

Welcome!

PHP on the D-BUS

PHP UK 2010 - London, UK

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About Me

Derick Rethans

- Dutchman living in London
- PHP development
- Author of the `mcrypt`, `input_filter`, `dbus`, `translit` and `date/time` extensions
- Author of `Xdebug`
- Freelancer doing PHP (internals) development



What is DBUS?

- Part of the freedesktop.org project
- It is meant to replace Corba (GNOME) and DCOP (KDE)
- A message bus system, a simple way for applications to talk to one another
- It consists of a daemon, a library and a protocol
- It is both meant for system level and session level communication

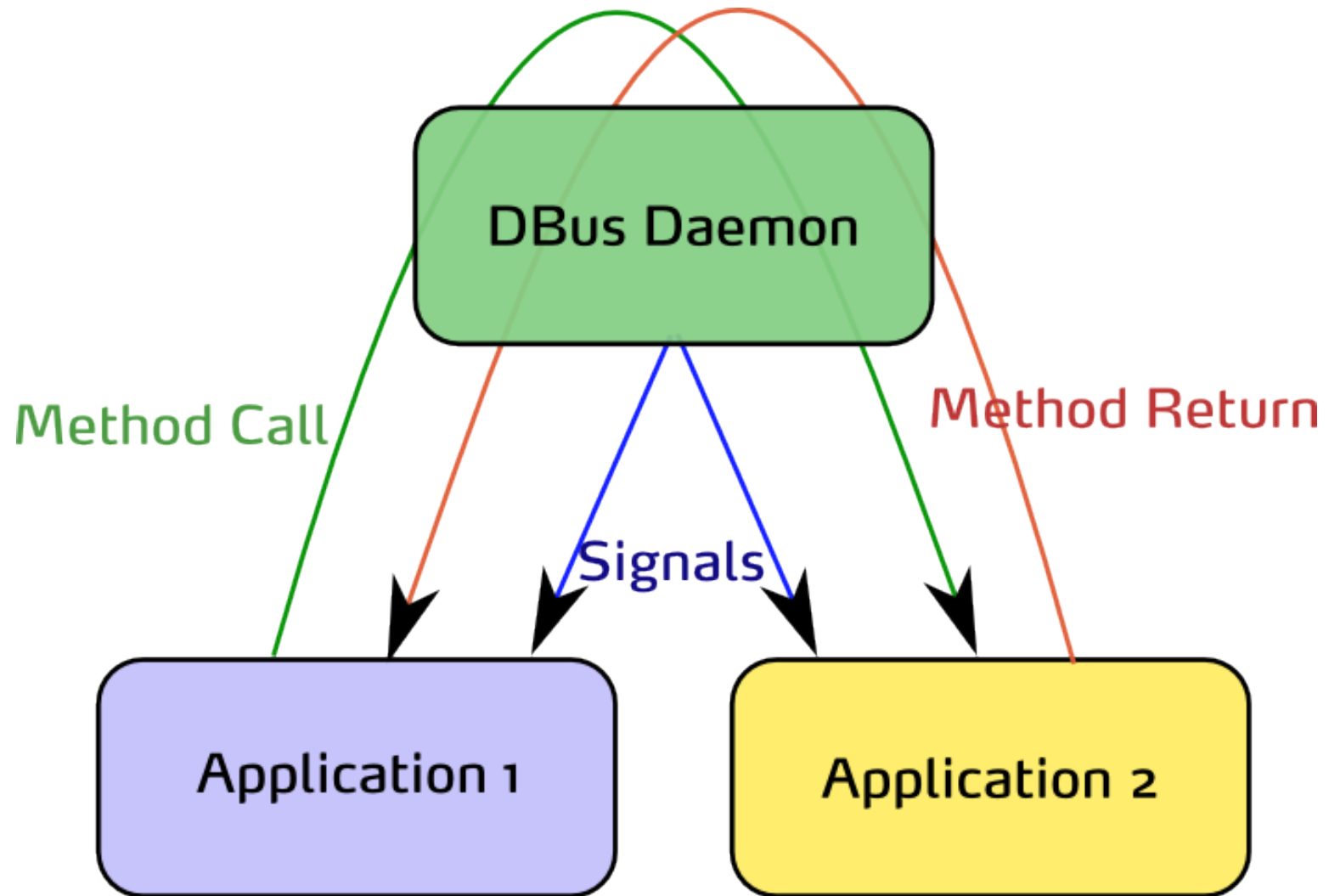


freedesktop.org

What is DBUS used for?

- On the (GNOME) desktop: Avahi, CUPS, GConf, Nautilus, Network Manager, Power Manager, Screen Saver, Volume Manager
- System level elements: HAL, Network manager
- Gnome applications: Pidgin, Empathy/Telepathy, Liferea, Rhythmbox
- Other applications: skype
- But also on the Openmoko platform (freesmartphone.org)

Architecture



Message Types

Method calls

- From one application to another

Method returns

- Upon successful method execution

Method error returns

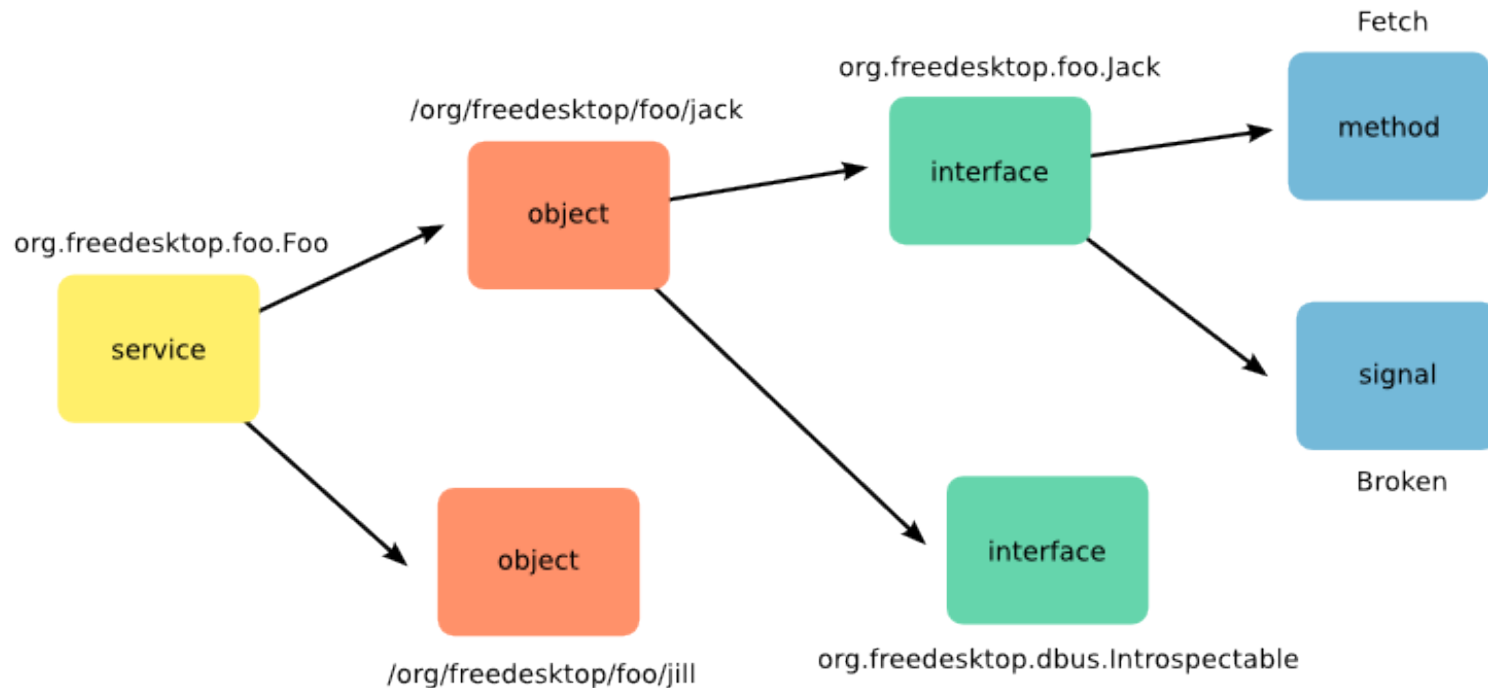
- Upon a failure while executing the method

Signals

- Broadcast from one application to all others

DBus Parts

- Bus: Communication pathways that clients can transport messages over
- Proxy: A client-level representation of an object on the bus.



Data-types

Basic types

- byte
- boolean (0 = false, 1 = true)
- integer (int16, uint16, int32, uint32, int64 and uint64)
- double (IEEE 754 double)
- string (UTF-8 string)

Compound types

- array (contains elements of the same type)
- struct (contains one or more complete types)
- dictionary entry (contains a key (basic type) and a value, must be part of an array)
- variant (contains a type and a value)
- object path (a string representation of a DBUS Object)

PHP DBUS extension

- DBUS bindings using the low-level C library (libdbus)
- Provides proxy objects
- Implements automatic-marshalling of data
- Provides specific classes for full control
- Support for method invocation, method calls, sending and receiving signals
- (Basic) support for introspection

Talking to a DBUS object from PHP

Activating the screensaver

screensaver.php:

```
<?php
$d = new Dbus;
$n = $d->createProxy(
    "org.gnome.ScreenSaver",
    "/org/gnome/ScreenSaver",
    "org.gnome.ScreenSaver"
);

var_dump($n->GetActive());
$n->SetActive( true );
var_dump($n->GetActive());
sleep(5);
$n->SetActive( false );
?>
```

Data-type mapping

From PHP to DBUS

- boolean -> boolean
- integer -> int32
- double -> double
- string -> string
- array -> array (only basic types as values are supported)
- DbusByte, DbusBool, DbusInt16, DbusUInt16, DbusInt32, DbusUInt32, DbusInt64, DbusUInt64, DbusDouble
- DbusArray(int \$type, array \$elements [, string \$signature])
- DbusDict(int \$type, array \$elements)
- DbusVariant(mixed \$data)
- DbusStruct(string \$signature, array \$elements)
- DbusSet(array \$elements)
- DbusObjectPath(string \$path)

Data-type mapping

From DBUS to PHP

Basic types

- boolean -> boolean
- byte, int16, uint16, int32, uint32, int64, uint64 -> integer
- double -> double
- string -> string

Compound types

- array -> DbusArray or DbusDict (depending on whether there is a dict-entry embedded)
- dict-entry -> variable (could be anything)
- variant -> DbusVariant
- struct -> DbusStruct
- object-path -> DbusObjectPath

Talking to a DBUS object from PHP

Using explicit integer types

notify.php:

```
<?php
$d = new Dbus( Dbus::BUS_SESSION );
$n = $d->createProxy(
    "org.freedesktop.Notifications", // connection name
    "/org/freedesktop/Notifications", // object
    "org.freedesktop.Notifications" // interface
);
$id = $n->Notify(
    'Testapp', new DbusUInt32( 0 ), // app_name, replaces_id
    'iceweasel', 'Testing http://ez.no', 'Test Notification', // app_icon, summary, body
    new DbusArray( Dbus::STRING, array() ), // actions
    new DbusDict(
        // hints
        Dbus::VARIANT,
        array(
            'x' => new DbusVariant( 500 ), // x position on screen
            'y' => new DbusVariant( 500 ), // y position on screen
            'desktop-entry' => new DbusVariant( 'rhythmbox' )
        )
    ),
    1000 // expire timeout in msec
);
echo $id[0], "\n";
?>
```

Introspection

- Most services provide information about their methods' arguments through `org.freedesktop.DBus.Introspectable`.
- The DBUS extension currently switches between `i` and `u` only.

```
<!DOCTYPE node PUBLIC "-//freedesktop//DTD D-BUS Object Introspection 1.0//EN"
"http://www.freedesktop.org/standards/dbus/1.0/introspect.dtd">
<node>
<interface name="org.freedesktop.Notifications">
  <method name="Notify">
    <arg name="app_name" type="s" direction="in"/>
    <arg name="id" type="u" direction="in"/>
    <arg name="icon" type="s" direction="in"/>
    <arg name="summary" type="s" direction="in"/>
    <arg name="body" type="s" direction="in"/>
    <arg name="actions" type="as" direction="in"/>
    <arg name="hints" type="a{sv}" direction="in"/>
    <arg name="timeout" type="i" direction="in"/>
    <arg name="return_id" type="u" direction="out"/>
  </method>
  <method name="GetServerInformation">
    <arg name="return_name" type="s" direction="out"/>
    <arg name="return_vendor" type="s" direction="out"/>
    <arg name="return_version" type="s" direction="out"/>
    <arg name="return_spec_version" type="s" direction="out"/>
  </method>
  <method name="GetCapabilities">
    <arg name="return_caps" type="as" direction="out"/>
  </method>
  <method name="CloseNotification">
    <arg name="id" type="u" direction="in"/>
```

Talking to a DBUS object from PHP

Using introspection to select the correct integer type

notify-introspect.php:

```
<?php
$d = new Dbus( Dbus::BUS_SESSION, true );
$n = $d->createProxy(
    "org.freedesktop.Notifications", // connection name
    "/org/freedesktop/Notifications", // object
    "org.freedesktop.Notifications" // interface
);
$id = $n->Notify(
    'Testapp', 0, // app_name, replaces_id
    'iceweasel', 'Testing http://ez.no', 'Test Notification', // app_icon, summary, body
    new DbusArray( Dbus::STRING, array() ), // actions
    new DbusDict(
        // hints
        Dbus::VARIANT,
        array(
            'x' => new DbusVariant( 500 ), // x position on screen
            'y' => new DbusVariant( 500 ), // y position on screen
            'desktop-entry' => new DbusVariant( 'rhythmbox' )
        )
    ),
    1000 // expire timeout in msec
);
echo $id[0], "\n";
?>
```

Providing DBUS services through PHP

- Request a connection name
- Register a class that provides methods
- Introspection is not yet supported

```
<?php
$d = new Dbus( Dbus::BUS_SESSION, true );
$d->requestName( 'nl.derickrethans.test' );
$d->registerObject(
    '/nl/derickrethans/test', 'nl.derickrethans.test', 'testClass' );

class testClass {
    static function echoOne( $a ) {
        return $a;
    }
    static function echoTwo( $a, $b ) {
        return new DbusSet( $a, $b );
    }
}

do {
    $s = $d->waitLoop( 1000 );
} while ( true );
?>
```

Watching signals

```
<?php
$d = new Dbus( Dbus::BUS_SYSTEM );
$d->addWatch( 'org.freedesktop.Hal.Device' );
$d->addWatch( 'nl.derickrethans.Interface' );
$b = 0;
do
{
    $s = $d->waitLoop( 1000 );
    if ( !$s ) continue;
    if ( $s->matches( 'org.freedesktop.Hal.Device', 'Condition' ) )
    {
        $b = $s->getData()->getData();
        if ( in_array( 'brightness-up', $b ) ||
            in_array( 'brightness-down', $b ) )
        {
            echo "Brightness changed\n";
        }
    }
    else if ( $s->matches( 'nl.derickrethans.Interface', 'TestSignal' ) )
    {
        var_dump( $s->getData() );
    }
}
while ( true );
?>
```

Sending signals

```
<?php
$d = new Dbus( Dbus::BUS_SESSION, true );
$d->requestName( 'nl.derickrethans.test' );
$s = new DbusSignal(
    $d,
    '/nl/derickrethans/SignalObject',
    'nl.derickrethans.Interface',
    'TestSignal'
);
$s->send( "ze data", new DbusArray( Dbus::STRING, array( 'one', 'two' ) ) );
?>
```

Skype

- Implements (on Linux) a DBUS API for communications
- Documented at <https://developer.skype.com/Docs/ApiDoc/src> (sparsely)

Skype

Objects

- USER object
- PROFILE object
- CALL object
- MESSAGE object
- CHAT object
- CHATMEMBER object
- CHATMESSAGE object
- VOICEMAIL object
- SMS object
- APPLICATION object
- GROUP object
- FILETRANSFER object

Skype

Odd DBUS API

- Everything in and out happens with a weird string protocol
- It does not make use of objects at all
- It doesn't send signals, but you have to provide a callback

Skype in polling mode

```
<?php
$d = new Dbus( Dbus::BUS_SESSION, true );
$n = $d->createProxy( "com.Skype.API", "/com/Skype", "com.Skype.API");
$n->Invoke( "NAME PHP" );
$n->Invoke( "PROTOCOL 7" );
$chatId = $n->Invoke( "CHAT CREATE {$argv[1]}" );
list( $ignore, $id, $stuff, $stuff2 ) = explode( " ", $chatId );
$n->Invoke( "OPEN CHAT $id" );

while ( true )
{
    $r = $n->Invoke( "GET CHAT $id RECENTCHATMESSAGES" );
    list( $ignore, $dummy, $dummy, $messageIds ) = explode( ' ', $r, 4 );
    foreach( explode( ", ", $messageIds ) as $messageId )
    {
        $data = $n->Invoke( "GET CHATMESSAGE $messageId FROM_HANDLE" );
        list( $a, $b, $c, $name ) = explode( ' ', $data, 4 );
        $data = $n->Invoke( "GET CHATMESSAGE $messageId BODY" );
        list( $a, $b, $c, $body ) = explode( ' ', $data, 4 );
        echo $name, ": ", $body, "\n";
        $n->Invoke( "SET CHATMESSAGE $messageId SEEN" );
    }
    sleep( 30 );
}
?>
```

Skype with callback

Instead they should have used signals...

```
<?php
$d = new Dbus( Dbus::BUS_SESSION, true );
$n = $d->createProxy( "com.Skype.API", "/com/Skype", "com.Skype.API");
$n->Invoke( "NAME PHP" );
$n->Invoke( "PROTOCOL 7" );
$chatId = $n->Invoke( "CHAT CREATE {$argv[1]}" );
list( $ignore, $id, $stuff, $stuff2 ) = explode( " ", $chatId );
$n->Invoke( "OPEN CHAT $id" );

class testClass {
    static function notify($a)
    {
        global $n;

        @list( $a, $b, $c, $d ) = explode( ' ', $a, 4 );

        if ( $a === "CHATMESSAGE" && in_array( $d, array( 'READ', 'SENT' ) ) )
        {
            $data = $n->Invoke( "GET CHATMESSAGE $b BODY" );
            list( $a, $b, $c, $body ) = explode( ' ', $data, 4 );
            echo $body, "\n";
        }
    }
}

$d->registerObject(
    '/com/Skype/Client', 'com.Skype.API.Client', 'testClass'
);

do {
    $s = $d->waitLoop( 1000 );
}
while ( true );
?>
```

What's the real goal?

- Running apps on the OpenMoko
- With PHP-GTK

Phone Services

Playing Sounds

```
<?php
$d = new Dbus( Dbus::BUS_SYSTEM );
$soundDbus = $d->createProxy(
    'org.freemartphone.odeviced',
    '/org/freemartphone/Device/Audio',
    'org.freemartphone.Device.Audio'
);

$soundDbus->PlaySound(
    '/usr/share/sounds/notify_message.wav',
    0, 0
);
?>
```

Phone Services

Making a call

```
<?php
$d = new DBus( DBus::BUS_SYSTEM );
$callInterface = $d->createProxy(
    'org.freesmartphone.ogsmd',
    '/org/freesmartphone/GSM/Device',
    'org.freesmartphone.GSM.Call'
);

$callInterface->Initiate( $nr, 'voice' );

?>
```

Phone Services

Sending SMS

```
<?php
$d = new DBus( DBus::BUS_SYSTEM );
$smsInterface = $d->createProxy(
    'org.freesmartphone.ogsmd',
    '/org/freesmartphone/GSM/Device',
    'org.freesmartphone.GSM.SMS'
);

if ( strlen( $text ) <= 160 )
{
    $smsInterface->SendMessage(
        $nr,
        $text,
        new DBusDict( Dbus::VARIANT,array() )
    );
    echo "Sending: $text\n";
}
else
{
    $textParts = chunk_split( $text, 140, "\n" );
    $textParts = explode( "\n", trim( $textParts ) );
    $id = mt_rand( 0, 255 );
    $cnt = count( $textParts );
    $c = 1;
    foreach( $textParts as $textPart )
    {
        $smsInterface->SendMessage(
            $nr,
            $textPart,
            new DBusDict( Dbus::VARIANT,
                array(
                    'csm_id' => new DBusVariant( $id ),
                    'csm_num' => new DBusVariant( $cnt ),
                    'csm_seq' => new DBusVariant( $c )
                )
            )
        );
    }
}
```

Phone Services

Getting GPS coordinates

```
<?php
$d = new Dbus( Dbus::BUS_SYSTEM );
$gpsPos = $d->createProxy(
    'org.freedesktop.Gypsy', '/org/freedesktop/Gypsy',
    'org.freedesktop.Gypsy.Position'
);
$gpsDevice = $d->createProxy(
    'org.freedesktop.Gypsy', '/org/freedesktop/Gypsy',
    'org.freedesktop.Gypsy.Device'
);
$coords = $gpsPos->GetPosition()->getData();
$fix     = $gpsDevice->GetFixStatus();
switch ( $fix )
{
    case 0: $txt = 'Invalid fix'; break;
    case 1: $txt = 'No fix'; break;
    case 2: $txt = '2D fix'; break;
    case 3: $txt = '3D fix'; break;
}
printf(
    "%s | Location: %.2f, %.2f | %s",
    date_create()->format( 'H:i:s' ),
    $coords[2], $coords[3], $txt
);
?>
```

Questions



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