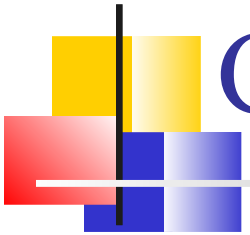


Concurrence

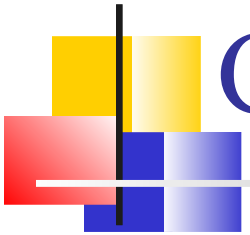
Luc Courtrai

Introduction à **dbus**

Système de communication Inter Processus

IPC 2002

Communications entre applications via le bus
(ie CORBA 1992 Common Object Request Broker Architecture)



Concurrence

Luc Courtrai

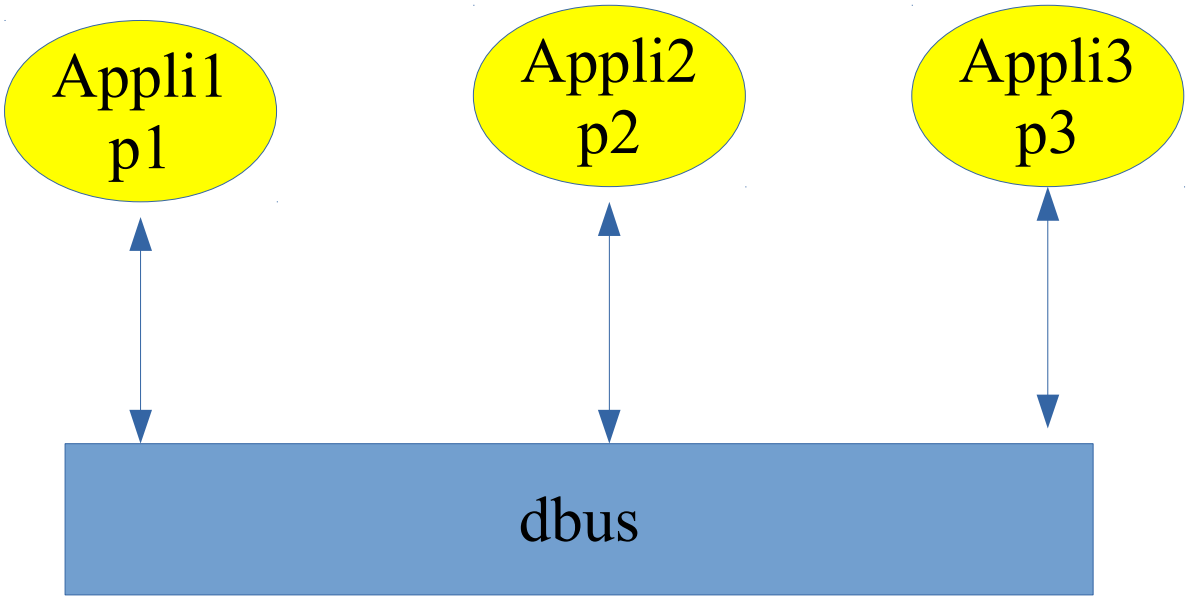
DBUS

- **Architecture**
- **Commande dbus-send (ex rhythmbox,**
  method_call, notification, introspection, tools
- **Programmation**
  - **client python**
  - **server Python (Hello, Date)**

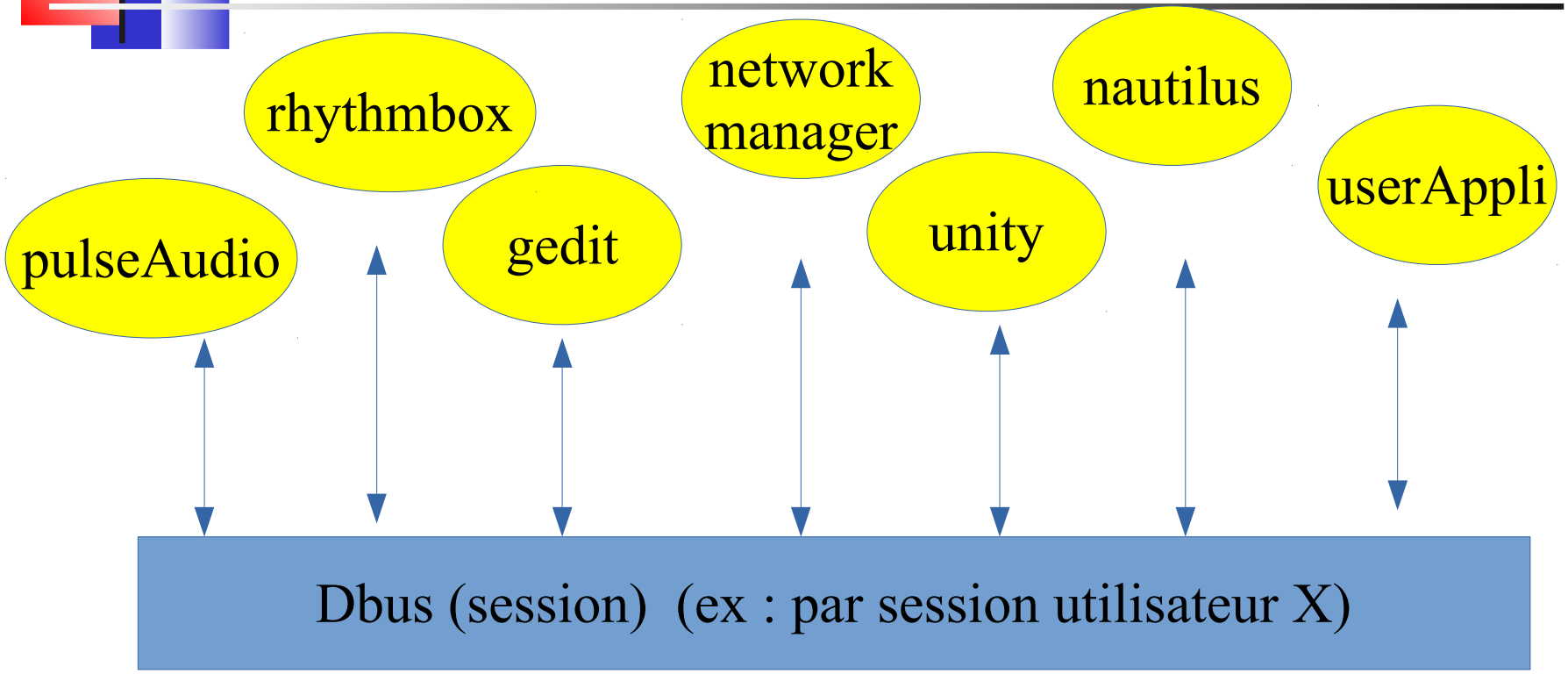
Client :dbus-send,python, C

Exception et Signaux ..

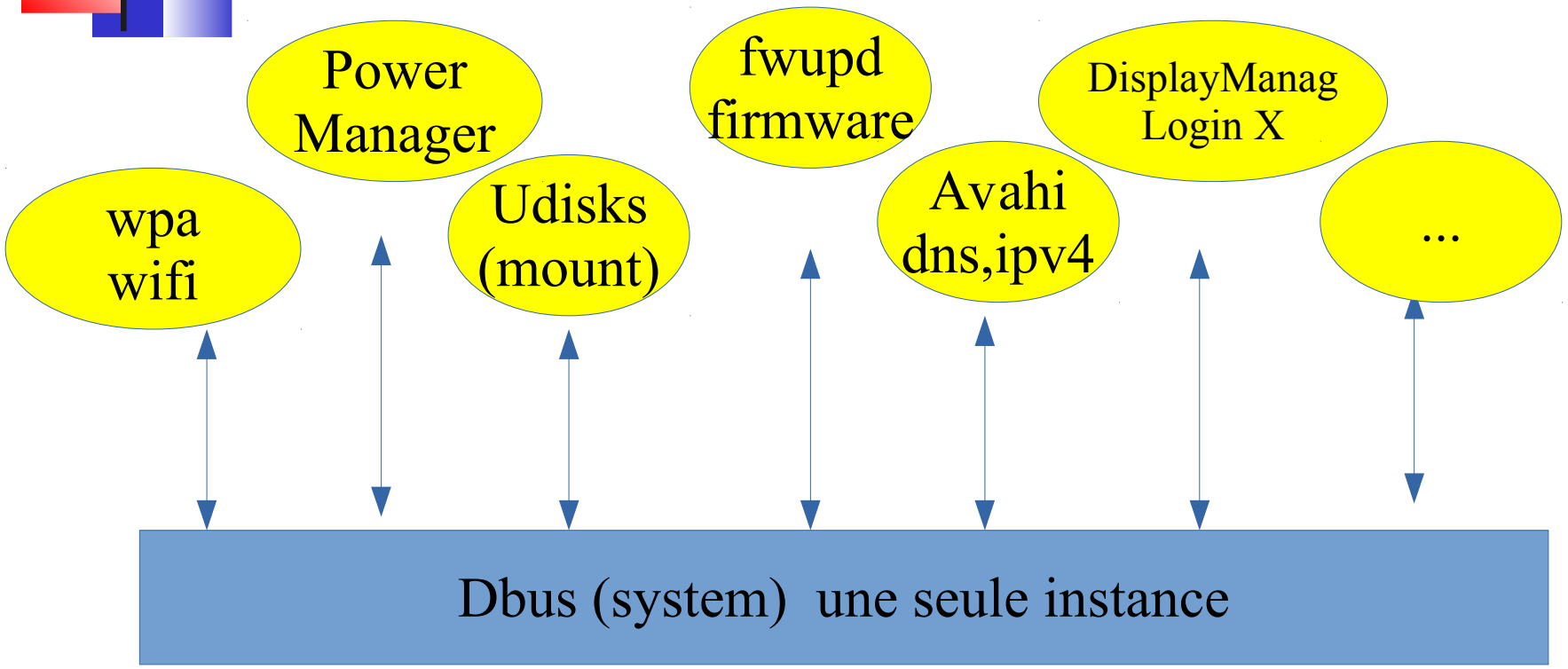
Concurrence

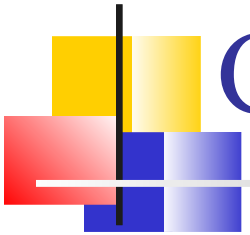


Concurrence



Concurrence





Concurrence

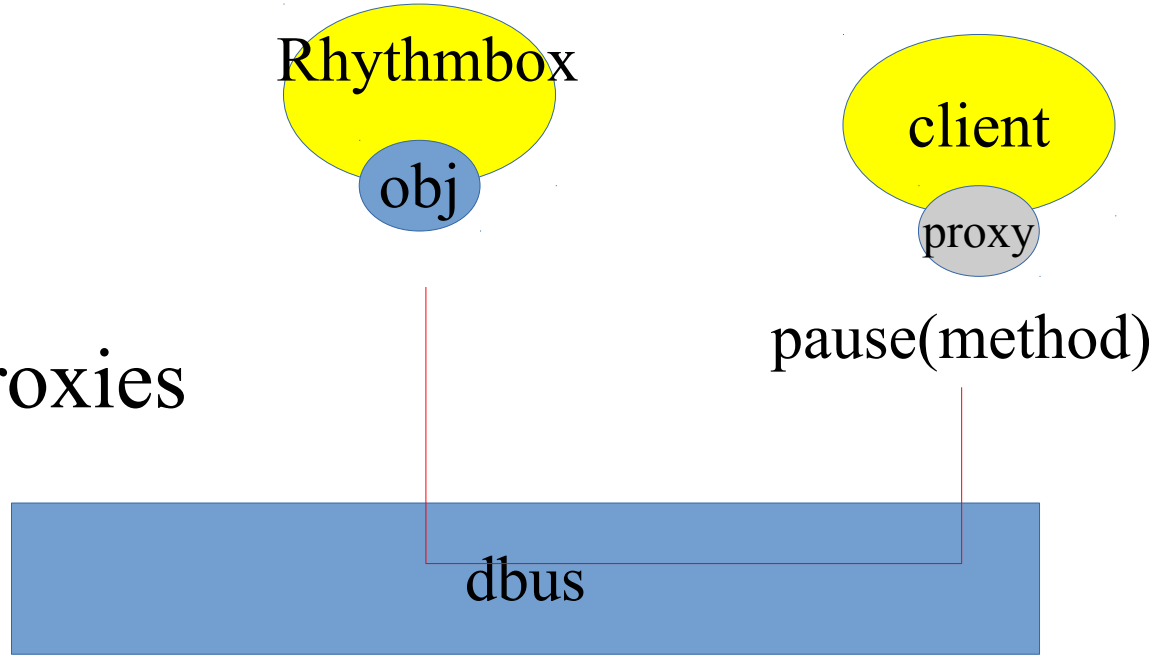
DBUS

- appel de mèthodes (sur les objets services)
- multilanguage (programmation)
- activation des services
- intropection (découverte des services)
- message d’erreur (exception)
- signaux

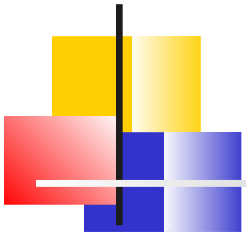
Concurrence

DBus

- Services et proxies



Activation possible du service



dbus-daemon : lancement le daemon D-Bus

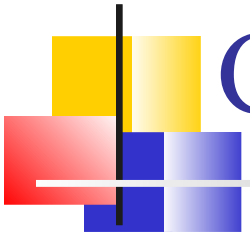
dbus-launch : permet de démarrer un bus session depuis un script shell

dbus-send : permet d'envoyer un message sur le bus depuis un script shell

dbus-monitor : permet d'observer ce qui transite sur un ou plusieurs bus

dbus-cleanup-sockets : fait le ménage dans les sockets ouverts par des bus et qui ne sont plus utilisés.

dbus-uuidgen : génère des uuids pour les sessions de D-Bus

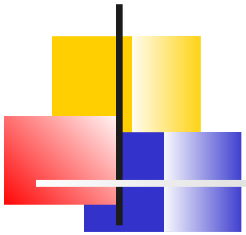


Concurrence

Utilisation

Programmation : bindings : C, C++, Python, Java, Perl, Php, Ruby,...)

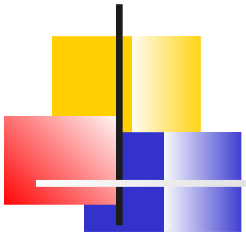
Ligne de commande : *dbus-send, dbus-monitor*



Ligne de commande

```
> dbus-send --type=method_call  --print-reply  \ --
dest=org.mpris.MediaPlayer2.rhythmbox     \ /org/
mpris/MediaPlayer2 \
org.mpris.MediaPlayer2.Player.Pause

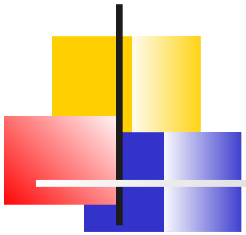
 dbus-send [--system | --session | --
address=ADDRESS] [--dest=NAME]
                [--print-reply [=literal]] [--reply-
timeout=MSEC]
```



Ligne de commande

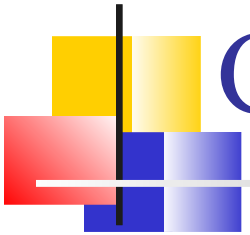
dbus-send [--system | --session | – address=ADDRESS]
[--dest=NAME]
[--print-reply [=literal]]
[--reply-timeout=MSEC]
[--type=TYPE]
OBJECT_PATH
INTERFACE.MEMBER [CONTENTS...]

dbus –type method_call,signal… [--print-replay]
adresseApplicationDestinataire nomD'unObjet
nomInterface.Methode



Client Python (proxy et appel de method)

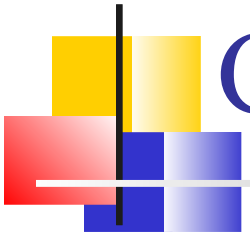
```
import dbus
session_bus = dbus.SessionBus()
player = session_bus.get_object(
        'org.mpris.MediaPlayer2.rhythmbox',     # nom application
         '/org/mpris/MediaPlayer2')                    # un objet de l'application
proxy = dbus.Interface(
         player,
        dbus_interface='org.mpris.MediaPlayer2.Player')
                    #une interface sur l'objet player
proxy.Pause()
```



Concurrence

Introspection (methode Introspect des objects)

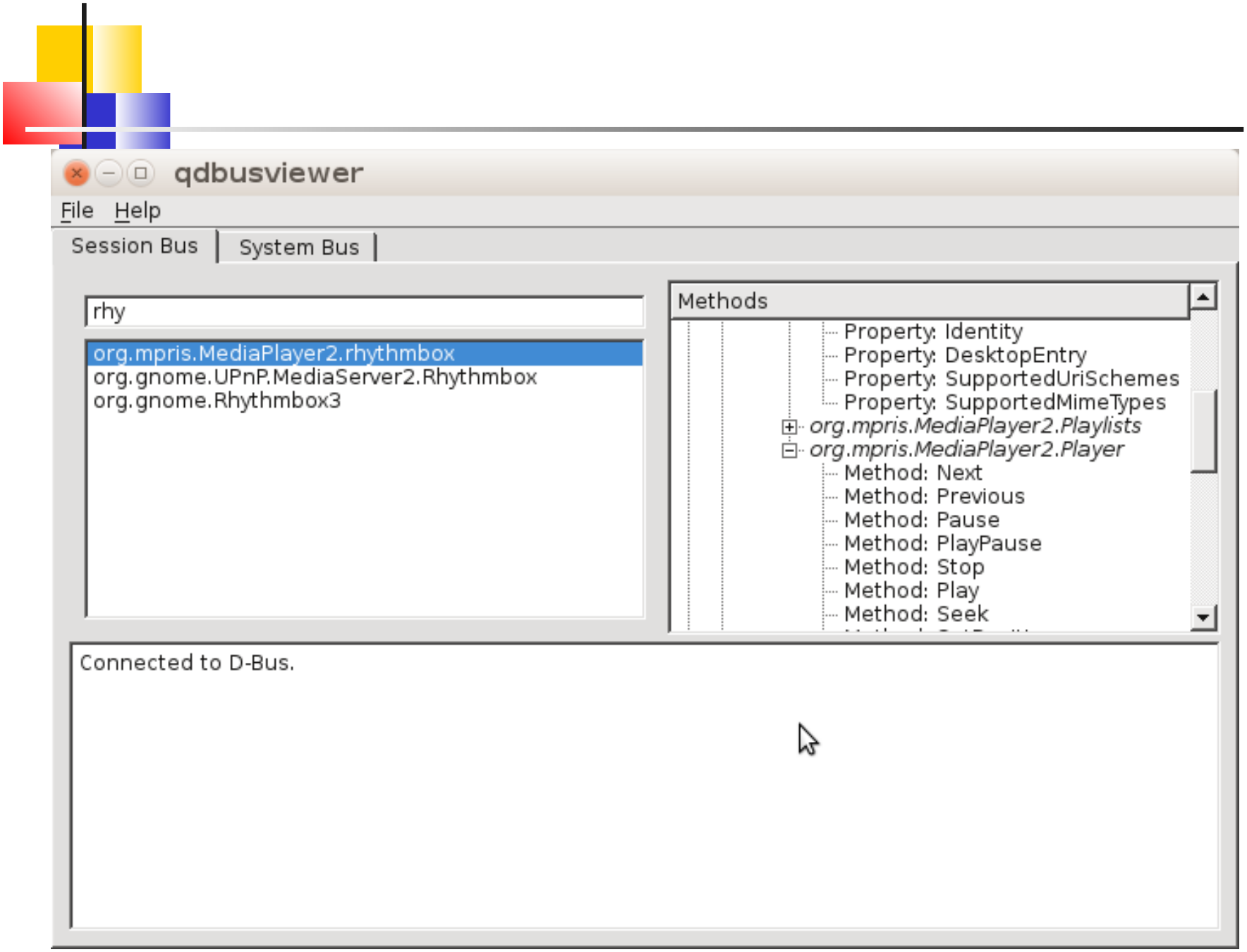
```
dbus-send --type=method_call --print-reply --
   dest=org.mpris.MediaPlayer2.rhythmbox
   /org/mpris/MediaPlayer2
   org.freedesktop.DBus.Introspectable.Introspect
```

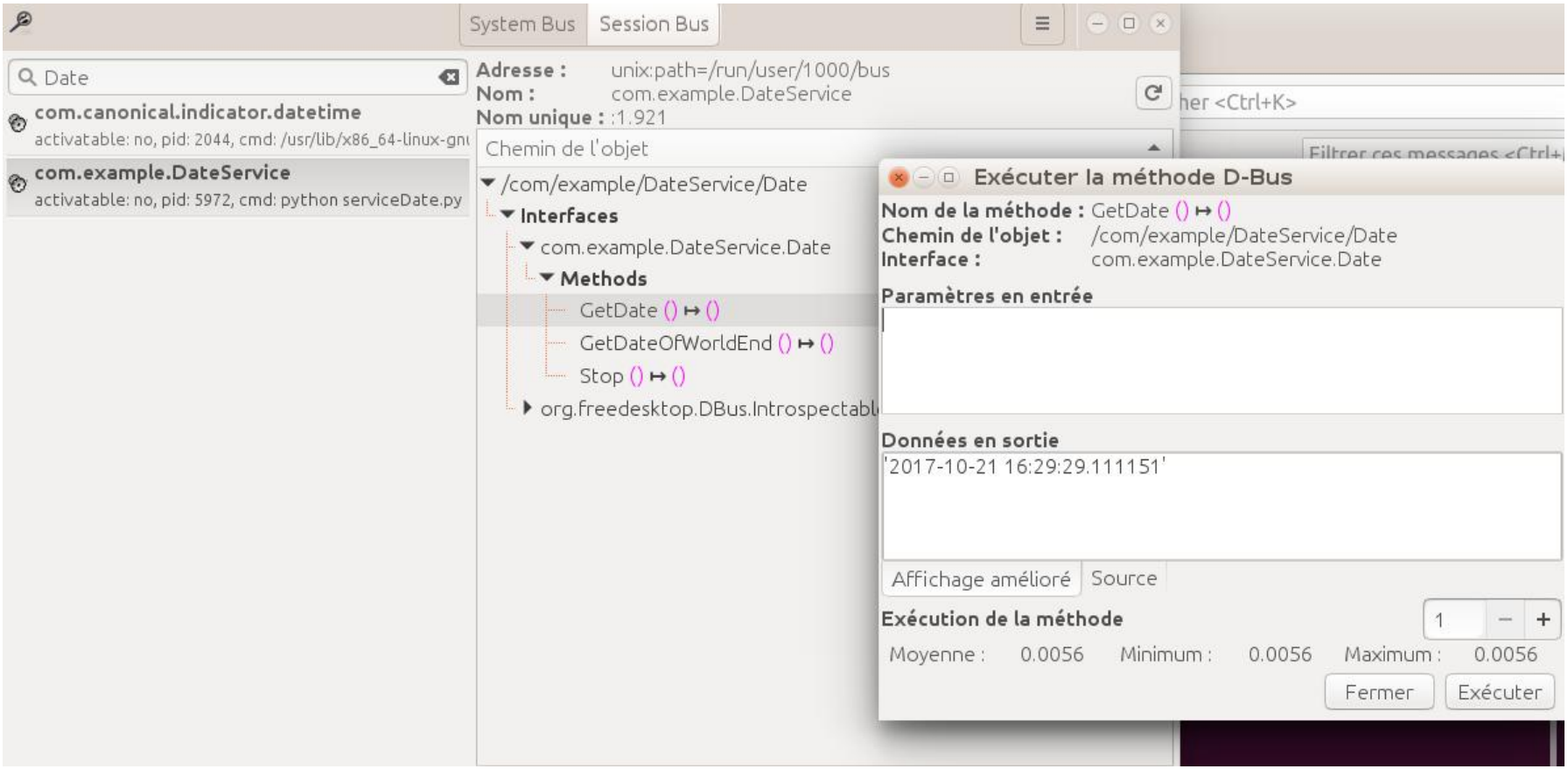


Concurrence

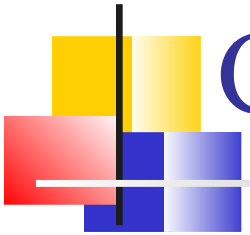
Monitoring d’un objet

```
dbus-monitor --session
   "path=/org/mpris/MediaPlayer2,member=Properties
   Changed" --monitor
```


qdbusviewer
File
Help
Session Bus
System Bus
rhy
org.mpris.MediaPlayer2.rhythmbox
org.gnome.UPnP.MediaServer2.Rhythmbox
org.gnome.Rhythmbox3
Methods
Property: Identity
Property: DesktopEntry
Property: SupportedUriSchemes
Property: SupportedMimeTypes
org.mpris.MediaPlayer2.Playlists
org.mpris.MediaPlayer2.Player
Method: Next
Method: Previous
Method: Pause
Method: PlayPause
Method: Stop
Method: Play
Method: Seek
Connected to D-Bus.


System Bus
Session Bus
Date
com.canonical.indicator.datetime
activatable: no, pid: 2044, cmd: /usr/lib/x86_64-linux-gnu
com.example.DateService
activatable: no, pid: 5972, cmd: python serviceDate.py
Adresse : unix:path=/run/user/1000/bus
Nom : com.example.DateService
Nom unique : :1.921
Chemin de l'objet
/com/example/DateService/Date
Interfaces
com.example.DateService.Date
Methods
GetDate () ↦ ()
GetDateOfWorldEnd () ↦ ()
Stop () ↦ ()
org.freedesktop.DBus.Introspectable
Exécuter la méthode D-Bus
Nom de la méthode : GetDate () ↦ ()
Chemin de l'objet : /com/example/DateService/Date
Interface : com.example.DateService.Date
Paramètres en entrée
Données en sortie
'2017-10-21 16:29:29.111151'
Affichage amélioré
Source
Exécution de la méthode
1
Moyenne : 0.0056
Minimum : 0.0056
Maximum : 0.0056
Fermer
Exécuter

d-feet



Concurrence

Python :

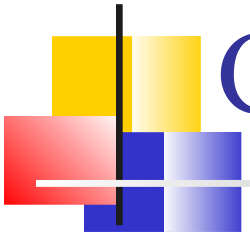
Ecriture d'une Application et Objet helloWorld

- ```
  import gobject
  import dbus
  import dbus.service

  from dbus.mainloop.glib import DBusGMainLoop
  DBusGMainLoop(set_as_default=True)



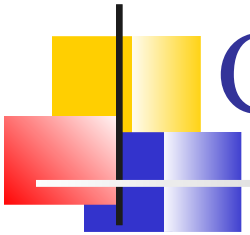
  OPATH = "/com/example/HelloWorld"
  IFACE = "com.example.HelloWorld"
  BUS_NAME = "com.example.HelloWorld"
  ```
  ```



Concurrence

```
class Example(dbus.service.Object):
  def __init__(self):
      bus = dbus.SessionBus()
      bus.request_name(BUS_NAME)
      bus_name= dbus.service.BusName(BUS_NAME, bus=bus)
      dbus.service.Object.__init__(self, bus_name, OPATH)

    @dbus.service.method(dbus_interface=IFACE + ".SayHello",
                         in_signature="", out_signature="")
   def SayHello(self):
       print "hello, world"
if __name__ == "__main__":
  a = Example()
  loop = gobject.MainLoop()
  loop.run()
```



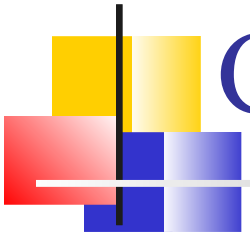
Concurrence

Ecriture d'un service helloWorld Python

. > python helloService.py

client

>dbus-send --type=method_call --print-reply --dest=com.example.HelloWorld /com/example/HelloWorld com.example.HelloWorld.SayHello.SayHello

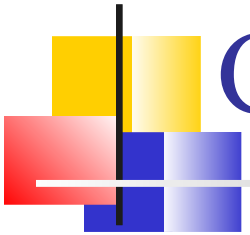


Concurrence

Ecriture d'un service Date (avec signature interface)

```
class Date(dbus.service.Object):

    loop = None
    def __init__(self, lo):
        print "Lancement de DateService Date"
        bus = dbus.SessionBus()
        bus.request_name("com.example.DateService")
        bus_name = dbus.service.BusName("com.example.DateService",
                                        bus=bus)
        dbus.service.Object.__init__(self, bus_name,
                                     "/com/example/DateService/Date")
```



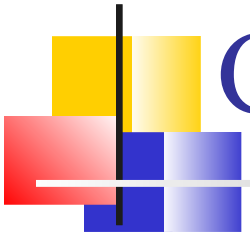
Concurrence

Ecriture d'un service Date (avec signature interface)

```
    @dbus.service.method(dbus_interface="com.example.DateService.Date
                         in_signature="", out_signature="s")
                              #  out_signature : s pour String
        def GetDate(self):
            print "Appel GetDate"
            return str(datetime.datetime.now())
.
        @dbus.service.method("com.example.DateService.Date")
        def Stop(self):
            print "Stop DateService"
            self.loop.quit()
            return 'Quit '
```

Python type	converted to D-Bus type	notes
D-Bus proxy object	ObjectPath (signature 'o')	(+)
dbus.Interface	ObjectPath (signature 'o')	(+)
dbus.service.Object	ObjectPath (signature 'o')	(+)
dbus.Boolean	Boolean (signature 'b')	a subclass of int
dbus.Byte	byte (signature 'y')	a subclass of int
dbus.Int16	16-bit signed integer ('n')	a subclass of int
dbus.Int32	32-bit signed integer ('i')	a subclass of int
dbus.Int64	64-bit signed integer ('x')	(*)
dbus.UInt16	16-bit unsigned integer ('q')	a subclass of int
dbus.UInt32	32-bit unsigned integer ('u')	(*)_
dbus.UInt64	64-bit unsigned integer ('t')	(*)_
dbus.Double	double-precision float ('d')	a subclass of float
dbus.ObjectPath	object path ('o')	a subclass of str
dbus.Signature	signature ('g')	a subclass of str
dbus.String	string ('s')	a subclass of unicode
dbus.UTF8String	string ('s')	a subclass of str
bool	Boolean ('b')	
int or subclass	32-bit signed integer ('i')	
long or subclass	64-bit signed integer ('x')	
float or subclass	double-precision float ('d')	
str or subclass	string ('s')	must be valid UTF-8

Array "ax" structure (xxs) dictionnaire 'a{xy}' x key



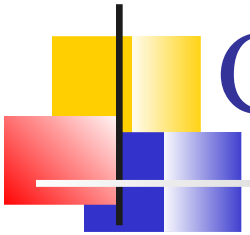
Concurrence

Client en ligne de commande

```
> dbus-send --type=method_call
    --print-reply    # réponse
    --dest=com.example.DateService       # Application service
    "/com/example/DateService/Date"    # un objet
     com.example.DateService.Date.GetDate  # interface. method

method return time=1508735716.142016 sender=:1.943 ->
destination=:1.992 serial=4 reply_serial=2
   string "2017-10-23 07:15:16.141586"

> dbus-send --type=method_call   --dest=com.example.DateService
"/com/example/DateService/Date"  com.example.DateService.Date.Stop
```



Concurrence

Client Python

```
import dbus
session_bus = dbus.SessionBus()
dateService = session_bus.get_object(
        'com.example.DateService',
        '/com/example/DateService/Date')
iface = dbus.Interface(
        dateService,
        dbus_interface='com.example.DateService.Date')

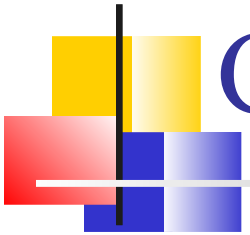
print iface.GetDate()
```

```
> python getDate.py
  2017-10-23 07:19:55.003694
```

Concurrence

Client C (morceaux de code :manque la gestion des erreurs)

```
#include <dbus/dbus.h>
int main(){
// connect to the system bus and check for errors
DBusConnection*conn = dbus_bus_get(
                DBUS_BUS_SESSION, &err);
  // request our name on the bus
int rc = dbus_bus_request_name(conn, "com.example.DateService",
                  DBUS_NAME_FLAG_REPLACE_EXISTING , &err);
msg = dbus_message_new_method_call("com.example.DateService", // target for the method call
                                   "/com/example/DateService/Date", // object to call on
                                   "com.example.DateService.Date", // interface to call on
                                   "GetDate"); // method name
// send message and get a handle for a reply
 if (!dbus_connection_send_with_reply (conn, msg, &pending, -1))
 ….
// block until we recieve a reply
 dbus_pending_call_block(pending);
// read the parameters
 if (dbus_message_iter_init(msg, &args))  printf("Date Reply:%s\n",str);
```

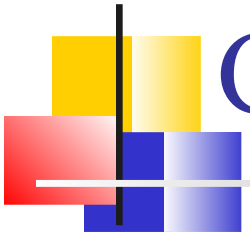


Concurrence

Exception

```
>  @dbus.service.method("com.example.DateService.Date")
    def GetDateOfWorldEnd(self):
        print "Appel GetDateOfWorldEnd"
        raise Exception('Unknow Date Error !!!!!')
```

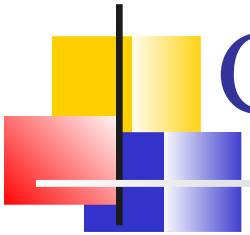
```
 dbus-send --type=method_call  --print-reply --
dest=com.example.DateService  "/com/example/DateService/Date"
com.example.DateService.Date.GetDateOfWorldEnd
```



Concurrence

Signaux

```
# fin de la classe
def quit_handler():  # fonction
        """Signal handler for quitting the receiver."""
        print 'Quitting....'
        loop.quit()
        return 'Quit'
if __name__ == "__main__":
    ...
    date = Date(bus_name,loop)
    bus.add_signal_receiver(quit_handler,
                    dbus_interface='com.example.DateService.Date',
                   signal_name='quit_signal')
    loop.run()
dbus-send --type=signal  --dest=com.example.DateService  "/com/example/DateService/
Date"  com.example.DateService.Date.quit_signal
```



Concurrence

Activation

/usr/share/dbus-1/services/org.gnome.Rhythmbox3.service
[D-BUS Service]
Name=org.gnome.Rhythmbox3
Exec=/usr/bin/rhythmbox