
- ejbRemove will delete the record corresponding to the bean from the database.
- ejbLoad and ejbStore methods synchronize instance variables of an entity bean with the corresponding values stored in a database. ejbLoad refreshes the instance variables from the db and ejbStore writes variables to the database. Container does this not the client.
- ejbFinder allows client to locate entity beans. Find the collection of records with “Smith” as author.
- Business methods and home methods.

SQL statements in SavingsAccountBean

Method	SQL Statement
ejbCreate	INSERT
ejbFindPrimaryKey	SELECT
ejbFindByLastName	SELECT
ejbFindInRange	SELECT
ejbLoad	SELECT
ejbRemove	DELETE
ejbStore	UPDATE