XML-RPC

lesson #advanced02

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XML-RPC

XML-RPC is one of the fundamental distributed system "glue" technologies..

It lets you make remote procedure calls, to system components resident on other network nodes.

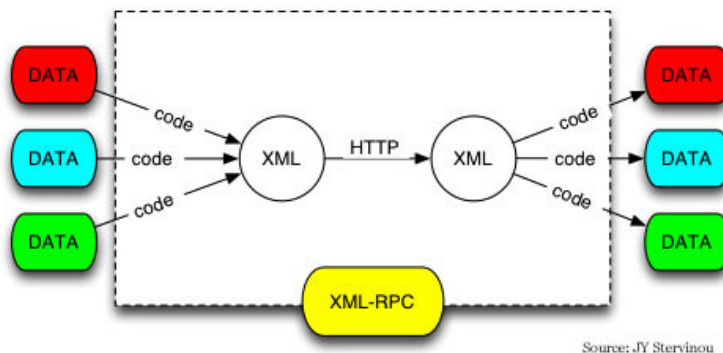# Agenda

1. WHAT IS XML-RPC?

XML-RPC is one flavor of RPC...

- The Remote Procedure Call (RPC) model relates client-server communication to conventional procedure calls.
- It views each server as implementing one or more (remote) procedures.
- Like conventional procedures, remote procedures accept arguments and can return results.
- Using the RPC model helps programmers focus on the application instead of the communication protocol.

XML-RPC Visual

XML is used to represent data - parameters to a remote procedure, as well as a returned data structure.

HTTP is the transport protocol used to exchange messages.

Source: JY Stervinou

XML-RPC: Definition

- XML-RPC is a specification and a set of implementations that allow software running on disparate operating systems, running in different environments, to make procedure calls over the Internet.
- It is remote procedure calling using HTTP as the transport and XML as the encoding.
- It is designed to be as simple as possible, while allowing complex data structures to be transmitted, processed and returned.
- It's been around since 1998.

XML-RPC Reference Implementation

- Apache XML-RPC is a Java implementation of XML-RPC
- It is the de facto standard
- Supports asynchronous requests on client, which isn't true of PHP implementations
- Doesn't help us much :(
- http://ws.apache.org/xmlrpc/

XML-RPC Support in PHP

- XML-RPC library in PHP (since v4), but experimental and just functions (not OO)
- XML-RPC for PHP from sourceforge.net
- Multiple independent implementations
- **CodeIgniter libraries: xmlrpc and xmlrpcs**
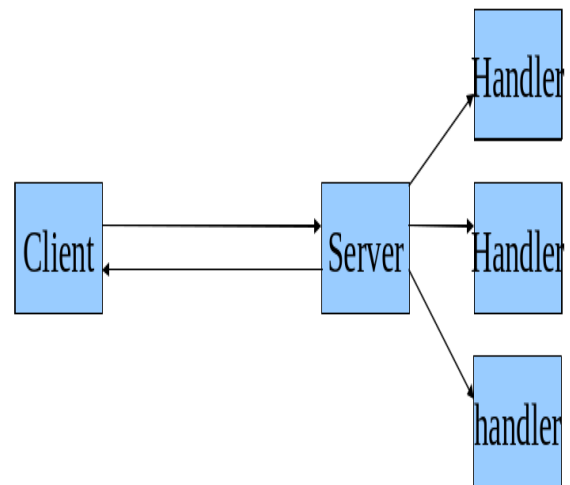
2. HOW DOES AN XML-RPC SERVER WORK?

- An XML-RPC request has a target and a set of parameters (even if empty).
- The target is usually of the form "cn.mn", denoting the "mn" method inside the "cn" class.
- The server maintains a table of registered "services", mapping external URIs to internal objects & methods. The RPC server tries to find a matching class and method, that takes method parameter types that match those in the RPC request.
- Once a match is made, the method is called, and the result is encoded and sent back to the client.

Normal XML-RPC

Client: browser with Ajax, or standalone

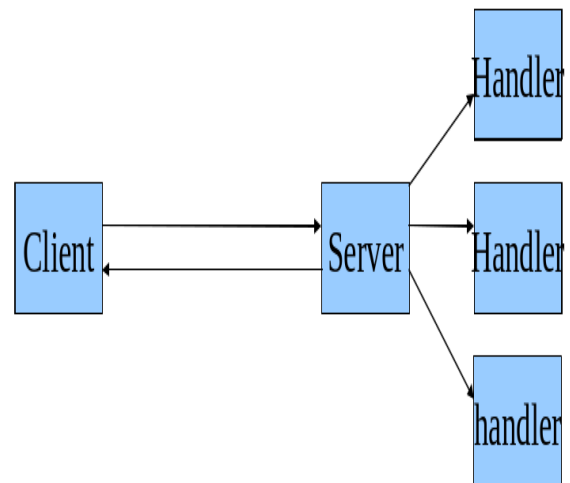Server: httpd

Handlers: ...

PHP XML-RPC

Client: browser with Ajax assumed

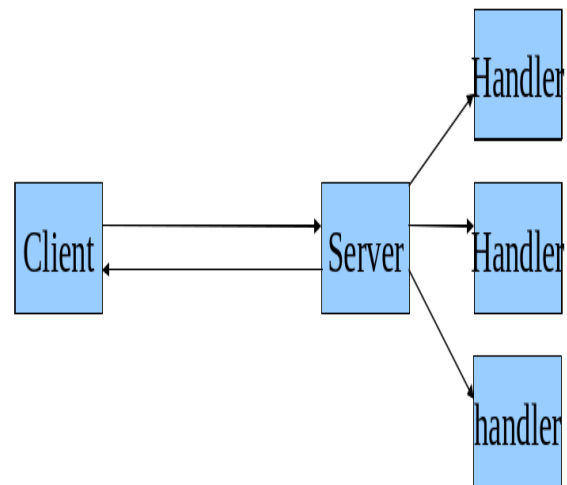Server: script with helper functions

Handlers: ...

Normal XML-RPC

Client: browser with Ajax assumed

Server: Controller

Handlers: ...

3. XML-RPC MECHANICS

An XML-RPC request has a target method name, and a parameters data structure.

An XML-RPC reeponse has with a returned value data structure or an error message data structure.

See `example-xmlrpc/data/xmlrpc.dtd`

XML-RPC Data Types

There are only a handful of data types allowed:

XML-RPC Data Type	Java Data Type
int	int
boolean	boolean
string	java.lang.String
double	double
dateTime.iso8601	java.util.Date
struct	java.util.Hashtable
array	java.util.Vector
base64	byte[]

An XML-RPC Request

```
                    POST /RPC2 HTTP/1.0
                    User-Agent: Frontier/5.1.2 (WinNT)
                    Host: betty.userland.com
                    Content-Type: text/xml
                    Content-length: 181
<?xml version="1.0"?>
<methodCall>
  <methodName>hello.sayHello</methodName>
  <params>
    <param>
      <value><string>Fred</string></value>
    </param>
  </params>
</methodCall>
```

An XML-RPC Reply

```
                    HTTP/1.1 200 OK
                    Connection: close
                    Content-Length: 158
                    Content-Type: text/xml
                    Date: Fri, 17 Jul 1998 19:55:08 GMT
                    Server: UserLand Frontier/5.1.2-WinNT
<?xml version="1.0"?>
<methodResponse>
  <params>
    <param>
      <value><string>Hello Fred</string></value>
    </param>
  </params>
</methodResponse>
```

An XML-RPC Fault

```
                    HTTP/1.1 200 OK
                    Connection: close
                    Content-Length: 426
                    Content-Type: text/xml
                    Date: Fri, 17 Jul 1998 19:55:02 GMT
                    Server: UserLand Frontier/5.1.2-WinNT
<?xml version="1.0"?>
<methodResponse>
  <fault>
    <value>
      <struct>
        <member>
          <name>faultCode</name>
          <value><int>4</int></value>
        </member>
        <member>
          <name>faultString</name>
          <value><string>Error</string></value>
        </member>
      </struct>
    </value>
  </fault>
</methodResponse>
```

4. XML-RPC IN CODEIGNITER

A client excerpt...

```
                    $this->load->library('xmlrpc');

                    $this->xmlrpc->server('http://rpc.pingomatic.com/', 80);
                    $this->xmlrpc->method('weblogUpdates.ping');

                    $request = array('My Photoblog', 'http://www.my-site.com/photoblog/');
                    $this->xmlrpc->request($request);

                    if ( ! $this->xmlrpc->send_request())
                    {
                    echo $this->xmlrpc->display_error();
                    } else
                    $this->xmlrpc->display_response();
```

A CodeIgniter XML-RPC Server

```
class Xmlrpc_server extends Controller {
function index(){
$this->load->library('xmlrpc');
$this->load->library('xmlrpcs');
$config['functions']['Greetings'] = array('function' => 'Xmlrpc_server.process');
$this->xmlrpcs->initialize($config);
$this->xmlrpcs->serve();
}

function process($request){
$parameters = $request->output_parameters();
$response = array(
array(
'you_said'  => $parameters['0'],
'i_respond' => 'Not bad at all.'),
'struct');
return $this->xmlrpc->send_response($response);
}
}
```

CodeIgniter XML-RPC Request

The request looks like a vector of either string values or value/type array rows. Yes, this would be a positional array.

```
$request = array (
array('John', 'string'),
array('Doe', 'string'),
array(FALSE, 'boolean'),
array(12345, 'int'),
'Plumber'
);
$this->xmlrpc->request($request);
```

CodeIgniter XML-RPC Response

The response is an associative array of arrays.

```
$response = array(
array('nickname'  => array('Smitty','string'),
'userid'    => array('99','string'),
'url'       => array('http://yoursite.com','string'),
'email'     => array('jsmith@yoursite.com','string'),
'lastname'  => array('Smith','string'),
'firstname' => array('John','string') ),
'struct');
return $this->xmlrpc->send_response($response);
```

5. XML-RPC ELSEWHERE

- XML-RPC ... Simple, cross-platform; being supplanted by "JSON"
- RMI ... Java only, transparent; elegant
- SOAP ... Complex, cross-platform, data type extensions; out of favor
- COM & DCOM ... Old Windows only, but interest reappearing
- REST ... The "in" protocol for now Hard to pin down :(

A Note About XML-RPC Stubs

Some non-PHP implementations have **stubs**

A stub has the same interface as a remote object; the local object is unaware that it is calling a remote method

The local stub does the marshalling, then invokes the XML-RPC layer

The remote stub is called by the remote server; it does the unmarshalling and "calls" the remote object, etc

The remote object is unaware that it is being invoked from afar

Done properly, this is transparent :)

Congratulations!

You have completed lesson #advanced02: XML-RPC

If you would take a minute to provide some feedback, we would appreciate it!

The next activity in sequence is: xml XML-RPC Examples

You can use your browser's back button to return to the page you were on before starting this activity, or you can jump directly to the course homepage, organizer, or reference page.