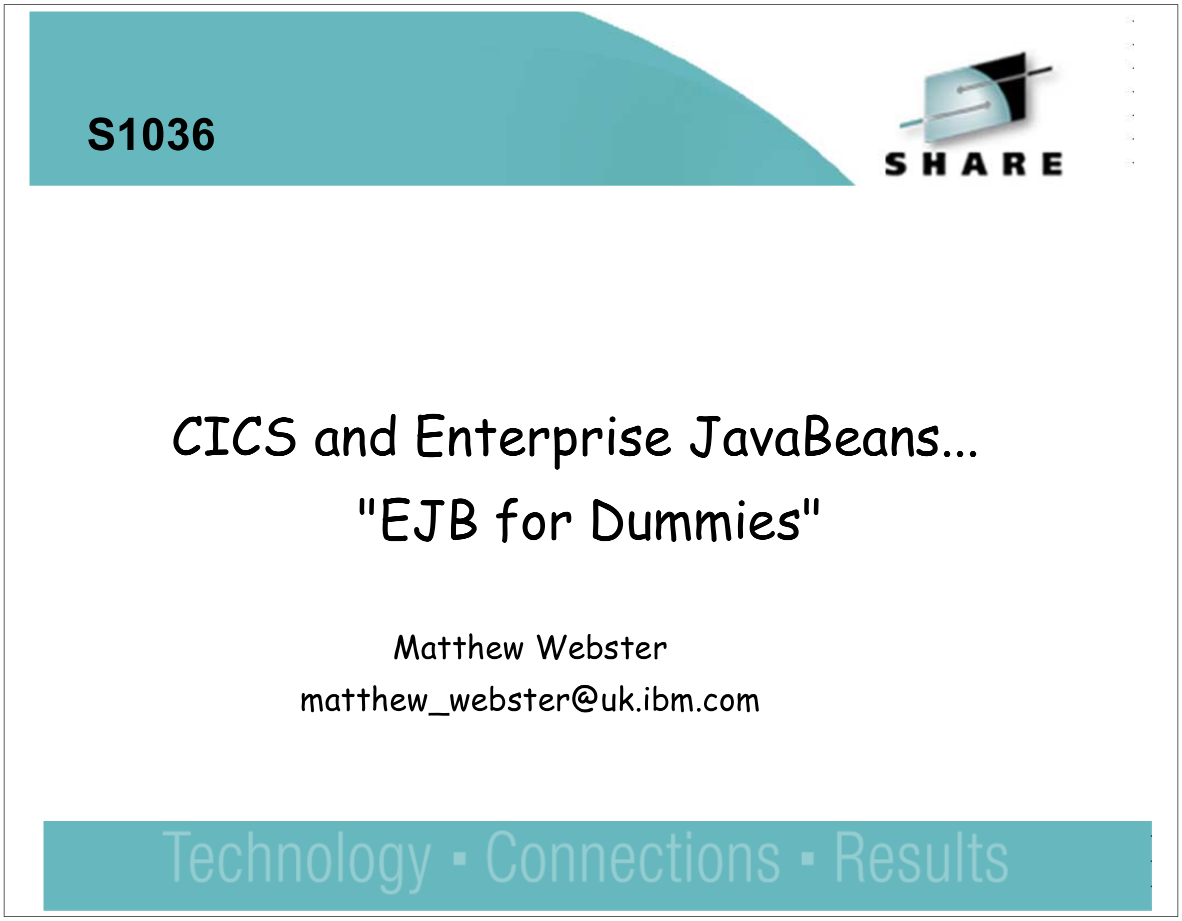


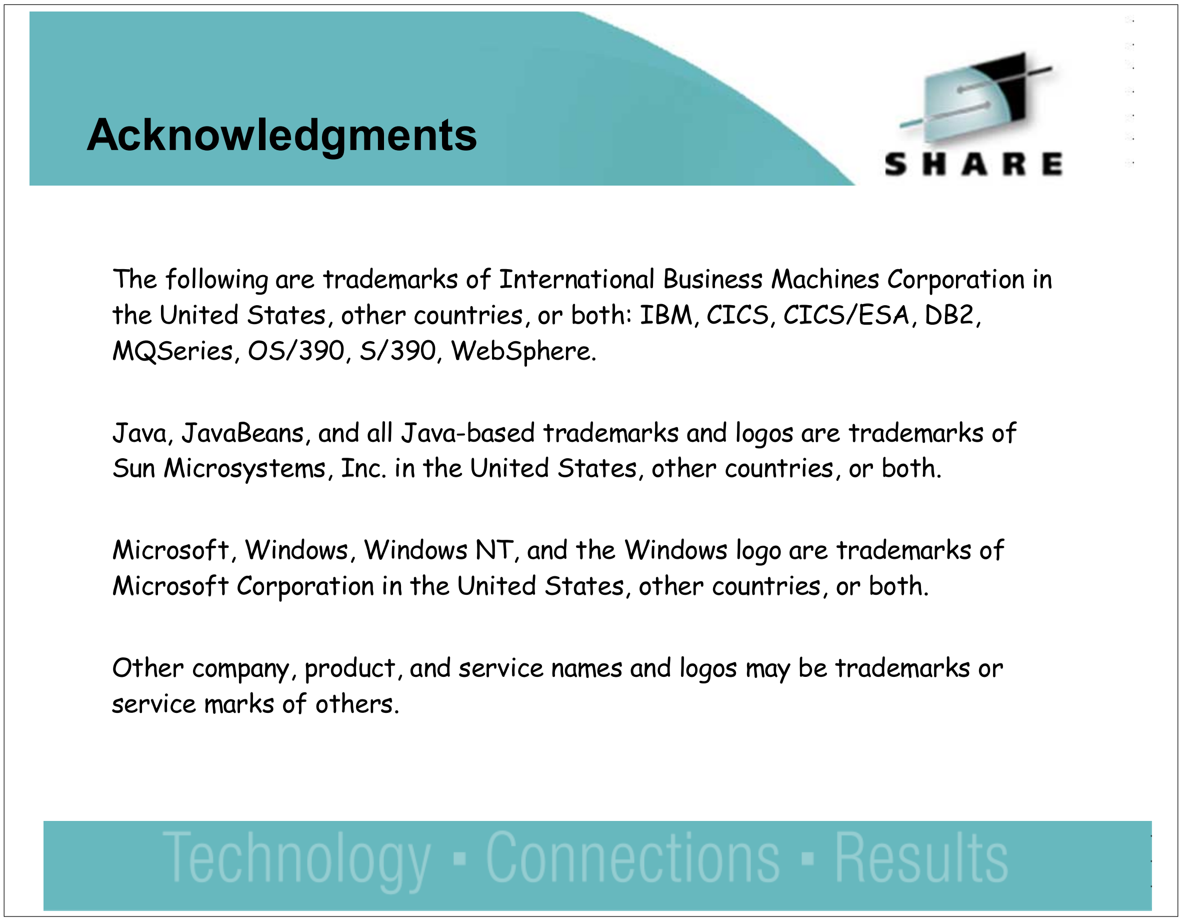
S1036

SHARE

CICS and Enterprise JavaBeans... "EJB for Dummies"

Matthew Webster
matthew_webster@uk.ibm.com

Technology • Connections • Results



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Agenda

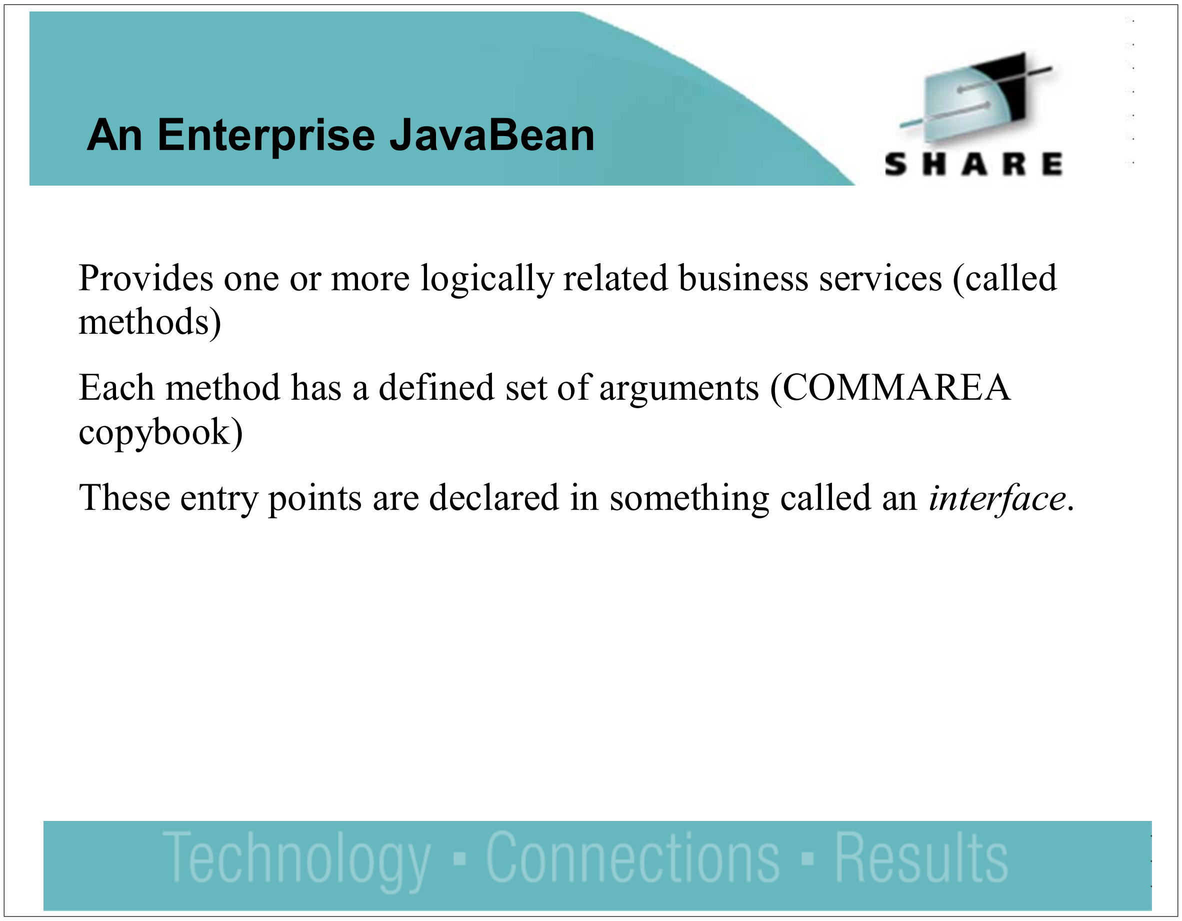
Why Java?

Enterprise JavaBeans Overview

Why Enterprise JavaBeans??

Comparison to COBOL

Mixing EJBs and COBOL



An Enterprise JavaBean

Provides one or more logically related business services (called methods)

Each method has a defined set of arguments (COMMAREA copybook)

These entry points are declared in something called an *interface*.

EJB vs COBOL

EJB	COBOL
Known by bean name	Known by program name
Many entry points, each with own argument list	Single entry point with defined COMMAREA
Caller uses interface	Caller uses copybook

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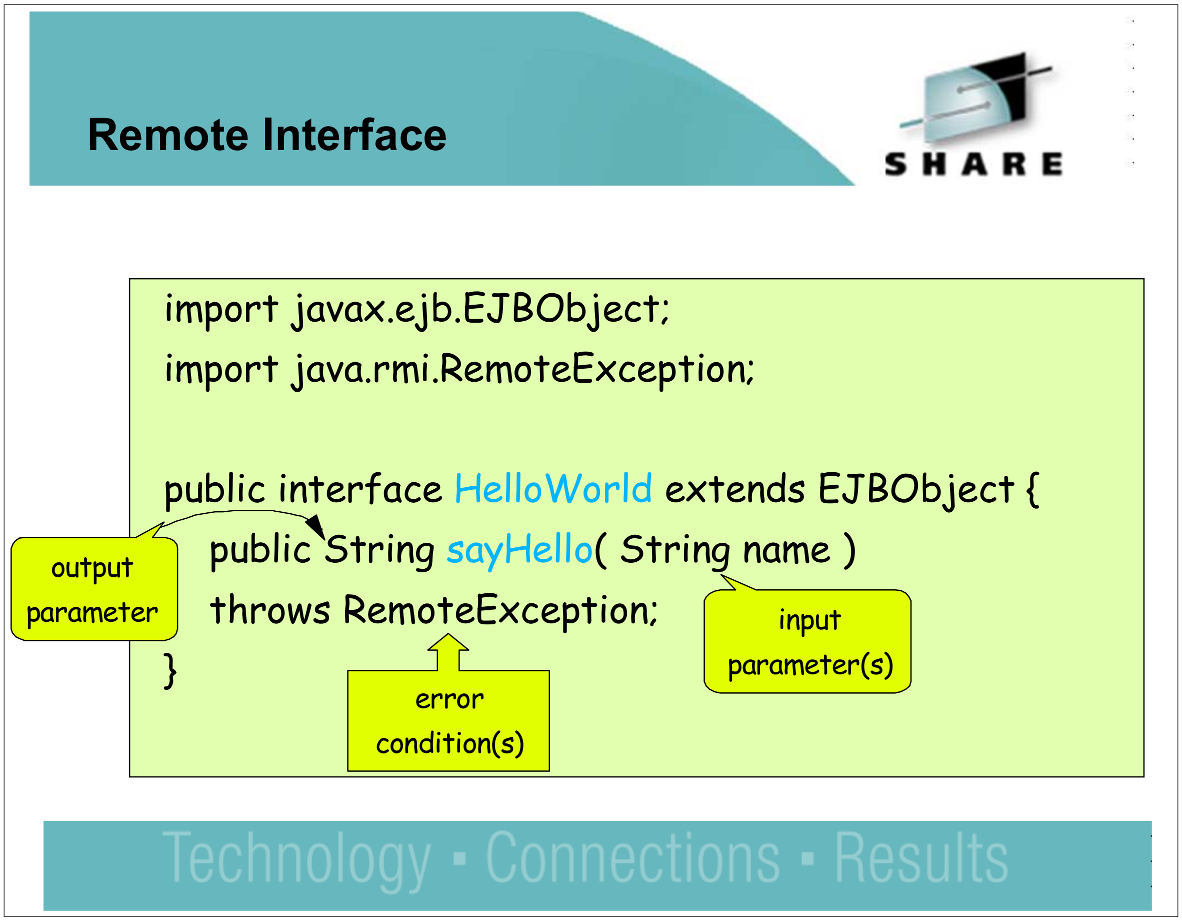

Remote Interface

SHARE

```
import javax.ejb.EJBObject;
import java.rmi.RemoteException;

public interface HelloWorld extends EJBObject {
   public String sayHello( String name )
   throws RemoteException;
}
```

output parameter

input parameter(s)

error condition(s)

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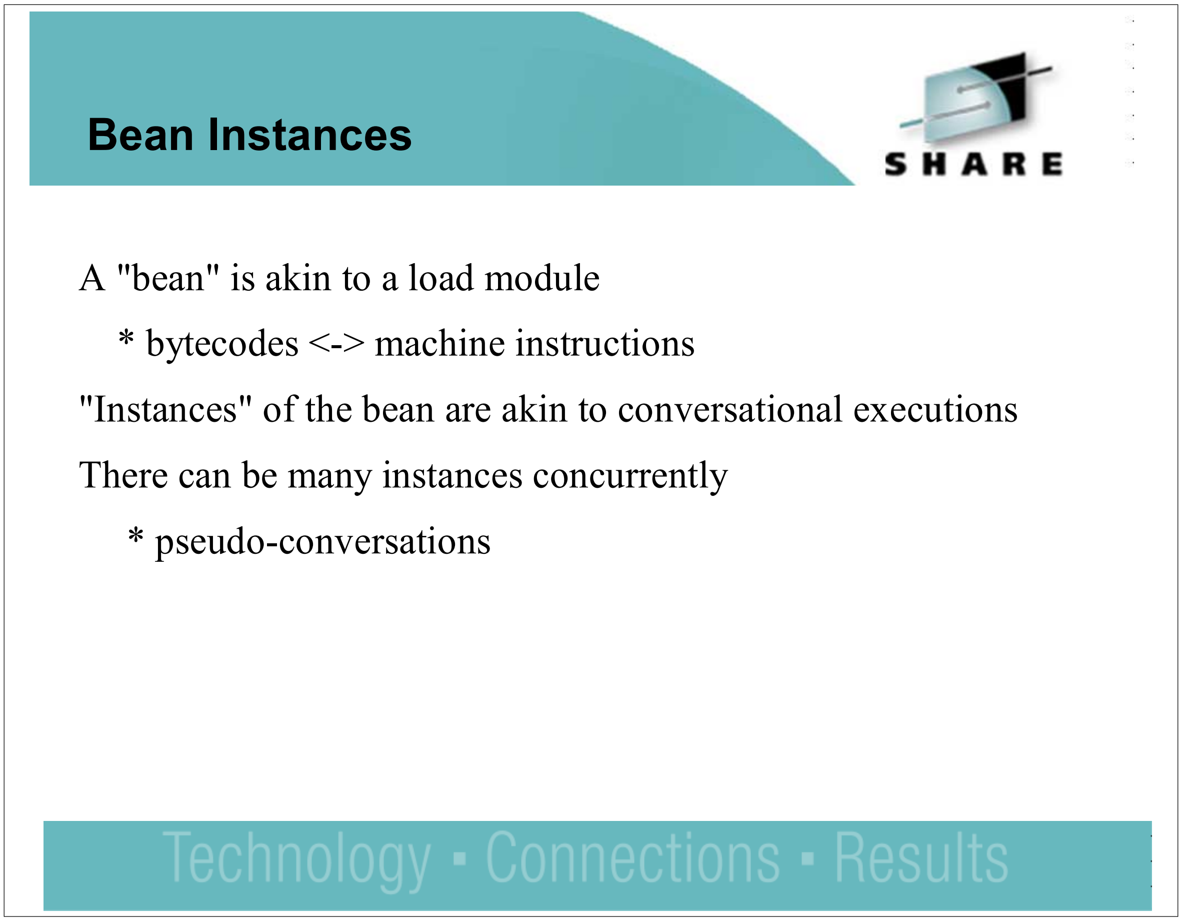

Bean Instances

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A "bean" is akin to a load module

* bytecodes <-> machine instructions

"Instances" of the bean are akin to conversational executions

There can be many instances concurrently

* pseudo-conversations

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Pseudo-conversations

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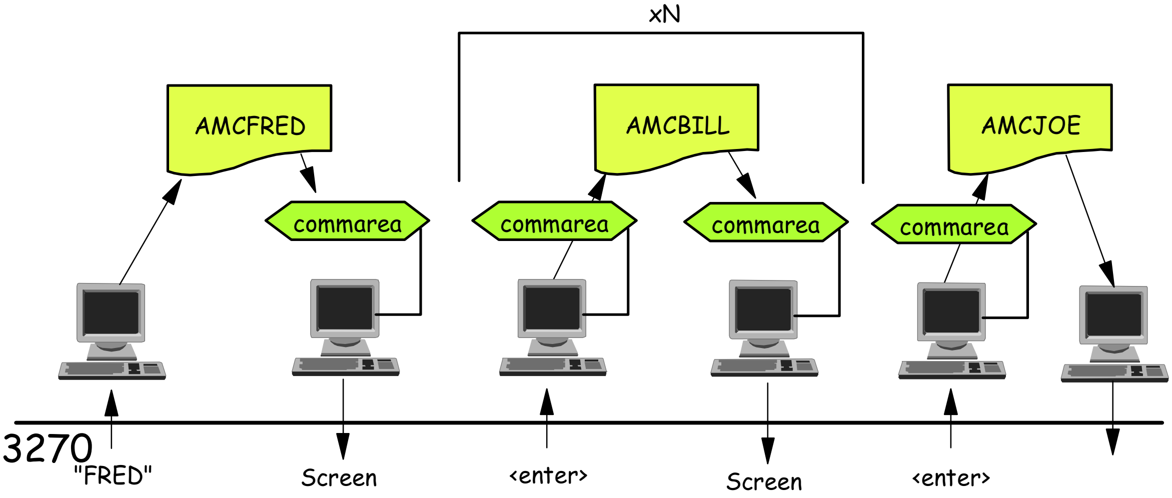

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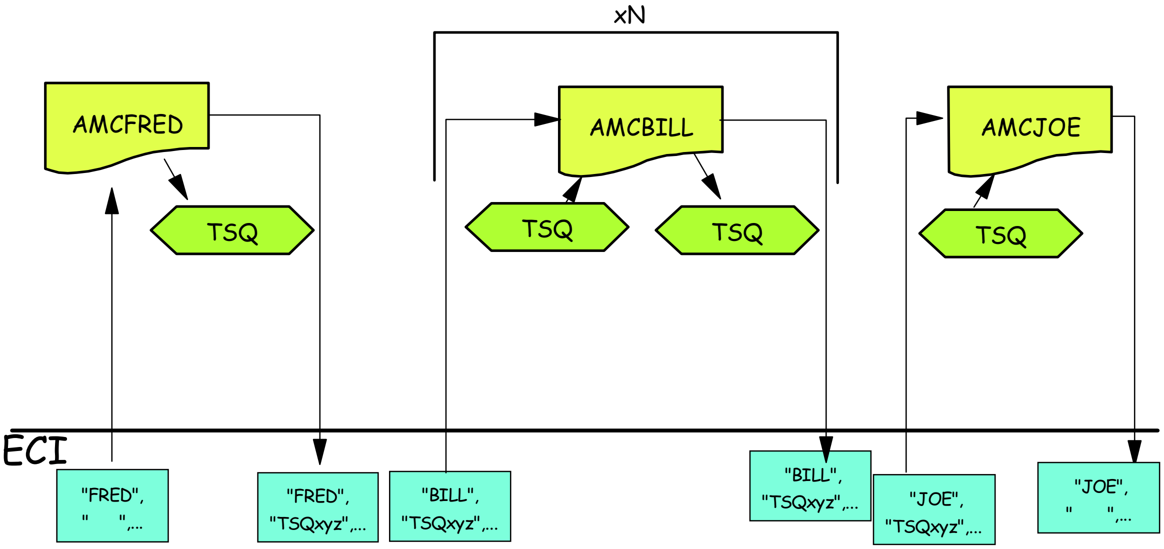
Pseudo-conversations (ECI)



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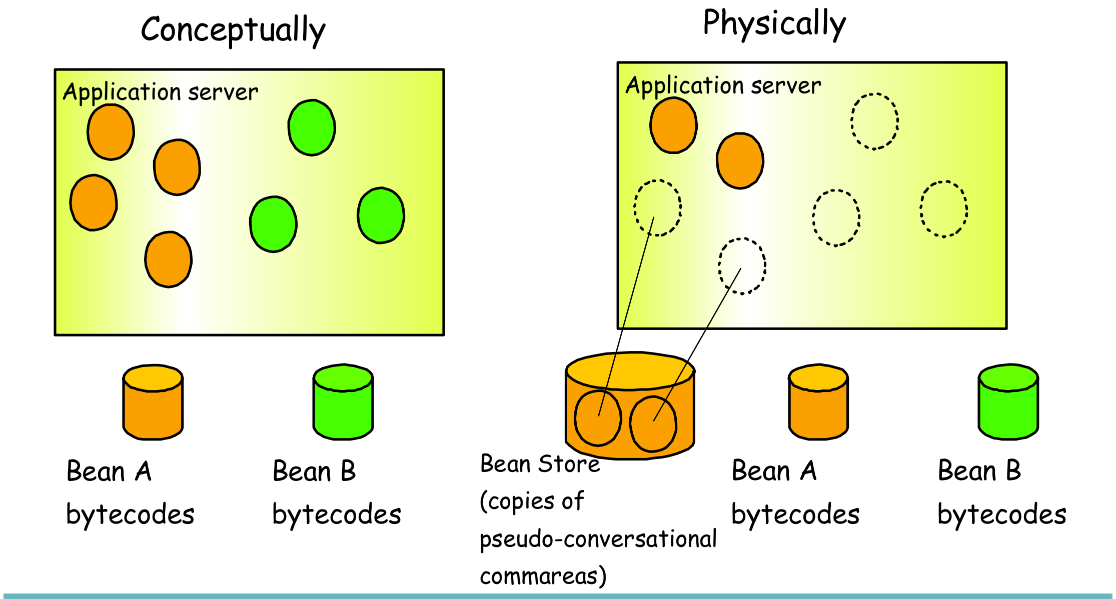
Bean Instances



Conceptually

Application server

Bean A bytecodes

Bean B bytecodes

Physically

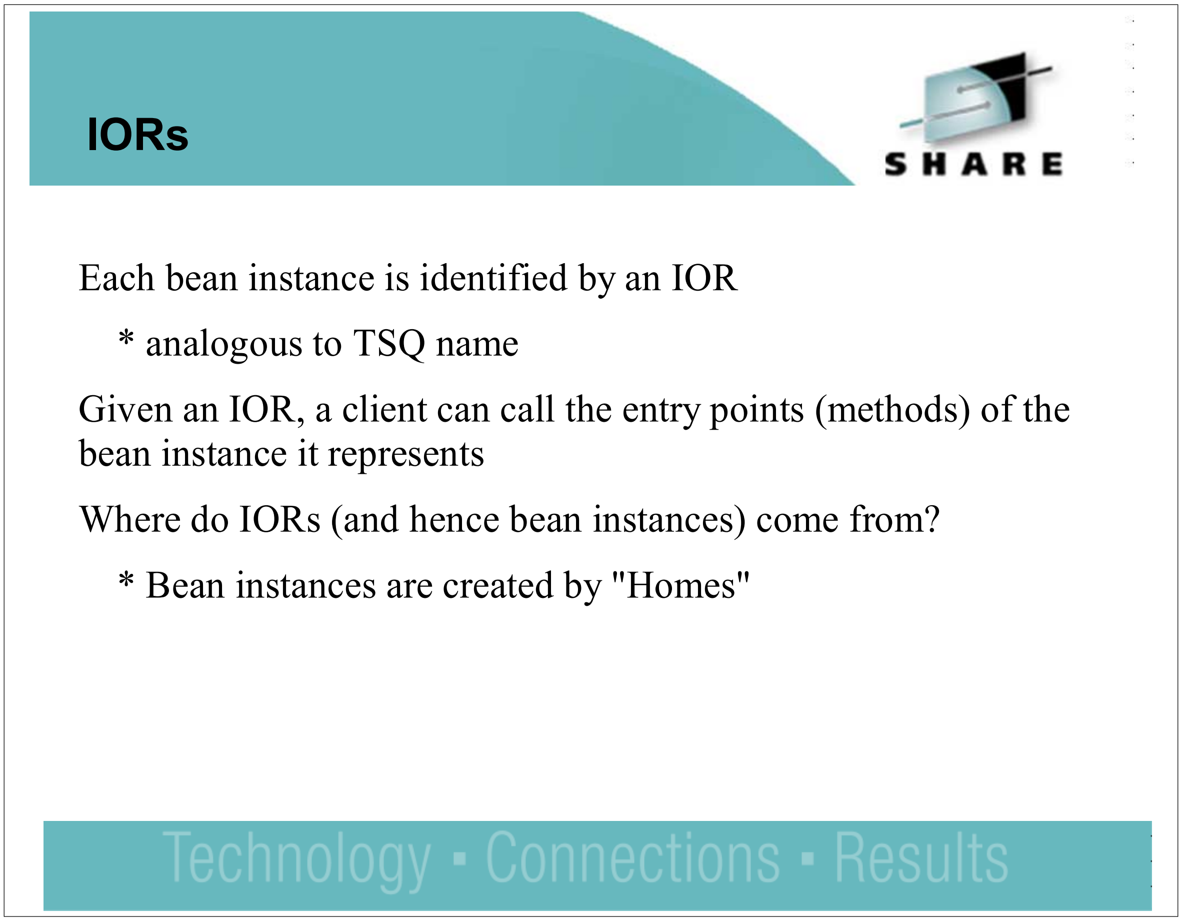
Application server

Bean Store (copies of pseudo-conversational commareas)

Bean A bytecodes

Bean B bytecodes

Technology • Connections • Results



IORs

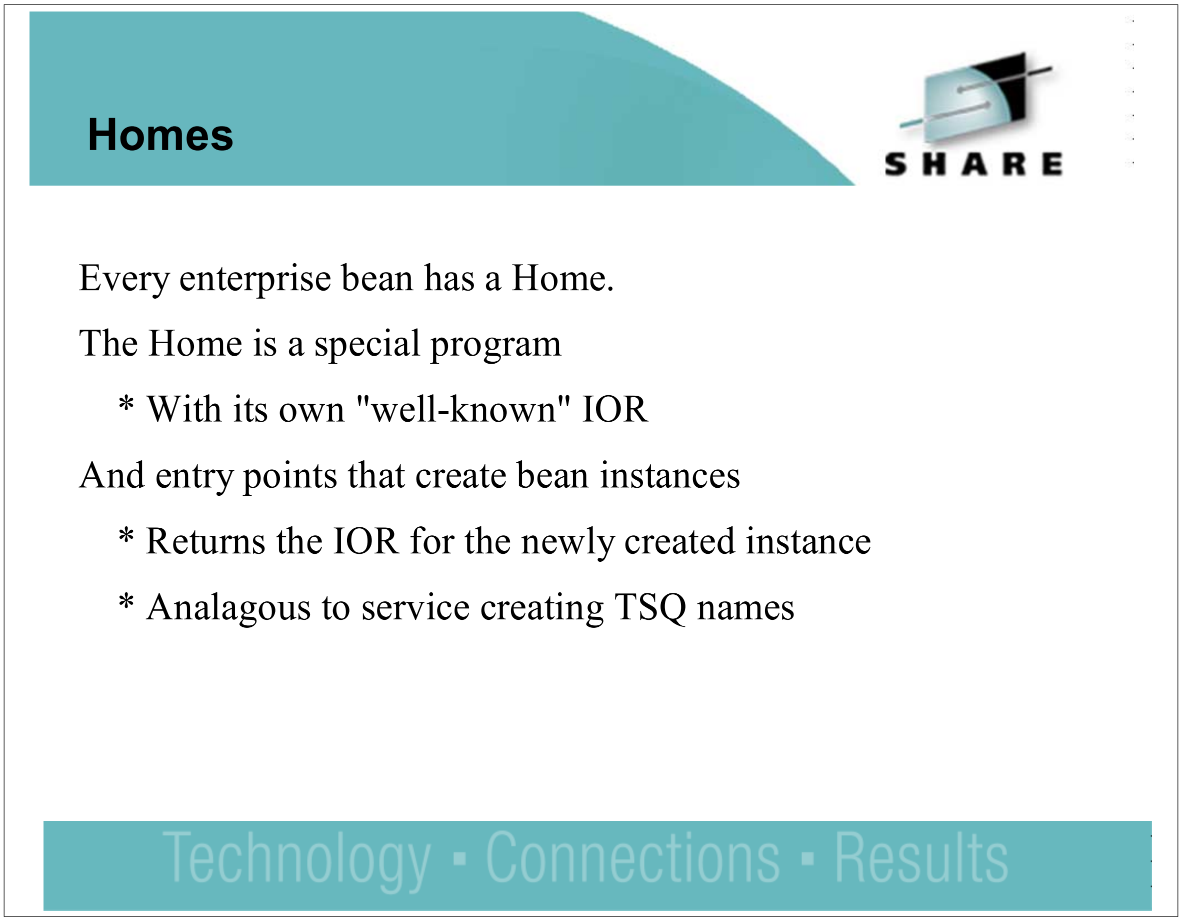
Each bean instance is identified by an IOR

  * analogous to TSQ name

Given an IOR, a client can call the entry points (methods) of the bean instance it represents

Where do IORs (and hence bean instances) come from?

  * Bean instances are created by "Homes"



Homes

Every enterprise bean has a Home.

The Home is a special program

  * With its own "well-known" IOR

And entry points that create bean instances

  * Returns the IOR for the newly created instance

  * Analagous to service creating TSQ names

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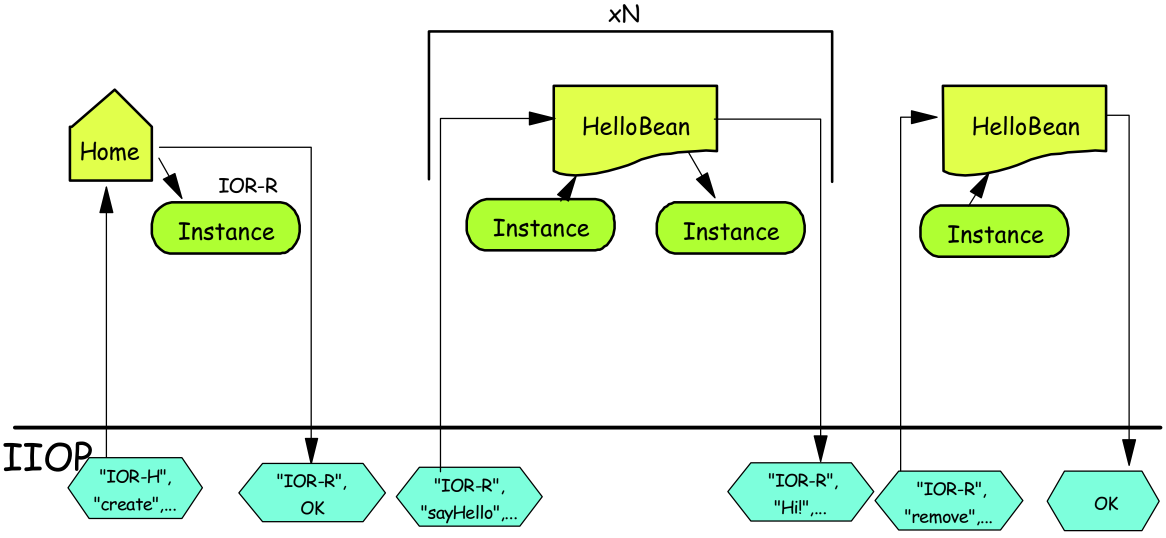
Pseudo-conversations (EJBs)



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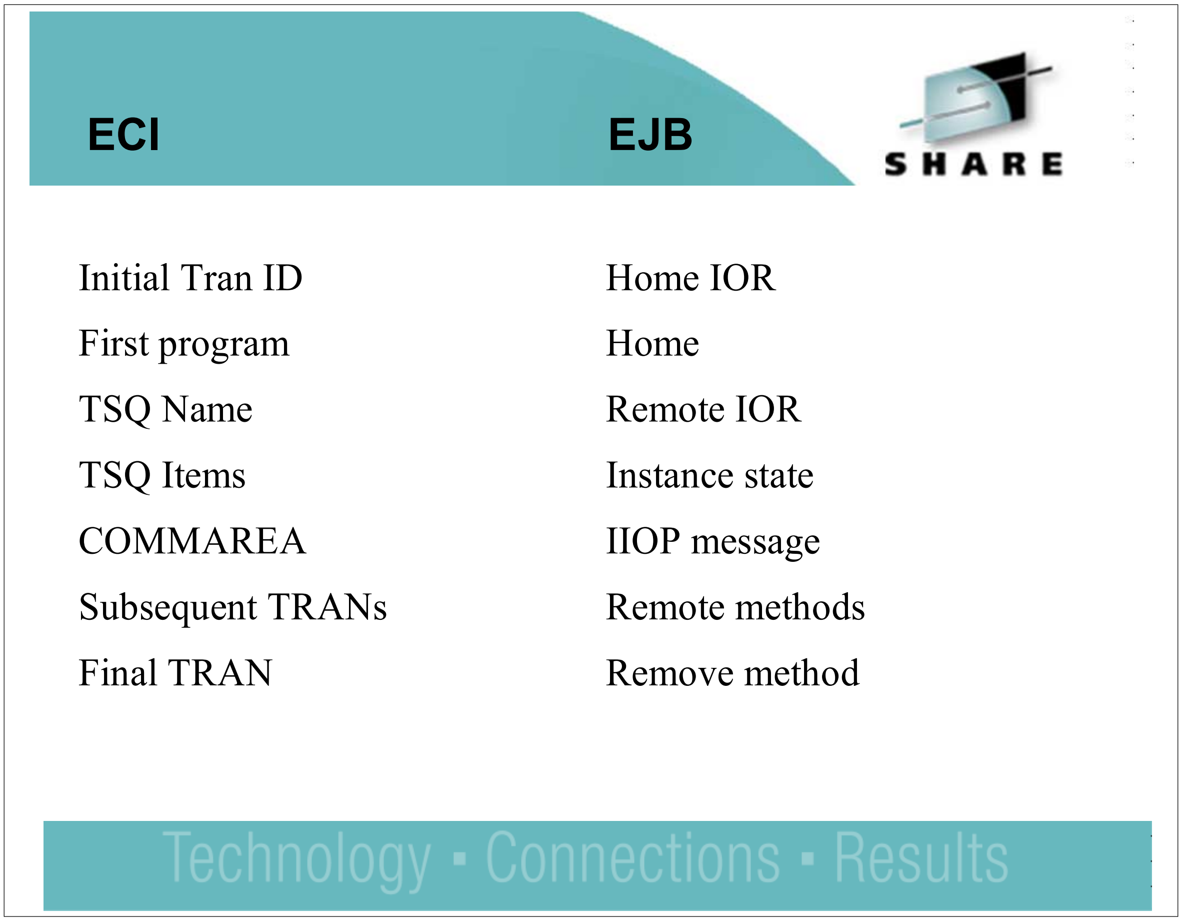

ECI	EJB
Initial Tran ID	Home IOR
First program	Home
TSQ Name	Remote IOR
TSQ Items	Instance state
COMMAREA	IIOP message
Subsequent TRANs	Remote methods
Final TRAN	Remove method

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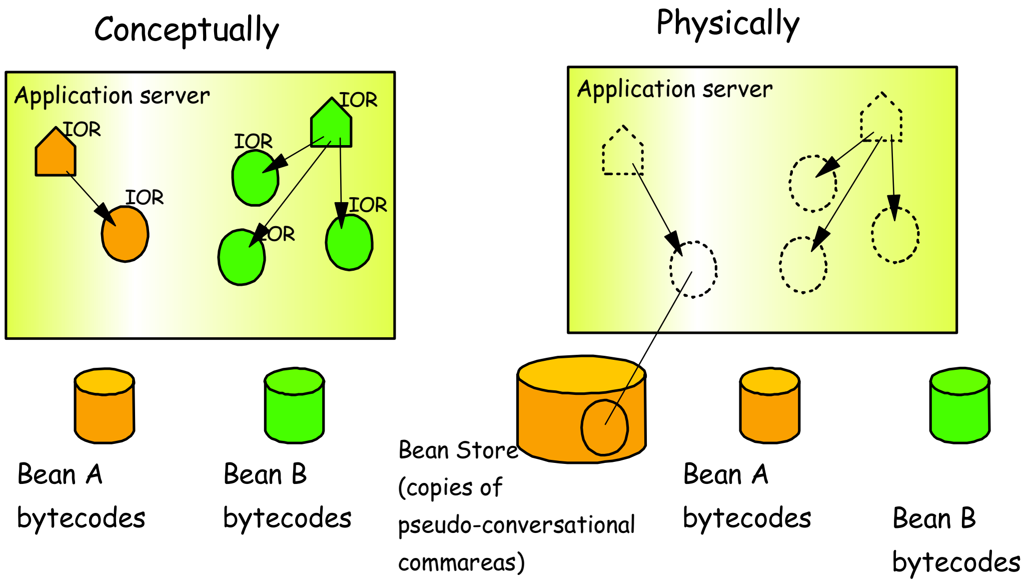
Homes


Conceptually

Physically

Bean A bytecodes

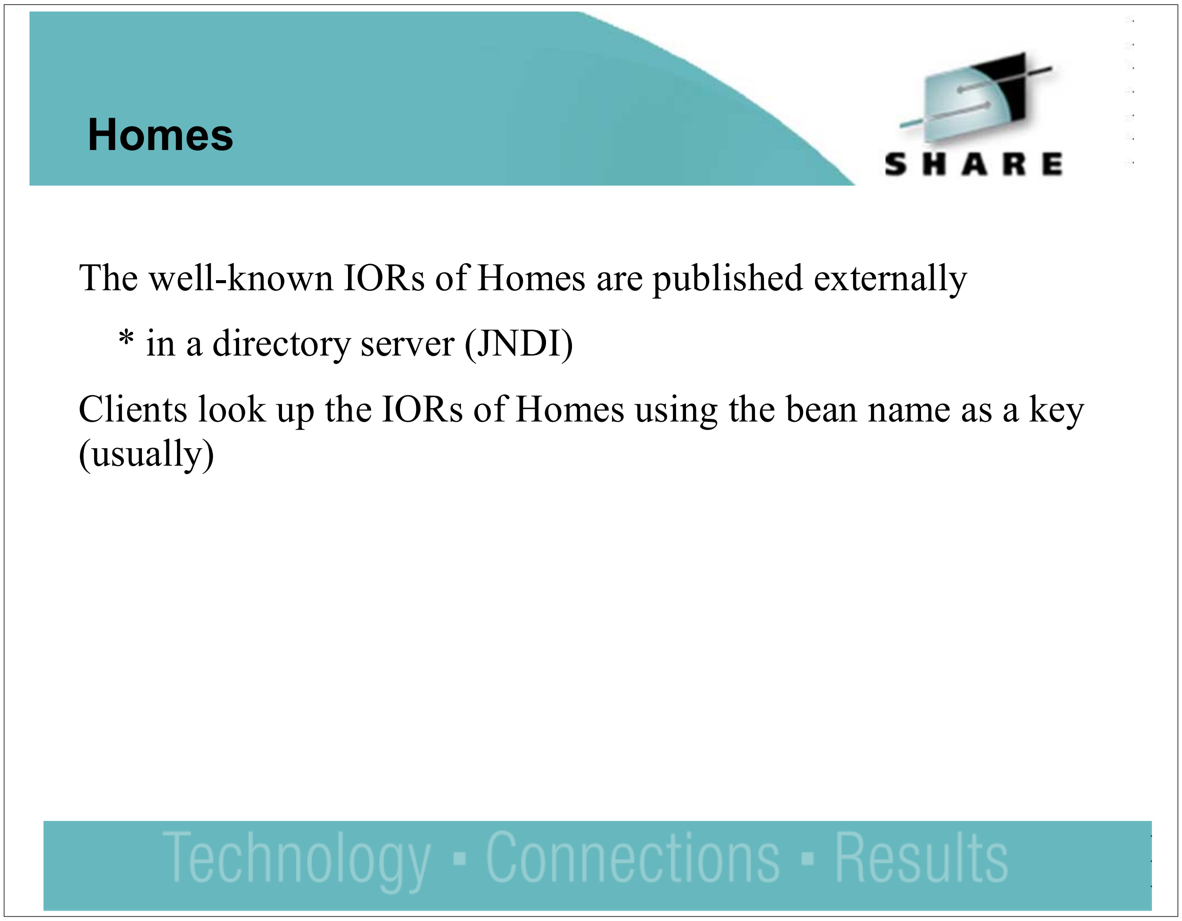
Bean B bytecodes

Bean Store (copies of pseudo-conversational commareas)

Bean A bytecodes

Bean B bytecodes

Technology • Connections • Results

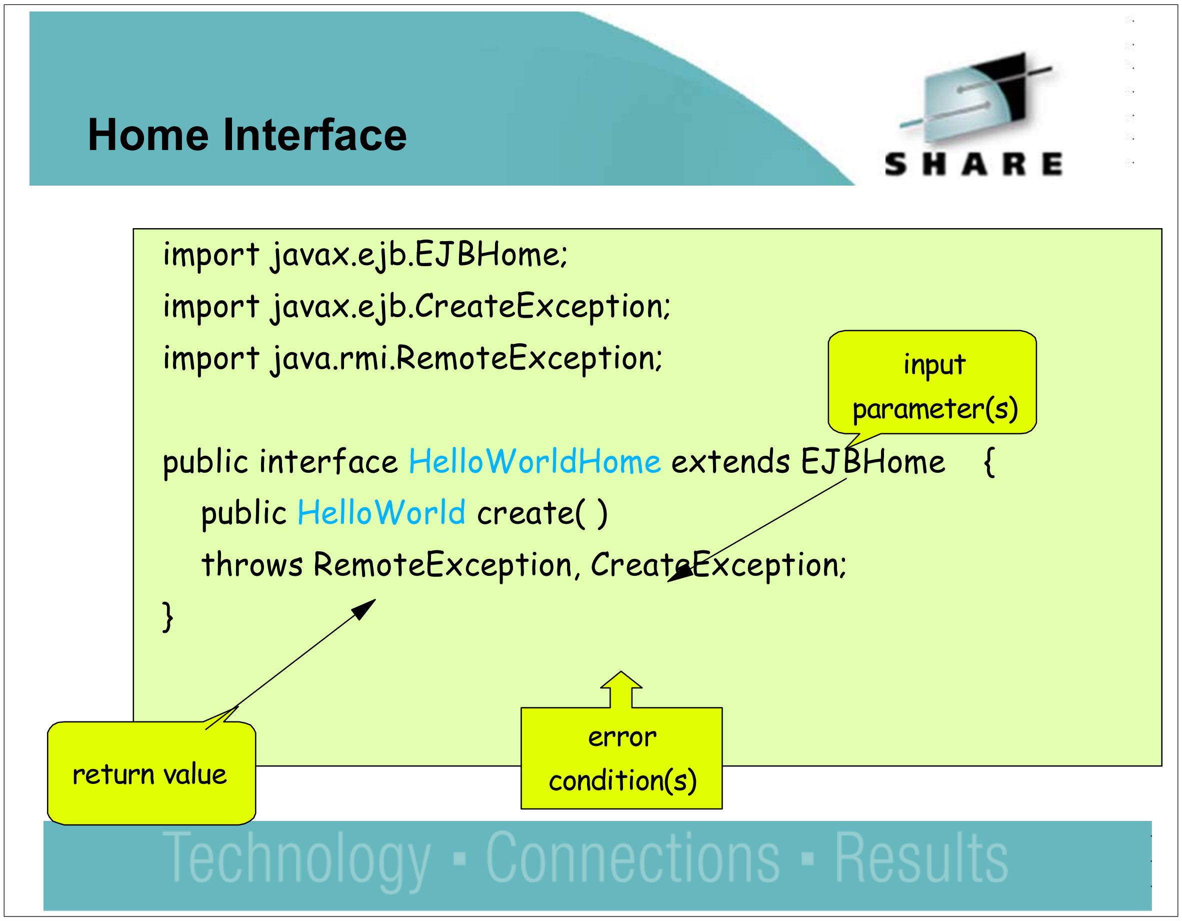


Homes

The well-known IORs of Homes are published externally

- in a directory server (JNDI)

Clients look up the IORs of Homes using the bean name as a key (usually)



Home Interface

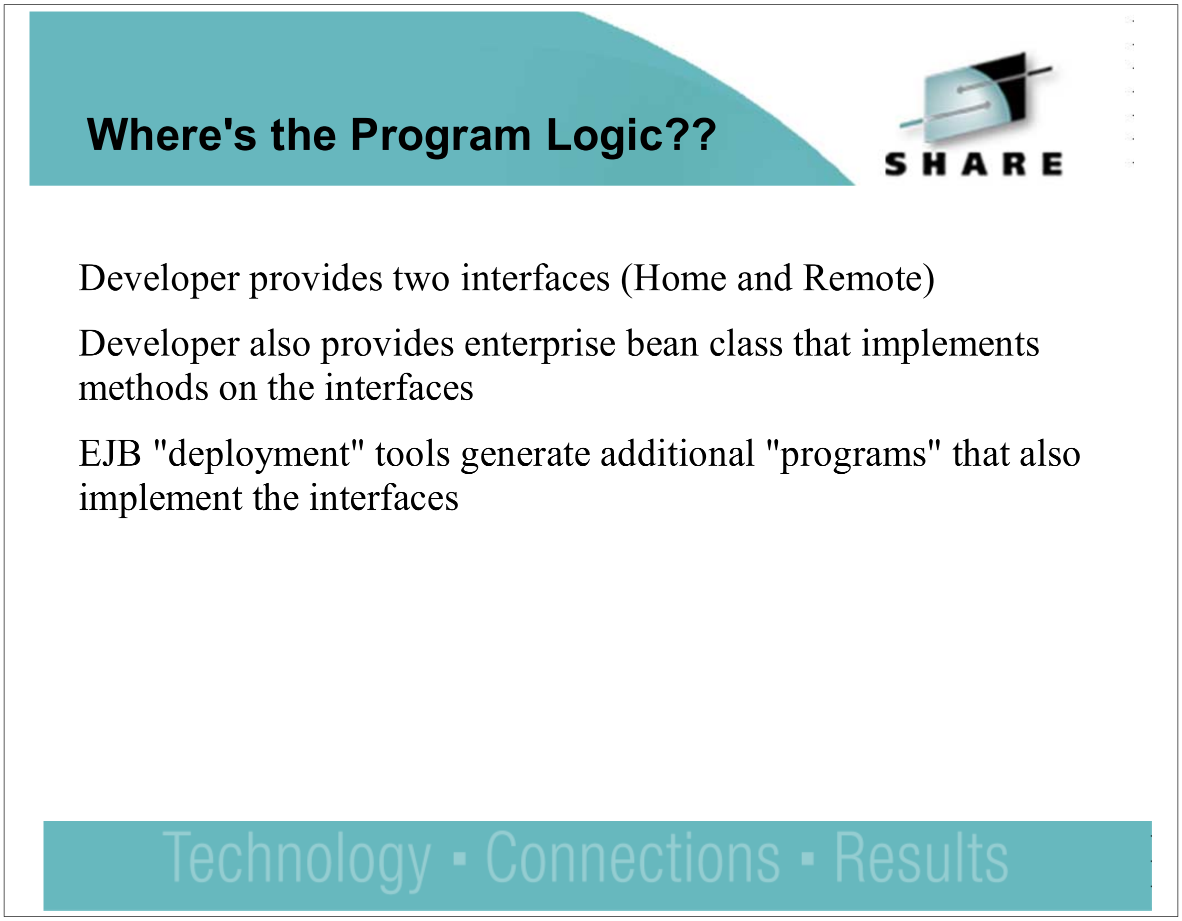
```
import javax.ejb.EJBHome;
import javax.ejb.CreateException;
import java.rmi.RemoteException;

public interface HelloWorldHome extends EJBHome   {
   public HelloWorld create( )
   throws RemoteException, CreateException;
}
```

input parameter(s)

return value

error condition(s)

Technology ▪ Connections ▪ Results



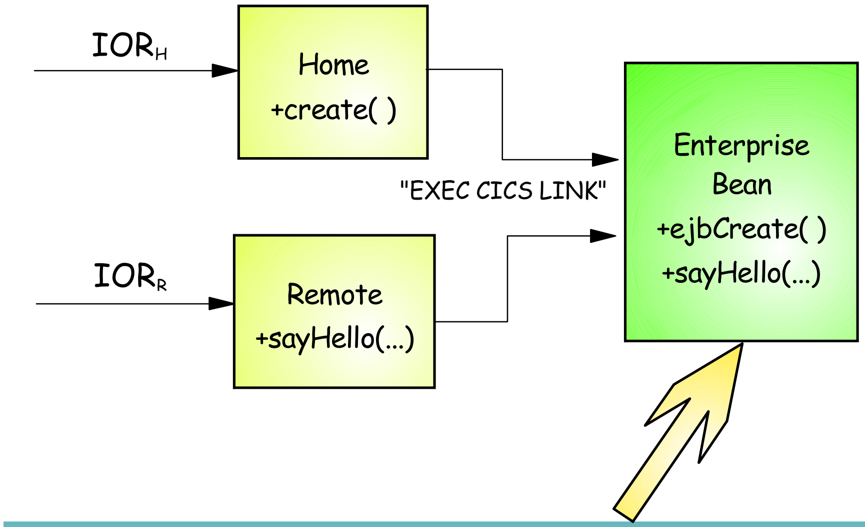
Where's the Program Logic??

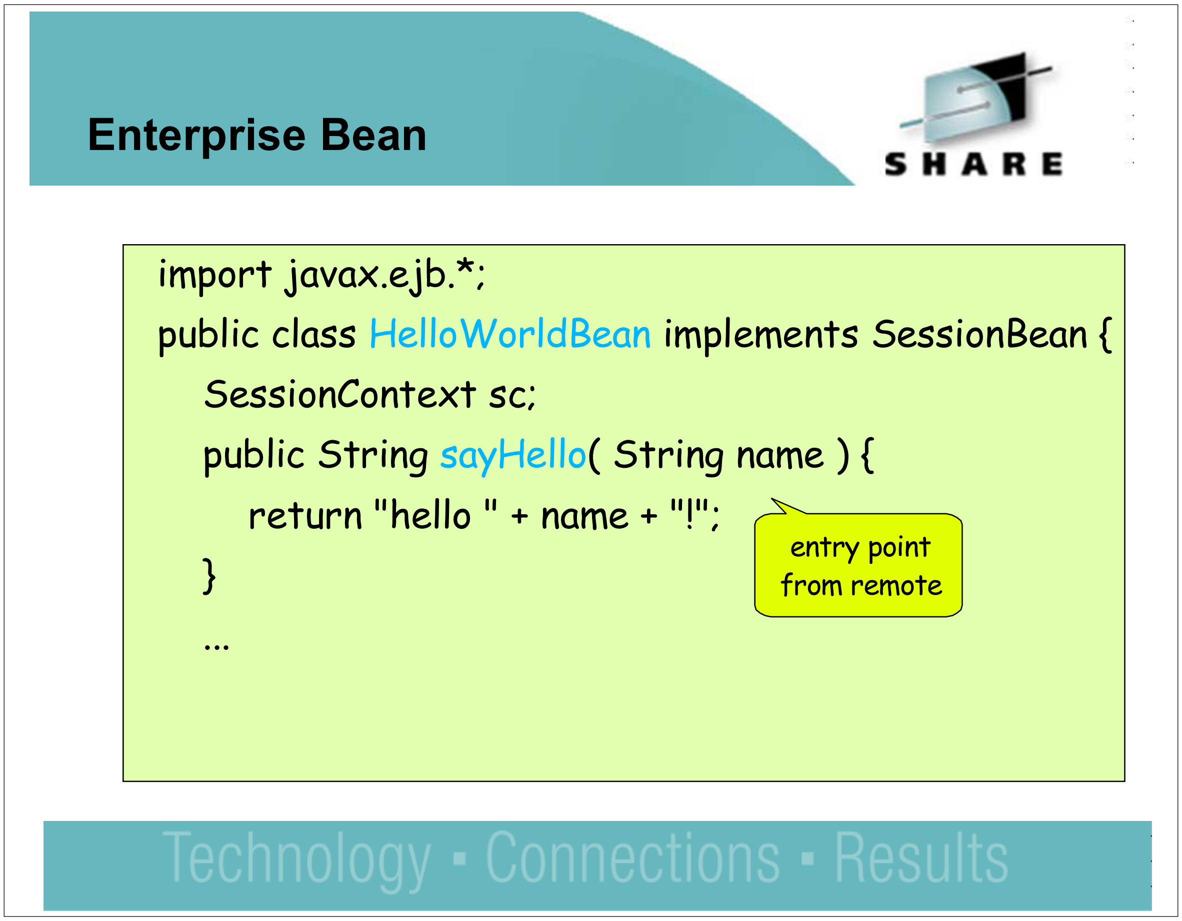
Developer provides two interfaces (Home and Remote)

Developer also provides enterprise bean class that implements methods on the interfaces

EJB "deployment" tools generate additional "programs" that also implement the interfaces

Where's the Program Logic?



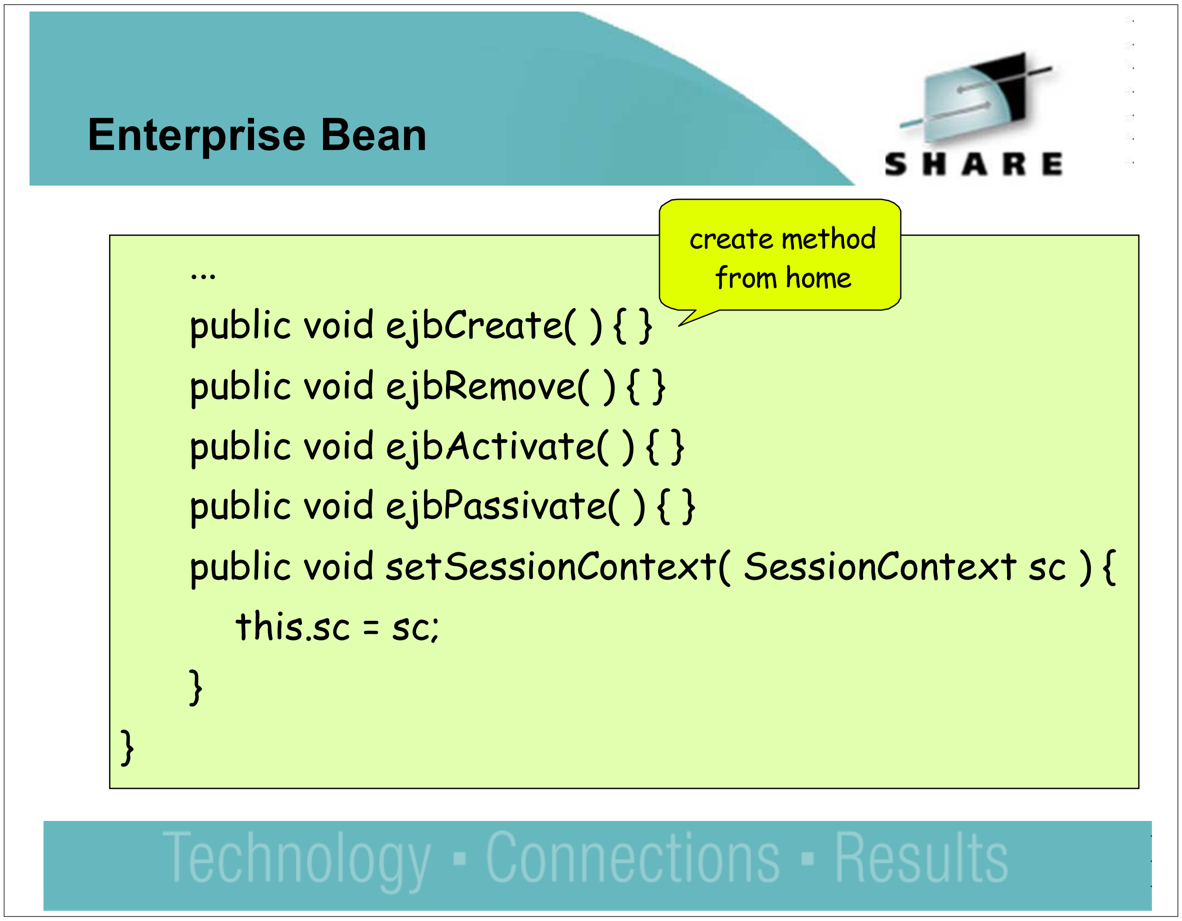


Enterprise Bean

```
import javax.ejb.*;
public class HelloWorldBean implements SessionBean {
    SessionContext sc;
    public String sayHello( String name ) {
        return "hello " + name + "!";
    }
    ...
```

entry point from remote

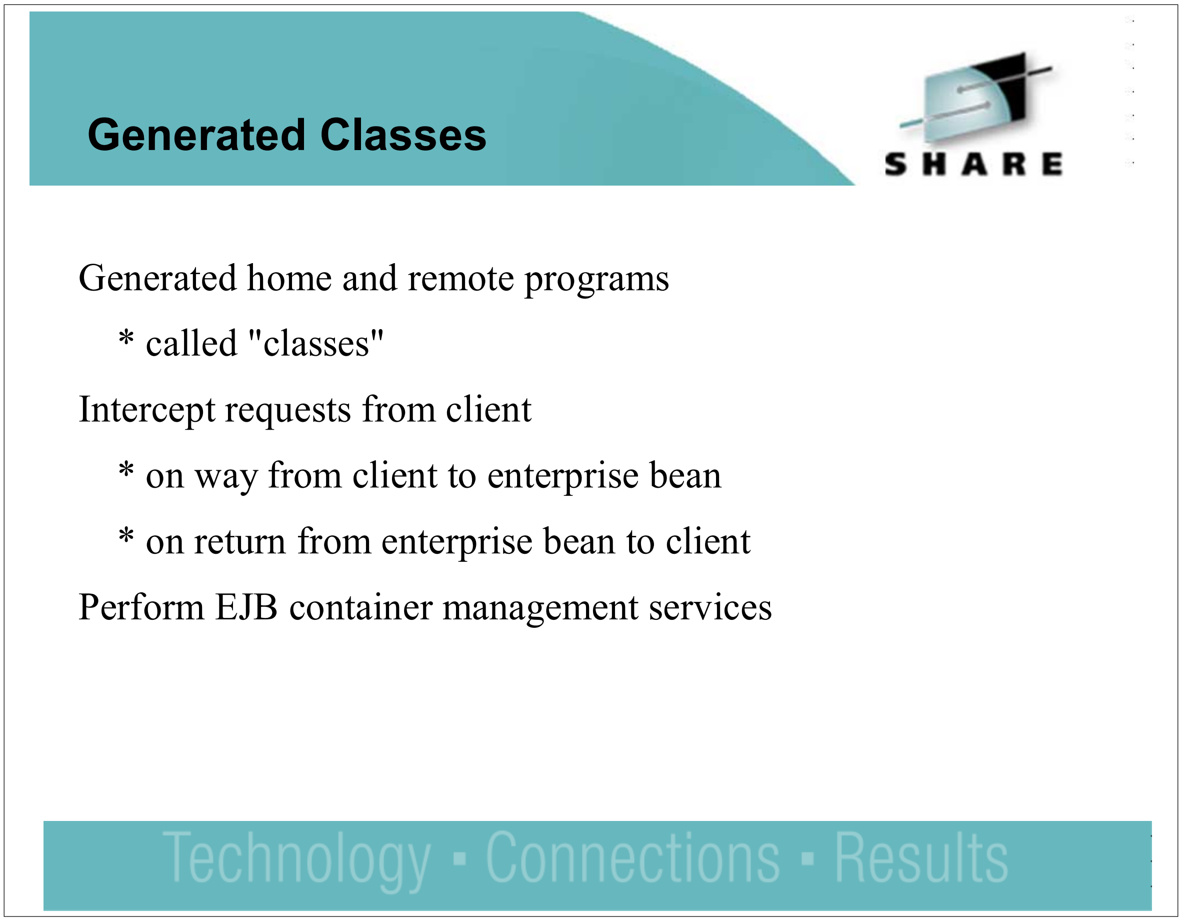
Technology ▪ Connections ▪ Results



Enterprise Bean

```
        ...
        public void ejbCreate( ) { }
        public void ejbRemove( ) { }
        public void ejbActivate( ) { }
        public void ejbPassivate( ) { }
        public void setSessionContext( SessionContext sc ) {
            this.sc = sc;
        }
}
```

create method from home



Generated Classes

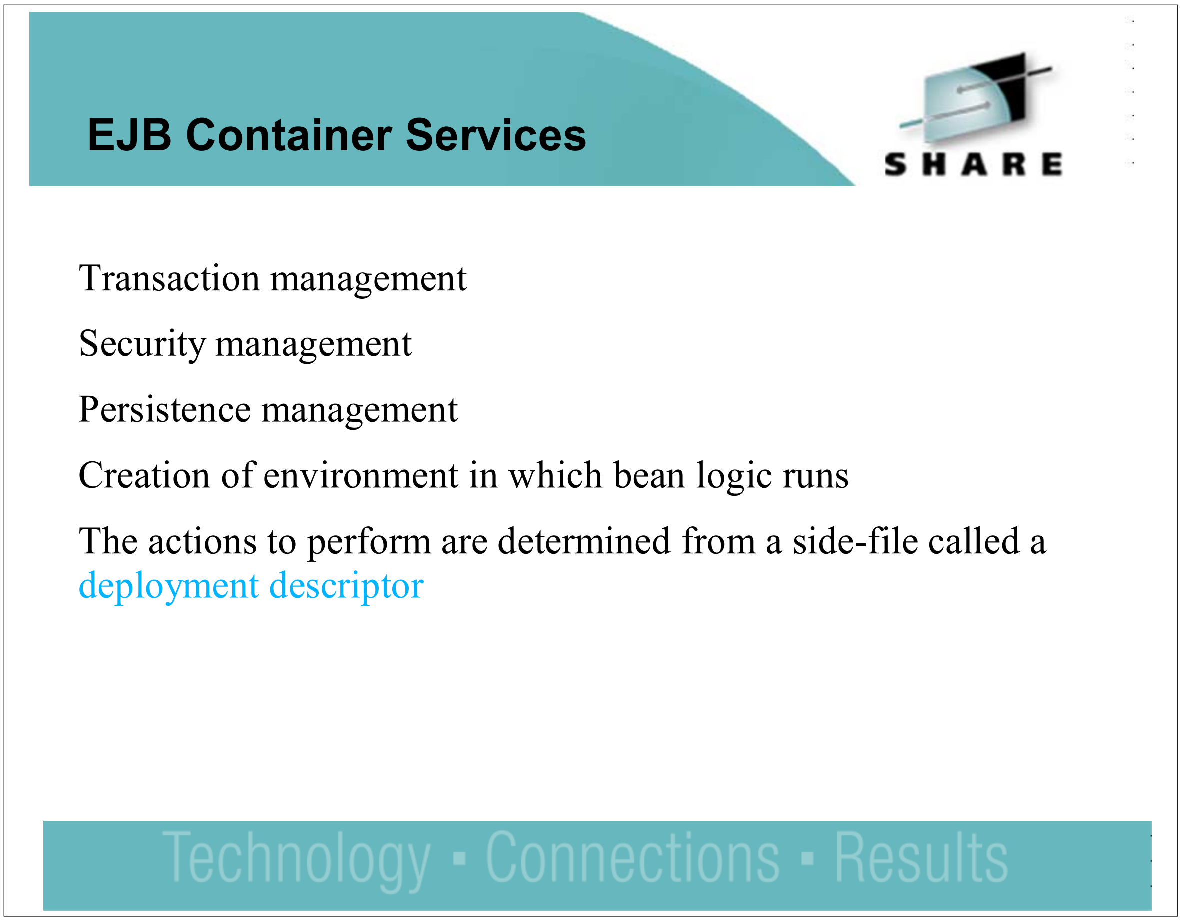
Generated home and remote programs

- * called "classes"

Intercept requests from client

- * on way from client to enterprise bean
- * on return from enterprise bean to client

Perform EJB container management services



EJB Container Services

Transaction management

Security management

Persistence management

Creation of environment in which bean logic runs

The actions to perform are determined from a side-file called a deployment descriptor

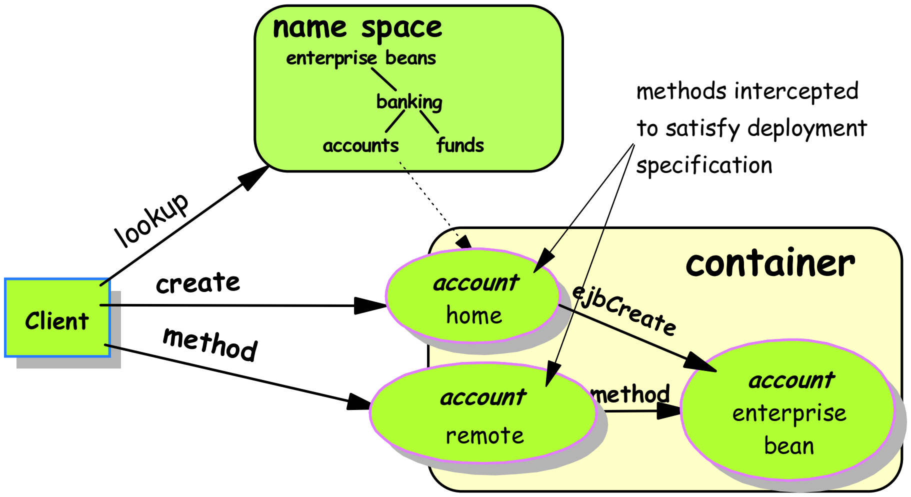
Deployment Descriptor

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE ejb-jar PUBLIC "-//Sun Microsystems, Inc.//DTD Enterprise
JavaBeans 1.1//EN" "http://java.sun.com/j2ee/dtds/ejb-jar_1_1.dtd">
  <ejb-jar>
    <enterprise-beans>
      <session>
        <ejb-name>HelloWorld</ejb-name>
        <home>HelloWorldHome</home>
        <remote>HelloWorld</remote>
        <ejb-class>HelloWorldBean</ejb-class>
        <session-type>Stateless</session-type>
        <transaction-type>Container</transaction-type>
      </session>
    </enterprise-beans>
   ...
```

Deployment Descriptor

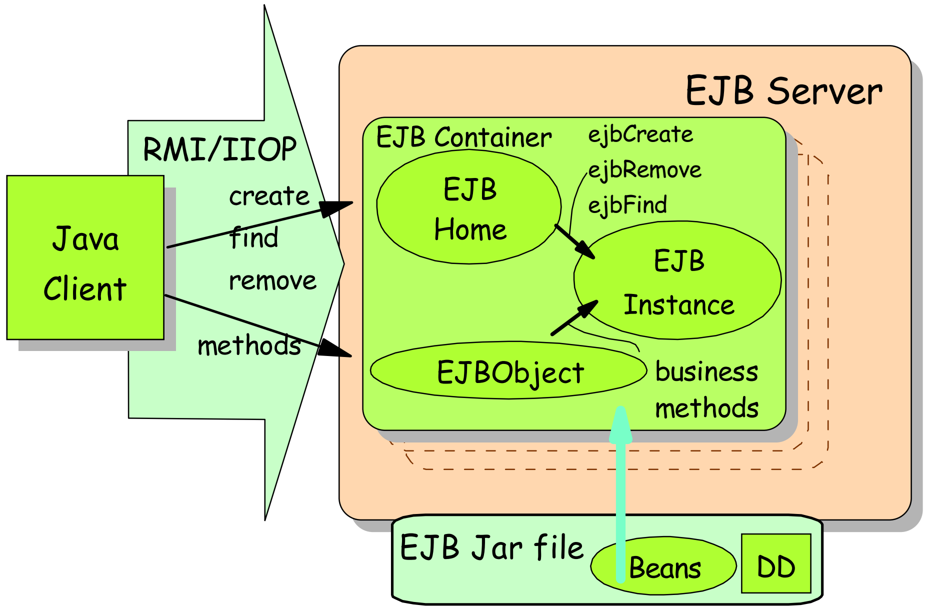
```
 …
 <assembly-descriptor>
   <container-transaction>
     <method>
       <description></description>
       <ejb-name>HelloWorld</ejb-name>
       <method-name>*</method-name>
     </method>
     <trans-attribute>Supports</trans-attribute>
   </container-transaction>
 </assembly-descriptor>
</ejb-jar>
```

EJB Architecture - Client View

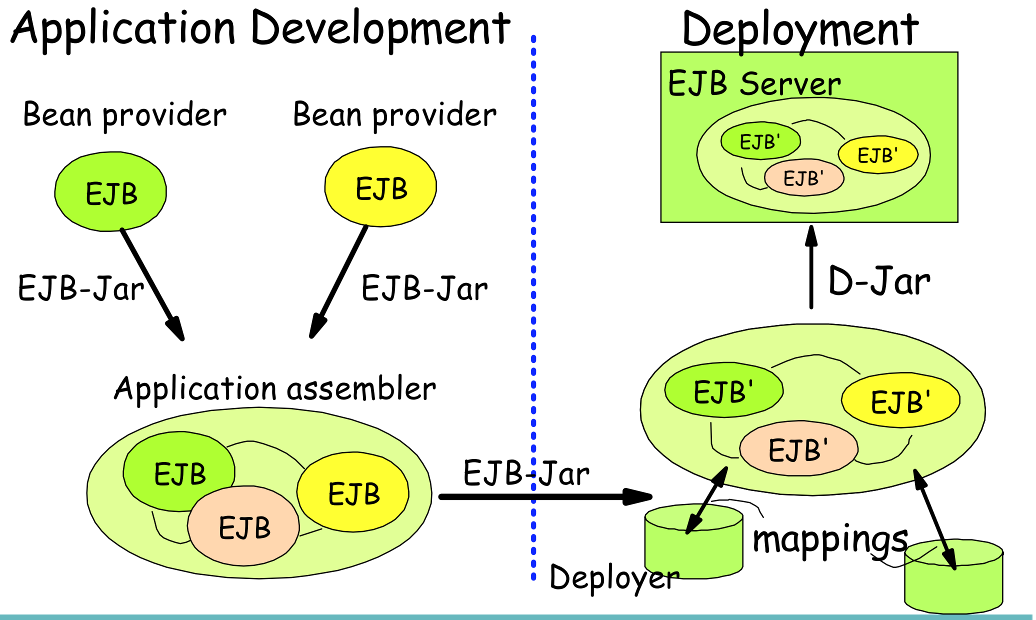


methods intercepted to satisfy deployment specification

EJB Architecture - runtime



EJB Architecture - Deployment



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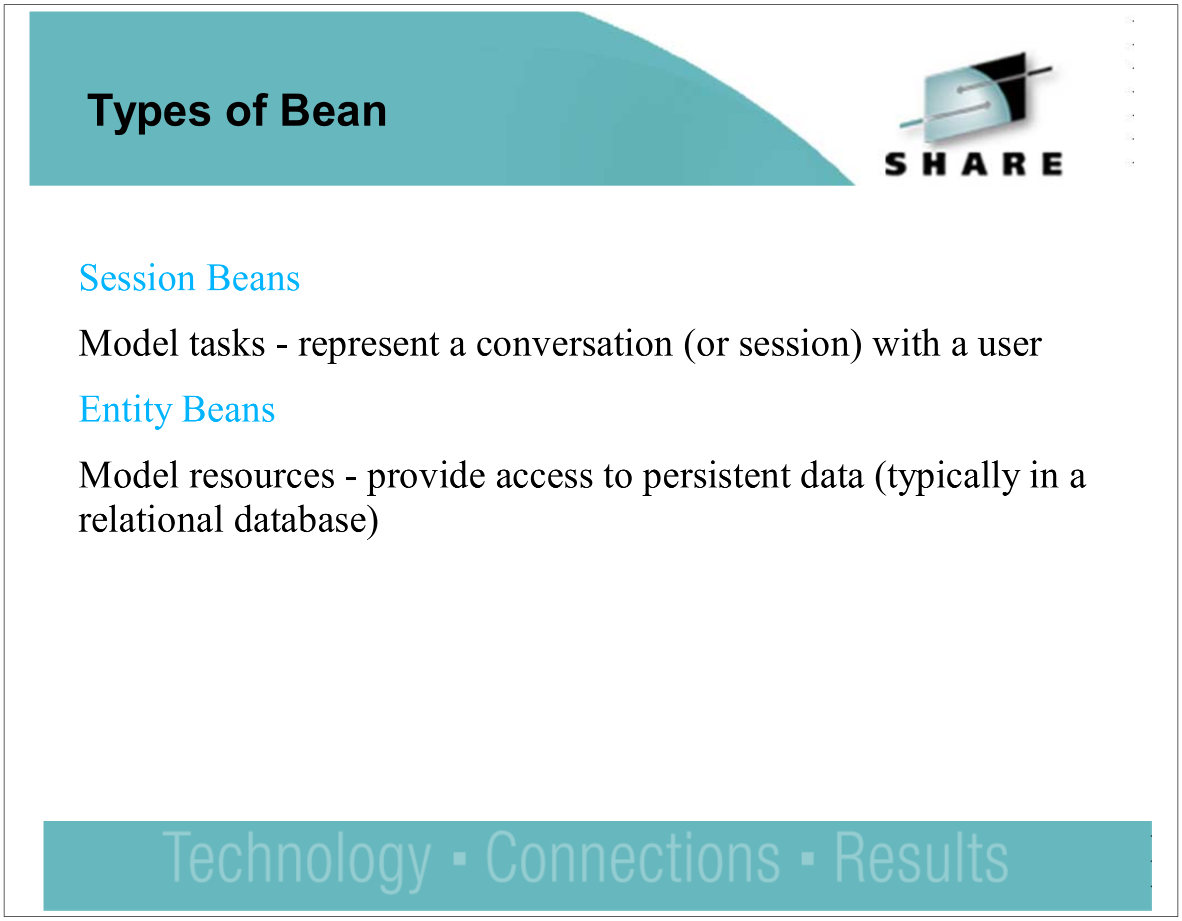


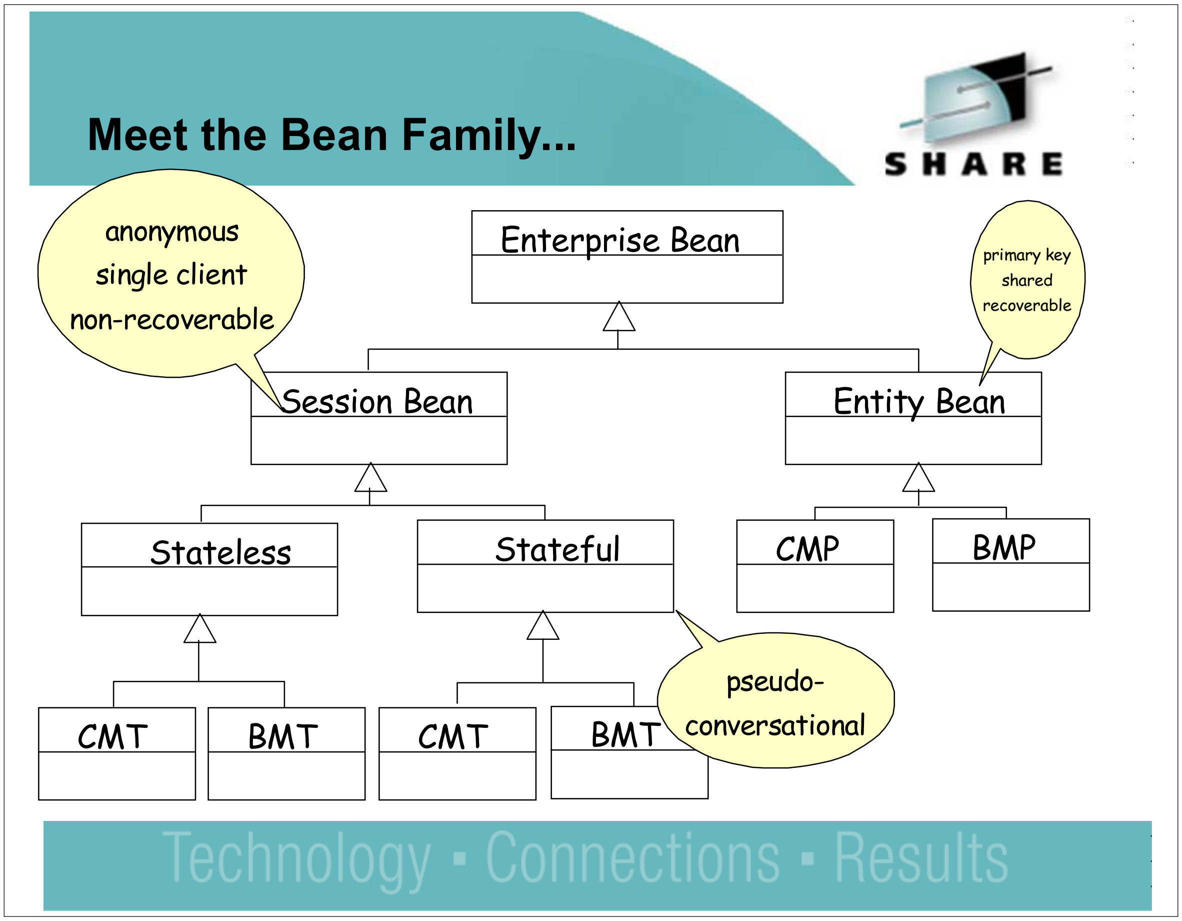
Types of Bean

Session Beans

Model tasks - represent a conversation (or session) with a user

Entity Beans

Model resources - provide access to persistent data (typically in a relational database)



Meet the Bean Family...

SHARE

Enterprise Bean

Session Bean

Entity Bean

anonymous
single client
non-recoverable

primary key
shared
recoverable

Stateless

Stateful

CMP

BMP

CMT

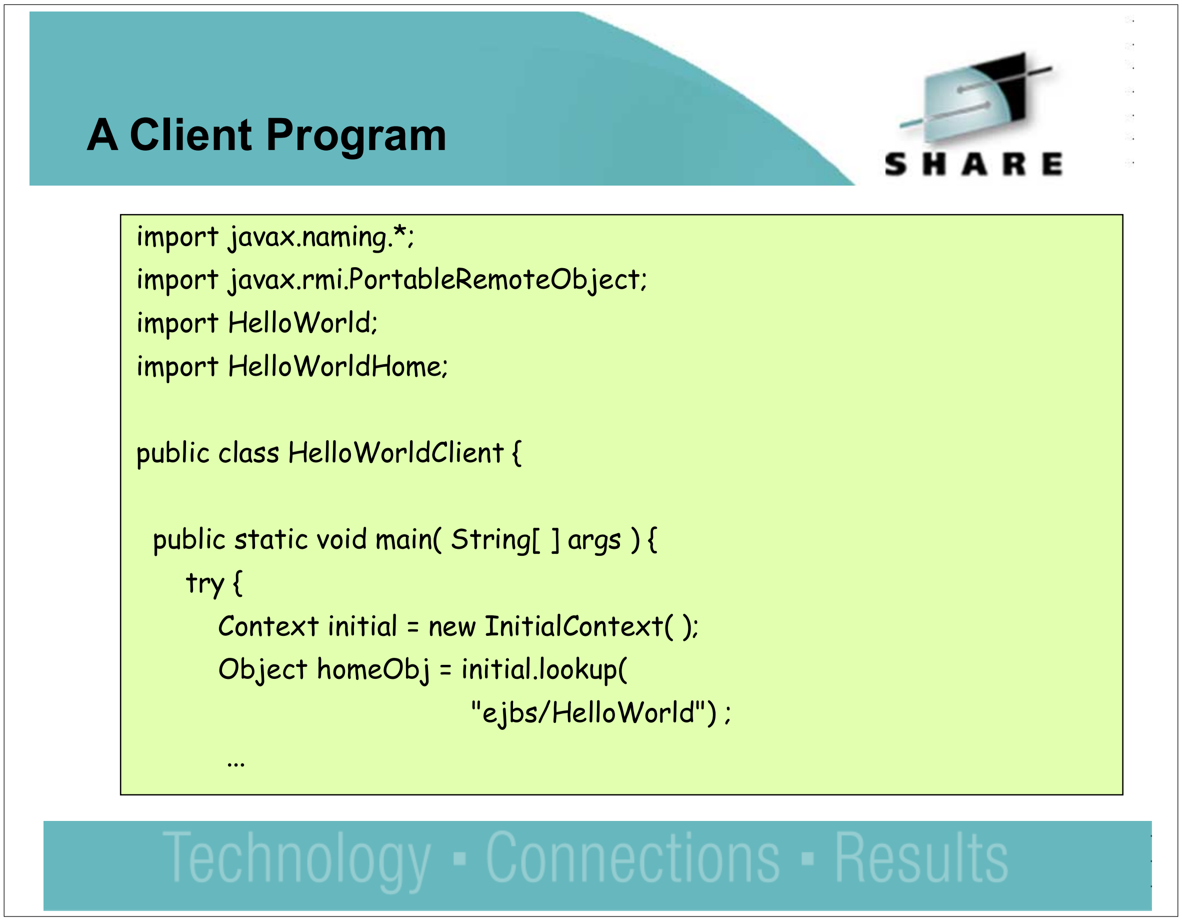
BMT

CMT

BMT

pseudo-
conversational

Technology • Connections • Results



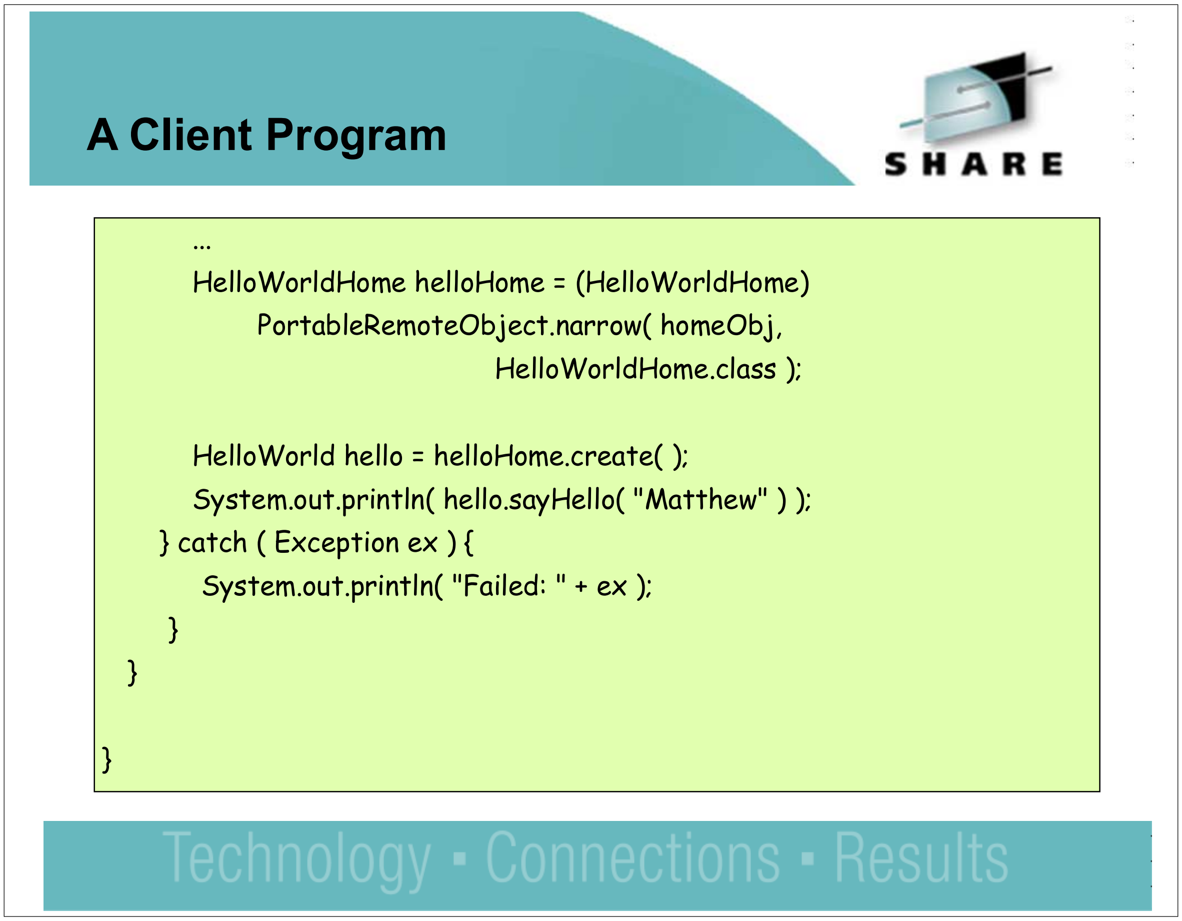
A Client Program

```
import javax.naming.*;
import javax.rmi.PortableRemoteObject;
import HelloWorld;
import HelloWorldHome;

public class HelloWorldClient {

  public static void main( String[ ] args ) {
      try {
          Context initial = new InitialContext( );
          Object homeObj = initial.lookup(
                                      "ejbs/HelloWorld") ;
           ...
```

Technology • Connections • Results



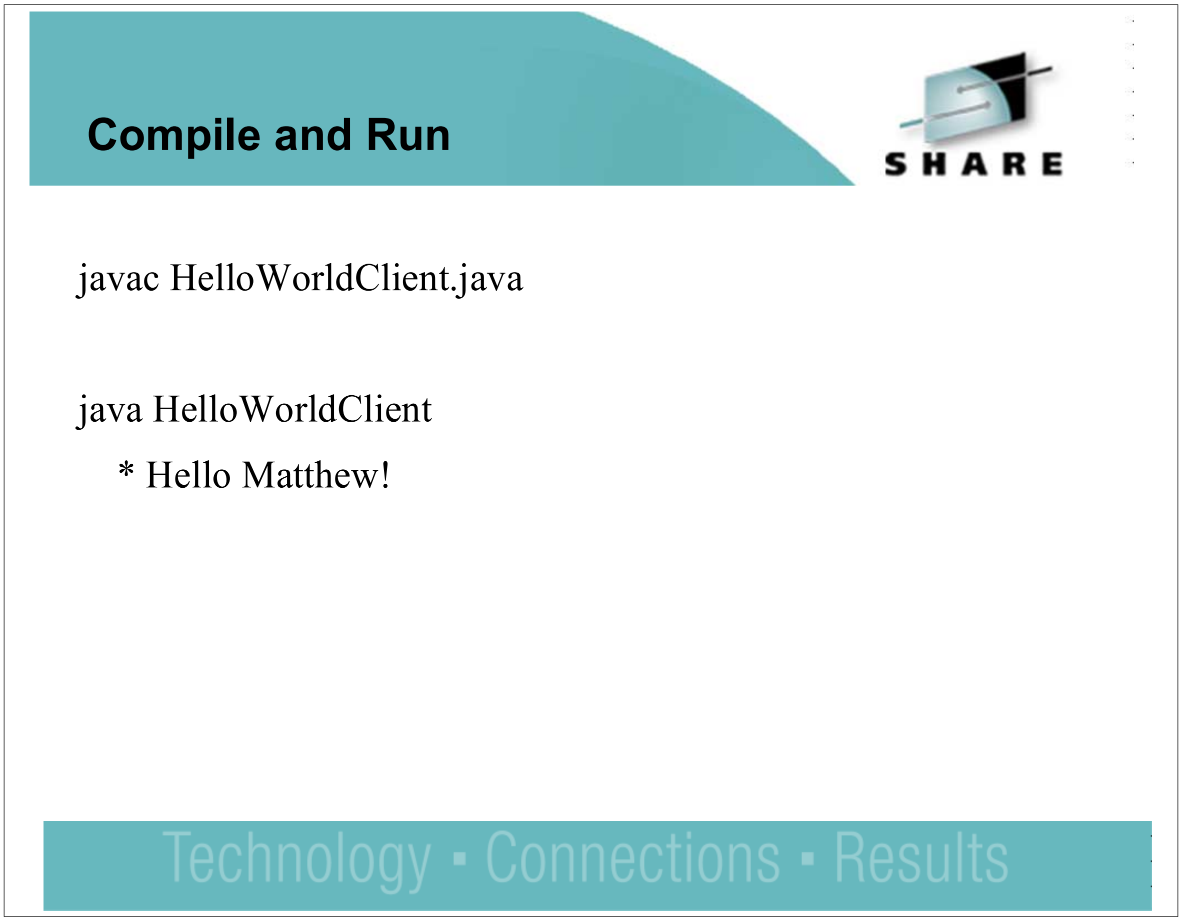
A Client Program

```
         ...
         HelloWorldHome helloHome = (HelloWorldHome)
               PortableRemoteObject.narrow( homeObj,
                                      HelloWorldHome.class );

         HelloWorld hello = helloHome.create( );
         System.out.println( hello.sayHello( "Matthew" ) );
      } catch ( Exception ex ) {
          System.out.println( "Failed: " + ex );
       }
   }


}
```

Technology • Connections • Results

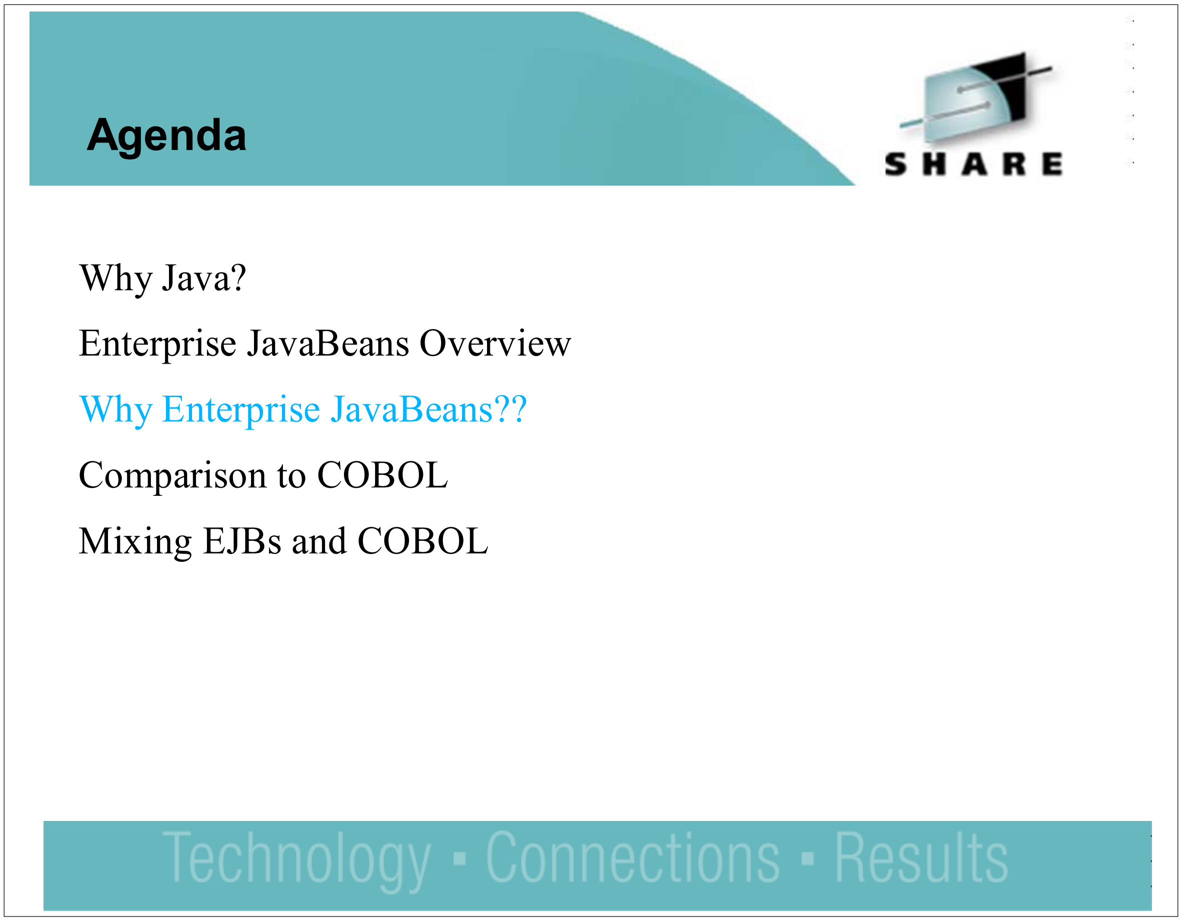


Compile and Run

```
javac HelloWorldClient.java

java HelloWorldClient
   * Hello Matthew!
```

Technology ▪ Connections ▪ Results



Agenda

Why Java?

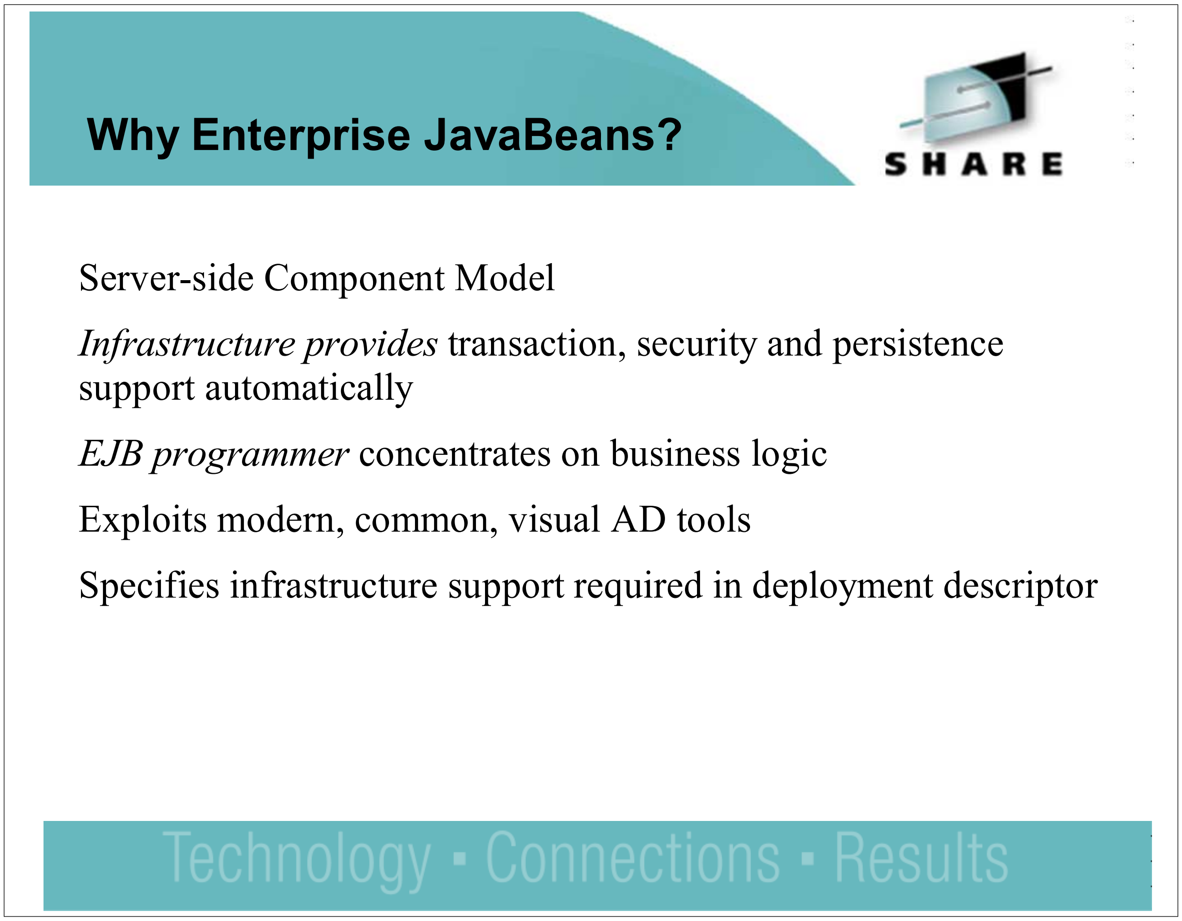
Enterprise JavaBeans Overview

Why Enterprise JavaBeans??

Comparison to COBOL

Mixing EJBs and COBOL

Technology ▪ Connections ▪ Results



Why Enterprise JavaBeans?

Server-side Component Model

Infrastructure provides transaction, security and persistence support automatically

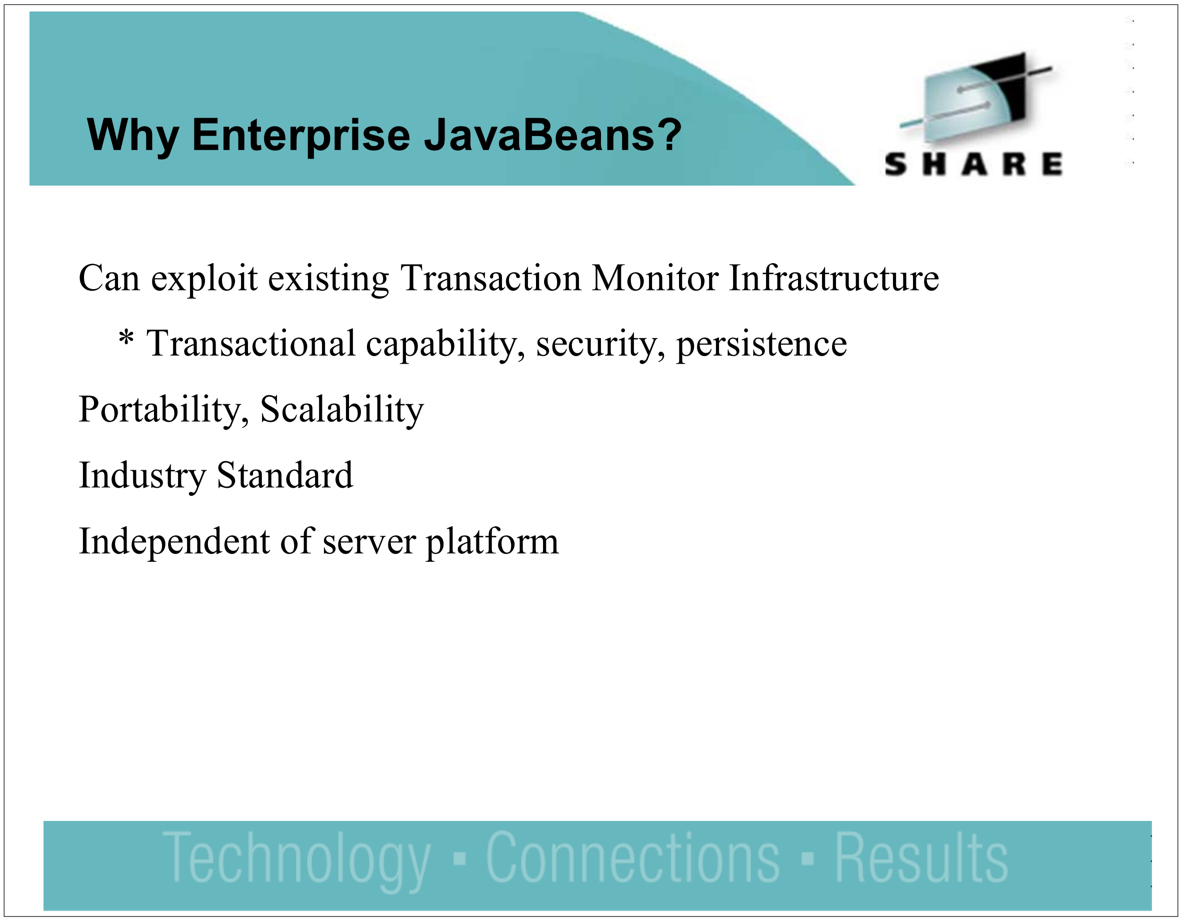
EJB programmer concentrates on business logic

Exploits modern, common, visual AD tools

Specifies infrastructure support required in deployment descriptor

Technology • Connections • Results

- 1) Forces clear separation of concerns.
- Enterprise Bean Provider provides the Business Logic. Is an expert in the application domain. Does not require expertise in system infrastructure.
- Application Assembler composes application out of off-the-shelf EJBs. Is an expert in the specific requirements of the target businesses. Does not require expertise in system infrastructure.
- Deployer. Is an expert in the operational environment and deploys/administers the Java Beans and containers without needing detailed knowledge of the application domain.
- This approach facilitates reuse and customization.
- 2) Ease of use
- Same programming model as client side Java Beans Programming model. Multiple client types are supported (Web, RMI applications, CORBA).
- 3) Infrastructure portability
- Allows possibility of moving an application developed for one container to another without application code change or recompilation. Containers can be built on different operating systems and EJB can exploit the underlying capabilities (e.g. robustness, scalability, security) of the application deployment platform without change.
- 4) CICS/ESA value add
- CICS/ESA will support EJB with the robustness, availability, scalability and integrity as for other CICS applications.
- This includes monitoring, statistics, security and full sysplex enablement.
- EJBs in CICS/ESA will also have access to the CICS services through CICS Java classes and seamless access to existing applications on the platform without the need for gateways, connectors or adapters.



Why Enterprise JavaBeans?

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Can exploit existing Transaction Monitor Infrastructure

* Transactional capability, security, persistence

Portability, Scalability

Industry Standard

Independent of server platform

Technology ▪ Connections ▪ Results

- 1) Forces clear separation of concerns.
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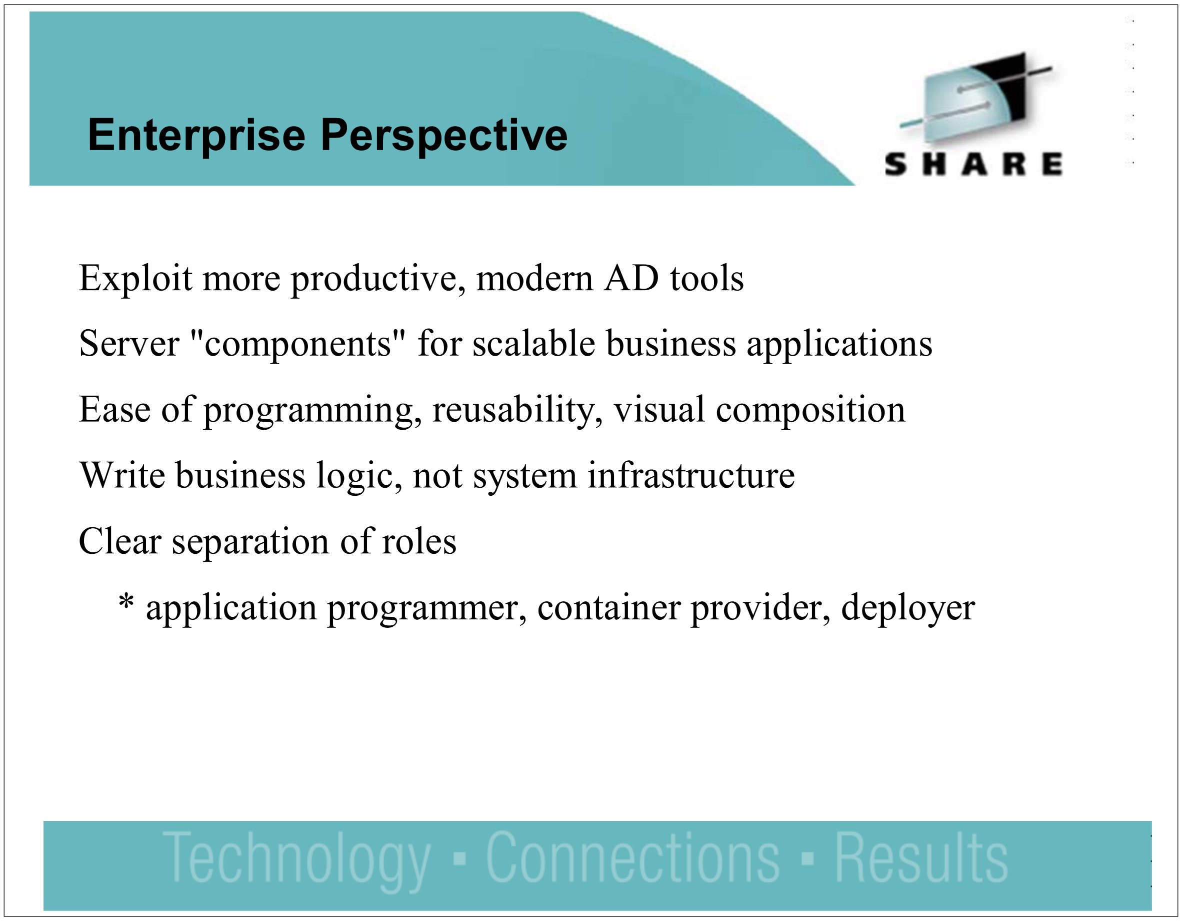

Enterprise Perspective

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Exploit more productive, modern AD tools

Server "components" for scalable business applications

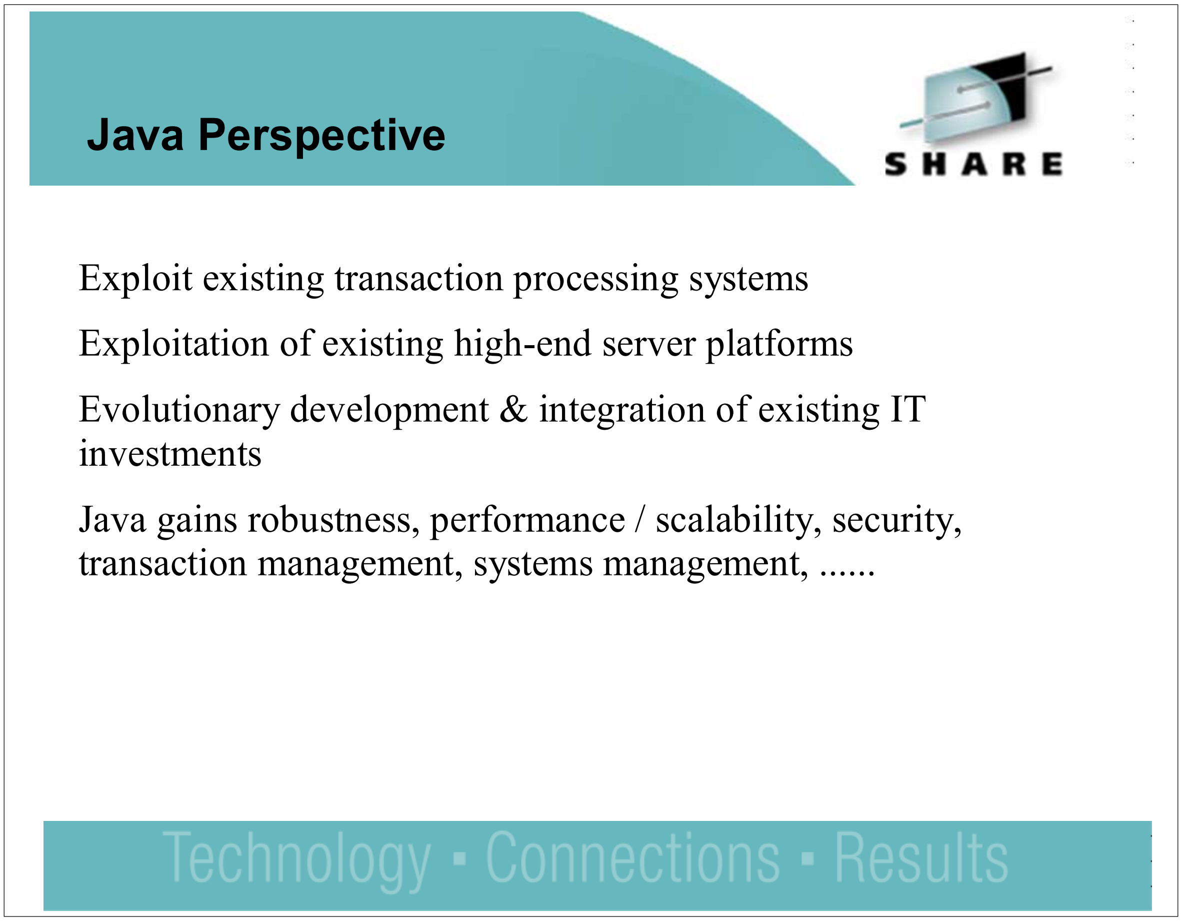
Ease of programming, reusability, visual composition

Write business logic, not system infrastructure

Clear separation of roles

- * application programmer, container provider, deployer

Technology • Connections • Results



Java Perspective

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Exploit existing transaction processing systems

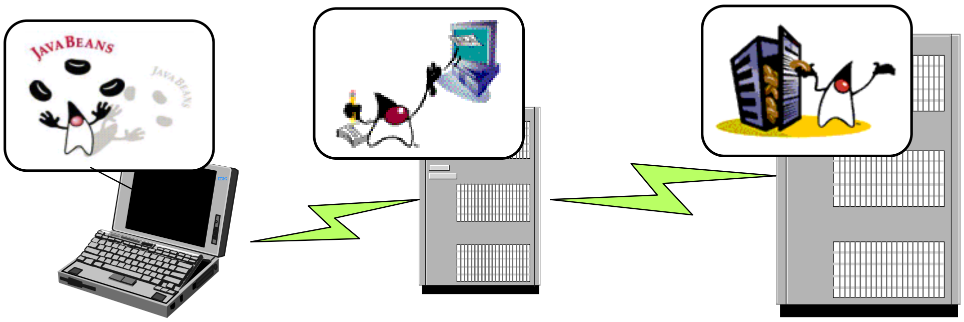
Exploitation of existing high-end server platforms

Evolutionary development & integration of existing IT investments

Java gains robustness, performance / scalability, security, transaction management, systems management, ...

Technology ▪ Connections ▪ Results

End to End Architecture



Client-side presentation

Client:
pure HTML (browser)
applets
Java applications

Middle-tier view & controller

Web (Application) Server:
servlets, JSPs

Business logic (Model)

Enterprise Application Server:
EJBs

Agenda

Why Java?

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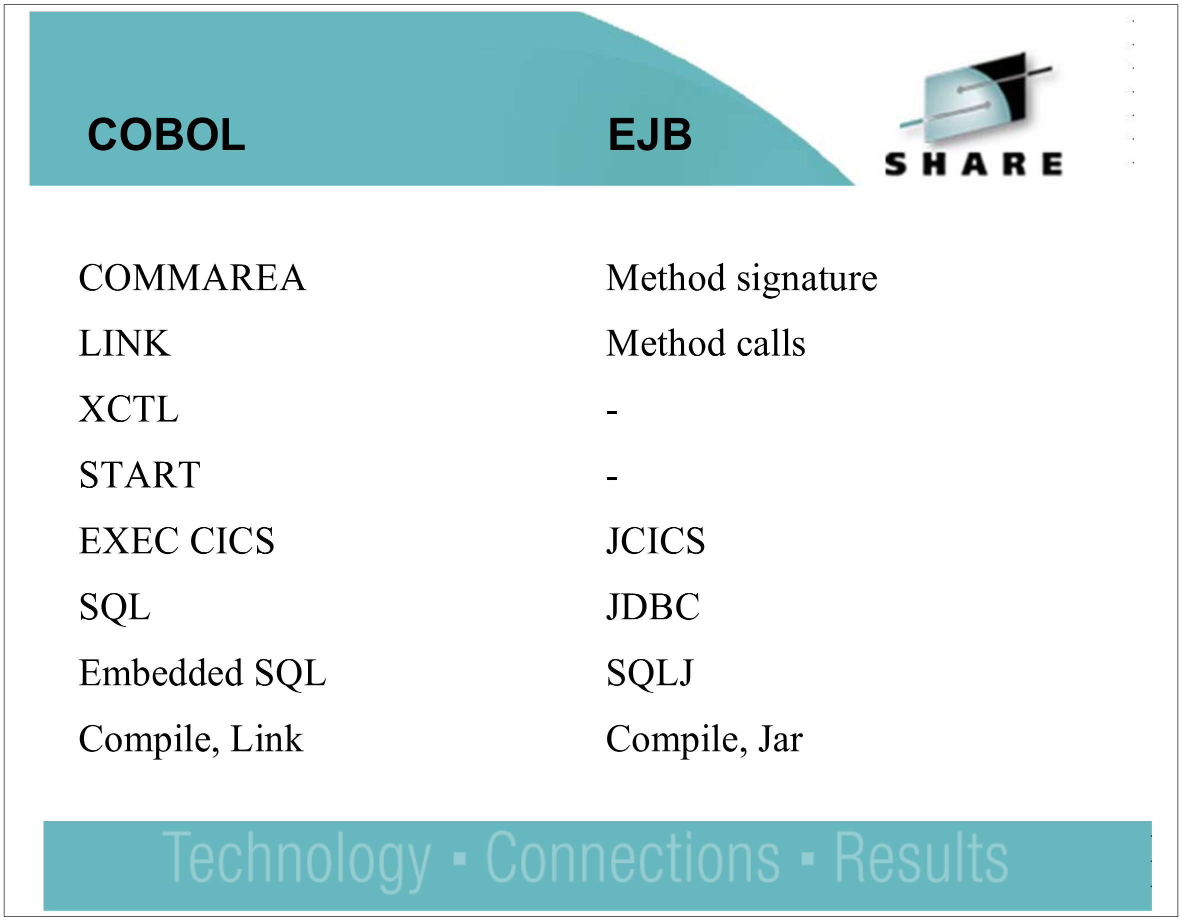
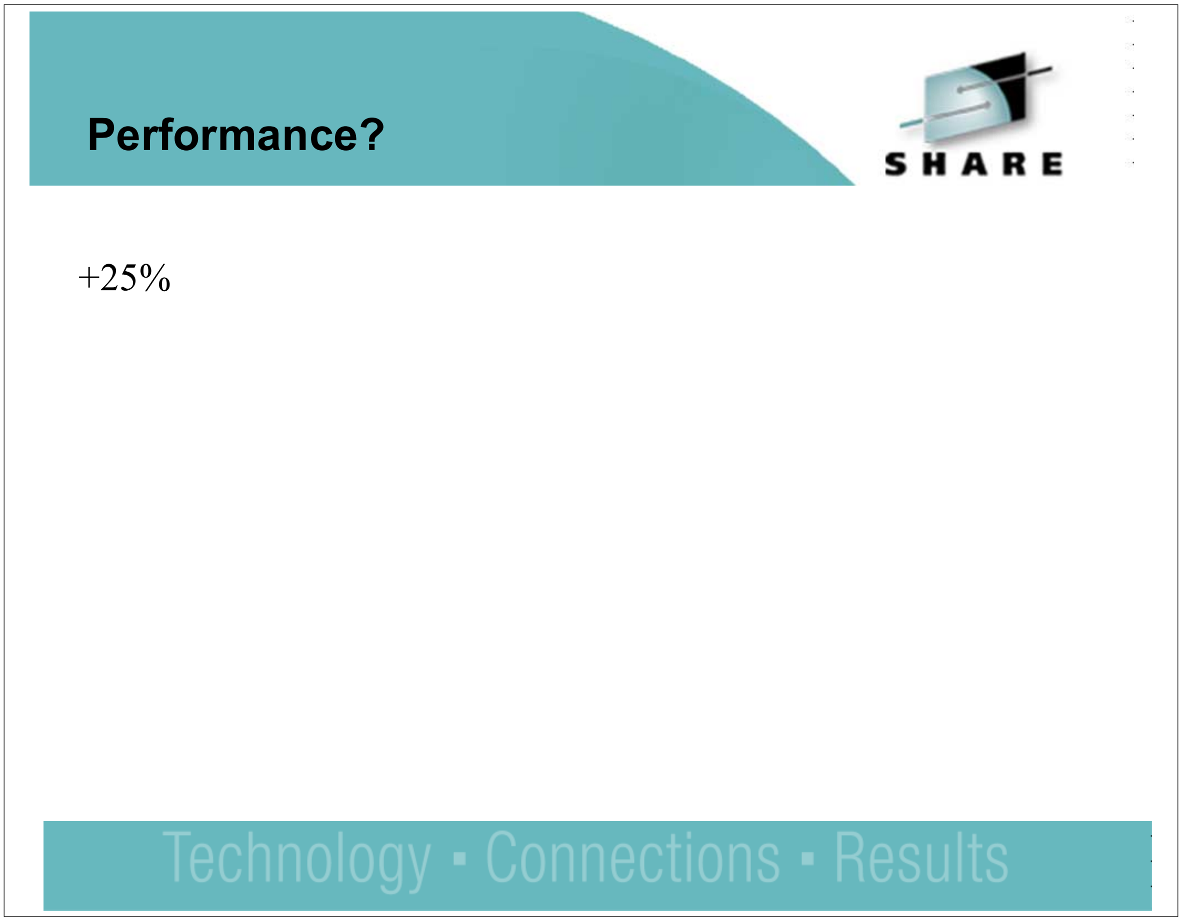
Comparison to (CICS) COBOL

Mixing EJBs and COBOL

Technology • Connections • Results



COBOL	EJB
COMMAREA	Method signature
LINK	Method calls
XCTL	-
START	-
EXEC CICS	JCICS
SQL	JDBC
Embedded SQL	SQLJ
Compile, Link	Compile, Jar



Performance?

+25%

Technology ▪ Connections ▪ Results

Agenda

Why Java?

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Why Enterprise JavaBeans??

Comparison to (CICS) COBOL

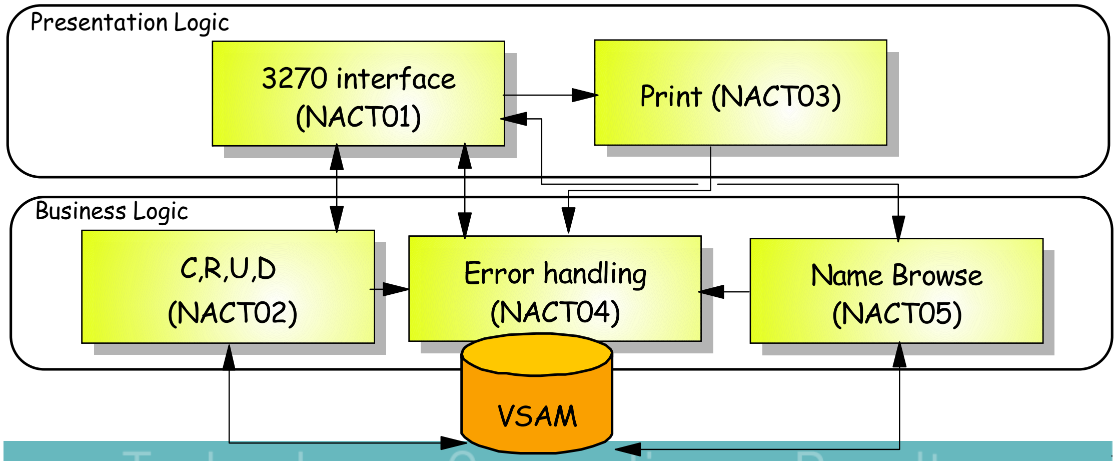
Mixing EJBs and COBOL

Technology • Connections • Results

Example

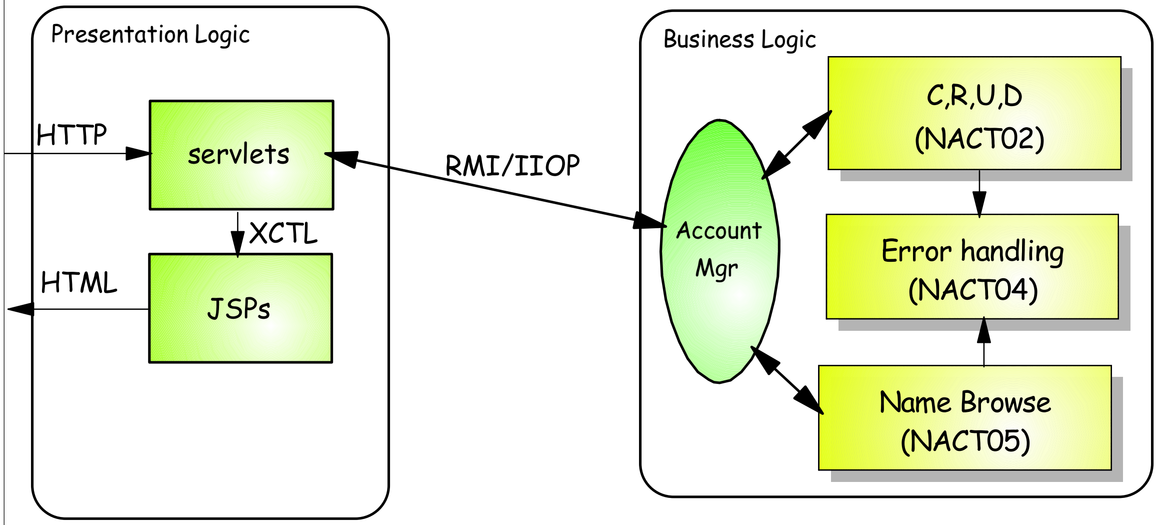
Create, Read, Update, Delete, Browse Customer Account Records.

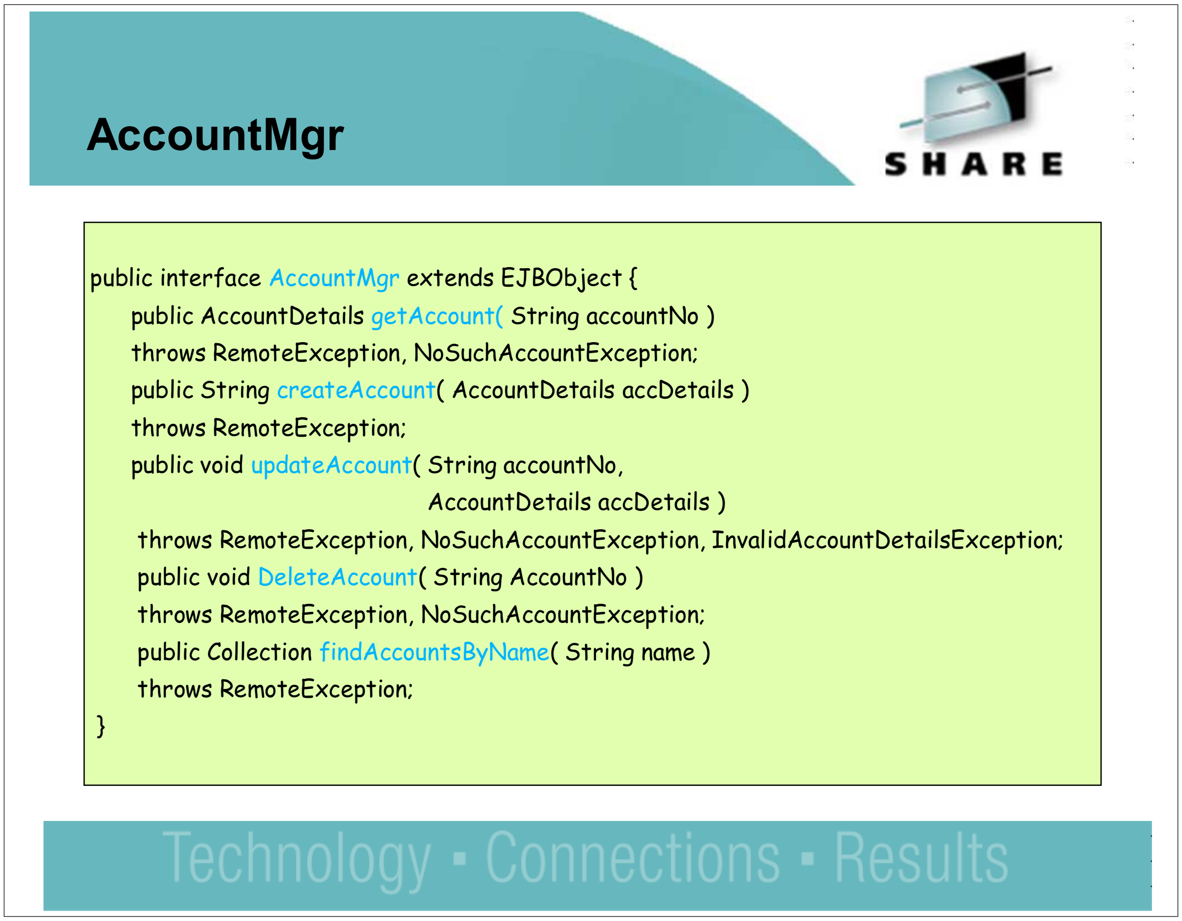
From "Designing and Programming CICS Applications", Horswill et al. O'Reilly



Technology • Connections • Results

Example

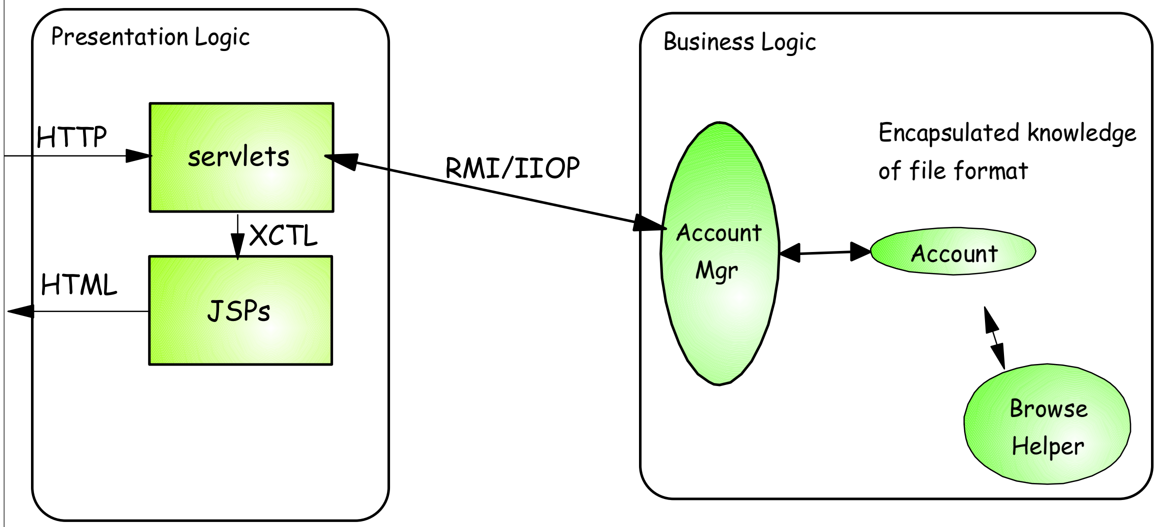

Presentation Logic
HTTP
servlets
XCTL
HTML
JSPs
RMI/IIOP
Business Logic
Account Mgr
C,R,U,D (NACT02)
Error handling (NACT04)
Name Browse (NACT05)

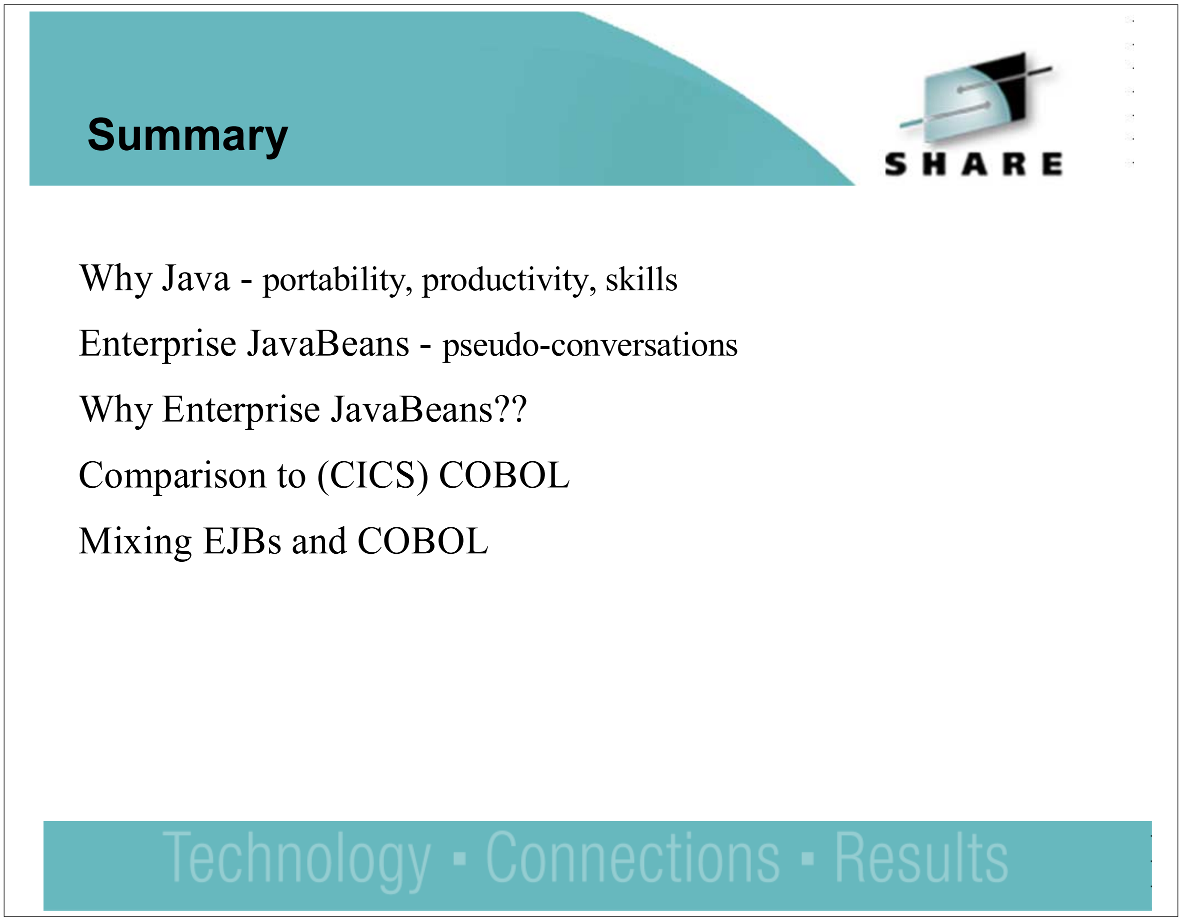


AccountMgr

```
public interface AccountMgr extends EJBObject {
      public AccountDetails getAccount( String accountNo )
      throws RemoteException, NoSuchAccountException;
      public String createAccount( AccountDetails accDetails )
      throws RemoteException;
      public void updateAccount( String accountNo,
                                            AccountDetails accDetails )
       throws RemoteException, NoSuchAccountException, InvalidAccountDetailsException;
       public void DeleteAccount( String AccountNo )
       throws RemoteException, NoSuchAccountException;
       public Collection findAccountsByName( String name )
       throws RemoteException;
 }
```

Example


Presentation Logic
HTTP
servlets
XCTL
HTML
JSPs
RMI/IIOP
Business Logic
Encapsulated knowledge of file format
Account Mgr
Account
Browse Helper



Summary

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Why Java - portability, productivity, skills

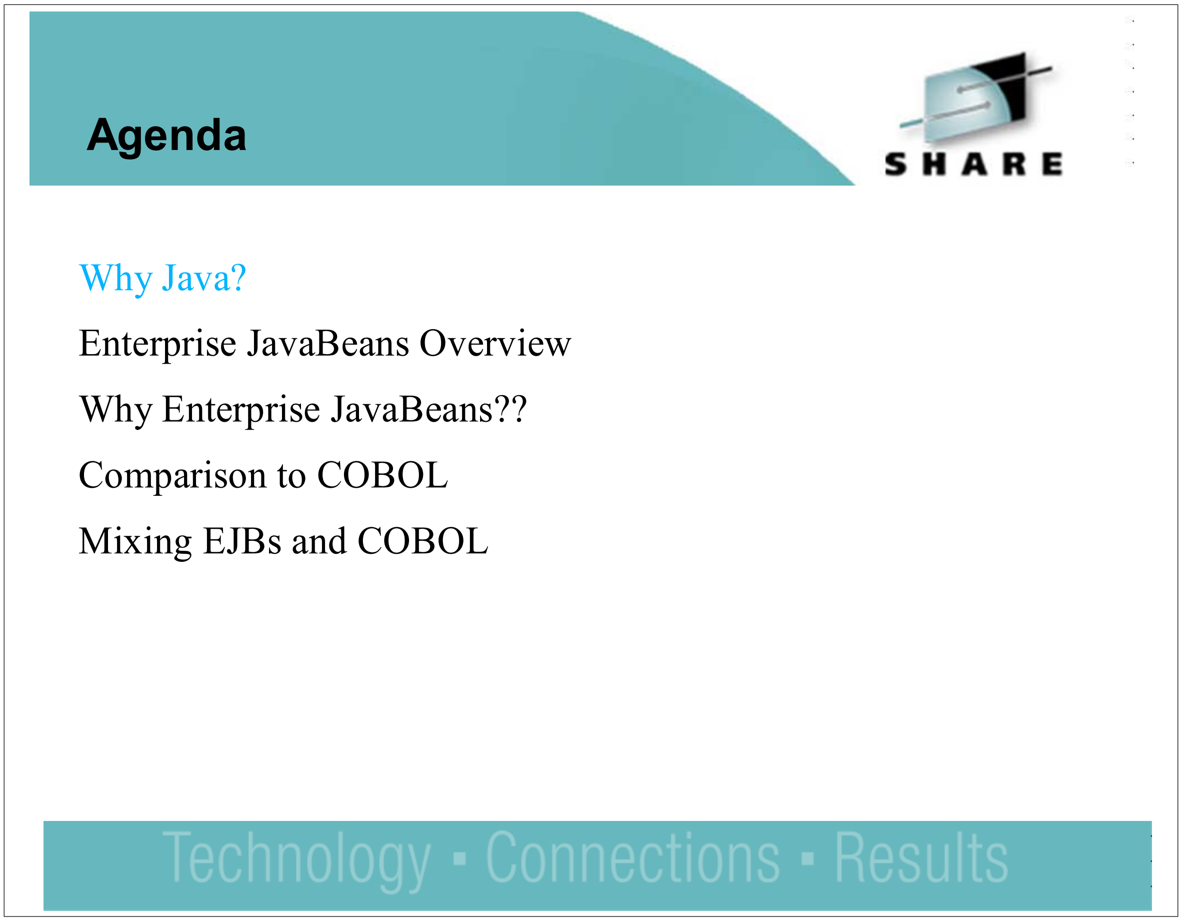
Enterprise JavaBeans - pseudo-conversations

Why Enterprise JavaBeans??

Comparison to (CICS) COBOL

Mixing EJBs and COBOL

Technology ▪ Connections ▪ Results



Agenda

Why Java?

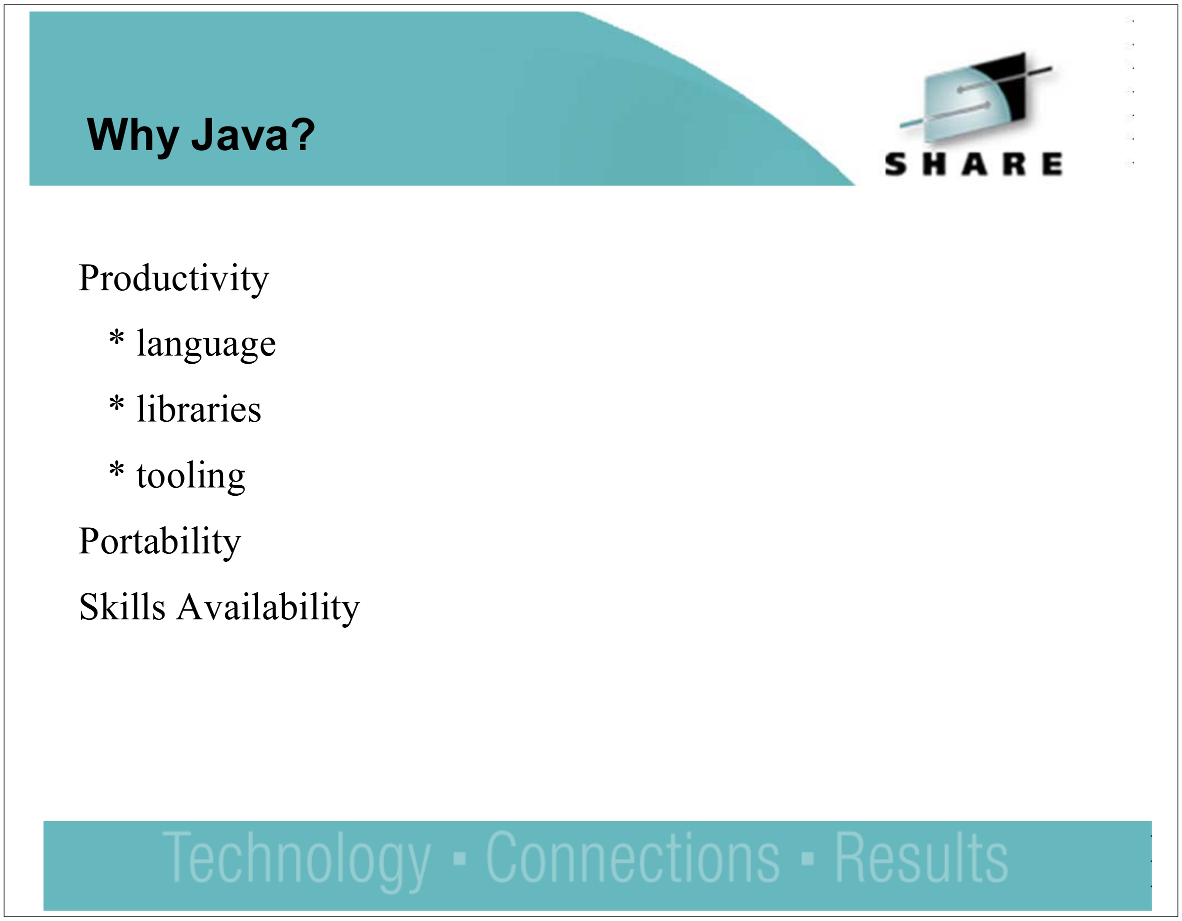
Enterprise JavaBeans Overview

Why Enterprise JavaBeans??

Comparison to COBOL

Mixing EJBs and COBOL

Technology ▪ Connections ▪ Results



Why Java?

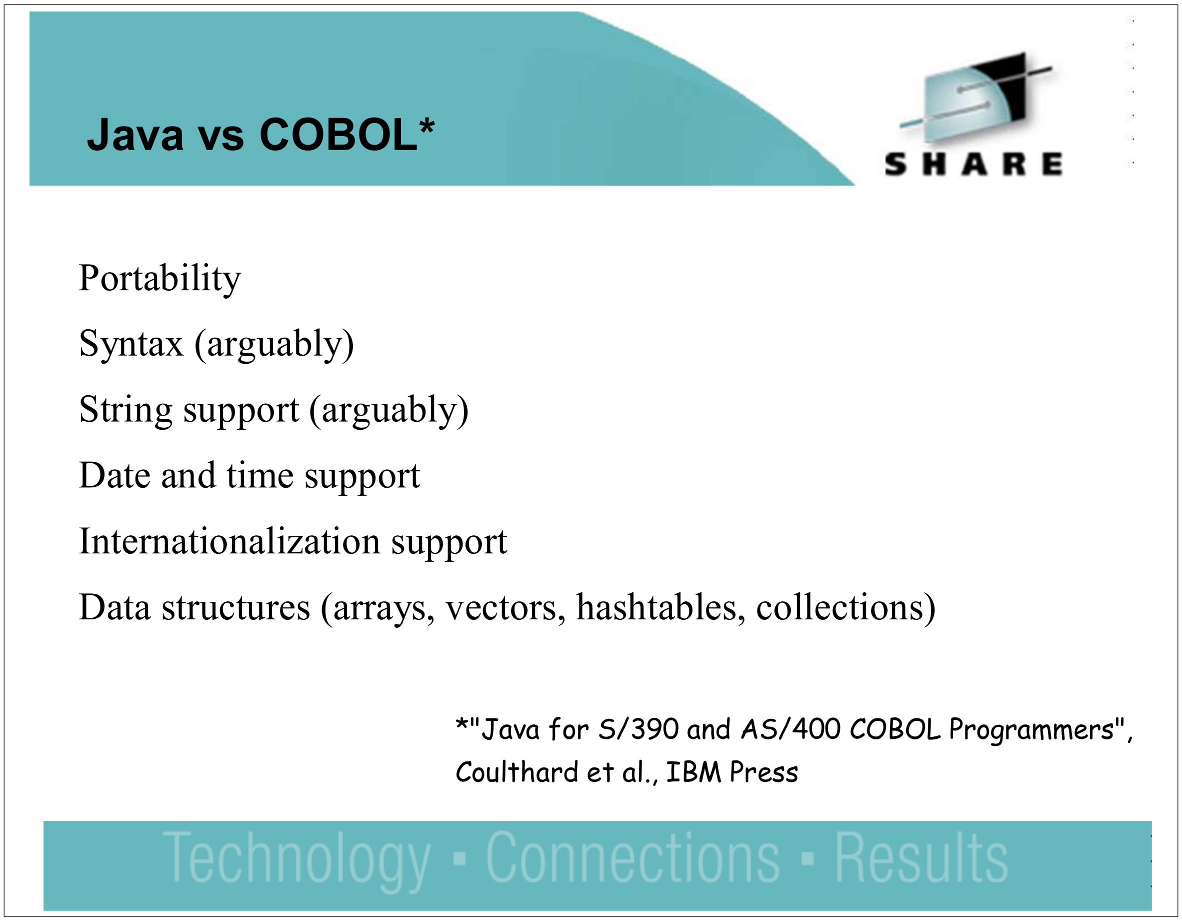
Productivity

- * language
- * libraries
- * tooling

Portability

Skills Availability

Technology ▪ Connections ▪ Results



Java vs COBOL*

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Portability

Syntax (arguably)

String support (arguably)

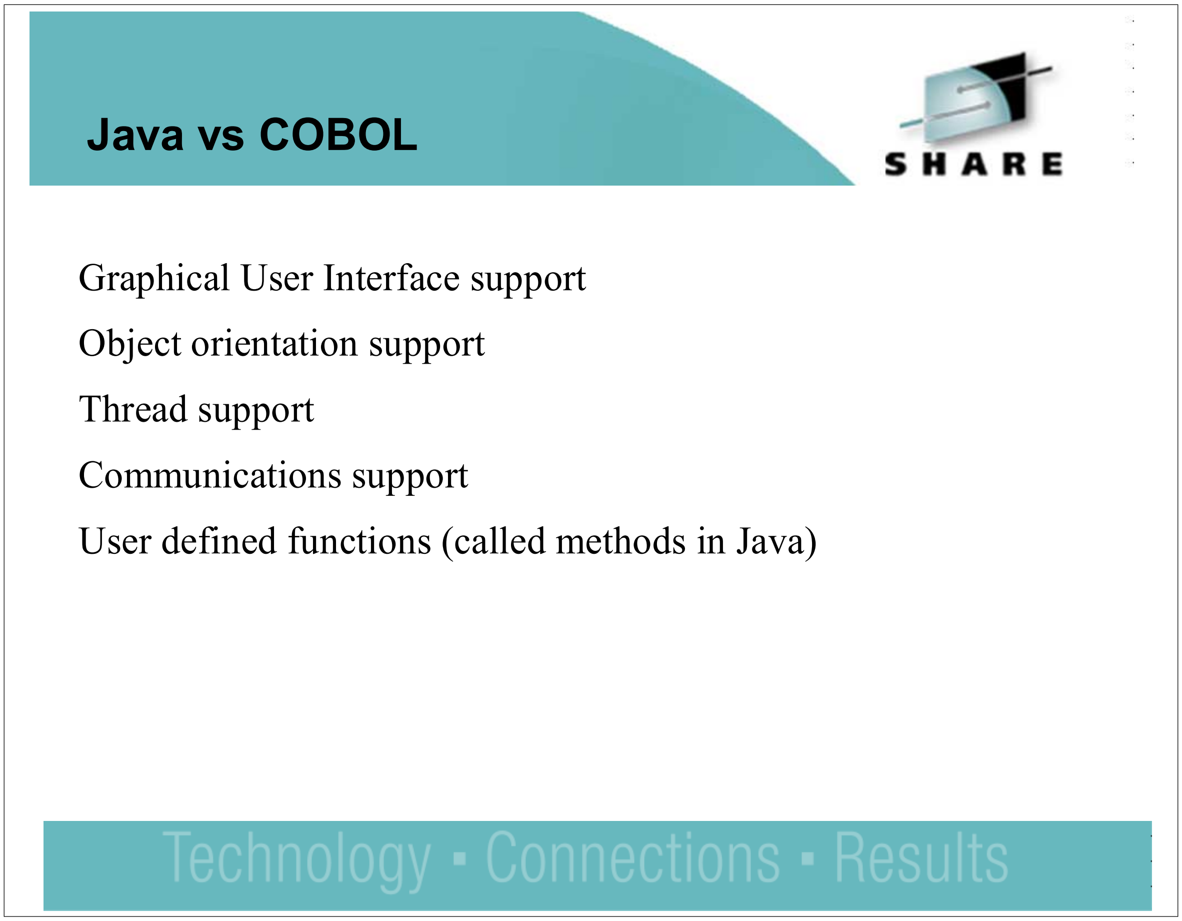
Date and time support

Internationalization support

Data structures (arrays, vectors, hashtables, collections)

*"Java for S/390 and AS/400 COBOL Programmers", Coulthard et al., IBM Press

Technology • Connections • Results



Java vs COBOL

Graphical User Interface support

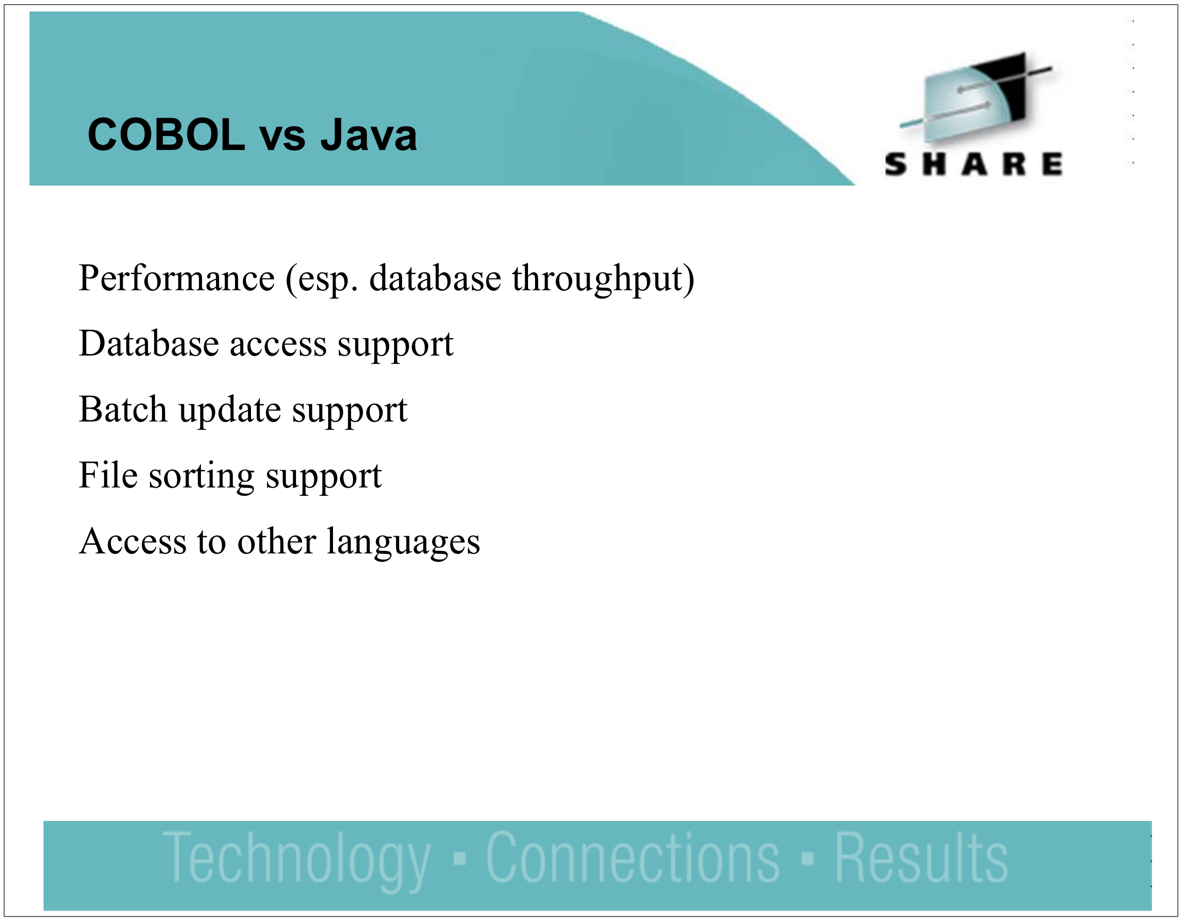
Object orientation support

Thread support

Communications support

User defined functions (called methods in Java)

Technology ▪ Connections ▪ Results



COBOL vs Java

Performance (esp. database throughput)

Database access support

Batch update support

File sorting support

Access to other languages