Guile-GNOME: CORBA

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1 (gnome corba)

1.1 Overview
A CORBA wrapper for Guile.

1.2 Opening CORBA modules
(gnome corba) allows full integration between Scheme and remote CORBA objects. However, the problem is how to get type information about these remote objects – it’s not very useful to have an opaque `<CORBA::Object>` in Scheme. It’s also not very useful if you can’t write your own CORBA servants in Scheme.

Basically, there are two ways to solve this problem. You can parse the type’s interface description language (IDL) at runtime, or you can get the necessary information from some other source. (gnome corba) does the latter, via so-called “imodules”.

Imodules are a feature of ORBit2, the ORB used in GNOME. ORBit2 is a CORBA 2.4-compliant Object Request Broker (ORB), which is of course interoperable with other ORB implementations. An imodule is a shared library, installed as `$(libdir)/<modulename>_<imodule>.la`. To create such a library for your own IDL, you need to run ORBit2’s IDL compiler, `orbit-idl`, with the ‘`--imodule`’ argument. See the demos/corba/ directory in this distribution for an example.

As an example, the rest of this section will refer to the sample IDL which can be found in demos/corba/Foo.idl in this distribution.

Once you have installed the Foo CORBA library (including its imodule), you can load its type information into Scheme by calling:

```scheme
(corba-primitive-open-module "Foo")
```

As a side effect, this call will define all of the GOOPS classes and methods associated with the Foo module.

If there is a CORBA interface `Foo::Hello`, `corba-primitive-open-module` will create a GOOPS class `<Foo::Hello>` which serves as stub class and another GOOPS class `<POA:Foo:Hello>` which serves as skeleton class.

All stub classes are derived from `<CORBA::Object>` and their CORBA class hierarchy is preserved in Scheme.

All skeleton classes are derived from `<PortableServer-ServantBase>` and their CORBA class hierarchy is preserved as well.

1.3 Calling CORBA Methods
To call a CORBA method, all you need to do is to invoke the corresponding method in the stub class. Let’s assume `hello` is an instance of the `<Foo::Hello>` class. We may invoke the `Foo::Hello::doHello` method directly, in a most Schemely fashion:

```scheme
(Foo::Hello::doHello hello)
```

So to call CORBA methods, you don’t even need to know that it’s CORBA.
Chapter 1: (gnome corba)

If a CORBA exception is signalled, a Scheme error will be thrown to the key corba-system-exception or corba-user-exception, as appropriate.

1.4 Implementing CORBA servants

The interesting part is to implement CORBA servants in Scheme. Let’s assume you want to write a servant for the Foo::Hello interface.

The first thing you need to do is to derive its POA class

\[
\text{(define-class <hello> (<POA:Foo:Hello>))}
\]

Then, you define methods:

\[
\text{(define-method (Foo:Hello:doHello (hello <hello>))}
\]
\[
\text{(display (list "Hello World!" hello)) (newline))}
\]

If you call (next-method), the POA class’ method will be run, which by default will throw a CORBA::NO_IMPLEMENT system exception.

However, you can override this:

\[
\text{(define-method (Foo:Bar:Baz:haveFun (object <POA:Foo:Bar:Baz>) a b)}
\]
\[
\text{(display (list "Default Foo:Bar:Baz:haveFun handler!" a b)) (newline))}
\]

If you created all the methods, you can create servants and call corba-servant->reference to get a CORBA::Object reference:

\[
\text{(define servant (make <hello>))}
\]
\[
\text{(define hello (corba-servant->reference servant))}
\]

Now you have a CORBA Object hello, and can invoke methods on it:

\[
\text{(Foo:Hello:doHello hello)}
\]

Although this looks like a normal Scheme procedural application, this is a "real" CORBA call: hello is a "normal" CORBA Object.

Note of course that any CORBA Objects which you create in Guile are "owned" by Guile’s garbage collector, so make sure to CORBA_Object_duplicate() in a C function before you store it somewhere.

1.5 Multiple inheritance

Like in C, you can also create servants for CORBA interfaces which are derived from other interfaces:

\[
\text{(define-class <maximum> (<hello> <POA:Foo:MaximumHello>))}
\]
\[
\text{(define-method (Foo:Hello:doHello (hello <maximum>))}
\]
\[
\text{(display (list "Hello Maximum World!" hello)) (newline) (next-method))}
\]
(define maximum-servant (make <maximum>))
(define maximum (corba-servant->reference maximum-servant))

This creates a new servant for the CORBA interface Foo::MaximumHello which is derived from Foo::Hello and Foo::Bar::Baz. This inheritance is reflected in Scheme.

;;; Calls method ‘Foo:Hello:doHello’ in class <maximum> and then
;;; in <hello> because of the (next-method).
(Foo:Hello:doHello maximum)

;;; Calls method ‘Foo:Bar:Baz:haveFun’ in class <POA:Foo:Bar:Baz>,
;;; the default handler.
(Foo:Bar:Baz:haveFun maximum 1 2)

Since we’re using real CORBA calls, all of this also works for calls which are coming "from the outside", i.e. from C or from a remote process.

1.6 An important limitation
CORBA servants can be implemented either in C or in Scheme, but you cannot mix them.

For example, in the example above, you learned how to create a CORBA servant for the Foo::MaximumHello CORBA interface in Scheme. Now let’s assume you already have an implementation for the Foo::Hello interface in C.

Even if Foo::MaximumHello is derived from Foo::Hello, you cannot use the Foo::Hello C implementation in Scheme.

This limitation may sound obvious, but it’s not so obvious at all if you’re a bit familiar with CORBA. In C, you would normally expect to have a vepv and a epv vector in a CORBA servant, and to be able to poke around in the vepv to override methods.

As an ORBit2 specific implementation detail, servants which you create from Scheme don’t have a vepv at all and the epv is not what you’d expect – the epv entries are Scheme vectors and not pointers to C functions.

1.7 CORBA structs / sequences
There is also support to access CORBA structs / sequences from Scheme, including a special record type for structs. See the source code for details.

1.8 Usage

<CORBA:Object> [Class]
<PortableServer-ServantBase> [Class]
corba-record-type-vtable [Variable]
bonobo-get-object moniker class [Primitive]
bonobo-object-query-interface object class [Primitive]
corba-servant->reference servant

[Primitive]
corba-record-accessor rtd field-name

[Function]
corba-record-constructor rtd . opt

[Function]
corba-record-constructor-from-struct rtd

[Function]
corba-record-modifier rtd field-name

[Function]
corba-record-predicate rtd

[Function]
corba-record-type-descriptor obj

[Function]
corba-record-type-fields obj

[Function]
corba-record-type? obj

[Function]
corba-record-typecode obj

[Function]
corba-record? obj

[Function]
corba-sequence->list sequence

[Function]
corba-struct->record struct

[Function]
gnome-corba-error format-string . args

[Function]
make-corba-record-type typecode . opt

[Function]
2 (gnome corba primitives)

2.1 Overview
A CORBA wrapper for Guile.

2.2 Usage

| <CORBA:Object> | [Class] |
| <PortableServer-ServantBase> | [Class] |
| corba-primitive-find-poa-class class | [Primitive] |
| corba-primitive-invoke-method method_name imethod class args | [Primitive] |
| corba-primitive-main | [Primitive] |
| corba-primitive-make-poa-instance class | [Primitive] |
| corba-primitive-open-module name | [Primitive] |
| corba-primitive-register-interface name | [Primitive] |
| corba-primitive-typecode->class type | [Primitive] |
| corba-typecode-primitive->name typecode | [Primitive] |
| corba-typecode-primitive? typecode | [Primitive] |
3 (gnome corba types)

3.1 Overview
A CORBA wrapper for Guile.

3.2 Usage

\%corba-sequence-vtable  [Variable]
\%corba-sequence-vtable-offset-printer  [Variable]
\%corba-sequence-vtable-offset-user  [Variable]
\%corba-struct-vtable  [Variable]
\%corba-struct-vtable-offset-printer  [Variable]
\%corba-struct-vtable-offset-user  [Variable]
corba-object-class->typecode  class  [Primitive]
corba-sequence-length  corba_sequence  [Primitive]
corba-sequence-ref  corba_sequence index  [Primitive]
corba-sequence-set!  corba_sequence index value  [Primitive]
corba-sequence-set-length!  corba_sequence length  [Primitive]
corba-sequence-type  corba_sequence  [Primitive]
corba-struct-fields  typecode  [Primitive]
corba-struct-is-a?  corba_struct typecode  [Primitive]
corba-struct-ref  corba_struct index  [Primitive]
corba-struct-set!  corba_struct index value  [Primitive]
corba-struct-type  corba_struct  [Primitive]
corba-struct?  corba_struct  [Primitive]
corba-typecode->gtype-class  typecode  [Primitive]
make-corba-sequence  typecode num_tail_elts init_smob  [Primitive]
make-corba-struct  typecode num_tail_elts init_struct  [Primitive]
gnome-corba-error  format-string . args  [Function]
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