Exploiting z/OS

Cheryl Watson
Watson & Walker, Inc.
www.watsonwalker.com

November 5, 2013
Session VA
Agenda

- Health Checker
- HyperPAV
- zIIPs/zAAPs
- zFS
- HiperDispatch
- zHPF
- BCPii
- EAVs
- OPERLOG
- zPCR
- z/OSMF
- ITSO Pubs
- Exploiting z/OS 2.1 Today
Exploiting z/OS – Health Checker

Health Checker (77%)

- Primary complaint – too many alerts; too little time
- Primary misconception – their systems are well run and Health Checker won’t find anything of value

References -

- IBM Redpaper REDP-4590-01 – Exploiting the IBM Health Checker for z/OS Infrastructure
- SHARE SF Session 13118, Marna Walle, Introduction and Getting Started with the IBM Health Checker for z/OS
- Website – www.ibm.com/systems/z/os/zos/hchecker/
Health Checker (cont.)

**Benefit**
- Detect problems early; avoid outages
- Provide more stable, reliable, and available systems
- Teaches Best Practices

**My recommendation**
- If too many alerts, then maybe you REALLY need HC!
- Run on test or development system first and work through most of the alerts
- EVERY site should implement this on all production systems
- Implement APARs for new checks when they come out – PSP bucket HCHECKER
- Review checks on a yearly basis in case you’ve bypassed some that should be activated
Exploiting z/OS – HyperPAV

HyperPAV (55%)

- Primary complaint – couldn’t justify cost
- Primary misconception – non-IBM storage vendors don’t support it (but they do – just ask)

References –

- ATS White Paper [WP101175](#) – DS8000 HyperPAV UCB and Alias Analysis Case Study
- IBM Redbook [SG24-8886-02](#) - IBM System Storage DS8000 Architecture and Implementation
Exploiting z/OS – HyperPAV

HyperPAV (cont.)

Benefits –

- Reduces number of PAV-aliases needed for each logical subsystem (LSS)
- Reduces IOSQ time on volumes, especially on extended address volumes (EAVs)
- Provides automatic configuration when workload changes

My recommendation –

- Ask your IBM rep to run a free HyperPAV study using your SMF 70-78 record
- Consider sharing cost and justification with zLinux and z/VM LPARs
Exploiting z/OS – zIIPs/zAAPs

zIIPs/zAAPs (76%/25%)

- Primary reason for no plans – not running DB2 or Java work
- Primary misconception – zIIPS/zAAPs are ONLY useful for DB2 or Java work

References –

- SHARE SF session 12446, Catherine Moxey, CICS and Java: How the JVM Server Transforms Java in CICS
- Website -
Exploiting z/OS – zIIPs/zAAPs

zIIPs/zAAPs (cont.)

Benefits –

- Lets work run on cheaper MIPS (e.g. $51/MIPS vs $1000/MIPS)
- Reduces software costs more than enough to pay for the specialty processors
Exploiting z/OS – zIIPs/zAAPs

zIIPs/zAAPs (cont.)

My recommendation –

- Start running zAAPs on zIIPs; zEC12 last model to support zAAPs; software now lets you use both for evaluation
- If you don’t have a zIIP now, re-evaluate why not; more applications can let you run on a zIIP (z/OSMF is one)
- Look into vendor products that exploit zIIPs (e.g. SHARE SF session 12424, Russ Teubner of HostBridge Technologies, CICS Integration & Optimization: Tales from the Trenches)
Exploiting z/OS – zFS

zFS (64%)

Primary complaint – performance problems, especially with a large number of entries in directory; vendors still ship HFS; HFS easier to use; can’t migrate without an outage

References –

Redbook SG24-6580-05, z/OS Distributed File Service zSeries File System Implementation z/OS V1R13 (Oct2012)

Redpaper REDP-4328-00, HFS to zFS Migration Tool

Redpaper REDP-4769-00, zFS Reorganization Tool
Exploiting z/OS – zFS

zFS (cont.)

Benefits –

- HFS will stop being supported at some point in the future
- Performance, error handling, and administration are greatly improved in z/OS 1.13
- z/OS 2.1 provides a new file format to support very large directories (but even smaller directories see 33% improvement in directory updates)
Exploiting z/OS – zFS

zFS (cont.)

My recommendation –

- If you haven’t migrated, wait until z/OS 2.1 to use new zFS file format
- If you have migrated, be sure that you’re getting the z/OS 1.13 improvements
- If you have large directories (over 2,000 entries), don’t migrate yet
Exploiting z/OS – HiperDispatch

HiperDispatch (46%)

- Primary complaint – there are too many bugs; management is afraid
- Primary misconceptions – there are still bugs; it’s not useful for single-book installation (all hogwash!)
Exploiting z/OS – HiperDispatch

HiperDispatch (46%)

References –

- SHARE SF session 13101, Kathy Walsh, *Configuring LPARs for Performance*
- Redbook [SG24-7853-00](https://www.ibm.com), *z/OS V1R12 Implementation*
- SHARE Anaheim session 11609, Horst Sinram, *z/OS WLM Update for z/OS V1.13 and V1.12*
- ATS White Paper [WP101229](https://www.ibm.com), Kathy Walsh & Steve Grabarits, *z/OS: Planning Considerations for HiperDispatch Mode*
Exploiting z/OS – HiperDispatch

HiperDispatch (cont.)

Benefits –
- Reduction in CPU time (up to 10%) and improvement in response time

My recommendation –
- Turn HiperDispatch on unless told to turn it off by IBM (very few examples of this)
- Why throw away CPU cycles? This is a no-brainer
- Use the default of HD=YES in z/OS 1.13 on a z196 and newer machines
Exploiting z/OS – zHPF

zHPF (30%)

- Primary complaint – couldn’t justify cost or hardware didn’t support it
- Primary misconception – some thought it wasn’t available on 1.11 and 1.12
- Requirements: z/OS 1.11+; z10 (Driver 76 or higher) or newer through zBC12; DS8800 or DS8700 (min level 7.6.2) with zHPF feature; FICON Express2 or above. DB2 list prefetch needs FICON Express8S channels.
Exploiting z/OS – zHPF

zHPF References

- ATS White Paper [WP101175] – DS8000 HyperPAV UCB and Alias Analysis Case Study
- IBM Redbook [SG24-8886-02] - IBM System Storage DS8000 Architecture and Implementation
- SHARE 2009 Denver session 2178, Anthony Mungal, On the Importance of I/O Parallelism, I/O Priority Structures and Partitioning in z/OS Environments
- SHARE Boston session 14281, Howard Johnson, Lou Ricci, FICON Buffer to Buffer Credits, Exchanges and Urban Legends
Exploiting z/OS – zHPF

zHPF Benefits

- Reduces number of channels (e.g. 90 to 16 channels)
- Improve response times for high-activity applications (especially for small block I/Os (4k))
- Applicable to DB2, VSAM, PDSE, HFS, zFS, IMS, indexed VTOCs (CVAF), catalog VVDS/BCS, and non-extended format data sets
- Can also reduce switch ports, and control unit ports
- Can benefit EAVs by increasing I/O rates as volumes expand
- Can get reduced response times for DB2
Exploiting z/OS – zHPF

zHPF Recommendations

This is normally applicable to medium to large sites who need to reduce response times or reduce the number of channels

See if zHPF enabled with ‘D M,DEV(...) or D M,CHP(...)

Use the FICON Aggregation Tool in zCP3000 to consolidate work onto fewer FICON channels

Use the Redbooks and configuration manuals for implementation
Exploiting z/OS – BCPii

BCPii (7%)

Base Control Program internal interface (BCPii) lets authorized programs use APIs to query, modify and perform HMC-like functions

Requirements: z/OS 1.10+, any System z processor. Unix system services can get event notification using CEA.

API support available for C and Assembler. REXX available in 2.1.
Exploiting z/OS – BCPii

BCPii References

- IBM ATS Conference Presentation TC000050 (Spring2010) - *Parallel Sysplex Partitioning Using BCPii*
- IBM Manual SA22-7613-10 - *z/OS MVS Programming: Callable Services for High Level Languages*
- IBM Redbook SG24-7817-00 - *System z Parallel Sysplex Best Practices*
- IBM Redbook SG24-7946-00 (27Mar2012) - *z/OS Version 1 Release 13 Implementation*
- IBM z/OS Hot Topics - August 2009 - Stephen Warren - *The application doesn't fall far from the tree BCPii: Control your HMC and support element directly from z/OS apps*
- IBM z/OS Hot Topics Newsletter - August 2012 - Stephen Warren - *Seeing BCPii with new eyes*
Exploiting z/OS – BCPii

BCPii References

- SHARE 2011 in Anaheim - Session 8665 - Steve Warren - *BCPii for Dummies: Start to finish installation, setup and usage*
- SHARE 2011 in Orlando - Session 9704 - Mark Brooks and Nicole Fagen – *Parallel Sysplex Resiliency*
- SHARE 2011 in Orlando - Session 9865 - Steve Warren - *Simple BCPii Programming for the z/OS System Programmer*
- SHARE 2012 in Anaheim - Session 12088 - Brian Valentine - *IBM System z HMC (Hardware management Console) Security Basics & Best Practices*
Exploiting z/OS – BCPii

BCPii References

SHARE 2013 in San Francisco - Session 12504 - Mike Shorkend - *Back to the Future: Creating Consistent Copies at Isracard*

SHARE 2013 in San Francisco - Session 13035 - Steve Warren - *BCPii Programming Beyond the Basics for the z/OS System Programmer*

SHARE 2013 in Boston - Session 13847 - Frank Kyne – *Recent z/OS Enhancements You Can Use to Reduce Down Time*

SHARE 2013 in Boston – Session 13836 – Steve Warren – *What’s New in BCPii in z/OS 2.1? Full REXX Support and Faster Data Retrieval*
Exploiting z/OS – BCPii

BCPii Benefits

When exploited, BCPii usually provides for more stable systems

Current exploiters:

- Capacity Provisioning Manager (CPM) can add or delete temporary capacity based on WLM policy
- XCF System Status Detection (SSD) Partitioning Protocol (SYSSTATDETECT) can determine if system is truly dead
- HCD uses BCPii
- Several ISVs
- Customers write their own

BCPii Recommendation

Implement BCPii as soon as you can
EAVs (30%)

- Extended Address Volumes (EAVs) allow DASD volumes to have more space (over 54 GB) than traditional DASD volumes.
- This reduces the number of 4-digit device numbers needed.
- Requirements: z/OS 1.10+, DS8000 storage controller. z/OS 1.12-1.13 allow up to 1 TB EAVs and support for DS8700.
- Storage above 54 GB is called extended address space (EAS).
- Control of which data sets can use EAS is determined by SMS storage groups or esoteric names.
Exploiting z/OS – EAVs

EAV References

- IBM Manual SC26-7400-14 - z/OS 1.13 DFSMSdfp Advanced Services (contains information about the EAV migration assistant tracker)
- IBM Manual SC26-7473-11 - z/OS 1.13 DFSMS Using the New Functions (contains changes in each release and the implementation steps for each release)
- IBM Redbook SG24-7617-00 (Updated 25Sep2009) - DFSMS V1.10 and EAV Technical Guide
Exploiting z/OS – EAVs

EAV References

- SHARE 2008 in San Jose - Session 2571 - Michael Graham - Extended Address Volume (EAV) Performance
- SHARE 2009 in Austin - Session 3023 - James Cammarata - Extended Address Volume - Overview, Usage and Invocation
- SHARE 2009 in Austin - Session 3024 - James Cammarata - Extended Address Volume (EAV) - Migration, Coexistence, Installation
- SHARE 2010 in Seattle - Session 2417 - Scott Drummond - What's New with Extended Address Volumes (EAV) in z/OS
- SHARE 2010 in Boston - Session 7525 - Tom Wasik - z/OS 1.12 JES2 New Functions, Features, and Migration Actions
- SHARE 2013 in San Francisco - Session 13030 - David Jones - z/OS JES3 Product Update and Review of Newer Features
Exploiting z/OS – EAVs

EAV Benefits

- Reduces effort to manage large DASD farm.
- Provides relief from 4-digit device limitation.
- z/OS 1.10 support: VSAM (KSDS, RRDS, ESDS, Linear) data sets used by DB2 V8+, CICS, zFS, IMS V9+, NFS, SMP/E CSI.
- z/OS 1.11 support: sequential extended format data sets, XRC journal data sets, ability to override system default for specific data sets using EATTR data set attribute.
- z/OS 1.12 support: non-VSAM sequential (basic and large format), PDS, PDSE, BDAM, undefined DSORGs, XRC state, catalog VVDS and BCS. DFSMSHsm, DFSORT support.
Exploiting z/OS – EAVs

EAV Recommendation

- Wait on EAVs unless you really, really need them.
- Most ISVs have coded support for EAVs, but few customers are using EAVs. Therefore, not all products are thoroughly tested.
- Many ISV products, especially old or small products, may never have EAV support.
- Search FIXCAT of IBM.function.EAV for APARs. (There were over 60 for last year. Most were adding support to products or components.)
- This is a MAJOR implementation effort and policies and procedures will have to be changed.
- You should really consider using HyperPAVs to maintain performance when using EAVs.
OPERLOG (51%)

SYSLOG provides a single system log of messages (WTOs – write to operator messages) that is contained as a SYSOUT data set on JES SPOOL.

OPERLOG is a sysplex-wide log of messages that is written to a system logger log stream.

OPERLOG, if available, is used by the z/OSMF Incident Log feature to capture the messages surrounding an incident.

zAware requires OPERLOG
Exploiting z/OS – OPERLOG

OPERLOG References

- IBM Manual SA22-7601-12 – z/OS MVS Planning: Operations
- SHARE 2012 in Anaheim - Session 11714 – Nicholas R. Jones – System Logger Top 10 Problems
- SHARE 2012 in Anaheim - Session 11715 – Nicholas R. Jones – System Logger Update
Exploiting z/OS – OPERLOG

OPERLOG Benefits

- Provides backup in case JES SYSLOG is lost
- Provides intermixed messages from multiple systems in parallel sysplex – can be a big help in debugging multi-system problems
- Provides messages before JES is brought up and after JES comes down
- SDSF has a FILTER command for OPERLOG, but not for SYSLOG
- You don’t need a CF for OPERLOG because you can use a DASD ONLY logstream
- Logstreams are easier to backup for archive than SYSLOG
- Message descriptor codes are available in OPERLOG, but not SYSLOG
Exploiting z/OS – OPERLOG

OPERLOG Recommendation
- Implement this as soon as you can, even if not in a sysplex
- Have it ready for when you install z/OSMF!
Exploiting z/OS – zPCR

zPCR (45%)

- zPCR estimates CPU usage when changing processors or LPAR configurations
- Primary complaint – don’t have confidence in it
- Primary misconception – it’s only for upgrading to new CECs

References –

- SHARE Boston session 14219, John Burg, zPCR Capacity Sizing Lab – Part 1 of 2: Introduction and Overview
Exploiting z/OS – zPCR

Benefits –

- It’s free and keeps you from making capacity planning or configuration mistakes
- It’s the ONLY way you can estimate the impact of new hardware or hardware changes, such as the change in your LPAR configuration or use of specialty processors (zIIPs/zAAPs) – don’t use MIPS tables for expectations
- Can help you improve performance of your configuration
Exploiting z/OS – zPCR

• My recommendation –
  - EVERYBODY needs to install and learn to use this before making any type of configuration change
  - Turn on type 113 records as input to zPCR
Exploiting z/OS – zPCR – Caution!

zPCR does NOT take into account the following:

Hardware Changes
- Changes in memory size
- Changes in channel subsystem/DASD controllers
- Effect of changes in speed of coupling facility processors
- Changes in channels, such as FICON Express
- Not turning on HiperDispatch
- Addition of zFlash or solid state devices
- Changes in queuing due to HyperPavs

Software Changes
- Changes in subsystem releases or versions
- Changes in CPU busy
- Changes in workload
Exploiting z/OS – zPCR – Caution!

zEC12 User Presentations

At last SHARE, there were several user presentations showing a decrease in MSUs when moving to a zEC12 by 15% to 45%

My customers are experiencing this too

Why is this happening? MSUs are designed by IBM to provide equivalency between two machines.

BUT – IBM doesn’t make all of the changes noted on the previous slides

If you add memory or increase the speed of a CF or provide faster channels or . . . . . . , each job will take less CPU and, therefore, less MSUs
Exploiting z/OS – zPCR – Caution!

Chargeback

What does this mean to chargeback?

You can’t necessarily modify your charging by normalizing between the MIPS or MSUs based on just zPCR

Prices will vary, and you need to be prepared to deal with that
Exploiting z/OS – zPCR – Caution!

This breaks golden rule of performance management: Never make more than one change at a time.

Measure, make a single change, measure again, report change.

When you make multiple changes, you don’t know WHY there is a change in results.
Exploiting z/OS – z/OSMF

z/OSMF (24%)

Primary complaint – takes too many resources; and “I have my own way of doing things”

Resource usage is corrected in z/OS 2.1

Primary misconception – it’s only for new sysprogs

References –

z/OSMF website
  • www.ibm.com/systems/z/os/zos/zosmf/

IBM z/OSMF User’s Guide – SA38-0652
Exploiting z/OS – z/OSMF

References (cont.) –

SHARE Boston sessions:

14247, Anuja Deedwaniya, z/OSMF Configuration Made Easy

14253, Anuja Deedwaniya, Diagnosing Problems on my z/OS System – New Technologies

14249, Greg Daynes, z/OSMF Software Management Capabilities

14267, Geoff Smith, Dan Hui Fan, Engaging Users and Reducing Complexity: z/OSMF Software Deployment Project Usability Discussion

14230, Anuja Deedwaniya, The New and Improved z/OSMF 2.1
Exploiting z/OS – z/OSMF

References (cont.) –

SHARE SF sessions:

13052, Toshiba Burns-Johnson, *Engaging Users and Reducing Complexity: z/OSMF Software Deployment Project Usability Discussion*

13061, Anuja Deedwaniya, *z/OSMF Advanced Functionality*

13099, Juergen Baumann, *Capacity Provisioning Update for z/OS*

Several labs this week
Exploiting z/OS – z/OSMF

Benefits –

- Improves sysprog and performance analyst productivity
- Provides easier training for new sysprogs
- Implements “Best Practices”
- Provides software management, which is a totally new feature unavailable through other techniques
- Positions you for use of workflow scenarios to decrease the time to implement other features in z/OS 2.1
Exploiting z/OS – z/OSMF

My recommendation –

Install this on your test or development system as soon as possible (caution – prior to z/OS 2.1, it might run as slow as molasses on a small LPAR, but just have patience and see the benefits)

For small production LPARs, wait until z/OSMF 2.1 where it’s expected to use the WAS Liberty Profile:

- z/OS 1.13 with WAS OEM – 4,481 cylinders down to 602 cylinders
- z/OS 2.1 can start up in seconds versus minutes

Install PTFs for December 2012 enhancements; see WSC Flash10794 – IBM z/OSMF V1.13 Service Updates Available
Exploiting z/OS – z/OSMF

My recommendation –

- Implement WLM first because it is very easy and very popular;
- ...then software management because it’s new information you haven’t had;
- ...then configuration assistant for TCP/IP because the download version is going away;
- ...then incident log because it implements best practices and reduces sysprog time (even if it takes a little more setup);
- ...then ISPF because it’s fun!
Exploiting z/OS – CPU MF

CPU Measurement Facility (MF) (34%)

- Primary complaint – haven’t had time
- Primary misconception – don’t see a use

References –

- SHARE SF session 13098, John Burg, *CPU MF – 2013 Update and WSC Experiences – Now More Than Ever*
- SHARE SF session 13097, John Burg, *zPCR Capacity Sizing Lab – Part 1 of 2: Introduction and Overview*
Exploiting z/OS – CPU MF

Benefits –

- Provides much better data for determining LSPR workload
- Helps zPCR provide better capacity estimates

My recommendation –

- EVERYBODY needs to turn on the type 113 records
- See John Burg’s session for volunteering data
Exploiting z/OS – ITSO Redbooks

ITSO produces Redbooks – [www.redbooks.ibm.com](http://www.redbooks.ibm.com)

Two were specifically written to reduce outages and mean time to recovery (MTTR):

- **SG24-7328-00** – z/OS Planned Outage Avoidance
- **SG24-7816-00** – Mean Time to Recovery (MTTR)

Sadly, less than 50% of responders had tried any of these Best Practices

Benefit – More reliable and stable systems; less downtime; training in Best Practices
Exploiting z/OS 2.1 Today

APARs let you exploit many 2.1 functions on z/OS 1.12 and 1.13 today

z/OS 1.12 and above:

- zHPF support for EXCP – OA38185
- Increase spin data sets for JES2 – OA38944/PM59496
- XCF performs additional validation – OA40966
- Basic Hyperswap reduces false freezes – OA37632
- RACF health checks – OA37164
- zAAP on zIIP support works if zAAP is available – OA38829
- Interrupt delay time facility on zEC12 – OA39993
Exploiting z/OS 2.1 Today

z/OS 1.12 and above:
- Add comments to parmlib members – OA38328

z/OS 1.13:
- System logger enhancement to use separate tasks – OA38613/OA40633/OA41465/OA41470
- XCF IXCNOTE note pads – OA38450
- z/OSMF software management – PM73833/PM80167
- z/OSMF application linking – PM74502/PM74508/PM74517
- z/OSMF capacity provisioning – PM74519
- Additional text for DFSMS abends – OA37957/OS37505/OA39175
Thank you!

Cheryl Watson Walker with partner, husband, and best friend Tom Walker in Cuba in December (www.tomandcheryltravels.me)

- Email: technical@watsonwalker.com
- Website: www.watsonwalker.com