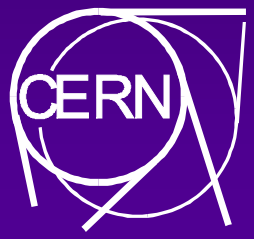


Java RMI and Enterprise JavaBeans

Vito Baggiolini SL/CO

What is RMI

- Java Remote Method Invocation
  - between objects in different Java Virtual Machines
- Mono-language
- Multi-platform
- 100% Java

RMI Features

- OO remote method call
  - Pass Java objects as parameters
- Name lookup & binding (location service)
  - Find and bind to remote objects
- Easy multi-threaded servers
- Remote object activation
  - server objects occupy memory only when active
- Automatic distributed garbage collection
- Dynamic class loading over the net

Java Features used by RMI

- Communication-level security
  - Encryption and authentication (SSL)
- Introspection
  - Explore interfaces at run-time

    => support for generic clients and servers
- Locking
  - Enforces exclusive access to server methods
- Integration of legacy (JNI)
  - Relatively easy for server-side C/C++ code
  - Bulky for client-side C/C++ code
- Late binding (linking)

Importance of Features

- Fully OO Remote Method Call
  - Local and distributed programming very similar
  - Allows late decisions on how to distribute application
- Passing objects as parameters
  - Not only data, but also code
  - No manual packaging/unpackaging
- Dynamic class loading + late binding
  - No need to re-compile on changes
  - Smooth and transparent upgrades

RMI code example

Server

```
public class Magnet extends UnicastRemoteObject
   implements MagnetI
{
   public Magnet() {
     Naming.bind("//eanorth/magnet", this);
   }
   int current;
   public void setCurrent(int val) {
     current = val;
   }
}
```

Client

```
public static void main(…) {
   MagnetI mag = (MagnetI)
     Naming.lookup("//eanorth/magnet");
   mag.setCurrent(300);
}
```

Java vs. CORBA

- **CORBA: integration tool**
  - **CORBA's strength: language independent**
- **RMI: distributed programming tool**
  - **RMI's strength: language centric**

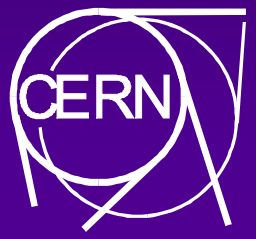
- **RMI + CORBA ⟶ RMI over IIOP**
  - ✔ **Easy programming interface (RMI)**
  - ✔ **Interoperability**
  - ✘ **Restricted functionality**

Java Centric vs. Language Independent

Java centric	Language independent
✔ Full Java functionality everywhere	✘ Lowest common denominator
✘ More difficult to integrate other languages	✔ Easy to integrate languages

Related Java Technology

- **JavaBeans**
  - Software components, enable visual programming
- **JavaDoc**
  - Easy documentation on the Web
- **Embedded Java**
  - Small memory footprint, 100% Java
- **Compiled Java (unofficial)**
  - Easy programming, good performance



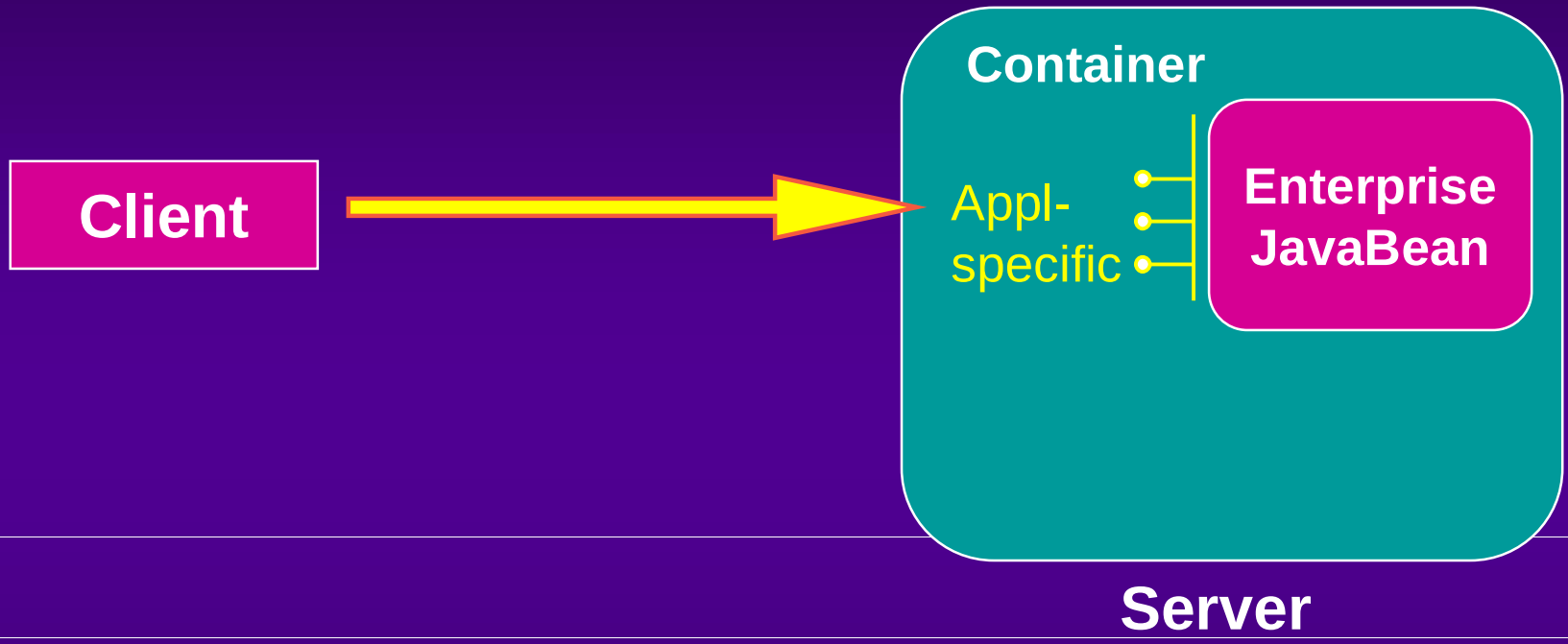
Enterprise JavaBeans

What are Enterprise JavaBeans?

- Framework for Server Components...
- …with access to Middleware services

- 1. Goal: easy server development
  - Developers concentrate on their application
- 2. Goal: portable server components
  - Components can be used in any EJB Product

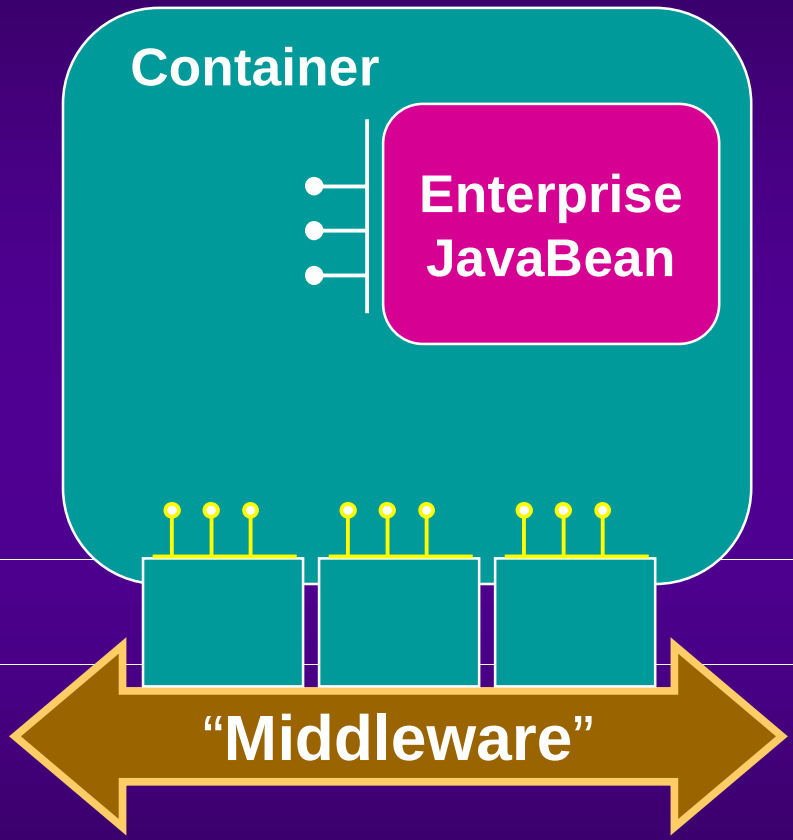
EJB Component Model



- **Container** (= Run-time Environment)
- **Enterprise JavaBean** (= your application)

Middleware Access

- Container provides access to middleware services...
- …transparently
- EJBean can use middleware explicitly
- … through standardized Java API's



Standardized Enterprise API's

- Naming and Directory Service
- Transactions
- Message-oriented Middleware
- Remote Method Call
- Database Access

Summary

- **RMI**
  - ✔ Easy to use
  - ✔ Truly OO
  - ✔ Dynamic class loading and late binding
  - ✔ Distributed garbage collection
  - ✗ Integration of other languages less easy
  - ✗ Performance, scalability (solved with Java 2.0?)
  - ✗ Still in evolution
- **EJB**
  - ✔ Easy to use
  - ✔ 100% Java, portable
  - ✗ Still in evolution
  - ✗ Not much vendor support yet