
PHP Toolkit from Zend and IBM

Open source on IBM i



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Focus on PHP with IBM i

- PHP project leader, Zend/IBM Toolkit
- Contributor, Zend Framework DB2/i enhancements
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Where to download these slides

From my site

<http://alanseiden.com/presentations>

On SlideShare

<http://slideshare.net/aseiden>

The latest version will be available on both sites

Today's toolkit topics

- **Toolkit from Zend/IBM**
 - Brings out beauty of PHP on IBM i
- **Then and now**
- **Who and how?**
 - Open source on IBM i? Yes!
 - Community project
- **Install/configure/use**
- **Program and command calls**
- **Compatibility Wrapper (CW)**
- **Tips, troubleshooting, resources**

Zend Server quick primer

PHP on i—always something new

- **2004: i5php.net**
 - Unofficial PHP binary for “i” available online
- **2005: IBM and Zend got together**
- **2006: Zend Core for i5/OS**
 - Official release with help from IBM, technical support from Zend
- **2007: Zend Studio and Zend Platform**
- **2008: Zend Framework supports “i” variant of db2**
- **2009: Zend Server beta for “i”**
- **2010: Zend Server 5 released**
- **2011: New toolkit on “i” ...and GA in 2012....**
- **2013: Zend Server 6, now on IBM i (as of yesterday)**

Zend Server for IBM i

- **Two license levels**

- Zend Server for IBM i Community Edition (CE)

- Available at no charge per IBM partnership
 - Includes “Optimizer+” that speeds up code
 - One year silver (email) support

- Zend Server for IBM i, a.k.a. Professional Edition

- Subscription license
 - High value extra features, Code Tracing, Monitoring, higher support levels

- **Details of differences:**

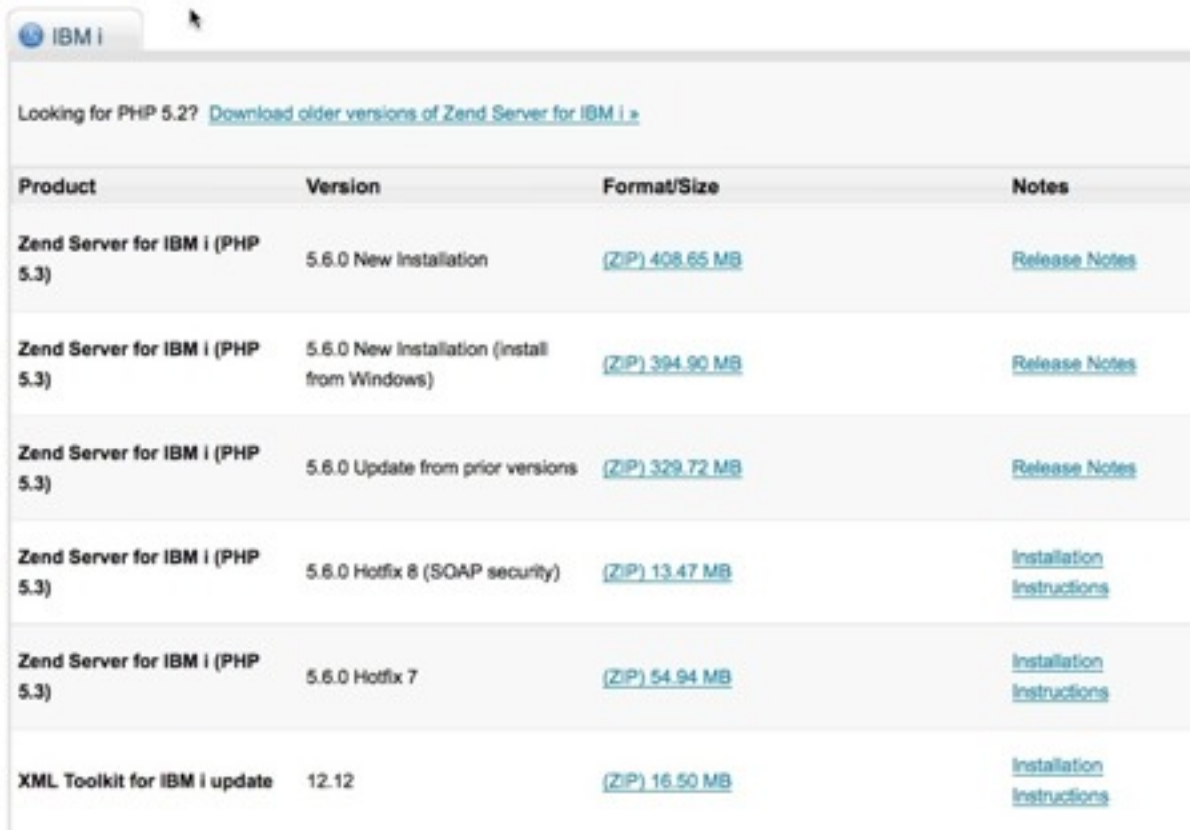
- <http://mikepavlak.blogspot.com/2010/08/i-want-to-do-php-on-ibm-i-so-what-do-i.html>

Zend Server Installation

- **<http://www.zend.com/en/products/server/downloads-ibmi>**
 - Download Zend Server, hotfixes, and any toolkit updates from here
- **Zend Server prerequisites**
 - IBM i v5r4 or higher and:
 - IBM's FastCGI PTF (free)
 - http://files.zend.com/help/Zend-Server-IBMi/i5_installing_zend_server.htm
- **Try Zend Studio's IDE (no charge, courtesy of IBM)**
 - "Zend Studio for Eclipse"
 - <http://zend.com/en/products/studio/downloads>

Screenshot of download page

Example Zend Server / IBM i download page



Looking for PHP 5.2? [Download older versions of Zend Server for IBM i »](#)

Product	Version	Format/Size	Notes
Zend Server for IBM i (PHP 5.3)	5.6.0 New Installation	(ZIP) 408.65 MB	Release Notes
Zend Server for IBM i (PHP 5.3)	5.6.0 New Installation (install from Windows)	(ZIP) 394.90 MB	Release Notes
Zend Server for IBM i (PHP 5.3)	5.6.0 Update from prior versions	(ZIP) 329.72 MB	Release Notes
Zend Server for IBM i (PHP 5.3)	5.6.0 Hotfix 8 (SOAP security)	(ZIP) 13.47 MB	Installation Instructions
Zend Server for IBM i (PHP 5.3)	5.6.0 Hotfix 7	(ZIP) 54.94 MB	Installation Instructions
XML Toolkit for IBM i update	12.12	(ZIP) 16.50 MB	Installation Instructions

Additional prerequisites for toolkit

- **IBM i V5R4 or higher**
 - 6.1+ is even better
- **Cumulative PTFs for IBM i**
 - HTTP
 - Java (contains PASE)
 - DB2 (latest group) or **at minimum, these “CLOB” PTFs**
 - SI39831/SI39917 - for 7.1
 - SI39829 - for 6.1
 - SI39610 - for v5r4

Toolkit connects PHP to the i

Access traditional 'i' resources from PHP

- **Call RPG, COBOL, CL**
 - Including IBM i APIs
 - Most popular use of toolkit
- **Commands**
 - ADDLIB LIB(MYLIB)
 - More command types (details later)
- **Read/write objects that store data**
 - Data areas
 - User spaces
- **Send/receive data queues**
- **Get lists, read data or attributes from these:**
 - Spooled files
 - Job logs
 - Active jobs
 - Objects
 - System values

Call RPG/COBOL: adapt 5250 logic to the web

The image shows a web browser window displaying the Medrano Express website. The browser's address bar shows the URL: <http://l.medranopress.com/MedranoExpress/ISOE/boorder.php?invoice=00192913>. The page header includes the Medrano Express logo and the text "bienvenido! LA GUADALUPANA MARKET (GUAMAR) February 2,2010 Branch Medrano Express - Minneapolis Phone: 612-721-4547".

The main content area is titled "Work with Order 00192913-1" and displays order details:

- Bill-to Customer:** 2223492 CALDERON RIVERA, MARGARITA 754 26TH ST EAST MOLINE, IL 61244-1864 USA Telephone: 309-292-3297
- Ship-to:** FAMILIA CALDERON RIVAS, ELSA MARINA BARRIO LAS CRUCITAS SANTA CRUZ DE VOJOLA, CORTES HONDURAS Telephone: 6549412
- Branch:** 65 Medrano Express - Minneapolis
- Order Date:** 2009-12-15
- Order taken by:** YVONNES (Branch-65)
- Dealer:** GUAMAR-LA GUADALUPANA MARKET
- Zone:** GUAMAR

Below the order details, there are pickup and shipment dates with comments: "Pickup Date-Comments: 2009-01-02 ESTA CAJA SE RECOGERA POR FEDEX" and "Shipment Date-Comments: 2009-01-05".

The main table lists the order items:

Line#	Item	Item Description	# of Pkgs	Declared Value	Quantity	Unit Price	Customs Fee	Insurance	Extended Amount
1	22"x22"x22"	Box Size: 22 X 22 X 22 Weight: .03	1	500.00	1	165.00	.00	15.00	180.00
Status: X									
Qty / Package Content and Description									
Package 1 of 1									
0 ZAPATOS				0.00					
0 BOPA				0.00					
0 CAMARA DE VIDEO				0.00					
0 PACLES DESECHABLES				0.00					
Total Content Value:				0.00					
Order Totals:			1		1		0.00	15.00	180.00

At the bottom of the page, there are buttons for "Print Invoice", "Print Labels", and "Add New Notes". Below these buttons is an "Order Notes" section with the following entries:

- 2009-12-15 Invoice scheduled for PU on 12/15/09 By YVONNES. SYSTEM
- 2009-12-15 Package Content entered/updated by YVONNES. SYSTEM
- 2009-12-16 Zone changed from LAPAZM To GUAMAR by YALITZAF. SYSTEM

On the left side of the image, there is a vertical strip of text in a green monospace font, typical of a 5250 terminal. It contains information such as "Minnesota", "Invoice #", "Bill To...", "CALDERON RIVERA", "754 26TH ST", "EAST MOLINE, IL 61244-1864", "Country USA U", "Phone 309-2", "Dealer. GUAMAR", "Empty Box Deliv", "Request Pickup", "Zone", "Request Ship Date". A large red arrow points from this terminal text towards the web interface, illustrating the transition from legacy mainframe logic to a web-based application.

Toolkit

Open Source is good for Toolkit

- **Free and Open Source Software (FOSS)**
 - Source code is there—read it, learn, extend, give feedback
 - Open source on IBM i appeals to young developers
- **Collaborative**
 - IBM built functionality on the back end
 - XMLSERVICE back-end
 - Zend built the PHP interface (Sam Pinkhasov and team)
 - Later, Zend asked me to build the CW and then to maintain and help support the package
- **Community involved**
 - People are already contributing enhancements and fixes (PHP and RPG code). Luca Zovi, Martin Hieden. Tell us your ideas

Is it really free?

- **Yes!**
 - BSD license (business friendly)
 - http://en.wikipedia.org/wiki/BSD_licenses
 - Source code available to all
 - Community code contributions welcome
 - Inner workings of toolkit revealed—nothing hidden
 - Fast problem resolution...sometimes in hours
- **No registration or special license required**
 - (Zend Server itself does work better with a license)
- **Never a “nag” message**
 - Your QSYSOPR message queue can relax

Toolkits shipped by Zend (then and now)

- **2006-2011: i5 Toolkit (Easycom)**
 - No longer shipped with Zend Server
 - May still be used if already installed
 - Remains available commercially from Aura company
- **2012+: New Open Source Toolkit**
 - Courtesy of Zend and IBM
 - Made of pure PHP and RPG, free and open source
 - Functionality similar to i5 Toolkit
 - Includes a Compatibility Wrapper (CW), developed by me, to ease transition to new toolkit

Do I have to switch to the new toolkit?

- **If a fresh Zend Server install**

- Use new Open Source toolkit
- Zend Server 5.6+ no longer includes Easycom
- Compatibility Wrapper helps migration
 - Intercepts i5 function calls
 - Passes to new toolkit, transparently

- **Upgrading older Zend Server to 5.6 via PTF**

- PTF upgrade process retains Easycom
- Continue to use Easycom or migrate to new toolkit

XML Service

Toolkit's back-end: "XML Service"

- **One of IBM's few open source projects on IBM i**
 - Though IBM is generally an open source advocate
- **Made of RPG and DB2 stored procedures**
- **Like a generic stored procedure**
 - Without the hassle of setting up individual stored procedures
 - Works via XML passed to/from it
 - Can handle complex data structures easily
- **Tony Cairns, IBM Rochester**



XML Service architecture

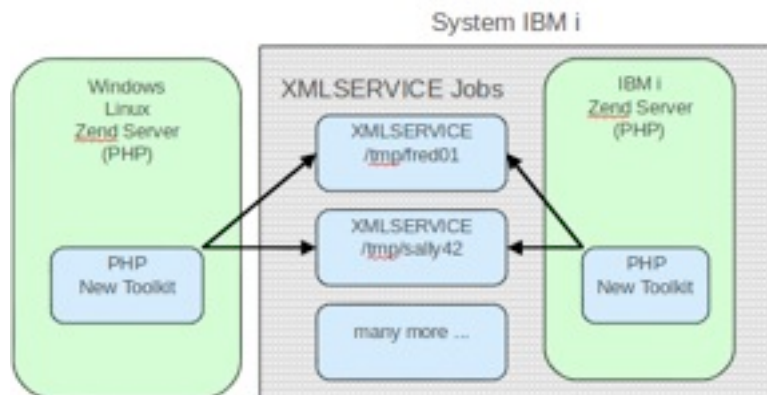
- **Cross platform, accessible by all languages**
- **Expects parameters defined in XML**
- (XML is handled for you by PHP toolkit)

```
<pgm name='ZZCALL' lib='MYLIB'>
  <parm><data type='1A'>a</data></parm>
  <parm><data type='1A'>b</data></parm>
  <parm><data type='7p4'>11.1111</data></parm>
  <parm><data type='12p2'>222.22</data></parm>
  <parm><ds>
    <data type='1A'>x</data>
    <data type='1A'>y</data>
    <data type='7p4'>66.6666</data>
    <data type='12p2'>77777.77</data>
  </ds>
</parm>
<return><data type='10i0'>0</data></return>
</pgm>
```

PHP toolkit “front end”

PHP front end

- **PHP talks to XMLSERVICE through generic stored procedures (installed automatically with package)**
- **Any environment that can send/receive XML can use XMLSERVICE**



- **PHP is the first major “client” to use XMLSERVICE but there will be more, further strengthening XMLSERVICE as a back-end**
 - Craig Pelkie reports good results using .NET

Tony and Alan at work (ZendCon '11)



Install and configure

Two ways to get new toolkit

- **Zend Server download page**
 - Official, tested release packaged as a PTF
- **Young i Professionals (YiPs) site**
 - Various levels of testing done
 - Install from source code
- **Details coming up**

Official release

- <http://zend.com/en/products/server/downloads>
 - Approved QA version in latest quarterly PTF

Product	Version	Format/Size	Notes
Zend Server for IBM i (PHP 5.3)	5.6.0 New Installation	(ZIP) 408.65 MB	
Zend Server for IBM i (PHP 5.3)	5.6.0 New Installation (install from Windows)	(ZIP) 394.90 MB	
Zend Server for IBM i (PHP 5.3)	5.6.0 Update from prior versions	(ZIP) 329.72 MB	Release Notes
Various hotfixes here...			
Zend Server for IBM i	5.6.0 Hotfix 4	(ZIP) 23.95 MB	Instructions
Zend Server for IBM i	5.6.0 Hotfix 5 (PHP 5.3 only)	(ZIP) 2.69 MB	
XML Toolkit for IBM i	12.07	(ZIP) 14.79 MB	Installation Instructions

Leading edge versions on YiPs

- **Young i Professionals (YiPs) site**

- <http://youngiprofessionals.com/wiki/XMLSERVICE>
- Latest tested versions there
- Install from source code
- Two parts: RPG and PHP

1) XMLSERVICE Server: Download XMLSERVICE RPG source library (RPG)

{Download
Latest}

{XMLSERVICE Changelog}

2) PHP Client: Download new Toolkit API and Compatibility Wrapper (CW)

{Download
Latest}

{PHP toolkit API and CW changelog}

- **Installation instructions are on the site**

“Bleeding edge” also on YiPs

- **Test versions of XMLSERVICE**
 - “For brave and helpful only”
 - Rapid releases to resolve issues or add functionality
 - <http://174.79.32.155/wiki/index.php/XMLSERVICE/XMLSERVICETesting>
- **Look under “Active test versions”**

XMLSERVICE Testing

XMLSERVICE new enhancements and fix testing [Quick Page Table of Contents](#)

[Goto Main Page](#)

Notification

Test versions are for brave and helpful ONLY. This page is explanation of things being worked with XMLSERVICE. You are welcome to download the new version and try it out (main page under testing), but we recommend you try it from the test library XMLSERVICE (ortxm), not production (ortxm2) until the actual release GA. We appreciate any help checking out XMLSERVICE open source project (free programs), our goal is not to be intrusive into your daily activities, but your help testing makes XMLSERVICE better for every one. If you find an overriding issue or need a critical enhancement please let one of the authors know via email (main page).

Zend usually produces a PTF every quarter new toolkit RPG+PHP wrapper, so XMLSERVICE new main page releases will generally follow a 3 month cycle of testing (March, June, Sept, Dec.).

Active test versions

- none

Older test versions

- 2012-09-14 - xmlservice-rpg-1.7.2-sgt.zip
 - BUG — VSR4 increase POM OPM limit 32 to 256 parms (Thanks Sandy)
 - Note: VSR4 issue OPM (vSR4=true or <pgm mode='opm' ...)
 - Parm max is essentially unlimited for non-OPM (vSR4=false)

YiPs installation location

- **Two choices for XMLSERVICE installation library**
 - CRTXML compiles into XMLSERVICE test library
 - If use test library, configure with toolkit.ini's "XMLServiceLib"
 - CRTXML2 compiles into ZENDSVR production library
- **Standard directory for PHP toolkit code**
 - /usr/local/zendsvr/share/ToolkitApi

If added toolkit to Zend Server via ZS PTF

- **Must add path to Include_Path in php.ini**
- **via GUI: Server Setup → Directives → Paths & Directories**
- **Add path: “:/usr/local/zendsvr/share/ToolkitAPI”**



Useful settings in toolkit.ini

- **Located in /usr/local/zendsvr/share/ToolkitApi**
- **Useful settings:**
 - [system]
 - Debug=true
 - Creates debug.log
 - XMLServiceLib = "ZENDSVR"
 - Or = "XMLSERVICE"
 - Encoding = "ISO-8859-1"
 - For some, = "UTF-8" works better (a Japanese report)

Set your CCSID

- **Coded Character Set Identifier**
 - Determines translation between EBCDIC and ASCII
 - ASCII or similar “PC” text format
 - 65535 is special, meaning “never translate”
 - 65535 is NOT our friend, but IS the default QCCSID
 - Everyone must choose and set a CCSID
 - North Americans use 37. Different elsewhere
- **Not only for toolkit**
 - Many DB2 operations require CCSID
- **Next slide, see how to set it**

How to check or set CCSID

- **DSPSYSVAL QCCSID**

- If not 65535, you're probably OK
- Change with CHGSYSVAL SYSVAL(QCCSID) VALUE(xyz)

- **or in Apache config: /www/zendsvr/conf/httpd.conf**

- USA settings:
 - DefaultFsCCSID 37
 - CGIJobCCSID 37
- Different outside of USA. Check list of "Job CCSID":
 - http://www-03.ibm.com/systems/i/software/globalization/default_list.html

- **Everyone must set a CCSID**

- This really means YOU.....otherwise toolkit will not work
- I mean it 😊

- **P.S. Please set your CCSID**

Verify installation: run demo scripts

- `/www/zendsvr/htdocs/Samples/Toolkit/*.*`
- `http://your_i:10088/Samples/Toolkit/`

New PHP Toolkit Demo Scripts

The new Toolkit technology is based on an open source XML transport developed by IBM and Zend, which allows you to extend PHP code to access IBM i resources. The Toolkit XML service

protocol is designed to work with "state full" RPG/CL programs (many open database files and other system resources), so a developer won't have to rewrite any programs just to get on the web.

Clicking on the script name will run the code and clicking on the display code will display the PHP code. The scripts location is `/www/zendsvr/htdocs/NewToolkit`.

- [Run Display Library \(DSPLIB\) command](#) [Display Code](#)
- [Program Call with two parameters](#) [Display Code](#)
- [Program Call with Data structure parameters](#) [Display Code](#)
- [Service Program call that returns function value](#) [Display Code](#)

Additional code samples

- Work with Spooled File entries [Display Code](#)
- Work with Data Queue (keyed) [Display Code](#)
- Work with User Space [Display Code](#)
- Work with Objects [Display Code](#)
- Work with Jobs [Display Code](#)

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Program calls

Calling script with result

http://my_ibmi:10088/Samples/Toolkit/Call_program_RPG.html

Calling an RPG program with two parameters

Code: (Valid Code is 1 or 2)

Click “Call program” to pass parameter to PHP and then RPG
http://my_ibmi:10088/Samples/Toolkit/Call_RPG_example.php

Parameter Name	Parameter Value
CODE	1
DESC	IBM

RPG program from ZENDSVR samples

File: ZENDSVR/QRPGLESRC

Member: COMMONPGM

```
C      *ENTRY          PLIST
C              PARM                CODE          10
C              PARM                NAME          10
*****
C      CODE           IFEQ          ' 1 '
C              move1          ' IBM '          name
C              ELSE
C      CODE           IFEQ          ' 2 '
C              move1          ' Zend '          name
C              ELSE
C              move1          ' wrong code '    name
C              ENDIF
C              ENDIF
C*
C              SETON
C              RETURN
```

LR

PHP to call it

/www/zendsvr/htdocs/Samples/Toolkit/Call_RPG_example.php

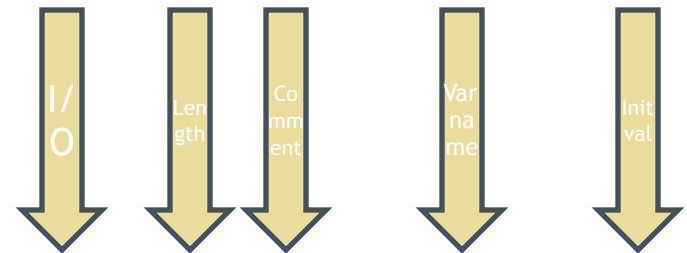
```
75 require_once('ToolkitService.php'); // bring in toolkit class
```

```
76     //Instantiate the toolkit service object...
77 $ToolkitServiceObj->setToolkitServiceParams(array('InternalKey'=>"/tmp/$user"));
78
79 // Program call...
80 $code = 2; //1 = IBM and 2 = Zend...
81 $desc = ' ';
82
83 $param[] = $ToolkitServiceObj->AddParameterChar('both', 10, 'CODE', 'CODE', $code);
84 $param[] = $ToolkitServiceObj->AddParameterChar('both', 10, 'DESC', 'DESC', $desc);
85
86 $result = $ToolkitServiceObj->PgmCall("COMMONPGM", "ZENDSVR", $param, null, null);
```

AddParameterChar in detail

```
function AddParameterChar(  
    $io, $size, $comment, $varName = '', $value, $varying, $dimension)
```

AddParameterChar() is defined in ToolkitService.php



Our example:

```
37 $param[] = $ToolkitServiceObj->AddParameterChar('both', 10, 'CODE', 'CODE', $code);  
38 $param[] = $ToolkitServiceObj->AddParameterChar('both', 10, 'DESC', 'DESC', $desc);  
39  
40 $result = $ToolkitServiceObj->PgmCall("COMMONPGM", "ZENDSVR", $param, null, null);  
41  
42 if($result){  
43     showTable( $result['io_param']);  
44 }  
45 else  
46     echo "Execution failed.";
```

More parameter types

```
AddParameterChar($io, $size, $comment, $varName, $value, $varying, $dimension)
```

```
AddParameterInt32($io, $comment, $varName, $value, $dimension)
```

```
AddParameterInt64($io, $comment, $varName, $value, $dimension)
```

```
AddParameterUInt32($io, $comment, $varName, $value, $dimension)
```

```
AddParameterUInt64($io, $comment, $varName, $value, $dimension)
```

```
AddParameterFloat($io, $comment, $varName, $value, $dimension)
```

```
AddParameterReal($io, $comment, $varName, $value, $dimension)
```

```
AddParameterPackDec($io, $length, $scale, $comment, $varName, $value,  
$dimension)
```

```
AddParameterZoned($io, $length, $scale, $comment, $varName, $value,  
$dimension)
```

```
AddParameterBin($io, $size, $comment, $varName, $value, $dimension)
```

```
AddDataStruct(array $parameters, $name='struct_name', $dim, $by, $isArray,  
$labelLen)
```

Commands

Several ways to call commands

```
$conn->CLCommand('my command');
```

```
$conn->CLInteractiveCommand('DSP.... command');
```

```
$conn->CLCommandWithOutput('RTV... command');
```

Details ahead...

Simple command

```
// CLCommand to add library list entry
$cmdString = 'ADDLIB LIB(ALANLIB)';
$success = $conn->CLCommand($cmdString);
if($success) {
    echo 'Added library';
} else {
    echo 'Error: ' . $conn->getErrMsg();
}
```

Interactive command output

```
$cmdString = 'DSPLIBL';

// CLInteractiveCommand returns "screen" results
$liblArray = $conn->CLInteractiveCommand ($cmdString);

if($liblArray) {
    // output full result of DSPLIBL command in an array
    // <pre> </pre> formats the array
    echo '<PRE>' . print_r($liblArray, true) . '</PRE>';
}
```

Results on next slide...

Results of DSPLIBL

Array

(

```
[0] => 5770SS1 V7R1M0 100423 Library List 3/19/12 8:52:44 Page 1
[1] => ASP
[2] => Library      Type      Device      Text Description
[3] => QSYS          SYS      System Library
[4] => QSYS2         SYS      System Library for CPI's
[5] => QHLPSYS      SYS
[6] => QUSRSYS      SYS      System Library for Users
[7] => DBU80        SYS
[8] => QSYS38       SYS
[9] => DC@EPC03    USR      EPC-814 DC@ADKPGM
[10] => ZENDSVR     USR
[11] => QGPL        USR      General Purpose Library
[12] => QTEMP       USR
[13] => * * * * * E N D   O F   L I S T I N G   * * * * *
```

)

Output from RTVJOBA

Array of job attributes

```
Array (  
  [JOB] => QSQSRVR  
  [USER] => QUSER  
  [NBR] => 240164  
  [CURUSER] => QTMHHTTP  
  [SYSLIBL] => QSYS           QSYS2           QUSRSYS  
  [CURLIB] => *NONE  
  [USRLIBL] => QTEMP        QGPL           MYUTIL  
  [LANGID] => ENU  
  [CNTRYID] => US  
  [CCSID] => 37  
  [DFTCCSID] => 37  
)
```

Connecting

Basic connection

- **Connect with database, user, password**
 - Try *LOCAL or real database name
 - WRKRDBDIRE shows valid names
 - If leave blank (“”, “”, “”): connect with default web user
 - QTMHHTTP
 - in 1.4.0+, new func setOptions(), easier than setToolkitServiceParams()

```
require_once('ToolkitService.php'); // bring in toolkit class
```

```
try {  
    $ToolkitServiceObj = ToolkitService::getInstance($db, $user, $pass);  
}  
  
catch (Exception $e)  
{  
    echo $e->getMessage(), "\n";  
    exit();  
}
```

```
$ToolkitServiceObj->setToolkitServiceParams(array('InternalKey'=>"/tmp/$user"));
```

Choice of stateless or stateful (private)

- **Easiest way to start: stateless**

- Quicker initial connection, runs toolkit directly in DB2 job (QSQSRVR job)
- No guarantee that you'll get same job from pool
- Specify 'stateless'

```
$conn=>setOptions(array('stateless'=>>true));
```

- **Advanced: stateful/private**

- A new job is started and “reserved” for re-use
- Maintains file cursors (READE position), QTEMP, LIBL, open file handles
- Best performance when many program calls
- Specify 'InternalKey' as unique job identifier

```
$conn=>setOptions(array('InternalKey'=>'/tmp/jim123'));
```

How to use persistent DB2 connection

- See “DB2 and PHP Best Practices on IBM i”
 - <http://alanseiden.com/presentations>
- **Persistent DB connection**
 - `$conn = ToolkitService::getInstance('*LOCAL', 'myuser', 'mypw', "", true);`
 - Fifth param is persistence flag
 - Or re-use an existing DB2 persistent connection:
 - <http://forums.zend.com/viewtopic.php?f=113&t=46688>

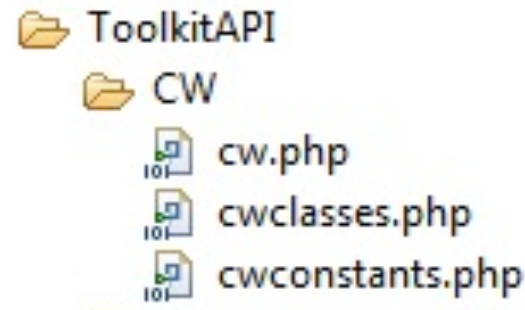
Compatibility Wrapper

Compatibility Wrapper (CW)

- **For existing PHP scripts that use ‘i5 toolkit’**
 - “i5 toolkit” by Easycom, formerly shipped with Zend Server

- **Included with new toolkit**

- Written in pure PHP
- Feel free to read the code



- **Handles Easycom-style i5_ function requests**

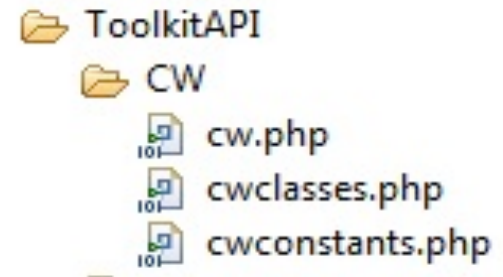
- i5_connect(), i5_program_call(), etc.
- Converts to them to new Toolkit API style
- new API passes them to XMLSERVICE

- **CW was created by me (Alan) for Zend**

Two steps to incorporate the CW

- **Add the CW code library to your script**

- `require_once('CW/cw.php');`



- **Deactivate Easycom extension**

- In PHP.INI, prepend semicolon (comment symbol) to `i5comm.so`
 - `;i5comm.so`
- Restart Apache
- If you forget this step: “function i5_connect() already defined” error

- **‘Readme’ file tells how to test in parallel, if needed**

One more tweak to your code

- **Add new function `i5_output()` to get output from programs, commands**

- **Example (fragment):**

```
// call a program
$ret = i5_program_call($prog, $params, $retvals);
// export output into variables, just as i5 toolkit did
if (function_exists('i5_output')) extract(i5_output());
```

- **Q. Why is this new line needed in CW?**
- **A. CW is made of pure PHP, not a C-based extension (as the old toolkit was). PHP must be explicit when creating variables.**

CW connection types

- **Non-persistent connection:**
 - `$conn = i5_connect('localhost', 'myuser', 'mypw');`
- **Persistent connection:**
 - `$conn = i5_pconnect('localhost', 'myuser', 'mypw');`
- **If private connection desired, specify in \$options array:**
 - `$options = array(I5_OPTIONS_PRIVATE_CONNECTION=>$connId);`
 - `$conn = i5_pconnect('localhost', 'myuser', 'mypw', $options);`
- **Details: http://files.zend.com/help/Zend-Core-i5/i5_php_connector_api.htm**

Optional: configure host name

- **Old toolkit connected to host names or IP addresses**
 - `i5_connect('localhost',.....)`
 - `i5_connect('1.2.3.4',.....)`
- **New toolkit uses a database name or *LOCAL**
- **If your scripts use a host name, map it to db name**
 - In `/usr/local/zendsvr/share/ToolkitApi/toolkit.ini`
- **Examples:**
 - `[host]`
 - `localhost=*LOCAL ; default`
 - `1.2.3.4 = MYDB`
 - Normally don't change default unless your application already specifies an IP address or host
 - Find database names with `WRKRDBDIRE`

**Connect from
“off the box”**

2-tier = Run PHP on Windows/Linux/Mac

- **A common developer request**
- **Develop on laptop**
 - Connect to XMLSERVICE on IBM i; then deploy PHP code to IBM i with no code changes
- **Or run production PHP on non-i machine, calling IBM i-based RPG, commands, etc.**
- **Never a charge or cost for this 2-tier support**
 - All free and open source

Alternatives for 2-tier transports

- **Two popular transports (drivers/connectivity)**
 - “DB2 Connect” software from IBM (paid software)
 - Advantage: handles SQL queries, too, as if they were local to PC
 - No-charge alternative: ODBC (free with IBM i Access)
- **Other alternatives**
 - CGI/HTTP (no drivers needed)
 - Many more are possible because XML can be sent over any type of connection

Connect via ODBC

- **First, set up ODBC database config on your PC**

- Connection name will be used as the db name (*LOCAL is not allowed)
- Documentation: <http://publib.boulder.ibm.com/infocenter/iserics/v7r1m0/index.jsp?topic=%2Frzaii%2Frzaiiodbc04.htm>

- **New API style connection**

```
$conn = ToolkitService::getInstance('MYODBCCONN', 'myuser',  
    'mypw', 'odbc');
```

- **CW style connection**

- Specify database name in toolkit.ini

```
[hosts]
```

```
myibmi = MYODBCCONN
```

```
// PHP to connect via ODBC
```

```
$options = array(CW_TRANSPORT_TYPE=>'odbc');
```

```
$conn = i5_connect('myibmi', 'myuser', 'mypw', $options);
```

HTTP transport (experimental)

- **HTTP/CGI interface, no drivers needed (1.5.0+)**
- **Not enabled by default (secure)**
 - See <http://www.youngiprofessionals.com/wiki/XMLSERVICE>
 - “Optional XMLSERVICE REST interface via RPG CGI (xmlcgi.pgm)”
- **Point to it with toolkit.ini**

```
[transport]
; transport type allows configuration of transport from this INI.
transportType = "http" ; ibm_db2 is default. Other choices: "odbc", "http"

; for http transport only
httpTransportUrl = "http://example.com/cgi-bin/xmlcgi.pgm"
; default plug size (expected output size): 4K, 32K, 512K (default), 65K, 512K, 1M, 5M, 10M, 15M
; can also change in code with $conn->setOptions(array('plugSize' => '4K')); or desired size
```

Raw XML demos for the curious

<http://174.79.32.155/Samples/Toolkit/HTMLXML/index.html>

```
<pgm name='ZZCALL' lib='XMLSERVICE'>
  <parm><data type='1A'>a</data></parm>
  <parm><data type='1A'>b</data></parm>
  <parm><data type='7p4'>11.1111</data></parm>
  <parm><data type='12p2'>222.22</data></parm>
  <parm><ds>
    <data type='1A'>x</data>
    <data type='1A'>y</data>
    <data type='7p4'>66.6666</data>
    <data type='12p2'>77777.77</data>
  </ds>
</parm>
<return><data type='10i0'>0</data></return>
</pgm>
```

Troubleshooting

Troubleshooting tips

- **Get latest toolkit version**

- Start with PTF on Zend Server download site
- or latest XMLSERVICE and PHP wrapper
 - <http://www.youngprofessionals.com/wiki/XMLSERVICE>
- Test in XMLSERVICE library if unsure

- **Set your CCSID**

- See earlier slides on this topic

- **Create debug log**

- In toolkit.ini, set debug=true, then run script again
 - Creates /usr/local/zendsvr/share/toolkitapi/debug.log
 - debug.log contains all XML send/received, connection info
- Review log, post to forum, or share with support rep

Future of toolkit

The latest

- **PHP toolkit version 1.5.0 / XMLSERVICE 1.7.8**
 - Faster
 - HTTP (driverless) transport
 - Swap user (“adopt authority”) via `changeCurrentUser()`
 - Fixes for data queues, data areas
 - International: PASE CCSID configurable
- **Future**
 - Always faster and faster
 - Further improvements for ease of use

Full list of current improvements:

<http://174.79.32.155/wiki/index.php/XMLSERVICE/XMLSERVICEChangeLog>

<http://174.79.32.155/wiki/index.php/XMLSERVICE/CWChangeLog>

Resources, events, Q&A

Recent articles/podcast

- **New PHP Toolkit: A Perfect Match for RPG** (Alan Seiden)
 - <http://www.iprodeveloper.com/article/application-development/php-toolkit-perfect-match-rpg-699367>
- **Meet Zend's New PHP Toolkit** (Erwin Earley and Alan Seiden)
 - <http://www.iprodeveloper.com/article/php/meet-zends-php-toolkit-699336>
- **Podcast: What's New with the Open-Source PHP Toolkit** (Alan)
 - <http://www.iprodeveloper.com/podcast/php/whats-opensource-php-toolkit-699531>

Resources

- **Alan's toolkit page with links to other resources**
 - <http://alanseiden.com/toolkit>
- **Young i Professionals site**
 - <http://youngiprofessionals.com/wiki/XMLSERVICE>
- **Zend Toolkit Forum**
 - <http://forums.zend.com/viewforum.php?f=113>
 - "PHP on IBM i"->"Zend Server for IBM i"->"New Toolkit"
- **Zend toolkit manual**
 - http://files.zend.com/help/Zend-Server-IBMi/php_toolkit_xml_service_functions.htm

A community resource: get involved

- **Help us enhance the toolkit**
 - Report any issues on the Forum
- **Contribute enhancements, tips, fixes**
 - Write to forum or alan@alansen.com
- **Why?**
 - Make the toolkit and IBM i platform better for everyone
 - Sharpen your skills; work with great people 😊
 - Working with open source demonstrates commitment to your chosen platform and your career as a whole

Contact

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