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TECHNICAL NOTES

EMC® Enginuity™ 5773 Flexible Device Geometry in a Sun Solaris Environment

Technical Note

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This technical note contains information on these topics:

Executive summary

EMC® Enginuity™ 5773 now includes Flexible Device Geometry, which provides improved interoperability when migrating data from Sun Solaris hosts between older Symmetrix® systems or CLARiiON® arrays and DMX-3 or DMX-4. Flexible Device Geometry allows Symmetrix devices to be presented with an external device geometry that is different from its native geometry and matches the geometry of the source array.

In the Solaris operating system, disk geometry, disk size, manufacturer ID, and the partition table are stored in the label in sector 0 of the disk. The label is written to the disk using the `format` utility, which makes a device usable to the OS. When a Solaris device is opened for I/O activity, the label is written to host cache and the SCSI driver uses the partition information to translate relative partition addresses to device absolute logical block addresses.

Migration between devices with different disk geometries will cause the target device to contain an incorrect label. This will occur when devices are migrated using a block level copy from a CLARiiON or third-party storage array that uses a different disk geometry than the Symmetrix.

This can occur even when migrating between two Symmetrix arrays. When the EMC Symmetrix DMX-3 was introduced, the disk geometry presented to the host by the disk array changed. The number of sectors per track was doubled from 64 to 128, which also led to a doubling of the cylinder size. The following depicts the differences in geometries between current Symmetrix products:

Dimensions for Symmetrix 4.8/5/DMX/DMX-2:

* 512 bytes/sector
* 64 sectors/track
* 15 tracks/cylinder
* 960 sectors/cylinder
* X cylinders
* X-2 accessible cylinders

Dimensions for DMX-3 and later:

* 512 bytes/sector
* 128 sectors/track
* 15 tracks/cylinder
* 1920 sectors/cylinder
* X cylinders
* X-2 accessible cylinders

The difference between disk geometries will not cause problems in most scenarios. However, there are specific situations where it might.

For example, when a device is migrated from an earlier model Symmetrix to a DMX-3 using a product that produces a block-by-block copy of the source device on the target device (SRDF®, RecoverPoint, or Open Replicator for example), the entire device is migrated including the VTOC label. When this occurs between devices with heterogeneous disk geometries, there will be a difference between the disk geometry written in the label on the target (which was copied from the source) and the actual disk geometry that is presented to the target host by the target array.

If the device is relabeled by the Solaris systems administrator, data loss can occur. This is because Solaris reserves two cylinders from every device for use by the operating system. DMX-3 and later cylinders are twice as large as cylinders from previous generation Symmetrix disk arrays, meaning that the operating system will overwrite the last 1,920 sectors of the user data area with an area reserved for operating system use.

It should be noted that if the target device is never relabeled, no data loss will occur despite the difference in the geometry written in the label and the actual disk geometry of the target device.

Potential problems can also arise if a host volume manager such as Veritas Volume Manager is used to perform a migration. This is due to the smaller user data area that will be available on the DMX-3 device due to the greater amount of space taken by Solaris for the alternate cylinders.

Feature description

To alleviate any potential for corruption, a new feature called Flexible Device Geometry been added to Symmetrix Enginuity.

A bin file setting called FBA Geometry Emulation has been included that allows the array to present the 64 sectors-per-track disk geometry for all Symmetrix devices instead of its internal, native device geometry. Functionality has also been added to Enginuity 5773 and to Solutions Enabler that allows alternate disk geometry to be set on a device-by-device basis using Solutions Enabler. This will allow the array running 5773 to emulate either 64 sectors-per-track disk geometry, 128 sectors-per-track disk geometry, or CLARiiON geometry.

Note: If the geometry presented by the target array is modified through the setting of the FBA Geometry Emulation or by setting alternate device geometry on devices that will be presented to Solaris hosts, potential problems relating to the difference in geometry that are noted in the following sections will be avoided.

Introduction

This tech note describes the Flexible Device Geometry feature. The goals of this document are:

- Summarize what the potential problems are
- Describe when they might be encountered
- Summarize the limitations of Flexible Device Geometry
- Describe what must be done to enable Flexible Device Geometry
- Describe what steps must be taken from the host to ensure that the feature is correctly implemented

Audience

This tech note is intended for the technology professional who works in an environment with Symmetrix DMX-3 or DMX-4 arrays, CLARiiON and third-party arrays, and Solaris hosts. It is specifically targeted at EMC field technical staff and EMC customers who might need to implement Flexible Device Geometry and perform the required host changes.

Requirements and dependencies

Flexible Device Geometry requires Enginuity 5773 and Solutions Enabler 6.5.

An Enginuity E-Pack is available for DMX-3 and DMX-4 arrays running earlier Enginuity families that will allow the FBA Geometry Emulation setting to be enabled through a bin file change. This E-Pack can be obtained through an EMC Customer Engineer.

Conventions used in this document

An ellipsis (. . .) appearing on a line by itself indicates that unnecessary command output has been removed.

`Command syntax, output, and examples appear in the Courier New font.`

Note: Symmetrix arrays specified in the text and examples will be either DMX-3 or DMX-4 depending on the array to which the hosts were attached, however, all statements and examples apply equally to Symmetrix models DMX-3 and later.

Limitations

The following limitations must be taken into consideration before using this feature:

The Solaris Format utility depends on three attributes to be intact when performing a reformat operation: Geometry, Capacity, and Manufacturer ID. Because only the geometry and capacity can be changed by this feature, the format utility will write a default partition table to the disk. In order to preserve custom partitions the user must record the partition table prior to running the format utility. They must then run the format utility, run auto configure, write a new label, and rewrite the partition table using the "fmthard" utility. The user can also use `powerformat` to update the ASCII label.

Implementation of this feature using the bin flag requires an offline bin change and is valid for new Symmetrix installations only. Enabling this feature on a Symmetrix with existing Solaris host data can result in data loss.

When setting Flexible Device Geometry on individual devices, no downtime is required, but the alternate geometry must be set on the target device prior to migrating Solaris data. The geometry must also be set before the devices are made available to the host.

The device geometry cannot be changed for the following Symmetrix device types:

Individual meta member

Vault device

SFS device

Save device

Virtual Provisioning data device

Symmetrix Optimizer DRV

Mapped device

Non-FBA device

VCMDB device

Potential issues

There are three pieces of information contained in the disk label that, if modified, can cause a new label to be written to the disk by the operating system. If disk geometry, manufacturer ID, or the size of the disk device change, format will write a new label if "auto configure" is run from the "format> type" menu, and the disk is labeled.

For example:

```
# format
Searching for disks...done
...

AVAILABLE DISK SELECTIONS:
       0. c0t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@1f,4000/scsi@3/sd@0,0
       1. c0t1d0 <SUN4.2G cyl 3880 alt 2 hd 16 sec 135>
          /pci@1f,4000/scsi@3/sd@1,0
       2. c4t0d0 <EMC-SYMMETRIX-5771 cyl 94 alt 2 hd 15 sec 128>
          /pci@1f,4000/fibre-channel@4/sd@0,0
...
      17. c4t0d16 <EMC-SYMMETRIX-5671 cyl 9204 alt 2 hd 15 sec 64>

Specify disk (enter its number): 17
selecting c4t0d16
[disk formatted]


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        Quit

format> type


AVAILABLE DRIVE TYPES:
        0. Auto configure
        1. Quantum ProDrive 80S
```

```
        2. Quantum ProDrive 105S
        3. CDC Wren IV 94171-344
        4. SUN0104
        5. SUN0207
        6. SUN0327
        7. SUN0340
        8. SUN0424
        9. SUN0535
        10. SUN0669
        11. SUN1.0G
        12. SUN1.05
        13. SUN1.3G
        14. SUN2.1G
        15. SUN2.9G
        16. Zip 100
        17. Zip 250
        18. SUN36G
        19. EMC-SYMMETRIX-5771
        20. EMC-SYMMETRIX-5771
        21. SUN4.2G
        22. EMC-SYMMETRIX-5671
        23. EMC-SYMMETRIX-5671
        24. EMC-SYMMETRIX-5671
        25. EMC-SYMMETRIX-5671
        26. EMC-SYMMETRIX-5772
        27. EMC-SYMMETRIX-5771
        28. other
Specify disk type (enter its number)[23]: 0
c4t0d16: configured with capacity of 4.21GB
<EMC-SYMMETRIX-5771 cyl 4601 alt 2 hd 15 sec 128>
selecting c4t0d16
[disk formatted]
format> label
Ready to label disk, continue? y

format>
```

In this output, c4t0d16 had a label that was written to a disk residing on a Symmetrix DMX array running 5671 Enginuity. The volume was then migrated to a DMX-3 using array-based migration, which created a track-by-track copy of the device on the target. When auto-configure was run and the device was labeled, a default label was written to the disk with the DMX-3 disk geometry.

> Note: Array-based migrations can be performed using SRDF, Open Replicator, RecoverPoint, or PowerPath® Migration Enabler (PPME). With Open Migrator/LM, which is a host-based migration utility, the target device will be labeled before the migration. OM/LM allows the user the option of skipping over the label and not copying it from the source to the target device.

Data corruption with non-default partitions

Though the differences between the geometry that is written to the disk

and to host cache will not normally cause an issue, there are certain situations where it will be problematic. The most serious can occur during an array-based migration between devices with heterogeneous geometry types (DMX to DMX-4, for example). If the source volume has been formatted with a user-defined, non-default partition table, the label containing the partition information will be copied to the target device along with the user data.

Disk partitions are aligned on cylinder boundaries and therefore directly depend on the disk geometry that is reported for a device. In this scenario the disk geometry has changed on the target device. If "auto configure" is run and the disk is labeled, Solaris will write a default label to the disk device. This will cause the user-defined partitions to be overwritten, leading to data loss on the DMX-3 device.

This issue can also be encountered if the source device has been initialized by a volume manager. For example, Veritas Volume Manager (VxVM) writes a custom partition table to devices when they are initialized. The following output shows the same size device with both a default Solaris partition table and a VxVM partition table.

Default Solaris partition table:

```
# prtvtoc /dev/rdsk/c2t50060485C708E268d10s2
* /dev/rdsk/c2t50060485C708E268d10s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       0      2    00          0    263040    263039
       1      3    01     263040    263040    526079
       2      5    01          0   8833920   8833919
       6      4    00     526080   8307840   8833919
```

VxVM partition table (cdsdisk):

```
# prtvtoc /dev/rdsk/c2t50060485C708E268d11s2
* /dev/rdsk/c2t50060485C708E268d11s2 partition map
```

```
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags     Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919
```

When migrated with an array-based method, target devices in the disk group will have the exact same Solaris label as the source devices and the disk group will import without an issue. If, however, Solaris labels on the target devices are overwritten with a default label, the disk group will fail to import and the last 1920 sectors (or one DMX-3 cylinder) of the public region will be overwritten by a Solaris alternate cylinder.

```
# vxdg -Cf import geodg
VxVM vxdg ERROR V-5-1-587 Disk group geodg: import failed: No valid disk found
containing disk group
```

A VxVM partition table after relabeling at the target:

```
# prtvtoc /dev/rdsk/c2t3d11s2
* /dev/rdsk/c2t3d11s2 partition map
*
* Dimensions:
*     512 bytes/sector
*     128 sectors/track
*      15 tracks/cylinder
*    1920 sectors/cylinder
*    4602 cylinders
*    4600 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags     Sector     Count    Sector  Mount Directory
       0      2    00          0    263040    263039
       1      3    01     263040    263040    526079
       2      5    01          0   8832000   8831999
       6      4    00     526080   8305920   8831999
```

Smaller user data area

Problems performing a migration can also be encountered due to a smaller amount of user data space available on the DMX-3 device.

In Solaris, the last two cylinders of a disk device are reserved for use by the operating system as alternate cylinders. They are not available to the user for host data. Because DMX-3 cylinders are twice as large as cylinders from earlier Symmetrix models, DMX-3 devices will have one less cylinder worth of space available for user data. This means, following a track-by-track migration, that 960 KB at the end of the user data area of the target volume will be overwritten when the DMX-3 device is labeled.

In this example, the source device on a DMX is synchronized to a target device on a DMX-3 using SRDF. Both the source and the target devices are equally sized (4416960 KB):

DMX (5671 Enginuity):

```
# prtvtoc /dev/rdsk/c2t50060485C708E268d9s2
* /dev/rdsk/c2t50060485C708E268d9s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       0      2    00          0    263040    263039
       1      3    01     263040    263040    526079
       2      5    01          0   8833920   8833919
       6      4    00     526080   8307840   8833919
```

DMX-3 (5773 Enginuity):

After the SRDF pair is split, the host connected to the DMX-3 can access a track-by-track copy of the source device on the target device. This includes the Solaris label.

If a new label is not written, the target device will have the same VTOC information as the source device, which reflects the disk geometry of the older array. The device can be used with no issues.

```
# prtvtoc /dev/rdsk/c2t3d9s2
* /dev/rdsk/c2t3d9s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags     Sector     Count    Sector  Mount Directory
       0      2    00          0    263040    263039
       1      3    01     263040    263040    526079
       2      5    01          0   8833920   8833919
       6      4    00     526080   8307840   8833919
```

If a new label is written, however, the device's geometry is changed to the geometry presented by the DMX-3:

```
       ...
      44. c2t3d0 <EMC-SYMMETRIX-5773 cyl 94 alt 2 hd 15 sec 128>
          /pci@1f,4000/fibre-channel@5/sd@3,0
      45. c2t3d9 <EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64>
          /pci@1f,4000/fibre-channel@5/sd@3,9
      46. c2t3d10 <drive type unknown>
          /pci@1f,4000/fibre-channel@5/sd@3,a
      47. c2t3d11 <drive type unknown>
          /pci@1f,4000/fibre-channel@5/sd@3,b

Specify disk (enter its number): 45
selecting c2t3d9
[disk formatted]


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
```

```
        quit
format> type


AVAILABLE DRIVE TYPES:
        0. Auto configure
        1. Quantum ProDrive 80S
        2. Quantum ProDrive 105S
        3. CDC Wren IV 94171-344
        4. SUN0104
        5. SUN0207
        6. SUN0327
        7. SUN0340
        8. SUN0424
        9. SUN0535
        10. SUN0669
        11. SUN1.0G
        12. SUN1.05
        13. SUN1.3G
        14. SUN2.1G
        15. SUN2.9G
        16. Zip 100
        17. Zip 250
        18. SUN36G
        19. EMC-SYMMETRIX-5773
        20. EMC-SYMMETRIX-5773
        21. EMC-SYMMETRIX-5773
        22. EMC-SYMMETRIX-5671
        23. other
Specify disk type (enter its number)[22]: 0
c2t3d9: configured with capacity of 4.21GB
<EMC-SYMMETRIX-5773 cyl 4600 alt 2 hd 15 sec 128>
selecting c2t3d9
[disk formatted]
format> label
Ready to label disk, continue? y

format>

# prtvtoc /dev/rdsk/c2t3d9s2
* /dev/rdsk/c2t3d9s2 partition map
*
* Dimensions:
*     512 bytes/sector
*     128 sectors/track
*      15 tracks/cylinder
*    1920 sectors/cylinder
*    4602 cylinders
*    4600 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                          First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       0      2    00          0    263040    263039
```

```
1       3     01      263040     263040     526079
2       5     01           0    8832000    8831999
6       4     00      526080    8305920    8831999
```

In this example, the DMX source device has 8833920 total sectors (4416960 KB) in the backup partition, which represents all of the user data area available on the device. The DMX-3 target device has 8832000 sectors (4416000 KB). The difference is 960 KB or one DMX-3 cylinder.

Host-based migrations:

Because of this difference, the issues that can occur are not limited only to array-based migrations. Host-based migration methods such as a `dd` between raw volumes or volume manager mirroring are also affected.

When a device is initialized by Veritas Volume Manager, for example, the difference in the geometry will cause the public region (user data area) of the DMX-3 device to be smaller than on the DMX device.

This is output from a DMX (5671) device that is 9206 cylinders in size. It has a public region length of 8833536 blocks:

```
# symdev show 398 -sid 41
...
    Device Capacity
        {
        Cylinders             :       9206
        Tracks                :     138090
        512-byte Blocks       :    8837760
        MegaBytes             :       4315
        KiloBytes             :    4418880
        }
...

# vxdisk list c6t1d4s2
Device:    c6t1d4s2
devicetag: c6t1d4
type:      auto
hostid:    api179
disk:      name=testdg01 id=1179346008.107.api179
group:     name=testdg id=1179346083.109.api179
info:      format=cdsdisk,privoffset=256,pubslice=2,privslice=2
flags:     online ready private autoconfig autoimport imported
pubpaths:  block=/dev/vx/dmp/c6t1d4s2 char=/dev/vx/rdmp/c6t1d4s2
version:   3.1
iosize:    min=512 (bytes) max=256 (blocks)
public:    slice=2 offset=2304 len=8833536 disk_offset=0
private:   slice=2 offset=256 len=2048 disk_offset=0
update:    time=1179346083 seqno=0.6
...
```

A device on the DMX-3 (5771) that was created with 4603 cylinders is exactly the same size in the Symmetrix, yet it has a public region length

of only 8831616 blocks:

```
# symdev show 190 -sid 81

...
    Device Capacity
        {
        Cylinders            :       4603
        Tracks               :      69045
        512-byte Blocks      :    8837760
        MegaBytes            :       4315
        KiloBytes            :    4418880
        }
...


# vxdisk list c4t0d16s2
Device:    c4t0d16s2
devicetag: c4t0d16
type:      auto
hostid:
disk:      name= id=1179415402.38.api219
group:     name= id=
info:      format=cdsdisk,privoffset=256,pubslice=2,privslice=2
flags:     online ready private autoconfig autoimport
pubpaths:  block=/dev/vx/dmp/c4t0d16s2 char=/dev/vx/rdmp/c4t0d16s2
version:   3.1
iosize:    min=512 (bytes) max=256 (blocks)
public:    slice=2 offset=2304 len=8831616 disk_offset=0
private:   slice=2 offset=256 len=2048 disk_offset=0
update:    time=1179415402 seqno=0.1
...
```

If a user attempted a volume manager migration between these two devices, it would fail if all of the public region space on the DMX device had been used to create subdisks. There would not be enough public region space on the DMX-3 device to create an equal or larger subdisk and plex and the plex would not attach to the volume. Prior to Flexible Device Geometry, this would have required that another disk be added from the target DMX-3 or that the DMX-3 device be made larger.

With the FBA Geometry Emulation bin file flag enabled, the DMX-3 device's public region will be identical in size after it is initialized by Veritas. The following shows the same DMX-3 device after the FBA Geometry Emulation flag was set in the bin file, and the device was relabeled and reinitialized. It is now presented to the host with 64 sectors- per-track disk geometry and the public region is therefore the same size:

```
# vxdisk list c4t0d16s2
Device:    c4t0d16s2
```

```
devicetag: c4t0d16
type:      auto
hostid:
disk:      name= id=1179423803.40.api219
group:     name= id=
info:      format=cdsdisk,privoffset=256,pubslice=2,privslice=2
flags:     online ready private autoconfig autoimport
pubpaths:  block=/dev/vx/dmp/c4t0d16s2 char=/dev/vx/rdmp/c4t0d16s2
version:   3.1
iosize:    min=512 (bytes) max=256 (blocks)
public:    slice=2 offset=2304 len=8833536 disk_offset=0
private:   slice=2 offset=256 len=2048 disk_offset=0
...
```

Note: By default, Solutions Enabler 6.4 and earlier will report the size of DMX-3 or later devices using a 32K track size even when Flexible Device Geometry is not enabled. This behavior can be modified by changing the SYMAPI_TRACK_SIZE_32K_COMPATIBLE parameter to DISABLE in the /var/symapi/config/options file.

At 6.5, the default has been changed and will show the geometry that is native to the device by default. That means that DMX and earlier arrays will report devices with 32K tracks and DMX-3 and later arrays will report devices with 64K tracks.

Manufacturer ID

When a migration is performed from an earlier generation Symmetrix, a CLARiiON, or a third-party disk array to a DMX-3, the manufacturer ID will change. Because the manufacturer ID for Symmetrix includes the level of Enginuity, even migrations between like-model Symmetrix arrays can cause the target device to display an incorrect manufacturer ID. Since this is one of the previously mentioned parameters that can cause Solaris to rewrite the disk label, care must be taken to ensure that this will not cause a problem.

An incorrect manufacturer ID will not cause any issue in and of itself, but a user might find it desirable to ensure that the ID will be correct following a migration.

Viewing and modifying device geometry

The FBA Geometry Emulation setting, which is the system-wide disk geometry setting, can be viewed using the `symcfg list -v` command. This setting is not user-configurable and can only be modified with an offline bin file change:

```
# symcfg list -v -sid 14

Symmetrix ID: 000190100414
...

    Symmetrix Configuration Checksum     : 2ED58F
    Switched RDF Configuration State     : Enabled
    Concurrent RDF Configuration State   : Enabled
    Dynamic RDF Configuration State      : Enabled
    Concurrent Dynamic RDF Configuration : Enabled
    RDF Data Mobility Configuration State: Disabled
    Access Control Configuration State   : Enabled
    Device Masking (VCM) Config State    : Enabled
    VCMdb Access Restricted State        : N/A
```

```
    Multi LRU Device Assignment          : BY_NUMBER
    Disk Group Assignments               : Not in Use
    Hot Swap Policy                      : Permanent
    Symmetrix Disk Library               : Disabled
    FBA Geometry Emulation               : Native
    3 Dynamic Mirrors                    : Enabled
    Cache Partitioning                   : Disabled
    IPSec Status                         : Pass Thru
...
```

The geometry of individual devices can be viewed using Solutions Enabler. The `-geometry` option has been added to the `symld show`, `sympd show`, and `symdev show` commands. The device displayed here, which is Symmetrix volume 0078, is presenting the native 64K track geometry.

```
# symdev show 0078 -geometry -sid 0414

    ...

    Device Capacity
        {
        Cylinders            :       4602
        Tracks               :      69030
        512-byte Blocks      :    8835840
        MegaBytes            :       4314
        KiloBytes            :    4417920
        }

    Effective Device Geometry: Native
        {
        Sectors/Track        :        128
        Tracks/Cylinder      :         15
        Cylinders            :       4602
        512-byte Blocks      :    8835840
        MegaBytes            :       4314
        KiloBytes            :    4417920
        }
    ...
```

The Effective Device Geometry field can have three possible values.

- User Defined - Indicates that a user has defined a specific geometry for this device.
- Native - Indicates the device geometry is the same as the native geometry for the particular model of Symmetrix.
- Array Wide Emulation - Indicates that the FBA Geometry Emulation is set to "Enabled" and the effective geometry shown in the output is because of this setting.

> Note: Even if the FBA Geometry Emulation bin file flag is enabled, the user can still define the geometry at an individual device level. If defined, the individual device setting will take precedence over the FBA Geometry Emulation setting.
>
> For non-FBA devices, the CLI will indicate "N/A" with the `-v` and the `-geometry` options.

The `symld list -v`, `symdev list -v`, and `sympd list -v` commands will also display the geometry setting for each device.

Flexible Device Geometry on individual devices is set using the Symmetrix Configuration Control CLI (`symconfigure`). The device geometry is modified using new syntax added to `set dev`:

```
set dev SymDevName[:SymDevName]
  geometry [= SYMM-6 | = SYMM-7 | = CLARIION]
  cyls = <n>;


set dev SymDevName[:SymDevName]
  geometry = <NO GEOMETRY>;
```

SYMM-6 refers to the disk geometry presented by Symmetrix arrays prior to DMX-3. SYMM-7 refers to DMX-3 and later disk arrays. CLARIION allows the user to set a Symmetrix device to present itself with CLARiiON disk geometry. Setting a device to NO GEOMETRY will return the device to the native array geometry.

The `cyls` parameter allows the user to specify the number of cylinders that the device will contain when it presents the modified disk geometry. When modifying a 128 sectors-per-track device to emulate a 64 sectors-per-track device, the number of cylinders in the `cyls` parameter must be double the actual number of cylinders that the device contains.

Device 0078 is presented with its native 128 sectors-per-track disk geometry and contains 4602 x 960K cylinders.

```
# symdev show 0078 -geometry -sid 14
...
    Effective Device Geometry: Native
        {
        Sectors/Track        :        128
        Tracks/Cylinder      :         15
        Cylinders            :       4602
        512-byte Blocks      :    8835840
        MegaBytes            :       4314
        KiloBytes            :    4417920
        }
```

```
...
```

The device can be modified so that the Symmetrix presents 64 sectors-per-track geometry to a host:

```
# symconfigure -sid 14 -cmd "set dev 0078 geometry=Symm-6 cyls=9204;" commit

A Configuration Change operation is in progress. Please wait...

    Establishing a configuration change session..............Established.
    Processing symmetrix 000190100414
    Performing Access checks.................................Allowed.
    Checking Device Reservations.............................Allowed.
    Locking devices..........................................Locked.
    Validating configuration changes.........................Validated.
    Preparing configuration changes..........................Prepared.
    Committing configuration changes.........................Started.
    Committing configuration changes.........................Committed.
    Terminating the configuration change session..............Done.

The configuration change session has successfully completed.
```

The capacity of device 0078 has not changed, but it will now be presented with 64 sectors-per-track disk geometry:

```
# symdev show 0078 -geometry -sid 14

...
    Device Capacity
        {
        Cylinders            :       4602
        Tracks               :      69030
        512-byte Blocks      :    8835840
        MegaBytes            :       4314
        KiloBytes            :    4417920
        }

    Effective Device Geometry: User Defined
        {
        Sectors/Track        :         64
        Tracks/Cylinder      :         15
        Cylinders            :       9204
        512-byte Blocks      :    8835840
        MegaBytes            :       4314
        KiloBytes            :    4417920
        }
...
```

The `symdev list` command now has a `-geometry_set` option that allows the user to list only devices that have disk geometry set. In this case, only 0078 has been modified in Symmetrix 14:

```
# symdev list -geometry_set -sid 14

Symmetrix ID: 000190100414

       Device Name         Directors                    Device
------------------------- ------------ -------------------------------------
                                                                        Cap
Sym  Physical             SA :P DA :IT  Config        Attribute    Sts   (MB)
------------------------- ------------ -------------------------------------

0078 Not Visible          ???:? 16A:DA  2-Way Mir     N/Grp'd      RW    4314
```

When device 0078 is presented to a host and labeled, the operating system displays the device with 64 sectors-per-track geometry:

```
format> current
Current Disk = c4t50060482D52CEFA8d9
<EMC-SYMMETRIX-5773 cyl 9196 alt 2 hd 15 sec 64>
/pci@0,0/pci1022,7450@2/pci10df,fd00@1/fp@0,0/disk@w50060482d52cefa8,9


# prtvtoc /dev/rdsk/c4t50060482D52CEFA8d9s2
* /dev/rdsk/c4t50060482D52CEFA8d9s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9198 cylinders
*    9196 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
* Unallocated space:
*       First     Sector    Last
*       Sector     Count    Sector
*        4096   8824064   8828159
*
*                          First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01          0   8822784   8822783
       8      1    01          0      4096      4095
```

Note: Because the change in geometry is destructive, disk geometry changes should be made to a device prior to it being allocated to a host. If a device needs to be repurposed and does not contain data that needs to be kept, the device must be unmapped or unmasked and write disabled or not ready before its geometry can be modified.

Updating the disk label on the target device

Because array-based migrations copy the disk label from the source device to the target device, specific procedures must be followed when migrating data between earlier Symmetrix models and DMX-3 or later arrays.

The following procedures allow the user to migrate data and safely update the disk label.

> In some of the output, extra characters have been replaced with an asterisk (*) for readability.

Rewriting the disk label using native tools

The following procedure can be run to prepare the host volumes and update the disk label using only native operating system utilities.

General steps

1. Have an EMC Customer Engineer enable FBA Geometry Emulation or use Solutions Enabler to set the device geometry to SYMM-6.
2. Synchronize the source and target volumes.
3. Split the target volumes and ensure that they are ready and read/write.
4. Print the VTOC of the source volumes to a file.
   ```
   prtvtoc /dev/rdsk/<source_vol> > <filename>
   ```
5. Transfer the VTOC files to the target host.
6. Update the manufacturer information on the target volumes.
   ```
   format <target_vol>
   type
   Auto configure
   label
   ```
7. Update the partition information on the target volumes
   ```
   fmthard -s <filename> <target_vol>
   ```

Example of the procedure

The following is an example of how to perform this procedure on a Veritas disk group using Solutions Enabler to modify the target disk geometry and SRDF to perform the migration.

The disk group that will be migrated is called geodg and contains

Symmetrix devices 036 and 037 from the source array that is serial number 0073, and is a DMX 2000S-M2 running Enginuity 5671:

```
# symcfg list

                                S Y M M E T R I X

                                          Mcode    Cache      Num Phys  Num Symm
    SymmID       Attachment  Model       Version  Size (MB)  Devices   Devices

    000387720073 Local       2000S-M2    5671       65536        30        80
    000190100414 Remote      DMX3-24     5773      131072         0       144


# syminq | grep c2t50060485C708E268d11s2
/dev/rdsk/*d11s2    R1     EMC       SYMMETRIX    5671 7300036000    4417920
/dev/vx/rdmp/*d11s2 R1     EMC       SYMMETRIX    5671 7300036000    4417920


# syminq | grep c2t50060485C708E268d12s2
/dev/rdsk/*d12s2    R1     EMC       SYMMETRIX    5671 7300037000    4417920
/dev/vx/rdmp/*d12s2 R1     EMC       SYMMETRIX    5671 7300037000    4417920


# vxprint -htQq
dg geodg        default      default  29000    1203016756.36.licoa034

dm geodg01      c2t50060485C708E268d11s2 auto 2048 8831616 -
dm geodg02      c2t50060485C708E268d12s2 auto 2048 8831616 -

v  geodgvol01   -            ENABLED  ACTIVE  17663232 ROUND    -        fsgen
pl geodgplex01  geodgvol01   ENABLED  ACTIVE  17663232 CONCAT   -        RW
sd geodg01sd01  geodgplex01  geodg01  0       8831616  0        c2t5006* ENA
sd geodg02sd01  geodgplex01  geodg02  0       8831616  8831616  c2t5006* ENA
```

The disk group contains a single Veritas volume that is mounted and contains data:

```
# df -k
Filesystem            kbytes    used   avail capacity  Mounted on
/dev/dsk/c0t1d0s0    16379106 6176410 10038905    39%    /
/proc                      0       0       0     0%    /proc
mnttab                     0       0       0     0%    /etc/mnttab
fd                         0       0       0     0%    /dev/fd
swap                 1430576     112 1430464     1%    /var/run
dmpfs                1430464       0 1430464     0%    /dev/vx/dmp
dmpfs                1430464       0 1430464     0%    /dev/vx/rdmp
swap                 1430840     376 1430464     1%    /tmp
/dev/vx/dsk/geodg/geodgvol01
                     8831616 4213799 4329252    50%    /mp/geodgvol01_mp
```

```
# ls -l /mp/geodgvol01_mp
total 8388678
drwxr-xr-x   2 root     other       3072 Feb 14 16:36 flat_files
drwxr-xr-x   2 root     root          96 Feb 14 14:26 lost+found
-rw------T   1 root     other    1073741824 Feb 14 16:37 testfile1
-rw------T   1 root     other    1073741824 Feb 14 16:38 testfile2
-rw------T   1 root     other    1073741824 Feb 14 16:39 testfile3
-rw------T   1 root     other    1073741824 Feb 14 16:41 testfile4


# ls -l /mp/geodgvol01_mp/flat_files
total 290
-rw-r--r--   1 root     other        131 Feb 14 16:36 arp.conf
-rw-r--r--   1 root     other       1583 Feb 14 16:36 audiocs.conf
-rw-r--r--   1 root     other       1414 Feb 14 16:36 audioens.conf
-rw-r--r--   1 root     other       1601 Feb 14 16:36 audiots.conf
-rw-r--r--   1 root     other       1810 Feb 14 16:36 bofi.conf
-rw-r--r--   1 root     other        135 Feb 14 16:36 clone.conf
-rw-r--r--   1 root     other        129 Feb 14 16:36 cn.conf
-rw-r--r--   1 root     other        139 Feb 14 16:36 conskbd.conf
-rw-r--r--   1 root     other        164 Feb 14 16:36 consms.conf


# cat /mp/geodgvol01_mp/flat_files/arp.conf
#
# Copyright (c) 1992, by Sun Microsystems, Inc.
#
#ident  "@(#)arp.conf   1.4     93/06/03 SMI"
name="arp" parent="pseudo" instance=0;
```

The devices that will be the targets of the migration in Symmetrix 0414 (DMX3-24, Enginuity 5773) are devices 076 and 077. Before beginning the migration, the device geometry is correctly set to SYMM-6 so that it matches the source devices on the DMX:

```
# symconfigure -sid 14 -cmd "set dev 0076:0077 geometry=SYMM-6 cyls=9204;"
commit

A Configuration Change operation is in progress. Please wait...

    Establishing a configuration change session..............Established.
    Processing symmetrix 000190100414
    Performing Access checks.................................Allowed.
    Checking Device Reservations.............................Allowed.
    Locking devices..........................................Locked.
    Validating configuration changes.........................Validated.
    Preparing configuration changes..........................Prepared.
    Committing configuration changes.........................Started.
    Committing configuration changes.........................Committed.
    Terminating the configuration change session..............Done.

The configuration change session has successfully completed.
```

```
# symdev list -geometry_set -sid 14

Symmetrix ID: 000190100414

        Device Name          Directors                    Device
-------------------------- ------------ ------------------------------------
                                                                        Cap
Sym  Physical               SA :P DA :IT  Config       Attribute    Sts   (MB)
-------------------------- ------------ ------------------------------------

0076 Not Visible           ???:? 16C:C9  2-Way Mir     N/Grp'd      RW    4314
0077 Not Visible           ???:? 16D:DB  2-Way Mir     N/Grp'd      RW    4314
```

> Note: Setting the device geometry can be performed before or after the devices are configured as SRDF devices.

The devices are configured as SRDF devices using dynamic RDF (RDF group 01 already exists), and synchronized:

```
# cat dynamic
036 076
037 077

# symrdf -sid 73 -file dynamic -rdfg 1 createpair -type R1 -establish -nop

An RDF 'Create Pair' operation execution is in progress for device
file 'dynamic'. Please wait...

    Create RDF Pair in (0073,001).....................................Started.
    Create RDF Pair in (0073,001).....................................Done.
    Mark target device(s) in (0073,001) for full copy from source....Started.
    Devices: 0036-0037 in (0073,001)................................. Marked.
    Mark target device(s) in (0073,001) for full copy from source....Done.
    Merge track tables between source and target in (0073,001).......Started.
    Devices: 0036-0037 in (0073,001)................................. Merged.
    Merge track tables between source and target in (0073,001).......Done.
    Resume RDF link(s) for device(s) in (0073,001)...................Started.
    Resume RDF link(s) for device(s) in (0073,001)...................Done.

The RDF 'Create Pair' operation successfully executed for device
file 'dynamic'.
```

A Symmetrix device group containing the two devices has been created and the devices have been synchronized:

```
# symrdf -g vxgeodg query


Device Group (DG) Name             : vxgeodg
DG's Type                          : RDF1
DG's Symmetrix ID                  : 000387720073    (Microcode Version: 5671)
```

```
Remote Symmetrix ID                : 000190100414    (Microcode Version: 5773)
RDF (RA) Group Number              :   1 (00)


       Source (R1) View                Target (R2) View     MODES
--------------------------------    ----------------------- ----- ------------
             ST                   LI     ST
Standard      A                    N      A
Logical       T  R1 Inv   R2 Inv  K      T  R1 Inv   R2 Inv       RDF Pair
Device  Dev   E  Tracks   Tracks  S Dev  E  Tracks   Tracks MDA   STATE
-------------------------------- -- ----------------------- ----- ------------

DEV001  0036 RW       0        0 RW 0076 WD      0        0 S..   Synchronized
DEV002  0037 RW       0        0 RW 0077 WD      0        0 S..   Synchronized

Total          -------- --------          -------- --------
  Track(s)            0        0                 0        0
  MB(s)             0.0      0.0               0.0      0.0

Legend for MODES:

 M(ode of Operation): A = Async, S = Sync, E = Semi-sync, C = Adaptive Copy
 D(omino)           : X = Enabled, . = Disabled
 A(daptive Copy)    : D = Disk Mode, W = WP Mode, . = ACp off
```

A copy of the VTOC from the source volumes must be saved so that it can be written to the target devices after they are labeled. This is done by saving the output of `prtvtoc` to a file:

```
# prtvtoc /dev/rdsk/c3t50060485C708E247d11s2 > /mig_files/d11_0036.vtoc

# prtvtoc /dev/rdsk/c3t50060485C708E247d12s2 > /mig_files/d12_0037.vtoc


# cat /mig_files/d11_0036.vtoc
* /dev/rdsk/c3t50060485C708E247d11s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                          First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919
```

```
# cat /mig_files/d12_0037.vtoc
* /dev/rdsk/c3t50060485C708E247d12s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                          First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919
```

The VTOC files from the source volumes can then be transferred to the target host.

The SRDF pairs can now be split:

```
# symrdf -g vxgeodg split -nop

An RDF 'Split' operation execution is
in progress for device group 'vxgeodg'. Please wait...

    Suspend RDF link(s).......................................Done.
    Read/Write Enable device(s) on RA at target (R2)..........Done.

The RDF 'Split' operation successfully executed for
device group 'vxgeodg'.
```

The target devices are now available to the target host:

```
# ./inq -no_dots | grep 0076
/dev/rdsk/c2t3d11s2    :EMC   :SYMMETRIX      :5773  :1400076000 :     4417920
/dev/vx/rdmp/c2t3d11s2 :EMC   :SYMMETRIX      :5773  :1400076000 :     4417920


# ./inq -no_dots | grep 0077
/dev/rdsk/c2t3d12s2    :EMC   :SYMMETRIX      :5773  :1400077000 :     4417920
/dev/vx/rdmp/c2t3d12s2 :EMC   :SYMMETRIX      :5773  :1400077000 :     4417920
```

They contain the label from the source DMX. The labels can now be rewritten on the target devices:

```
...
      47. c2t3d11 <EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64>
```

```
           /pci@1f,4000/fibre-channel@5/sd@3,b
       48. c2t3d12 <EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64>
           /pci@1f,4000/fibre-channel@5/sd@3,c

Specify disk (enter its number): 47
selecting c2t3d11
[disk formatted]


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> type


AVAILABLE DRIVE TYPES:
        0. Auto configure
        1. Quantum ProDrive 80S
        2. Quantum ProDrive 105S
        3. CDC Wren IV 94171-344
        4. SUN0104
        5. SUN0207
        6. SUN0327
        7. SUN0340
        8. SUN0424
        9. SUN0535
        10. SUN0669
        11. SUN1.0G
        12. SUN1.05
        13. SUN1.3G
        14. SUN2.1G
        15. SUN2.9G
        16. Zip 100
        17. Zip 250
        18. SUN36G
        19. EMC-SYMMETRIX-5773
        20. EMC-SYMMETRIX-5773
        21. EMC-SYMMETRIX-5773
        22. EMC-SYMMETRIX-5671
        23. other
Specify disk type (enter its number)[22]: 0
c2t3d11: configured with capacity of 4.21GB
<EMC-SYMMETRIX-5773 cyl 9202 alt 2 hd 15 sec 64>
```

```
selecting c2t3d11
[disk formatted]
format> label
Ready to label disk, continue? Y


Specify disk (enter its number)[48]: 48
selecting c2t3d12
[disk formatted]
format> type


AVAILABLE DRIVE TYPES:
        0. Auto configure
        1. Quantum ProDrive 80S
        2. Quantum ProDrive 105S
        3. CDC Wren IV 94171-344
        4. SUN0104
        5. SUN0207
        6. SUN0327
        7. SUN0340
        8. SUN0424
        9. SUN0535
        10. SUN0669
        11. SUN1.0G
        12. SUN1.05
        13. SUN1.3G
        14. SUN2.1G
        15. SUN2.9G
        16. Zip 100
        17. Zip 250
        18. SUN36G
        19. EMC-SYMMETRIX-5773
        20. EMC-SYMMETRIX-5773
        21. EMC-SYMMETRIX-5773
        22. EMC-SYMMETRIX-5671
        23. EMC-SYMMETRIX-5773
        24. other
Specify disk type (enter its number)[22]: 0
c2t3d12: configured with capacity of 4.21GB
<EMC-SYMMETRIX-5773 cyl 9202 alt 2 hd 15 sec 64>
selecting c2t3d12
[disk formatted]
format> label
Ready to label disk, continue? y

format> q
#
```

The target device labels now contain the correct Manufacturer ID and disk geometry. The VTOC that was copied over from the source host can now be written to the target devices:

```
# fmthard -s /mig_files/d11_0036.vtoc /dev/rdsk/c2t3d11s2
fmthard:  New volume table of contents now in place.
```

```
# fmthard -s /mig_files/d12_0037.vtoc /dev/rdsk/c2t3d12s2
fmthard:  New volume table of contents now in place.
```

The VTOC on the target devices now matches the VTOC on the source devices:

```
# prtvtoc /dev/rdsk/c2t3d11s2
* /dev/rdsk/c2t3d11s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags     Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919


# prtvtoc /dev/rdsk/c2t3d12s2
* /dev/rdsk/c2t3d12s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags     Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919
```

The Veritas disk group can be imported, the volume can be started, and the file system can be mounted:

```
# vxdg -C import geodg

# vxvol -g geodg start geodgvol01

# vxprint -htQq
dg geodg        default      default  29000    1203016756.36.licoa034

dm geodg01      c2t3d11s2    auto     2048     8831616  -
dm geodg02      c2t3d12s2    auto     2048     8831616  -
```

```
v  geodgvol01   -            ENABLED  ACTIVE   17663232 ROUND     -      fsgen
pl geodgplex01  geodgvol01   ENABLED  ACTIVE   17663232 CONCAT    -        RW
sd geodg01sd01  geodgplex01  geodg01  0        8831616  0         c2t3d11  ENA
sd geodg02sd01  geodgplex01  geodg02  0        8831616  8831616   c2t3d12  ENA

# fsck -F vxfs /dev/vx/dsk/geodg/geodgvol01
log replay in progress
replay complete - marking super-block as CLEAN

# mount -F vxfs /dev/vx/dsk/geodg/geodgvol01 /mp/geodgvol01_R2mp
```

The data is preserved:

```
# ls -l /mp/geodgvol01_R2mp
total 8388678
drwxr-xr-x   2 root     other       3072 Feb 14 16:36 flat_files
drwxr-xr-x   2 root     root          96 Feb 14 14:26 lost+found
-rw------T   1 root     other    1073741824 Feb 14 16:37 testfile1
-rw------T   1 root     other    1073741824 Feb 14 16:38 testfile2
-rw------T   1 root     other    1073741824 Feb 14 16:39 testfile3
-rw------T   1 root     other    1073741824 Feb 14 16:41 testfile4

# ls -l /mp/geodgvol01_R2mp/flat_files
total 290
-rw-r--r--   1 root     other        131 Feb 14 16:36 arp.conf
-rw-r--r--   1 root     other       1583 Feb 14 16:36 audiocs.conf
-rw-r--r--   1 root     other       1414 Feb 14 16:36 audioens.conf
-rw-r--r--   1 root     other       1601 Feb 14 16:36 audiots.conf
-rw-r--r--   1 root     other       1810 Feb 14 16:36 bofi.conf
-rw-r--r--   1 root     other        135 Feb 14 16:36 clone.conf
-rw-r--r--   1 root     other        129 Feb 14 16:36 cn.conf
-rw-r--r--   1 root     other        139 Feb 14 16:36 conskbd.conf
-rw-r--r--   1 root     other        164 Feb 14 16:36 consms.conf
...

# cat /mp/geodgvol01_R2mp/flat_files/arp.conf
#
# Copyright (c) 1992, by Sun Microsystems, Inc.
#
#ident  "@(#)arp.conf   1.4     93/06/03 SMI"

name="arp" parent="pseudo" instance=0;
```

Rewriting the ASCII label using powerformat

The `powerformat` command is included with PowerPath 5.0 for Solaris. It is, however, a stand-alone utility that can be run regardless of whether PowerPath is installed or not. Following a migration, this utility can be used to update the ASCII label.

Note: The sections discussing `powerformat` apply to VTOC labels only. EFI labels are not supported.

General steps

1. Have an EMC Customer Engineer enable FBA Geometry Emulation or use Solutions Enabler to set the device geometry to SYMM-6.
2. Synchronize the source and target volumes.
3. Split the target volumes and ensure that they are ready and read/write.
4. Query the disk label information on the target device.

   ```
   powerformat <target_vol>
   ```
5. Preview the changes that will be made to the target device.
6. Rewrite the label and partition table.

Example of the procedure

The following uses the same Veritas disk group and devices that were used in the previous procedure. The steps are the same as detailed in the previous section except for the method in which the label and partition table are rewritten on the target device.

This example begins after the source and target devices are resynchronized, which overwrites the label on the target device.

In some of the output, extra characters have been replaced with an asterisk (*) for readability.

The target devices are now available to the target host:

```
# ./inq -no_dots | grep 0076
/dev/rdsk/c2t3d11s2    :EMC   :SYMMETRIX      :5773  :1400076000 :     4417920
/dev/vx/rdmp/c2t3d11s2 :EMC   :SYMMETRIX      :5773  :1400076000 :     4417920


# ./inq -no_dots | grep 0077
/dev/rdsk/c2t3d12s2    :EMC   :SYMMETRIX      :5773  :1400077000 :     4417920
/dev/vx/rdmp/c2t3d12s2 :EMC   :SYMMETRIX      :5773  :1400077000 :     4417920
```

They contain the label from the source devices as well as the source device partition table:

```
...
      47. c2t3d11 <EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64>
          /pci@1f,4000/fibre-channel@5/sd@3,b
```

```
       48. c2t3d12 <EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64>
           /pci@1f,4000/fibre-channel@5/sd@3,c
...

# prtvtoc /dev/rdsk/c2t3d11s2
* /dev/rdsk/c2t3d11s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919


# prtvtoc /dev/rdsk/c2t3d12s2
* /dev/rdsk/c2t3d12s2 partition map
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* Dimensions:
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*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919
```

The `powerformat` utility can be used to first query the devices and view the device's vendor, product, and revision information as well as its mode sense, disk geometry, and VTOC information:

```
# powerformat /dev/rdsk/c2t3d11s2

  Inquiry: "EMC     " "SYMMETRIX       " "5773"

  Mode Sense: pcyl 9204 hd 15 sec 64 cap 8835840
```

```
  GEOM: cyl 9202 alt 2 hd 15 sec 64 cap 8835840

  VTOC: "EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920

# powerformat /dev/rdsk/c2t3d12s2

  Inquiry: "EMC     " "SYMMETRIX       " "5773"

  Mode Sense: pcyl 9204 hd 15 sec 64 cap 8835840

  GEOM: cyl 9202 alt 2 hd 15 sec 64 cap 8835840

  VTOC: "EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920
```

The `powerformat` output contains the following fields:

Inquiry - Displays the vendor, product, and revision information for the specified device. This displays the actual information about the disk and not the information from the label. Device c2t3d12s2 has a label from the DMX running 5671 code, but the inquiry field correctly identifies the microcode of the target array as 5773.

Mode Sense - Displays the physical devices mode sense data, including the number of physical cylinders, heads, and sectors as well as the disk capacity. Like the inquiry field, this displays the actual information about the disk and not the information from the label. Because the disk geometry has already been modified on the target device to match the source, it will be the same as the geometry from the label on these two devices.

GEOM - Displays the number of cylinders, alternate cylinders, heads, and sectors as well as the disk capacity. The information in this field is read from the disk label and is showing the information from the source device.

VTOC - Displays the VTOC information for the logical unit, including the type of array and the number of cylinders, alternate cylinders, heads, and sectors. The information in this field is read from the disk label. The information in this field is read from the disk label and is showing the information from the source device.

Partition Table – Displays the partition table for the specified logical unit.

v_part — Volume partition number

p_start — Sector number where the partition starts

p_size — Number of sectors in the partition

The information in this field is read from the disk label and is showing the information from the source device.

> Note: In the previous section where the disk label was overwritten using format, the partition table needed to be restored using prtvtoc output from the source device. Unlike format, the powerformat utility provides the ability to update only the ASCII label without rewriting the partition table. Because the disk geometry is the same between the label and the actual device after the geometry was changed with Solutions Enabler, there is no change to make.

`Powerformat` allows the user to preview any changes that it will make to the device before any information is actually written. The `-a` option is used when only updating the ASCII label:

```
# powerformat -a /dev/rdsk/c2t3d12s2

  Inquiry: "EMC     " "SYMMETRIX       " "5773"

  Mode Sense: pcyl 9204 hd 15 sec 64 cap 8835840

  GEOM: cyl 9202 alt 2 hd 15 sec 64 cap 8835840

  VTOC (before): "EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920

  VTOC (after): "EMC-SYMMETRIX-5773 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920
```

The correct label for the target devices can be written by adding the –x option:

```
# powerformat -xa /dev/rdsk/c2t3d11s2
```

```
  Inquiry: "EMC     " "SYMMETRIX       " "5773"

  Mode Sense: pcyl 9204 hd 15 sec 64 cap 8835840

  GEOM (before): cyl 9202 alt 2 hd 15 sec 64 cap 8835840

  VTOC (before): "EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920

  GEOM (after): cyl 9202 alt 2 hd 15 sec 64 cap 8835840

  VTOC (after): "EMC-SYMMETRIX-5773 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920

# powerformat -xa /dev/rdsk/c2t3d12s2

  Inquiry: "EMC     " "SYMMETRIX       " "5773"

  Mode Sense: pcyl 9204 hd 15 sec 64 cap 8835840

  GEOM (before): cyl 9202 alt 2 hd 15 sec 64 cap 8835840

  VTOC (before): "EMC-SYMMETRIX-5671 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920

  GEOM (after): cyl 9202 alt 2 hd 15 sec 64 cap 8835840

  VTOC (after): "EMC-SYMMETRIX-5773 cyl 9202 alt 2 hd 15 sec 64"

    v_part    p_start      p_size
    ------   ---------   ---------
       2             0     8833920
       7             0     8833920
```

The operating system now displays the label correctly with no change made to the partition table:

```
...

47. c2t3d11 <EMC-SYMMETRIX-5773 cyl 9202 alt 2 hd 15 sec 64>
    /pci@1f,4000/fibre-channel@5/sd@3,b
48. c2t3d12 <EMC-SYMMETRIX-5773 cyl 9202 alt 2 hd 15 sec 64>
    /pci@1f,4000/fibre-channel@5/sd@3,c
```

```
...

# prtvtoc /dev/rdsk/c2t3d11s2
* /dev/rdsk/c2t3d11s2 partition map
*
* Dimensions:
*     512 bytes/sector
*      64 sectors/track
*      15 tracks/cylinder
*     960 sectors/cylinder
*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
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*    9204 cylinders
*    9202 accessible cylinders
*
* Flags:
*   1: unmountable
*  10: read-only
*
*                           First     Sector    Last
* Partition  Tag  Flags    Sector     Count    Sector  Mount Directory
       2      5    01          0   8833920   8833919
       7     15    01          0   8833920   8833919
```

The Veritas disk group can be imported, the volume can be started, and the file system can be mounted:

```
# vxdg -C import geodg

# vxvol -g geodg start geodgvol01

# vxprint -htQq
dg geodg        default      default  29000    1203016756.36.licoa034

dm geodg01      c2t3d11s2    auto     2048     8831616  -
```

```
dm geodg02      c2t3d12s2    auto     2048     8831616  -

v  geodgvol01   -            ENABLED  ACTIVE   17663232 ROUND    -       fsgen
pl geodgplex01  geodgvol01   ENABLED  ACTIVE   17663232 CONCAT   -       RW
sd geodg01sd01  geodgplex01  geodg01  0        8831616  0       c2t3d11  ENA
sd geodg02sd01  geodgplex01  geodg02  0        8831616  8831616 c2t3d12  ENA

# fsck -F vxfs /dev/vx/rdsk/geodg/geodgvol01
log replay in progress
replay complete - marking super-block as CLEAN

# mount -F vxfs /dev/vx/dsk/geodg/geodgvol01 /mp/geodgvol01_R2mp
```

The data is preserved:

```
# ls -l /mp/geodgvol01_R2mp
total 8388678
drwxr-xr-x   2 root     other       3072 Feb 14 16:36 flat_files
drwxr-xr-x   2 root     root          96 Feb 14 14:26 lost+found
-rw------T   1 root     other    1073741824 Feb 14 16:37 testfile1
-rw------T   1 root     other    1073741824 Feb 14 16:38 testfile2
-rw------T   1 root     other    1073741824 Feb 14 16:39 testfile3
-rw------T   1 root     other    1073741824 Feb 14 16:41 testfile4

# ls -l /mp/geodgvol01_R2mp/flat_files
total 290
-rw-r--r--   1 root     other        131 Feb 14 16:36 arp.conf
-rw-r--r--   1 root     other       1583 Feb 14 16:36 audiocs.conf
-rw-r--r--   1 root     other       1414 Feb 14 16:36 audioens.conf
-rw-r--r--   1 root     other       1601 Feb 14 16:36 audiots.conf
-rw-r--r--   1 root     other       1810 Feb 14 16:36 bofi.conf
-rw-r--r--   1 root     other        135 Feb 14 16:36 clone.conf
-rw-r--r--   1 root     other        129 Feb 14 16:36 cn.conf
-rw-r--r--   1 root     other        139 Feb 14 16:36 conskbd.conf
-rw-r--r--   1 root     other        164 Feb 14 16:36 consms.conf
...

# cat /mp/geodgvol01_R2mp/flat_files/arp.conf
#
# Copyright (c) 1992, by Sun Microsystems, Inc.
#
#ident  "@(#)arp.conf   1.4     93/06/03 SMI"

name="arp" parent="pseudo" instance=0;
```

Note: `Powerformat` has several other capabilities that are not applicable to this topic. For example, `powerformat` can be used to expand disk partitions when data is migrated to a larger device. In the example in this document, the devices are under control of Veritas Volume Manager. In that situation, it is recommended that Veritas Dynamic LUN Expansion be used to perform this operation.

For more details on the capabilities of `powerformat`, see the *EMC PowerPath Migration Enabler Version 5.1 User's Guide*.

Conclusion

The difference in disk geometry between DMX-3 and earlier Symmetrix arrays will not cause issues in most situations. However, when data is migrated between devices with heterogeneous disk geometries, potential problems can occur. It is important to reiterate that all issues discussed in this document are applicable only if auto-configure is run and the DMX-3 disk is labeled. Even then, this will only cause a new label to actually be written if disk geometry, manufacturer ID, or the size of the disk device change prior to the user running auto-configure and label. If this procedure is not part of the methods used by systems administrators in a particular environment, Flexible Device Geometry may not be required. However, if there is any situation where it might be run, the proper implementation of Flexible Device Geometry can mitigate the potential for data loss in a Solaris environment.