z/OS V1R13

z/OS UNIX: User mounts

Session objectives

- Define the functional content and benefit
- Explain the external changes
- Explain the expected usage
- Explain any migration issues or concerns
- Indicate list of Publications and References

Overview – Nonprivileged user mount support

- **Problem Statement / Need Addressed**
  - Mounting a UNIX file system is a privileged operation. Yet it would be nice to move the management of user data away from the system administrators and into the hands of the users that own the data.
- **Solution**
  - Provide capability to permit nonprivileged users to mount and unmount file systems based on the user's authority to the mount point and the file system root.
  - Only supported in BPX2MNT (mount2) interface (example: /usr/sbin/mount, TSO Mount commands)
- **Benefit / Value**
  - System administrators will no longer have the burden of end user file system data management.
  - Application developers/End users will now be able to manage their own data.
- In z/OS V1R13 with this support, permitted nonprivileged users will be able to perform mount and unmount file system operations and manage their own data data requirements. Significant restrictions and explicit enablement are placed on this capability so that security characteristics are not affected.
- This requirement has high impact to end user productivity as it allows the application and the end user to control their data. The ownership and the responsibility to manage application data into the hands of application/end user.

Mount security requirements:

- Read access to SUPERUSER.FILESYS.USERMOUNT UNIXPRIV profile
- Read-Write-Execute(RWX) access permission to the mount point directory
  - If Sticky bit is set, then the user must be the owner of mount point directory
- Mount point directory must be empty
- Read-Write-Execute(RWX) access permission to the file system root directory
  - If Sticky bit is set, then the user must be the owner of file system root
- Note that if any one of the requirements or restrictions are violated, a unique return code and reason code will be returned to identify the problem along with the audit failures.
- Automount facility must be running to mount a HSM-migrated file system using nonprivileged user mount, otherwise the request will fail with "JrFileSystemMigrated" reason code. User can manually HSM recall the file system and use it to mount the file system.

Unmount security requirements:

- Read access to SUPERUSER.FILESYS.USERMOUNT profile
- Must be the user who mounted the file system

Restrictions:

- Supported file system types are HFS, zFS and NFS
- SYSNAME option is **not** supported
- NOSECURITY option **cannot** be specified
- NOSETUID option **must** be specified
- chmount is **not** supported for nonprivileged users
- Remount is **not** supported for nonprivileged users
- Use of ***///*** as a file system name placeholder is **not** supported
- BPX1MNT callable service is **not** supported for nonprivileged users
- Mount operation is bounded by MAXUSERMOUNTSYS & MAXUSERMOUNTUSER BPXPRMxx PARMLIB limits

Usage and invocation

- Permit users to the new UNIXPRIV SUPERUSER.FILESYS.USERMOUNT profile
- Set following new keywords in BPXPRMxx:
  - ***MAXUSERMOUNTSYS( ):***
    - Use the MAXUSERMOUNTSYS statement to specify the maximum number of nonprivileged user mounts in the system or in shared file system configuration.
  - MAXUSERMOUNTUSER( ):
    - Use the MAXUSERMOUNTUSER statement to specify the maximum number of nonprivileged user mounts allowed for any nonprivileged user in the system or in shared file system configuration.
- The accepted value range for MAXUSERMOUNTSYS and MAXUSERMOUNTUSER is 0 to 35000
- The MAXUSERMOUNTSYS and MAXUSERMOUNTUSER values can be dynamically increased or decreased using SET OMVS command or SETOMVS command.
- Default value for MAXUSERMOUNTSYS and MAXUSERMOUNTUSER is zero, which indicates that no nonprivileged mount is allowed in the system or in the shared file system configuration.

- Note that most recent specification of these values will prevail for all of the systems participating in the shared file system configuration

- Examples of displaying nonprivileged user mount information:
  - D OMVS,FILE

```
BPXO045I 13.37.38 DISPLAY OMVS 589
OMVS     000E ACTIVE             OMVS=(Y2,3Z)
TYPENAME   DEVICE ----------STATUS----------- MODE  MOUNTED    LATCHES
ZFS            19 ACTIVE                     RDWR  07/22/2010  L=27
  NAME=MYFS1.ZFS                                    13.37.25    Q=0
  PATH=/u/myzfs1/mntzfs
  UID=295
ZFS             3 ACTIVE                     RDWR  07/22/2010  L=15
  NAME=ZOS113.VAR.ZFS                               12.46.09    Q=0
  PATH=/SYSTEM/var
```

  - MODIFY BPXOINIT,FILESYS=DISPLAY,FILESYSTEM=

```
BPXF035I 2010/07/22 14.50.59 MODIFY BPXOINIT,FILESYS=DISPLAY 847
--------------NAME--------------------------        DEVICE  MODE
ZOS113.SYSPLEX.ROOT.ZFS                                1  RDWR
  PATH=/
  STATUS=ACTIVE                 LOCAL STATUS=ACTIVE
  ........
  LOCAL FLAGS=40000212  LOCAL LFSFLAGS=22000000
  ACTIVECHK  =00000000  LFSFLAGS2     =D8000000
MYFS1.ZFS                                             16  RDWR
  PATH=/u/myzfs1/mntzfs
  UID=295
  STATUS=ACTIVE                 LOCAL STATUS=ACTIVE
  ........
  LOCAL FLAGS=40000400  LOCAL LFSFLAGS=02000000
  ACTIVECHK  =00000000  LFSFLAGS2     =D8000000
```

- D OMVS, O displays the current system settings:
  - MAXUSERMOUNTSYS, and MAXUSERMOUNTUSER
- D OMVS,F,UID=PRIV|USER|UID displays information for the file system mounted by the specific user
- D OMVS,USERMOUNTS displays summary information for the nonprivileged user mounts
- F BPXOINIT,FILESYS=DISPLAY,GLOBAL|FILESYSTEM=<xx>|ALL displays current sysplex settings and mounted file system information
- ISHELL File System mount table and file system attributes panels
- df -v OMVS shell command update to display user ID and EUID for nonprivileged user mounted file system
- Examples of displaying nonprivileged user mount info using filters:
  - D OMVS,FILE,UID=<euid|USER|PRIV>

- **D OMVS,F,UID=USER**

```
BPXO045I 13.37.38 DISPLAY OMVS 589
OMVS     000E ACTIVE             OMVS=(Y2,3Z)
TYPENAME   DEVICE ----------STATUS----------- MODE  MOUNTED    LATCHES
ZFS            19 ACTIVE                     RDWR  07/22/2010  L=27
  NAME=MYFS1.ZFS                                    13.37.25    Q=0
  PATH=/u/myzfs1/mntzfs
  UID=295
HFS            20 ACTIVE                     RDWR  07/22/2010  L=23
  NAME=MYFS1.HFS                                    13.37.28    Q=0
  PATH=/u/myhfs1/mnthfs
  UID=47
```

- **D OMVS,F,UID=PRIV**

```
BPXO045I 13.38.38 DISPLAY OMVS 592
OMVS     000E ACTIVE             OMVS=(Y2,3Z)
TYPENAME   DEVICE ----------STATUS----------- MODE  MOUNTED    LATCHES
ZFS             3 ACTIVE                     RDWR  07/22/2010  L=15
  NAME=ZOS113.VAR.ZFS                               12.46.09    Q=0
  PATH=/SYSTEM/var
ZFS             2 ACTIVE                     RDWR  07/22/2010  L=14
  NAME=ZOS113.ETC.ZFS                               12.46.09    Q=0
  PATH=/SYSTEM/etc
```

- USER - Displays all the file systems mounted by the nonprivileged users
- PRIV - Displays all the file systems mounted by the privileged users
- uid - Displays all the file systems mounted by the user whose effective UID is uid.

- Examples of displaying nonprivileged user mount info and Settings:
  - DISPLAY OMVS,USERMOUNTS

```
BPXO072I 13.28.20 DISPLAY OMVS 544
OMVS     000E ACTIVE             OMVS=(Y2,3Z)
NONPRIVILEGED USER MOUNTS SUMMARY
          UID   CURRENT MOUNTS
          295           1
           47           2
           25           1
```

- Examples of displaying settings
  - D OMVS,OPTIONS

```
BPXO043I 09.56.54 DISPLAY OMVS 513
 OMVS     000E ACTIVE              OMVS=(Y4)
 CURRENT UNIX CONFIGURATION SETTINGS:
 MAXPROCSYS      =        256    MAXPROCUSER     =        300
  .........
 AUTHPGMLIST     = NONE
 SWA             = BELOW
 SERV_LINKLIB    =
 SERV_LPALIB     =
 MAXUSERMOUNTSYS  = 200          MAXUSERMOUNTUSER = 222
```

- Examples of displaying nonprivileged user mount settings and Hiwater Marks:
  - D OMVS,LIMITS

```
SY1  BPXO051I 19.35.21 DISPLAY OMVS 896
OMVS     000E ACTIVE             OMVS=(Y8,MZ)
SYSTEM WIDE LIMITS:         LIMMSG=NONE
                      CURRENT  HIGHWATER     SYSTEM
                        USAGE      USAGE      LIMIT
MAXPROCSYS                  7          9        900
MAXUIDS                     2          2        200
.......
SHRLIBRGNSIZE               0          0   67108864
SHRLIBMAXPAGES              0          0       4096
MAXUSERMOUNTSYS            15         20        100
MAXUSERMOUNTUSER            7          8         10
```

  - MODIFY BPXOINIT,FILESYS=DISPLAY,GLOBAL

```
SY2  BPXM027I COMMAND ACCEPTED.
SY2  BPXF040I MODIFY BPXOINIT,FILESYS PROCESSING IS COMPLETE.
```

```
SY2  BPXF242I 2010/07/22 14.44.10 MODIFY BPXOINIT,FILESYS=DISPLAY,GLOBAL
SYSTEM   LFS VERSION ---STATUS---------------------- RECOMMENDED ACTION
.......
MAXIMUM MOUNT ENTRIES=     500   MOUNT ENTRIES IN USE=      14
MAXIMUM AMTRULES=           50   AMTRULES IN USE=            0
MAXUSERMOUNTSYS=           100   HIWATER MAXUSERMOUNTSYS=   20
MAXUSERMOUNTUSER=           10   HIWATER MAXUSERMOUNTUSR=    8
MAXSYSTEM=                   8
ALTROOT=  N/A
```

- Examples of ISHELL display for nonprivileged user mounted file system:
  - ISHELL Panel of File System Attributes

```
                                                    Work with Mounted File Systems
 .-----------------------------------------------------------------.
 | BPXWP22           File System Attributes                        |
 |                                                                 |
 | File system name:                                               |  Row 1 of 5
 | MYFS.ZFS                                                        |
 | Mount point:                                                    |
 | /u/zfs1                                                         |
 |                                                  More:   - +    |
 | Data blocks read . . . : 0                                      |
 | Data blocks written  . : 0                                      |
 | Dir blocks r/w . . . . : 0                                      |
 | User . . . . . . . . . : WELLIE(25)                             |
 | Char Set ID/Text flag  :                                        |
 | Seclabel . . . . . . . :                                        |
 | Mount parameter:                                                |
 |    _____________________________________________________       |
 |    _____________________________________________________       |
 |    _____________________________________________________       |
 |    _____________________________________________________       |
 |    _____________________________________________________       |
 |                                                                 |
 |  F1=Help        F3=Exit        F4=Name      F6=Keyshelp         |
 | F12=Cancel                                  F7=Backward         |
 '-----------------------------------------------------------------'
```

  - ISHELL Panel of Mounted File Systems

```
                    Work with Mounted File Systems

Select one or more file systems with / or action codes.
U=Unmount   A=Attributes   M=Modify   R=Reset unmount or quiesce
  Type  Owner     A/M  R/O  User          F  Row 1 of 9
_ ZFS   SY1       U    No                   ZOS113.SY1.ETC.ZFS
_ ZFS   SY1       U    No    WELLIE         MYFS.ZFS
_ ZFS   SY1       U    No                   ZOS113.SY1.VAR.ZFS
```

Additional Mount/Unmount enhancements

- NONEMPTYMOUNTPT (NOWARN|WARN|DENY)
  - Provides a new BPXPRMxx PARMLIB statement to control non-empty mount point directory contents overlay during mount operations
  - Can be dynamically changed using SET OMVS or SETOMVS commands
- Examples of displaying the settings
  - D OMVS,OPTIONS

```
 BPXO043I 09.56.54 DISPLAY OMVS 513
   OMVS     000E ACTIVE             OMVS=(Y4)
   CURRENT UNIX CONFIGURATION SETTINGS:
   MAXPROCSYS      =        256    MAXPROCUSER     =        300
    ........
   AUTHPGMLIST     = NONE
   SWA             = BELOW         NONEMPTYMOUNTPT = DENY
   SERV_LINKLIB    =
   SERV_LPALIB     =
   MAXUSERMOUNTSYS  = 200          MAXUSERMOUNTUSER = 222
```

- NOWARN - causes the system to mount any file system on mount point without any warning message when the mount point is a non-empty directory. The contents of that directory will be hidden for the duration of the mount.
- WARN - causes the system to mount any file system on mount point with a warning message when the mount point is a non-empty directory. The contents of that directory will be hidden for the duration of the mount.
- DENY - causes the system not to mount any file system when the mount point is a non- empty directory.
- **/usr/sbin/mount Shell Command Updates:**
  - If waiting for a asynchronous mount to complete, failures will now be reported to the user. (This also applies to TSO Mount)
  - File system type is dynamically determined if "–t" (type option) not used and "–o" (fsoptions) was specified
  - Now verifies file system name length and fails the mount if larger than 44 characters
  - Does not check for existence of path so mount syscall is issued that will fail and create a mount failure record
  - File system name is uppercased if –t (type option) not used and type determined to be zFS
- **/usr/sbin/unmount shell command Updates:**
  - Default behavior changed to unmount a file system only if the path specified is a mount point
  - New –m option created to retain default behavior (path specified can be any file/directory contained in the file system)

Interactions and dependencies

- None

Migration and coexistence considerations

- Default behavior changed for /usr/sbin/unmount to require path name specified to be a mount point
- Mounts via /usr/sbin/mount of zFS file systems may start to fail if –t option (type) not used and –o option (fsoption) was used and the fsoption were HFS parameters

Installation

- New parmlib statements in BPXPRMxx
  - MAXUSERMOUNTSYS(xx)
  - MAXUSERMOUNTUSER(xx)
  - NONEMPTYMOUNTPT(NOWARN|WARN|DENY)

Appendix - References

- SA22-7592 z/OS MVS Initialization and Tuning Reference
- SA22-7633 z/OS MVS System Messages Volume 3
- SA22-7627 z/OS MVS System Commands
- GA22-7581 z/OS MVS Data Areas Volume 1
- GA22-7800 UNIX System Services Planning
- SA22-7802 UNIX System Services Command Reference
- SA22-7803 UNIX System Services Programming Assembler Callable Services Reference
- SA22-7807 UNIX System Services Messages and Codes
- SA22-7801 UNIX System Services User's Guide
- SA22-7806 Using REXX and z/OS UNIX System Services
- SA22-7808 UNIX System Services File system interface Reference
- SA22-7994 IBM Health checker for z/OS: User's Guide