

Rest Web Service on IBM i

Mike Pavlak Solutions Consultant <u>mike.p@zend.com</u>

© All rights reserved. Zend Technologies, Inc.

Agenda

- Zend Server Update
- Discuss web services in general
- DB2 access
- Product Availability RPG Program
- Q&A





What's New with Zend Server



IBM Relationship History

Zend is an IBM strategic business partner

IBM selected Zend to bring PHP to IBM i in 2005

Beta, then Core, then Platform now Server

Thousands of downloads from Zend.com

Zend Server part of IBM i6.1 & i7.1 (distribution media)

Products are always available at Zend.com

Zend Server Mobile and Web Application Platform

IBM Relationship FAQ's

What do we get?

Zend Server Basic (Formerly Community Edition)

Zend Studio (Licensed for IBM only!)

1 year web support and updates (email/web 72 hour response) Phone support & improved SLA available from Zend at a charge

What happens after 1 year?

Products will still run as perpetual license

No updates to studio, server at Zend discretion

Forum support only

Support available for purchase from Zend



What Is Zend Server?

Production quality PHP stack

PHP, ZF2, DB connectivity, debugging extensions, and much more

Three Editions with Zend Server 6

Basic Edition - Included with IBM SWMA,

Enjoy Professional & Enterprise features for 7 days, upgrade to 28

Application monitoring and diagnostics (integrated with Zend Studio)

Multi-level performance enhancement capabilities

Easv ar	nd (aui	ck	c ir	ista	alla	ati	O	n	W	1/	Sc	oft	W	a	re	u	bd	a	tes		nd	ur	itv	hc)t f	ixes	
 Server server extension rates	Overview	Applications Co	ntigurations	Administration	administrator	12:32 🔬 🙆 (G- ?						Overview	Applicatio		onfigurations			ministrator		?	ser Ser	Overview	Applications				

	-			Dashboard II	eats Code Trected	Job General Sector Inthe	loge	Contect Zend	Monitor
-	renview		hboard		Overview	Dyttere incalls Dystere UMaydren		Weissee	
AL!	Apple	Bons				Tame Rampe: 1 day			Show Fill
•	ZendD	етоАрр		Events Breakdown		Requests Per Second	Aug. Response Tin	ne	100 10
•	ZendS	amplesA	sp.		2		34	M	Stown 3-14
			Resources 24	25	erformance : 10.5		10 -	×	0.0
					1	A	- 22		0
							h —		12
				R 4435.V	5 M	100 17. Apr 08.00	" 16.00 17. Adv	00.00	0
2044			cal Events					0.0000	
			Name	Last Deturned.	Application	Sunnary		Colls Trace	10 B
1	0	13	Sitve Request Execution	Today 09 07 50	ZeritSamplesApp	Request to http://192.168.15.110.10380/samp	oles/Toolick/CLCommand.php tools 29282ms		12
L	0	12	Sitve Query Execution	Today, 09:07:48	CentSamplesApp	Function (b2_execute() took 28592ma			E .
	0	12 11	Sitve Query Execution Database Error	Today, 09 107 48	CentSamplesApp	Function (b2_execute() took 28592ms Function mysql_connect() returned take		1	
					-		() caused a PHP error	and the show	
	Ø	11 6	Database Error	Today, 09:44:31	Cont/SamplesApp	Function mysql_connect() refurred talse	() caused a PHP error	the show	Terctor
	0	11 6 2	Database Error PHP Error	Today, 09-44-21 Today, 07-49-19	ConstSamplesApp	Function mysel_connect() returned take Function php_error_generator: generate_even	() caused a PHP error	a show	
	0	11 6 2	Database Error PHP Error Database Error	Today, 09:44:31 Today, 07:49:19 Today, 07:49:16	 ZendSamplesApp ZendDemoKpp ZendDemoKpp 	Function mysol_connect) intumed take Function phg_emat_generator: generator_even Function FOO_exec() returned take		show	Tunctor Tors

6

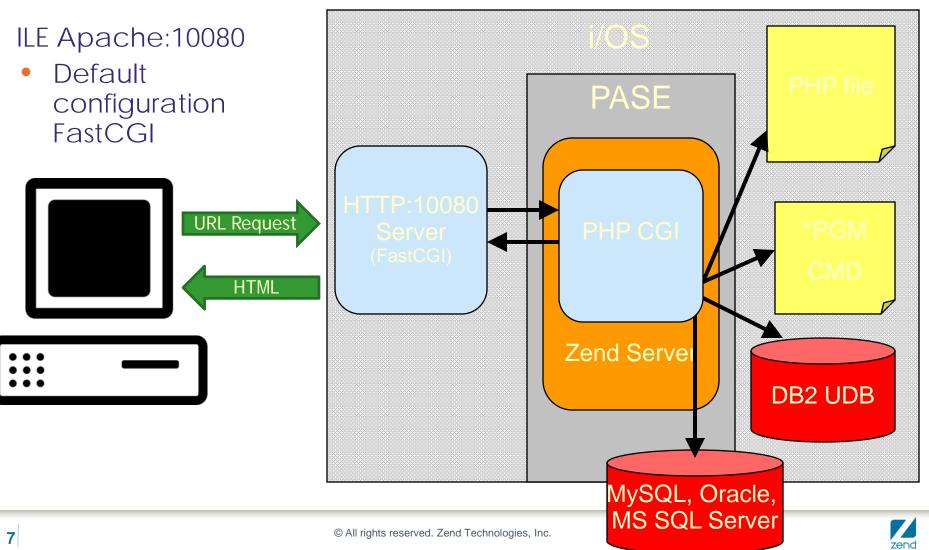
and the second	-	-	The state and the	Costitioner Events	CASH TENCING	Juli Garrie Somethin	store:	Contact Zend	
	itonng	Even							
Shin	Films a	Althread			Tana Ran	pr All 💽 From 16/4pr/2013 5:40	1= 17/4ex2013 5:40 III		
2	filler (B	Currently	ine filter selected						
Stewa .	1.14/34	Dehna Se	Delete Filtered						
	Court	Eveni ID	Raza	Last Docurred	Application	Summery		Code Trace	
	•	54	Slow Query Execution	Teday, 09:44:38	CandSamplesApp	Function db2_execute() took 1003ms			
n	Ð	10	PHP Env	Today, 09.44.31	SandSamplesApp	Function mysql_connect() caused a PHE	P error		
	•	11	Database Error	Today: 09:44:21	SandSamplesApp	Function mysql_connect() returned false			
		13	Slow Request Execution	Today: 09.07.50	SandSamplesApp	Request to http://192.168.15.110.10080/	samples/Teolkit/CLCommand.php.took.29282m	6	
	-	12	Slow Query Execution	Teday: 00.07.48	U ZendSamplesApp	Function db2_execute() took 28592ms		۲	
	63		Slow Request Execution	Today: 05 05 50	SandtlanglesApp	Request to http://192.108.15.110.10080/	samples/SQL_access/C02_SQL_example php		
	•		Custom Event	Today, 07 49 19	🚺 ZandDerro.App	Custom event triggered from /usi/local/20	index6\arlappshttp/_default_/0/demo-appk	show a	
	10	1.45	PHP Error	Teday, 07.49 15	ZandDemaApp	Function trigger_error() caused a PHP er	nor	stov (*)	
	08	1002-0127	0.0 1 10000/demo-application/m	ligste			Jamera (T1EDU ZEND.	Todax, 07, 42, 12	
		trigger_#						More Details O	
			_WARDING						
			Icendovrókarispisihitp/default, re-perectarit366210159.121	_Gidemo-application/1.0/public/	ntrigane				
0	63		PHP Error	Teday, 67-49-19	ZendDerroAco	Function php error generator generate	eventil) caused a PHP entr	abov	

	Overview						
	shboard Essere	Code Tracing	Job Garrow			# 0	ontact Zen
Monitoring Code Tracing 0.1664.1:1	localhostLocalsimyse/ex	amples/orderTotals.pl	iρ				
ummary							
Time Today, 15 35 32		Server US-11-Mitel		Apelicatio	a 1		
Type Manual request		File Size 2.13 KB					
fracing free Stretco per Function							
							-
🔄 Showment ny kaope 🔄 ni galagit be medilikas oromoto	19.948						P
Traced Functions			Running Time	Cistone		Called from the	#\$
PROJECT As sately order and an interfactories of them incating	ITE: Buccastryrelevana/selocter?			100.00%	\$2.360 cm		
DE HEADER // Zend Code Trailing: 0.1994.1							
IN HEADER/REPLACE See Cookie 2060-straggerhousehole							
BILLIOI C Program Filer (dR/ZandAgasha2948006Las	aldrong margladand sho			+1.00%	8012 mil	underTurbein phor (5)	
al ext							
* f rungi_connect_amo()				++.00%	0.000 ms	exterTetation pho (R)	
Forda war 0							
IN HEADER REPLACE Contemption to dotted							
CE HEALER HER LACE COMPANY WORKS							
				+1.00%	0.002 Au	anderTutals.php (52)	
E SENS HEADERS				+1.00% +1.00%		exterTates ptp (52) exterTates ptp (52)	
SEND JACABERS							



Zend Server Under the Covers

IBM i



Zend Server 5.x Users

Must install Zend Server 6 side by side with 5.x

Uses new directories

Copy your scripts to new directories, or

Use paths in /usr/local and change include path

Uses different port 10080 rather than 10088

Once successfully on Zend Server 6

Remove Zend Server 5.6 - DLTLICPGM (GO LICPGM, Option 12)



What's up with Web Services



Introduction to Web Services

- Tightly coupled
 - Mine, mine, mine...I own it all! mwa-ha-ha-ha-ha
 - API program calls
 - Stored procedures and ODBC
- Loosely coupled
 - We don't own all of our business logic
 - Web Services
 - Mash-ups



Direct Program Call



Advantages Compiled code Stable, predictable & efficient Changes required on both sides ensure security Disadvantages Changes require recompile Test, test, test Intersystem calls cumbersome



Usher in the new age of computing!

- Books that are the basis for my position
 - > The Cathedral & the Bazaar by Eric Raymond
 - Open Source is OK!
 - Dynamic is in, Monolithic is out
 - But there is room for both...for a while
 - Small Pieces Loosely Joined by David Weinberger
 - Modular is better!
 - Many small pieces around the Internet
 - Scattered amongst the cloud!



What is a Web Service?

- W3C says...
 - A software system designed to support interoperable machine to machine interaction over a network.
- Key words
 - Software system
 - Interoperable
 - Machine to machine
 - Network
- It's really just another way to call programs!





Who uses Web Services?

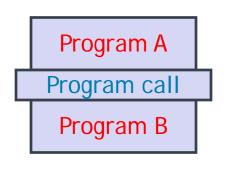
- Web presence today
 - ▶ Google → Maps, Spell checkers, etc.
 - ► Amazon.com → Product availability, Order processing
 - ► Salesforce.com → Application Integration
 - ► TerraServer → Cloud based applications
 - Many, many more
- API layer replacement tomorrow
 - Inter-program communication
 - Inter-system communication

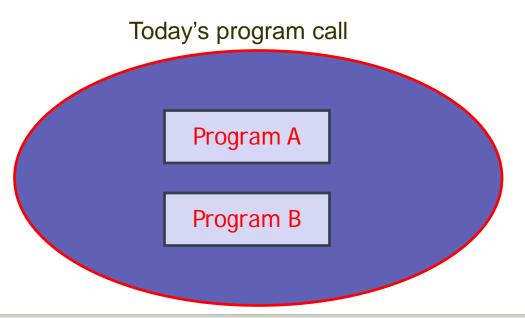


Why use Web Services?

- SOA Layer
 - Fancy term for modern program calls!
 - Parts are self defining and self documenting
 - Code is modular from the start
 - Facilitate the upgrade process









© All rights reserved. Zend Technologies, Inc.

What types

SOAP

Simple Object Access Protocol Self defining

Can be highly complex

ReST

Representational State Transfer

Much like API call

Requires external documentation



Data Access using ReST



© All rights reserved. Zend Technologies, Inc.

One example for two methods

Part 1

Form with drop down info populated by web service Select product and then move to part two No data on local IBM i

Part 2

Take selected item and call web service Remote web service calls RPG program RPG program develops on hand quantity & returns Again, no data on local IBM i



Two system setup

- Local & remote both IBM i for this example
- Local system can be ANY platform running PHP
- Remote system can also be any platform
 - In this example is IBM i
 - But must have access to Inventory data
 - Inventory availability is in RPG business logic
 - Simple example, can be VERY complex!



HTML Form using PHP

WebService Form 2 ×	
← → C □ 192.168.15.107:10088/mpav	lak/articles/websvc/WSForm2.php 🔍 숬 💽 🧔 💩 🌩 🖃
Pro WebService Form 2 ×	
	0088/mpavlak/articles/websvc/WSForm2.php 🔍 🏠 🚰 💩 🌞 🚅
List Product Inform	nation
Produ	
Chair List Products and G	et Details
Look U Product List:	
Stool	
Chair Stool	
Table	



Form source

```
1 <html><head><title>WebService Form 2</title></head>
 2⊖<style>
            { color:orange; margin-bottom:3px; }
 3 h1
            { color:red; } h3 { color:green; }
 4 h2
 5 .ValText { width:80px; } .OpText { width:250px; } </style>
 6⊖ <body>
 7 <h1>Product Information</h1><h2>List Products and Get Details</h2>
 8 <?php require_once 'WSCommon.php';</pre>
 9
   // Call the web service to populate the drop down in the form. Then call the client to show detail.
10
11
12 $SERVER URL = $ProductInfo . '?Function=List';
  //get the XML package
14 $response = file get contents($SERVER URL); //Send the request
       //turn it into an object
15
   $productsResponse = simplexml_load_string($response);
16
       //flip it into an array and process.
17
   $response array = json decode(json encode($productsResponse),true);
18
19
20 ?>
21 
   <Form action="WSClient2.php" method="GET">
22
23
       <h3>Product List:</h3>
       <select class="OpText" name="ProductSelected">
24
25
       <?php
       foreach ($response array as $productValue) {
26
27
           print ('<Option value="'. $productValue['prodNum'] . ''>'. $productValue['prodName'] . "</Option>\n\t");
28
       }
29
       >></select>
  /><Input type="submit" value="Look Up"></Form></body></html>
30
```



WSCommon.php

Common routines and standard locations

Here I store the location of my services

Easy to adjust and I can scan for common services

I'm using hardcoded IPs, but recommend DNS

```
<?php
 1
 2
 3
   // Common routines among the scripts...
 4
   // Formulas array used in drop down and validation...
 5
   $Formulas = array( 'AreaRectangle'=>'Area of a Rectangle',
6
7
                        'Pythgorean'=>'Length of the hypotenuse of right triangle',
                        'VolumeCone'=>'Volume of a Cone');
8
9
10
   $MathFormulaURLLocal = 'http://localhost:10088/mpavlak/articles/websvc/WSServer1.php';
   $MathFormulaURLRemote = 'http://192.168.15.112:10088/mpavlak/articles/websvc/WSServer1.php';
11
   $ProductInfo = 'http://192.168.15.112:10088/mpavlak/articles/websvc/WSServer2.php';
```



Target LPAR and host service, part 1

```
<?php
  1
  2
  3
      require_once 'ServerUtils.php';
  4
  5
       // Listing function and XML Builder
  6
  7
       if ($ GET ['Function'] == 'List') {
  8
               $products = listprod ();
  9
10
11
               print '<?xml version="1.0"?>';
12
               print ("<products>\n");
13
14
               If (is array ( $products )) {
                       foreach ( $products as $prod_array ) {
15
16
                                $productNumber = $prod array ['PRODUCTNUMBER'];
17
                                $productName = $prod array ['PRODUCTNAME'];
18
                                print ("<prod$productNumber>");
19
                                print ("<predNum>$productNumber</predNum><predName>$productName</predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName></predName>
20
                        }
21
                       print '</products>';
22
               } else {
23
                       print ("<error>Product List not Available</error>");
24
                }
25
```



Server Utils Part 1

```
39<sup>©</sup> function listProd() {
40
41
       $IBMiLink = Connect();
42
       $sq1 = 'SELECT productnumber, productname FROM zenddata.product';
43
       //$sql = 'SELECT CUSTOMER NUMBER, CUSTOMER NAME FROM zenddata.customer';
       $stmt = getdata($IBMiLink,$sql);
44
       while($row=db2 fetch assoc($stmt)) {
45
            //print r($row); echo "<BR>";
46
            $products[] = ($row);
47
48
        }
49
       if (is_array($products))
50
51
            return $products;
52
       else
53
            return "Error retrieving products";
54 }
```



Call RPG using ReST



© All rights reserved. Zend Technologies, Inc.

Remote service calls RPG

Review

- Created form to display products
- Products available listed on remote system
- Have product ID
- Now look up remote system for availability



Select product from form

ervice Form 2 ×
C 🗋 192.168.15.107:10088/mpavlak/articles/websvc/WSForm2.php 🔍 🏠 🚱 💩 🌞 🚅
WebService Form 2 ×
← → C 🗋 192.168.15.107:10088/mpavlak/articles/websvc/WSForm2.php 🔍 🏠 🛃 🧔 🎄 🚅
Product Information
List Products and Get Details
Product List:
Stool
Chair Stool
Table



Form source

```
1 <html><head><title>WebService Form 2</title></head>
 2⊖<style>
            { color:orange; margin-bottom:3px; }
 3 h1
            { color:red; } h3 { color:green; }
 4 h2
 5 .ValText { width:80px; } .OpText { width:250px; } </style>
 6⊖ <body>
 7 <h1>Product Information</h1><h2>List Products and Get Details</h2>
 8 <?php require_once 'WSCommon.php';</pre>
 9
   // Call the web service to populate the drop down in the form. Then call the client to show detail.
10
11
12
   $SERVER URL = $ProductInfo . '?Function=List';
       //get the XML package
13
   $response = file_get_contents($SERVER_URL); //Send the request
14
       //turn it into an object
15
   $productsResponse = simplexml load string($response);
16
       //flip it into an array and process.
17
18 $response array = json decode(json encode($productsResponse),true);
19
21 
22 <Form action="WSClient2.php" method="GET">
       <h3>Product List:</h3>
23
      <select class="OpText" name="PreductSelected">
24
25
       <?php
       foreach ($response array as $productValue) {
26
27
           print ('<Option value="'. $productValue['prodNum'] . ''>'. $productValue['prodName'] . "</Option>\n\t");
28
       }
29
       >></select>
  <br/><sinput type="submit" value="Look Up"></Form></body></html>
30
```



Now call WSClient2.php

```
10<html><head><title>Formla web service</title>
2⊖ <style>
3 h1
           { color:orange; margin-bottom:3px; }
4 h2 { color:red;}
5 h3 { color:green;}
6 pre { background-color:lightgreen; padding:5px; border:10px solid red; width:250px }
7⊖</style></head><body>
8 <h1>On Hand Quantity</h1>
9 <?php
  require_once("WSCommon.php");
10
11
12 //Build request
   $prod = $ GET['ProductSelected'];
13
14
  // Call the web service to determine on hand quantity or error.
16 $SERVER URL = $ProductInfo . "?Function=onHand&Prod=$prod";
17
18 //get the XML package
19 $response = file_get_contents($SERVER_URL); //Send the request
20 //turn it into an object
21 $productsResponse = simplexml_load_string($response);
22 //flip it into an array and process.
23
   $response array = json decode(json encode($productsResponse),true);
24
25
   print "here is the reponse: "; print r($response array). "<br /><br />";
26
27
   $xml = simplexml load string($response); //Parse the response and display
28 echo '<br/>><br />' . $xml->Parm1;
29 ?><b><a href="WSForm2.php">Start Over</a></b></body></html>
```



Target LPAR and host service, part 2

```
56 function listOnHand($prod) {
57
       $sess = getSessions ();
       // Call the open source toolkit for product info...
58
59
       $db = 'V7R1GOLD'; $user = ''; $pass = ''; $extension = 'ibm db2'; $ohQty = 0; $error = '';
60
61
62
       $ToolkitServiceObj = ToolkitService::getInstance ( $db, $user, $pass, $extension );
63
       $ToolkitServiceObj->setToolkitServiceParams ( array (
64
                'InternalKey' => "/tmp/$sess"
65
       ));
66
67
       $param [] = $ToolkitServiceObj->AddParameterPackDec ( 'both', 9, 0, 'PRODUCT', 'PRODUCT', $prod );
68
       $param [] = $ToolkitServiceObj->AddParameterPackDec ( 'both', 10, 0, 'ONHQTY', 'ONHQTY', $ohQty );
69
       $param [] = $ToolkitServiceObj->AddParameterChar ( 'both', 256, 'ERROR', 'ERROR', $error );
70
       $result = $ToolkitServiceObj->CLCommand ( "RMVLIBLE ZENDDATA" );
71
       $result = $ToolkitServiceObj->CLCommand ( "ADDLIBLE ZENDDATA" );
72
       $result = $ToolkitServiceObj->PgmCall ( "PRODAVAIL", "ZENDDATA", $param, null, null );
73
74
       if ($result) {
75
           return $result ['io param'];
76
       } else
77
           return "Execution failed.";
78
       echo 'Hello Mike<br />';
79
80
       $ToolkitServiceObj->disconnect ();
81
```



RPG code

FFilename++IPEA FPRODINV IF		ice+.Keywords+++++++++ K	* * * * * * * * * * *							
C *ENTRY	PLIST									
С	PARM	Prodin	9 0							
С	PARM	QtyAvail	100							
С	PARM	Error	256							
/free chain Prod if %found;	in PRODINVR;									
QtyAvail = ProdONH - ProdALC;										
Error = 'Order Inventory Successful';										
else;										
Error =	Error = 'Order Item not found';									
endif;										
<pre>#InLR = #On;</pre>										



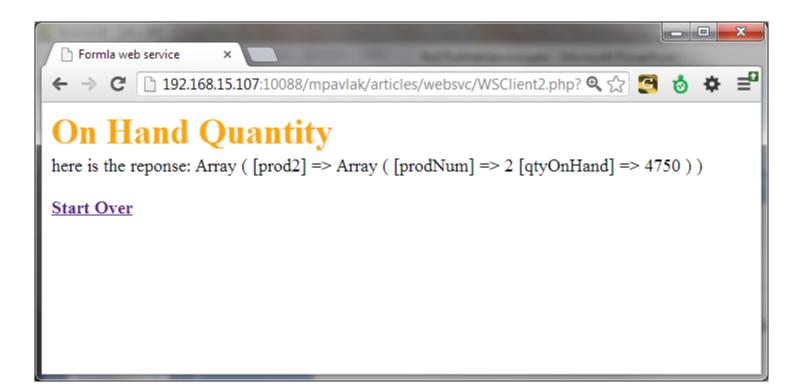
WSClient2.php receieves info and presents

```
10<html><head><title>Formla web service</title>
2⊖ <style>
3 h1
           { color:orange; margin-bottom:3px; }
4 h2 { color:red;}
5 h3 { color:green;}
6 pre { background-color:lightgreen; padding:5px; border:10px solid red; width:250px }
7⊖</style></head><body>
8 <h1>On Hand Quantity</h1>
9 <?php
  require once("WSCommon.php");
10
11
12 //Build request
   $prod = $ GET['ProductSelected'];
13
14
  // Call the web service to determine on hand quantity or error.
16 $SERVER URL = $ProductInfo . "?Function=onHand&Prod=$prod":
17
18 //get the XML package
19 $response = file_get_contents($SERVER_URL); //Send the request
20 //turn it into an object
21 $productsResponse = simplexml_load_string($response);
22 //flip it into an array and process.
23
   $response array = json decode(json encode($productsResponse),true);
24
25
   print "here is the reponse: "; print r($response array). "<br /><br />";
26
27
   $xml = simplexml load string($response); //Parse the response and display
   echo '<br/>
<br/>
br/>
<br />' . $xml->Parm1;
28
29 ?><b><a href="WSForm2.php">Start Over</a></b></body></html>
```



Final output

Not pretty, but would be used in finished application Shows on hand quantity for product selected





Feature article at iProDeveloper

With your subscription

Can read article and download code



Wrap it up!



© All rights reserved. Zend Technologies, Inc.

Q&A

www.zend.com

mike.p@zend.com

