

OSGi Remote Services with SCA using Apache Tuscany

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Agenda

- OSGi remote services - a distributed calculator
- Representing OSGi entities using SCA
- Predefined mapping from OSGi to SCA
- On-demand mapping from OSGi to SCA
- Discovery of OSGi remote services
- Demo of distributed calculator
- Q&A
- Free e-book of *Tuscany In Action*



OSGi remote services - A sample scenario



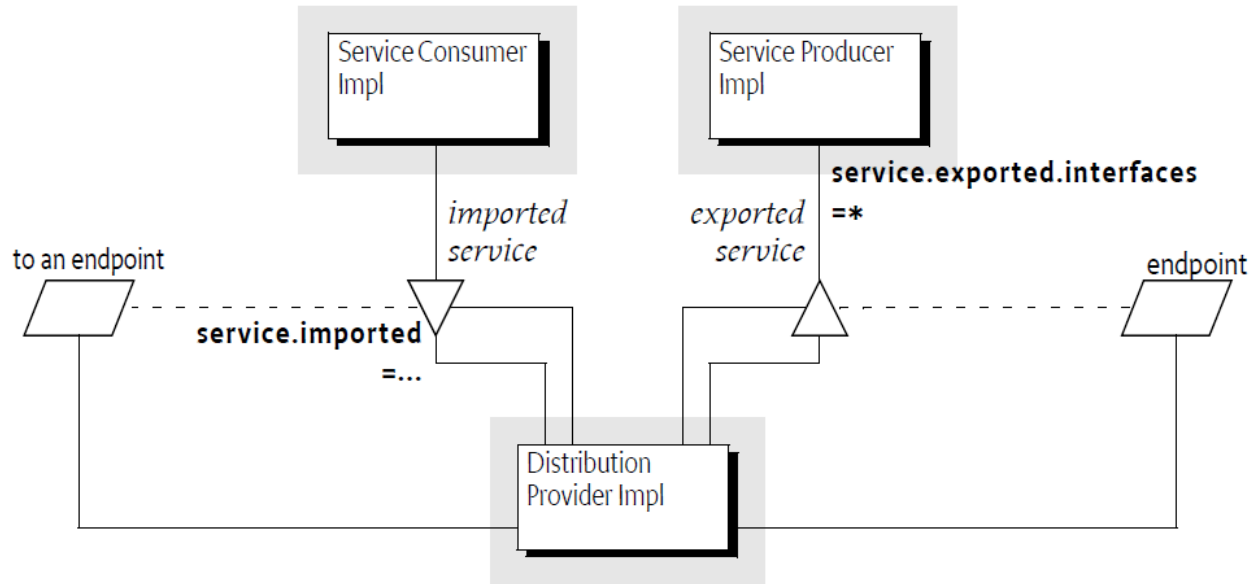
OSGi Remote Services

- The OSGi core framework specifies a model where bundles can use distributed services. (R4.2)
- The basic model for OSGi remote services is that a bundle can:
 - register services that are *exported* to a communication *endpoint*
 - use services that are *imported* from a communication endpoint



OSGi Remote Services

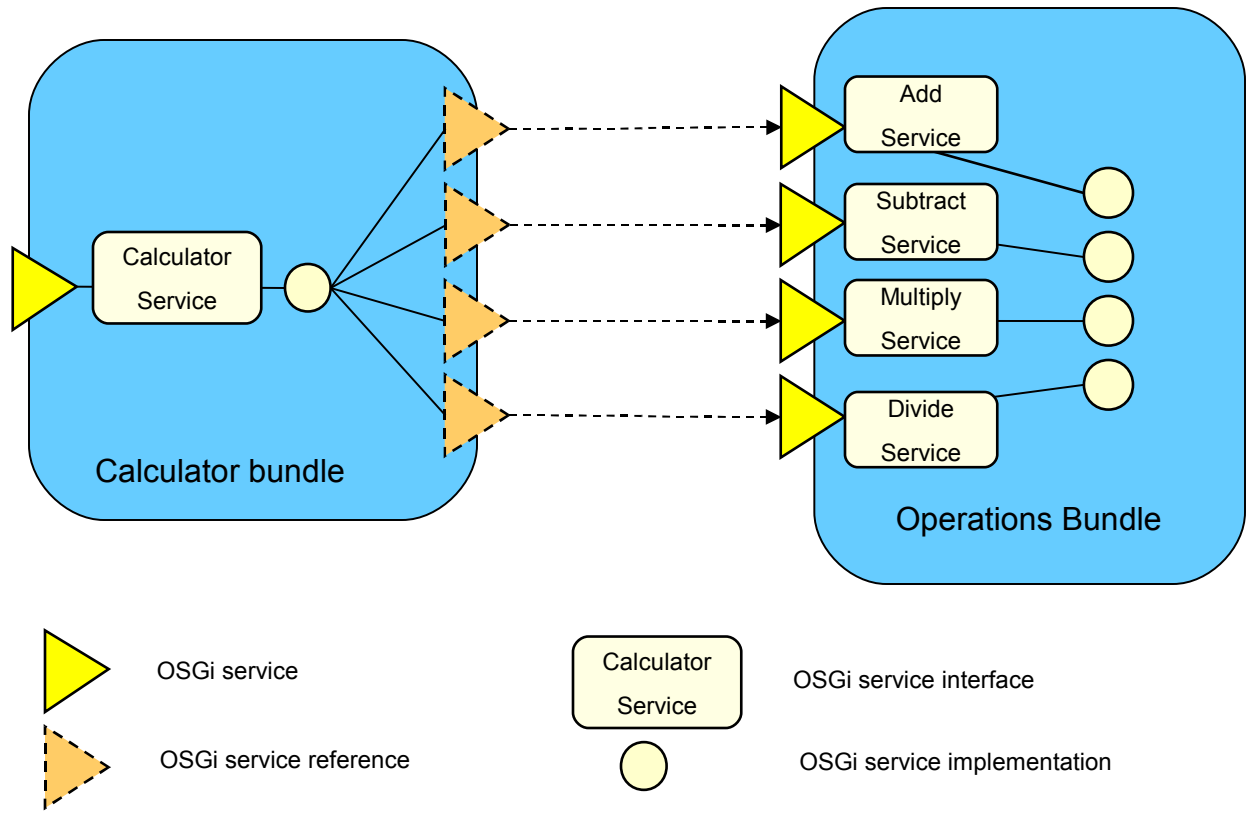
Figure 13.1 Remote Services Architecture



NOTE: The diagram is copied from OSGi Service Platform Service Compendium R4.2 spec



An OSGi based Calculator

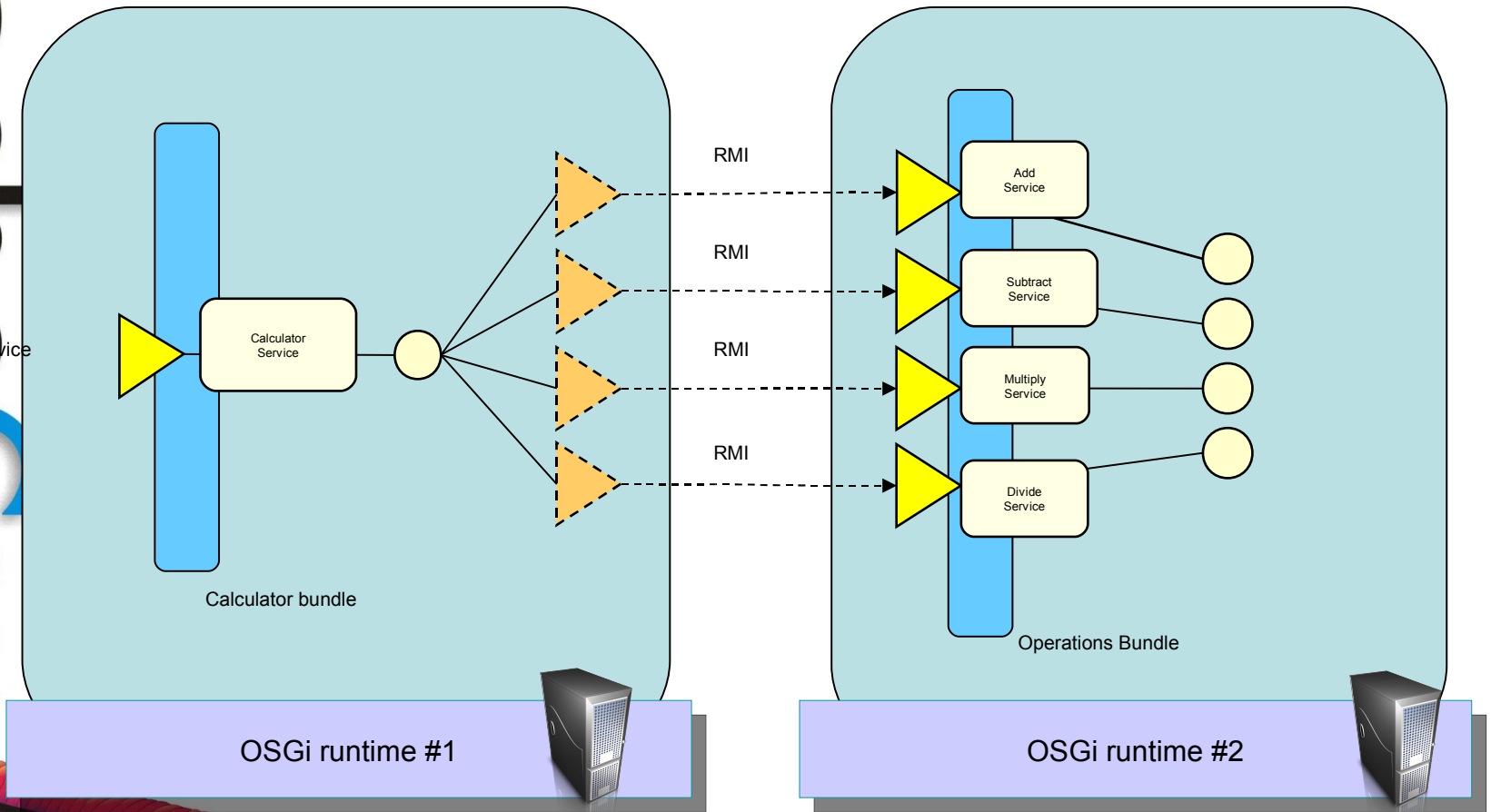


Making the Calculator Distributed

- Run the calculator bundle and the operations bundle on two OSGi framework instances.
 - The calculator bundle registers the CalculatorService and it looks up the Add/Subtract/Multiply/Divide services (which are remote over RMI) from the service registry. The CalculatorService is exported as a Web Service.
 - The operations bundle registers four remote services (Add/Subtract/Multiply/Divide). These services are exported over RMI.



OSGi Remote Services enabled Calculator



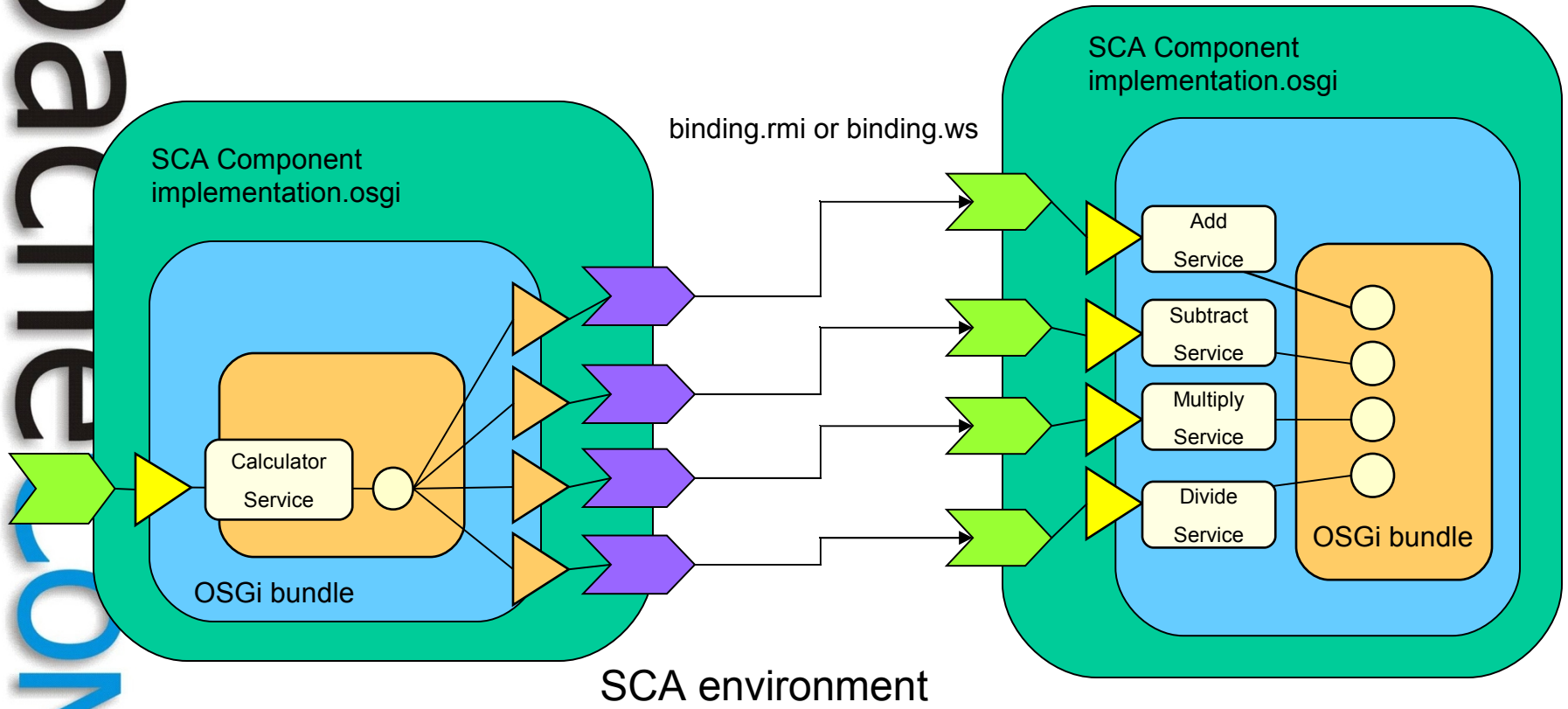
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Modeling OSGi entities using SCA

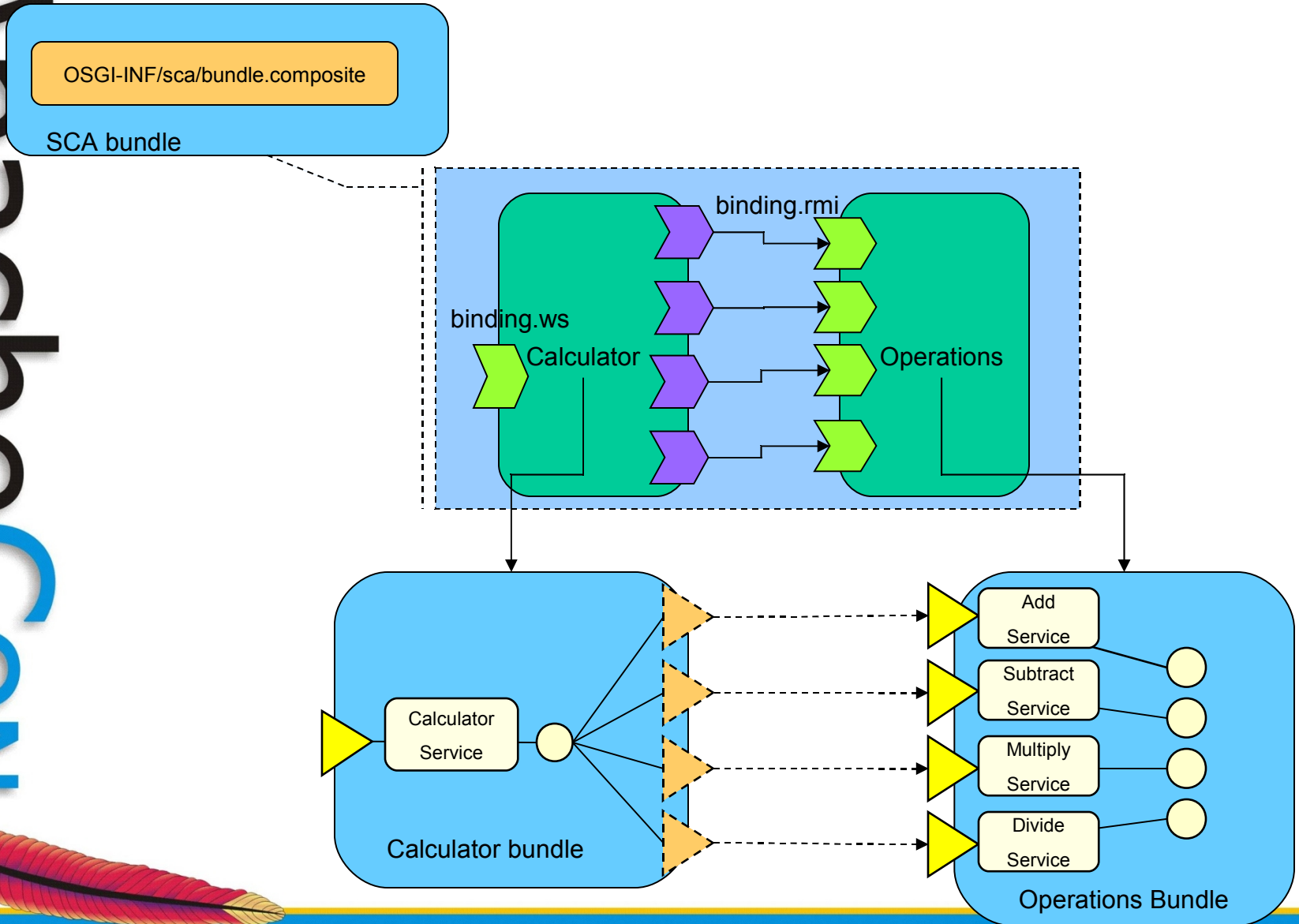


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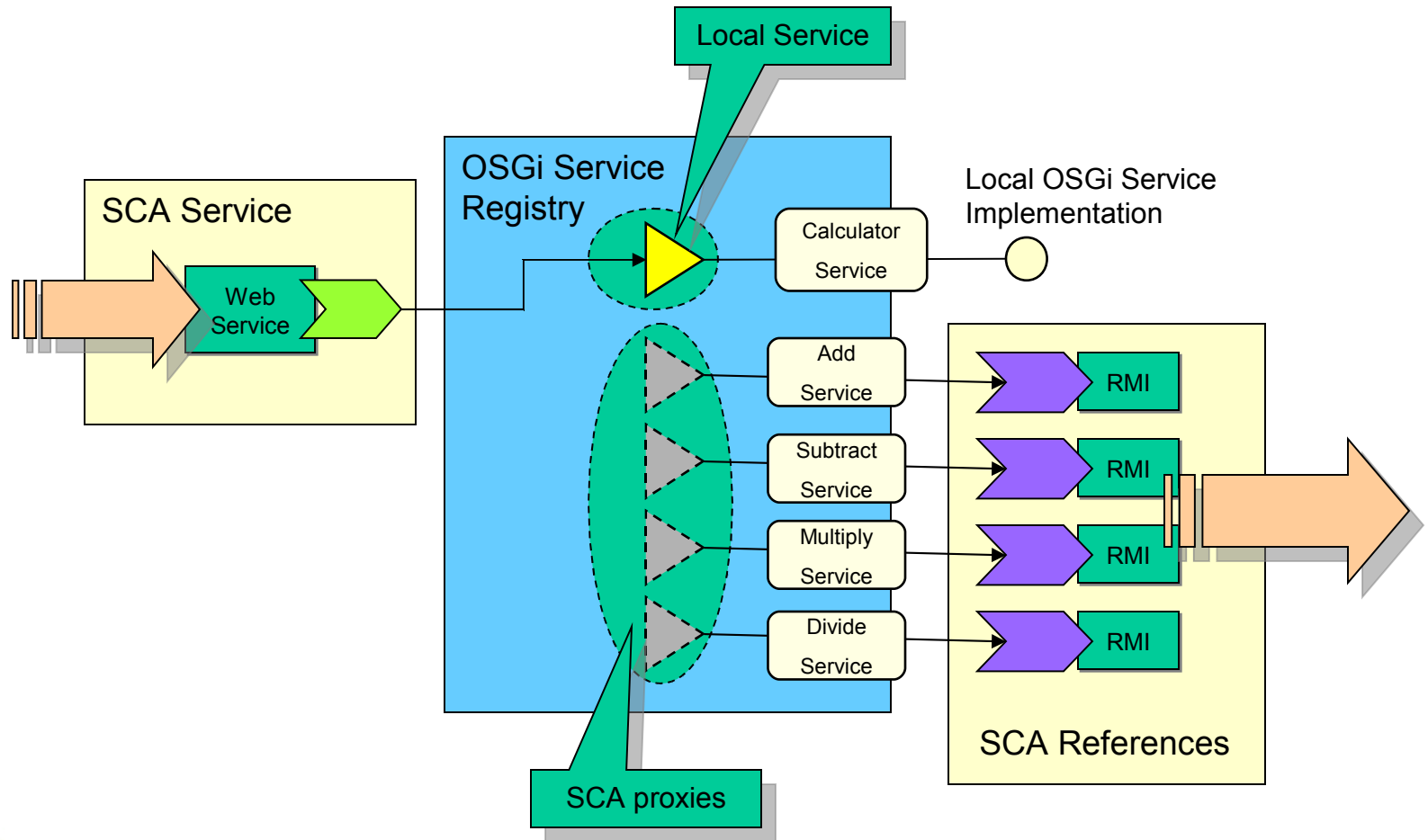
The Calculator Scenario: OSGi Remote Services with SCA runtime as the distribution software



Defining the SCA composite for OSGi bundles



SCA view of OSGi services and references



SCA implementation.osgi

- The SCA implementation.osgi component will be used to encapsulate one or more OSGi bundles.
 - OSGi View: implementation.osgi provides the metadata and infrastructure to enable the distribution of OSGi services
 - SCA View: implementation.osgi allows OSGi bundles to participate in the SCA assembly.
- The references for an SCA OSGi component represents the OSGi services to be consumed by the bundles
- The services for an SCA OSGi component represents the OSGi services to be provided by the bundles



Predefined mapping from OSGi to SCA

<http://svn.apache.org/repos/asf/tuscany/java/sca/samples/dosgi-calculator/>
<http://svn.apache.org/repos/asf/tuscany/java/sca/samples/dosgi-calculator-operations/>



Mapping an OSGi bundle to an SCA componentType

```

<componentType xmlns="http://docs.oasis-open.org/ns/opencsa/sca/200903"
xmlns:t="http://tuscany.apache.org/xmlns/sca/1.1">
  <!-- The service element defines an SCA view of the OSGi service -->
  <service name="CalculatorService">
    <!-- The interface will be mapped into the OSGi service class -->
    <interface.java interface="calculator.dosgi.CalculatorService"/>
  </service>
  <!-- The reference element defines an SCA proxy to a remote OSGi service -->
  <reference name="addService">
    <interface.java interface="calculator.dosgi.operations.AddService"/>
  </reference>
  <reference name="subtractService">
    <interface.java interface="calculator.dosgi.operations.SubtractService"/>
  </reference>
  <reference name="multiplyService">
    <interface.java interface="calculator.dosgi.operations.MultiplyService"/>
  </reference>
  <reference name="divideService">
    <interface.java interface="calculator.dosgi.operations.DivideService"/>
  </reference>

```

SCA composite for the OSGi bundle

```

<composite xmlns="http://docs.oasis-open.org/ns/opencsa/sca/200903"
  xmlns:tuscany="http://tuscany.apache.org/xmlns/sca/1.1"
  targetNamespace=http://calculator.dosgi name="CalculatorComposite">
  <component name="CalculatorComponent">
    <tuscany:implementation.osgi bundleSymbolicName="calculator.dosgi" bundleVersion="1.0.0" />
    <service name="CalculatorService">
      <binding.ws uri="http://localhost:8086/CalculatorService"/>
    </service>
    <reference name="addService">
      <tuscany:binding.rmi uri="rmi://localhost:8085/AddService"/>
    </reference>
    <reference name="subtractService">
      <tuscany:binding.rmi uri="rmi://localhost:8085/SubtractService"/>
    </reference>
    <reference name="multiplyService">
      <tuscany:binding.rmi uri="rmi://localhost:8085/MultiplyService"/>
    </reference>
    <reference name="divideService">
      <tuscany:binding.rmi uri="rmi://localhost:8085/DivideService"/>
    </reference>
  </component>
</composite>

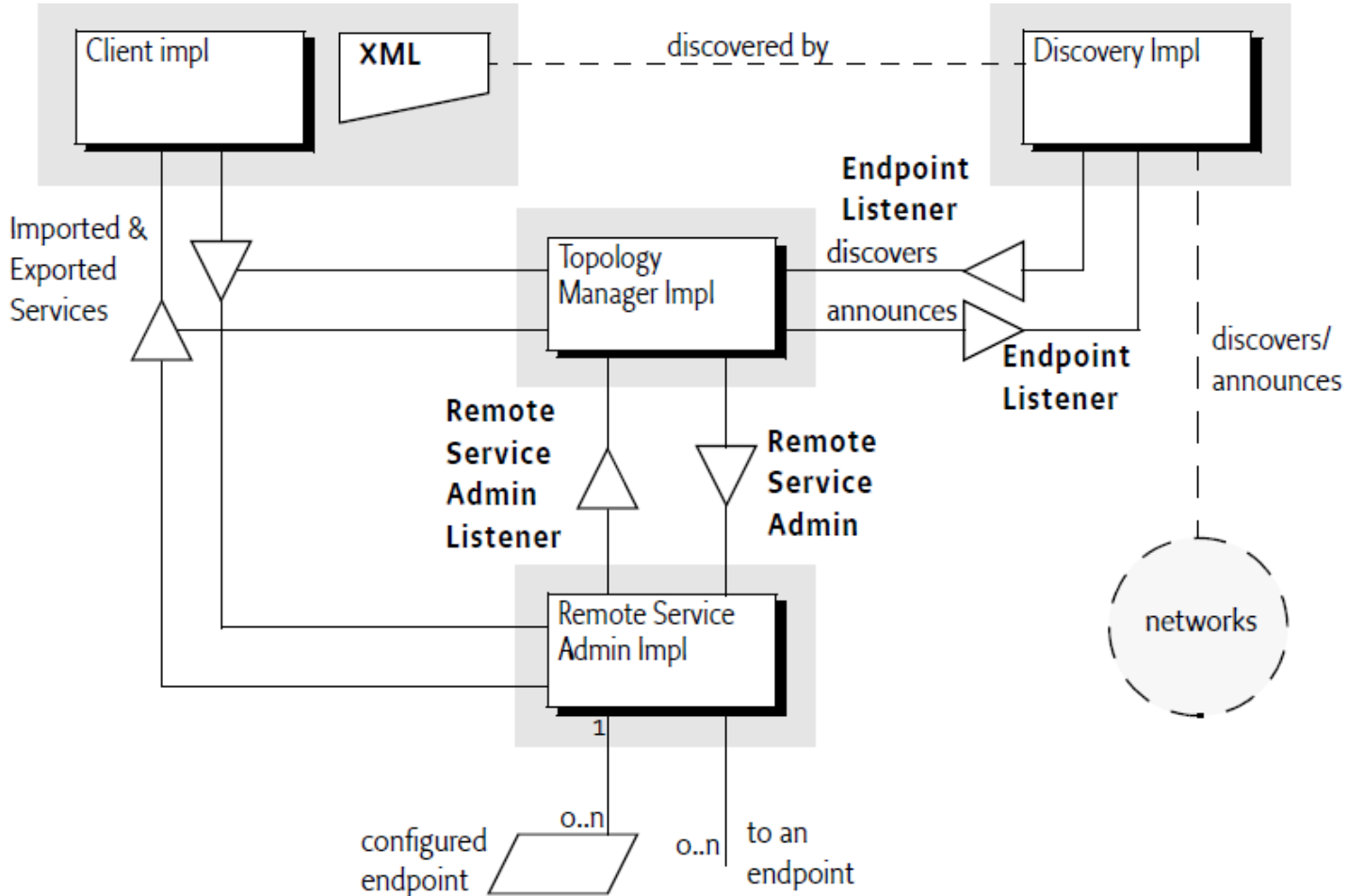
```

On-demand mapping from OSGi to SCA

<http://svn.apache.org/repos/asf/tuscany/java/sca/samples/dosgi-dynamic-calculator/>
<http://svn.apache.org/repos/asf/tuscany/java/sca/samples/dosgi-dynamic-calculator-operations/>



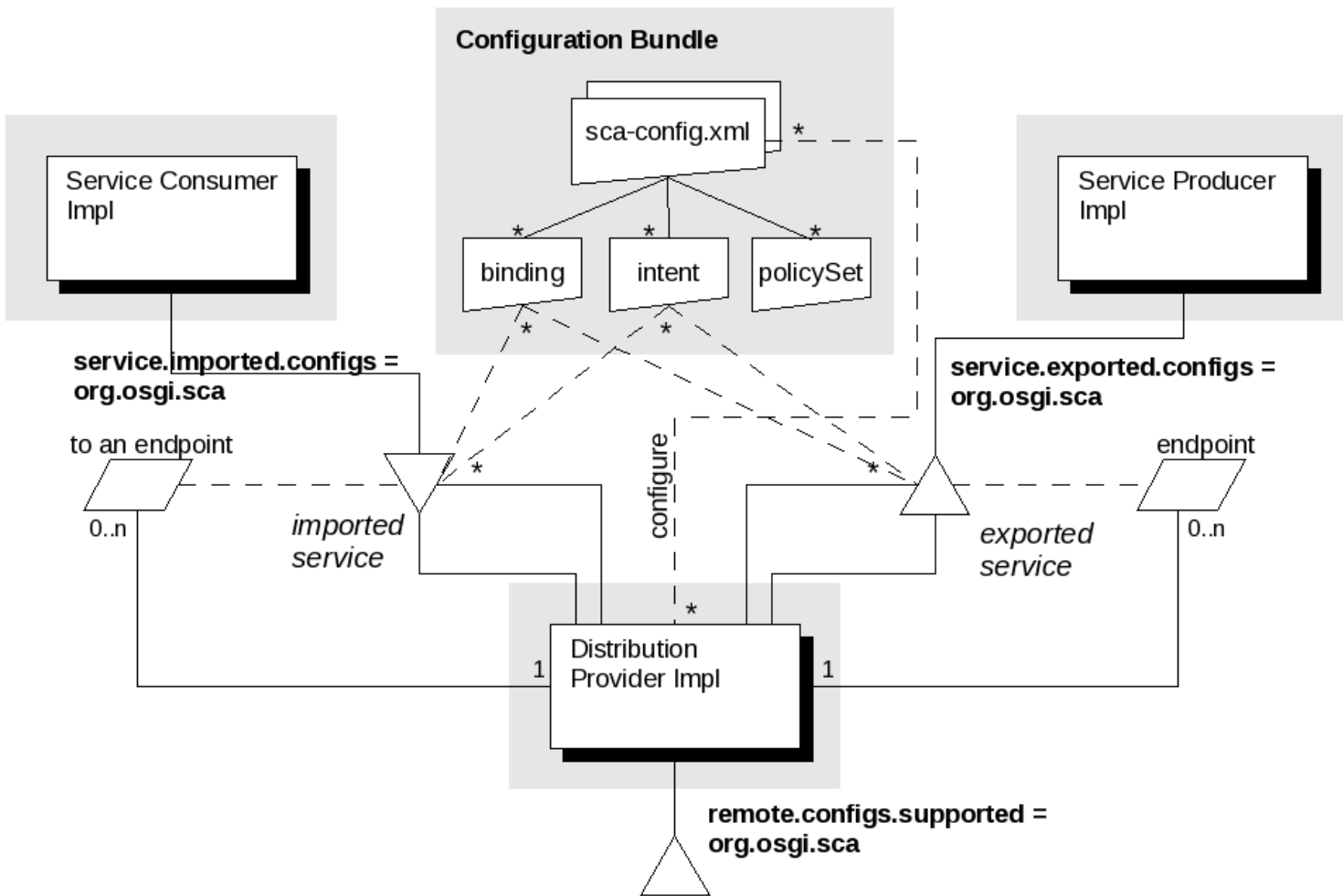
Remote Service Admin



NOTE: The diagram is copied from OSGi Remote Service Admin spec (to be published)



Remote Services with SCA



NOTE: The diagram is copied from OSGi Remote Service SCA Configuration Type spec (to be published)

Publish remote services

```
public void start(BundleContext context) throws Exception {
    Dictionary<String, Object> props = new Hashtable<String,
        Object>();
        props.put("sca.service", "CalculatorComponent#service-
            name(Calculator)");
        props.put("calculator", "Calculator");
        props.put("service.exported.configs", new String[]
            {"org.osgi.sca"});
        props.put("org.osgi.sca.bindings", new String[]
            {"{http://sample}Calculator"});
        props.put("service.exported.interfaces", new String[] {"*"});
    CalculatorService calculator = new CalculatorServiceImpl(context);
        context.registerService(CalculatorService.class.getName(),
            calculator, props);
}
```



Look up remote services (ServiceTracker)

```
Filter remoteFilter = null;
try {
    remoteFilter =
        context.createFilter("&" + OBJECTCLASS +
            "=calculator.dosgi.operations.*") (service.imported=*));
} catch (InvalidSyntaxException e) {
    ...
}
this.remoteServices = new ServiceTracker(context,
    remoteFilter, null);
remoteServices.open();
...
Object[] remoteObjects = remoteServices.getServices();
```



MANIFEST.MF

Manifest-Version: 1.0

Export-Package: calculator.dosgi;version="1.0.1",
calculator.dosgi.operations;version="1.0.1"

Bundle-Version: 1.0.0

Bundle-Name: calculator.dosgi.dynamic

Bundle-Activator: calculator.dosgi.impl.CalculatorActivator

Bundle-ManifestVersion: 2

Import-Package: org.oasisopen.sca.annotation;version="2.0.0",
org.osgi.framework,
org.osgi.service.component;resolution:=optional,
org.osgi.service.packageadmin,
org.osgi.util.tracker

Bundle-SymbolicName: calculator.dosgi.dynamic

Bundle-ActivationPolicy: lazy

Bundle-RequiredExecutionEnvironment: J2SE-1.5,JavaSE-1.6

SCA-Configuration: OSGI-INF/sca-config/calculator-config.xml

Remote-Service: OSGI-INF/remote-service/*.xml



SCA Configuration

```
<scact:sca-config targetNamespace="http://sample"
  xmlns:scact="http://www.osgi.org/xmlns/scact/v1.0.0"
  xmlns:sca="http://docs.oasis-open.org/ns/opencsa/sca/200903"
  xmlns:tuscany="http://tuscany.apache.org/xmlns/sca/1.1">
  <sca:binding.ws name="Calculator"
    uri="http://localhost:8086/CalculatorService"/>

  <!-- bindings for the remote services -->
  <tuscany:binding.rmi name="Add" uri="rmi://localhost:8085/AddService"/>
  <tuscany:binding.rmi name="Divide" uri="rmi://localhost:8085/DivideService"/
  >
  <tuscany:binding.rmi name="Subtract"
    uri="rmi://localhost:8085/SubtractService"/>
  <tuscany:binding.rmi name="Multiply"
    uri="rmi://localhost:8085/MultiplyService"/>
</scact:sca-config>
```

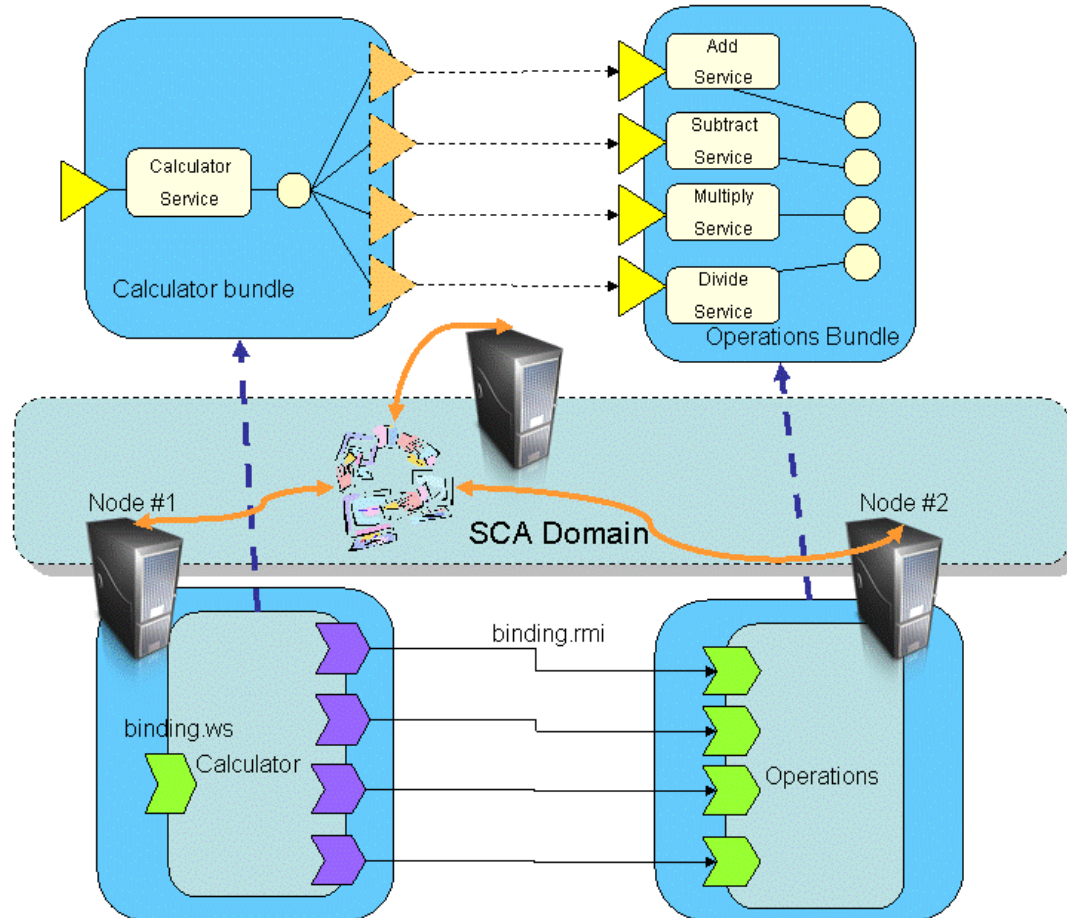


Local endpoint descriptions

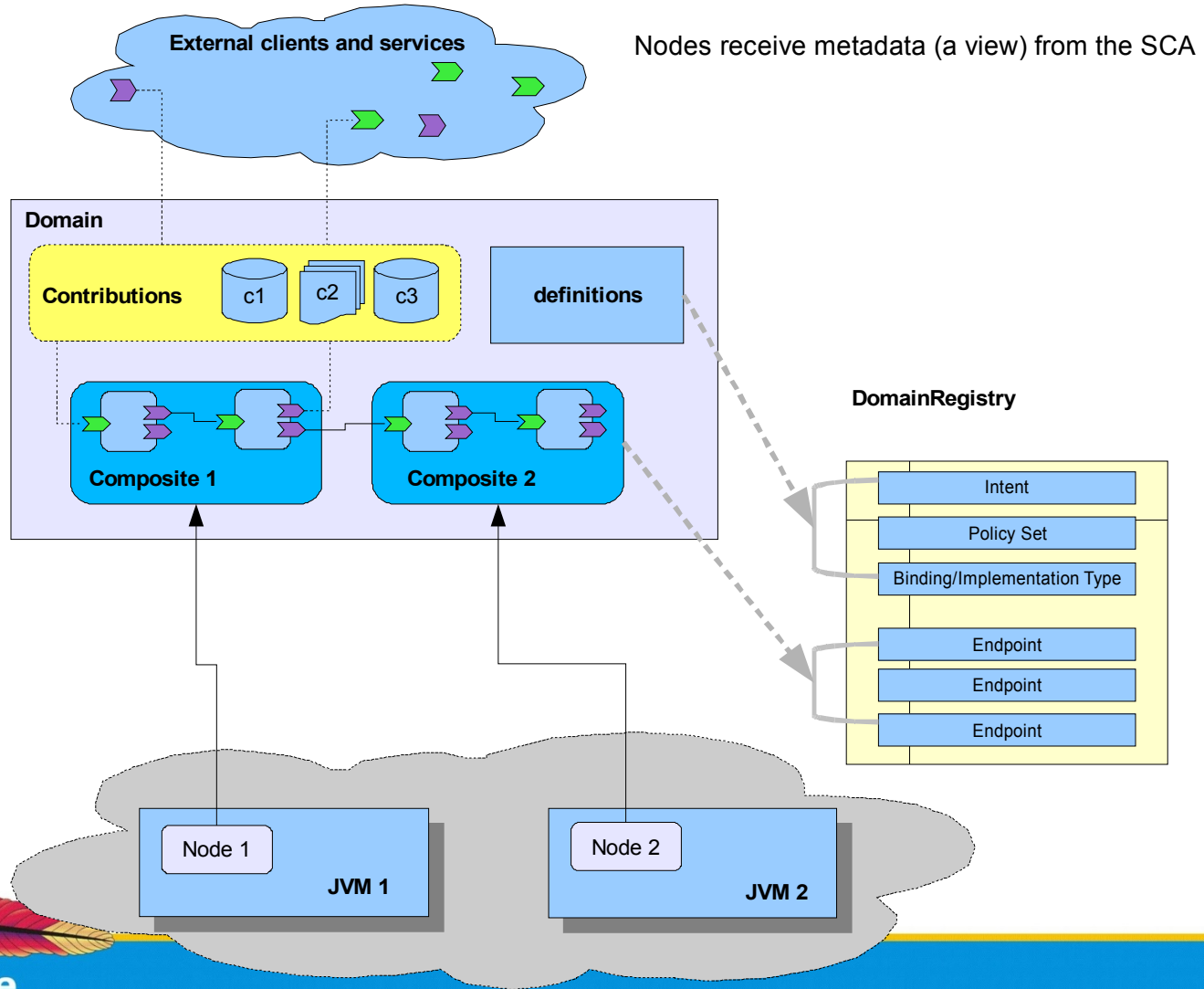
```
<service-descriptions xmlns="http://www.osgi.org/xmlns/sd/v1.0.0"
  xmlns:sca="http://docs.oasis-open.org/ns/opencsa/sca/200903"
  xmlns:tuscany="http://tuscany.apache.org/xmlns/sca/1.1">
  <!-- Describe a remote OSGi service -->
  <service-description>
    <provide interface="calculator.dosgi.operations.AddService" />
    <property name="remote.exported.intents"></property>
    <property
      name="remote.configs.supported">org.osgi.sca</property>
    <property
      name="org.osgi.sca.bindings">{http://sample}Add</property>
  </service-description>
  ...
</service-descriptions>
```



SCA Domain based service discovery



Domain Registry for OSGi discovery



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Tuscany In Action

(A practical guide of Tuscany SCA)



Tuscany In Action

- *Tuscany in Action* is a comprehensive, hands-on guide for developing technology agnostic, extensible applications using Apache Tuscany's lightweight SCA infrastructure. The book uses practical examples based on a travel booking scenario to demonstrate how to develop applications with Tuscany SCA. It also covers a rich set of out-of-box implementation and binding extensions that Tuscany provides. In addition, the book explains the

Tuscany's composable and extensible architecture and teaches you how to extend Tuscany to support other technologies when necessary.

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