

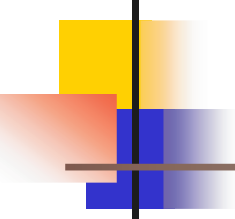


Auditing UNIX on z/OS

Vanguard Enterprise Security Expo 2007
Session AUD1

Mark S Hahn – Mark.S.Hahn@us.ibm.com
Bruce Wells – brwells@us.ibm.com

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Agenda

- RACF
 - Userids
 - Classes
 - Profiles
 - Datasets
 - Where to find more information



Gain System Access

- Request TSO userid
 - RACF AUDITOR
 - OMVS: uid or default?
 - Build data set to hold working papers
 - Ensure spool viewer (SDSF, IOF, etc) can save to PDS
 - Prepare batch TMP (PGM=IKJEFT01) jobstream
 - What class SYSOUT is held?



Broad Brush Overview

- Prepare batch TMP job with
 - SR CLASS(USER) UID(0)
 - SR CLASS(UNIXMAP) MASK(U0)
 - SR CLASS(FACILITY) MASK(BPX)
 - SR CLASS(UNIXPRIV) NOMASK
 - SR CLASS(SURROGAT) MASK(BPX.SRV)
 - SR CLASS(PROGRAM) NOMASK
- Collect RLIST commands following for batch TMP
- Alternate: browse IRRDBU00 unload
- Alternate: RACFICE reports
- Alternate: z/Audit reports
- Alternate: 3rd party General Resource reports



User Review

- Objective: document how many humans, who and why, have uid(0)?
- Review STARTED profiles, looking for TRUSTED and PRIVILEGED
- Review default started task userid STARTED (* or **) – is it uid(0)?
[RLIST STARTED ** STDATA NORACF
LU userid NORACF OMVS]



z/OS Unix Classes

- 7 basic classes added
- Use SETROPTS LIST and review LOGOPTIONS and AUDIT class lists
- No profiles
 - Appear in ICH408I messages, but informational as to action requested, not profile specific
- Set audit flags (LOGOPTNS and AUDIT)
- FSSEC (File System Security) must be ACTIVE for ACLs to be checked, otherwise (IN)ACTIVE not checked



z/OS Unix Classes

- DIRACC (Directory Access)
- DIRSRCH (Directory Search)
- FSOBJ (File System Objects)
- FSSEC (Files System Security)
- IPCOBJ (InterProcess Communication)
- PROCACT (Process Actions)
- PROCESS



Unix File-Level Audit Settings

- Same concept as RACF profile settings
 - Separate set for owner and AUDITOR
 - Log failures by default
 - Interact with SETROPTS same as datasets
- Set with `chaudit [-a]` shell command
- View settings with
 - `ls -W`
 - `find [-audit] [-aaudit]`
 - HFS Unload utility (RACF downloads page)



FACILITY Class: BPX.DAEMON

- Serves two purposes
 - Upgrades z/OS Unix security to z/OS level
 - Requires PROGRAM profiles for all authorized programs
 - Grants daemon privileges to READ users
 - IBM recommendation: the only person to have BPX.DAEMON access should be systems programmer responsible for restarting daemons.
 - Daemon privileges include changing uid to any person's uid without password
- [RLIST FACILITY BPX.DAEMON ALL]



FACILITY Class: BPX.SERVER

- Serves two purposes
 - Switch to z/OS security if present (should be)
 - Based on READ or UPDATE authority, authorization path to be taken (server + client, client only)
- [RLIST FACILITY BPX.SERVER ALL]



FACILITY Class: BPX.SUPERUSER

- First alternative to uid(0)
- Superuser status “on demand”
- Some processes (e.g. SMP/E will accept in lieu of uid(0))
- [RLIST FACILITY BPX.SUPERUSER ALL]



FACILITY Class: BPX.DEFAULT.USER

- Default user/group for those needing uid/gid without an OMVS segment
 - Access list ignored
 - Only used if OMVS segment needed
 - Partial / broken OMVS segment blocks its use
- For users needing OMVS segment for “general” service: ftp, etc
 - Not a good idea if your users use the shell and own files
- [`RLIST FACILITY BPX.DEFAULT.USER ALL`] and inspect the **APPLDATA**



FACILITY Class: BPX.SAFFASTPATH

- Trigger profile
 - If present, successful UNIX file accesses are not logged to SMF
 - Valuable during system maintenance
 - Requires SET OMVS=xx to activate, null member okay
- [RLIST FACILITY BPX.SAFFASTPATH
ALL]



FACILITY Class: BPX.FILEATTR.*

- Authorization to issue z/OS Unix specific command: *extattr*
- Command sets extended authorization attributes on program files including program control and APF (Authorized Program Facility)
- Review who is authorized to use command

```
[RLIST FACILITY BPX.FILEATTR.APF ALL]
```

```
[RLIST FACILITY BPX.FILEATTR.PROGCTL ALL]
```

```
[RLIST FACILITY BPX.FILEATTR.SHARELIB ALL]
```




UNIXPRIV Class: SUPERUSER

- Preferred means of granting superuser privileges (over BPX.SUPERUSER over uid(0))
- Designed to allow granular superuser privileges
 - SUPERUSER.FILESYS
 - CHOWN, MOUNT, ACLOVERRIDE, CHANGEPERMS
 - SUPERUSER.PROCESS.**
 - GETPSENT, KILL, PTRACE
- [RLIST UNIXPRIV * ALL]



UNIXPRIV Class: SHARED.IDS

- Special profile
 - Triggers suppression of duplicate uid / gid
 - If RACF database restructured to IRRIRA00 Stage 2 or 3
 - Authorizes use of SHARED keyword on AU/ALU/AG/ALG command if user has READ
- Most common shared uid? 0
- Profile included in RLIST command output from previous slide



SURROGAT Class: BPX.SRV.userid

- Allows *su* command to switch to userid without requiring password for new userid (if issuer has READ access) – normally issuer must supply new userid's password
- Carefully review users authorized to switch without password
- Usage can be audited (APAR OA18016)
- `[RLIST SURROGAT BPX.SRV.* ALL]`



PROGRAM Class: **

- PROGRAM profiles help define controlled programs – needed by daemons, servers and APF users
- Can list singular programs
 - Should restrict access to: IRRDPI00, ICHDSM00, IEHINITT using separate discrete profiles
- PROGRAM ** acceptable
 - Preferred over PROGRAM * (okay if present)
- Daemons may fail if profiles not defined
- Review libraries listed –
 - Must be current / remove obsolete data set names
 - Should not be user libraries – authorized exception
- [RLIST PROGRAM * ALL]



DATASETS: parmlib

- Generally SYS1.PARMLIB, could be other dataset in parmlib sequence
- Issue [D PARMLIB] operator command for list of dsns
 - Sequence important, as is protection of dsn where BPXPRMxx members found
- BPXPRMxx members
 - Specified by OMVS= keyword
 - SET OMVS=xx operator command
 - SETOMVS command does NOT reference parmlib
- Using ISPF 3.1 list all BPXPRMxx and add to working papers (exit, Keep and allocate new list file), add old list file to working papers PDS



parmlib(BPXPRMxx)

- Pairs of parameter members recommended
 - One for system limits and parameters
 - One for file system definitions
- Empty member advantageous
 - Select options require SET OMVS=xx to activate – null member works (e.g. BPX.SAFFASTPATH activation)



parmlib(BPXPRMxx)

- Review ROOT and FILESYSTEM statements
 - H/zFS data sets should be system owned, not user owned
 - OMVS kernel need not be TRUSTED if authorized to H/zFS datasets
 - SMS restriction lifted
 - Consider multiple system xFS files: protection from runaway logging or other process
 - ROOT (mountpoint '/')
 - ETC (mountpoint '/etc')
 - TMP (mountpoint '/tmp') or better TFS
Temporary file system – storage resident, non-persistent data
 - Consider automount for user filesystems (still system owned) – not audit requirement
 - `[LD DA ('xxx.yyy') ALL]`
for all datasets named in all BPXPRMxx members and for parmlib datasets housing the BPXPRMxx members



Publications – ITSO Redbooks

- z/OS UNIX Security Fundamentals
 - <http://www.redbooks.ibm.com/abstracts/redp4193.html?Open>
- UNIX System Services z/OS Version 1 Release 7 Implementation
 - <http://www.redbooks.ibm.com/abstracts/sg247035.html?Open>
- ABCs of z/OS System Programming Volume 9
 - <http://www.redbooks.ibm.com/abstracts/sg246989.html?Open>



Publications – z/OS UNIX

- Overall library (R8):
 - http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/BPXZSH70
- z/OS UNIX System Services Planning
 - Chapter 4 has a complete security overview
- z/OS UNIX System Services Command Reference
 - Syntax and required authority for commands
- z/OS UNIX System Services Programming Assembler Callable Services Reference
 - See authority required for various services like `setuid()`



Publications - RACF

- Overall library (R8):
 - http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/ICHZBK70
- Security Administrator's Guide
 - Chapter 20 – UNIX Security. Some overlap w/ UNIX Planning
- Auditor's Guide
 - Chapter 2 contains sections relating to UNIX audit controls
- Callable Services
 - More technical, and low-level, but contains authority required for various UNIX functions



Publications – C/C++

- Overall library (R8):
 - http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/CBCBS170
- Run-time Library Reference
 - Again, technical and low-level, but can be used to cross-check against USS Assembler Callable Services and RACF Callable Services, and maybe even glean some subtly different (and hopefully correct!) information.



Internet Resources

- RACF web page
 - <http://www-03.ibm.com/servers/eserver/zseries/zos/racf/>
 - Click on Presentations link
- racf-l list server
 - See “Other sources of information” section in the front-matter of any RACF book for instructions on joining
- mvs-oe list server
 - See “Where to find more information” section in the front-matter of any USS book for instructions on joining



Summary

- Tools exist to collect working papers online or via batch TMP
- Alternative data sources include the RACF Data Base Unload (IRRDBU00) or other products
- Much of the z/OS UNIX security resides in RACF – via profiles
- Collect and review RACF protections to ensure access to sensitive features is controlled (using RACF SEARCH, RACF RLIST, zAdmin, zAudit, or 3rd party tools)