Information System Architecture

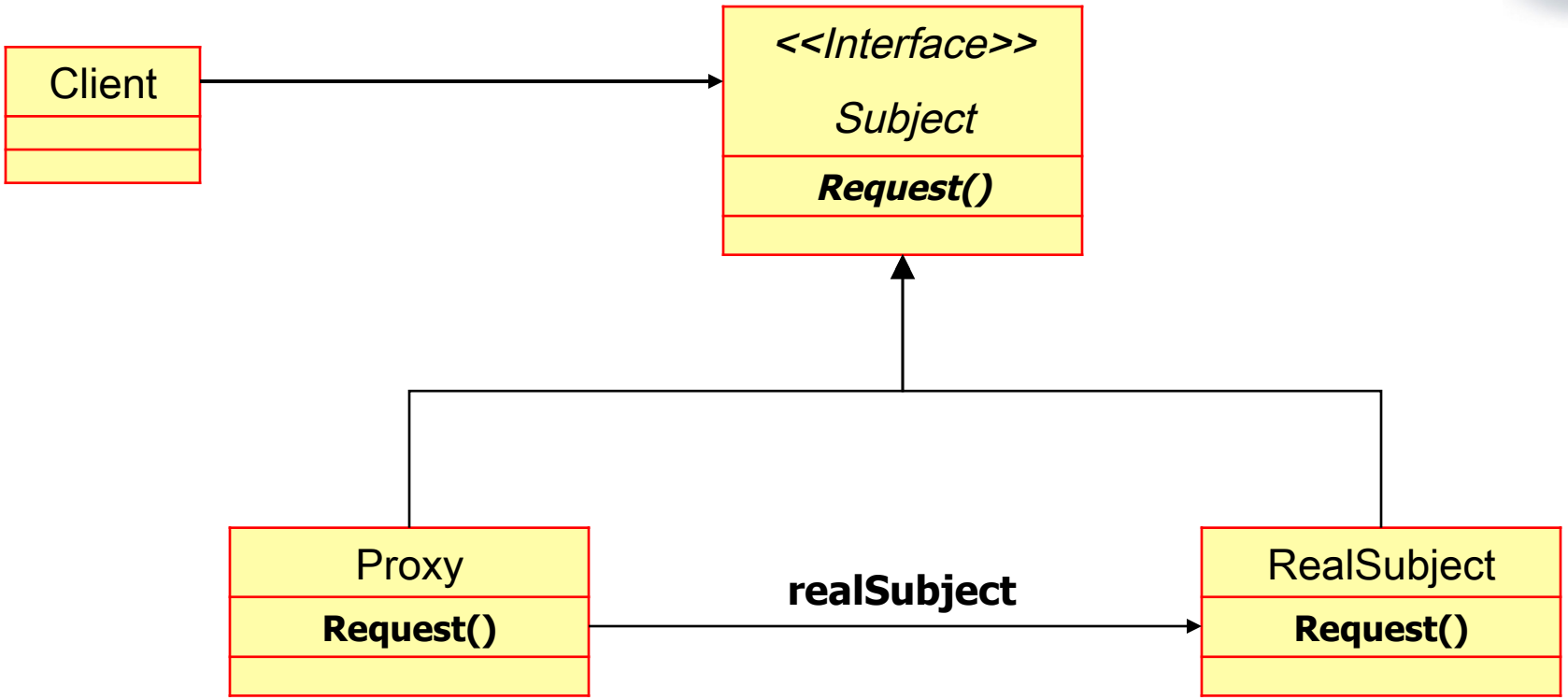
Java RMI

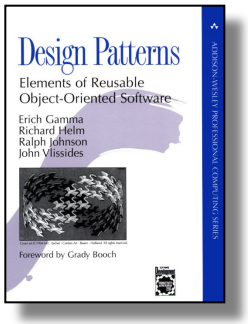
Exemple Add()

JRMP

Java RMI Method Protocol

Proxy (UML)


Client
<<Interface>>
Subject
Request()
Proxy
Request()
realSubject
RealSubject
Request()


Design Patterns
Elements of Reusable
Object-Oriented Software
Erich Gamma
Richard Helm
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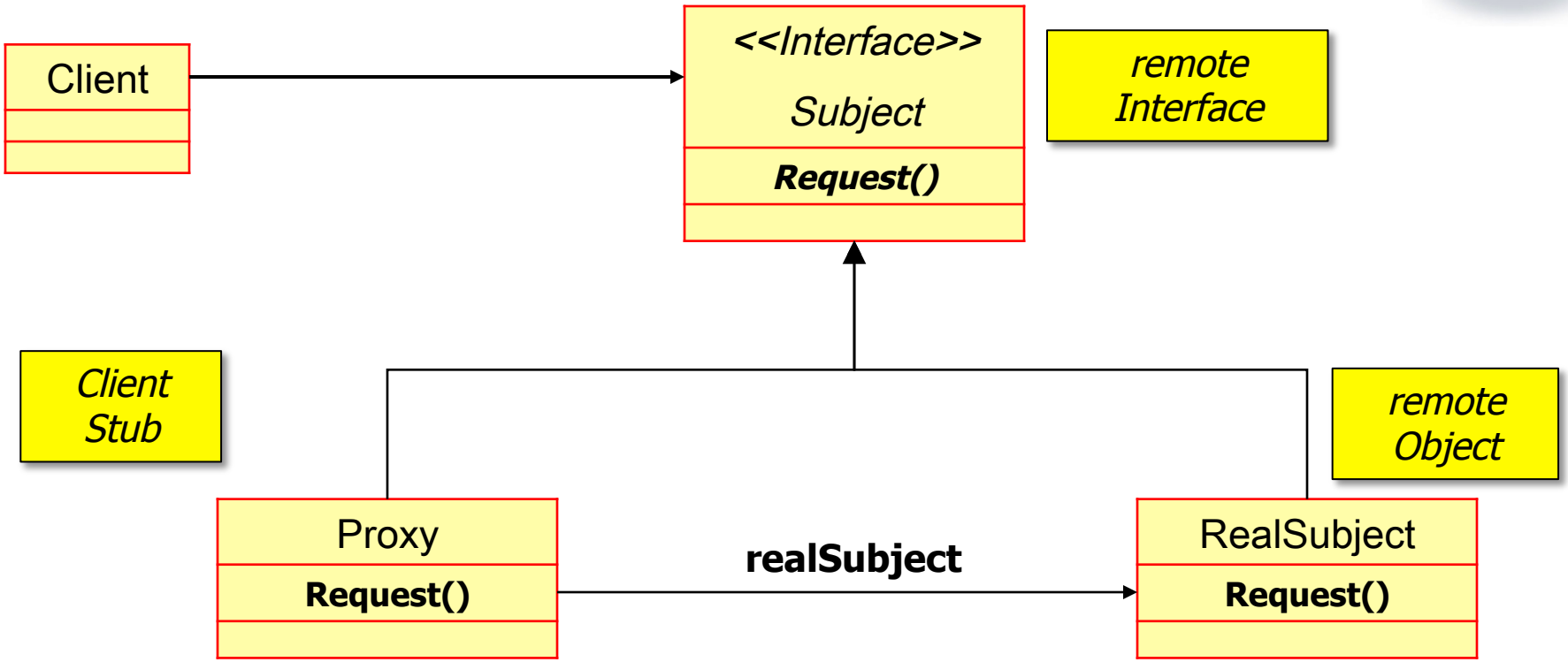
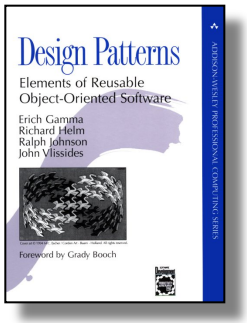
John Vlissides
Foreword by Grady Booch

Proxy (UML)


Client
<<Interface>>
Subject
Request()
remote
Interface
Client
Stub
remote
Object
Proxy
Request()
realSubject
RealSubject
Request()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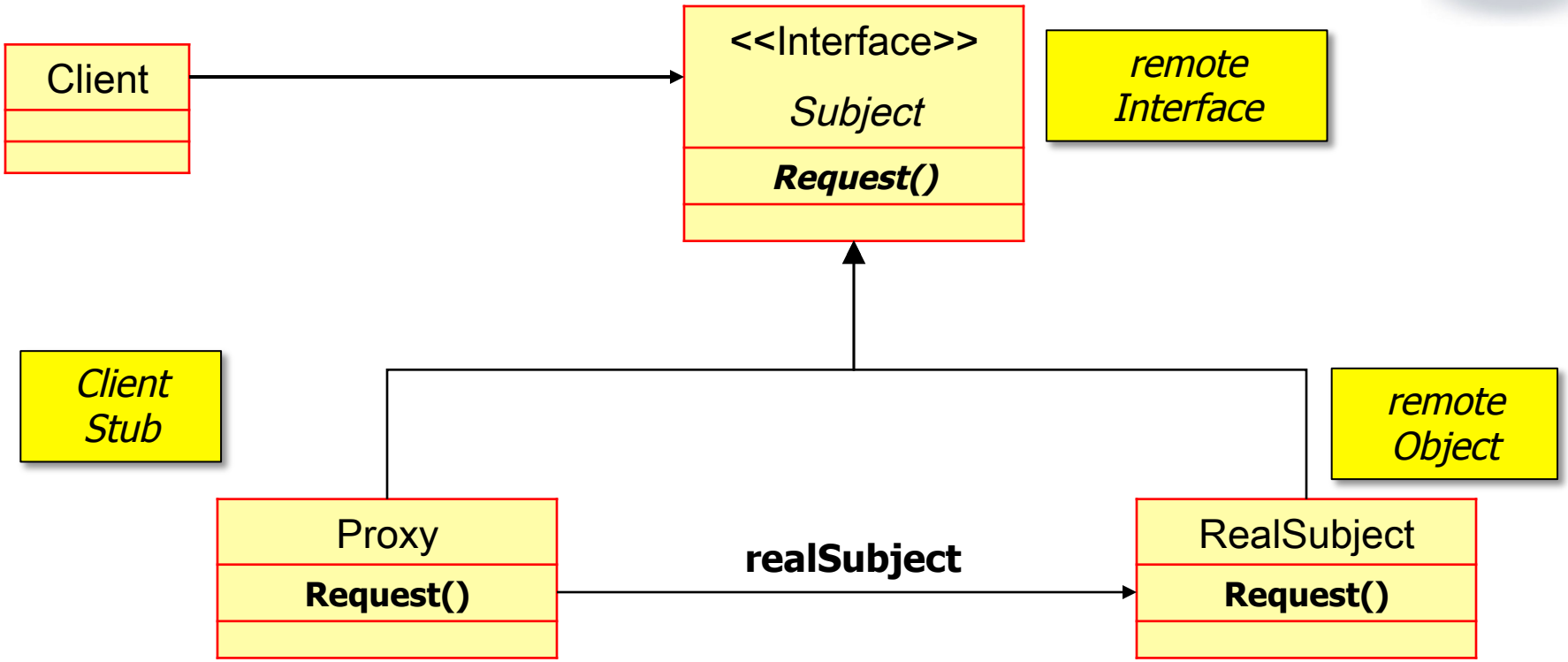


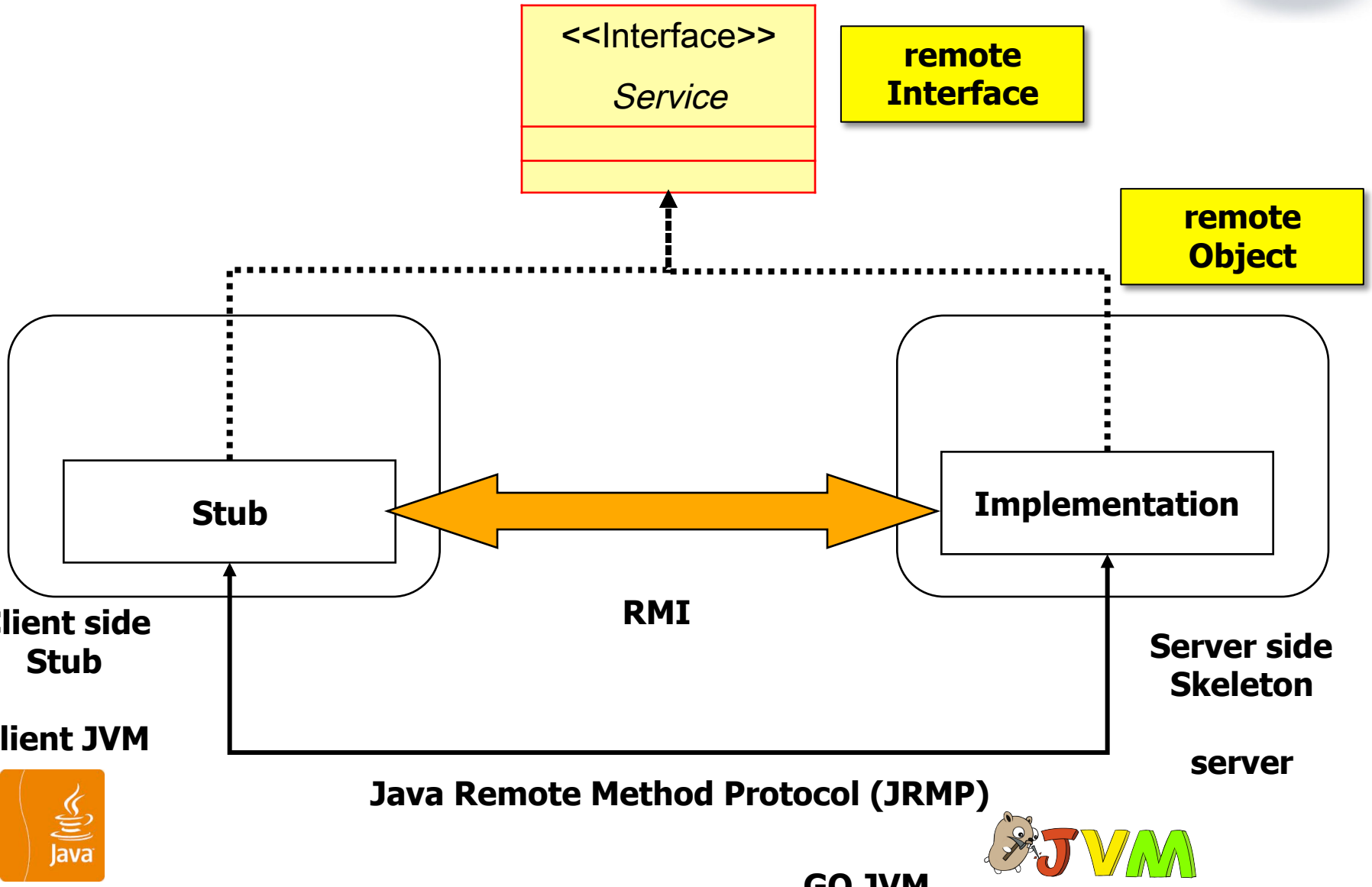
Client side Stub

Client JVM

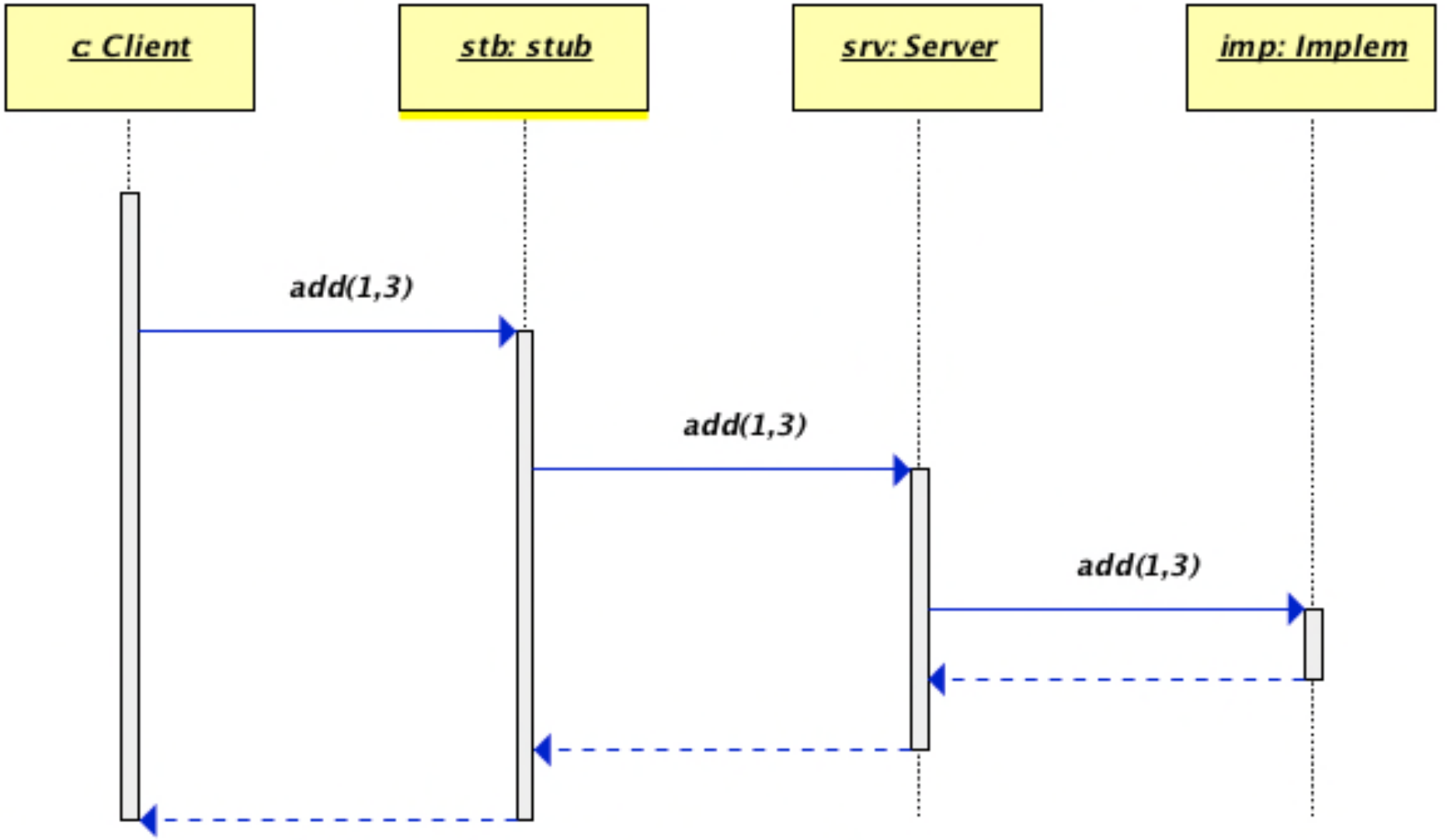
Server side Skeleton

Server JVM

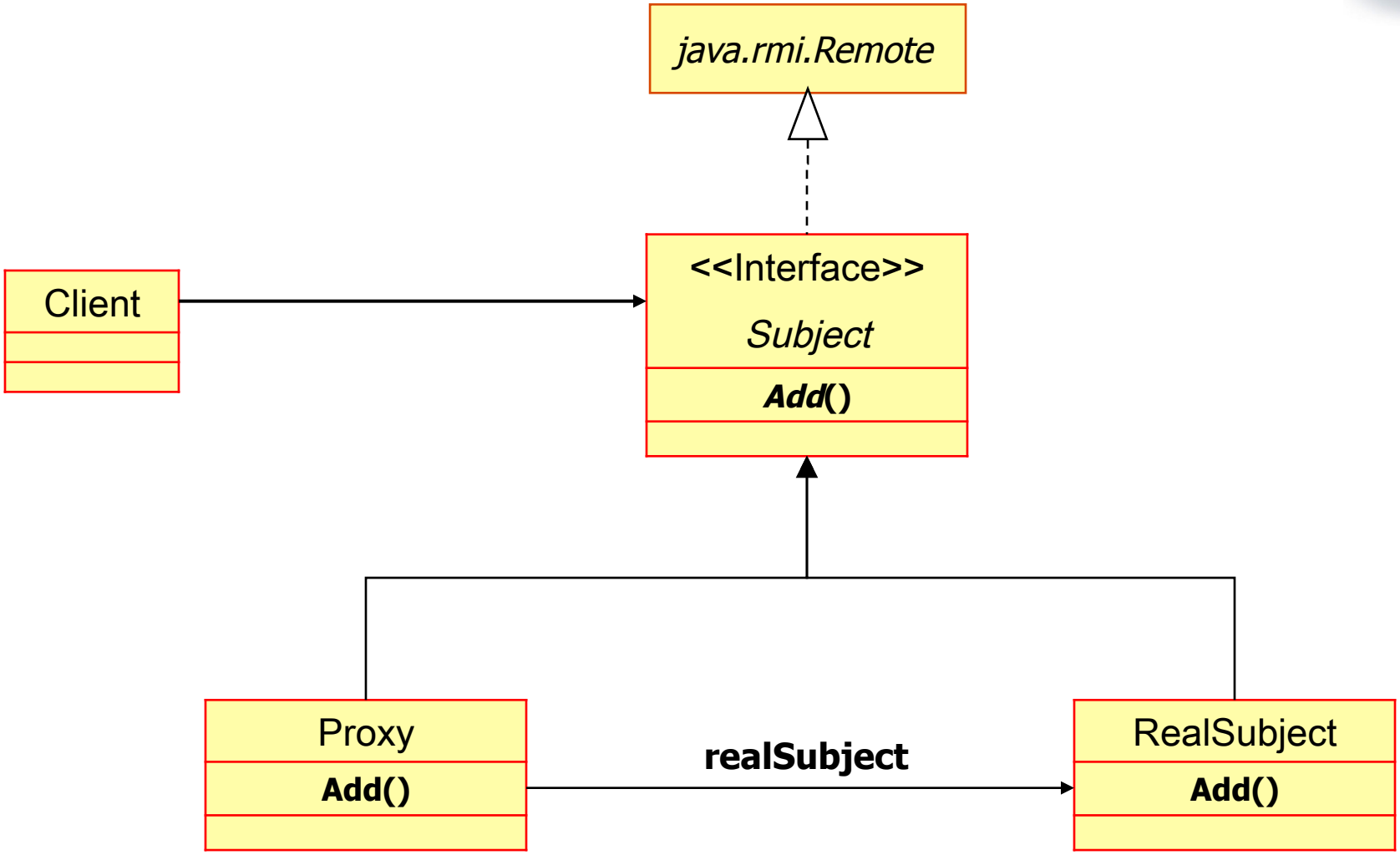
RMI proxy stub skeleton



RMI : Add server



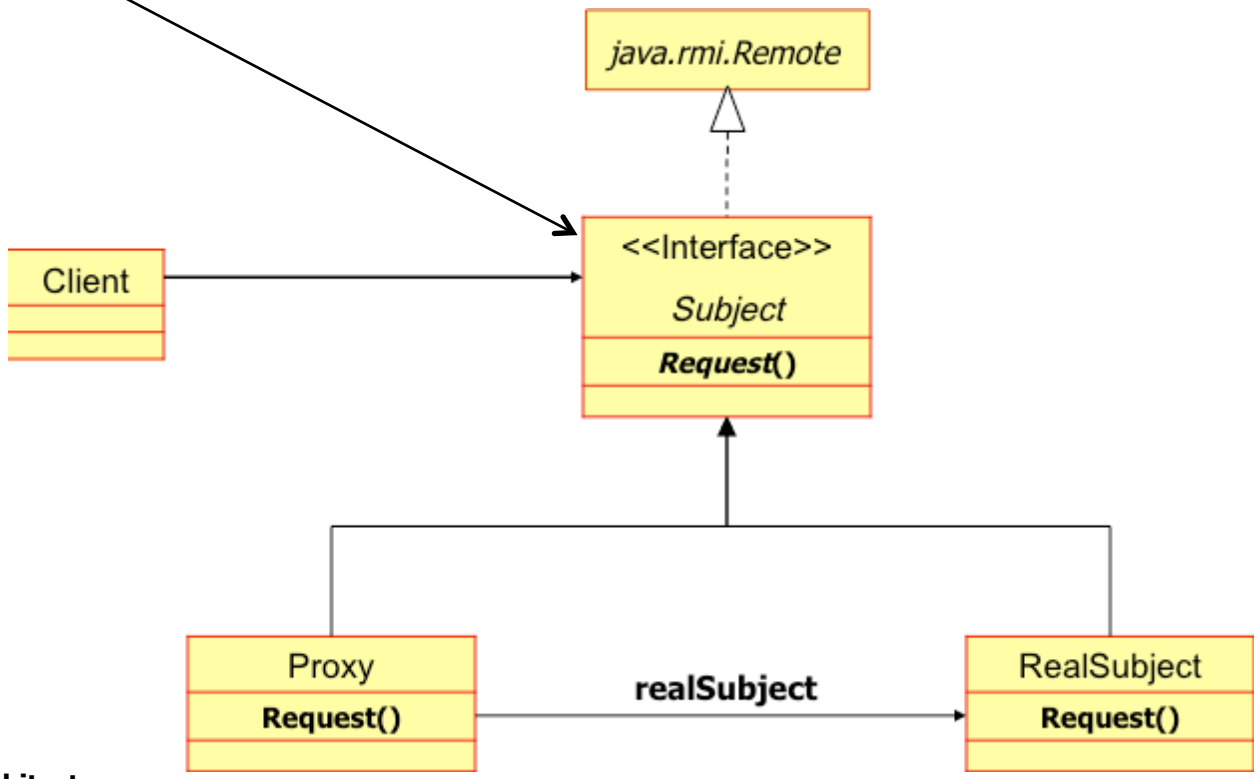
RMI


java.rmi.Remote
Client
<<Interface>>
Subject
Add()
Proxy
Add()
realSubject
RealSubject
Add()

Interface : Add

```java
import java.rmi.Remote;
import java.rmi.RemoteException;

public interface AddInterface extends Remote {
    public Integer add(Integer nb1, Integer nb2) throws RemoteException;
}
```

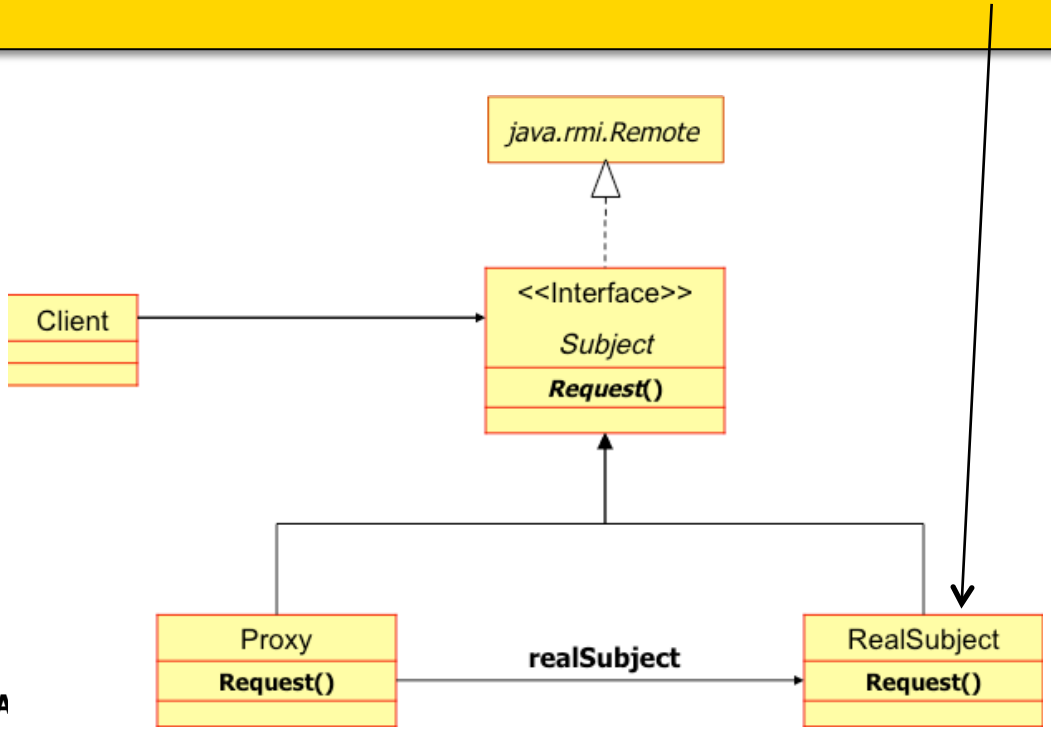


Implementation of the remote interface

```
import java.rmi.RemoteException;

public class AddImpl implements AddInterface {

    public Integer add(Integer nb1, Integer nb2)
                            throws RemoteException
         {
        return nb1 + nb2;
         }
}
```



The Server

```
import java.rmi.registry.LocateRegistry;
import java.rmi.registry.Registry;
import java.rmi.server.UnicastRemoteObject;

public class Server {
    public static void main(String[] argv) {
        try {

         AddInterface skeleton =
         (AddInterface) UnicastRemoteObject.exportObject(new AddImpl(), 0)

         Registry registry = LocateRegistry.createRegistry(0);

        registry.rebind("Add", skeleton);

        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}
```

Export a remote object

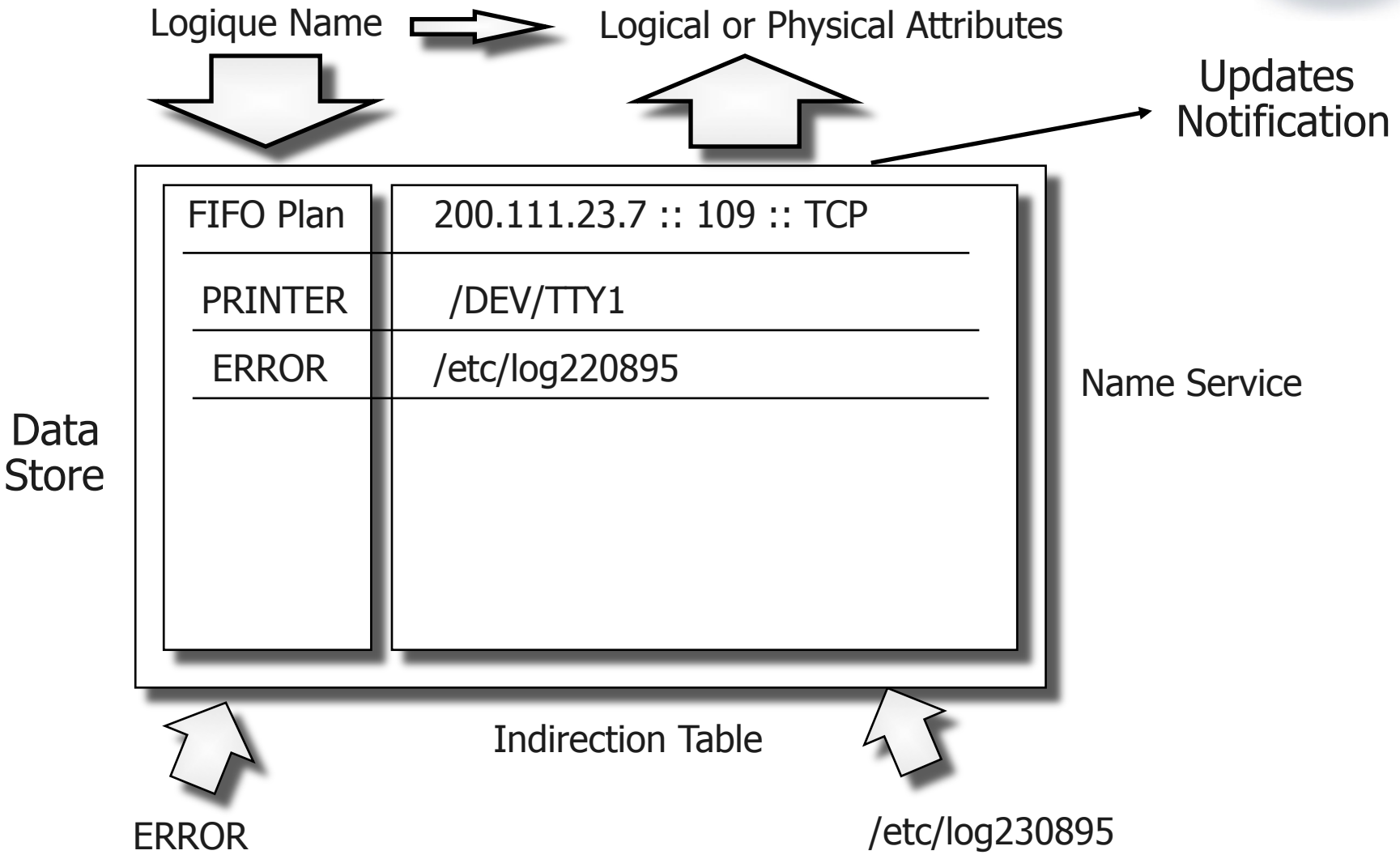
- Export a remote object :
  - to make it available to accept incoming calls from clients.
- The exportObject() method takes 2 parameters :
  - 1) Instance of the remote object,
  - 2) TCP port number.
- Port number can accept incoming calls for more than one remote objects.
- If TCP port number = 0, the default RMI port number 1099 is used.
- UnicastRemoteObject is used for exporting a remote object with JRMP and obtaining a stub that communicates to the remote object.

Java RMI registry

- To be able to invoke a method on a remote object, caller must first obtain a stub for the remote object.

- For bootstrapping, Java RMI provides a registry API for:
  - Server applications to bind a name to a remote object's stub.
  - clients to look up remote objects by name in order to obtain their stubs.

Registry model



Java RMI registry

- A Java RMI registry is a simplified name service that allows clients to get a reference (a stub) to a remote object.
- The Java RMI registry is a remote object that maps names to remote objects.
- LocateRegistry is a bootstrap to the registry.
- The method bind() or rebind() binds a unique name to the reference of the remote object
- the remote object name "Add" is bound to the stub that is returned from the exportObject() method.

The client

```
import java.rmi.registry.LocateRegistry;
import java.rmi.registry.Registry;

public class Client {
    public static void main(String[] argv) {
        try {

            Registry registry =
                LocateRegistry.getRegistry(0);

            AddInterface stub = (AddInterface)
                registry.lookup("Add");

            System.out.println(stub.add(1, 2));

        } catch (Exception e) { e.printStackTrace(); }
    }
}
```

Client registry

- The client program obtains a stub for the registry on the server's host.
- Looks up the remote object's stub by name in the registry.
- Then invokes the remote method on the remote object using the stub.