CCA

Common Component Architecture

BABEL RMI and You

A User Level View of Babel RMI.

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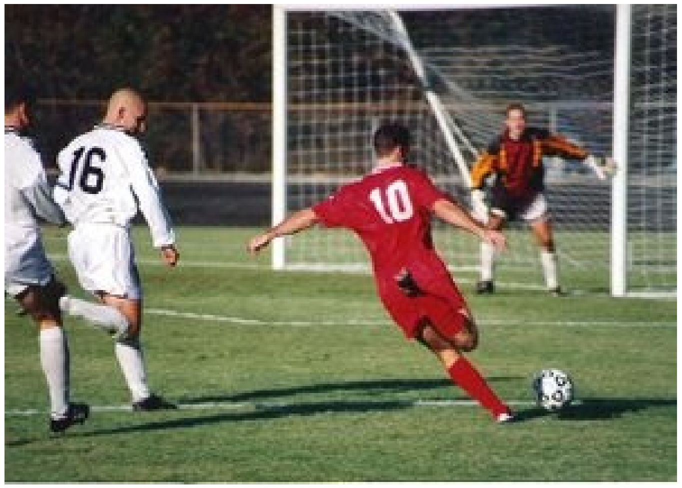
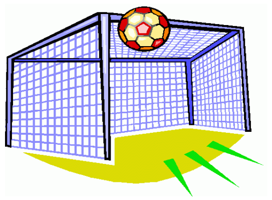
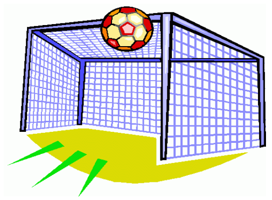




The Goals



- Transparency

  interchangeability with classic Babel code

  - Mostly successful
    - Very minor changes required in client code
    - No change required in server code
- Flexibility

  allow users to use a variety of protocols

  - Totally successful
    - any protocol that implements the Babel RMI API, OK!

Register a protocol

The first thing a client need to do to use RMI is to add a protocol to use

For example:

```
sidl.rmi.ProtocolFactory.addProtocol(
"simhandle","sidlx.rmi.SimHandle")
```

This registers a “short name” to be used in URLs

```
simhandle://faraway.com:9999
```

New builtin functions

Simple Builtins

bool _IsLocal() / bool _isRemote()

- Returns true if the object is local/remote

string _getURL()

- Returns the URL of the object
  - If the object is local, requires a local ORB

New builtin functions

The heart of RMI

```
void _exec(string name,
                    Deserializer inArgs,
                    Serializer outArgs)
```

– Method dispatch by name.

– Passes args by serializer

RMI/Classic Differences
Remote Creation

Concrete objects can be remotely created with:

_create[Remote](string URL)

- Creates on object on the server given by the URL.
- The URL is protocol specific
- Example URL simhandle://foo.com:9999/1000

RMI/Classic Differences

Remote Connection

Objects that exist on a remote server can be connected to with:

_connect(string URL)

- The URL must include a object ID string
- Can connect as either an object and an interface
- Example URL simhandle://foo.com:9999/1000

RMI/Classic Differences
Passing objects/arrays remotely

- foo.Bar method(foo.Quux x)
  - Will pass objects by reference

- copy foo.Bar method(copy foo.Quux x)
  - Will serialize objects
    - The objects must implement sidl.rmi.Serializable

- Arrays are always passed by serialization

RMI/Classic Differences

Passing local objects to remote servers

Passing an local object remotely by reference requires a local ORB

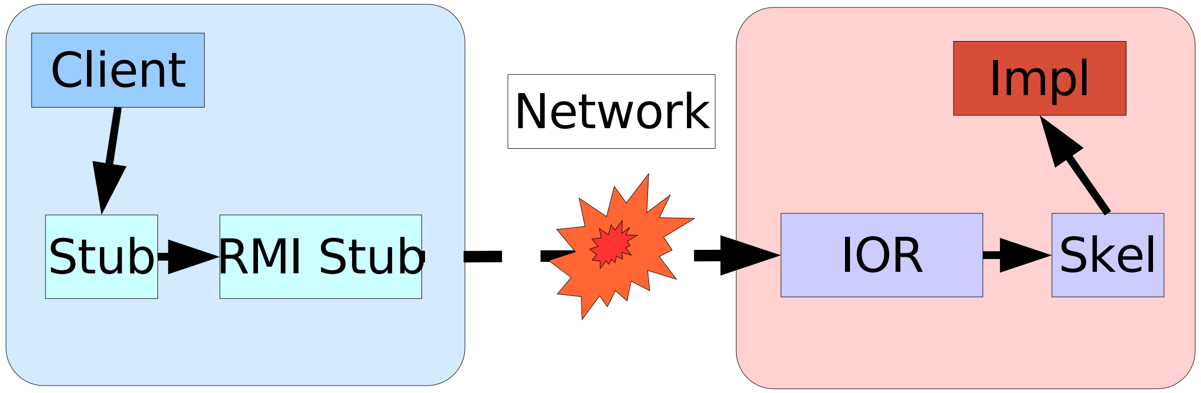
```
url = "simhandle://localhost:"+port;
orb = sidlx.rmi.SimpleOrb._create();
orb.init(url, 1);
long tid = orb.run();
sidl.rmi.ServerInfo si = orb;
sidl.rmi.ServerRegistry.registerServer(si);
```

General UI Changes

Exceptions

Any remote call may throw an exception, so all calls now throw RuntimeException

- New RuntimeException incudes:
  - NetworkException
  - MemoryException
  - Pre/Post Exception
  - IOException



General UI Changes
Cast _addrefs

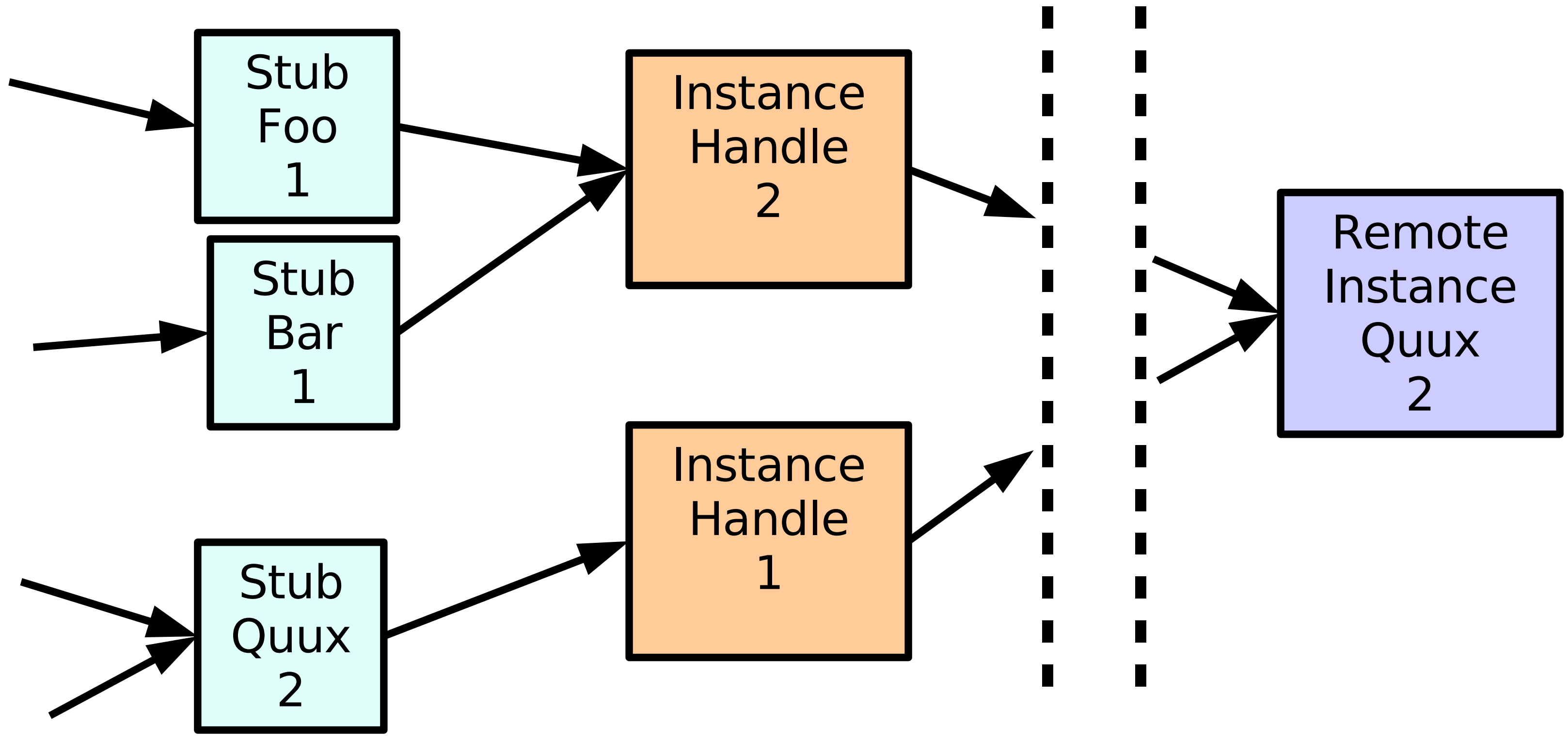
As of Babel 0.11, cast addrefs the object being cast. Let's see why RMI needs it.

```
package example Version 0.1 {
   interface Foo {}
   class Bar implements-all Foo {}
   class Quux extends Bar {}
}
```

General UI Changes

Cast _addrefs

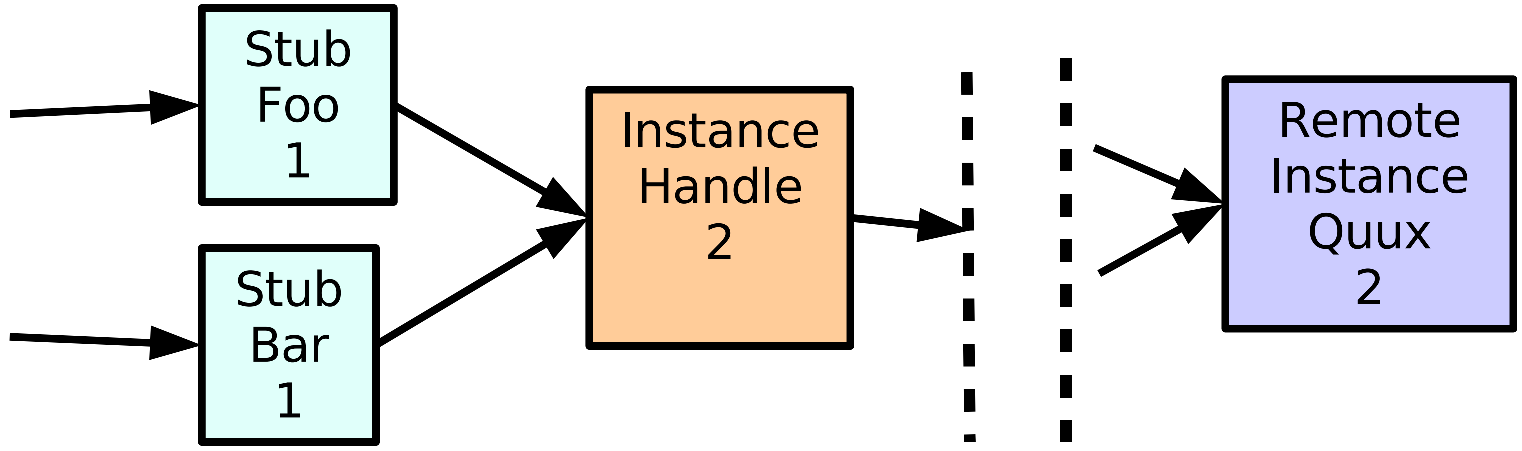
Example of RMI object structure:



General UI Changes

Cast _addrefs

How did we get this funky construct?

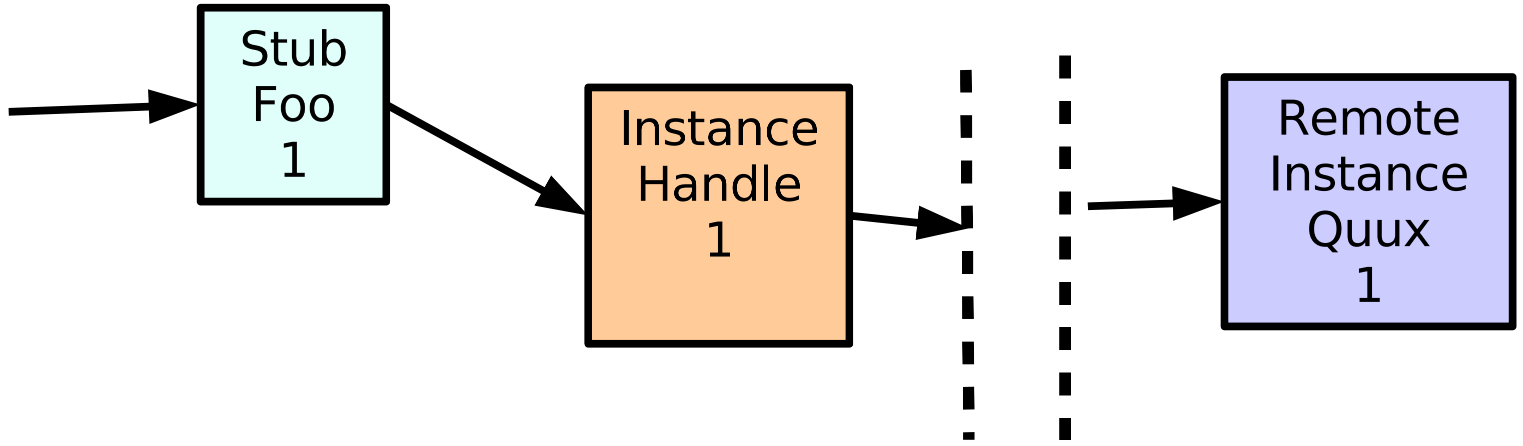


General UI Changes

Cast _addrefs

First we remotely connect Quux as a Foo

- quux may have been passed remotely as a Foo
- Or, example.Foo._connect(quuxURL) was called



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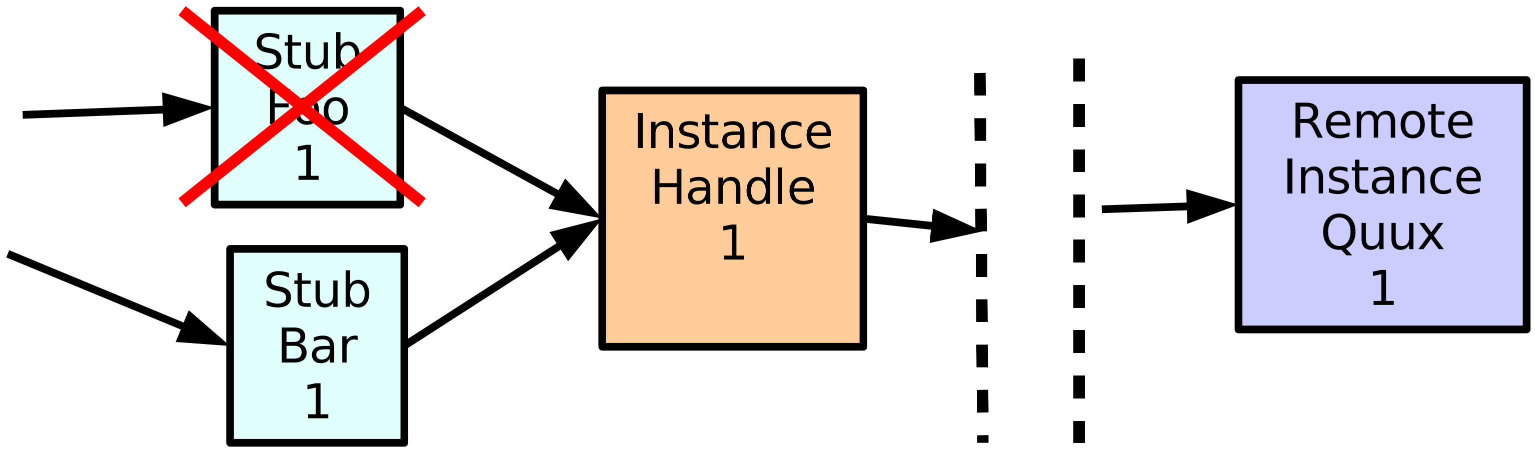
General UI Changes
Cast _addrefs

Cast Foo to a Bar. We need a new stub.

2 things could happen.

1) We destroy the old stub, in which case foo.deleteRef() will seg fault

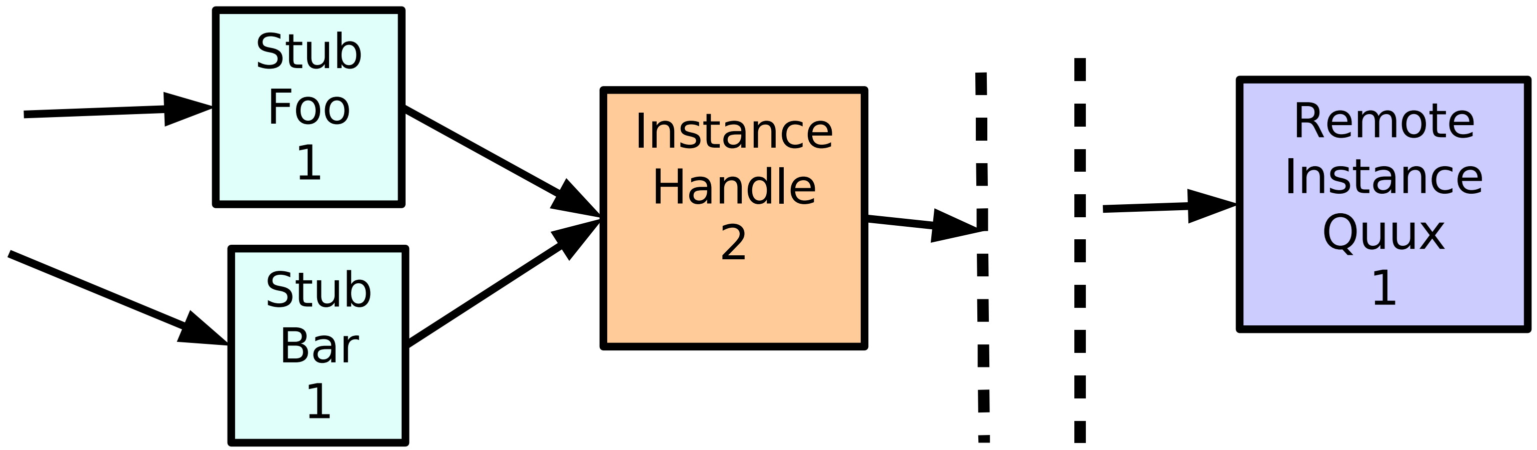


General UI Changes

Cast _addrefs

Or

2) We keep both stubs, and addref. Now the user must deleteRef both stubs



We chose option 2

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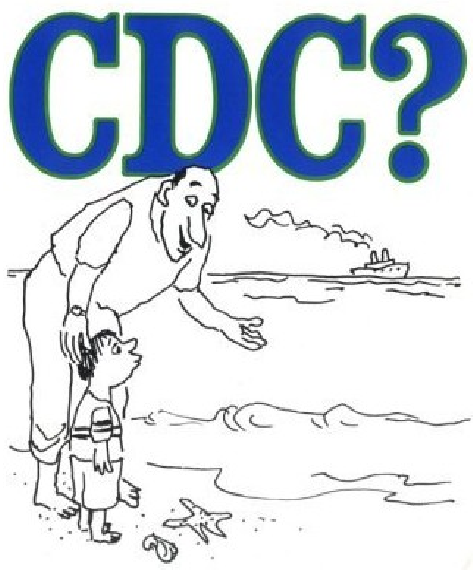
  - Structs
  - Other protocols

Language Specifics
C

Each language has pretty much the same interface, but there are small differences.



```
foo_Bar__createRemote(URL, exception);
foo_Bar__connect(URL, exception);
foo_Bar__isLocal(obj, exception);
foo_Bar__getURL(obj, exception);
```

```
foo_Bar__exec(obj, inArgs, outArgs, exception);
```

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Common Component Architecture

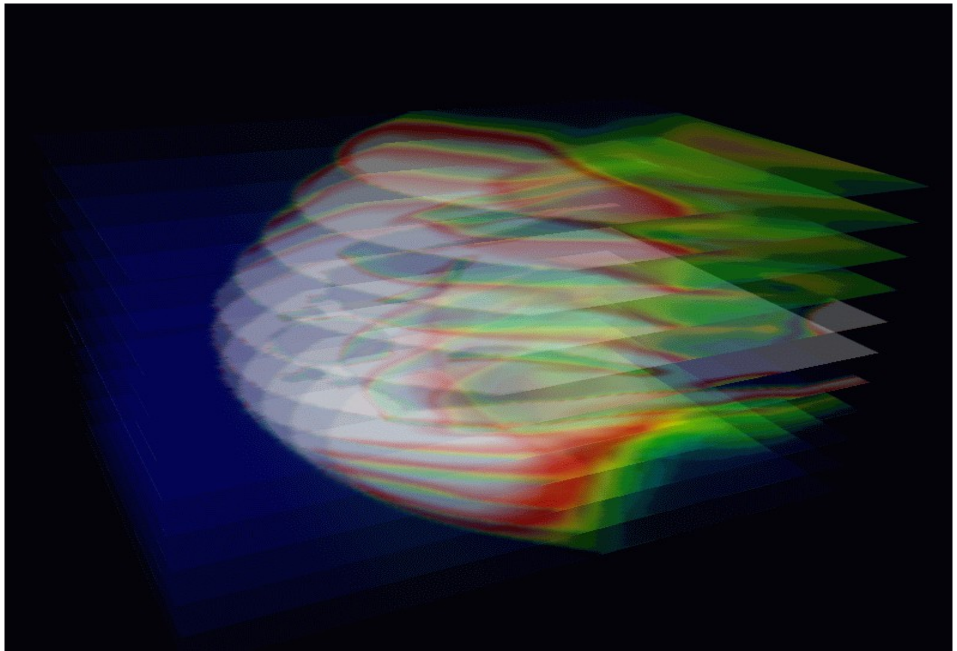
Language Specifics
UCxx

```
foo::Bar::_create(URL);
foo::Bar::_connect(URL);
obj._isLocal()
obj._getURL()
obj._exec(inArgs, outArgs, exception);
```

Language Specifics

F77

```
call foo_Bar__createRemote_f(obj, URL, ex);
call foo_Bar__connect(obj, URL, ex);
call foo_Bar__isLocal(obj, isloc, ex);
call foo_Bar__getURL(obj, isret, ex);
call foo_Bar__exec(obj, inArgs, outArgs, ex);
```



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Language Specifics

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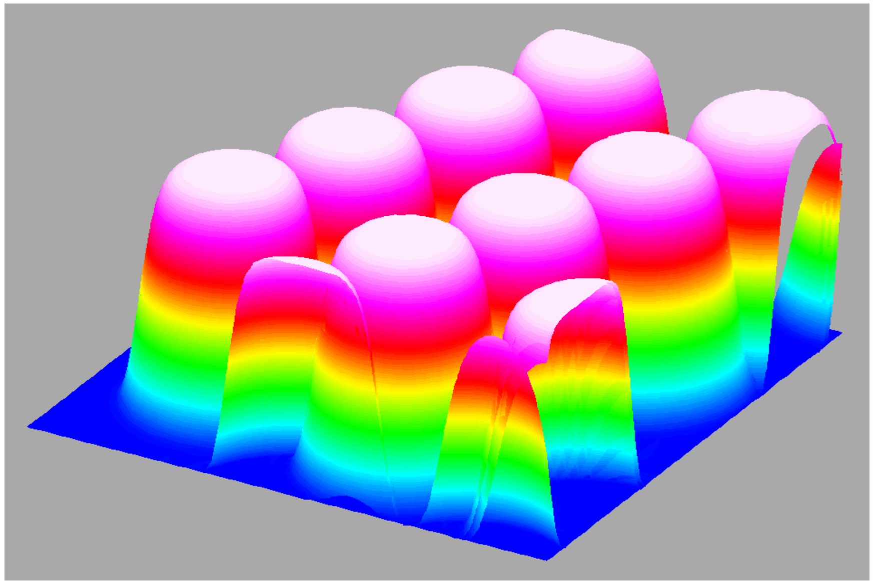

```
call new(obj, URL, ex);
call connect(obj, URL, ex);
call isLocal(obj, isloc, ex)
call getURL(obj, isret, ex)
call exec(obj, inArgs, outArgs, exception);
```

Language Specifics

Java

```
new foo.Bar(URL);

foo.Bar._connect(URL);

obj._isLocal()

obj._getURL()

obj._exec(obj, inArgs, outArgs, exception);
```

Language Specifics
Python

```
foo.Bar.Bar(url = “URL”);
foo.Bar._connect(URL);
obj._isLocal()
obj._getURL()
obj._exec(obj, inArgs, outArgs, exception);
```

Contents

Goals

User overview

- Add a protocol
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Language Specifics

- Language examples

➡ The FUTURE

- Non Blocking/One way calls
- Other protocols
- Structs

The FUTURE
in 0.11.2

Publishing Objects

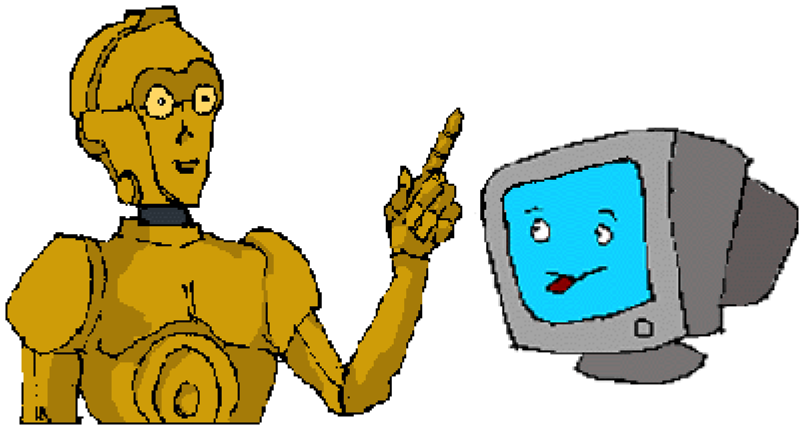
- Give your local object a specific object ID

Non-blocking and Oneway

- Although no protocol that supports it actually exists yet...
- Oneway looks just like a blocking call
- Non-blocking functions are of the form:
  - `sidl.rmi.Ticket obj.foo_send([inargs])`
  - `retval obj.foo_recv(sidl.rmi.Ticket,[outargs])`

New protocols

- A number of protocols are under development
  - SARS
    - Non-blocking high performance computing
  - BXSA
    - Scientific Binary XML
  - RMIX
    - Part of MOCCA
  - Tech-X
    - CORBA compatible
  - Psuedo-Protocol
    - Fake protocol for inprocess _exec use



Structs

Always useful for sending clean remote messages, structs!

- Gary Kumfert is prototyping this now
- I have no idea when this will arrive
  - (Not 0.11.2 in any case.)

Conclusion

In conclusion, you should use Babel RMI for all your remoteable needs.