Enterprise JavaBeans(™) EJB(™) 3.1 Technology

Overview

Kenneth Saks
EJB 3.1 Specification Lead

Agenda

- Introduction
- New functionality

EJB 3.1 Specification

- Goals
  - Continued focus on ease-of-use
  - New features
- JSR (Java Specification Request) 318
  - Expert Group Formed – August 2007
  - Public Draft – October 2008
  - Proposed Final Draft – March 2009
  - Final Specification – December 2009

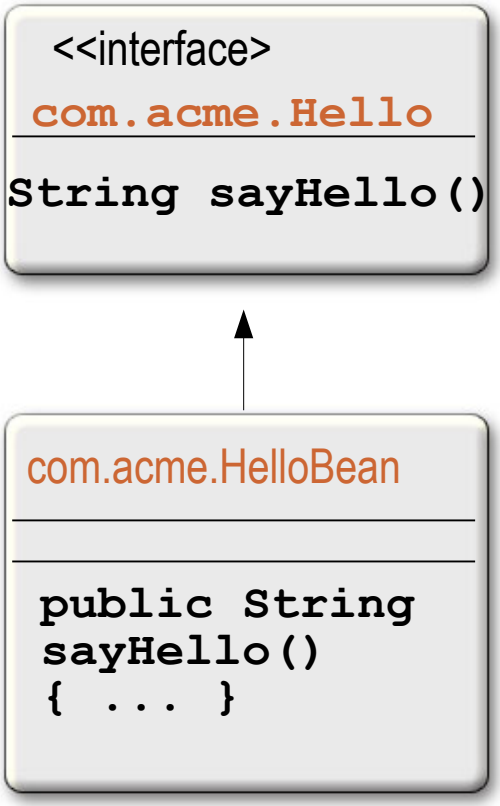
Ease of Use Improvements

- Optional Local Business Interfaces
- Simplified Packaging
- EJB 3.1 “Lite” API
- Portable JNDI Names
- Simple Component Testing

Session Bean with Local Business Interface

HelloBean Client

```
@EJB
private Hello h;
...

h.sayHello();
```



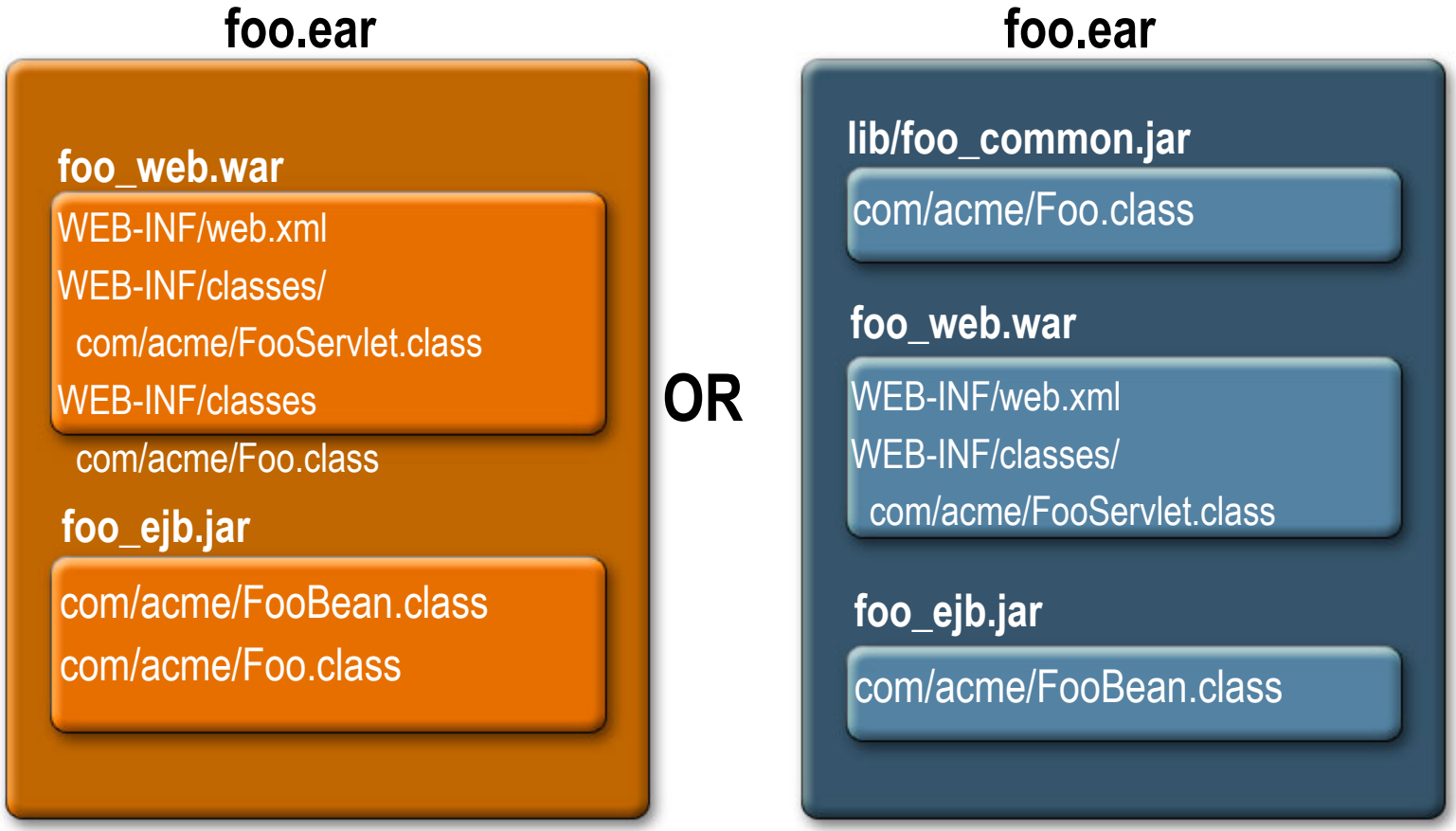
Session Bean with “No-interface” View

```
@Stateless
public class HelloBean {

    public String sayHello(String msg) {
        return “Hello “ + msg;
    }

}
```

No-interface View Client

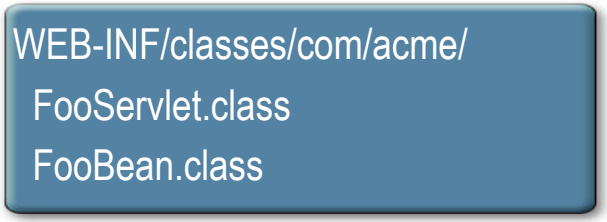
```
@EJB HelloBean h;

...

h.sayHello("bob");
```

Java™ EE Platform 5 Packaging



Simplified Packaging

foo.war



EJB 3.1 “Lite”

Lite

- Local Session Beans
- CMT / BMT
- Declarative Security
- Interceptors

** Web Profile also includes Java Persistence API

Full = Lite + :

- Message-Driven Beans
- Web Service Endpoints
- 2.x / 3.x Remote view
- RMI-IIOP Interoperability
- Timer Service
- Async method calls
- 2.x Local view
- CMP / BMP Entity Beans

Portable EJB JNDI Names

Each session bean gets the following entries :

- Globally unique name

```
java:global[/<app-name>]/<module-name>/<ejb-name>
```

- Unique name within same application

```
java:app/<module-name>/<ejb-name>
```

- Unique name within defining module

```
java:module/<ejb-name>
```

Session Bean

```
@Stateless
public class HelloBean implements Hello {
    public String sayHello(String msg) {
      return "Hello " + msg;
   }
}
```

If deployed as hello.jar, JNDI entries are:

java:global/hello/HelloBean
java:app/hello/HelloBean
java:module/HelloBean

EJB Component Testing

- It's too hard to test EJB components, especially Local session beans
  - Forced to go through Remote facade or Web tier
  - Separate processes needed for server and client
- Some support for client-side EJB component execution exists, but...
  - Not present in all implementations
  - No standard behavior for bootstrapping, component discovery, shutdown etc.

Simple Testing : Session Bean

```
@Stateless
@Local(Bank.class)
public class BankBean implements Bank {

  @PersistenceContext EntityManager accountDB;

  public String createAccount(AcctDetails d)
   { … }

  public void removeAccount(String acctID)
   { … }
```

Embeddable API

```
public class BankTester {
  public static void main(String[] args) {

    EJBContainer container =
       EJBContainer.createEJBContainer();

    // Acquire Local EJB reference
    Bank bank = (Bank) container.getContext().
      lookup("java:global/bank/BankBean");

    testAccountCreation(bank);
    container.close();
```

Test Client Execution

```
% java -classpath bankClient.jar :
                  bank.jar :
                  javaee.jar :
                  <vendor_rt>.jar

                  com.acme.BankTester
```

New Features

- Singletons
- Startup / Shutdown callbacks
- Automatic timer creation / Calendar-based timers
- Asynchronous session bean invocations

Singletons

- New session bean component type
  - Provides easy sharing of state within application
  - Designed for concurrent access
  - One bean instance per singleton component per process
- Lots in common with stateless / stateful beans
  - Client views (Local, Remote, Web Service)
  - CMT / BMT
  - Container services: resource managers, timer service, method authorization, etc.

Simple Singleton

```
@Singleton
public class SharedBean {

  private SharedData shared;

  @PostConstruct
  private void init() {
    shared = ...;
  }

  public int getXYZ() {
    return shared.xyz;
  }
```

Singleton Client

```
@Stateless
public class FooBean {

  // Inject reference to Singleton bean
  @EJB
  private SharedBean shared;

  public void foo() {
    int xyz = shared.getXYZ();
    ...
  }
```

Singleton Concurrency Options

- Single threaded (default)
  - For consistency with all existing bean types
- Container Managed Concurrency
  - Control access via method-level locking metadata
- Bean Managed Concurrency
  - All concurrent invocations have access to bean instance

Startup / Shutdown Callbacks

```
@Singleton
@Startup
public class StartupBean {

  @PostConstruct
  private void onStartup() { … }

  @PreDestroy
  private void onShutdown() { … }

}
```

Calendar Expression Examples

- “The last Thursday in November at 2 p.m.”
  - `(hour="14", dayOfMonth="Last Thu", month="Nov")`
- “Every day at 3:15 a.m. U.S. Eastern Time”
  - `(minute="15", hour="3", timezone="America/New_York")`
- “Every twenty seconds”
  - `(second="*/20", minute="*", hour="*")`

Automatic Timer Creation

```
@Stateless
public class BankBean {

  @PersistenceContext EntityManager accountDB;
  @Resource javax.mail.Session mailSession;

  // Callback the last day of each month at 8 a.m.

  @Schedule(hour="8", dayOfMonth="Last")
  void sendMonthlyBankStatements() {
    ...
  }
}
```

Asynchronous Session Bean Invocations

- *Simple* way to add Remote or Local asynchrony to enterprise bean applications
- "Fire and Forget" or async results via `Future<V>`
- Best effort delivery – persistent delivery guarantees are not required by spec
- Available for Stateful, Stateless, Singleton beans

Local Concurrent Computation

```
@Stateless public class DocBean {

  @PersistenceContext EntityManager resultsDB;
  @EJB DocBean myself;

  public void processDocument(Document document) {
    myself.doAnalysisA(document);
    myself.doAnalysisB(document);
  }

  @Asynchronous public void doAnalysisA(Document d) {...}

  @Asynchronous public void doAnalysisB(Document d) {...}
```

Asynchronous Results

- Based on `java.util.concurrent.Future`
- Result value is returned via `Future.get()`
  - Also supports `Future.get(long, TimeUnit)`
- Client exception wrapped by `ExecutionException`
  - `getCause()` returns same exception as would have been thrown by a synchronous invocation

Asynchronous Results -- Client

```
@EJB Processor processor;

Task task = new Task(...);

Future<int> computeTask =
processor.compute(task);

...

int result = computeTask.get();
```

Asynchronous Results

```
@Stateless
public class ProcessorBean implements Processor {

  @PersistenceContext EntityManager db;

  @Asynchronous
  public Future<int> compute(Task t) {

    // perform computation
    int result = ...;

    return new javax.ejb.AsyncResult<int>(result);
  }
```

Resources

Java EE 6 and GlassFish v3

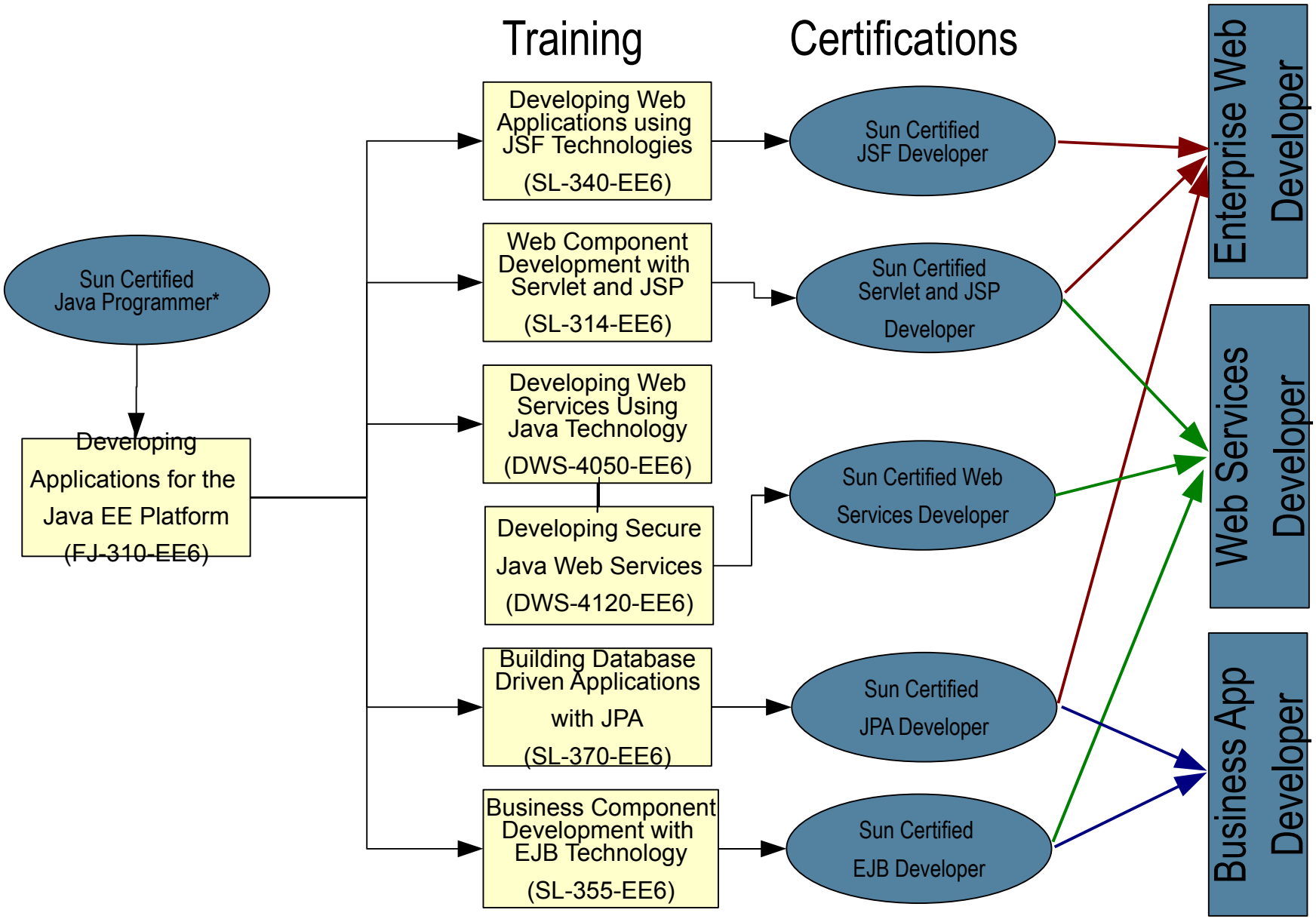
- Java EE 6 Home
  java.sun.com/javaee
- Java EE 6 Downloads
  java.sun.com/javaee/downloads
- Upcoming Training
  java.sun.com/javaee/support/training

Java EE 6

- Sun GlassFish Enterprise Server v3 Home
  www.sun.com/glassfishv3
- Community Page
  glassfish.org
- The Aquarium Blog
  blogs.sun.com/theaquarium
- White Papers/Webinars
  http://www.sun.com/glassfish/resources

GlassFish

Java EE6 Learning Path



Updated EJB 3.1 Training & Certification

- Completely updated Training course for EJB 3.1
  - Business Component Development with EJB Technology (SL-355-EE6) – 3 Days
- Includes coverage of:
  - Implement business-tier functionality using EJB technology
  - Best practices and other advanced issues in business component development with EJB technology
  - Integrate an EJB technology-based application using the Java Messaging Service API
  - Transactions, Security and more
- Register your interest!
  - https://dct.sun.com/dct/forms/reg_us_1611_480_0.jsp

Enterprise JavaBeans(™) EJB(™) 3.1 Technology

Overview

Kenneth Saks
kenneth.saks@sun.com