

IBM HTTP Server: Migration to Apache User Experience

Ed Webb

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Our Environment

- **SAS Product Build and Test is Our Real Production**
 - z9-BC for Production, Sandbox, Licensing LPARs
 - z196-706 for Product Development and Testing LPARs
 - 6 CPs and 1 ICF
 - 2 zIIPs (zAAP enabled)
- Small Shop, Small Staff
- **Big Data so Big SYSRES and Big DLIB Volumes**
- SYSRES libraries and file systems are not SMS-managed
- SYSRES data sets are indirectly cataloged (except VSAM)

Our Environment

- **2 Sysplexes Running z/OS in One GRS Ring**
 - Production Sysplex with One LPAR
 - Test Sysplex with One LPAR
 - System Programmer “Sandbox”
 - z9-BC Only
- **1 Sysplex Running z/OS in a GRS Star**
 - Development System with Four LPARs
 - One LPAR is Primarily for System Programmer Use
 - z196 (3 LPARs)
 - z9 (1 LPAR)

Our Environment

- **z/OS 2.1 at SAS**

- Include\$ RACF, DFrrmm, DFhsm, DFdss, DFSort, RMF, Print Support Facility and Fonts
- Include\$ HLASM Toolkit, C/C++, COBOL, FORTRAN, PL/1, Pascal, WebSphere MQ
- Includes Ported Tools (all features; IBM HTTP Apache server)
- Java (2 versions, 4 releases, two flavors of each = 8 Java FMIDs), XML V10
- Includes z/OSMF (and its “Liberty Profile” WAS)
- Include\$ JES3 (for use by z/OS guests under z/VM)
- Monthly RSU APPLY

IBM HTTP Server Domino Timeline at SAS

- **Domino Go WebServer (DGW)**
 - March 1998 (DGW 4.6.1)
 - **Early Implementation**
 - June 1999 (DGW 5.0)
 - **Upgrade**
 - February 2000 (DGW 5.1)
 - **Just another upgrade**
- **IBM HTTP Server 5.x powered by Domino (IHSD)**
 - March 2001 (DGW 5.3)
 - **Migration relatively smooth**
 - **Revised our file structure to run multiple HTTP Servers for SAS Product NLS (Native Language) Testing**

IBM HTTP Server Apache Timeline at SAS

- **IHSA 7.0**
 - November 2008 (z/OS V1R10)
 - IBM Ported Tools for z/OS HTTP Server
 - FMID HHAP700
 - No Charge product
 - Used it to test IPv6 with SAS product offerings
- **IHSA 8.5**
 - February 2014 (IHSA 8.5.5 CBPDO on z/OS V2R1)
 - IBM Ported Tools for z/OS HTTP Server
 - FMID HHAP85P
 - UI28569 IHSA 8.5.5.6
 - Migration from IHSD began slowly and continues

Resources for Migration

- Online Books
 - IBM HTTP Server on z/OS: Migrating from Domino-powered to Apache-powered
 - <http://www.redbooks.ibm.com/abstracts/redp4987.html?Open>
 - IBM HTTP Server - Powered by Apache User's Guide
 - <http://publibz.boulder.ibm.com/ebooks/pdf/dpr1cg00.pdf>
 - z/OS HTTP Server Planning... (IHS Domino)
 - http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/BOOKS/IMWZIU18/CCONTENTS

Resources for Migration

- **Sample Configuration Files**
 - **z/OS 2.1 or earlier (IHS Domino)**
 - **`/usr/lpp/internet/samples/config/httpd.conf`**
 - **z/OS 2.1 with Ported Tools IHS Apache feature**
 - **`/usr/lpp/IHSA/V8R5/conf/httpd.conf.default`**
 - **z/OS 2.2**
 - **`/usr/lpp/ihsa_zos/conf/httpd.conf.default`**

Resources for Migration

- **IBM HTTP Server powered by Domino**
 - Installed on z/OS 2.1 or z/OS 1.13
 - Up and Running
 - Customized for your shop

- **IBM HTTP Server powered by Apache feature of IBM Ported Tools for z/OS**
 - Installed on z/OS 2.1 or z/OS 1.13
 - CBPDO or
 - ServerPac
 - UI28569 Available July 2015
 - Time to setup our Apache Server

IBM HTTP Server on z/OS

Migrating from Domino-powered to Apache-powered

Comparison of features

Tips for migration

Usage tips for V8.5.5



IHSA Setup

- **Based on “Sample Real World Process” in Redpaper**
- **Define a configuration directory**
 - Used our existing /web/ which has its own File System
 - Defined a subdirectory (mountpoint) with its own FS
 - /web/server30
 - Created and mounted the hlq.WEB.SERVER30.image file system at /web/server30
- **Define a userid for the IHSA Server**
 - Used our existing WEBADM one in our IMWEB Group
 - Marked PROTECTED (NOPASSWORD NOOID)

IHSA Setup cont'd

- **Based on “Sample Real World Process” in Redpaper**
- **Create an HTTP Server instance**
 - su – webadm
 - cd /usr/lpp/IHSA/V8R5/bin
 - ./install_ihs /web/server30 8840 (8840 is listen port)
- **Define a Started Task Profile for the IHSA Server**
 - RDEFINE STARTED IMWEBS30.*
STDATA(USER(WEBADM))
 - SETROPTS RACLIST(STARTED) REFRESH

IHSA Setup cont'd

- **Create a Started Task Procedure in SYS1.PROCLIB**

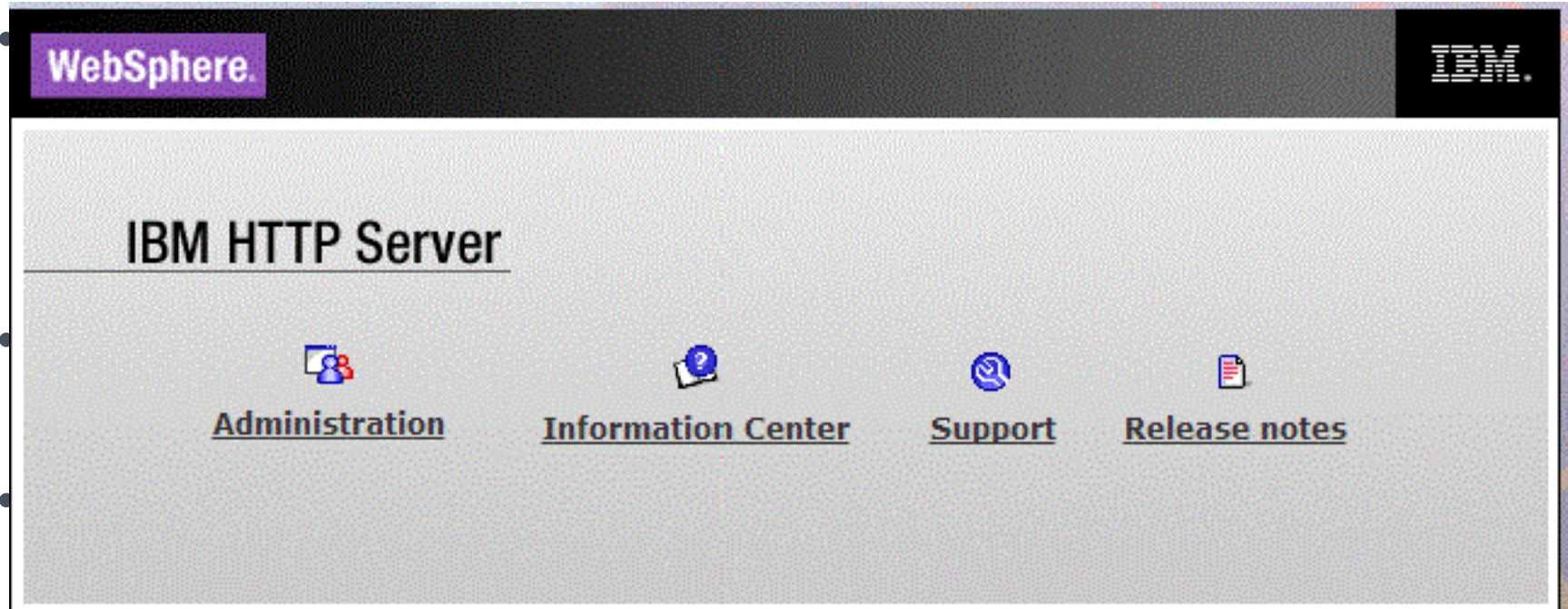
```
//IMWEBS30 PROC ACTION='start',  
//      DIR='/web/server30',  
//      CONF='conf/httpd.conf'  
/* To end this server, S IMWEBS30,ACTION='stop'  Restart is ='graceful'  
/* LIB: SYS1.PROCLIB(IMWEBS30) Original: SYS1.SHAPJCL2(HAPBPROC)  
//IHS   EXEC PGM=BPXBATCH,  
// PARM='SH &DIR/bin/apachectl -k &ACTION -f &CONF -DNO_DETACH',  
// MEMLIMIT=512M  
//STDOUT DD PATH='&DIR/logs/proc.output',  
//      PATHOPTS=(OCREAT,OAPPEND,OWRONLY),  
/*      PATHOPTS=(OWRONLY,OCREAT,OTRUNC),  
//      PATHMODE=(SIRUSR,SIWUSR,SIRGRP,SIWGRP)  
//STDERR DD PATH='&DIR/logs/proc.errors',  
//      PATHOPTS=(OCREAT,OAPPEND,OWRONLY),  
/*      PATHOPTS=(OWRONLY,OCREAT,OTRUNC),  
//      PATHMODE=(SIRUSR,SIWUSR,SIRGRP,SIWGRP)  
//      PEND
```

IHSA Setup cont'd

- Based on “Sample Real World Process” in Redpaper
- Start the HTTP Server
 - S IMWEBS30
 - Multiple Address Spaces are created, most are children to handle requests
- Verify the IHSA Server
 - <http://s390devt.mvs.sas.com:8840/index.html>

IHSA Setup cont'd

- Based on “Sample Real World Process” in Redpaper



IHSA Setup cont'd

- Check the IHS Domino Server
 - <http://s390deva.mvs.sas.com>



CONFIGURATION AND ADMINISTRATION FORMS (Web Administrator only)

To set up, configure, and administer the IBM HTTP Server.

Tune your browser first. (All users)



SAS/Intrnet demos

Sample demos using SAS/IntrNet



BonusPakII Demos

Demos distributed with BonusPakII offering (CICS/DB2/IMS/REXX)

IHSA Configuration

- Based on “Chapter 5: Migration” in Redpaper
- Our Goal for Migration: Do What We Do Now
 - No SSL, No SMF
 - No Application Changes – Required z/OS Services
 - CGIUTILS
 - CGIPARSE
 - MVSDS
- What’s Ours in the IHSD Configuration File
 - Compared our /web/server1/httpd.conf file with the IHSD sample in /usr/lpp/internet/samples/config/httpd.conf
 - Used ISPF 3.17 and its COMPare command

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- Enable Services in IHSA (uncomment in httpd.conf)
 - # Enable SAF (RACF) Security
 - LoadModule authnz_saf_module modules/mod_authnz_saf.so
 - # Enable support for z/OS Modify Commands
 - LoadModule zos_cmds_module modules/mod_zos_cmds.so
 - Add directive to shipped httpd.conf for MVSDS
 - # allow the server to display z/OS data sets
 - LoadModule mvds_module modules/mod_mvds.so

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- Existing Services in IHSD
 - #Enable addition logs
 - AccessLog /web/server1/logs/httpd-log
 - ErrorLog /web/server1/logs/httpd-errors
- Enable Services in IHSA
 - #Enable additional logs
 - CustomLog logs/referer_log referer
 - CustomLog logs/agent_log agent

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- “URL and File Mapping Directives”

IBM HTTP Server powered by Domino	IBM HTTP Server powered by Apache
Pass	Alias
Exec	ScriptAlias
Map	Rewrite
Redirect	Redirect
Fail	Deny
Proxy	ProxyPass

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- **PASS Directive in IHSD**
 - Pass /BonusPak2/* /usr/local/BonusPak2/*
 - Pass /BonusPak/* /usr/local/BonusPak2/bookdemo/*
- **ALIAS Directive in IHSA**
 - Alias /BonusPak2/ "/usr/local/BonusPak2/"
 - Alias /BonusPak/ "/usr/local/BonusPak2/bookdemo/"

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- EXEC Directive in IHSD
 - Exec /BonusCGI2/* /usr/local/BonusPak2/cgi-bin/*
 - Exec /BonusCGI/*
/usr/local/BonusPak2/bookdemo/cgi-bin/*
- ScriptAlias Directive in IHSA
 - ScriptAlias /BonusCGI2/ "/usr/local/BonusPak2/cgi-bin/"
 - ScriptAlias /BonusCGI/
"/usr/local/BonusPak2/bookdemo/cgi-bin/"

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- Redirect Directive in IHSD
 - Redirect `/secure/*` `https://s390devt.mvs.sas.com:443/*`
 - Redirect `/insecure/*` `http://s390devt.mvs.sas.com:80/*`
- Redirect Directive in IHSA
 - Redirect permanent `/secure/`
`https://s390deva.mvs.sas.com:443/`
 - Redirect permanent `/insecure/`
`http://s390deva.mvs.sas.com:8840/`

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- ASCII and EBCDIC Considerations
 - IHS Domino and “rough” Apache equivalents

DefaultFsCp	CharsetSourceEnc
DefaultNetCp	CharsetDefault
AddLanguage	AddLanguage
AddCharSet	AddCharSet
AddType	AddType

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- DefaultFsCp and DefaultNetCp Directives in IHSD
 - DefaultFsCp IBM-1047 # En_US / (English EBCDIC)
 - #DefaultNetCp - network code page for ASCII text
 - DefaultNetCp ISO8859-1 # En_US
- CharsetSourceEnc and CharsetDefault in IHSA
 - Provided by IBM in httpd.conf
 - LoadModule charset_lite_module modules/mod_charset_lite.so
 - <Location />
 - CharsetSourceEnc IBM-1047
 - CharsetDefault ISO8859-1
 - </Location>

IHSA Configuration cont'd

- Based on “Chapter 5: Migration” in Redpaper
- AddType Directive in IHSD
 - AddType .ief image/ief binary 1.0 # ImageExchange
 - AddType .jpg image/jpeg binary 1.0 # JPEG
 - AddType .JPG image/jpeg binary 1.0
- AddType Directive in IHSA
 - Not needed for these filetypes
 - Look in mime.types file in /CONF/
 - image/ief...ief
 - image/jpeg...jpeg jpg jpe

IHSA Setup for MVSDS

- Based on “New Features” in Redpaper
- Implement MVSDS functions in IHSA
 - # allow the server to display z/OS data sets
 - <Location /mvlds>
 - # Treat URL's as dataset names
 - MVSDS ON
 - # Data sets often lack file extensions
 - DefaultType text/plain
 - # Allow PDS listings
 - MVSDSIndexes On

IHSA Setup for MVSDS cont'd

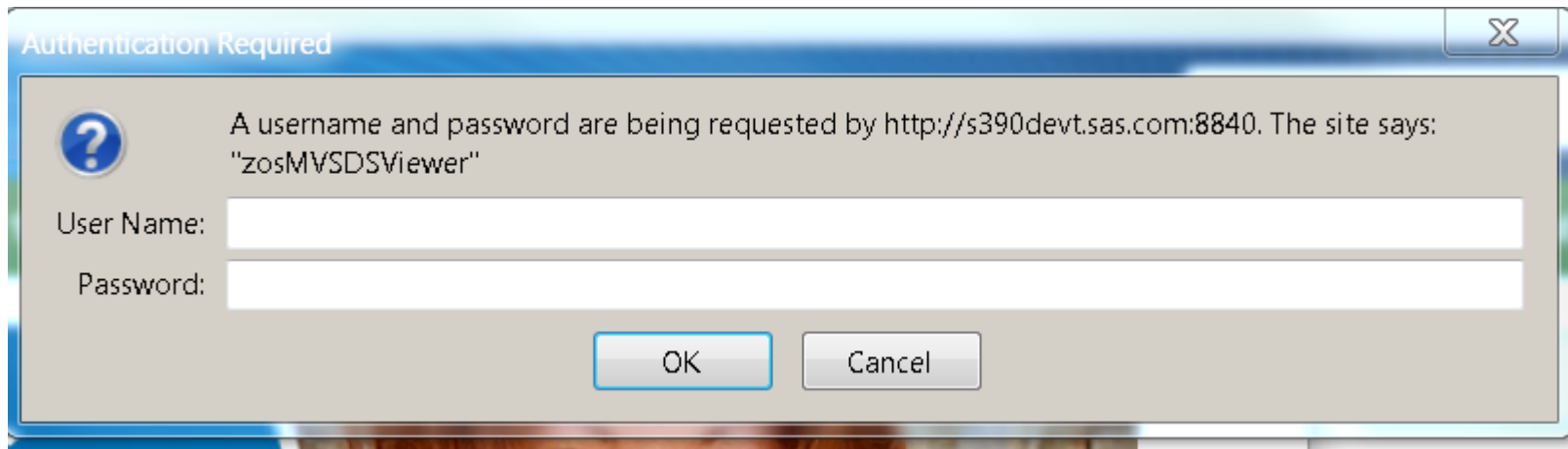
- Based on “New Features” in Redpaper
- Implement MVSDS Security in IHSA
 - AuthName zosMVSDSViewer
 - AuthType Basic
 - AuthBasicProvider saf
 - Require valid-user
 - SAFRunAS %%CLIENT%%
 - AuthSAFExpiration "EXPIRED! oldpw/newpw/newpw"
 - AuthSAFReEnter "Enter new password one more time"
 - CharsetSourceEnc IBM-1047
 - CharsetDefault ISO8859-1
 - </Location>

IHSA Setup for MVSDS cont'd

- MVSDS Security in IHS Domino
- Protection MVS_Logon {
}
Protect /MVSDS/* MVS_Logon %%CLIENT%%

IHSA Setup for MVSDS cont'd

- Based on “New Features” in Redpaper
- Security Prompt from IHS Apache says zosMVSDSViewer



IHSA Setup for MVSDS cont'd

- **MVSDS Displays PDS Directory**
 - Click the Member Name to view the member
 - Shows ISPF member statistics

Directory Listing of 'CPAC.C

Name	Size	Created	Changed		ID
\$\$\$COIBM	3	2005/12/14	2005/12/14	13:32:54	CS66787
BLSCDDIR	152	2013/07/17	2013/07/17	14:50:12	SNOSEW
CPPCLST	160	2013/06/10	2013/06/10	16:54:14	SCNPESP
ISPFENU	175	2013/06/10	2013/06/10	17:10:09	SCNPESP
ISPPDF	165	2013/06/10	2013/06/10	16:54:14	SCNPESP
SCROLL	89	2013/06/10	2013/06/10	16:54:15	SCNPESP

IHSA Setup for MVSDS cont'd

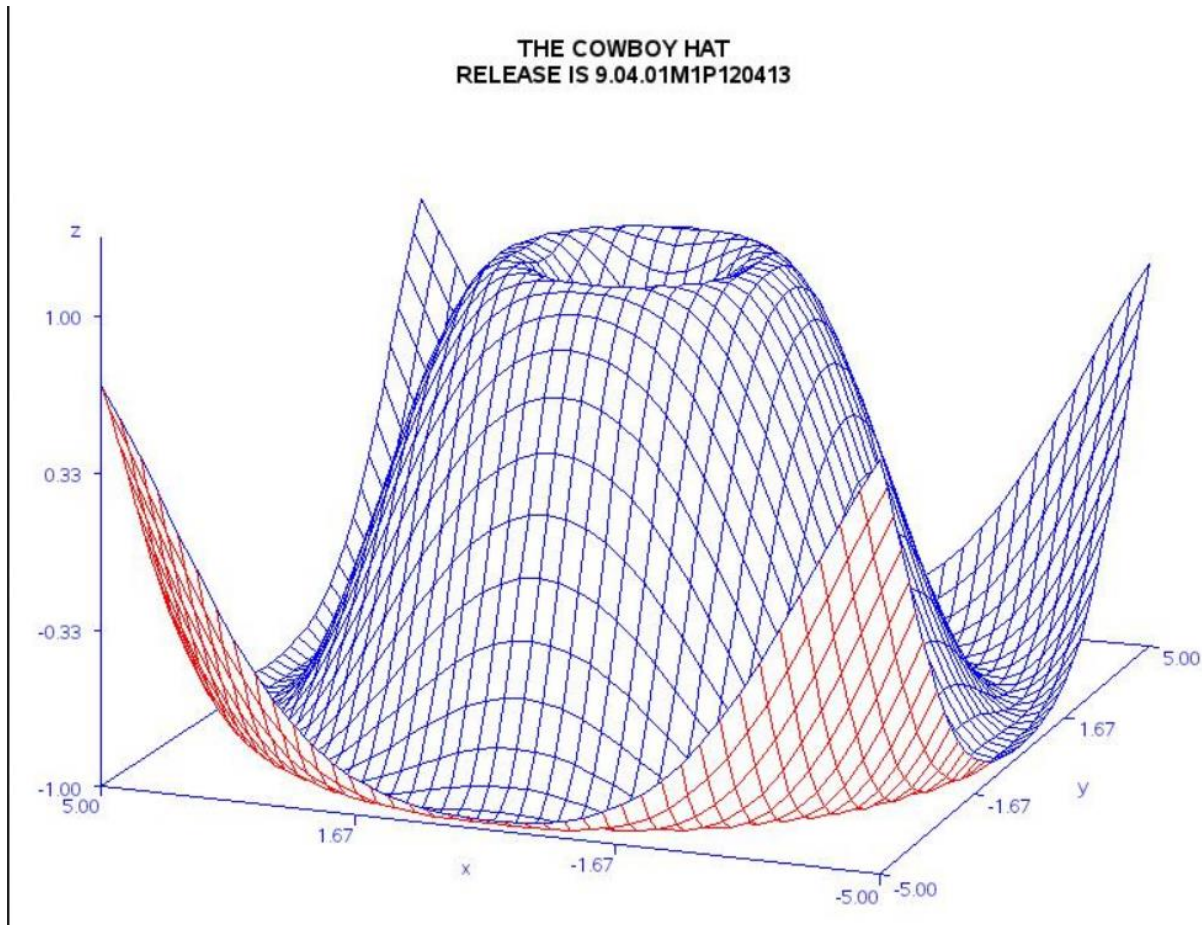
- Based on “New Features” in Redpaper
- ['http://s390devt.sas.com:8840/MVSDS/'cpac.PGMDIR.pdf\(QM000895\)'](http://s390devt.sas.com:8840/MVSDS/'cpac.PGMDIR.pdf(QM000895))

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IHSA Setup for MVSDS cont'd

- ['http://s390devt.sas.com:8840/MVSDS/'SNOSEW.PDSE.GIF\(JPEG1\)'](http://s390devt.sas.com:8840/MVSDS/'SNOSEW.PDSE.GIF(JPEG1))



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11-Aug-15

IHSA Setup for “Public” Security

- Based on “Chapter 5: Migration” in Redpaper
- Implement “Public” Security in IHSA
 - ScriptAlias /bin-public/ "/dept/iss/web/sww/bin-public/"
 - <Directory "/dept/iss/web/sww/bin-public">
 - AllowOverride None
 - Options None
 - Order allow,deny
 - Allow from all
 - </Directory>

IHSA Setup for MVSDS cont'd

- Check the IHS Apache Server
 - <http://s390deva.sas.com:8840/>



IBM
HTTP Server

[CONFIGURATION AND ADMINISTRATION FORMS](#) (Web Administrator only)

To set up, configure, and administer the IBM HTTP Server.

[Tune your browser first.](#) (All users)



[SAS/Intrnet demos](#)

Sample demos using SAS/IntrNet



[SAS/Intrnet 9 demos](#)

Sample demos using SAS/IntrNet 9



[BonusPakII Demos](#)

Demos distributed with BonusPakII offering (CICS/DB2/IMS/REXX)

IBM HTTP Server Domino Instance at SAS

```
• Pathname . : /DEVA/web/server1
•          SYSZFS.WEB.SERVER1.DEVA
•
•
•          Filename          Type Permission  Owner      Group
•          -----
•          .                  Dir   rwxr-xr-x  WEBADM     IMWEB
•          ..                 Dir   rwxr-xr-x  WEBADM     IMWEB
•          cgi                 Dir   rwxr-xr-x  WEBADM     IMWEB
•          SYSZFS.WEB.SERVER1.CGI.DEVA
•          httpd.conf         File  rwxr-xr-x  WEBADM     IMWEB
•          httpd.envvars      File  rw-r--r--  WEBADM     IMWEB
•          httpd-pid          File  rw-r--r--  BPXROOT    SYS1
•          ics_pics.conf      File  rw-r--r--  WEBADM     IMWEB
•          javelin.conf       File  rw-r--r--  WEBADM     IMWEB
•          lgw_fcgi.conf      File  rw-r--r--  WEBADM     IMWEB
•          logs               Dir   rwxr-xr-x  WEBADM     IMWEB
•          SYSZFS.WEB.SERVER1.LOGS.DEVA
•          mvds.conf          File  rw-r--r--  WEBADM     IMWEB
•          pub                 Dir   rwxr-xr-x  WEBADM     IMWEB
•          SYSZFS.WEB.SERVER1.PUB.DEVA
•          reports           Dir   rwxr-xr-x  WEBADM     IMWEB
•          SYSZFS.WEB.SERVER1.REPORTS.DEVA
•          rexx               Dir   rwxr-xr-x  WEBADM     IMWEB
•          SYSZFS.WEB.SERVER1.REXX.DEVA
•          sec                Dir   rwx-----  SNOJRH2    SYS1
•          SYSZFS.WEB.SERVER1.SEC.DEVA
•          servlets          Dir   rwxr-xr-x  WEBADM     IMWEB
•          SYSZFS.WEB.SERVER1.SERVLETS.DEVA
•          socks.conf         File  rw-r--r--  WEBADM     IMWEB
```

IBM HTTP Server Apache Instance at SAS

Pathname . : /DEVA/web/server30

SYSZFS.WEB.SERVER30.DEVA

Filename	Type	Permission	Owner	Group
.	Dir	rwxrwxr-x	WEBADM	IMWEB
..	Dir	rwxr-xr-x	WEBADM	IMWEB
.3lbit	Syml	rwxrwxrwx	BPXROOT	IMWEB
bin	Dir	rwxr-xr-x	WEBADM	IMWEB
build	Dir	rwxr-xr-x	WEBADM	IMWEB
cgi-bin	Dir	rwxr-xr-x	WEBADM	IMWEB
conf	Dir	rwxr-xr-x	WEBADM	IMWEB
error	Dir	rwxr-xr-x	WEBADM	IMWEB
example_module	Syml	rwxrwxrwx	BPXROOT	IMWEB
htdocs	Dir	rwxr-xr-x	WEBADM	IMWEB
icons	Dir	rwxr-xr-x	WEBADM	IMWEB
include	Dir	rwxr-xr-x	WEBADM	IMWEB
lib	Dir	rwxr-xr-x	WEBADM	IMWEB
logs	Dir	rwxr-xr-x	WEBADM	IMWEB
man	Syml	rwxrwxrwx	BPXROOT	IMWEB /usr/lpp/IHSA/V8R5/man
modules	Dir	rwxr-xr-x	WEBADM	IMWEB
notices	Syml	rwxrwxrwx	BPXROOT	IMWEB
properties	Dir	rwxr-xr-x	WEBADM	IMWEB
readme	Syml	rwxrwxrwx	BPXROOT	IMWEB IHSA Service Changes reports
readme.txt	Syml	rwxrwxrwx	BPXROOT	IMWEB
version.signature	File	rwxr-xr-x	WEBADM	IMWEB IBM HTTP Server 8.5.5.6
HAPBB001.zip	Syml	rwxrwxrwx	BPXROOT	IMWEB
HAPBE001.sh	Syml	rwxrwxrwx	BPXROOT	IMWEB
IBM	Syml	rwxrwxrwx	BPXROOT	IMWEB /usr/lpp/IHSA/V8R5/IBM

IBM HTTP Server Apache Instance at SAS

- Pathname . : /DEVA/web/server30/conf

Filename	Type	Permission	Owner	Group
-----	-----	-----	-----	-----
httpd.conf	File	rwxr-xr-x	WEBADM	IMWEB
httpd.conf.default	File	rwxr-xr-x	WEBADM	IMWEB
httpd.conf.orig	File	rwxr-xr-x	BPXROOT	IMWEB
mime.types	File	rw-r--r--	WEBADM	IMWEB
mime.types.default	Syml	rw-rw-rw-	BPXROOT	IMWEB
postinst.properties	File	rw-r--r--	WEBADM	IMWEB

IBM HTTP Server Apache Logs at SAS

- `/web/server30/logs/access_log`
- 10.17.15.76 - - 20/Jun/2015:11:35:31 -0400 "GET /MVSDS/%27SSD.ZOSV2R01.CNTL(\$\$\$\$DEVA)%27 HTTP/1.1" 401 475
- 10.17.15.76 - snosew 20/Jun/2015:11:35:41 -0400 "GET /MVSDS/%27SSD.ZOSV2R01.CNTL(\$\$\$\$DEVA)%27 HTTP/1.1" 200 273699
- 10.17.15.76 - - 20/Jun/2015:11:35:41 -0400 "GET /favicon.ico HTTP/1.1" 404 283
- 10.17.15.76 - snosew 20/Jun/2015:11:46:50 -0400 "GET /MVSDS/%27SSD.ZOSV2R01.CNTL(\$DEVA) HTTP/1.1" 404 303
- 10.17.15.76 - - 15/Jul/2015:17:13:24 -0400 "GET /bin-test/nfsmtptlk HTTP/1.1" 401 475
- 10.17.15.76 - snosew 15/Jul/2015:17:13:29 -0400 "GET /bin-test/nfsmtptlk HTTP/1.1" 200 11227
- 10.17.15.76 - snosew 15/Jul/2015:17:13:36 -0400 "POST /bin-test/nfsmtptlk HTTP/1.1" 200 4509

IBM HTTP Server Apache Logs at SAS

- **/web/server30/logs/error_log**

- Sat Jun 20 10:07:17 2015 notice IBM_HTTP_Server/8.5.5.5 (Unix) configured -- resuming normal operations
- Sat Jun 20 11:35:41 2015 error client 10.17.15.76 File does not exist: /web/server30/htdocs/favicon.ico
- Sat Jun 20 11:46:50 2015 error client 10.17.15.76 (47)EDC5047I An invalid file name was specified as a function parameter. (errno2=0xC00B028E): Unable to open dataset 'SSD.ZOSV2R01.CNTL(\$DEVA)
- Wed Jul 15 17:13:36 2015 error client 10.17.15.76 cgiparse: Error: Both QUERY_STRING and CONTENT_LENGTH not defined or invalid
- Sat Jul 18 11:11:56 2015 error (122)EDC5122I Input/output error. (errno2=0x052C00B6): apr_socket_accept: (client socket)
- Sat Jul 18 11:12:16 2015 notice caught SIGTERM, shutting down

IBM HTTP Server Apache Logs at SAS

- **/DEVA/web/server30/logs/proc.errors**
 - httpd: illegal option -- k
 - Usage: /web/server30/bin/httpd -d directory -D name -f file
 - -C "directive" -c "directive"
 - -k start|restart|graceful|graceful-stop|stop
 - -v -V -h -l -L -t -S
 - Options:
 - -D name : define a name for use in <IfDefine name> directives
 - -d directory : specify an initial ServerRoot
 - -f file : specify an alternate ServerConfigFile
 - <snip>
 - Sat Jun 20 10:07:15 2015 warn The ScriptAlias directive in /web/server30/conf/httpd.conf at line 600 will probably never match because it overlaps an earlier Alias.
 - postinst: Could not reliably determine the server's fully qualified domain name, using 127.0.0.1 for ServerName
 - postinst: Couldn't find perl interpreter in path, using default /usr/bin/perl



IBM HTTP Server: Migration

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