Introduction to PHP and Zend for i5/OS

Paul Roy – Real Solutions

i want stress-free IT.
i want control.
i want an i.

Thanks to

- **Michael Sandberg - IBM Senior Accredited IT Specialist** is a technical consultant in the IBM ISV Business Strategy and Enablement team, located in Rochester, Minnesota USA. For the past six years, he has been involved in supporting System i solution providers as they develop, enhance, and extend their solutions. As part of this work, he has accumulated technical expertise in WebSphere, IBM WebFacing Tool, Host Access Transformation Services (HATS), WDHT, PHP and other IBM technologies that focus on System i application innovation.

- **Michael Sandberg –** designed the basic presentation material that was used for this presentation.

Overview of PHP

- **What is PHP?**

- **What are the advantages of PHP and Open Source?**

- **Introduction to Zend**

- **Zend for i5/OS Environment**

- **Why System i for PHP?**

What is PHP?

Customer Pain Points for Web Applications

"We can not respond fast enough to our changing business."

"I need to get my green screen apps out to my suppliers."

"Our web enablement project is taking too long and costing to much."

"My boss just asked for my opensource strategy."

"I need I get my suppliers to access our data and applications."

"I need to cut my software budget."

"My boss just told me to implement a Wiki, what's a Wiki?"

"It is taking too long to learn Java."

What is PHP?

- **PHP is an easy to use, open source, platform independent scripting language**
  - Designed for web application development
  - 4.5+ Million PHP Developers

- **PHP is the leading scripting language deployed on the Internet**
  - 22+ Million Internet domains
  - Out Pacing Microsoft's ASP*

- **Thousands of PHP applications are available**
  - Web applications tied to databases
  - Content management
  - Wikis and Blogs

www.hotscripts.com,

www.phpjunkyard.com

www.phpfreaks.com

www.phpfreebies.com

* Source: 2005 Netcraft Survey - http://www.php.net/usage.php

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What is PHP?

PHP = PHP: Hypertext Preprocessor

– Scripting language for developing Web applications.
– PHP Scripts can be embedded within HTML documents.
– Scripts are processed when needed (not compiled).

- **PHP is both a computer language and a Web Server processing environment**

- **Web Server Side processing environment**
  – No PHP at the browser side
  – Creates Dynamic HTML Pages
  – Works with HTML and HTML templates
  – All PHP infrastructure is written in 'C' for optimization and performance
  – Platform Agnostic (i5/OS, Linux & Unix, Windows, etc.)

What is PHP?

- **PHP Language**
  – "C" Like Scripting language
  – PHP Language can be extended using PHP extensions
    – Huge number of extensions are available to support most software available today
    – Supports all available databases open source (MySQL, Postgress, Cloudscape) and commercial (DB2,Oracle, MSSQL)

- **Many applications**
  – PHPNuke, SugarCRM, phpBB, Joomla, Wordpress, MediaWiki

- **Frameworks**
  – ZendFramework, CakePHP, Mojavi, Agavi, PHP on Trax, Phrame, Webwork, Ismo, Symfony, Pipeline, Claw
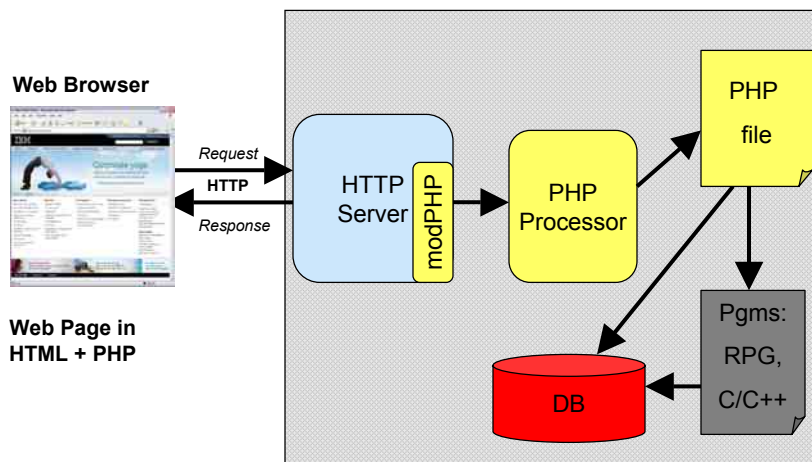
- **Compatible with AJAX**

The PHP Stack

L	A	M	P
i	p	y	H
n	a	S	P
u	c	Q	
x	h	L	
	e		

W	I	M	P
i	I	y	H
n	S	S	P
d		Q	
o		L	
w			
s			

i	A	D	P
5	p	B	H
/	a	2	P
O	c		
S	h		
	e		

Windows

i5OS

PHP

Web Browser

Web Page in HTML + PHP

Request
HTTP
Response

HTTP Server — modPHP

PHP Processor

PHP file

Pgms: RPG, C/C++

DB

PHP Processing

- **Web Server detects:**
  - URL reference to *.php
  - HTML includes php
    - <html>
      <head>
      <title>PHP Test</title>
      </head>
      <body>
      <?php echo '<p>Hello World</p>'; ?>
      </body>
      </html> HTTP Request moves to PHP
    - <?php phpinfo(); ?>

Why PHP? – Simple, Intuitive, Robust

Low Learning Curve

Rapid Development

Easy Integration into Heterogeneous Environments

Application Integration (Glue, SOA, XML, Web Services)

Vibrant Community

Proven Deployment

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Why is PHP so Popular?

- **Simple**
  - Easy to learn and use

- **Powerful**
  - Supports most protocols, data sources, data manipulation

- **Independent**
  - Supported by almost every HTTP server, operating system, DB

- **No Charge**
  - Open-source with large community providing extensions, documentation, templates, sample code
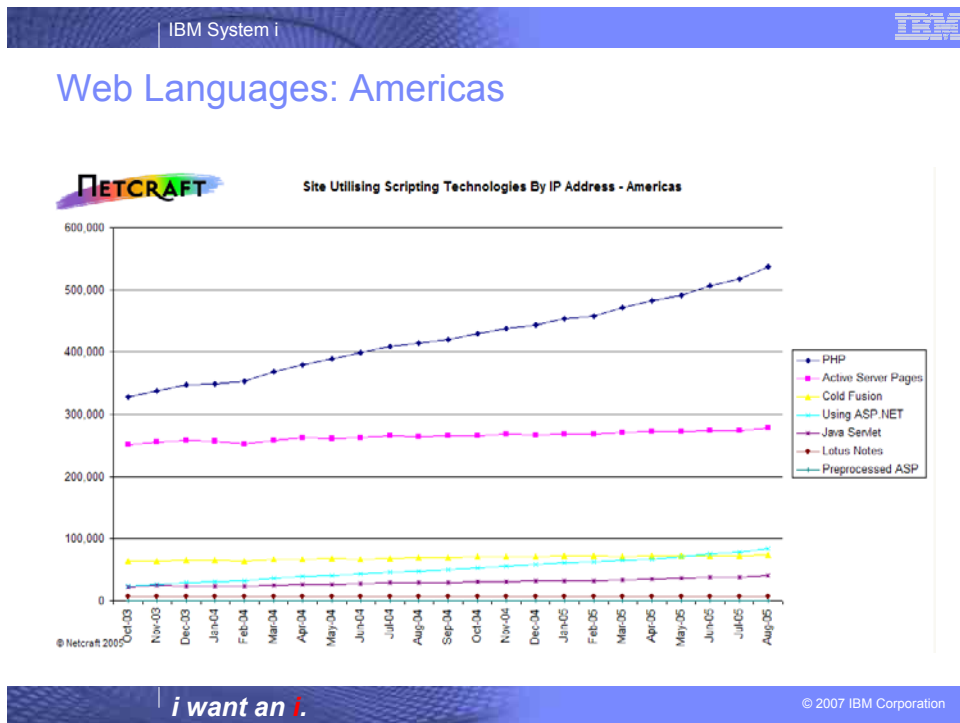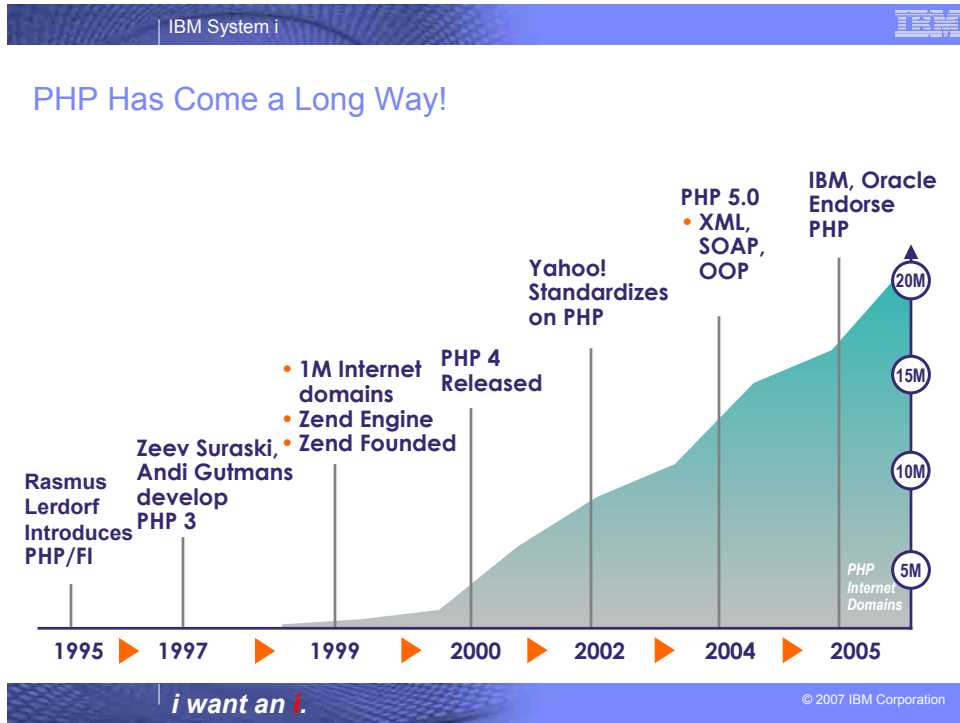
Source: www.php.net July 2006

PHP is the single most widely used Web programming language.

PHP community

- **Hosted at: http://php.net**
- PHP is backed by a very strong **community**
  - ~ **500** committers
  - ~ **4.5M** developers worldwide
  - Thousands of opensource projects

- **PHP Tutorial** http://php.net/manual/en/tutorial.php

- **Extensions are hosted at pecl.php.net**
  - *PECL* is a repository for PHP Extensions, providing a directory of all known extensions and hosting facilities for downloading and development of PHP extensions
  - Ibm_db2 extension: http://pecl.php.net/package/ibm_db2

- **Pear**
  - *PEAR* is a framework and distribution system for reusable PHP components.

PHP Has Come a Long Way!

IBM, Oracle
Endorse
PHP

PHP 5.0
• XML,
SOAP,
OOP

Yahoo!
Standardizes
on PHP

• 1M Internet
domains
PHP 4
Released

• Zend Engine
• Zend Founded

Zeev Suraski,
Andi Gutmans
develop
PHP 3

Rasmus
Lerdorf
Introduces
PHP/FI

20M

15M

10M

5M

PHP
Internet
Domains

1995   1997   1999   2000   2002   2004   2005

Web Languages: Americas

NETCRAFT   Site Utilising Scripting Technologies By IP Address - Americas

— PHP
— Active Server Pages
— Cold Fusion
— Using ASP.NET
— Java Servlet
— Lotus Notes
— Preprocessed ASP

© Netcraft 2005

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What are the advantages of PHP and Open Source?

The Open Source Phenomena

- **Open source software is similar in idea to "free software" but slightly less rigid than the free software movement. Users of open source software are (generally) able to view the source code, alter and re-distribute open source software. There is however less of an emphasis in the open source movement on the right of information and source code to be free and in some cases companies are able to develop proprietary products based on open source ones.**

- **Create a none proprietary Unix OS**
  - BSD (Berkley Software Distribution) – FreeBSD, OpenBSD, NetBSD
  - The GNU project
  - '91 – Linus Torvalds develop the Linux Kernel
  - '95 – Apache Web Server Was initially released

- **Many successful Open source project such as:**
  - Apache, xFree86, KDE, Gimp, Mozilla (NetScape), MySQL

Open Source approaches

- **License Agreement covers distribution of the software and derivative work**
- **The two basic License Agreements are:**
- **GNU Public License (GPL)**
  - Infected license (derivative work is also open-source)
  - Can not be used in commercial software product
  - Can be use to run commercial software
- **BSD License**
  - None infected (derivative work is not open-source)
  - In most cases can be used in commercial software products
  - Many additional license are BSD compatible

Open Source commercial

- **Commercial Linux Distributors appears**
  - RedHat, Suse
  - UNIX alternative
- **Commercial company use, contribute and use Open Source**
  - IBM
    - Contribute (Eclipse, Linux contribution, PHP, Cloudscape/Derby)
    - Use (WebShpere uses Apache, all eServers)
  - HP, Intel…
- **Over than 50% of commercial software products run on Linux**

MySQL

- **MySQL is the database for the PHP application portfolio**
  - MySQL is the "M" in LAMP
  - MySQL is the most popular open source database
  - 1000s of PHP scripts and applications use MySQL

- **Database Products**
  - MySQL Community Server
    - No charge, Supported by community
  - MySQL Enterprise
    - Chargeable, Supported by MySQL

- **We have MySQL running in i5/OS today**
  - "How to" posted on Zend Forum… (but not an IBM supported environment)

Opensource Applications: PHP and MySQL

Customer Relationship Management

Help Desk

Portal

Portal

Portal

Course Management System

e-Commerce

Wiki

Bulletin Board

Content Management System

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Deploy Opensource Applications on i5/OS

- **Solution**
  - System i offers an integrated and open web application deployment environment based on Apache, MySQL, and PHP on i5/OS

- **Value**
  - **Deploy applications faster, maintain systems easier**
    - i5/OS provides a leading *integrated and complete environment* for LAMP-based applications.
    - Delivers enterprise *scalability* from one to 64-way POWER5 processors.
    - The integrated i5/OS architecture is *secure and virus resistant* by design
    - i5/OS delivers industry leading *availability and reliability*.
    - i5/OS provides ability to easily integrate web apps with business apps on the same server
    - i5/OS has a proven track record of delivering the *lowest TCO and highest customer satisfaction*

  - **Access i5/OS applications and data easier and faster**
    - PHP applications have *direct and easy access* to business apps and data running on i5/OS

  - **Run MySQL applications**

Opportunities for Opensource Applications

SMB	Large Enterprise
Consolidate: Move PHP applications that are running on Windows or Linux to i5/OS	
Develop new applications: Create PHP apps to access i5/OS data and applications	
Leverage PHP portfolio: Run opensource PHP applications on i5/OS.	

- **Best Candidates**
  - Need to implement a new web application that uses i5/OS data and applications
  - Looking to give suppliers, partners, or customers access to i5/OS data and applications
  - Have existing PHP applications that access i5/OS data and applications
  - Interested in open source applications
  - Looking for new collaborative applications (Wiki, Blog, Forum)
  - Have not invested in Java applications and skills

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Objections for Opensource Applications

- **Why should we deploy a LAMP application on i5/OS?**
  - i5/OS provides leading reliability, security, and scalability for web applications. The Zend toolkit for i5/OS provides easy and fast access to i5/OS applications and data.

- **Is the System i community embracing PHP?**
  - Yes, the System i community is an active participant in the PHP community. The Zend forum for i5/OS is 3x more active than the Zend forum for Oracle.

- **Who provides support for PHP, isn't it opensouce?**
  - Zend offers a range of support options for their PHP development and deployment products. 3 years of standard support is included with Zend Core and Studio for i5/OS at no charge.

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PHP Applications

- **Check out the thousands of PHP scripts available that can be used as-is or as the starting point for Web projects.**
  - http://www.hotscripts.com
  - http://www.phpjunkyard.com/
  - http://www.phpfreaks.com/
  - http://phpfreebies.com/

- **Examples on i5/OS** www.zend.com/forums
  - **MediaWiki** (Open Source Wiki) on Zend Core for i5/OS - http://www.zend.com/forums/index.php?t=msg&th=3134
  - **SugarCRM** (Open Source Customer Relationship Management (CRM)) on Zend Core for i5/OS - http://www.zend.com/forums/index.php?t=msg&th=3111
  - **Joomla!** (Open Source Content Management System) on Zend Core for i5/OS - http://www.zend.com/forums/index.php?t=msg&th=3068
  - **Zen Cart** (Open Source Online Store) on Zend Core for i5/OS - http://www.zend.com/forums/index.php?t=msg&th=3041
  - **PmWiki** (Open Source Wiki) on Zend Core for i5/OS - http://www.zend.com/forums/index.php?t=msg&goto=8085
  - **phpBB** (Open Source Bulletin Board) on Zend Core for i5/OS - http://www.zend.com/forums/index.php?t=msg&goto=8049
  - **MySQL** (Open Source DB) on i5/OS - http://www.zend.com/forums/index.php?t=msg&goto=3004
  - **PHP-Nuke** (Open Source Content Management System) on Zend Core for i5/OS - http://www.zend.com/forums/index.php?t=msg&goto=3541

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Joomla! (Open Source Content Management System)

- **Application Website:**
  http://joomla.org/
- **Description:**
  http://en.wikipedia.org/wiki/Joomla

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SugarCRM (Open Source Customer Relationship Management (CRM))

Application Website: www.sugarcrm.com/ **Description:** http://en.wikipedia.org/wiki/SugarCRM
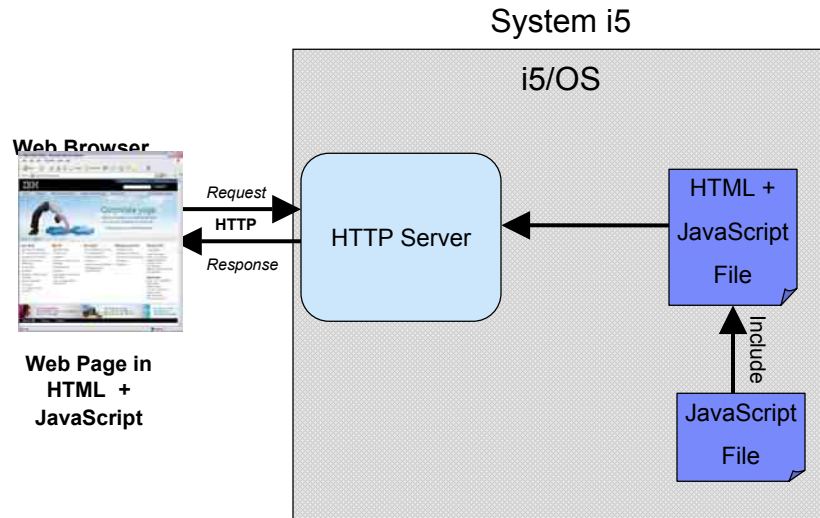
i want an i.

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ZenCart (Open Source Content Management System)

- **Application Website:** http://joomla.org/
- **Description:**
  http://en.wikipedia.org/wiki/Joomla

Comparison of PHP and other Web options

JavaScript

System i5

i5/OS

Web Browser

Request

HTTP

HTTP Server

Response

HTML + JavaScript File

include

JavaScript File

Web Page in HTML + JavaScript

Example: HTML and JavaScript

Hello World

```
<!DOCTYPE html PUBLIC "-//W3C//DTD
   HTML 4.01 Transitional//EN">
<html>
 <head>
  <title>PHP Test</title>
 </head>
 <body>
  <SCRIPT>
  var hello = "Hello World"
  document.write(hello)
  </SCRIPT>
 </body>
</html>
```

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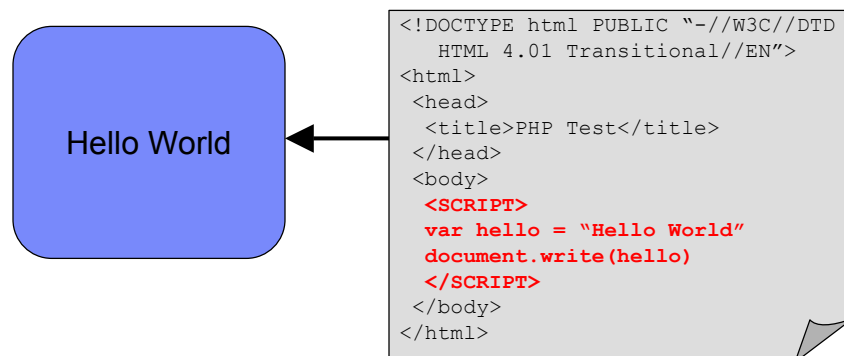
Compare: PHP and JavaScript

- **PHP and JavaScript are very similar**
  - Both are scripting languages embedded in HTML
  - Both allow dynamic Web page creation

- **PHP and JavaScript are different**
  - JavaScript is most commonly used for client-side entry validation and linking Web pages together
  - JavaScript has much less function than PHP extensions

CGI

System i5
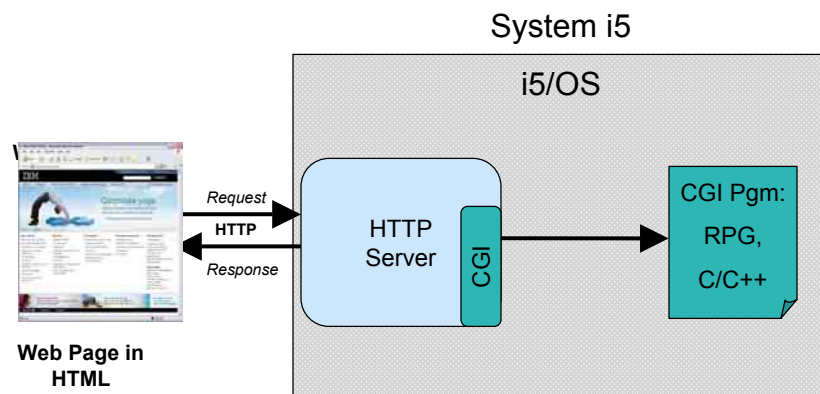
CGI = Common Gateway Interface

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Compare: PHP and CGI

- **PHP and CGI are very similar**
  - Both allow dynamic Web page creation
  - Both can call existing programs and access data
  - Both have open source toolkits
- **PHP and CGI are different**
  - PHP is a programming language
  - CGI is an interface to many programming languages (RPG, COBOL, C/C++, REXX)
  - PHP toolkit is available for PHP coding
  - CGI toolkits are specific for each programming language
    - IBM provides RPG toolkit (CGIDEV2) and COBOL toolkit for System i
    - Easy400 Web site has information

Net.Data

System i5

i5/OS

Web Browser

Request

HTTP

Response

Web Page in
HTML

HTTP
Server

CGI

Net.Data
Processor

Pgms:
RPG,
C/C++

DB

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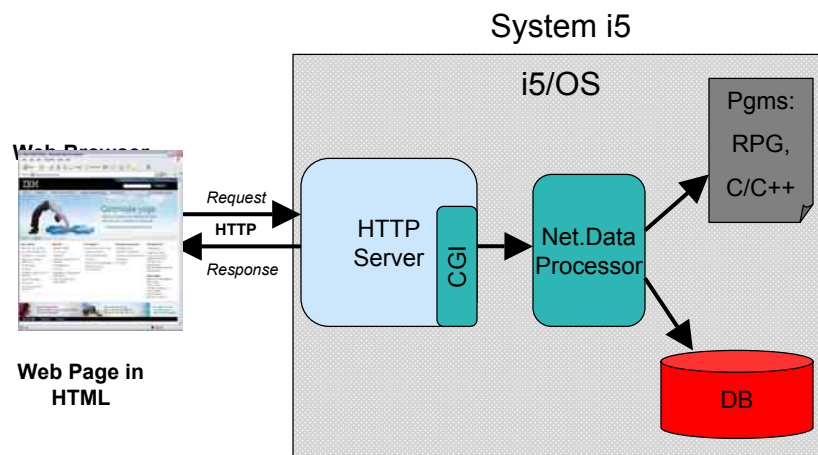
Compare: PHP and Net.Data

- **PHP and Net.Data are very similar**
  - Both are server-side scripting languages
  - Both allow dynamic Web page creation
  - Both can call existing programs and access data

- **PHP and Net.Data are different**
  - PHP is open source language
  - Net.Data is an IBM specific language (not open source)
  - Net.Data has less function than PHP extensions

PHP and Java

- Java™ is a general purpose programming language used for a wide range of application types.
- PHP is a specialized programming language focused on Web and Web services development.
- Even though there can be overlap, in general Java is applied more for transaction based systems and for embedded applications, while PHP is used more for web applications.
- For web applications, PHP can be a simpler language to learn and combined with the availability of open components, it can allow for quick prototyping and deployment.
- The two languages can be easily mixed in environments where Java back-end applications have PHP web-based front-ends.

Java™ Web applications

System i5

i5/OS

Session

Web Browser

Request

Response

HTTP
Server

Application
Server

Java™

**Web Page in
HTML**

DB
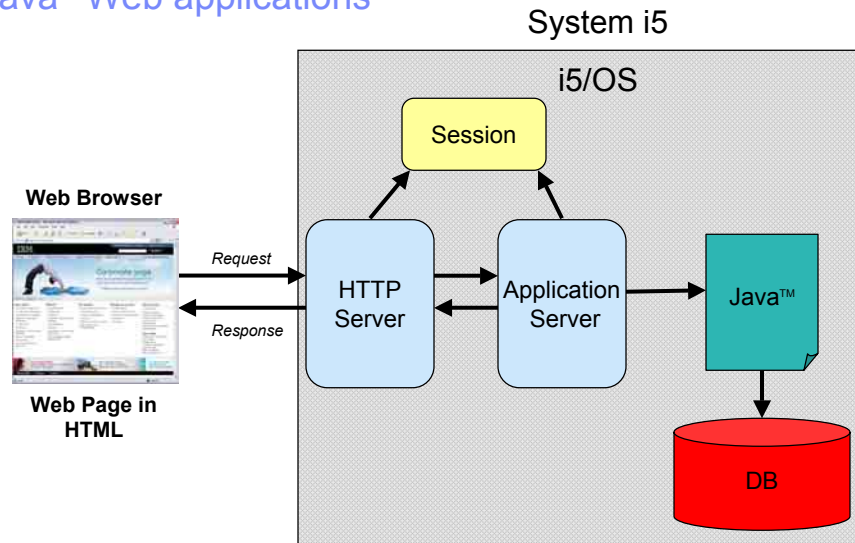
Compare: PHP and Java

- **PHP and Java have some similarities**
  – Both have similar development tools available
  – Both have open source examples
  – Both have similar integration with System i
  – Both can access Java beans
  – Both offer choices for deployment servers
  – Both have similar pricing

Key Differences

	PHP	Java
Language syntax and features	➢Web applications only ➢Procedural ➢Portable across all OS ➢Functions built-in + extensions ➢Subset of function compared to JSF and JSP ➢More flexibility with arrays/typing	➢Many application types ➢Requires object-oriented ➢Portable across many OS ➢Functions in pkgs + runtime comps
Programming model and architecture	➢No architecture	➢MVC is required
Development	➢Process is function-driven ➢Easier to customize for specific customers	➢Process is architecture-driven
Deployment	➢Code is interpreted at runtime ➢Application is packaged as ZIP ➢Code runs in a PHP server ➢Copy/paste with no config	➢Code is compiled ➢Application is packaged as EAR ➢Code runs in an application server ➢Additional server configuration needed
Ease of use/skill	➢Easier RPG => PHP	➢Easier PHP => Java ➢Requires OO skills
Future	➢Focus on structured architecture and framework for enterprise apps	➢Focus on simplifying development

Introduction to Zend

Zend Technologies

- The founders of Zend have been <u>key contributors to the PHP language</u> since 1997

- Zend <u>delivers commercial products</u> that enable developers and IT personnel to deliver and operate business-critical PHP applications

  – Zend has been the leading supplier of PHP products and solutions for the last six years. Its products and solutions are being used by more than 15,000 companies worldwide. The Zend Engine (the PHP kernel) is being utilized on more than 22 million websites today

  – Zend takes the open source PHP code through rigorous testing for additional quality assurance and adds over 35 popular PHP extensions to deliver their PHP runtime environment

- Zend <u>provides enterprise level support</u> for the PHP environment

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System i and Zend Announcements

- **November 2005 : PHP on System I was a requirement from COMMON to IBM issued through the CEAC (Common Europe Advisory Council) and followed by the CAC (Common Advisory Council)**
- **April 3 2006: IBM and Zend announced a multi-year agreement to deliver selected Zend PHP products and solutions for i5/OS®**

- **2200+ people download the Early Access/Beta release of Zend Core for i5/OS**

- **July 11 2006: IBM announcement of order taking for Zend Core and Studio for i5/OS with GA on July 28 2006.**

http://www.ibm.com/systems/i/software/php

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Zend Products for Linux®, Windows®, and UNIX®

- **Zend Core**

  $199 per year with Standard Support

  – A fully tested and enhanced version of the open source PHP runtime environement.

- **Zend Studio**

  $299 per year with Standard Support

  – Provides an integrated IDE for building and debugging PHP applications

- **Zend Guard**

  $995 per year

  – Provides code protection and license enforcement tools for solution providers

- **Zend Platform**

  Prices not Public

  – A robust PHP production environment providing performance, scalability, and monitoring for PHP applications

  – Prices from zend.com on 6-29-06

Zend for i5/OS

Zend Products for i5/OS

- **Zend Core for i5/OS**
  - Available today via Zend's web site

- **Zend Studio Professional for i5/OS**
  - Available today via Zend's web site

- **Zend Guard**
  - Available today via Zend's web site

- **Zend Platform for i5/OS**
  - Available today via Zend's web site

Zend and System i

- **Products Available for i5/OS V5R4 and <u>V5R3</u>**
  - Zend Core for i5/OS

    `No Charge`
  - A fully tested and enhanced version of the open source PHP runtime environement.
  - Includes toolkit for easy access to i5/OS applications and data

    `No Charge`
  - Zend Studio for i5/OS
    - Provides an integrated IDE for building and debugging PHP applications

  - Zend Platform for i5/OS
    - A robust PHP production environment providing performance, scalability, and monitoring for PHP applications

- **Products can be ordered from IBM or via www.zend.com**
  - Zend Platform being added to econfig in February

Price Comparison

	Linux / Windows	i5/OS
Zend Core with 3 years Standard Support	$199 x 3 = $597	$0
Zend Studio Professional with 3 years Standard Support for 5 people	$299 x 3 x 5 = $4485	$0
Total	$5082	$0

Zend Studio Professional for i5/OS

- **Special, freely-available version for i5/OS servers**
- **The most productive development environment for PHP**
  - Highly advanced PHP editor
  - Client/Server debugging & profiling
  - Database integration
  - Fully supports PHP 5 and the latest technologies
  - Runs on Windows, Linux, MAC
  - Tightly integrated with the Zend product line

Zend Studio Professional for i5/OS

Code Editor

Projects

Inspectors

Debug Messages

Debug Output

Code Views

Zend Studio Example

- **Executes an SQL query, returning records whose LASTNAME field begins with 'S'.**

Employee Records On System i starting with S

000310	Setright	Maude	E11	OPERATE	15900.00
000300	Smith	Philip	E11	OPERATOR	17750.00
000280	Schneider	Ethel	E11	OPERATOR	26250.00
000250	Smith	Daniel	D21	CLERK	19280.00
000180	Scoutten	Marilyn	D11	DESIGN	21340.00
000100	Spenser	Theodore	E21	MANAGER	26150.00
000060	Stern	Irving	D11	MANAGER	32250.00

Zend Platform for i5/OS

Available Now

PHP Application Performance:
– Code Acceleration and Dynamic Content Caching

PHP Intelligence
– Events, triggers, and actions

Application Insight
– Run-time profiling and performance monitoring

Java Bridge
– Java interoperability, requires one JVM for all PHP scripts

Audit trail
– Error re-creation and online debugging

Support for Zend Products

Zend
network

- **Zend provides support for i5/OS based products through the Zend Network**

- **Zend Core for i5/OS and Zend Studio Professional for i5/OS are provided with 3 years of Standard Support**
  - Product downloads including current and previous versions
  - Software updates and information
  - Knowledge Base access
  - Web-based support including unlimited support tickets

- **Gold and Platinum Support options are available**
  - **Gold:** phone support, Monday through Friday, eight hours a day
  - **Platinum:** phone support, seven days a week, twenty-four hours a day

- http://www.zend.com/core/network/

Zend Support Offerings for i5/OS

	Standard	Gold	Platinum
Zend Support Subscription Period	3 years	1 year	1 year
Zend Network	✓	✓	✓
Web-based Support	✓	✓	✓
Web Response Time/SLA	3 days	1 business day	1 business day
North American Phone Support M-F 6am-6pm PST	✗	✓	✓
Global Phone Support M-F 6am-6pm GMT	✗	✓	✓
Phone Response Time/SLA (English)	✗	4 business hours	4 business hours
7x24 P1 Issues Phone Support (English)	✗	✗	✓
7x24 P1 Issues Response Time/SLA	✗	✗	2 hours
Price	No Charge	$	$

PHP Environment After Installation

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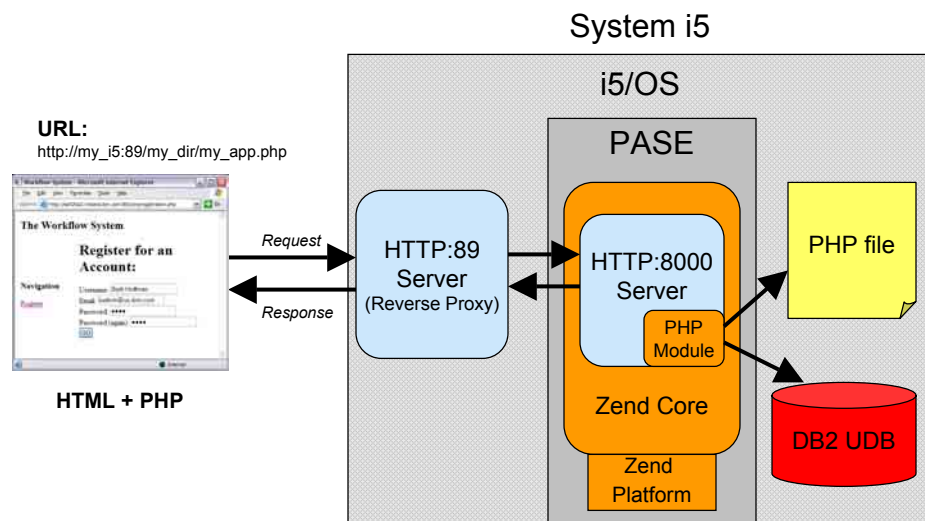
PHP Integration with i5/OS

- **Zend Core for i5/OS includes Extensions and Toolkit so PHP applications can access:**
  - DB2 UDB – SQL and Native
  - Program call
  - Procedure call
  - Data Area
  - Data Queue
  - Message Queue
  - Commands
  - System values
  - Spool files

Why System i for PHP?

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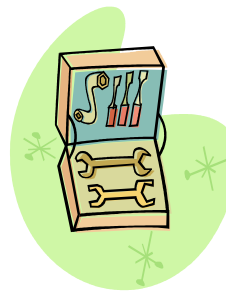
PHP on System i

- **Workload consolidation** of PHP applications onto System i.

- **For System i customers** who need to innovate their business and are looking for an easy, cost-effective and rapid way to deploy web applications

- **For i5/OS solution providers** who need to enhance their application offerings and are looking for an easy, cost-effective and rapid way to develop web applications

- **For PHP solution providers** who need to expand their market for new PHP-based applications with the help of an established partner

i want simple web enablement. i want Control. i want an i.

Value Add of PHP for ISVs

- **When selecting a new programming language, the size of the community is a key factor.**
- **A large open-source community drives higher quality**
  - In products, tools, code samples, documentation
- **Easier to recruit new skilled programmers**
- **Affordable support**
  - Users helping users, less expensive consulting services
- **Large library of open-source sample applications**

Value Add of PHP on i5/OS

- **Extend existing applications to the Web**
  - Integration with System i5 applications and objects
    - Examples: RPG, Java, data queues
- **Create new applications quickly with minimal code**
  - Using existing PHP sample code
  - Using extensions
- **Zend Core packages commonly used extensions**
  - Extensions are plugged in and ready to use
  - Examples: XML, LDAP, FTP, SOA for Web Services
- **Applications benefit from System i5 environment**
  - Stability, reliability, security, virus resistance, ….
- **Consolidate all applications onto one System i5**
  - Including PHP applications

Value Add of PHP for an ISV's Customers

- **Benefits of a Web interface**
  - Without the need for an application server
  - Web browser is the only system requirement
- **Run ISV and other PHP applications on i5/OS**
  - i5/OS is the platform they have and know
  - Customers can find and run other PHP applications
- **Less expensive to buy custom applications**

Installation and Administration of Zend for i5/OS (PHP)

Paul Roy – Real Solutions

i want stress-free IT.
i want control.
i want an i.

© 2007 IBM Corporation
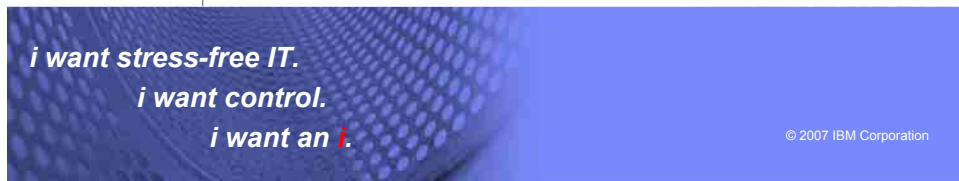
Agenda

- **Installing Zend Core and Studio**
  - Obtaining Zend Core & Zend Studio for i5/OS
  - Installing Zend Core for i5/OS
  - Installing Zend Studio for i5/OS
- **Administering ZendCore**
- **Troubleshooting the PHP environment**

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Obtaining Zend Core & Zend Studio for i5/OS

Obtaining Zend Core & Zend Studio for i5/OS

- **Zend.com Registration**
- **Download (**to your PC**) Zend Core for i5/OS & Zend Studio for i5/OS**
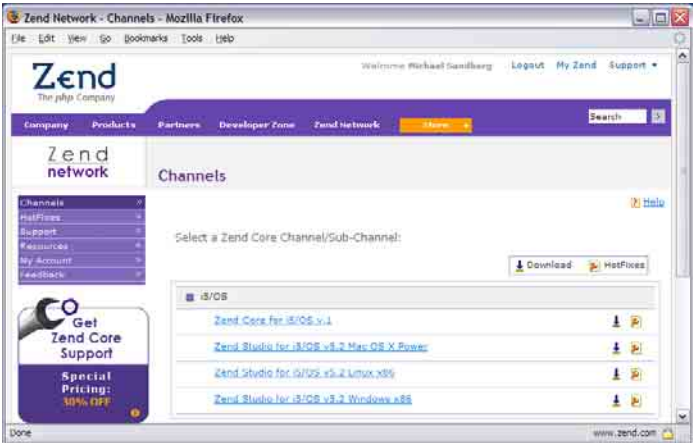
Installing Zend Core for i5/OS

Zend Core Prerequisites

- **Most Current prerequisites -**
  www.zend.com/products/zend_core/zend_for_i5_os
- **System i products that run i5/OS V5R4 or V5R3**
  - System i5™ models
    - 520, 550, 570, and 595
  - iSeries™ models
  - 270, 800, 810, 820, 825, 830, 840, 870, 890, SB2

Zend Core Prerequisites

- **OS V5R4 or V5R3**
- **The latest CUM PTF for System i**
- **Verify the existence of the /usr/local directory. Zend Core files will be installed under this directory.**

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whatever tomorrow brings.

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Zend Core Prerequisites

- **i5/OS V5R4 prerequisite license programs**

Description	Product Option	Licensed Program
Portable App Solutions Environment	33	5722ss1
Qshell	30	5722ss1
System Openness Includes	13	5722ss1
Digital Certificate Manager	34	5722ss1
CCA Cryptographic Service Provider	35	5722ss1
Java Development kit 1.3 or 1.3	5 or 6	5722JV1
IBM HTTP Server for i5/OS	*BASE	5722DG1
IBM Portable Utilities For I5/OS	*BASE	5733sc1
OpenSSH ,OpenSST,Zlib	1	5733sc1

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Unzip Zend Core for i5/OS
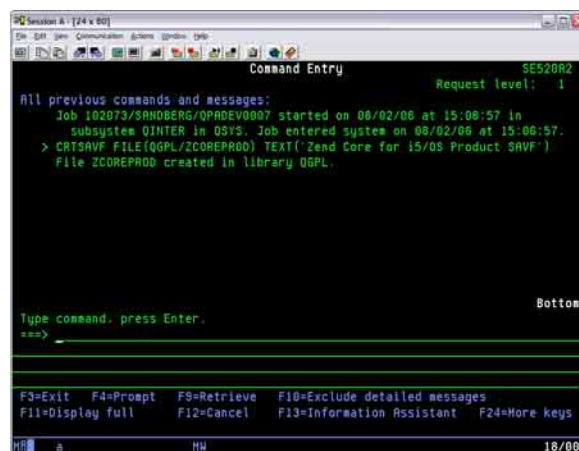
- **Unzip ZendCoreFori5_OS-v1.4.1GA.zip**
  – README
  – RELEASE_NOTES
  – zcoreprod.savf
  – Zend_Core_User_Guide_i5OS.pdf

Name ▲	Size	Type
ZendCoreFori5_OS-v1.4.1GA.zip	47,648 KB	Compressed (zipped) Folder

Name ▲	Size	Type
README	2 KB	File
RELEASE_NOTES	7 KB	File
zcoreprod.savf	301,889 KB	SAVF File
Zend_Core_User_Guide_i5OS.pdf	1,082 KB	Adobe Acrobat 7.0 Document

ZCOREPROD SAVF Creation

- **CRTSAVF FILE(QGPL/ZCOREPROD) TEXT('Zend Core for i5/OS Product SAVF')**

FTP of SAVF to System i

- **Open a Command Prompt on the PC**
- **Change the directory to the location of zcoreprod.savf (cd c:\ in this example)**
- **Start a ftp session with the System i (ftp <System i host name>)**
- **Log in using your System i User & Password**
- **Change the transfer type to binary (bin)**
- **Transfer zcoreprod.savf (put zcoreprod.savf QGPL/ZCOREPROD)**
- **When the transfer is complete exit (quit)**

Install Zend Core for i5/OS

- **Open a 5250 session with the System i**

- **Issue the restore license program command RSTLICPGM LICPGM(1ZCORE5) DEV(*SAVF) SAVF(QGPL/ZCOREPROD) This will launch the install process to install and start the environment. NOTE: The user profile must be of *SECOFR user class, and the QGPL and QTEMP libraries must be in the library list. You will be prompted through several screens.**

Install Zend Core for i5/OS

- **This is the password that will be used when you use the browser based administration for Zend Core.**
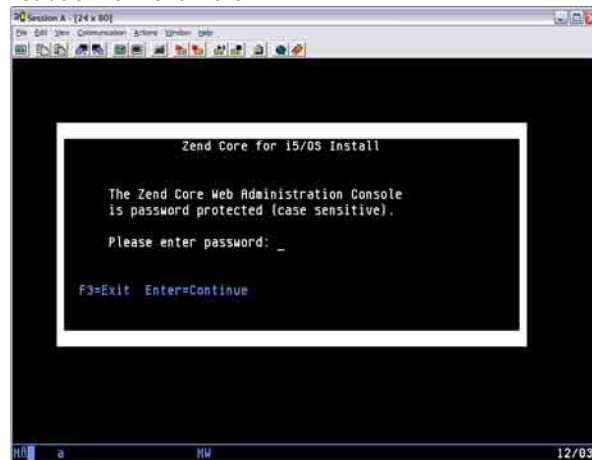
Install Zend Core for i5/OS

- **On this screen you will need to enter the User ID and Password you registered on zend.com**
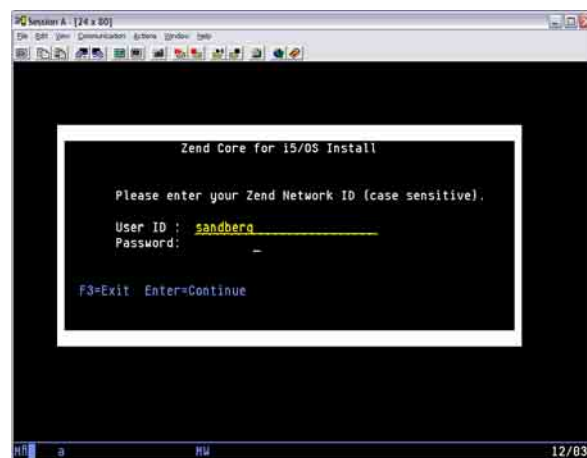
Install Zend Core for i5/OS

- **Once installation is complete the environment is installed and running ready for use.**
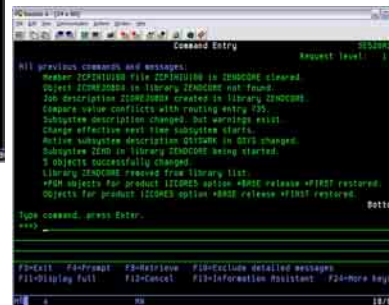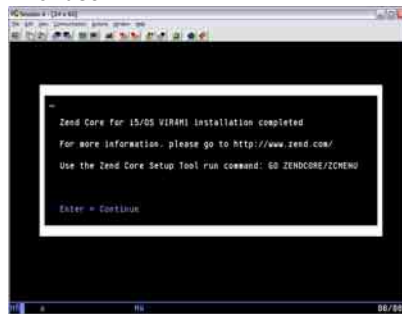
Installing Zend Studio for i5/OS

Zend Studio for i5/OS System Requirements

- **Supported Operating Systems, Platforms and OS versions:**

  - Windows x86 2000, XP, 2003
  - Linux x86
  - Linux x86-64
  - Mac OS X Power 10.4

- **Zend Studio Client - PHP Compatibility:**

  - Supports all PHP versions

Installing Zend Studio for i5/OS

- **Launch ZendStudio_for_i5OS-5_2_0.exe on PC**

Name	Size	Type
ZendCoreFori5_OS-v1.4.1GA.zip	47,648 KB	Compressed (zipped) Folder
ZendStudio_for_i5OS-5_2_0.exe	61,203 KB	Application
ZendStudio_for_i5OS-5_2_0.tar.gz	73,050 KB	GZ File
ZendStudio_for_i5OS-5_2_0_Mac_OSX_POWER.zip	33,815 KB	Compressed (zipped) Folder

InstallAnywhere

InstallAnywhere is preparing to install...

39%

Cancel

Created with InstallAnywhere. © 1998-2005 Zero G Software, Inc. www.ZeroG.com

40
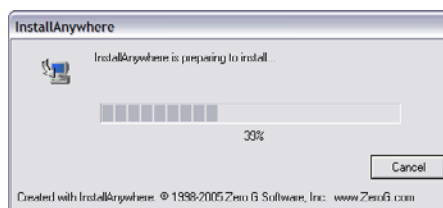
Installing Zend Studio for i5/OS

- **Zend Studio for i5/OS installation GUI**

IBM System i™
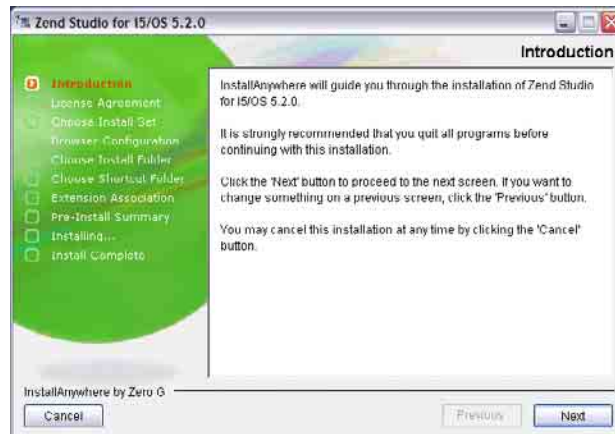
Administering Zend Core for i5/OS

Documentation

- **System i**
  - http://publib.boulder.ibm.com/iseries
- **Zend for i5/OS**
  - www.zend.com/products/zend_core/zend_for_i5_os
- **PHP**
  - www.php.net
- **Apache**
  - www.apache.org

Subsystems

- **There is one subsystem and multiple jobs that run Zend Core**
  - ZEND / I5_COMD
  - ZEND / ZC_STR_PRN
  - ZEND / ZENDCOREAP
  - QHTTPSVR / ZENDCORE

Subsystem/Job	Current User	Type	CPU %	Function	Status
QHTTPSVR	QSYS	SBS	.0		DEQW
ZENDCORE	QTMHHTTP	BCH	.0	PGM-QZHBMAIN	SIGW
ZENDCORE	QTMHHTTP	BCI	.0	PGM-QZSRLOG	SIGW
ZENDCORE	QTMHHTTP	BCI	.0	PGM-QZSRLOG	SIGW
ZENDCORE	QTMHHTTP	BCI	.0	PGM-QZSRHTTP	SIGW
ZENDCORE	QTMHHTTP	BCI	.0	PGM-QZSRHTTP	DEQW
ZEND	QSYS	SBS	.0		DEQW
I5_COMD	QTCP	ASJ	.0	PGM-EASYCOMD	TIMW
ZC_STR_PRN	ZENDADMIN	BCI	.0	PGM-prngd	SELW
ZENDCOREAP	QSECOFR	BCI	.0	PGM-httpd	SELW
ZENDCOREAP	QSECOFR	BCI	.0	PGM-httpd	DEQW
ZENDCOREAP	NOBODY	BCI	.0	PGM-httpd	SELW
ZENDCOREAP	NOBODY	BCI	.0	PGM-httpd	TIMW

Directories & Libraries

- **Library**
  - ZENDCORE
  - Directoriesqsecofr
  - \usr\local\Zend
  - \www\zendcore
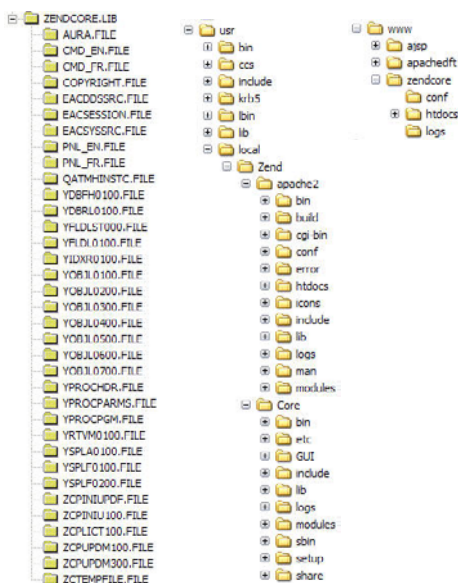
Log Files

- **Zend Core Log Files**
  - \www\zendcore\logs
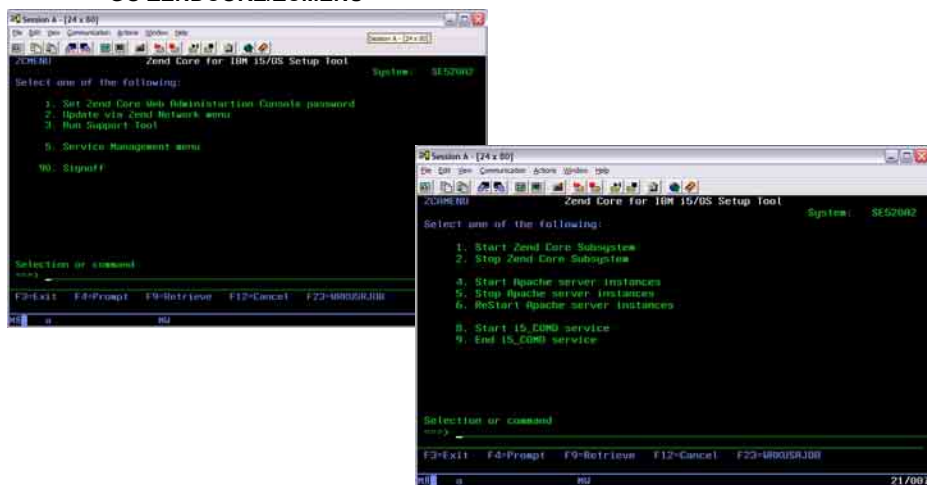 - \usr\local\Zend\apache2\logs
  - \usr\local\Zend\Core\logs

- **Output Errors to Browser**
  - Global in Zend Core administrative interface
  - Individual PHP files

```
//Turn on display_errors
ini_set('display_errors','1');
// Display ALL errors including notices
error_reporting (E_ALL);
```
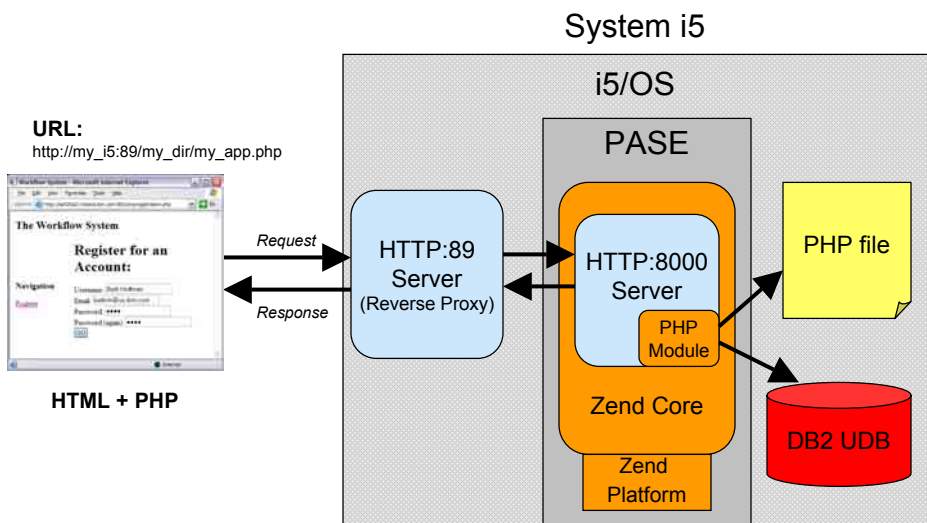
Administration from 5250

- **GO ZENDCORE/ZCMENU**

PHP Environment After Installation

System i5

URL:
http://my_i5:89/my_dir/my_app.php

HTML + PHP

i5/OS

PASE

Request

Response

HTTP:89 Server (Reverse Proxy)

HTTP:8000 Server

PHP Module

Zend Core

Zend Platform

PHP file

DB2 UDB

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Browser Administration – External Apache

- **External Apache Web Server**
  - http://<System i Server>:2001
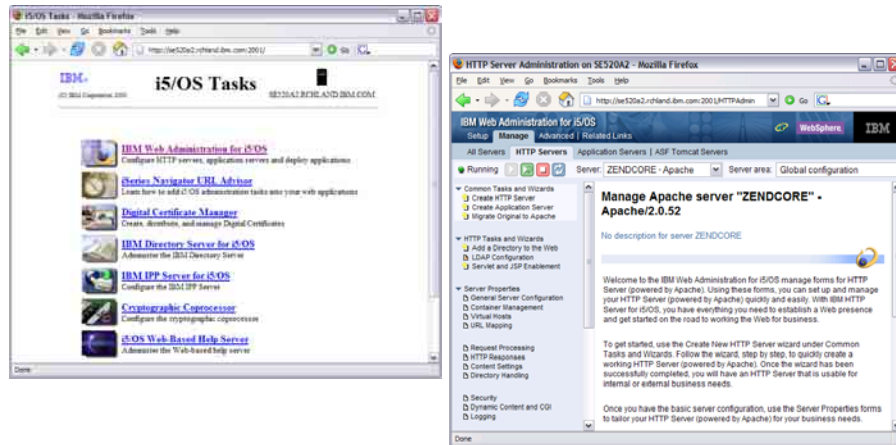
Browser Administration – Zend Core

- **Zend Core Administration**
  - http://<System i Server >:89/ZendCore/
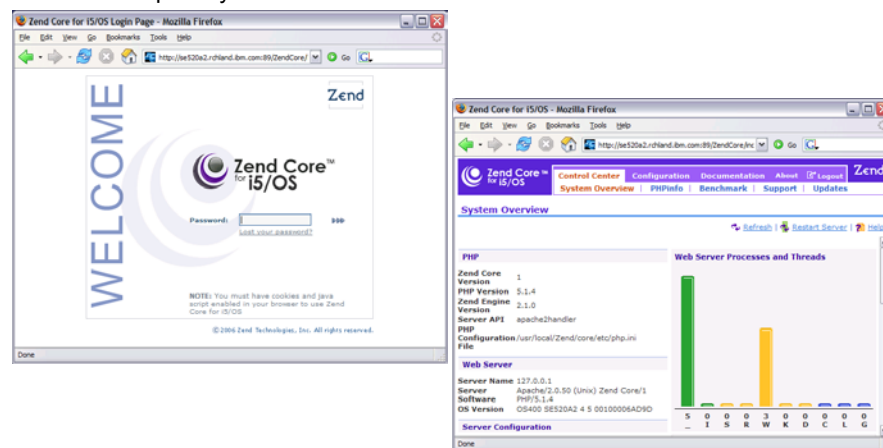
Backup and recovery

- **Use i5/OS save and restore commands**
  - Save Library (SAVLIB) and Restore Library (RSTLIB)
  - Save Object (SAV) and Restore Object (RST)
    - Use for backing up directories
- **Objects to back up:**
  - ZENDCORE product library
    - Contains the product binaries
  - IBM HTTP Server for i5/OS instance:
    - /www/zendcore/*
  - Zend Core for i5/OS (including Apache HTTP Server)
    - /usr/local/Zend/*

Configuration data to back up

- **If you do not perform a full backup of the product, at least back up these files and directories:**
  - /www/zendcore/htdocs/*
    - This directory contains your PHP files and other Web resources
  - /www/zendcore/conf/httpd.conf
    - Configuration file for the IBM HTTP Server instance (ZENDCORE)
  - /usr/local/Zend/apache2/conf/httpd.conf
    - Configuration file for the i5/OS PASE Apache HTTP Server
  - /usr/local/Zend/Core/etc/*
    - Configuration files for Zend Core

Troubleshooting the PHP environment

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In what component is the problem occurring?
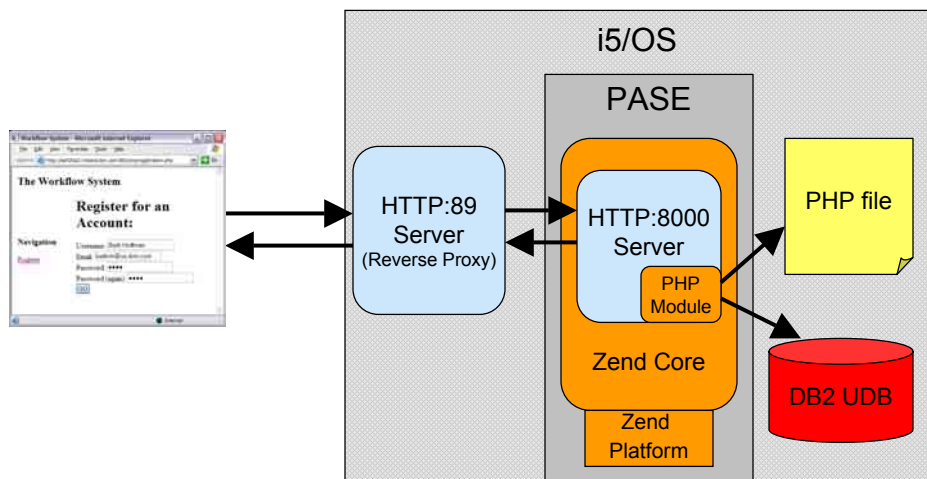
Components to check

- **Browser**
- **Network**
- **IBM HTTP Server for i5/OS (ZENDCORE)**
- **i5/OS PASE Apache HTTP Server**
- **Zend Core for i5/OS**
- **Application**
- **External resources**

Gathering troubleshooting information

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HTTP server log files

- **Types**
  - Error logs show error messages
  - Access logs help you determine if the server received the request
  - You can also create custom logs for tracking certain activity

- **IBM HTTP Server for i5/OS**
  - /www/zendcore/logs
  - To configure:
    - Use IBM Web Administration for i5/OS:
      - **Server Properties** > **Logging**

- **i5/OS PASE Apache HTTP Server**
  - /usr/local/Zend/apache2/logs
  - To configure:
    - Edit the httpd.conf file
      - `ErrorLog` directive
      - `LogFormat` directives

Zend Core for i5/OS logs

- **Located in /usr/loca/Zend/Core/logs**
  - ini_modifier_log – Changes to the php.ini file
  - php_error_log – Script errors

- **Configured in the Zend Core console**
  - **Configuration** > **PHP** > **Error Handling and Logging**
  - Key values:
    - display_errors – If on, writes error messages to the browser
      - Useful for seeing <u>when</u> an error appears
    - display_startup_errors – Turn on to troubleshoot server startup
    - error_log – Specifies the path and name of the error log file
    - error_reporting – Sets the level of error reporting
      - Set to the highest level (ALL) by default
    - log_errors_max_len – Maximum size of the log file

- **Application code can write messages to the log file**

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i5/OS job logs

- **To view a job log:**
    1. Use WRKACTJOB to display running jobs
    2. Option 5 (Work with Jobs)
    3. Option 10 (Display Job Log)
    - **Tip:** Position the cursor over a message and press F1 for more details about the message.

- **More useful for IBM HTTP Server for i5/OS and DB2 UDB for i5/OS troubleshooting**
    - Zend Core jobs do not write much to these (check the product logs instead)
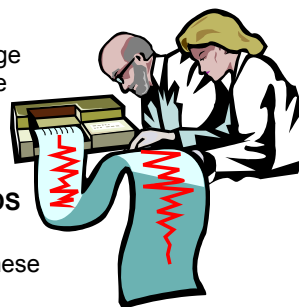
QEZJOBLOG

- **When a job ends, messages are written to an output queue**
    - Useful for tracking down database problems

- **Look for the user profile you use on the connection**
    - QSQSRVR appears in the User Data column for DB jobs

```
                     Work with All Spooled Files

Type options, press Enter.
  1=Send   2=Change   3=Hold   4=Delete   5=Display   6=Release   7=Messages
  8=Attributes        9=Work with printing status

                        Device or                       Total    Cur
Opt   File      User      Queue     User Data    Sts    Pages    Page   Copy
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  5   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
  _   QPJOBLOG  PHPUSER   QEZJOBLOG  QSQSRVR      RDY      2              1
```

QHST job log (History log)

- **Contains system messages**
  - Helpful for determining when jobs started and stopped
    - Gives a historical view for activities system-wide
  - Messages about hardware problems

- **Type the DSPLOG command and press F4 (to enter time period)**

```
                       Display History Log Contents

Subsystem ZEND in library ZENDCORE starting.
Subsystem ZEND started.
Job 291064/QTCP/I5_COMD started on 09/03/06 at 20:51:54 in subsystem ZEND in
Job 291065/ZENDADMIN/ZC_STR_ASJ started on 09/03/06 at 20:51:55 in subsystem
Job 291066/ZENDADMIN/ZC_STR_PRN started on 09/03/06 at 20:51:55 in subsystem
Job 291067/ZENDADMIN/ZCOREJOBD started on 09/03/06 at 20:51:55 in subsystem Z
Job 291069/QTMHHTTP/ZENDCORE started on 09/03/06 at 20:51:55 in subsystem QHT
Job 291067/ZENDADMIN/ZCOREJOBD ended on 09/03/06 at 20:51:55; 1 seconds used;
Job 291066/ZENDADMIN/ZC_STR_PRN ended on 09/03/06 at 20:51:55; 1 seconds used
Sep  3 20:51:55 prngd[5842]: prngd 0.9.29 (12 Jul 2004) started up for user u

Sep  3 20:51:55 prngd[5842]: have 7 out of 2000 filedescriptors open

Job 291065/ZENDADMIN/ZC_STR_ASJ ended on 09/03/06 at 20:51:56; 1 seconds used
Job 291077/QSECOFR/ZENDCOREAP started on 09/03/06 at 20:51:56 in subsystem ZE
Job 291084/QTMHHTTP/ZENDCORE started on 09/03/06 at 20:51:57 in subsystem QHT
Job 291085/QTMHHTTP/ZENDCORE started on 09/03/06 at 20:51:57 in subsystem QHT
                                                                      More...
Press Enter to continue.
```

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Message queues

- **i5/OS user profiles have message queues associated with them**

- **Use the WRKMSGQ MSGQ(<user_profile>) command**

- **User profiles to check:**
  - QSYSOPR
    - System administrative messages
  - QTCP
    - TCP/IP messages
    - The i5 Toolkit for PHP messages
  - The Zend user profiles:
    - ZENDADMIN
    - ZENDTECH
    - NOBODY
      - Zend/Apache server jobs
    - NOGROUP
  - QTMHHTTP
    - IBM HTTP Server for i5/OS

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Troubleshooting checklists


Installation

- **Check for libraries and directories from previous installations**
  - ZENDCORE library
  - /usr/local/Zend/*
  - /www/zendcore/*

- **Check that your user profile has sufficient authority (use the WRKUSRPRF command):**
  - *SECOFR user class
  - *ALLOBJ authority

- **Check that the library list for your user profile contains the following libraries (use the DSPLIBL command):**
  - QGPL
  - QTEMP
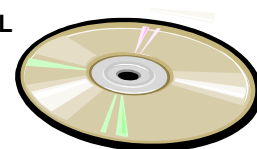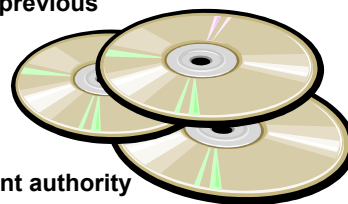
First steps

- **Make sure you have the latest fixes applied**
  - i5/OS
  - DB2 UDB for i5/OS
  - IBM HTTP Server for i5/OS
  - Zend Core for i5/OS
    - Run the Updater tool
      1. GO ZENDCORE/ZCMENU
      2. Option 2 (Update via Zend Network menu)
      3. Option 5 (Update Zend Core components)

- **Make sure all servers are running**
  - WRKACTJOB SBS(QHTTPSVR)
    - IBM HTTP Server for i5/OS instance (ZENDCORE job)
  - WRKACTJOB SBS(ZEND)
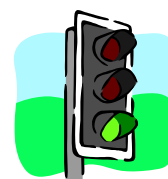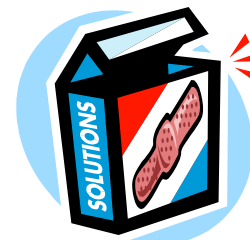
Web servers

- **Make sure the IBM HTTP Server is forwarding requests to the port on which i5/OS PASE Apache HTTP Server is listening**
  - 8000, by default

- **Access logs**
  - Use the access logs to track requests coming into the IBM HTTP Server for i5/OS server.
  - Look for the same request in the i5/OS PASE Apache HTTP Server access logs

- **Note that all content served by the IBM HTTP Server instance (ZENDCORE) is sent to the PASE HTTP server**
  - Create another server instance for static content and use ZENDCORE only for PHP files

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Web server port conflicts

- **Port conflicts result when a server tries to use a port that is already in use**

- **The typical symptom is a server that starts but does not stay running**

- **The default ports:**
  - 89: IBM HTTP Server for i5/OS
  - 8000: i5/OS PASE Apache HTTP Server

- **Use the NETSTAT *CNN command**
  - Press F14 (Shift + F2) to display port numbers
  - Option 8 (Display jobs) shows what jobs are using the port
    - Helpful to identify the conflicting application

- **Change the port number for the application or your Web servers**
  - IBM HTTP Server for i5/OS
    - IBM Web Administration for i5/OS: General Server Configuration
  - i5/OS PASE Apache HTTP Server
    - Edit the httpd.conf file: Listen directive

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Displaying jobs that use a particular port


```
                    Work with TCP/IP Connection Status

Type options, press Enter.
  3=Enable debug    4=End    5=Display details    6=Disable
  8=Display jobs
            Display Jobs Using Connection        Local
                                                 Port   Idle Time   State
Connection type . . . . . . :    *TCP             515   145:05:43   Listen
Local address . . . . . . . :    *               657   145:05:53   Listen
Local port . . . . . . . . :    6077            2001   000:28:52   Listen
Remote address . . . . . . :    *               2301   145:05:59   Listen
Remote port . . . . . . . . :    *               3000   145:06:03   Listen
                                                4111   145:04:03   Listen
Type options, press Enter.                      5544   145:05:25   Listen
  5=Work with job                               5555   145:05:14   Listen
                                         *       6077   042:24:01   Listen
Opt  Name      User      Number   Opt  Name  *  8000   000:10:43   Listen
_    I5_COMD   QTCP      292914            *     8470   145:05:10   Listen
                                           *     8471   145:05:09   Listen
```

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Browsers

- **JavaScript or cookies not enabled**

- **Firewall interference (pop-up blockers, ad blockers)**
  - Some firewall products add code to downloaded Web pages

- **Missing plug-ins**
 - Java, Shockwave, etc.

- **Missing fixes**

Zend Core for i5/OS

- **Check the console for any extension errors**
  - **Configuration** > **Extensions**
  - A red exclamation mark means a problem

- **Examine recently changed settings**
  - **Configuration** > **PHP**
  - Memory usage may be set too low
    - Look under **Resource Limits**
  - Changes to the **Language Options** settings could affect existing applications

- **Check the Zend directives in the Apache httpd.conf file**
  - /usr/local/Zend/apache2/conf/httpd.conf
  - The directives at the very bottom
  - Back up the file periodically so you have something to compare

55
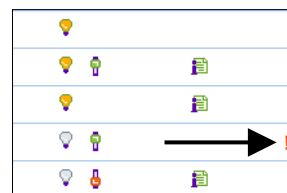
Applications

- **Check that any required modules are loaded**
  - In the Zend Core console, go to
    Configuration > **Extensions**
- **For "File not found" errors, check file names and URLs**
- **If using the i5 Toolkit for PHP, make sure the TCP/IP port it uses (6078) is not being used by another application**
- **Running a debugger**
  - Can help identify access problems with external resources
  - Can help identify conditions that may be true in a development or test environment, but not in a production environment
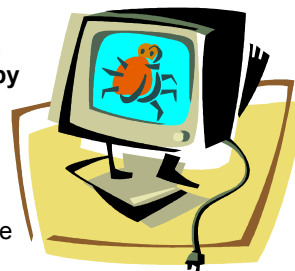
Database access

- **Check the user profile you use on the database connection**
  - Use WRKUSRPRF
  - Is the user profile enabled?
  - Has the password expired?

- **Check existence and names of database objects**
  - WRKLIB (schema)
  - WRKF (table)

Data

- **Check library (schema) and file (table) authorities**
  - DSPOBJAUT OBJ(MYSCHEMA) OBJTYPE(*LIB)
  - DSPOBJAUT OBJ(MYSCHEMA/MYTABLE) OBJTYPE(*FILE)
  - Use CHGOBJAUT to change authorities
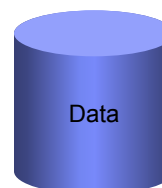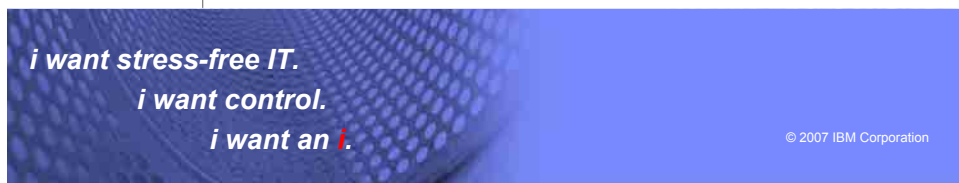
Developing PHP applications for System i

Paul Roy – Real Solutions

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Agenda

- Introduction to PHP Language
- Introduction to Zend Studio for i5/OS
- Accessing i5OS resources with the PHP Toolkit

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Introduction to the PHP language

Basic syntax

- **Flat-text files with a PHP extension (or whatever Zend Core is configured to process)**

- **Can be used for command scripting (using the i5/OS PASE utilities)**

- **Typically used to add dynamic function to HTML**

- **PHP code embedded in PHP tags:**
  ```
  <?php
    // PHP code
  ?>
  ```

- **Lines are delimited with a semicolon (;)**

- **PHP code is processed and the results are sent to the user as HTML**

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Variables

- **Variables**
  - Are signified by a dollar sign ($): $myvar
  - Start with a letter or underscore(_), contain only alphanumeric characters and underscore, and are CaSe-SeNsiTiVe

- **Unlike C/C++/Java, variable type is not declared.**
  - Determined at runtime by the interpreter as one of the following data types:
    - Boolean
    - Integer
    - Float
    - String
    - Array
    - Object
    - Resource
    - Null

Arrays

- **An array in PHP is actually an ordered map**
  - Keys are mapped to values

- **Can be used as a list, vector, hashtable, dictionary, collection, stack, queue, etc.**

- **Can be of three types:**
  - Numeric
    - `$customer[0] = 'Foo Widgets';`
  - Associative
    - `$customer['name'] = 'Foo Widgets';`
  - Multidimensional
    - `$data['customer']['name'] = 'Foo Widgets';`

Control statements

- **if / elseif / else**

```
if ($x > 0) {
  // do this
} elseif ($x < 0) {
  // do this
} else {
  // do this
}
```

- **foreach**

```
foreach($customer as
  $value) {
  echo "Customer:
  $customer";
}
```

- **while**

```
while ($y < 0) {
  y++;
}
```

- **do-while**

```
do {
  y++;
} while ($y < 0);
```

- **for**

```
for ($i = 0; $i < 10; $i++) {
  echo "Number: $i";
}
```

Resources for the PHP language

- **php.net documentation:**
  - http://www.php.net/manual/en/

- **Zend Developer Zone: Tutorials**
  - http://devzone.zend.com/public/view/tag/tutorials

- **W3 Schools: PHP**
  - http://www.w3schools.com/php/default.asp

Application development architecture

Design

- **It is easy to write PHP without thinking about design**
  - Bad separation of display and logic
  - No reuse
  - Poor maintainability
  - Inflexible to changes in technology

- **Take time to gather requirements and work out a design**
  - Can use standard modeling tools for design work

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Model-View-Controller (MVC) architecture

- **The <u>controller</u> directs traffic through the application**
- **The <u>model</u> represents business logic and often accesses business resources**
- **The <u>view</u> is the display**
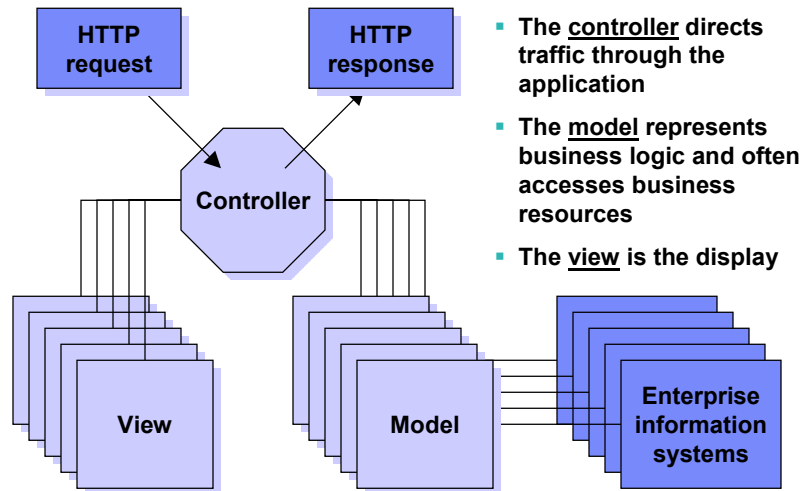
Sample MVC architecture
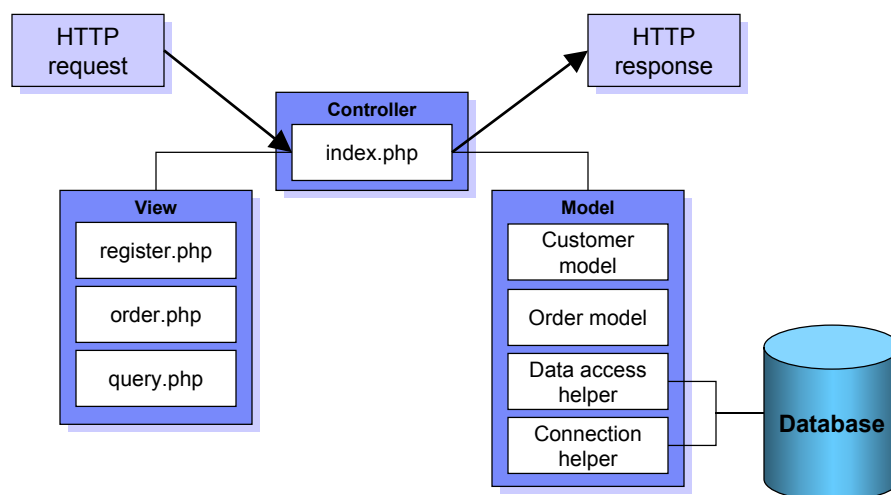
Separation of display and logic

- **Minimize code in the view**
  - Code should only be used for displaying variable data – not performing processing (which should be done in the model)

- **Separate HTML from PHP wherever possible**
  - HTML form in one file, PHP form handler in another file
  - Better opportunity for reuse and migration
    - Can reuse HTML if switching to another dynamic technology
    - Can reuse PHP if switching to another formatting language
  - Static pages require little to no processing
  - Probably results in smaller files that are easier to read and maintain
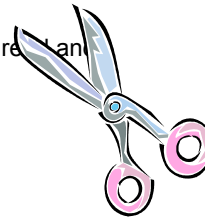
Zend Framework

- **Provides a repository of components that you can use in your PHP applications**

- **Provides a systematic MVC architecture and supporting application programming interfaces (APIs)**

- **Currently a preview**

- **Available at http://framework.zend.com/**

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Introduction to Zend Studio

Zend Studio for i5/OS

- **Zend Development Environment**

- **Free download for Zend Core for i5/OS users**
  - http://www.zend.com/products/zend_core/zend_for_i5_os

- **Different versions for different workstation platforms:**
  - Windows 2000, XP, 2003
  - Linux 32-bit
  - Linux 64-bit
  - Mac OS X on Power

- **Integration with Zend Core**

Zend Studio
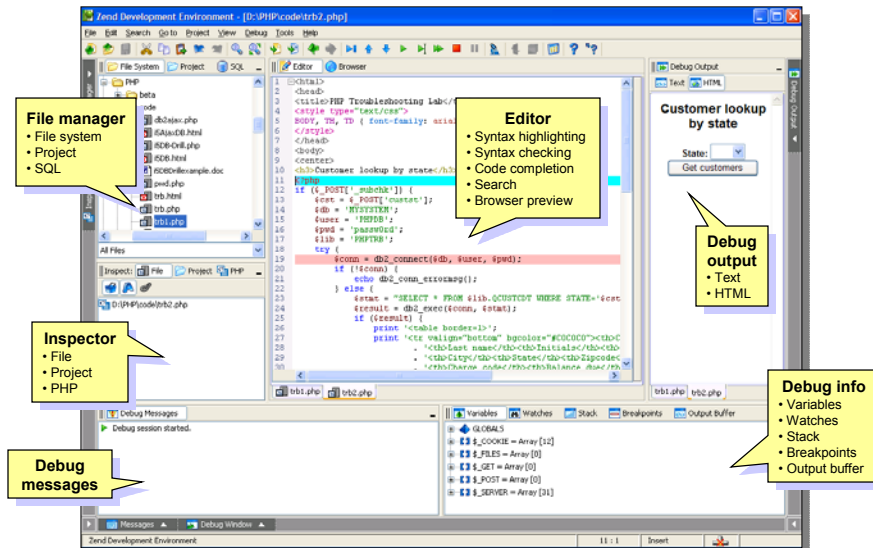
Zend Studio features

- **Editing**
  - Code completion, syntax highlighting, code folding
  - Code analysis
  - Templates
  - Smart navigation and search

- **Web Services (SOAP)**
  - Web Services and WSDL file support

- **Database support**
  - View and query builder

- **Optimization**
  - Code analyzer and profiler

- **Debug**
  - Internal and Web server debugging

- **Browser integration**
  - Internal Internet Explorer (IE) browser on Windows
  - IE and Firefox toolbar to control debugging

- **Team collaboration and documentation**
  - CVS & sub-version support
  - PHPDoc

- **Deployment**
  - Integration with FTP and SFTP

Browser toolbar

- **Integrated into Microsoft Internet Explorer and Mozilla Firefox**
  - Zend Studio – Open the IDE
  - Debug – Current page, next page, POST forms, all pages
  - Profile – Gather performance data
  - Extra Stuff – Settings and Web links
  - Search for PHP information – on Zend.com, Zend Knowledge Base, php.net, Google
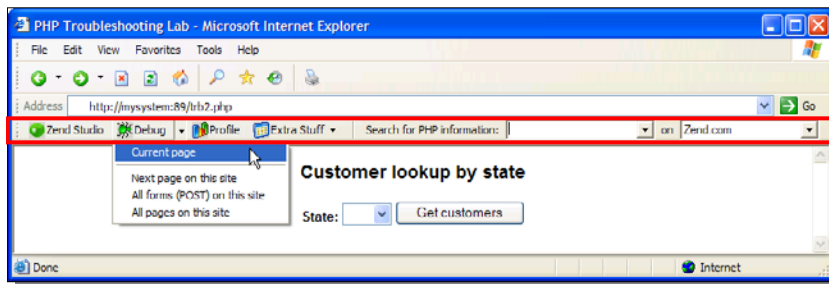
Internal and remote debugging

66
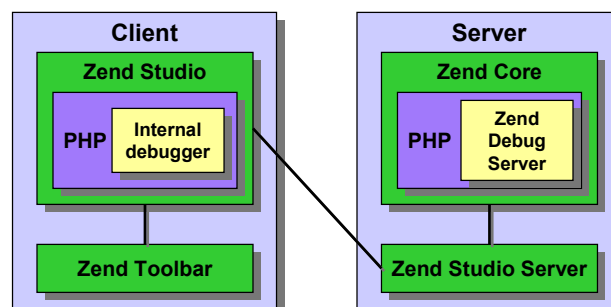
Profiling

- **Profiling tool in Zend Studio can be used to gather performance data about your PHP applications**
  - Page information
  - Time pie chart
  - Function statistics
  - Call trace analysis

Source control

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SQL browser

Multiple database connections

View data

Database structure

Run SQL queries

IBM System i™
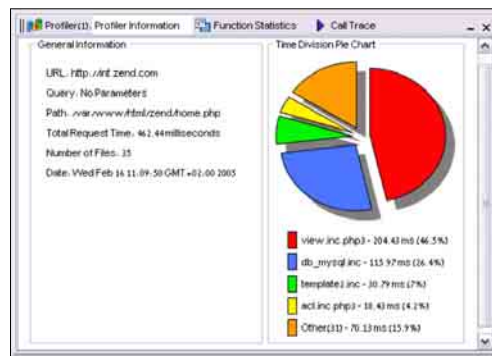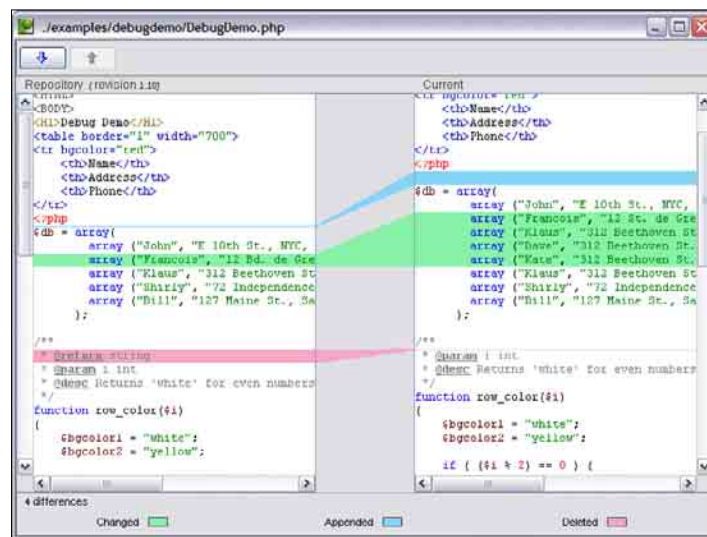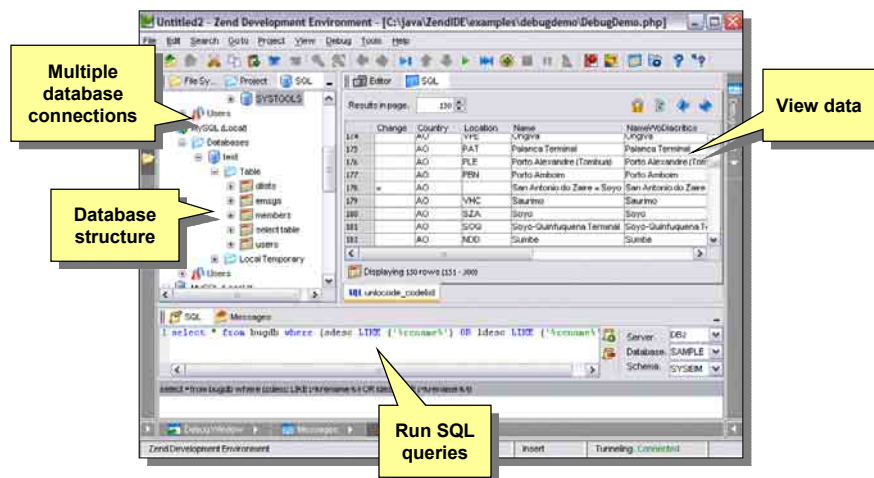
System i PHP Security, Globalization, and Porting considerations

Paul Roy – Real Solutions

PHP: Security

i want stress-free IT.
i want control.
i want an i.
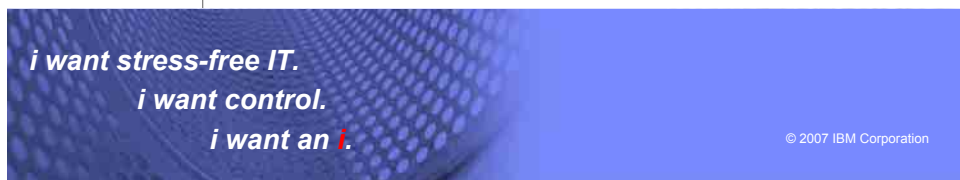
Agenda

- **Review key components of the PHP environment**
- **Security considerations with PHP applications**
- **Security recommendations**
- **Security configuration**
- **Globalization**

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Review Key Components of PHP Environment

General Security Considerations for Default Environment

- **The installation of Zend Core creates the several IFS directories:**
  - /www/zendcore/htdocs   (to store PHP applications)
  - /www/zendcore/conf   (for IBM HTTP Server config file)
  - /usr/local/Zend/apache2/conf (for Apache Server config file)

- **Everyone is able to store and run applications in htdocs directory.**

- **Everyone is able to change the configuration files.**

- **The default environment should not be used for PHP applications that require any level of security.**

- **Use the default environment for prototyping, public applications, and applications using public data.**

- **Once you have a PHP application that you need to secure, you must change the default configurations.**

PHP Run-time Environment

System i5

i5/OS

URL:
http://myproxy:89/core/registration.php

i5/OS PASE

PHP file

Request → **IBM HTTP Server (Reverse Proxy)** → **Apache Server** →

Response ←

PHP Module → Objects

Zend Core

DB2 UDB

Zend Platform

HTML + PHP

Server instance name: **ZENDCORE**
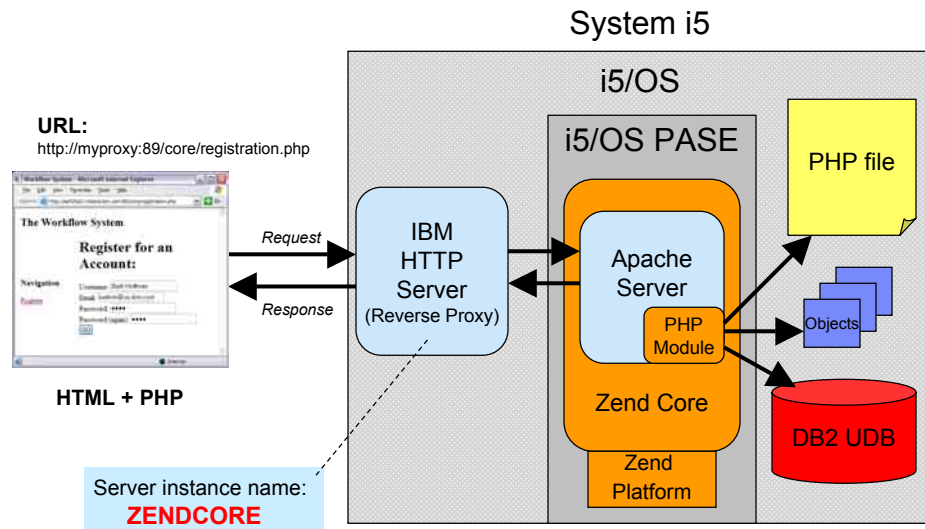
Generic Reverse Proxy Features

- **Improves performance**
  - Can cache static documents in memory
  - Can aid with balancing requests to a set of HTTP servers

- **Improves security**
  - Can control access at the front door
  - Can keep server in DMZ separate from internal network
  - Hides the content server environment
  - Can log activity

- **The reverse proxy used in the PHP environment does not realize many of these advantages.**

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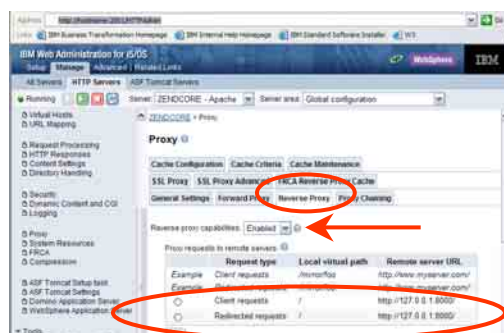
Comparison of the Two HTTP Servers

IBM I5/OS HTTP Server	Zend PASE Apache Server
ZENDCORE server instance; using 5722DG1 product	UNIX-based open source server
ZENDCORE instance created and preconfigured automatically when Zend Core product is installed	Server instance created and preconfigured automatically when Zend Core product is installed
Server runs in i5/OS	Server runs in i5/OS PASE
Main function: reverse proxy server	Main function: run the PHP application and return results
Configure server instance using IBM Web Administration Tool	<u>Cannot</u> configure the server using the IBM GUI; requires manual file updates
All PHP security configuration will be done to ZENDCORE instance	Recommend not changing this configuration

Default Configuration: IBM i5/OS HTTP Server (Reverse Proxy)

- **Server instance name is: ZENDCORE**

- **Configuration file: /www/zendcore/conf/httpd.conf**

- **Listens on port 89**
  - Only receives URL requests that are sent to that port

- **Only accepts requests for PHP applications with a URL of /www/zendcore/htdocs**

- **Users are denied access if requesting any other directory/files/applications**

- **Forwards on those requests to the Apache Server**

- **Allows any user to make requests**

- **All data flowing on the network between client and server is public**

Default Configuration: Zend PASE Apache Server

- **Listens on port 8000**
  - Only receives URL requests that are sent to that port

- **Configuration file: /usr/local/Zend/apache2/conf/httpd.conf**

- **Only accepts requests coming from the localhost (IP address 127.0.0.1)**

- **Allows any user to make these requests**

- **All data flowing between the IBM HTTP Server (Reverse Proxy) and the Apache server is not encrypted**

- **Starting and stopping this server must be done by a user with *SECOFR authority**

Default Configuration: PHP application

- **PHP applications run under the user profile NOBODY**

- **NOBODY user profile**
  - NOBODY user profile is created by Zend Core product install
  - NOBODY has *USER level access
  - NOBODY has no password so you cannot login with it

- **For objects, programs, and data that the PHP code accesses using the i5/OS PHP toolkit, you should specify the appropriate user and password during the initial connection.**
  - Example: db2_connect(user, pwd, …)

- **PHP applications are not able to run as a specific user profile which would allow it to access only the data it has access to.**
  - You cannot reconfigure this. All PHP apps run as NOBODY.

- **PHP application can do different things based on the user making the request.**

Conclusions about Security with the Default Environment

- **After installing Zend Core for i5/OS, placing a PHP application into /www/zendcore/htdocs allows all users to run the PHP application.**
  - You should change/configure this when needed.

- **Any data sent or retrieved by the user could potentially be "seen" by others on the network.**

Conclusion: the default environment should <u>not</u> be used for PHP applications requiring any level of security.

Security Recommendations

Security Recommendations for i5/OS

- **Change the access to the HTTP server configuration files**
  - /www/zendcore/conf/httpd.conf
  - /usr/local/Zend/apache2/conf/httpd.conf
  - Webmasters should have all access.

- **Change the access to the default directory path /www/zendcore/htdocs**
  - For Developers: grant write authority
  - For Public (*PUBLIC): grant *EXCLUDE authority (they have write by default)

- **Do not store applications requiring access control in the default directory path**
  - Store applications requiring similar access control in the same directory or subdirectory. Example: /www/zendcore/protected

- **New PHP application files that need to be secured should be created with the following access:**
  - *PUBLIC *EXCLUDE and write authority for application developers
  - NOBODY read and/or execute

Security Recommendations for IBM i5/OS HTTP Server

Configure ZENDCODE instance to control access to secure applications:

- **Configure it to require users to identify themselves (client authentication)**

- **Configure it to determine if the authenticated user should be given access to the requested application (client authorization)**

- **Configure it to use SSL to encrypt data that travels between the client user and the ZENDCODRE HTTP Server instance (server authentication)**
  - This requires the IBM HTTP Server to have a server digital certificate. Some configuration is required with the Digital Certificate Manager.
  - Note: All data between the IBM HTTP Server and the Apache server is not encrypted.

- **Configure it by adding an alias to hide the real directory name where PHP applications exist and to shorten the URL length**
  - Use an alias

Security Recommendations for PHP Developers

- **Always use .php for the file extension for PHP application files.**
  - Using other extensions causes the Apache server to send back the file source code rather than running the PHP application.

- **Always store backup copies of files in a separate directory from the directories that the IBM HTTP Server is configured to serve from.**
  - Hackers often try to view PHP source code by requesting your PHP application using .BAK extension.

- **Always do input form validation to avoid SQL injection attacks.**
  - When using user-supplied data as part of an SQL statement, you should check that the user-supplied value does not contain SQL escape characters.
  - SQL escape characters allow hackers to append their own SQL statements.
  - Read more on **http://en.wikipedia.org/wiki/Sql_injection**

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Security Recommendations for PHP Applications

If your application needs to know the requesting user to perform user-specific operations, there are several methods:

1. **PHP code can access the user name and password using server environment variables: PHP_AUTH_USER and PHP_AUTH_PW**
   - echo "<p>Hello {$_SERVER['PHP_AUTH_USER']}.</p>";
   - echo "<p>Your password is {$_SERVER['PHP_AUTH_PW']} .</p>";
   - www.php.net/manual/en/reserved.variables.php#reserved.variables.server

2. **Use session support in PHP code to store user data needed by multiple subsequent URL invocations.**
   - **A user accessing your web site is assigned a unique id (or session id) which is stored in a cookie on the user side or is propagated in the URL.**
   - **http://www.php.net/manual/en/ref.session.php**

3. **PHP code can perform its own user authentication using standard HTTP header authentication mechanism. This requires manual Apache server configuration.**
   - **http://httpd.apache.org/docs/1.3/howto/auth.html**
   - **http://www.zend.com/manual/features.http-auth.php**

NOTE: When using the toolkit to access System i5 files, objects, and DB2, you can pass in a specific user name and password.
   - Ex. db2_connect(user, pwd, …………)

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Configuration Preparation

System i Software Prerequisites (V5R4)

- **5722-DG1 IBM HTTP Server for iSeries**
  - Required to serve files and applications and to configure security.

- **5722-SS1 Option 34 Digital Certificate Manager (DCM)**
  - Required for creating and managing digital certificates for the HTTP server.

- **NOTE: If you support a Web server today, you will likely have both of these products installed and configured.**
  - If not, installing the Zend product will install them for you.

Security Roles

- **<u>PHP application developer</u> documents security recommendations for a PHP application.**

- **<u>System administrator</u> installs the PHP application in IFS and secures the files in IFS.**
  - Security is configured using IFS security features.

- **<u>Web administrator</u> configures security for the PHP application.**
  - Security is configured on the IBM HTTP server.

Security Configuration Steps

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Native i5/OS Security Configuration

1. **Create IFS directory for storing applications requiring security**
2. **Set authority for the directory and files**
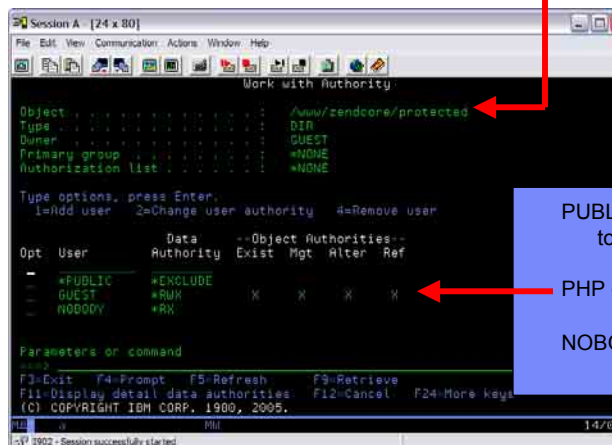
PUBLIC must be excluded in order to protect the application

PHP developers need all access

NOBODY needs read and execute

IBM HTTP Server Security Configuration

1. **In a Web browser, bring up the i5/OS Tasks Page**
   - http://hostname:2001
   - Enter your Webmaster user profile and password
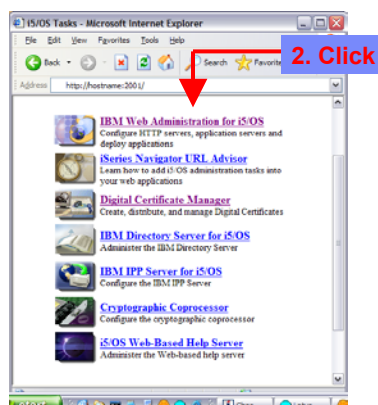
2. Click
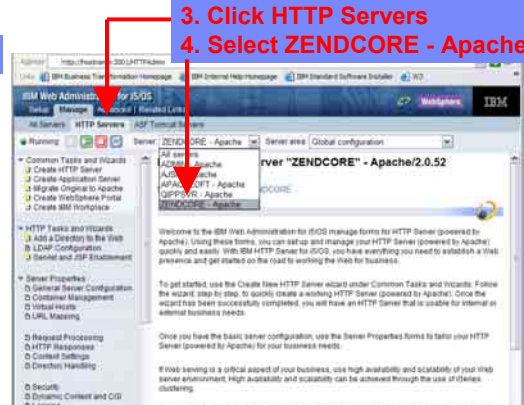
3. Click HTTP Servers
4. Select ZENDCORE - Apache

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Summary

- **Use the default PHP environment for prototyping, public applications, and applications using public data.**

- **Once you have a PHP application that you need to secure, change the default HTTP Server configuration for the ZENDCORE instance.**

- **Your Webmaster will use the same IBM Web Administration Tool to secure PHP applications using the same techniques used for securing other Web applications and files.**

IBM System i™

PHP: Globalization

Agenda

- **Introduction to Application Globalization**
- **Internationalization support in PHP 5**
- **Configuration**

Introduction to Globalization

- **Enabling an application to be used by people who speak different languages.**
- **3 key areas within an application that need focus**
  1. User interface strings that are seen by the application user
  2. Data stored and retrieved by the application user
  3. Formatting of the data viewable by the application user

User Interface Strings

- **If you want your application to be usable by people who read a certain language, the strings that your application displays to the user must be translated into that language.**

- **Best approach is to store all strings in separate files away from the program source code.**
  - This makes it easier to provide the text files to a human language translator.

- **Your PHP code can retrieve the application user's preferred language to determine which language strings to show a particular user.**
  - Using default_charset directive which is configured in the user's Web browser and sent to your HTTP server.

Data

- **Best approach for a global application is to support Unicode data**
- **Unicode is a comprehensive character set that contains all characters from all languages.**
- **Unicode enables a user to enter a field value where each character could potentially be from different language character sets.**
- **System i supports globalization and Unicode**
  - i5/OS operating system, middleware, DB2, etc
  - Read information center: http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp?topic=/nls/rbagsglobalmain.htm
- **The Internet and Web environments support Unicode**
  - Example: Web browsers and Java language

- **PHP 5 does <u>not</u> support Unicode**
  - PHP 6 likely will

Formatting Data

- **Best approach is to store data in a "raw" form (not formatted)**
- **Data should be appropriately formatted based on the application user's language/country**
- **PHP code can retrieve the application user's preferred language/country.**
  - Using default_charset directive which is configured in the user's Web browser and sent to your HTTP server.
- **Data should be formatted just prior to displaying it to the user**
- **Examples of data requiring language/country-specific formatting:**
  - Addresses and telephone numbers
  - Currency and taxes

PHP 5 Internationalization Support for Data

- **Today Unicode is not supported**
- **PHP supports UTF-8 which should be used**
  - This will allow many Latin-based languages to be used
  - Definition: http://en.wikipedia.org/wiki/Utf-8
  - UTF specification: http://tools.ietf.org/html/rfc3629
- **On i5/OS, UTF-8 is supported with CCSID 1208**
- **PHP applications run in i5/OS PASE which inherits globalization environment variables from i5/OS**
  - Examples: LANG, CCSID, NLSPATH

UTF-8 with PHP

- **Data transformations in PHP are determined using the default_charset value in the php.ini file**

- **This value is sent to the client's browser in the Content-Type header so the browser knows what kind of characters it will be displaying.**

Configuration Required

- **i5/OS**
  - Change the job to the right language and CCSID
  - Example: CHGJOB LANGID(RUS) CTRYID(RU) CCSID(1025)

- **i5/OS PASE**
  - Start a i5/OS PASE terminal and change ASCII environment to use UTF-8
  - CALL PGM(QP2TERM)
  - export QIBM_PASE_CCSID=1208
  - export PASE_LANG=RU_RU
  - export LANG=RU-RU

- **PHP**
  - Configure PHP to use UTF-8
  - Edit file: /usr/local/zend/Core/etc/php.ini
  - Locate the line containing 'default_charset' (it will likely be commented out)
  - Change the line to: default_charset = "UTF-8";

Summary

- **Encode character data in DB2 for i5/OS in EBCDIC, UTF-8, or Unicode**

- **After completing the configuration steps, the PHP can extract that character data from DB2 and it will be correctly displayed by the client's browser.**

Additional Resources

PHP Unicode Support

- us3.php.net/unicode

Zend Unicode Support

- www.zend.com/zend/week/php-unicode-design.txt

Globalization: An Overview

- www.ibm.com/servers/enable/site/education/abstracts/88ca_abs.html

Introduction to Unicode for i5/OS on IBM eServer iSeries

- www.ibm.com/servers/enable/site/education/abstracts/8fce_abs.html

Understanding the basics of machine language translation

- www.ibm.com/servers/enable/site/education/abstracts/b766_abs.html

Porting PHP applications to System i

What does "Port" really mean for PHP applications?

- **What level of PHP is the application?**
- **What DB is involved?**
  - MySQL
  - DB2 for i5/OS
  - DB2 for Multiplatforms
- **Does the DB need to be Ported or Migrated?**
- **Open Source Examples**
- **Resources**

Previous Versions of PHP

- **PHP 5 introduced in 2004**

IBM, Oracle Endorse PHP

PHP 5.0
• XML, SOAP, OOP

Yahoo! Standardizes on PHP

• **1M Internet domains**
• **Zend Engine**
• **Zend Founded**

PHP 4 Released

Zeev Suraski, Andi Gutmans develop PHP 3

Rasmus Lerdorf Introduces PHP/FI

20M

15M

10M

5M

PHP Internet Domains

1995 ▶ 1997 ▶ 1999 ▶ 2000 ▶ 2002 ▶ 2004 ▶ 2005
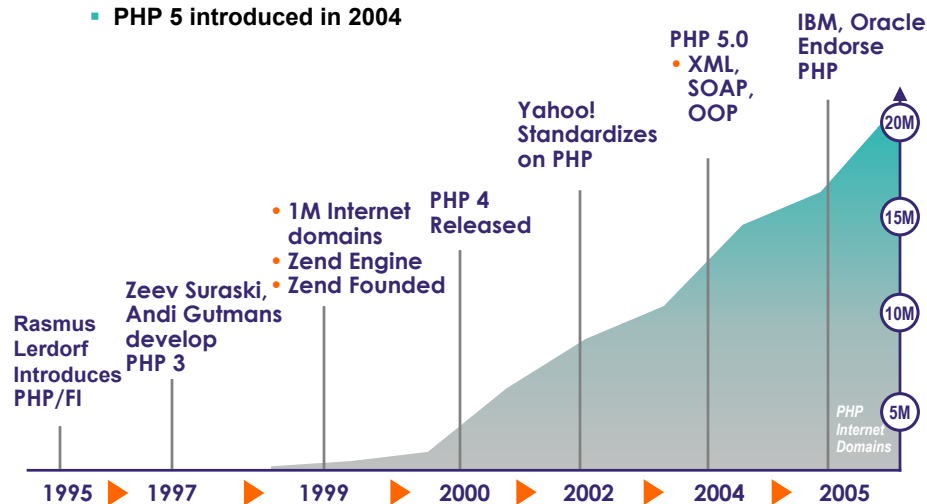
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PHP Version

- **Zend Core for i5/OS provides PHP Version 5.1.6**

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DB2

- **Preferred DB on System i is DB2**
  - Integrated into i5/OS
  - No additional license
  - Developed & Supported by IBM

- **Three ways to access DB2 for i5/OS**
  - DB2 Extensions in PHP
    - http://us2.php.net/manual/en/ref.ibm-db2.php
  - ODBC Extensions in PHP
    - http://us2.php.net/manual/en/ref.uodbc.php

MySQL

- **MySQL is a multithreaded, multi-user, SQL Database Management System (DBMS) with more than six million installations.**

- **MySQL available as free software under the GNU General Public License (GPL)**

- **The Swedish company MySQL AB develops and maintains MySQL, selling support and service contracts.**

- **Many PHP applications utilize MySQL for their DB**

- **MySQL can be installed and run in i5/OS PASE**
  - http://www.zend.com/forums/index.php?t=msg&th=1131

- **MySQL is currently not supported on the System i, use accordingly**

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Does the DB need to be Ported or Migrated?
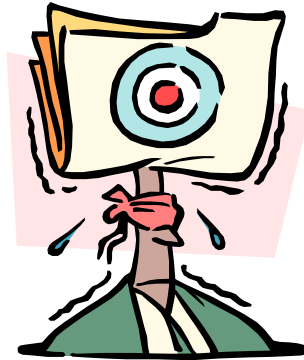
MySQL to DB2

Encountered Issue	MySQL Version	DB2 Equivalent
Want to return a selected amount of rows from a table	SQL -> LIMIT	SQL -> RRN(FROM table_name) BETWEEN row_a AND row_b
Want to know last generated ID of a table after an insert statement	PHP-> mysql_insert_id	A trigger can be created to do a similar task
Want to show tables	SQL -> SHOW TABLES FROM table_name	SQL -> SELECT TABLE_NAME FROM schema_name.SYSTABLES WHERE TABLE_NAME=table_name
Want to show indexes	SQL -> SHOW INDEX FROM table_name	SQL -> SELECT INDEX_NAME FROM schema_name.SYSINDEXES WHERE TABLE_NAME=table_name
Want to know number of rows affected by an SQL statement	PHP -> mysql_num_rows() for SELECT statements, ->mysql_affected_rows() for INSERT, UPDATE, DELETE	PHP -> db2_num_rows(); this does not work for SELECT statements when using non-scrollable cursor
Inserting a key into a table where a primary key already exists	SQL-> IGNORE will simply drop the insert statement	
Setting a column to automatically generate and increment its values	auto_increment	GENERATED BY DEFAULT AS IDENTITY
want to escape a character	add a slash ('\') in front of the character ie. "Smith\'s"	add an apostrophe (') in front of the character, ie. "Smith''s"
Returns an array, indexed by both column name and position, representing a row in a result set	mysql_fetch_array()	db2_fetch_both()

MySQL to DB2

- **MySQL example for table creation**

```
create table myTable (
        age int(11) unsigned NOT NULL auto_increment,
        first_name varchar(10) unsigned default NULL,
        last_name varchar(20) unsigned default NULL,
        PRIMARY KEY (age)) type=MyISAM;
```

- **DB2 Equivalent for Table Creation**

```
create table myTable (
        age INT NOT NULL GENERATED BY DEFAULT AS IDENTITY,
        first_name VARCHAR(10) default NULL,
        last_name VARCHAR(20) default NULL,
        PRIMARY KEY (age));
```

- **Differences in Datatypes**

MySQL	DB2
TINYINT	SMALLINT
MEDIUMINT	INTEGER
INT	INTEGER
TINYTEXT	CLOB(255)
...	...

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Examples of Open Source Applications Running (i5/OS www.zend.com/forums)

- **MediaWiki** (Open Source Wiki) on Zend Core for i5/OS - www.zend.com/forums/index.php?t=msg&th=3134
- **SugarCRM** (Open Source Customer Relationship Management (CRM)) on Zend Core for i5/OS - www.zend.com/forums/index.php?t=msg&th=3111
- **Joomla!** (Open Source Content Management System) on Zend Core for i5/OS - www.zend.com/forums/index.php?t=msg&th=3068
- **Zen Cart** (Open Source Online Store) on Zend Core for i5/OS - www.zend.com/forums/index.php?t=msg&th=3041
- **PmWiki** (Open Source Wiki) on Zend Core for i5/OS - www.zend.com/forums/index.php?t=msg&goto=8085
- **phpBB** (Open Source Bulletin Board) on Zend Core for i5/OS - www.zend.com/forums/index.php?t=msg&goto=8049
- **MySQL** (Open Source DB) on i5/OS - www.zend.com/forums/index.php?t=msg&goto=3004
- **PHP-Nuke** (Open Source Content Management System) on Zend Core for i5/OS - www.zend.com/forums/index.php?t=msg&goto=3541

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Papers & Redbooks

- **Use PHP on System i, Part 1: Introduction and examples**

  http://www-128.ibm.com/developerworks/systems/library/es-path2php

- **Use PHP on System i, Part 2: Net.Data and PHP**

  http://www-128.ibm.com/developerworks/systems/library/es-phppart2

- **PHP: Zend for i5/OS Redook**

  http://www.redbooks.ibm.com/abstracts/sg247327.html

- **Building SOA-based Solutions for IBM System i5 Platform Redbook (PHP WebServices)**

  http://www.redbooks.ibm.com/redpieces/abstracts/sg247284.html

- **Developing PHP Applications for IBM Data Servers Redbook**

  http://www.redbooks.ibm.com/abstracts/sg247218.html

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