

Maemo Diablo Source code for the GLib
D-Bus synchronous example
Training Material

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Contents

1	Source code for the GLib D-Bus synchronous example	2
1.1	glib-dbus-sync/common-defs.h	2
1.2	glib-dbus-sync/value-dbus-interface.xml	3
1.3	glib-dbus-sync/server.c	4
1.4	glib-dbus-sync/client.c	11
1.5	glib-dbus-sync/Makefile	14

Chapter 1

Source code for the GLib D-Bus synchronous example

1.1 glib-dbus-sync/common-defs.h

```
#ifndef INCLUDE_COMMON_DEFS_H
#define INCLUDE_COMMON_DEFS_H
/**
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 * that can be found in the file called "License" in the same
 * directory as this file.
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 *
 * This file includes the common symbolic defines for both client and
 * the server. Normally this kind of information would be part of the
 * object usage documentation, but in this example we take the easy
 * way out.
 *
 * To re-iterate: You could just as easily use strings in both client
 * and server, and that would be the more common way.
 */

/* Well-known name for this service. */
#define VALUE_SERVICE_NAME "org.maemo.Platdev_ex"
/* Object path to the provided object. */
#define VALUE_SERVICE_OBJECT_PATH "/GlobalValue"
/* And we're interested in using it through this interface.
   This must match the entry in the interface definition XML. */
#define VALUE_SERVICE_INTERFACE "org.maemo.Value"

/* Symbolic constants for the signal names to use with GLib.
   These need to map into the D-Bus signal names. */
#define SIGNAL_CHANGED_VALUE1 "changed_value1"
#define SIGNAL_CHANGED_VALUE2 "changed_value2"
#define SIGNAL_OUTOFRANGE_VALUE1 "outofrange_value1"
#define SIGNAL_OUTOFRANGE_VALUE2 "outofrange_value2"

#endif
```

Listing 1.1: glib-dbus-sync/common-defs.h

1.2 glib-dbus-sync/value-dbus-interface.xml

```
<?xml version="1.0" encoding="UTF-8" ?>

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<!-- If you keep the following DOCTYPE tag in your interface
specification, xmllint can fetch the DTD over the Internet
for validation automatically. -->
<!DOCTYPE node PUBLIC
"-//freedesktop//DTD D-Bus Object Introspection 1.0//EN"
"http://standards.freedesktop.org/dbus/1.0/introspect.dtd">

<!-- This file defines the D-Bus interface for a simple object, that
will hold a simple state consisting of two values (one a 32-bit
integer, the other a double).

The interface name is "org.maemo.Value".
One known reference implementation is provided for it by the
"/GlobalValue" object found via a well-known name of
"org.maemo.Platdev_ex". -->

<node>
  <interface name="org.maemo.Value">

    <!-- Method definitions -->

    <!-- getvalue1(): returns the first value (int) -->
    <method name="getvalue1">
      <!-- NOTE Naming arguments is not mandatory, but is recommended
so that D-Bus introspection tools are more useful.
Otherwise the arguments will be automatically named
"arg0", "arg1" and so on. -->
      <arg type="i" name="cur_value" direction="out"/>
    </method>

    <!-- getvalue2(): returns the second value (double) -->
    <method name="getvalue2">
      <arg type="d" name="cur_value" direction="out"/>
    </method>

    <!-- setvalue1(int newValue): sets value1 -->
    <method name="setvalue1">
      <arg type="i" name="new_value" direction="in"/>
    </method>

    <!-- setvalue2(double newValue): sets value2 -->
    <method name="setvalue2">
      <arg type="d" name="new_value" direction="in"/>
    </method>

  </interface>
</node>
```

Listing 1.2: glib-dbus-sync/value-dbus-interface.xml

1.3 glib-dbus-sync/server.c

```
/**
 * This program implements a GObject for a simple class, then
 * registers the object on the D-Bus and starts serving requests.
 *
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 *
 * In more complicated code, the GObject definition, implementation
 * and D-Bus registration would all live in separate files. In this
 * server, they are all present in this file.
 *
 * This program will pull the automatically generated D-Bus/GLib stub
 * code (which contains the marshaling code as well as a binding/call
 * table.
 *
 * This program also might serve as an introduction into implementing
 * custom GType/GObjects, but it is not the primary purpose here.
 * Important things like object life-time management (freeing of
 * objects), sub-classing and GObject properties are not covered at
 * all.
 *
 * Demonstrates a simple implementation of "tracing" as well (via the
 * NO_DAEMON define, as when built as non-daemonizing version, will
 * output information about what is happening and where. Adding
 * timestamps to each trace message is left out (see gettimeofday()
 * system call for a simple solution).
 */

#include <glib.h>
#include <dbus/dbus-glib.h>
#include <stdlib.h> /* exit, EXIT_FAILURE */
#include <unistd.h> /* daemon */

/* Pull symbolic constants that are shared (in this example) between
   the client and the server. */
#include "common-defs.h"

/* This defines the per-instance state.

   Each GObject must start with the 'parent' definition so that common
   operations that all GObjects support can be called on it. */
typedef struct {
    /* The parent class object state. */
    GObject parent;
    /* Our first per-object state variable. */
    gint value1;
    /* Our second per-object state variable. */
    gdouble value2;
} ValueObject;

/* Per class state.

   For the first Value implementation we only have the bare minimum,
   that is, the common implementation for any GObject class. */
typedef struct {
    /* The parent class state. */
    GObjectClass parent;
} ValueObjectClass;
```

```

/* Forward declaration of the function that will return the GType of
   the Value implementation. Not used in this program since we only
   need to push this over the D-Bus. */
GType value_object_get_type(void);

/* Macro for the above. It is common to define macros using the
   naming convention (seen below) for all GType implementations,
   and that's why we are going to do that here as well. */
#define VALUE_TYPE_OBJECT (value_object_get_type())

#define VALUE_OBJECT(object) \
    (G_TYPE_CHECK_INSTANCE_CAST((object), \
    VALUE_TYPE_OBJECT, ValueObject))
#define VALUE_OBJECT_CLASS(klass) \
    (G_TYPE_CHECK_CLASS_CAST((klass), \
    VALUE_TYPE_OBJECT, ValueObjectClass))
#define VALUE_IS_OBJECT(object) \
    (G_TYPE_CHECK_INSTANCE_TYPE((object), \
    VALUE_TYPE_OBJECT))
#define VALUE_IS_OBJECT_CLASS(klass) \
    (G_TYPE_CHECK_CLASS_TYPE((klass), \
    VALUE_TYPE_OBJECT))
#define VALUE_OBJECT_GET_CLASS(obj) \
    (G_TYPE_INSTANCE_GET_CLASS((obj), \
    VALUE_TYPE_OBJECT, ValueObjectClass))

/* Utility macro to define the value_object GType structure. */
G_DEFINE_TYPE(ValueObject, value_object, G_TYPE_OBJECT)

/**
 * Since the stub generator will reference the functions from a call
 * table, the functions must be declared before the stub is included.
 */
gboolean value_object_getvalue1(ValueObject* obj, gint* value_out,
    GError** error);
gboolean value_object_getvalue2(ValueObject* obj, gdouble* value_out,
    GError** error);
gboolean value_object_setvalue1(ValueObject* obj, gint value_in,
    GError** error);
gboolean value_object_setvalue2(ValueObject* obj, gdouble value_in,
    GError** error);

/**
 * Pull in the stub for the server side.
 */
#include "value-server-stub.h"

/* A small macro that will wrap g_print and expand to empty when
   server will daemonize. We use this to add debugging info on
   the server side, but if server will be daemonized, it does not
   make sense to even compile the code in.

   The macro is quite "hairy", but very convenient. */
#ifdef NO_DAEMON
#define dbg(fmtstr, args...) \
    (g_print(PROGNAME ":%s: " fmtstr "\n", __func__, ##args))
#else
#define dbg(dummy...)
#endif

/**

```

```

* Per object initializer
*
* Only sets up internal state (both values set to zero)
*/
static void value_object_init(ValueObject* obj) {
    dbg("Called");

    g_assert(obj != NULL);

    obj->value1 = 0;
    obj->value2 = 0.0;
}

/**
* Per class initializer
*
* Registers the type into the GLib/D-Bus wrapper so that it may add
* its own magic.
*/
static void value_object_class_init(ValueObjectClass* klass) {

    dbg("Called");

    g_assert(klass != NULL);

    dbg("Binding to GLib/D-Bus");

    /* Time to bind this GType into the GLib/D-Bus wrappers.
    NOTE: This is not yet "publishing" the object on the D-Bus, but
    since it is only allowed to do this once per class
    creation, the safest place to put it is in the class
    initializer.
    Specifically, this function adds "method introspection
    data" to the class so that methods can be called over
    the D-Bus. */
    dbus_g_object_type_install_info(VALUE_TYPE_OBJECT,
                                    &dbus_glib_value_object_object_info);

    dbg("Done");
    /* All done. Class is ready to be used for instantiating objects */
}

/**
* Function that gets called when someone tries to execute "setvalue1"
* over the D-Bus. (Actually the marshaling code from the stubs gets
* executed first, but they will eventually execute this function.)
*
* NOTE: If you change the name of this function, the generated
* stubs will no longer find it! On the other hand, if you
* decide to modify the interface XML, this is one of the places
* that you will have to modify as well.
* This applies to the next four functions (including this one).
*/
gboolean value_object_setvalue1(ValueObject* obj, gint valueIn,
                                GError** error) {

    dbg("Called (valueIn=%d)", valueIn);

    g_assert(obj != NULL);

    /* Change the value. */
    obj->value1 = valueIn;

```

```

    /* Return success to GLib/D-Bus wrappers. In this case we do not need
       to touch the supplied error pointer-pointer. */
    return TRUE;
}

/**
 * Function that gets executed on "setvalue2".
 * Other than this function operating with different type input
 * parameter (and different internal value), all the comments from
 * set_value1 apply here as well.
 */
gboolean value_object_setvalue2(ValueObject* obj, gdouble valueIn,
                                GError** error) {

    dbg("Called (valueIn=%.3f)", valueIn);

    g_assert(obj != NULL);

    obj->value2 = valueIn;

    return TRUE;
}

/**
 * Function that gets executed on "getvalue1".
 */
gboolean value_object_getvalue1(ValueObject* obj, gint* valueOut,
                                GError** error) {

    dbg("Called (internal value1 is %d)", obj->value1);

    g_assert(obj != NULL);

    /* Check that the target pointer is not NULL.
       Even is the only caller for this will be the GLib-wrapper code,
       we cannot trust the stub generated code and should handle the
       situation. We will terminate with an error in this case.

       Another option would be to create a new GError, and store
       the error condition there. */
    g_assert(valueOut != NULL);

    /* Copy the current first value to caller specified memory. */
    *valueOut = obj->value1;

    /* Return success. */
    return TRUE;
}

/**
 * Function that gets executed on "getvalue2".
 * (Again, similar to "getvalue1").
 */
gboolean value_object_getvalue2(ValueObject* obj, gdouble* valueOut,
                                GError** error) {

    dbg("Called (internal value2 is %.3f)", obj->value2);

    g_assert(obj != NULL);
    g_assert(valueOut != NULL);
}

```

```

    *valueOut = obj->value2;
    return TRUE;
}

/**
 * Print out an error message and optionally quit (if fatal is TRUE)
 */
static void handleError(const char* msg, const char* reason,
                       gboolean fatal) {
    g_printerr(PROGNAME ": ERROR: %s (%s)\n", msg, reason);
    if (fatal) {
        exit(EXIT_FAILURE);
    }
}

/**
 * The main server code
 *
 * 1) Init GType/GObject
 * 2) Create a mainloop
 * 3) Connect to the Session bus
 * 4) Get a proxy object representing the bus itself
 * 5) Register the well-known name by which clients can find us.
 * 6) Create one Value object that will handle all client requests.
 * 7) Register it on the bus (will be found via "/GlobalValue" object
 *    path)
 * 8) Daemonize the process (if not built with NO_DAEMON)
 * 9) Start processing requests (run GMainLoop)
 *
 * This program will not exit (unless it encounters critical errors).
 */

int main(int argc, char** argv) {
    /* The GObject representing a D-Bus connection. */
    DBusGConnection* bus = NULL;
    /* Proxy object representing the D-Bus service object. */
    DBusGProxy* busProxy = NULL;
    /* Will hold one instance of ValueObject that will serve all the
       requests. */
    ValueObject* valueObj = NULL;
    /* GMainLoop for our program. */
    GMainLoop* mainloop = NULL;
    /* Will store the result of the RequestName RPC here. */
    guint result;
    GError* error = NULL;

    /* Initialize the GType/GObject system. */
    g_type_init();

    /* Create a main loop that will dispatch callbacks. */
    mainloop = g_main_loop_new(NULL, FALSE);
    if (mainloop == NULL) {
        /* Print error and terminate. */
        handleError("Could not create GMainLoop", "Unknown(OOM?)", TRUE);
    }

    g_print(PROGNAME ":main Connecting to the Session D-Bus.\n");
    bus = dbus_g_bus_get(DBUS_BUS_SESSION, &error);
    if (error != NULL) {
        /* Print error and terminate. */
        handleError("Could not connect to session bus", error->message,
                   TRUE);
    }
}

```

```

}

g_print(PROGNAME ":main Registering the well-known name (%s)\n",
        VALUE_SERVICE_NAME);

/* In order to register a well-known name, we need to use the
   "RequestMethod" of the /org/freedesktop/DBus interface. Each
   bus provides an object that will implement this interface.

   In order to do the call, we need a proxy object first.
   DBUS_SERVICE_DBUS = "org.freedesktop.DBus"
   DBUS_PATH_DBUS = "/org/freedesktop/DBus"
   DBUS_INTERFACE_DBUS = "org.freedesktop.DBus" */
busProxy = dbus_g_proxy_new_for_name(bus,
                                     DBUS_SERVICE_DBUS,
                                     DBUS_PATH_DBUS,
                                     DBUS_INTERFACE_DBUS);

if (busProxy == NULL) {
    handleError("Failed to get a proxy for D-Bus",
               "Unknown(dbus_g_proxy_new_for_name)", TRUE);
}

/* Attempt to register the well-known name.
   The RPC call requires two parameters:
   - arg0: (D-Bus STRING): name to request
   - arg1: (D-Bus UINT32): flags for registration.
     (please see "org.freedesktop.DBus.RequestName" in
     http://dbus.freedesktop.org/doc/dbus-specification.html)
   Will return one uint32 giving the result of the RPC call.
   We are interested in 1 (we are now the primary owner of the name)
   or 4 (we were already the owner of the name, however in this
   application it would not make much sense).

   The function will return FALSE if it sets the GError. */
if (!dbus_g_proxy_call(busProxy,
                       /* Method name to call. */
                       "RequestName",
                       /* Where to store the GError. */
                       &error,
                       /* Parameter type of argument 0. Note that
                        since we are dealing with GLib/D-Bus
                        wrappers, you will need to find a suitable
                        GType instead of using the "native" D-Bus
                        type codes. */
                       G_TYPE_STRING,
                       /* Data of argument 0. In our case, this is
                        the well-known name for our server
                        example ("org.maemo.Platdev_ex"). */
                       VALUE_SERVICE_NAME,
                       /* Parameter type of argument 1. */
                       G_TYPE_UINT,
                       /* Data of argument 0. This is the "flags"
                        argument of the "RequestName" method which
                        can be use to specify what the bus service
                        should do when the name already exists on
                        the bus. We will go with defaults. */
                       0,
                       /* Input arguments are terminated with a
                        special GType marker. */
                       G_TYPE_INVALID,
                       /* Parameter type of return value 0.
                        For "RequestName" it is UINT32 so we pick

```

```

        the GType that maps into UINT32 in the
        wrappers. */
        G_TYPE_UINT,
        /* Data of return value 0. These will always
        be pointers to the locations where the
        proxy can copy the results. */
        &result,
        /* Terminate list of return values. */
        G_TYPE_INVALID)) {
    handleError("D-Bus.RequestName RPC failed", error->message,
               TRUE);
    /* Note that the whole call failed, not "just" the name
    registration (we deal with that below). This means that
    something bad probably has happened and there's not much we can
    do (hence program termination). */
}
/* Check the result code of the registration RPC. */
g_print(PROGNAME ":main RequestName returned %d.\n", result);
if (result != 1) {
    handleError("Failed to get the primary well-known name.",
               "RequestName result != 1", TRUE);
    /* In this case we could also continue instead of terminating.
    We could retry the RPC later. Or "lurk" on the bus waiting for
    someone to tell us what to do. If we would be publishing
    multiple services and/or interfaces, it even might make sense
    to continue with the rest anyway.

    In our simple program, we terminate. Not much left to do for
    this poor program if the clients will not be able to find the
    Value object using the well-known name. */
}

g_print(PROGNAME ":main Creating one Value object.\n");
/* The NULL at the end means that we have stopped listing the
property names and their values that would have been used to
set the properties to initial values. Our simple Value
implementation does not support GObject properties, and also
does not inherit anything interesting from GObject directly, so
there are no properties to set. For more examples on properties
see the first GTK+ example programs from the maemo Application
Development material.

NOTE: You need to keep at least one reference to the published
object at all times, unless you want it to disappear from
the D-Bus (implied by API reference for
dbus_g_connection_register_g_object(). */
valueObj = g_object_new(VALUE_TYPE_OBJECT, NULL);
if (valueObj == NULL) {
    handleError("Failed to create one Value instance.",
               "Unknown(OOM?)", TRUE);
}

g_print(PROGNAME ":main Registering it on the D-Bus.\n");
/* The function does not return any status, so can not check for
errors here. */
dbus_g_connection_register_g_object(bus,
                                   VALUE_SERVICE_OBJECT_PATH,
                                   G_OBJECT(valueObj));

g_print(PROGNAME ":main Ready to serve requests (daemonizing).\n");
#endif NO_DAEMON

```

```

    /* This will attempt to daemonize this process. It will switch this
    process' working directory to / (chdir) and then reopen stdin,
    stdout and stderr to /dev/null. Which means that all printouts
    that would occur after this, will be lost. Obviously the
    daemonization will also detach the process from the controlling
    terminal as well. */
    if (daemon(0, 0) != 0) {
        g_error(PROGNAME ": Failed to daemonize.\n");
    }
#else
    g_print(PROGNAME
           ": Not daemonizing (built with NO_DAEMON-build define)\n");
#endif

    /* Start service requests on the D-Bus forever. */
    g_main_loop_run(mainloop);
    /* This program will not terminate unless there is a critical
    error which will cause abort() to be used. Hence it will never
    reach this point. */

    /* If it does, return failure exit code just in case. */
    return EXIT_FAILURE;
}

```

Listing 1.3: glib-dbus-sync/server.c

1.4 glib-dbus-sync/client.c

```

/**
 * A simple test program to test using of the Value object over the
 * D-Bus.
 *
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 * directory as this file.
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 *
 * It will first create a GLib/D-Bus proxy object connected to the
 * server's Value object, and then start firing away value set
 * methods.
 *
 * The methods are fired from a timer based callback once per second.
 * If the method calls fail (the ones that modify the values), the
 * program will still continue to run (so that the server can be
 * restarted if necessary).
 */

#include <glib.h>
#include <dbus/dbus-glib.h>
#include <stdlib.h> /* exit, EXIT_FAILURE */
#include <string.h> /* strcmp */

/* Pull the common symbolic defines. */
#include "common-defs.h"

/* Pull in the client stubs that were generated with
dbus-binding-tool */

```

```

#include "value-client-stub.h"

/**
 * Print out an error message and optionally quit (if fatal is TRUE)
 */
static void handleError(const char* msg, const char* reason,
                       gboolean fatal) {
    g_printerr(PROGNAME ": ERROR: %s (%s)\n", msg, reason);
    if (fatal) {
        exit(EXIT_FAILURE);
    }
}

/**
 * This function will be called repeatedly from within the mainloop
 * timer launch code.
 *
 * The function will start with two statically initialized variables
 * (int and double) which will be incremented after each time this
 * function runs and will use the setValue* remote methods to set the
 * new values. If the set methods fail, program is not aborted, but an
 * message will be issued to the user describing the error.
 *
 * NOTE: There is a design issue in the implementation in the Value
 * object: it does not provide "adjust" method which would make
 * it possible for multiple clients to adjust the values,
 * instead of setting them separately. Now, if you launch
 * multiple clients (at different times), the object internal
 * values will end up fluctuating between the clients.
 */
static gboolean timerCallback(DBusGProxy* remoteobj) {

    /* Local values that we'll start updating to the remote object. */
    static gint localValue1 = -80;
    static gdouble localValue2 = -120.0;

    GError* error = NULL;

    /* Set the first value. */
    org_maemo_Value_setvalue1(remoteobj, localValue1, &error);
    if (error != NULL) {
        handleError("Failed to set value1", error->message, FALSE);
    } else {
        g_print(PROGNAME ":timerCallback Set value1 to %d\n", localValue1);
    }

    /* If there was an error with the first, release the error, and
     * don't attempt the second time. Also, don't add to the local
     * values. We assume that errors from the first set are caused by
     * server going off the D-Bus, but are hopeful that it will come
     * back, and hence keep trying (returning TRUE). */
    if (error != NULL) {
        g_clear_error(&error);
        return TRUE;
    }

    /* Now try to set the second value as well. */
    org_maemo_Value_setvalue2(remoteobj, localValue2, &error);
    if (error != NULL) {
        handleError("Failed to set value2", error->message, FALSE);
        g_clear_error(&error); /* Or g_error_free in this case. */
    } else {

```

```

    g_print(PROGNAME ":timerCallback Set value2 to %.3lf\n",
            localValue2);
}

/* Step the local values forward. */
localValue1 += 10;
localValue2 += 10.0;

/* Tell the timer launcher that we want to remain on the timer
   call list in the future as well. Returning FALSE here would
   stop the launch of this timer callback. */
return TRUE;
}

/**
 * The test program itself.
 *
 * 1) Setup GType/GSignal
 * 2) Create GMainLoop object
 * 3) Connect to the Session D-Bus
 * 4) Create a proxy GObject for the remote Value object
 * 5) Start a timer that will launch timerCallback once per second.
 * 6) Run main-loop (forever)
 */
int main(int argc, char** argv) {
    /* The D-Bus connection object. Provided by GLib/D-Bus wrappers. */
    DBusGConnection* bus;
    /* This will represent the Value object locally (acting as a proxy
       for all method calls and signal delivery. */
    DBusGProxy* remoteValue;
    /* This will refer to the GMainLoop object */
    GMainLoop* mainloop;
    GError* error = NULL;

    /* Initialize the GType/GObject system. */
    g_type_init();

    /* Create a new GMainLoop with default context (NULL) and initial
       state of "not running" (FALSE). */
    mainloop = g_main_loop_new(NULL, FALSE);
    /* Failure to create the main loop is fatal (for us). */
    if (mainloop == NULL) {
        handleError("Failed to create the mainloop", "Unknown (OOM?)",
                   TRUE);
    }

    g_print(PROGNAME ":main Connecting to Session D-Bus.\n");
    bus = dbus_g_bus_get(DBUS_BUS_SESSION, &error);
    if (error != NULL) {
        handleError("Couldn't connect to the Session bus", error->message,
                   TRUE);
        /* Normally you'd have to also g_error_free() the error object
           but since the program will terminate within handleError,
           it is not necessary here. */
    }

    g_print(PROGNAME ":main Creating a GLib proxy object for Value.\n");

    /* Create the proxy object that we'll be using to access the object
       on the server. If you would use dbus_g_proxy_for_name_owner(),
       you would be also notified when the server that implements the
       object is removed (or rather, the interface is removed). Since

```

```

we don't care who actually implements the interface, we'll use the
more common function. See the API documentation at
http://maemo.org/api_refs/4.0/dbus/ for more details. */
remoteValue =
    dbus_g_proxy_new_for_name(bus,
                              VALUE_SERVICE_NAME, /* name */
                              VALUE_SERVICE_OBJECT_PATH, /* obj path */
                              VALUE_SERVICE_INTERFACE /* interface */);
if (remoteValue == NULL) {
    handleError("Couldn't create the proxy object",
               "Unknown(dbus_g_proxy_new_for_name)", TRUE);
}

g_print(PROGNAME ":main Starting main loop (first timer in 1s).\n");

/* Register a timer callback that will do RPC sets on the values.
   The userdata pointer is used to pass the proxy object to the
   callback so that it can launch modifications to the object. */
g_timeout_add(1000, (GSourceFunc)timerCallback, remoteValue);

/* Run the program. */
g_main_loop_run(mainloop);
/* Since the main loop is not stopped (by this code), we shouldn't
   ever get here. The program might abort() for other reasons. */

/* If it does, return failure as exit code. */
return EXIT_FAILURE;
}

```

Listing 1.4: glib-dbus-sync/client.c

1.5 glib-dbus-sync/Makefile

```

# This is a relatively simplistic Makefile suitable for projects which
# use the GLib bindings for D-Bus.
#
# One extra target (which requires xmllint, from package libxml2-utils)
# is available to verify the well-formedness and the structure of the
# interface definition xml file.
#
# Use the 'checkxml' target to run the interface XML through xmllint
# verification. You'll need to be connected to the Internet in order
# for xmllint to retrieve the DTD from fd.o (unless you setup local
# catalogs, which are not covered here).
#
# If you want to make the server daemonized, please see below for the
# 'NO_DAEMON' setting. Commenting that line will disabling tracing in
# the server AND make it into a daemon.

# Interface XML name (used in multiple targets)
interface_xml := value-dbus-interface.xml

# Define a list of pkg-config packages we want to use
pkg_packages := dbus-1 dbus-glib-1

PKG_CFLAGS := $(shell pkg-config --cflags $(pkg_packages))
PKG_LDFLAGS := $(shell pkg-config --libs $(pkg_packages))
# Add additional flags:
# -g : add debugging symbols

```

```

# -Wall : enable most gcc warnings
# -DG_DISABLE_DEPRECATED : disable Glib functions marked as deprecated
ADD_CFLAGS := -g -Wall -DG_DISABLE_DEPRECATED
# -DNO_DAEMON : do not daemonize the server (on a separate line so can
#               be disabled just by commenting the line)
ADD_CFLAGS += -DNO_DAEMON

# Combine flags
CFLAGS := $(PKG_CFLAGS) $(ADD_CFLAGS) $(CFLAGS)
LDFLAGS := $(PKG_LDFLAGS) $(LDFLAGS)

# Define a list of generated files so that they can be cleaned as well
cleanfiles := value-client-stub.h \
              value-server-stub.h

targets = server client

.PHONY: all clean checkxml
all: $(targets)

# We don't use the implicit pattern rules built into GNU make, since
# they put the LDFLAGS in the wrong location (and linking consequently
# fails sometimes).
#
# NOTE: You could actually collapse the compilation and linking phases
#       together, but this arrangement is much more common.

server: server.o
$(CC) $^ -o $@ $(LDFLAGS)

client: client.o
$(CC) $^ -o $@ $(LDFLAGS)

# The server and client depend on the respective implementation source
# files, but also on the common interface as well as the generated
# stub interfaces.
server.o: server.c common-defs.h value-server-stub.h
$(CC) $(CFLAGS) -DPROGRAMNAME="\$(basename $@)" -c $< -o $@

client.o: client.c common-defs.h value-client-stub.h
$(CC) $(CFLAGS) -DPROGRAMNAME="\$(basename $@)" -c $< -o $@

# If the interface XML changes, the respective stub interfaces will be
# automatically regenerated. Normally this would also mean that your
# builds would fail after this since you would be missing
# implementation
# code.
value-server-stub.h: $(interface_xml)
dbus-binding-tool --prefix=value_object --mode=glib-server \
$< > $@

value-client-stub.h: $(interface_xml)
dbus-binding-tool --prefix=value_object --mode=glib-client \
$< > $@

# Special target to run DTD validation on the interface XML. Not run
# automatically (since xmllint isn't always available and also needs
# Internet connectivity).
checkxml: $(interface_xml)
@xmllint --valid --noout $<
@echo $< checks out ok

```

```
clean:
  $(RM) $(targets) $(cleanfiles) *.o

# In order to force a rebuild if this file is modified, we add the
# Makefile as a dependency to all low-level targets. Adding the same
# dependency to multiple files on the same line is allowed in GNU make
# syntax as follows. Just make sure that additional dependencies are
# listed after explicit rules, or that no implicit pattern rules will
# match the dependency. Otherwise funny things happen. Placing the
# Makefile dependency at the very end is often the safest solution.
server.o client.o: Makefile
```

Listing 1.5: glib-dbus-sync/Makefile