

Notes

- Case study
 - Please pick your topic and post on the case study folder on Piazza soon.
 - Try to work with the same teammates you have for homework/exercise.
- No extra assignments besides the ones in syllabus

Discussion #7

- The advantages of using CodeIgniter framework
 - Naturally follow MVC pattern
 - Built-in libraries for many routine tasks
 - Light-weight, easy to learn
- Disadvantages of using CodeIgniter framework
 - Learning curve
 - Locked in: the same code won't work for other framework
 - You might not know how they are implemented for some tasks

IS 651: Distributed Systems

Chapter 10: SOAP revisited

Jianwu Wang

Fall 2020

Learning Outcomes

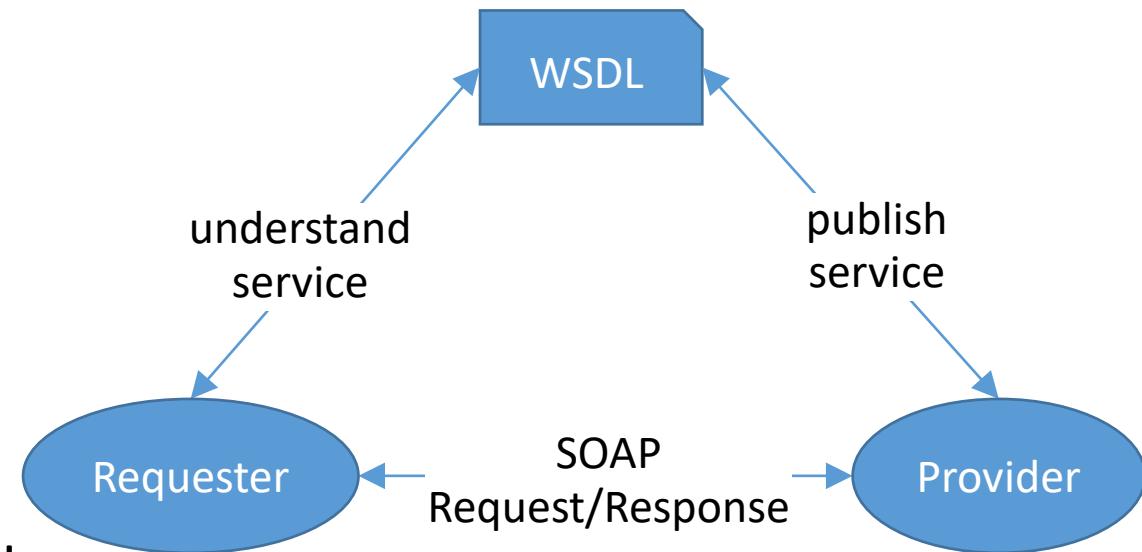
- After learning this chapter, you should be able to
 - Build Web service and its client using NuSOAP
 - Understand the task separation between third-party library and your own code
 - Know the basics of hard-coding and how to make it flexible

SOAP Revisited

- We have learned SOAP message and how to send it manually using tools like curl and postman.
- We will implement our own SOAP client codes and server codes in this chapter.
- NuSOAP: SOAP Toolkit for PHP Web Site
 - It contains a set of PHP libraries to allow developers to create, publish and call web services

SOAP Web Service and Third-party Library

- We often use third-party library for routine tasks
 - Generate WSDL at provider side
 - Parse WSDL at requester side
 - Generate SOAP at requester side
 - Parse SOAP at provider side
- Additional tasks
 - Implement service at provider side
 - Choose WSDL operation at requester side
 - Provide parameter values at requester side



Web Service Libraries

Name	Programming Language Support	Protocol Support
Apache Axis2	Java	SOAP, WSDL, REST
Apache CXF	Java	SOAP, WSDL, REST
Windows Communication Foundation	C#	SOAP, WSDL, REST
Flask	Python	REST
NuSOAP	PHP	SOAP, WSDL
...		

NuSOAP

- [NuSOAP at Sourceforge](#)
- Installation instruction
 - Put the zip file of the downloadable release (from SourceForge) in the `www` directory of your `gl` account. The easiest way to do this is to use the `wget` command on `gl`. You can also `scp` it from your machine to `gl`.
 - Use the `unzip` command to unzip the file.
 - Rename the long directory name to something shorter such as `nusoap`.
 - It is installed! It really only required copying the files to the server.

NuSOAP Example 1

- Implement NuSOAP Client for a published service
 - Hard-coded Temperature Conversion Web Service Client (replacing php to txt for source code):
<https://userpages.umbc.edu/~jianwu/is651/programs/ch10/convertTempWS.php>
 - Temperature Conversion Web Service Client Support User Input:
<https://userpages.umbc.edu/~jianwu/is651/programs/ch10/convertTempWS.html>

Hard-coded Client

- [NuSOAP Temp Client](#)
- [Client without htmlspecialchars\(\)](#)
- The example shows WSDL is the only thing a client needs to call the service

```
<?php
require_once('nusoap/lib/nusoap.php'); // 1. pull in nusoap library
$request = array('Fahrenheit' => '100'); // 2. create an array
$wsdl="https://www.w3schools.com/xml/tempconvert.asmx?WSDL";
$soapClient = new nusoap_client($wsdl, true); // 3. create a soapClient object
$result = $soapClient->call( // 4. use the call method from the soapClient object
    'FahrenheitToCelsius', // 5. a method name from the web service
    $request, // 6. the Request tag parameter for the method defined above
    'https://www.w3schools.com/xml/', // 7. the namespace
    'https://www.w3schools.com/xml/FahrenheitToCelsius' // 8. the soapaction
);
echo '<h2>Tempconvert Web Service Response from a PHP Client</h2>';
echo '<h2>PHP Array Response</h2>';
print_r($result); // 9. php function that displays an array variable
// 10. Display the request and response soap with 'htmlspecialchars'
echo '<h2>Request</h2>';
echo '<pre>' . htmlspecialchars($soapClient->request, ENT_QUOTES) . '</pre>';
echo '<h2>Response</h2>';
echo '<pre>' . htmlspecialchars($soapClient->response, ENT_QUOTES) . '</pre>';
?>
```

convertTempWS.php

SOAP Messages

Request

```
POST /xml/tempconvert.asmx HTTP/1.0
Host: www.w3schools.com
User-Agent: NuSOAP/0.9.5 (1.123)
Content-Type: text/xml; charset=ISO-8859-1
SOAPAction: "https://www.w3schools.com/xml/FahrenheitToCelsius"
Content-Length: 440
<?xml version="1.0" encoding="ISO-8859-1"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/">
  <SOAP-ENV:Body>
    <FahrenheitToCelsius xmlns="https://www.w3schools.com/xml/">
      <Fahrenheit>100</Fahrenheit>
    </FahrenheitToCelsius>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Response

```
HTTP/1.1 200 OK
Cache-Control: private, max-age=0,public
Content-Type: text/xml; charset=utf-8
Date: Tue, 17 Apr 2018 03:22:44 GMT
Server: Microsoft-IIS/7.5 X-AspNet-Version: 4.0.30319 X-Frame-Options: SAMEORIGIN X-Powered-By: ASP.NET
Content-Length: 415
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <soap:Body>
    <FahrenheitToCelsiusResponse xmlns="https://www.w3schools.com/xml/">
      <FahrenheitToCelsiusResult>37.7777777777778</FahrenheitToCelsiusResult>
    </FahrenheitToCelsiusResponse>
  </soap:Body>
</soap:Envelope>
```

A More Flexible NuSOAP Request

- NuSOAP SOAP Request (HTML calls PHP client)

```
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
<head>
  <meta http-equiv="Content-Type" content="text/html; charset=utf-8"/>
  <title>HTML form for Temperature Conversion web service</title>
</head>
<body>
  <h2>ConvertTemp</h2>
  <h3>HTML Form for convertTemp Web Service</h3>
  <form action="convertTempWS2.php" method="get"><!--1. http GET method -->
    Temperature: <input type="text" size="40" name="temp" /><!--2. parameter -->
    OperationName: <select name="opName">
      <option value="FahrenheitToCelsius">FahrenheitToCelsius</option>
      <option value="CelsiusToFahrenheit">CelsiusToFahrenheit</option>
    </select>
    <input type="submit" />
  </form>
</body>
</html>
```

convertTempWS2.html

NuSOAP Example 2

- Implement NuSOAP Client and Server

- CD Store Server:

- <https://userpages.umbc.edu/~jianwu/is651/programs/ch10/cd.php>

- CD Store Service Implementation:

- <https://userpages.umbc.edu/~jianwu/is651/programs/ch10/cdx.php>

- CD Store Client:

- <https://userpages.umbc.edu/~jianwu/is651/programs/ch10/cdc.php>



NuSOAP Server for CD Store

- [NuSOAP Server for CD Store](#)
- A webpage for the service is automatically generated

```
<?php
require_once("nusoap/lib/nusoap.php");
include('cdx.php');
$server = new nusoap_server;
$ns = "https://userpages.umbc.edu/~jianwu/cds";
//configure the WSDL for its name, namespace and style (rpc|document)
$server->configureWSDL('cds', $ns, '', 'document');
$server->register('cdStore', // register as a service operation.
    array('cd' => 'xsd:string', 'quant' => 'xsd:int'), //input
    array('invoice' => 'xsd:string'), //output
    $ns, // namespace
    $ns.'#cdStore', // soapaction
    'document', // style
    'literal', // use
    'Submit a PO for cdStore' // documentation
);
// cdx.php has the definition and implementation of cdStore function
$HTTP_RAW_POST_DATA = isset($HTTP_RAW_POST_DATA) ? $HTTP_RAW_POST_DATA : '';
$server->service($HTTP_RAW_POST_DATA); //processes request, returns response
?>
```

cd.php

NuSOAP Service Implementation for CD Store

- NuSOAP Server function implements the service operation

```
<?php
function cdStore($cd, $quant) {
    $price=array('cd1'=>12, 'cd2'=>9, 'cd3'=>11, 'cd4'=>15, 'cd5'=>20);
    $name=array('cd1'=>'Led Zepplin', 'cd2'=>'Buddy Miller', 'cd3'=>'AC/DC',
'cd4'=>'Neko Case', 'cd5'=>'Motorhead');
    $stock=array('cd1'=>8, 'cd2'=>10, 'cd3'=>6, 'cd4'=>2, 'cd5'=>4);
    if ($quant <= $stock[$cd])
        $result="In Stock - ".$quant." ".$name[$cd]."@".$price[$cd]." - Price=
$" . $quant*$price[$cd];
        else $result="Sorry, Out of Stock.";
    return array('invoice'=>$result);
}
?>
```

cdx.php

NuSOAP Client for CD Store

- [NuSOAP client calls the service \(hard-coded\)](#)
- **Invoice** In Stock - 2 Led Zeppelin@\$12 - Price= \$24

```
<?php
require_once( "nusoap/lib/nusoap.php" );
$ns="https://userpages.umbc.edu/~jianwu/cds";
$client = new
nusoap_client('https://userpages.umbc.edu/~jianwu/is651/programs/ch10/cd.php?wsdl', true);
$params=array("cd"=>"cd1", "quant"=> 2);
$result = $client->call("cdStore", array("parameters"=>$params), $ns);
echo "<h3>Invoice</h3>".$result['invoice'];
if ( $client->getError() ) {
    print "<h2>Soap Constructor Error:</h2><pre>".$client->getError()."</pre>";
}
?>
```

cdc.php

A More Real Purchase Order Scenario

