

Rapid Application Development of Middleware Components by Using XML

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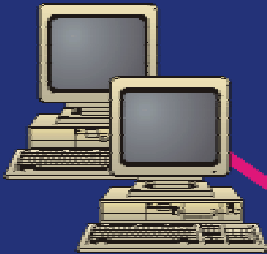
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Outline

- Motivation and overview
- System overview
- XML representation of objects
- Generation of middleware components
- Summary & future work

Motivation

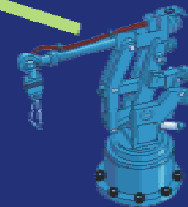
Workstations



Mobile Devices



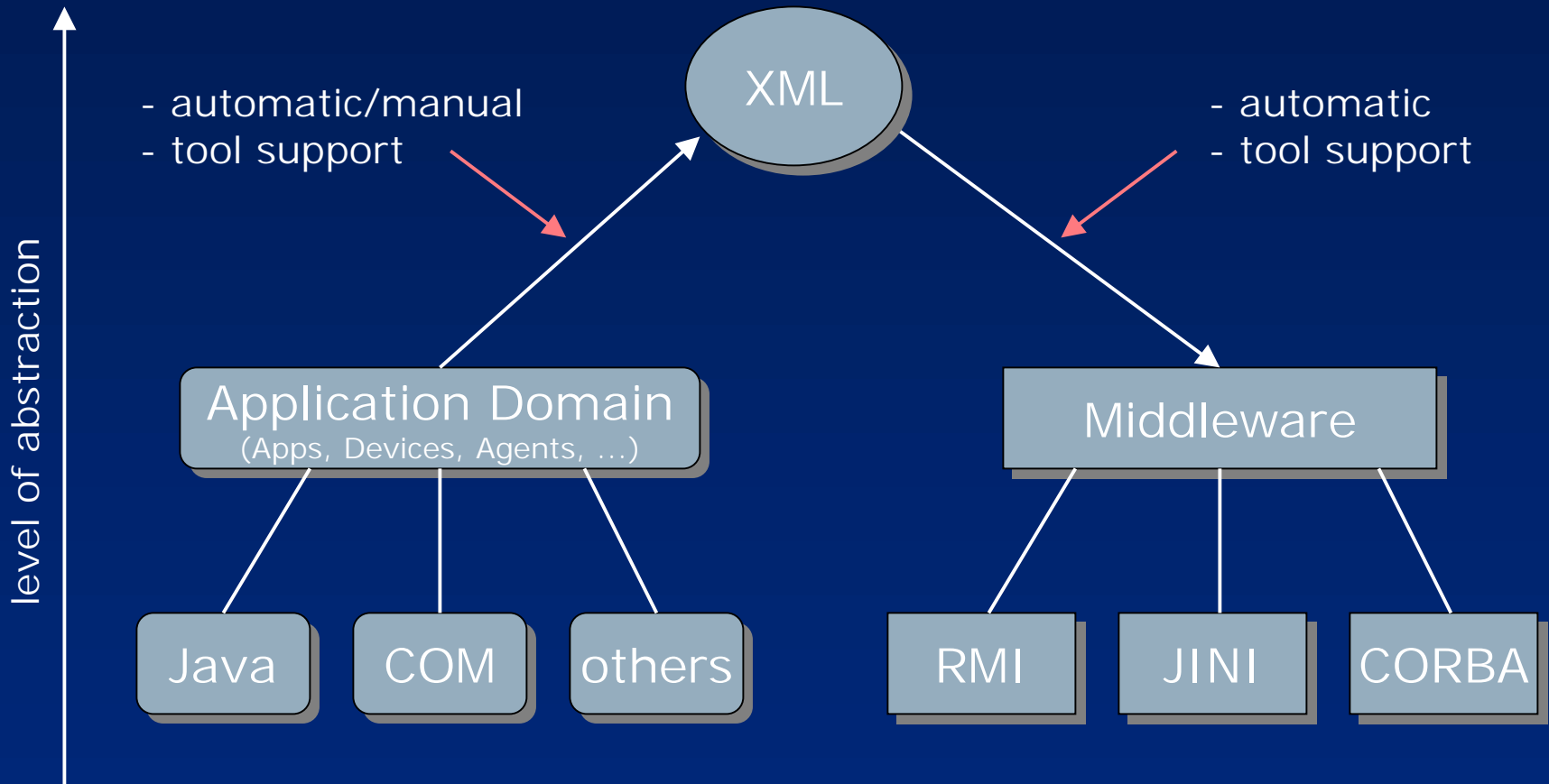
Industrial Devices



Legacy Systems

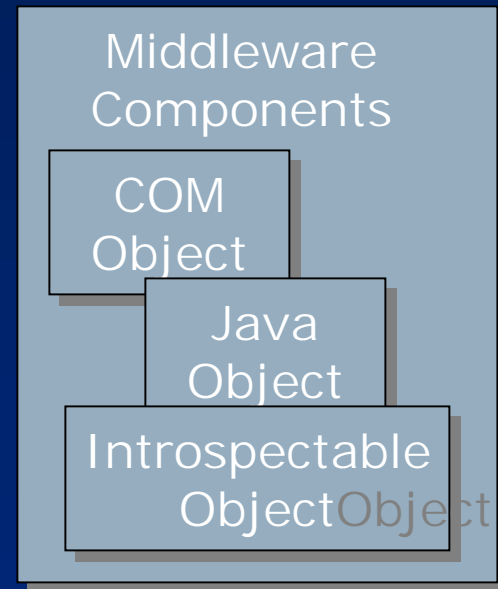


Overview



System overview

generation



Benefits

- Rapid application development and integration
- Remote accessibility
- Uniform interface descriptions
- Reliable and stable applications
- Retrieval capabilities
- Automatic/dynamic integration (agents)
- Open standard through XML, tool support

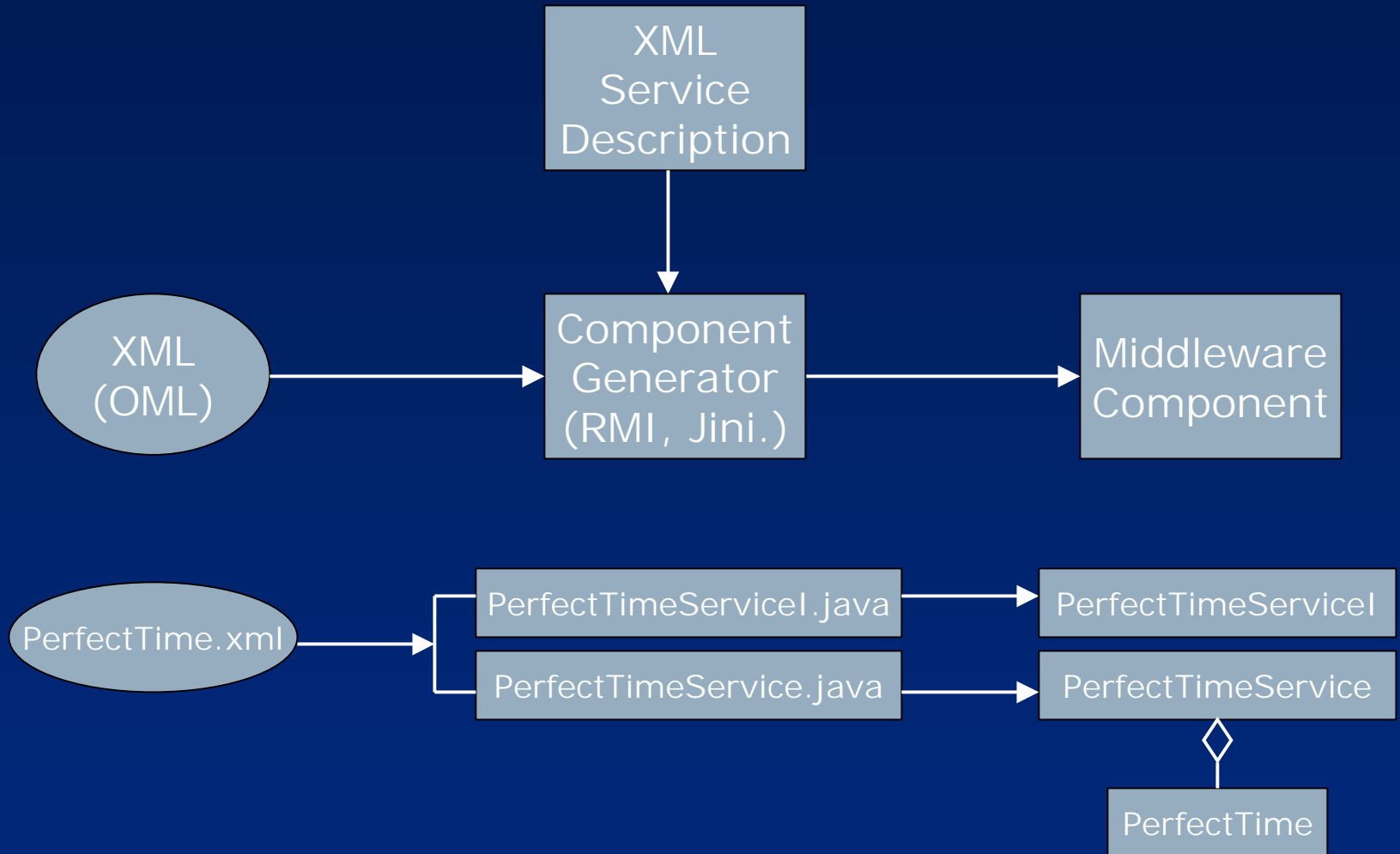
XML representation of objects

- Introspection
 - Java objects
 - Java classes (*.class, *.zip, *.jar)
 - Reflection
 - COM objects
 - Type libraries (*.tlb, *.olb, *.dll, *.ocx, *.exe)
 - Windows registry
- XML representation of objects (OML)
 - system and (programming language) independent
 - Metadata

Java OML example

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE XmlClass SYSTEM "JavaClass.dtd">
<XmlClass Type="Java" Host="134.2.2.3" Repository="...">
  <Class Name="PerfectTime"/>
  <Imports/>
  <Constructors>
    <Constructor Name="PerfectTime"/>
  </Constructors>
  <Methods>
    <Method Name="getPerfectTime" ReturnType="long">
      <Exceptions>
        <Exception Name="e3" Type="java.lang.Exception"/>
      </Exceptions>
    </Method>
  </Methods>
</XmlClass>
```

Generation of Middleware Components



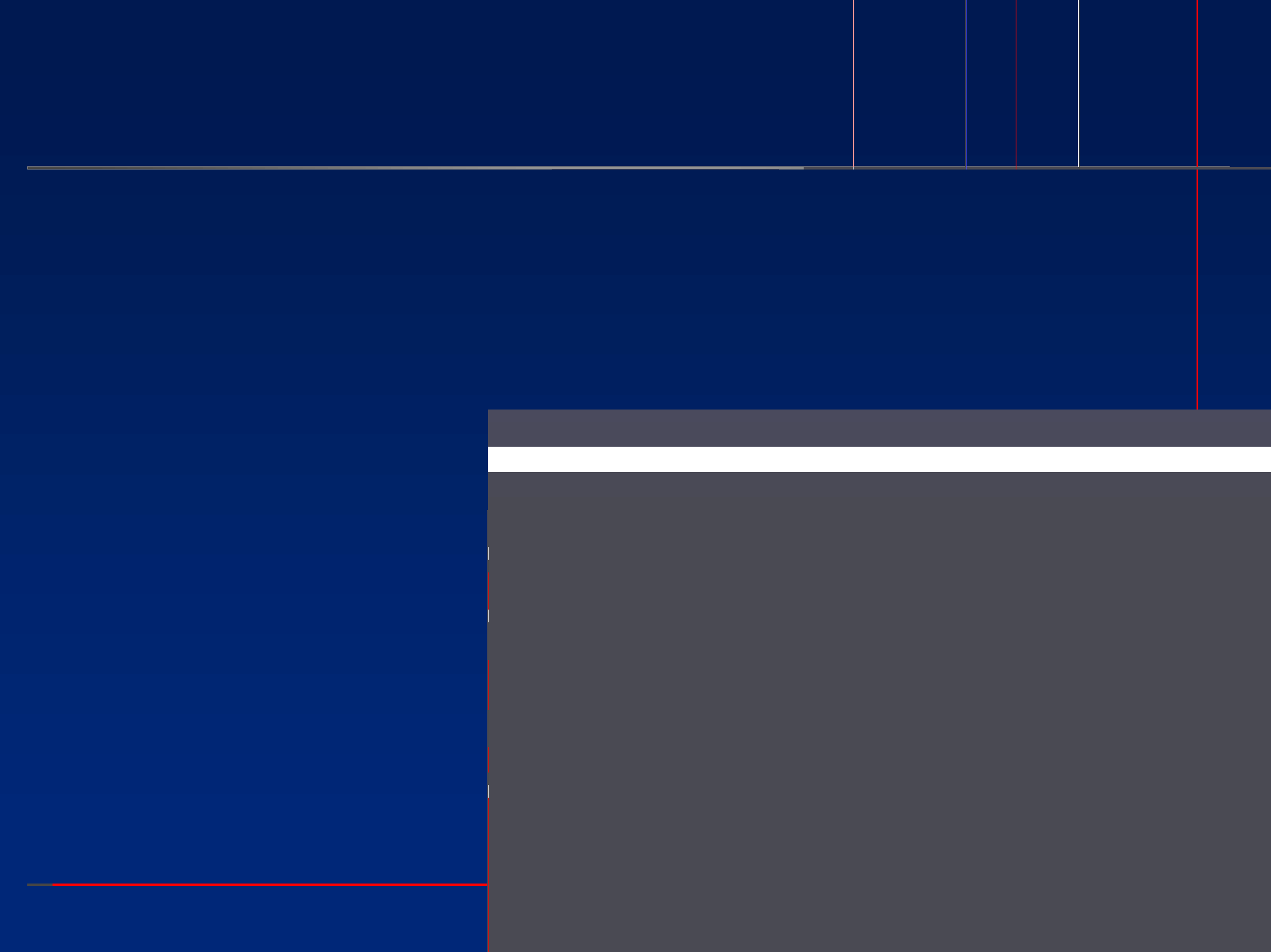
RMI generation example

```
public class PerfectTimeService extends UnicastRemoteObject implements PerfectTimeServiceI
{
    private PerfectTime obj = null;

    public PerfectTimeService() throws RemoteException {
        obj = new PerfectTime();
    }

    public long svc_getPerfectTime() throws RemoteException {
        return(obj.getPerfectTime());
    }

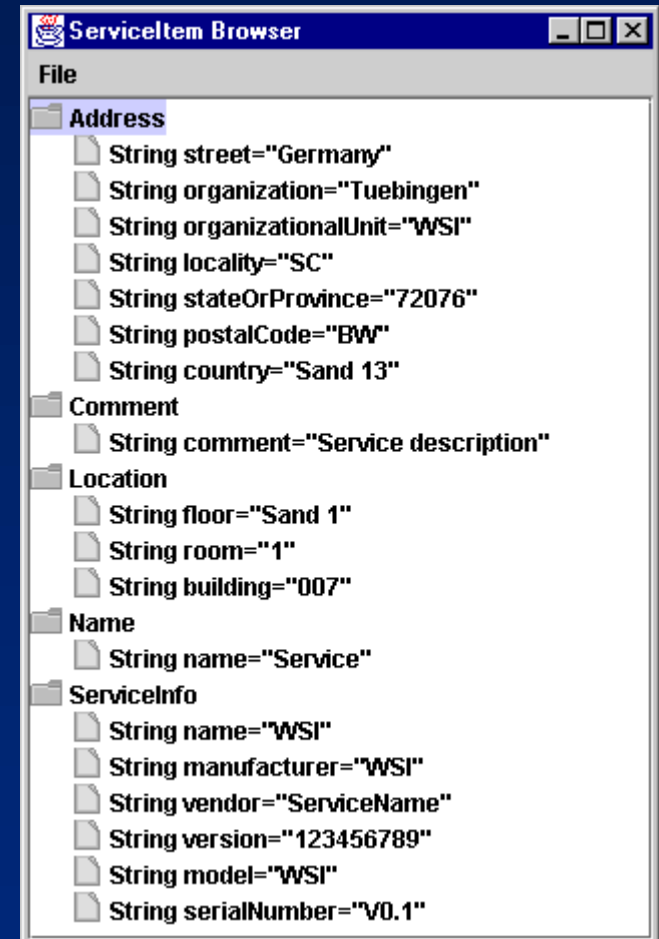
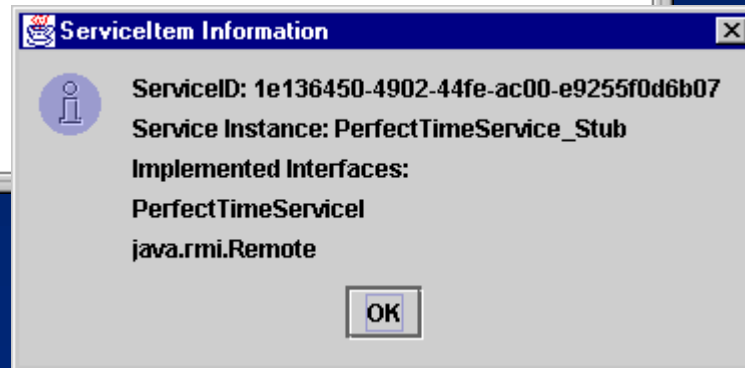
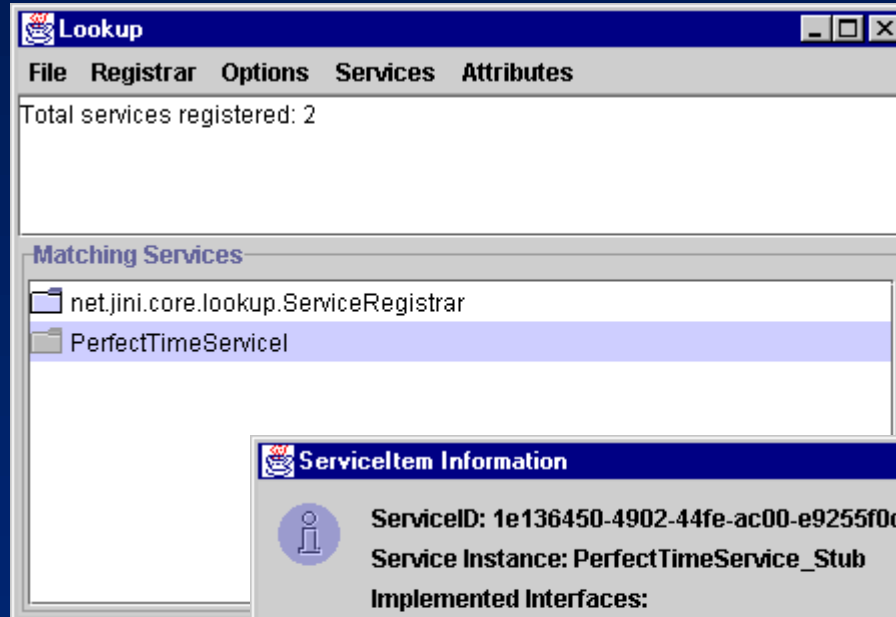
    public static void main(String[] args) {
        System.setSecurityManager(new RMISecurityManager());
        try {
            PerfectTimeService svc = new PerfectTimeService();
            Naming.bind("//134.2.2.3:2005/PerfectTimeService", svc);
            System.out.println("Service bound in registry");
        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}
```



JINI generation example/service description

```
public class PerfectTimeService extends UnicastRemoteObject implements PerfectTimeServiceI
{
    ....
    public static void main(String[] args)
    {
        System.setSecurityManager(new RMISecurityManager());
        String[] groups = new String[] { "" };
        Address entry0 = new Address("Germany", "Tuebingen", "WSI", "SC", "72076", "BW", "Sand 13");
        Comment entry1 = new Comment("Service description");
        Location entry2 = new Location("Sand 1", "1", "007");
        Name entry3 = new Name("Service");
        ServiceInfo entry4 = new ServiceInfo("WSI", "WSI", "SvcName", "12345678", "WSI", "V0.1");
        Entry[] entries = new Entry[] {entry0, entry1, entry2, entry3, entry4};
        try {
            PerfectTimeService svc = new PerfectTimeService();
            LookupDiscoveryManager mgr = new LookupDiscoveryManager(groups, null, null);
            JoinManager manager = new JoinManager(svc, entries, svc, mgr, null);
        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}
```

Generated JINI service example



Summary & Future work

- XML representation of objects
- Automatic generation of middleware components
- Remote accessibility

- Future Work
 - Generalization of XML representations
 - Automatic generation of servlets
 - Representation of devices (CANopen)
 - Simulation of virtual components
 - Mobile applications
 - Database retrieval
 - Service infrastructure