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HyperPAV

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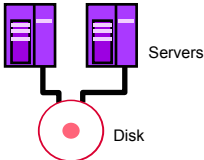
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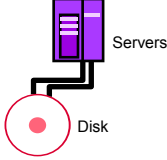
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IBM Enterprise Storage Server (ESS) – MA, PAV and HyperPAV


- Multiple Allegiance (MA) – ESS 2105 / DS8000
 - The ECKD DASD CU 'Multiple Allegiance' function enables different operating systems (images) to perform concurrent I/O operations to the same logical volume
- Parallel Access Volumes (PAV) – ESS 2105 / DS8000
 - z/Architecture CKD DASD CUs and z/OS together, support a function called Parallel Access Volumes (PAV)
 - Allows more than one I/O operation from the same OS/390 or z/OS system to be sent and to access the same logical volume (Parallel Access Volume) at the same time
- Together, Multiple Allegiance and Parallel Access Volumes (PAV) reduces I/O queuing and I/O response time delays, thereby providing significant improvement in I/O disk performance
- HyperPAV – DS8000
 - Intended to address the logical volume size and performance limitations that users have encountered for traditional static and WLM managed PAVs



Multiple Allegiance



PAV and HyperPAV

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IBM ESS - MA and PAV Background

- CKD and ECKD Disk / DASD CUs for years have been shared between multiple systems (z9 - zSeries - S/390 - host images)
- Prior to the ESS, a single Disk device (volume) could only perform one operation at a time
Two or more systems (host images) wanting to use the same disk device at the same time would cause I/O device contention, with the 2nd and other contending I/O operations being delayed
- I/O device contention has been managed by customers over the years in a variety of ways
 - Move the highly accessed datasets to lightly loaded volumes
 - This has been a mostly manual process, although some vendors are offering products to help identify and move the data
 - Isolate the highly accessed datasets on their own volumes
 - Use high performance (cached) controllers
 - However it would be better if the problem could be handled differently, without special volumes, without having to move the data
- The IBM ESS introduced - Multiple Allegiance and Parallel Access Volumes
 - Multiple Allegiance (MA) - allows different host systems to access the same Disk device (volume) at the same time
 - Parallel Access Volumes (PAV) - allows the same host system to start multiple I/Os in parallel to the same Disk device (volume). PAV introduces Base and Alias devices

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z9 - zSeries Operations to the Enterprise Storage Server - 2105 and 2107

CKD - Disk / DASD CU – With Multiple Allegiance and PAV


Multiple Allegiance
Two or more I/O operations from different SCPs (different path groups) accessing the same volume at the same time (when no extent conflict exists)

Parallel Access Volume
Two or more I/O operations accessing the same volume at the same time, from the same SCP (when no extent conflict exists)

I/O Request Sequence
1 Application A = Normal I/O
2 Application B + A = MA
3 Application B + C = PAV

ESS PAV Alias to Base UA Mapping

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z/OS - DEVSERV QPAVS command


- The z/OS and DFSMS display commands support PAV display commands


```

DS QPAVS,1000,VOLUME

IEE459I 09.09.39 DEVSERV QPAVS 591
      Host                               Subsystem
Configuration                           Configuration
-----
UNIT          UA   TYPE      STATUS      SSID  ADDR.  UA
-----
1000 00  BASE
1080 80  ALIAS-1000
1081 81  ALIAS-1000
1082 82  ALIAS-1000
***      4 DEVICE(S) MET THE SELECTION CRITERIA


```

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z/OS - PAV Operational Conditions

- Static PAVs**
 - Customized in the IBM ESS as an Alias device (UA)
 - Initial association between PAV-Base and its PAV-Alias(es) is assigned using the IBM ESS 'StorWatch ESS Specialist'
 - PAV assignments can be changed as needed without IML (using the ESS 'StorWatch ESS Specialist')
 - Static PAVs are supported by OS/390 V1 Release 3 (+SPE) and DFSMS/MVS 1.3 with PTFs
- Dynamic PAVs**
 - Customized in the IBM ESS the same as a static Alias PAV
 - Current association between a PAV-Alias and a PAV-Base can be dynamically changed
 - (OS/390 and z/OS)
 - WLM provide management of Alias assignment within an LSS
 - WLM in goal mode manages the assignment requirement of Aliases
 - WLM instructs IOS when to reassign an Alias, within an ESS LSS
 - Dynamic PAVs are supported by OS/390 V2 Release 7 (+SPE) and DFSMS/MVS 1.5

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z/OS - PAV - Base and Alias - Device Definition and Set-up

3 HCD - OSCONFIG Device Definition

OS/390 (Rel 2.7+)

Main UCB Chain

Base UCBs

- B-1000 Vol 1
- B-1001 Vol 2
- B-1002 Vol 3
-

Alias UCBs

- A-1080
- A-1081
- A-1082
- A-1083
- A-1084
- A-1085
- A-1086
- A-1087
- A-1088

2 HCD - Processor Device Definition

zSeries CSS - UCWs

1000 - 00013134 - IP = UCB VA	CHPID.LINK.0.00
1001 - 00013135 - IP = UCB VA	CHPID.LINK.0.01
1002 - 00013136 - IP = UCB VA	CHPID.LINK.0.02
10xx - 0001xxxx - IP = UCB VA	CHPID.LINK.0...
1080 - 0001317C - IP = UCB VA	CHPID.LINK.0.80
1081 - 0001317B - IP = UCB VA	CHPID.LINK.0.81
1082 - 0001317A - IP = UCB VA	CHPID.LINK.0.82
1083 - 00013179 - IP = UCB VA	CHPID.LINK.0.83
1084 - 00013178 - IP = UCB VA	CHPID.LINK.0.84
1085 - 00013177 - IP = UCB VA	CHPID.LINK.0.85
1086 - 00013176 - IP = UCB VA	CHPID.LINK.0.86
2077 - 00013175 - IP = UCB VA	CHPID.LINK.0.87
1088 - 00013174 - IP = UCB VA	CHPID.LINK.0.88

1 ESS StorWatch ESS Specialist Setup

ESS (CKD) (Logical Subsystem)

UA Mapping

V1: Base Device UA (B 00) → Alias Device UA (A 80, A 81, A 82)

V2: Base Device UA (B 01) → Alias Device UA (A 83, A 84, A 85)

V3: Base Device UA (B 02) → Alias Device UA (A 86, A 87, A 88)

StorWatch ESS Specialist initially assigns Alias to Base

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z/OS - PAV Binding Aliases to Bases (IPL - Vary Base Online)

3 HCD - OSCONFIG Device Definition

OS/390 (Rel 2.7+)

Main UCB Chain

Base UCBs

- B-1000 Vol 1
- B-1001 Vol 2
- B-1002 Vol 3
-

Alias UCBs

- A-1080
- A-1081
- A-1082
- A-1083
- A-1084
- A-1085
- A-1086
- A-1087
- A-1088

Aliases bound to a Base

4a: A-1080, A-1081, A-1082 bound to B-1000

4b: A-1083, A-1084, A-1085 bound to B-1001

4c: A-1086, A-1087, A-1088 bound to B-1002

4: IOS determines Alias to Base association

2 HCD - Processor Device Definition

zSeries CSS - UCWs

1000 - 00013134 - IP = UCB VA	CHPID.LINK.0.00
1001 - 00013135 - IP = UCB VA	CHPID.LINK.0.01
1002 - 00013136 - IP = UCB VA	CHPID.LINK.0.02
10xx - 0001xxxx - IP = UCB VA	CHPID.LINK.0...
1080 - 0001317C - IP = UCB VA	CHPID.LINK.0.80
1081 - 0001317B - IP = UCB VA	CHPID.LINK.0.81
1082 - 0001317A - IP = UCB VA	CHPID.LINK.0.82
1083 - 00013179 - IP = UCB VA	CHPID.LINK.0.83
1084 - 00013178 - IP = UCB VA	CHPID.LINK.0.84
1085 - 00013177 - IP = UCB VA	CHPID.LINK.0.85
1086 - 00013176 - IP = UCB VA	CHPID.LINK.0.86
2077 - 00013175 - IP = UCB VA	CHPID.LINK.0.87
1088 - 00013174 - IP = UCB VA	CHPID.LINK.0.88

1 ESS StorWatch ESS Specialist

ESS (CKD) (Logical Subsystem)

UA Mapping

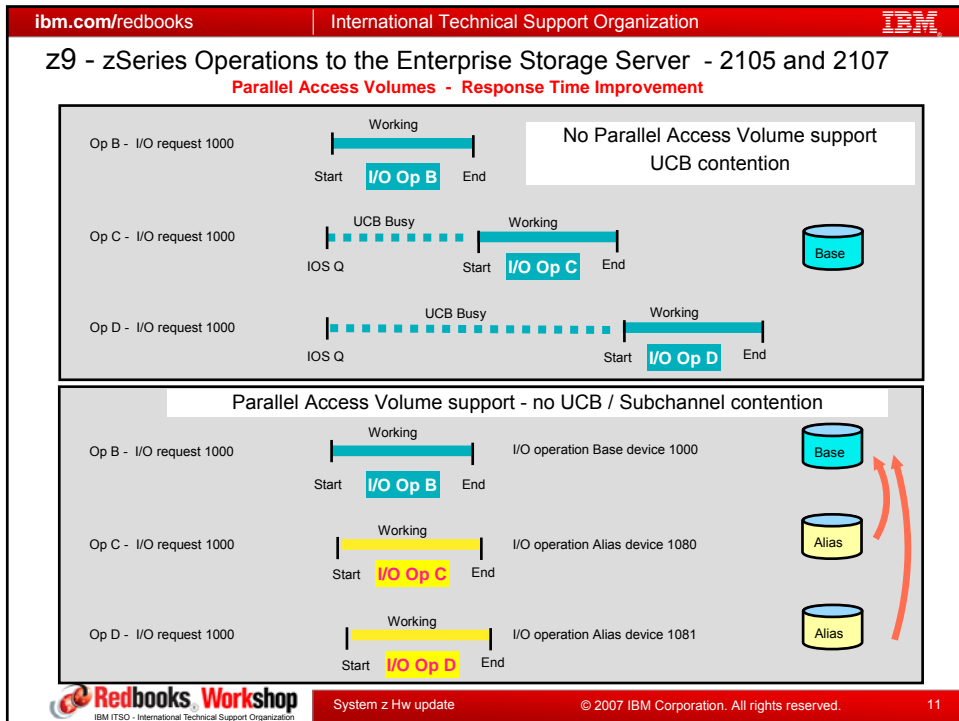
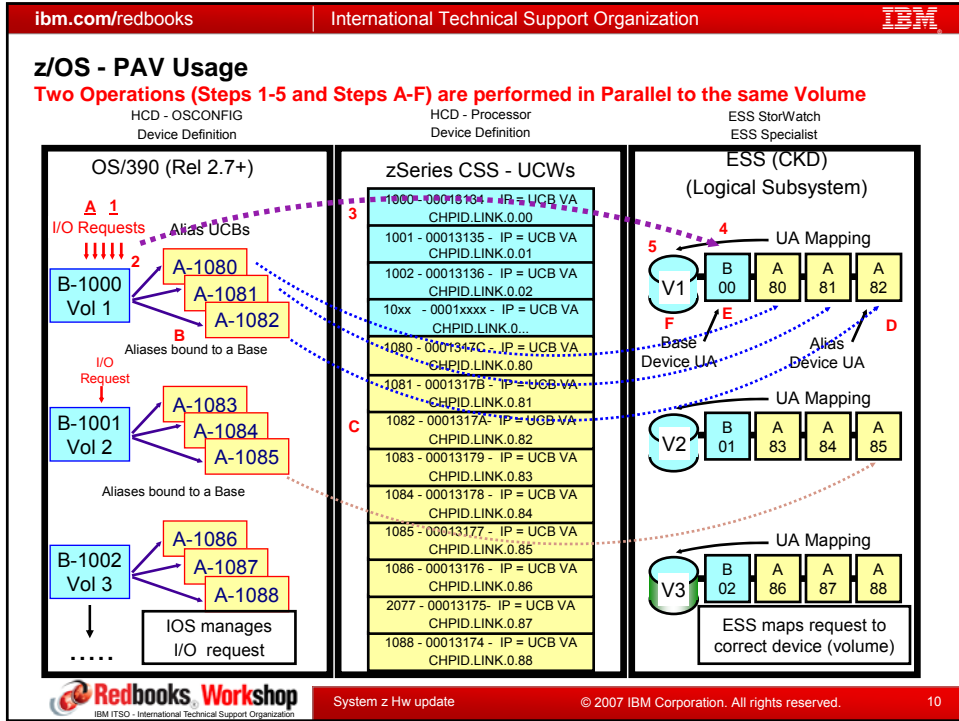
V1: Base Device UA (B 00) → Alias Device UA (A 80, A 81, A 82)

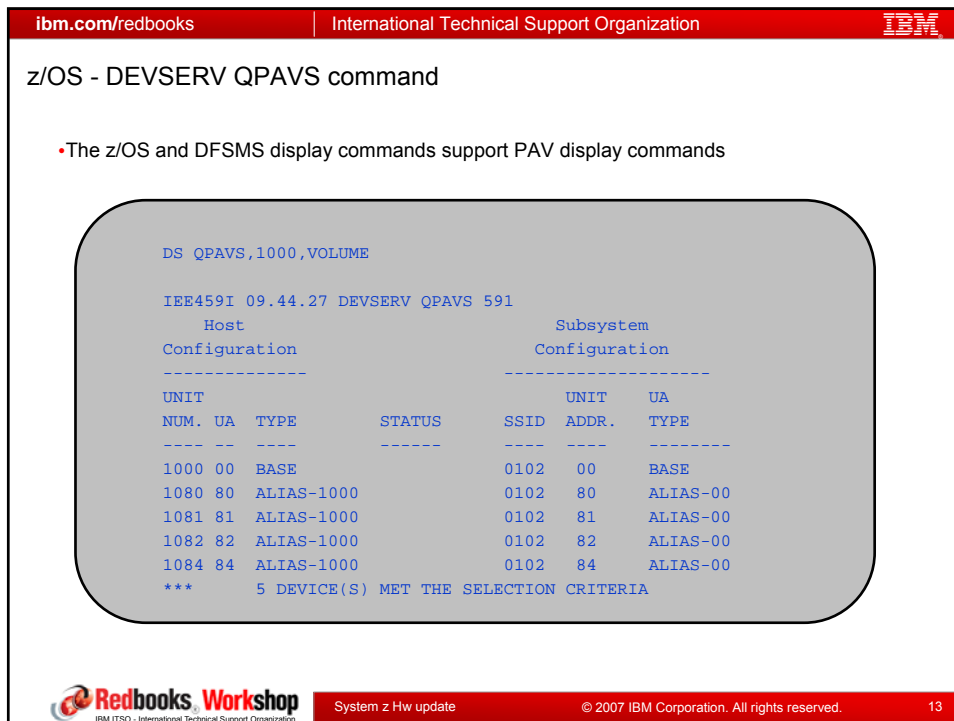
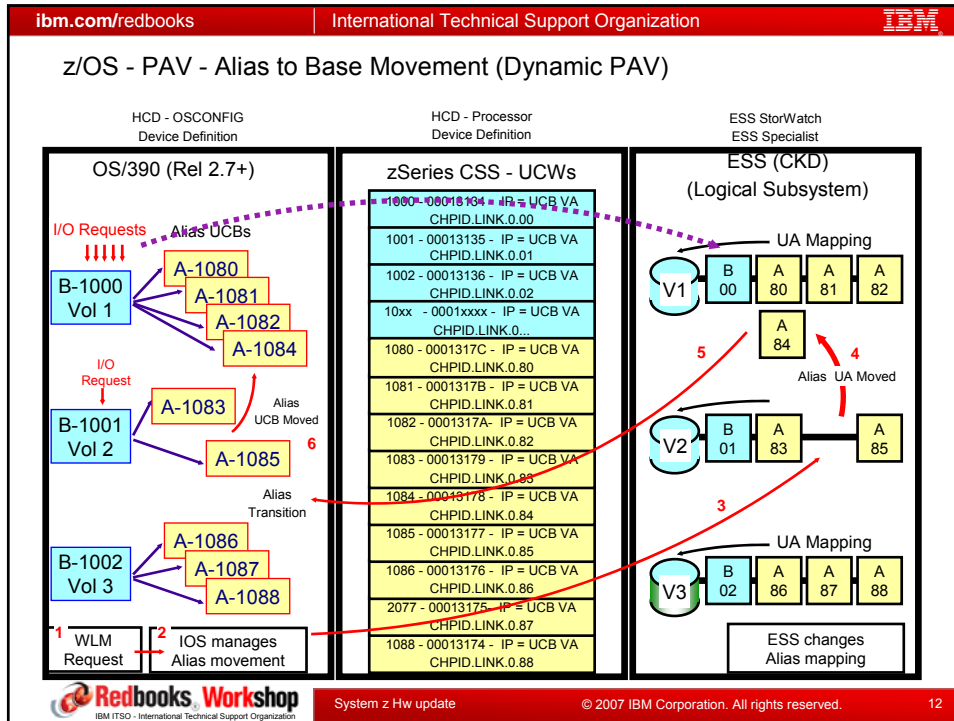
V2: Base Device UA (B 01) → Alias Device UA (A 83, A 84, A 85)

V3: Base Device UA (B 02) → Alias Device UA (A 86, A 87, A 88)

StorWatch ESS Specialist initially assigns Alias to Base

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Parallel Access Volumes - Today

The diagram illustrates the architecture for parallel access volumes in a z/OS sysplex. Two zOS images, A and B, are connected to a common LSS 1000. Each image has its own WLM (Workload Manager) and an ALIAS Interlock WLM Couple. zOS Image A and B both have outstanding I/Os for base volumes (B-1000, B-1001) and their aliases (A-1080, A-1081, A-1083, A-1084). The LSS 1000 structure contains BASE UA 00, BASE UA 01, and ALIAS UA 80, 81, 83, 84. Red dashed arrows indicate the flow of I/O requests from the images to the LSS.

7 concurrent I/O operations shown

- zOS Image A has 1 outstanding I/Os for base1000 and 1 for base 1001
- zOS image B has 5 outstanding I/Os: 1 for the base 1000 and 2 for its aliases; 1 for the base 1001 and 1 for its alias 1083

- Each of these I/Os has an IORP assigned for behind UCB queuing
- WLM makes "go/efficiency" decisions every 10/60 seconds to minimize IOSQ'ing
- LSS 1000 is the structure inside DS8000 that corresponds to LCU 1000 within zOS image
- WLM interlock for alias management

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HyperPAV


The diagram illustrates the HyperPAV (Hyper Parallel Access Volumes) architecture. Similar to the previous slide, two zOS images, A and B, are connected to a common LSS 1000. However, in this architecture, alias management is handled within the zOS image using LCU (Logical Channel Unit) pools. zOS Image A and B have outstanding I/Os for base volumes (B-1000, B-1001) and their aliases (A-1080, A-1081, A-1083, A-1084). The LSS 1000 structure contains BASE UA 00, BASE UA 01, and ALIAS UA 80, 81, 83, 84. Red dashed arrows indicate the flow of I/O requests from the images to the LSS.

- No WLM interlock for alias management
- Alias managed in LCU pools within zOS image
- In the LSS (DS8000), alias exist as a global resource and are assigned on an I/O by I/O basis rather than being bound to a base (sysplex wide)
- Note that alias 1080 (*) is in use simultaneously by 2 zOS images for 2 different bases at the same time

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<h2>HyperPAV</h2> <ul style="list-style-type: none"> With HyperPAV, aliases are dynamically assigned to individual I/Os WLMs in each zOS image are not interlocked via WLM Couple structure for alias management HyperPAV alias assignment exist only for the duration of the I/O Alias are managed in LCU pools within zOS Aliases are a global resource assigned on a I/O by I/O basis 		<h2>PAV</h2> <ul style="list-style-type: none"> PAV assigns aliases statically or dynamically, to base addresses WLM dynamic alias management requires that the assignment be globally implemented across all images in the sysplex Alias are statically defined via HCD or dynamically by WLM Users tend to over configure aliases in order to avoid IOSQing
<ul style="list-style-type: none"> Additionally zOS IOS will assign HyperPAV managed alias addresses by: <ul style="list-style-type: none"> IORP assigned by WLM <ul style="list-style-type: none"> Priorities based on user defined WLM policies Availability of unused aliases within the pool for the LCU Multi-system state of the logical volume <ul style="list-style-type: none"> IOS will not assign additional aliases to a reserved logical volume 		
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<h2>HyperPAV - IOS</h2>		
<ul style="list-style-type: none"> IOS / Alias Assignments <ul style="list-style-type: none"> I/O application requests a base address within and LSU <ul style="list-style-type: none"> Base UCB busy ? <ul style="list-style-type: none"> Yes: dynamically assigns an alias from the LCU's pool No: performs I/O against the base Multiple simultaneous I/O requests for the same base in the LSU ? <ul style="list-style-type: none"> Alias get assigned based on the IORP of the queued I/O requests The higher IOPR requestor is served first IOS \leftarrow \rightarrow LSS <ul style="list-style-type: none"> Transmits the alias assignment request for the I/O to the LSS along with the I/O Subsystem dynamically binds the alias to the base in the LSS for the duration of the I/O in the subsystem When IOS is notified of the I/O completion by the LSS: <ul style="list-style-type: none"> Alias will be reassigned to the highest priority I/O request in the queue for the LCU Returns the alias to the LCU pool if no queued I/O requests 		
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Benefits of HyperPAV


- Reduce number of required aliases
 - Give back addressable device numbers
- z/OS can react more quickly to I/O loads
 - Eliminates need for multi-system interlock
 - React instantaneously to “market open” conditions
- Overhead of managing alias exposures reduced
 - WLM not involved in measuring and moving aliases
 - Alias moves not coordinated throughout sysplex
- Initialization doesn't require “static” bindings
 - Static bindings not required after swaps
- Increases I/O Parallelism


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HyperPAV – System Requirements


- Hardware
 - DS/8000 or DS/6000 version 2
 - FC7899 and FC0782
 - DS/8000 Licensed Machine Code (LMC)
 - (bundle 6.2.400.xx or later)
 - FICON connectivity
- Software - z/OS 1.6+
 - IOS support (OA13915)
 - DFSMS support: DFSMS, SMS, AOM, DEVSERV
 - (OA13928, OA13929, OA14002, OA14005, OA17605, OA17746)
 - WLM support (OA12699)
 - GRS support (OA14556)
 - ASM support (OA14248)
 - z/OS RMF
 - OA12865

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HyperPAV - Migration

- No HCD changes required
- HyperPAV deployment can be staged
 - Load HyperPAV feature on DS/8000 or DS/6000
 - Can run without exploiting this feature if necessary using z/OS PARMLIB option
 - Enable HyperPAV feature on z/OS images that want to utilize HyperPAV via PARMLIB or command
 - Eventually enable HyperPAV feature on all z/OS images in the sysplex
 - Finally, reduce the number of aliases defined


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HyperPAV installation experience

- Steps used to enable / use HyperPAV
 - HyperPAV featured enabled on the DS8300 (new install)
 - bundle 6.2.400.xx or later
 - Base/alias definition on DS8300
 - Installed PSP for zOS 1.7
 - Latest updates from March/07
 - HCD – add new DS8300 CU and devices
 - Activated new I/O config
 - HyperPAV activation via: SETIOS HYPERPAV = YES
 - Changed PARMLIB IECIOSxx To: HYPERPAV = YES
 - Migrated datasets from existing ESS2105 to DS8300
 - Monitoring
 - RMF reports in the backup foils section

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Mixed mode – PAV and HyperPAV

zOS Image A HyperPAV = NO

zOS Image B HyperPAV = YES

LSS 1000

- No WLM interlock for alias management
- Alias managed in LCU pools within zOS image
- In the LSS (DS8000), alias exist as a global resource and are assigned on an I/O by I/O basis rather than being bound to a base (sysplex wide)
- Note that alias 1080 (*) is in use simultaneously by 2 zOS images for 2 different bases at the same time


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HyperPAV – z/OS Options and Commands

- **SYS1.PARMLIB(IECIOSxx)**
 - HYPERPAV=YES|NO|BASEONLY
 - YES – Attempt to initialize LSSes in HyperPAV mode
 - NO – Do not attempt to initialize LSSes in HyperPAV mode
 - BASEONLY – Attempt to initialize LSSes in HyperPAV mode, but only start I/Os on base volumes
- **Enhanced Commands**
 - SETIOS HYPERPAV=YES|NO|BASEONLY
 - D M=DEV
 - D IOS,HYPERPAV
 - DEVSERV QPAV,dddd
 - DEVSERV QPAV,hpav

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HyperPAV – D M=DEV

D IOS.HYPERPAV
IOS098I 16.33.29 HYPERPAV DATA 513
HYPERPAV MODE IS SET TO YES

D M=DEV(0718)
IEE174I 23.39.07 DISPLAY M 838
DEVICE 0718 STATUS=POOLED HYPERPAV ALIAS

D M=DEV(dddd) where dddd is an alias device in a HyperPAV LSS

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HyperPAV – D M=DEV

```

SY1 d m=dev(0710)
SY1 IEE174I 23.35.49 DISPLAY M 835
DEVICE 0710 STATUS=ONLINE
CHP                10  20  30  40
DEST LINK ADDRESS  10  20  30  40
PATH ONLINE       Y   Y   Y   Y
CHP PHYSICALLY ONLINE Y   Y   Y   Y
PATH OPERATIONAL  Y   Y   Y   Y
MANAGED           N   N   N   N
CU NUMBER         0700 0700 0700 0700
MAXIMUM MANAGED CHPID(S) ALLOWED:  0
DESTINATION CU LOGICAL ADDRESS = 07
SCP CU ND         = 002107.000.IBM.TC.03069A000007.00FF
SCP TOKEN NED     = 002107.900.IBM.TC.03069A000007.0700
SCP DEVICE NED    = 002107.900.IBM.TC.03069A000007.0710
HYPERPAV ALIASES IN POOL 4
  
```

D M=DEV(dddd) where dddd is a base volume in a HyperPAV LSS

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HyperPAV - displays

- New HyperPAV (hpav) parameter

```

10.08.32 SYSTEM1
10.08.32 SYSTEM1
QPAVS 461
HOST
CONFIGURATION
UNIT
NUM. UA TYPE STATUS SSID ADDR. TYPE
-----
0D200 00 BASE-H
0D2F9 00 ALIAS-H
0D2FA 00 ALIAS-H
0D2FB 00 ALIAS-H
0D2FC 00 ALIAS-H
0D2FD 00 ALIAS-H
0D2FE 00 ALIAS-H
**** 6 DEVICE(S) IN HYPERPAV ALIAS POOL
                
```

```

ds qp,d200,hpav
TEE4591 10.08.32 DEVSEV
SUBSYSTEM
CONFIGURATION
UNIT UA TYPE STATUS SSID ADDR. TYPE
-----
0D200 00 BASE-H 00FF 00 BASE
0D201 01 BASE-H 00FF 01 BASE
0D202 02 BASE-H 00FF 02 BASE
0D203 03 BASE-H 00FF 03 BASE
0D204 04 BASE-H 00FF 04 BASE
0D205 05 BASE-H 00FF 05 BASE
0D206 06 BASE-H 00FF 06 BASE
0D207 07 BASE-H 00FF 07 BASE
0D2F9 F9 ALIAS-H 00FF F9
0D2FA FA ALIAS-H 00FF FA
0D2FB FB ALIAS-H 00FF FB
0D2FC FC ALIAS-H 00FF FC
0D2FD FD ALIAS-H 00FF FD
0D2FE FE ALIAS-H 00FF FE
**** 14 DEVICE(S) MET THE SELECTION CRITERIA
                
```

- Use of the **hpav** parameter will show either the pool of alias devices of a base and all HyperPAV devices associated with the base
- A **ds,qp,d2f...hpav** will display just the HyperPAV addresses (6)
- The **ssid** parameter will show devices that are in Hyperpav state
 - Shows all devices in a LCU
 - Either the pool of alias devices in a LCU or a base and all HyperPAV devices associated with the base

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HyperPAV – D M=DEV

```

SY1 d m=dev
SY1 IEE174I 23.42.09 DISPLAY M 844
DEVICE STATUS: NUMBER OF ONLINE CHANNEL PATHS
0 1 2 3 4 5 6 7 8 9 A B C D E F
000 DN 4 DN DN DN DN DN DN DN . DN DN 1 1 1 1
018 DN DN DN DN 4 DN DN DN DN DN DN DN DN DN DN
02E 4 DN 4 DN 4 8 4 4 4 4 4 4 4 4 DN 4 DN
02F DN 4 4 4 4 4 4 4 DN 4 4 4 4 4 DN DN 4
030 8 . . . . . . . . . . . . . . . .
033 4 . . . . . . . . . . . . . . . .
034 4 4 4 4 4 DN DN DN DN DN DN DN DN DN DN DN
03E 1 DN DN DN DN DN DN DN DN DN DN DN DN DN DN
041 4 4 4 4 4 4 4 4 4 AL AL AL AL AL AL AL AL
048 4 4 DN DN DN DN DN DN DN DN DN DN DN DN 4
051 4 4 4 4 4 4 4 4 4 UL UL UL UL UL UL UL UL
061 4 4 4 4 4 4 4 4 4 AL AL AL AL AL AL AL AL
071 4 4 4 4 DN DN DN DN HA HA DN DN . . . .
073 DN DN DN . DN . DN . DN . HA . HA
098 4 4 4 4 DN 8 4 4 4 4 4 DN 4 4 4 4
0E0 DN DN 1 DN DN DN DN DN DN DN DN DN DN DN DN
0F1 1 DN DN DN DN DN DN DN DN DN DN DN DN DN DN
FFF . . . . . . . . . . HA HA HA HA
***** SYMBOL EXPLANATIONS *****
@ ONLINE, PHYSICALLY ONLINE, AND OPERATIONAL INDICATORS ARE NOT EQUAL
+ ONLINE # DEVICE OFFLINE . DOES NOT EXIST
BX DEVICE IS BOXED SN SUBCHANNEL NOT AVAILABLE
DN DEVICE NOT AVAILABLE PE SUBCHANNEL IN PERMANENT ERROR
AL DEVICE IS AN ALIAS UL DEVICE IS AN UNBOUND ALIAS
HA DEVICE IS A HYPERPAV ALIAS
                
```

D M=DEV shows HA for HyperPAV aliases


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RMF – Updated SMF Records

- SMF 74 subtype 1 (Device Activity)
 - HyperPAV indications, HyperPAV alias counts
- SMF 78 subtype 3 (I/O Queuing)
 - Counts for
 - Starts where no HyperPAV aliases were available
 - I/Os
 - Max aliases in use for the LSS
 - Max aliases in use by a single device in this LSS
 - Max I/Os queued
- SMF 79 subtype 9 (Device Activity)
 - HyperPAV indications, HyperPAV alias counts


RMF – Updated Reports and Displays


- RMF Postprocessor I/O Queuing Activity
- RMF DASD Activity Report
- Monitor II
 - Device Report
- Monitor III
 - Job Delays
 - Device Resource Delays
 - Data Set Delays
 - Storage Resource Delays

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WLM and HyperPAV

- WLM Dynamic Alias Tuning
 - Ignores HyperPAV control units
 - Avoids sysplex communications for devices on HyperPAV control units
 - Eliminates need for multi-system interlock
 - Mixed environment tolerated (within a system and within a sysplex)
 - Manages non-HyperPAV aliases for all systems in the sysplex
 - Control units in mixed mode (some systems in HyperPAV, some in Base-PAV mode) – only manages aliases in Base-PAV mode


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HyperPAV utilization RMF report

```

z/OS V1R7          SYSTEM ID M21A          START 04/20/2007-11.00.00 INTERVAL 000.59.59
RPT VERSION V1R7 RMF  END 04/20/2007-12.00.00 CYCLE 1.000 SECONDS
-TOTAL SAMPLES = 3596 IODF = A2 CR-DATE: 04/12/2007 CR-TIME: 18.51.08 ACT: POR
-
  LCU  CU   DCM GROUP  CHAN  CHPID  % DP  % CU  CUB  CMR  CONTENTION  Q  CSS  HPAV
        MIN MAX DEF  PATHS  TAKEN  BUSY  BUSY  DLY  DLY  RATE      LNTH  DLY  WAIT  MAX
0 0062 1D00
        39  6.125  0.00  0.00  0.0  0.0
        35  6.998  0.00  0.00  0.0  0.0
        02
        50  2.053  0.00  0.00  0.0  0.0  PATH OFFLINE
        44 10.657  0.00  0.00  0.0  0.0
        63  8.222  0.00  0.00  0.0  0.0
        80  7.591  0.00  0.00  0.0  0.0
        9A  7.271  0.00  0.00  0.0  0.0
        *  48.917  0.00  0.00  0.0  0.0  0.000  0.00  0.1  0.000  3
0 0063 1D80
        3D 39.322  0.00  0.00  0.0  0.0
        DD 42.850  0.00  0.00  0.0  0.0
        96
        6C 20.933  0.00  0.00  0.0  0.0  PATH OFFLINE
        4B 64.987  0.00  0.00  0.0  0.0
        69 57.300  0.00  0.00  0.0  0.0
        88 53.932  0.00  0.00  0.0  0.0
        A2 51.917  0.00  0.00  0.0  0.0
        * 331.24  0.00  0.00  0.0  0.0  0.000  0.00  0.1  0.000  10
0 0064 1E00
        3F 16.535  0.00  0.00  0.0  0.0
        D9 30.674  0.00  0.00  0.0  0.0
        16 45.624  0.00  0.00  0.0  0.0
        54 33.956  0.00  0.00  0.0  0.0
        31 26.430  0.00  0.00  0.0  0.0
        55 28.549  0.00  0.00  0.0  0.0
        72 29.026  0.00  0.00  0.0  0.0
        8F 29.569  0.00  0.00  0.0  0.0
        * 240.36  0.00  0.00  0.0  0.0  0.000  0.00  0.1  0.000  7
    
```

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Questions ?

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Thank You !

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