

# Advanced Deployment



# Architectural Composition

Saverio Giallorenzo | [sgiallor@cs.unibo.it](mailto:sgiallor@cs.unibo.it)

# Previously on Jolie

```
include "console.io1"  
include "myService.io1"
```

# Architectural Composition

A composition technique based on deployment abstractions.

# Architectural Composition

A composition technique based on deployment abstractions.

E.g., a **service may execute other sub-services** in the same execution engine for performances and resource control.

# Architectural Composition

A composition technique based on deployment abstractions.

E.g., we want proxies, redirections, and specific hierarchies to create a particular **topology** of a **Service-Oriented Architecture (SOA)**

# Architectural Composition - Embedding

**Embedding** executes multiple services in the same virtual machine.

The **embedder** embeds an **embedded** service by targeting it with the **embedded** primitive.

```
embedded {  
  Language : path [ in OutputPort ]  
}
```

# Architectural Composition - Embedding

**Embedding** executes multiple services in the same virtual machine.



# Architectural Composition - Embedding Jolie Services

```
include "twiceInterface.iol"

inputPort LocalIn {
  Location: "local"
  Interfaces: TwiceInterface
}

main
{
  twice( number )( result ) {
    result = number * 2
  }
}
```

twice\_service.ol



```
include "twiceInterface.iol"
include "console.iol"

outputPort TW {
  Interfaces: TwiceInterface
}

embedded {
  Jolie: "twice_service.ol"
  in TW
}

main
{
  twice@TW( 5 )( response );
  println@Console( response )()
}
```



# Architectural Composition - Embedding Java Services

When embedding a Java service:

- the **path URL** must unambiguously identify a Java class;
- the **class** must be **in the Java classpath** of the Jolie interpreter;
- the class must **extend** the **abstract class** `jolie.runtime.JavaService`, offered by the Jolie library (jolie.jar) inside the Jolie installation folder.

# Architectural Composition - Embedding Java Services

Many services of the Jolie standard library (like **Console**) are Java services.

**Each public method** of the Java Service **is an input operation** invokable by the embedder.

If the output of the method is:

**void**, it will be a **one-way** operation

**non-void**, it will be a **request-response** operation

( `@RequestResponse` annotation overrides this for void-returning operations).

# Architectural Composition - Embedding Java Services

## MyConsole.java

```
package example;  
import jolie.runtime.JavaService;  
  
public class MyConsole extends JavaService {  
  
    public void println( String s ){  
        System.out.println( s )  
    }  
}
```

# Architectural Composition - Embedding Java Services

## MyConsole.java

We have to compile the class into a **.jar library**.

- `javac -cp $JOLIE_HOME/jolie.jar MyConsole.java;`
- `jar cvf example.jar example/MyConsole.class`
- then either:
  - `jolie -l /path/to/example.jar myService.ol`
  - `jolie myService.ol` (with example.jar in the folder of execution of myService.ol or in the folder "javaService" under \$JOLIE\_HOME )

```
package example;
import
jolie.runtime.JavaService;

public class MyConsole
extends JavaService {

    public void
        println( String s ){
        System.out.println( s )
    }
}
```

# Architectural Composition - Embedding Java Services

**Value** and **ValueVector** objects to handle a custom-typed structures in JavaServices.

```
import jolie.runtime.JavaService;
import jolie.runtime.Value;
import jolie.runtime.ValueVector;
//...

Value pinco = Value.create();
pinco.getNewChild("name").setValue("Pinco");
pinco.getNewChild("surname").setValue("Pallino");

Value paperino = Value.create();
paperino.getNewChild("name").setValue("Paolino");
paperino.getNewChild("surname").setValue("Paperino");

ValueVector response = new ValueVector();
response.set( 0, pinco );
response.set( 1, paperino );
//...
```

# Architectural Composition - Embedding JavaScript

Embedding a JavaScript Service enables to use both the **JavaScript** language and **Java** methods by importing their classes.

```
importClass( java.lang.System );
importClass( java.lang.Integer );

function twice( request )
{
    var number = request.getFirstChild("number").intValue();
    System.out.println( "'Twice' request for number: " + number );
    return Integer.parseInt(number + number);
}
```

# Architectural Composition - Embedding JavaScript

```
importClass( java.lang.System );
importClass( java.lang.Integer );

function twice( request )
{
    var number =
request.getFirstChild("number").intValue();
    System.out.println( "'Twice' request for
    number: " + number );
    return Integer.parseInt(number + number);
}
```



```
include "console.io1"

outputPort TwiceService {
Interfaces: TwiceInterface
}

embedded {
JavaScript:
    "TviceService.js" in TwiceService
}

main
{
    request.number = 5;
    twice@TwiceService( request )
    ( response );
    println@Console( "Response: " +
    response )()
}
```

## TwiceService.js

# Architectural Composition - Dynamic Embedding

Dynamic embedding associates a **unique embedded instance** (session) to the embedder.

```
include "runtime.iol"      Include the runtime.iol library

outputPort CounterService{
  Interfaces: CounterInterface
}

execution{ concurrent }

main
{
  startNewCounter();

  embedInfo.type = "Jolie";
  embedInfo.filepath = "CounterService.ol"; } Embedding settings

  loadEmbeddedService@Runtime( embedInfo )( CounterService.location );

  start@CounterService();      loadEmbeddedService returns the
  // ...                       (local) location of the embedded service
}
```



# Architectural Composition - Aggregation

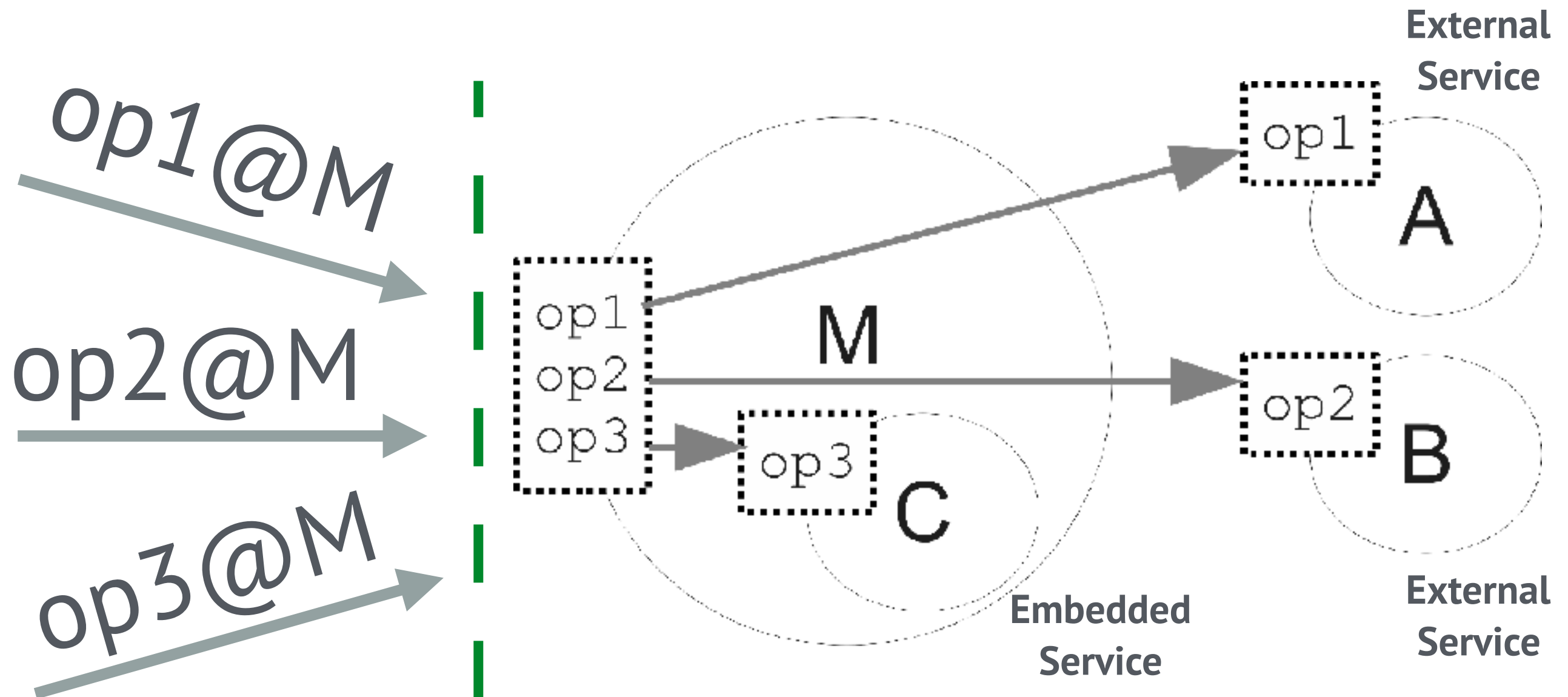
A generalisation of proxies. Allows a service to expose operations it does not implement.

It **delegates** them to the services it **aggregates**.

```
inputPort id {  
  Location: URI  
  Protocol: p  
  Interfaces: iface_1, ..., iface_n  
  [ Aggregates: outputPort_1, outputPort_2, ... ]  
}
```

Attention: when aggregating outputPorts the **inputPort must declare** their interfaces to expose their operations.

# Architectural Composition - Aggregation



# Architectural Composition - Aggregation

```

outputPort A {
  Location: "socket://someurlA.com:80/"
  Protocol: soap
  Interfaces: InterfaceA
}

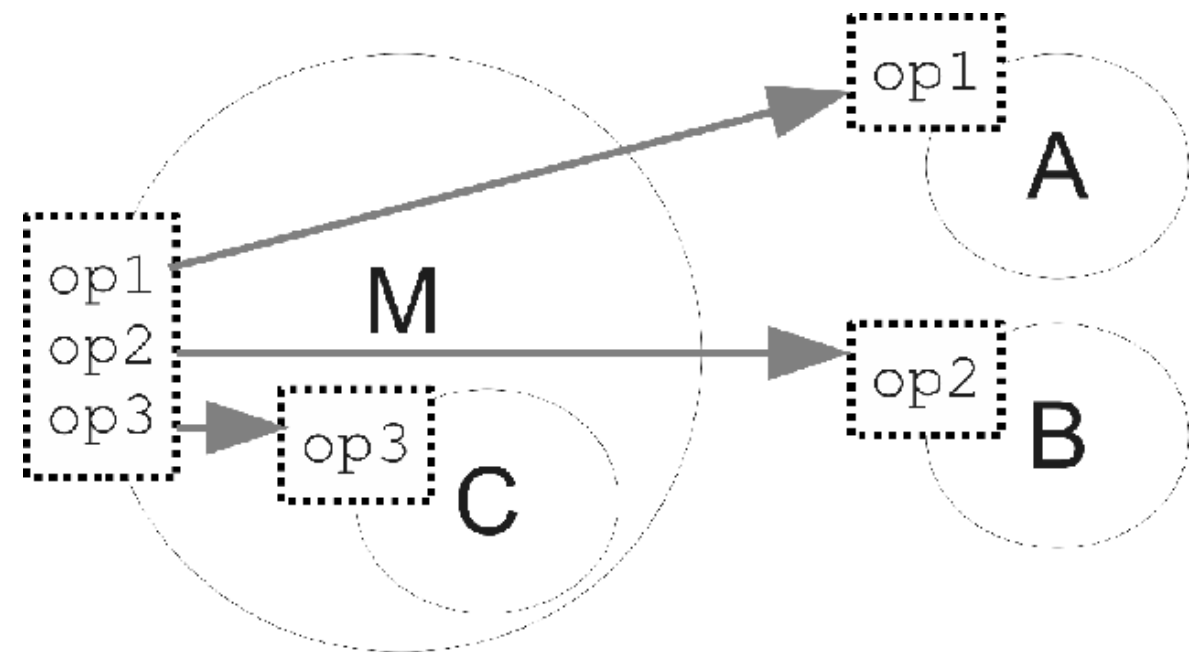
outputPort B {
  Location: "socket://someurlB.com:80/"
  Protocol: xmlrpc
  Interfaces: InterfaceB
}

outputPort C {
  Interfaces: InterfaceC
}

embedded {
  Java: "example.serviceC" in C
}

inputPort M {
  Location: "socket://urlM.com:8000/"
  Protocol: sodep
  Aggregates: A, B, C
}

```

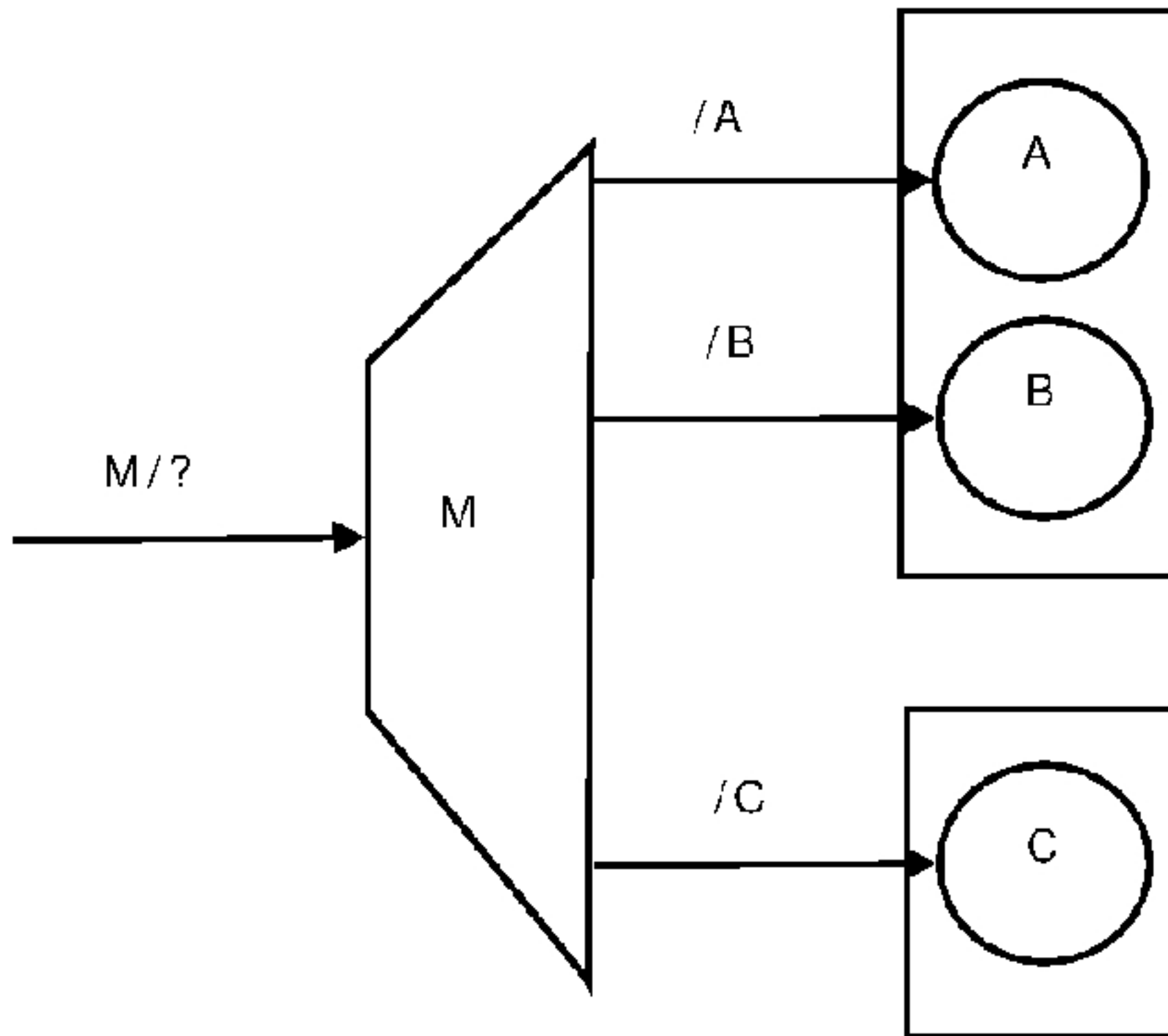


# Architectural Composition - Redirection

Allows the creation of a **master service** acting as a single communication endpoint to multiple service, called **resources**.

```
inputPort id {  
  Location: URI  
  Protocol: p  
  Redirects:  
    res1 => OutputPortToService1,  
    // ...  
    resN => OutputPortToServiceN  
}
```

# Architectural Composition - Redirection



# Architectural Composition - Redirection

```

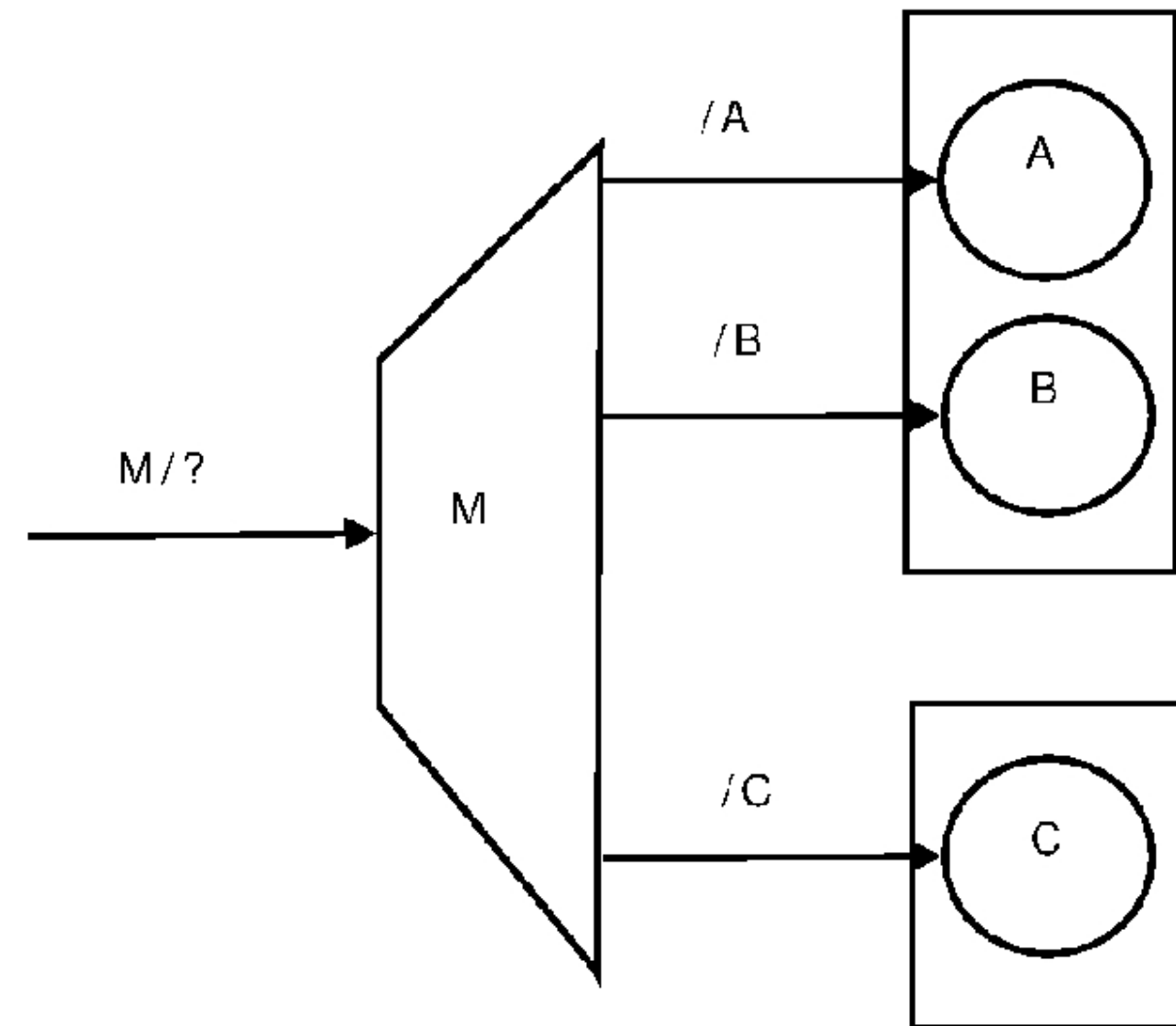
outputPort ServiceA {
  Location: "socket://A.com/"
  Protocol: soap
  Interfaces: A_interface
}

outputPort ServiceB {
  Location: "socket://B.com/"
  Protocol: sodep
  Interfaces: B_interface
}

outputPort ServiceC {
  Location: "socket://C.com/"
  Protocol: http
  Interfaces: C_interface
}


inputPort M {
  Location: "socket://M.com:8000/"
  Protocol: sodep
  Redirects:
    A => ServiceA,
    B => ServiceB,
    C => ServiceC
}

```



# Architectural Composition - Redirection

```
outputPort A{
  Location:
    "socket://M.com/8000!/A"
  Protocol: sodep
  Interfaces: A_interface
}
```



The address of a resource declared by a master service is **the location of the master** followed by the resource name separator **! /** and the **name of the resource**.

```
outputPort ServiceA {
  Location: "socket://A.com/"
  Protocol: soap
  Interfaces: A_interface
}

outputPort ServiceB {
  Location: "socket://B.com/"
  Protocol: sodep
  Interfaces: B_interface
}

outputPort ServiceC {
  Location: "socket://C.com/"
  Protocol: http
  Interfaces: C_interface
}

inputPort M {
  Location: "socket://M.com:8000/"
  Protocol: sodep
  Redirects:
    A => ServiceA,
    B => ServiceB,
    C => ServiceC
}
```

# Architectural Composition - Dynamic Redirection

Redirection can be changed dynamically changing the binding of its outputPort.

```
outputPort SumService {
  Interfaces: SumInterface
}

inputPort MyService {
  Location: "socket://localhost:2000/"
  OneWay: balance( void )
  // no need to declare SumInterface
  Protocol: sodep
  Redirects: Sum => SumService
}

main
{
  sumService[0].location = "socket://S1.com:2001";
  sumService[0].protocol = "soap";
  sumService[1].location = "socket://S2.com:2002";
  sumService[1].protocol = "sodep";
  SumService << sumService[ i ];
  while( true ){
    balance();
    SumService << sumService[ i++%2 ]
  }
}
```