Rest Web Service on IBM i

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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

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

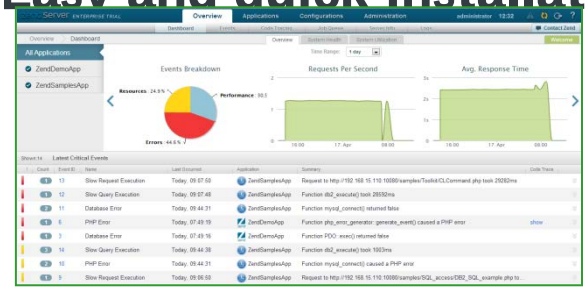
Basic Edition – Included with IBM SWMA,

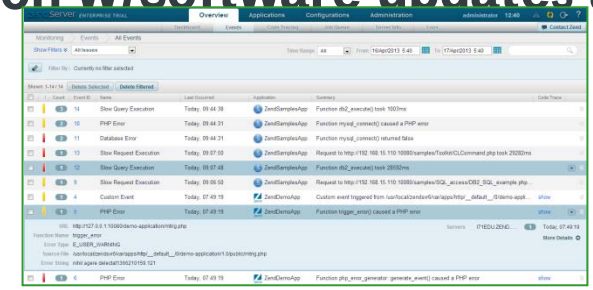
Enjoy Professional & Enterprise features for 7 days, upgrade to 28

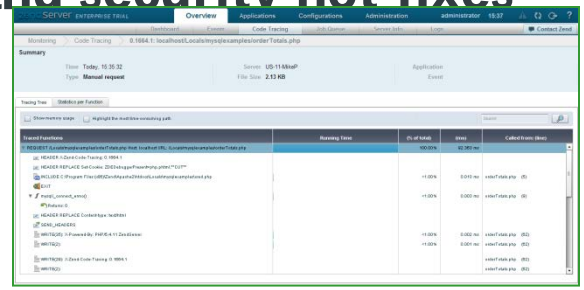
Application monitoring and diagnostics (integrated with Zend Studio)

Multi-level performance enhancement capabilities

Easy and quick installation w/Software updates and security hot fixes



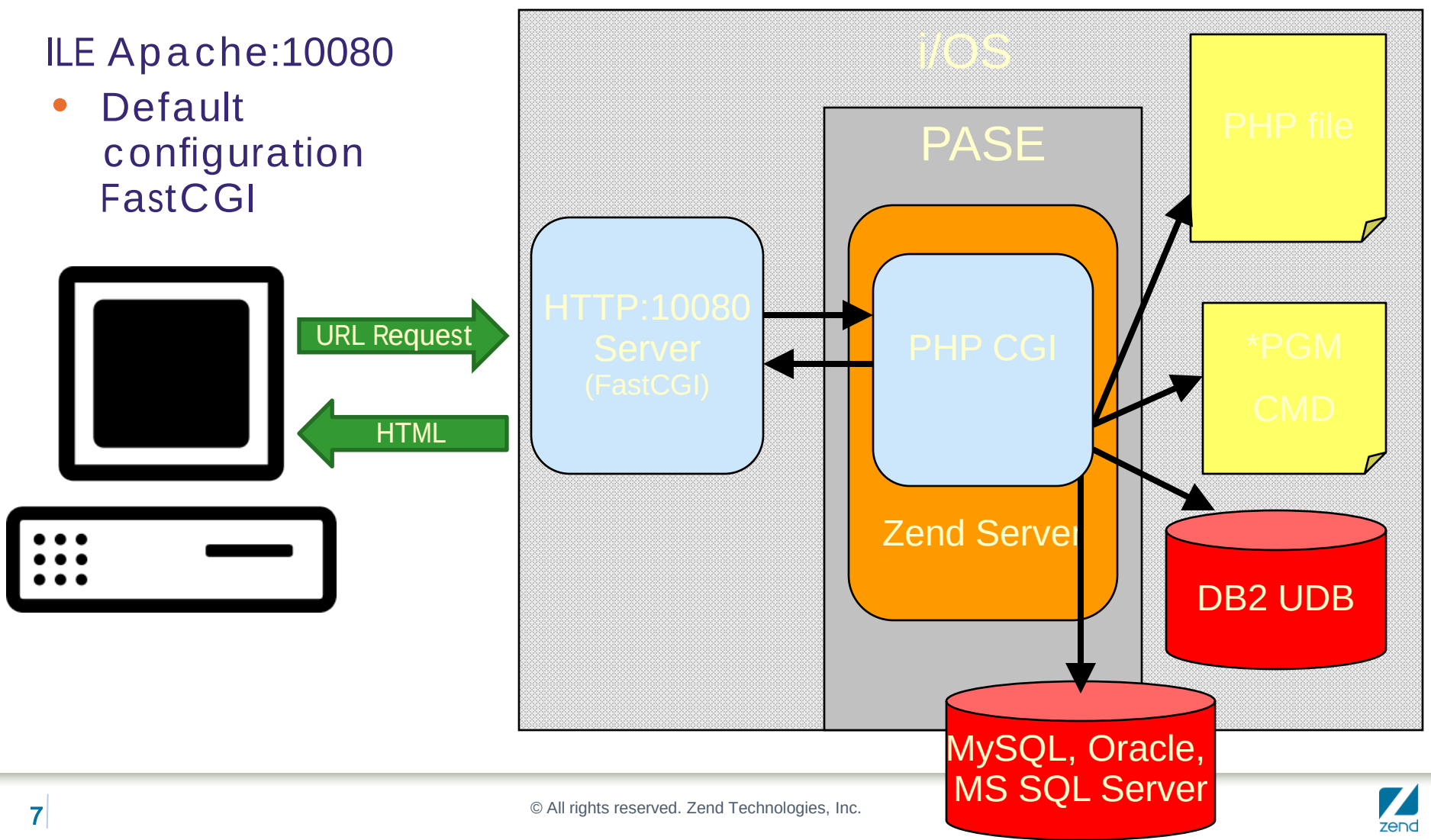




Zend Server Under the Covers

ILE Apache:10080

- Default configuration FastCGI



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

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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!**

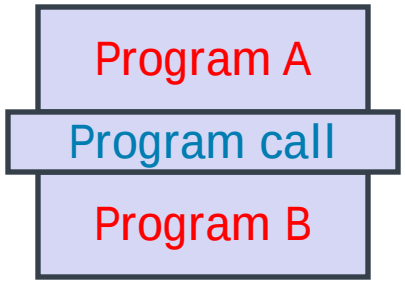
Who uses Web Services?

- **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

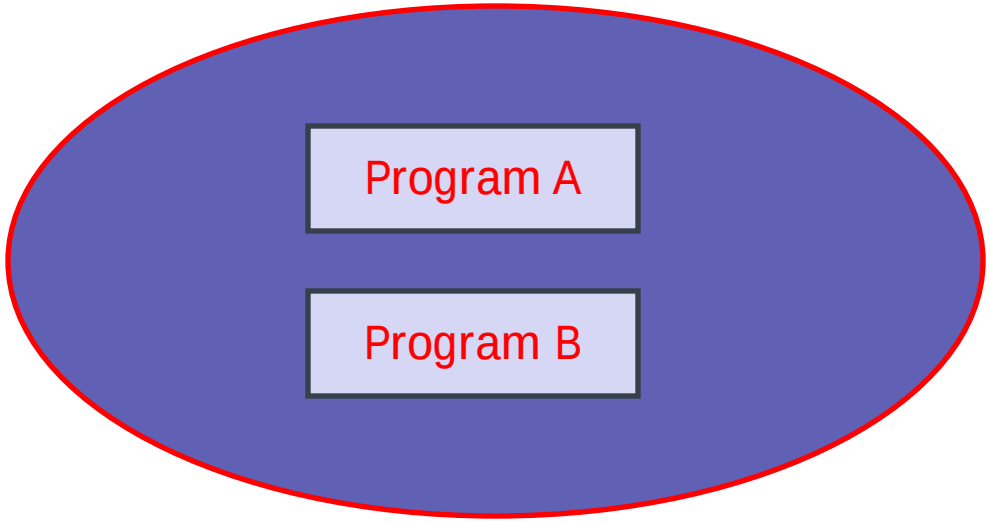
Why use Web Services?

- **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

Yesterday's program call



Today's program call



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

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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

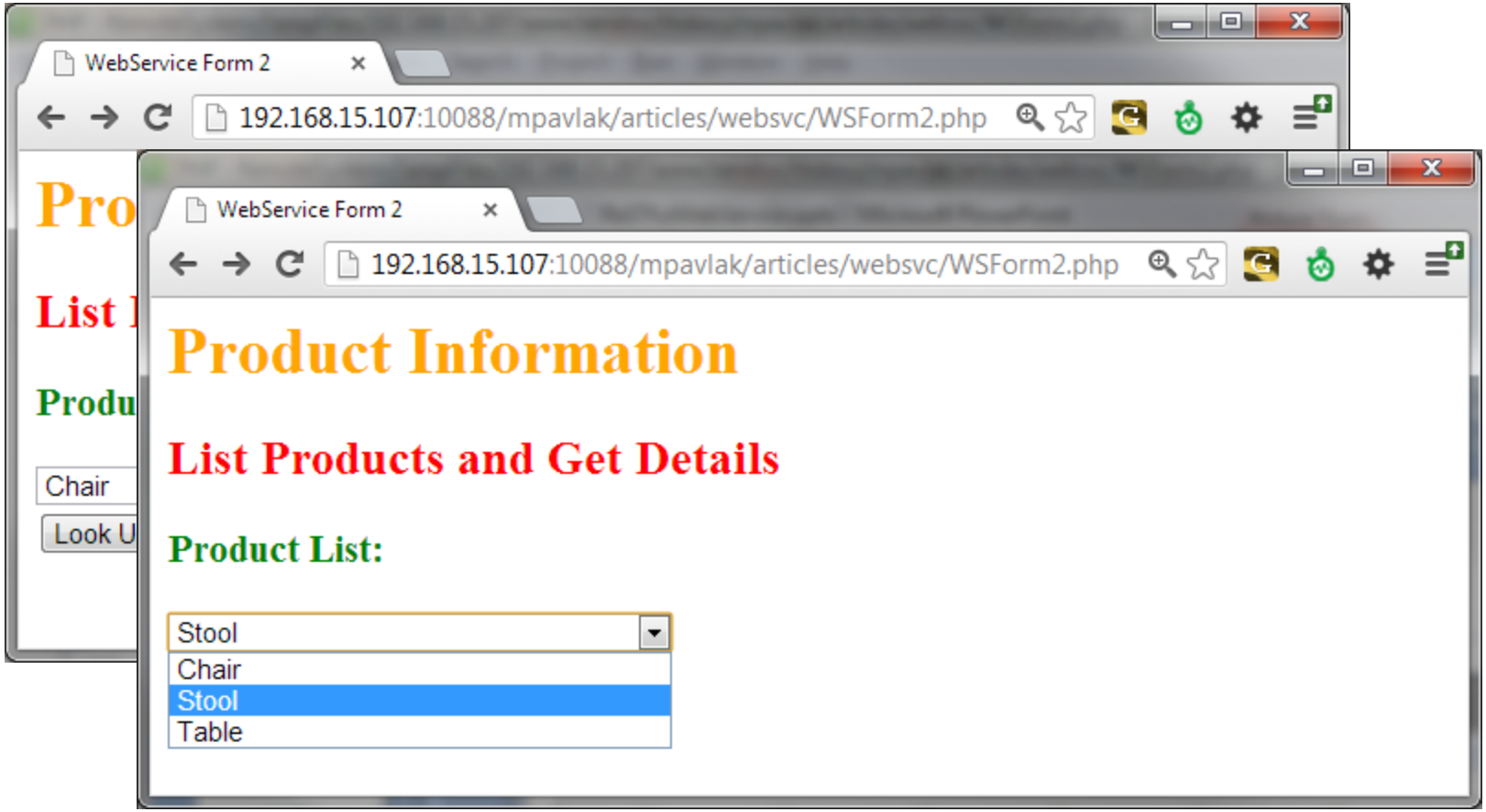
Local & remote both IBM i for this example

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



Form source

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

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
<?php

// Common routines among the scripts...

// Formulas array used in drop down and validation...
$Formulas = array(  'AreaRectangle'=>'Area of a Rectangle',
                    'Pythgorean'=>'Length of the hypotenuse of right triangle',
                    'VolumeCone'=>'Volume of a Cone');

$MathFormulaURLLocal = 'http://localhost:10088/mpavlak/articles/websvc/WSServer1.php';
$MathFormulaURLRemote = 'http://192.168.15.112:10088/mpavlak/articles/websvc/WSServer1.php';
$ProductInfo = 'http://192.168.15.112:10088/mpavlak/articles/websvc/WSServer2.php';
```

Target LPAR and host service, part 1

```php
<?php

require_once 'ServerUtils.php';

// Listing function and XML Builder

if ($_GET ['Function'] == 'List') {

    $products = listprod ();

    print '<?xml version="1.0"?>';
    print ("<products>\n") ;

    If (is_array ( $products )) {
        foreach ( $products as $prod_array ) {
            $productNumber = $prod_array ['PRODUCTNUMBER'];
            $productName = $prod_array ['PRODUCTNAME'];
            print ("<prod$productNumber>") ;
            print ("<prodNum>$productNumber</prodNum><prodName>$productName</prodName></prod$productNumber>\n") ;
        }
        print '</products>';
    } else {
        print ("<error>Product List not Available</error>") ;
    }
}
```

Server Utils Part 1

```
39 function listProd() {
40
41     $IBMiLink = Connect();
42     $sql = 'SELECT productnumber, productname FROM zenddata.product';
43     //$sql = 'SELECT CUSTOMER_NUMBER, CUSTOMER_NAME FROM zenddata.customer';
44     $stmt = getdata($IBMiLink,$sql);
45     while($row=db2_fetch_assoc($stmt)) {
46         //print_r($row); echo "<BR>";
47         $products[] = ($row);
48     }
49
50     if (is_array($products))
51         return $products;
52     else
53         return "Error retrieving products";
54 }
```

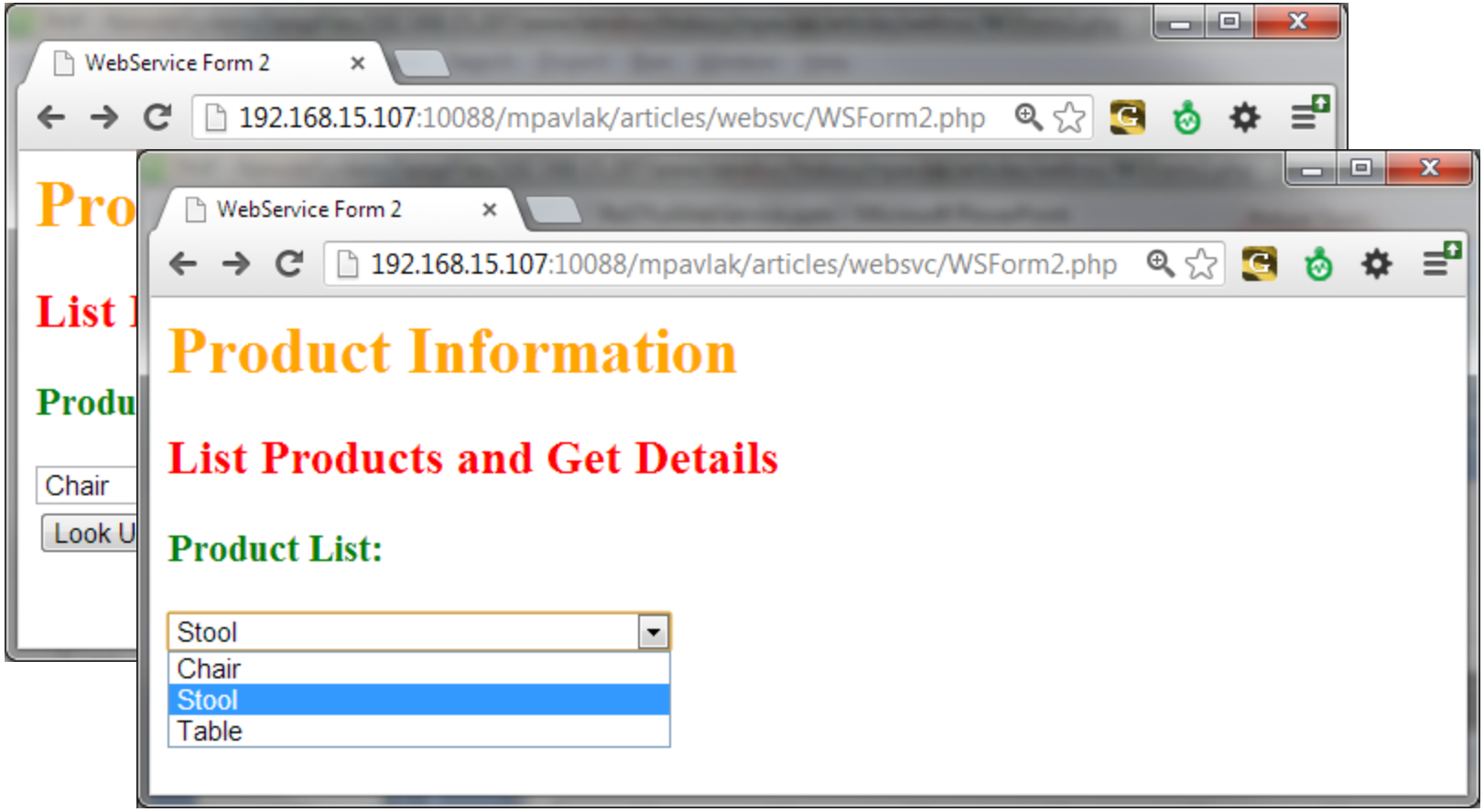
Call RPG using ReST

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



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30 <br /><Input type="submit" value="Look Up"></Form></body></html>
```

Now call WSClient2.php

```
1  <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
10 require_once("WSCommon.php");
11
12 //Build request
13 $prod = $_GET['ProductSelected'];
14
15 // 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

```php
function listOnHand($prod) {
    $sess = getSessions ();
    // Call the open source toolkit for product info...

    $db = 'V7R1GOLD';   $user = '';  $pass = '';  $extension = 'ibm_db2';  $ohQty = 0;  $error = '';

    $ToolkitServiceObj = ToolkitService::getInstance ( $db, $user, $pass, $extension );
    $ToolkitServiceObj->setToolkitServiceParams ( array (
            'InternalKey' => "/tmp/$sess"
    ) );

    $param [] = $ToolkitServiceObj->AddParameterPackDec ( 'both', 9, 0, 'PRODUCT', 'PRODUCT', $prod );
    $param [] = $ToolkitServiceObj->AddParameterPackDec ( 'both', 10, 0, 'ONHQTY', 'ONHQTY', $ohQty );
    $param [] = $ToolkitServiceObj->AddParameterChar ( 'both', 256, 'ERROR', 'ERROR', $error );
    $result = $ToolkitServiceObj->CLCommand ( "RMVLIBLE ZENDDATA" );
    $result = $ToolkitServiceObj->CLCommand ( "ADDLIBLE ZENDDATA" );
    $result = $ToolkitServiceObj->PgmCall ( "PRODAVAIL", "ZENDDATA", $param, null, null );

    if ($result) {
        return $result ['io_param'];
    } else
        return "Execution failed.";
    echo 'Hello Mike<br />';

    $ToolkitServiceObj->disconnect ();
}
```

RPG code

```
FFilename++IPEASF.....L.....A.Device+.Keywords++++++++++++++++++++++
FPRODINV   IF   E             K DISK


C      *ENTRY         PLIST
C                     PARM                    Prodin            9 0
C                     PARM                    QtyAvail         10 0
C                     PARM                    Error           256

 /free
     chain Prodin  PRODINVR;
     if %found;
        QtyAvail = ProdONH - ProdALC;
        Error = 'Order Inventory Successful';
     else;
        Error = 'Order Item not found';
     endif;
  *InLR = *On;
```

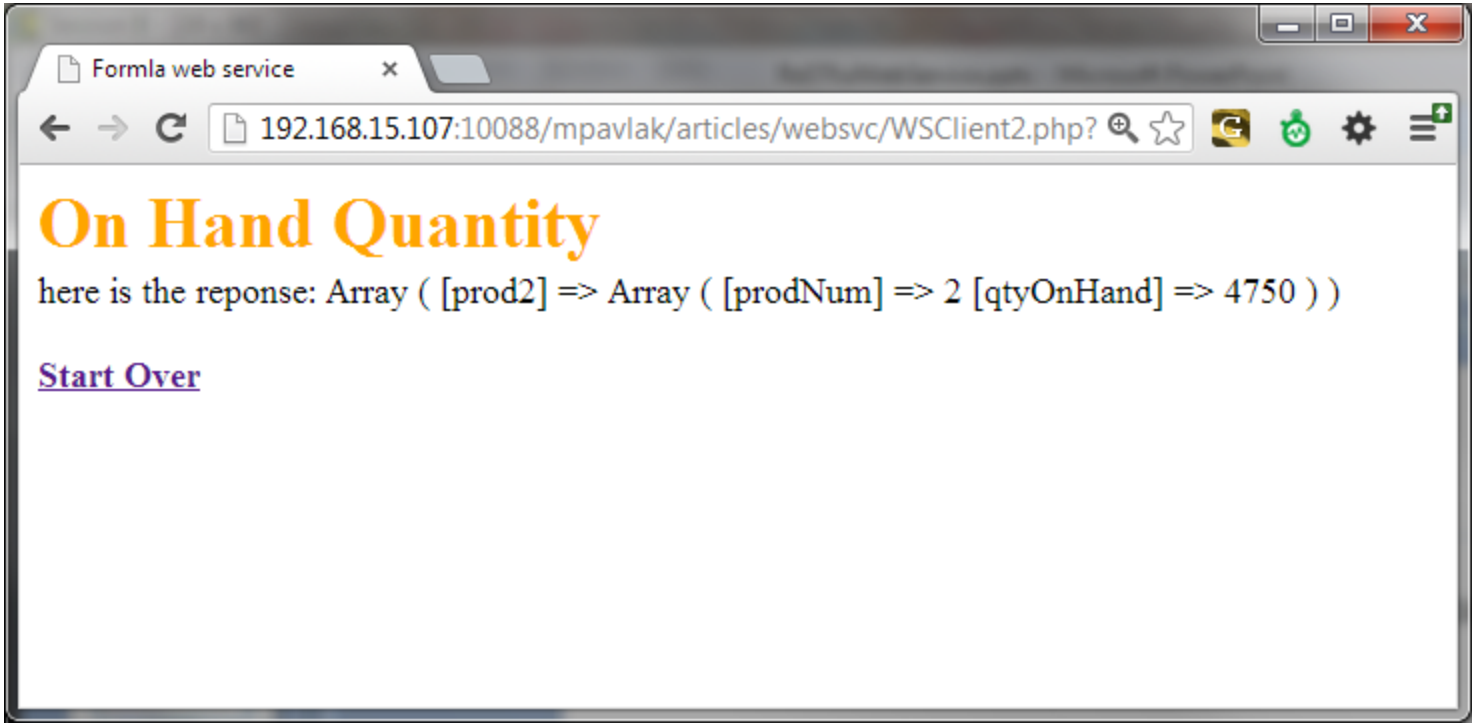
WSClient2.php receieves info and presents

```
<html><head><title>Formla web service</title>
<style>
h1      { color:orange; margin-bottom:3px; }
h2      { color:red;}
h3      { color:green;}
pre { background-color:lightgreen; padding:5px; border:10px solid red; width:250px }
</style></head><body>
<h1>On Hand Quantity</h1>
<?php
require_once("WSCommon.php");

//Build request
$prod = $_GET['ProductSelected'];

// Call the web service to determine on hand quantity or error.
$SERVER_URL = $ProductInfo . "?Function=onHand&Prod=$prod";

//get the XML package
$response = file_get_contents($SERVER_URL); //Send the request
//turn it into an object
$productsResponse = simplexml_load_string($response);
//flip it into an array and process.
$response_array = json_decode(json_encode($productsResponse),true);

print "here is the reponse: "; print_r($response_array). "<br /><br />";

$xml = simplexml_load_string($response); //Parse the response and display
echo '<br/><br />' . $xml->Parm1;
?><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



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