# Virtualization Standards for Business Continuity: Part 7

This is the seventh of a series of articles defining the policies, guidelines, standards, and procedures that provide the foundation of a virtualized environment, thus enabling business continuity, disaster recovery, and high availability, with an emphasis toward Return On Investment (ROI).

The focus of this article will be to describe a Virtual Target Device (VTD) naming standard that will help the system administrator organize and manage the the associated storage on the VIO Servers and client LPAR's. As mentioned in previous articles of this series, one of the most difficult tasks in a virtualized AIX environment is the identification and management of virtualized storage devices. These tasks are more difficult on large platforms where there will likely be multiple VIO servers and dozens, if not hundreds of client LPAR's on a single hardware frame. The most difficult tasks are adding and deleting storage from the VIO servers and the associated client LPAR's. The system administrator must be able to accurately identify the associations between the virtualized storage devices and the client LPAR's on all VIO servers. Adding storage to the wrong virtual SCSI adapter on a VIO server will probably not be a catastrophic error, however deleting storage from the wrong adapter on a VIO server will almost certainly be catastrophic to the applications running on the client LPAR.

The VTD name is defined on the VIO server by the system administrator to assist in identifying the physical storage device being virtualized. The physical storage device on the VIO server being virtualized is typically a numbered hdisk. These hdisks may be internal storage contained within the frame or may be presented to the VIO server from an external storage device or array. The VTD should be defined by the VIO server system administrator when the hdisk is associated with a "vhost" adapter for a client LPAR.

The VTD naming standard described here is based on an entity called the "Resource Group" (RG), which may be familiar to the reader if they use the IBM clustering software HACMP. However the term "Resource Group" is used here in a much larger sense than used in HACMP. The HACMP definition of a resource group is a named set of resources consisting of host names, volume groups, logical volumes, file systems, application servers, and other items that are used to support a program or application. In the business continuity methodology defined by this series of article, the resource group concept is extended to include all resources supporting a business function on any system, regardless of whether the system is running HACMP or not. This definition of a resource group provides the ability to containerize business functions so they may be portable across multiple systems, between data centers, or between organizations. So before defining a standard for the VTD's, we must first define a standard for resource group names, since the VTD naming standard is dependent upon it.

| Application Code | Environment Identifier | Function Identifier | Company Code | Sequence Identifier |
|---|---|---|---|---|
| 3 characters Alpha-Numeric *Lower Case* | 1 character Alphabetic *Lower case* | 1 character Alphabetic *Lower Case* | 2 characters Alphabetic *Lower case* | 1 character Numeric |
| Represents the application supported by this resource group. | Represents the business environment. | Represents the business function. | Represents the customer supported by this resource group. | Represents the sequence number of this resource group to distinguish |

| Application Code | Environment Identifier | Function Identifier | Company Code | Sequence Identifier |
|---|---|---|---|---|
| | | | | between multiple instances of resource groups of the same type. |
| Examples:<br><br>ora = Oracle<br>db2 = DB2<br>tib = Tibco<br>web = Websphere<br>apa = Apache<br>pag = Paging Space | Examples:<br><br>p = Production<br>g = Pre-production<br>a = Acceptance<br>t = Test<br>d = Development | Examples:<br><br>d = Database<br>a = Application<br>u = Utility<br>m = Management | Examples:<br><br>mx = Mt Xia<br>ib = IBM<br>hp = HP<br>ci = Cisco | Examples:<br><br>0,1,2,3,4,5,6,7,8,9 |

Table 5.1: Resource Group Naming Structure Standard

Table 5.1 illustrates the structure for a resource group naming standard. This structure identifies a resource group name that is 8 characters in length. The reason for the limited number of characters in the resource group name is because this name will be used as the basis of numerous entities in the AIX environment, such as VTD names, volume group names, logical volume names, file system directory mount points, host name aliases, and others. Each of these entities will begin with the resource group name and additional characters will be added to produce an enterprise wide unique identifier. Some of the naming standards for these other AIX entities extend the length of the name to 14 characters, so to avoid creating a name for these other entities that is too long, the resource group name is limited to 8 characters. Some example resource group names using the values shown in Table 5.1 are illustrated in Table 5.2.

| Application Code | Environment Identifier | Function Identifier | Company Code | Sequence Identifier | Example Resource Group Name |
|---|---|---|---|---|---|
| ora | p | d | mx | 0 | orapdmx0 |
| ora | p | d | mx | 1 | orapdmx1 |
| db2 | a | d | ib | 0 | db2adib0 |
| tib | t | a | hp | 8 | tibtahp8 |
| web | d | a | ib | 4 | webdaib4 |
| apa | a | a | ci | 3 | apaaaci3 |
| pag | p | u | mx | 0 | pagpumx0 |

Table 5.2: Example Resource Group Names

Defining the VTD name on the VIO servers requires planning of the client LPAR before it is created or

provisioned by the VIO servers.  This planning includes identification of the application volume groups on the client LPAR and quantity of storage space to be allocated to each volume group.  The volume group name is another entity that will be based on the resource group name.  Since a resource group can contain multiple volume groups, each volume group will have a sequence number to distinguish it as an *enterprise wide unique* value.  A volume group naming standard will be provided in a later article in this series, but for the purpose of this article and defining the VTD name, the volume group name will consist of the resource group name, followed by a 2 digit sequence number, followed by the literal characters "vg".  So before the client LPAR is created and before any storage space is allocated, the client LPAR volume group names must be defined.

Another part of planning the client LPAR storage, requires that multiple types of storage be identified.  These types of storage will include operating system storage, application/data storage, paging space, and perhaps other types.  For the system administrator to be able to easily identify the different types of storage assigned to client LPARs from the VIO server, a "purpose code" is used as part of the VTD name.  Numerous example "purpose codes" are shown in Table 5.3.

| Purpose of VIO Server disk on Client LPAR | Purpose Code |
|---|---|
| AIX OS Storage | A |
| Linux OS Storage | L |
| OS/400 OS Storage | O |
| Paging Space | P |
| Application (APPL) Volume Group | V |

Table 5.3: VTD Purpose Codes

The standard defined here for the VTD naming structures has two distinct forms, the first form is used to define VTD names for disks allocated to client LPARs for operating system storage.  This form of the VTD consists of the "purpose code", followed by the 10 character client LPAR node name (as defined in a previous article in this series), followed by the 3 digit hdisk number from the VIO server.  This  form of the VTD naming structure is illustrated in Table 5.4.

| Purpose Code | Client LPAR Node Name | VIO Server hdisk Number |
|---|---|---|
| 1 character Alphabetic *Upper Case* | 10 characters Alpha-numeric *Lower case* | 3 digits Numeric |

Table 5.4: Virtual Target Device Naming Structure for OS disks

The second form of the VTD name is used to identify disks allocated for all other types of storage and it consists of multiple parts that include a "purpose code", the resource group name, a volume group number as defined on the client LPAR, and the hdisk number as defined on the VIO server.  Table 5.5

illustrates the structure of the VTD name.

| Purpose Code | Resource Group Name | Volume Group Sequence Number | VIO Server hdisk Number |
|---|---|---|---|
| 1 character Alphabetic *Upper Case* | 8 characters Alpha-numeric *Lower case* | 2 digits Numeric | 3 digits Numeric |

Table 5.5: Virtual Target Device Naming Structure for non-OS disks

Before creating a new client LPAR, numerous entities must be determined.  These client LPAR entities include:

- The partition name, profile name, and node name of the client LPAR.
- Virtual SCSI adapter operating system slot numbers on one or more VIO servers.
- Virtual SCSI adapter operating system slot numbers on the client LPAR (should be the same as defined on the VIO servers).
- Virtual SCSI adapter non – operating system slot numbers on one or more VIO servers.
- Virtual SCSI adapter non - operating system slot numbers on the client LPAR (should be the same as defined on the VIO servers).
- Resource Group name.
- Volume Group name and sequence number.
- VIO server hdisk to use for operating system storage on the client LPAR.
- VIO server hdisk(s) to use for non – operating system storage on the client LPAR.

| Client LPAR Node Name | Client LPAR Resource Group | Client LPAR Volume Group # | VIO Server Hdisk # | Client LPAR Disk Purpose | VIO Server VTD Name |
|---|---|---|---|---|---|
| dalapora00 | N/A | N/A | hdisk3 | AIX OS | Adalapora00003 |
| dalapora00 | orapdmx0 | 01 | hdisk10 | Appl VG | Vorapdmx001010 |
| dalapora00 | orapdmx0 | 01 | hdisk11 | Appl VG | Vorapdmx001011 |
| dalapora00 | orapdmx0 | 01 | hdisk12 | Appl VG | Vorapdmx001012 |
|  |  |  |  |  |  |
| dalapora01 | N/A | N/A | hdisk4 | AIX OS | Adalapora01004 |
| dalapora01 | orapdmx1 | 01 | hdisk13 | Appl VG | Vorapdmx101013 |
| dalapora01 | orapdmx1 | 01 | hdisk14 | Appl VG | Vorapdmx101014 |

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| Client LPAR Node Name | Client LPAR Resource Group | Client LPAR Volume Group # | VIO Server Hdisk # | Client LPAR Disk Purpose | VIO Server VTD Name |
|---|---|---|---|---|---|
| dalapora01 | orapdmx1 | 01 | hdisk15 | Appl VG | Vorapdmx101015 |
| | | | | | |
| dalapora02 | N/A | N/A | hdisk5 | AIX OS | Adalapora02005 |
| dalapora02 | orapdmx2 | 01 | hdisk16 | Appl VG | Vorapdmx201016 |
| dalapora02 | orapdmx2 | 01 | hdisk17 | Appl VG | Vorapdmx201017 |
| | | | | | |
| dalapora03 | N/A | N/A | hdisk6 | AIX OS | Adalapora03006 |
| dalapora03 | orapdmx3 | 01 | hdisk18 | Appl VG | Vorapdmx301018 |
| dalapora03 | orapdmx3 | 01 | hdisk19 | Appl VG | Vorapdmx301019 |

Table 5.6: Virtual Target Device Naming Structure for non-OS disks

Recognize the tables shown in this article all refer to defining a VTD name on a single VIO server. In environments that implement multiple VIO servers, the VTD name may be duplicated across multiple VIO servers. If the disks are configured into the VIO servers with the same hdisk numbers, then the VTD names will be identical between multiple VIO servers. The point of the VTD name is to provide the system administrator with a mechanism to easily and quickly identify on the VIO server, the disk resources associated with any specific client LPAR, resource group, and volume group. This VTD naming structure also aids the task of automation for management of the VIO servers and client LPARs. The following "mkvdev" commands define the VTD names for the client LPARs referenced in Table 5.6.

```
$ mkvdev -vdev hdisk3  -vadapter vhost0  -dev Adalapora00003
$ mkvdev -vdev hdisk10 -vadapter vhost1  -dev Vorapdmx001010
$ mkvdev -vdev hdisk11 -vadapter vhost1  -dev Vorapdmx001011
$ mkvdev -vdev hdisk12 -vadapter vhost1  -dev Vorapdmx001012

$ mkvdev -vdev hdisk4  -vadapter vhost5  -dev Adalapora01004
$ mkvdev -vdev hdisk13 -vadapter vhost6  -dev Vorapdmx101013
$ mkvdev -vdev hdisk14 -vadapter vhost6  -dev Vorapdmx101014
$ mkvdev -vdev hdisk15 -vadapter vhost6  -dev Vorapdmx101015

$ mkvdev -vdev hdisk5  -vadapter vhost10 -dev Adalapora02005
$ mkvdev -vdev hdisk16 -vadapter vhost11 -dev Vorapdmx201016
$ mkvdev -vdev hdisk17 -vadapter vhost11 -dev Vorapdmx201017

$ mkvdev -vdev hdisk6  -vadapter vhost15 -dev Adalapora03006
$ mkvdev -vdev hdisk18 -vadapter vhost16 -dev Vorapdmx301018
$ mkvdev -vdev hdisk19 -vadapter vhost16 -dev Vorapdmx301019
```

Assuming the client LPAR "dalapora00" is configured to use VSCSI adapters in the number range of 10 -19 (as detailed in a previous article in this series), then viewing the adapters "vhost0" and "vhost1" shows the VTD information as defined in the above "mkvdev" commands. The VSCSI adapter "vhost0" contains the operating system disk and is assigned to the client LPAR "dalapora00" using slot number "C10". The VSCSI adapter "vhost1" contains the application storage disks and is assigned to the client LPAR "dalapora00" using slot number "C12".

```
$ lsmap -vadapter vhost0

SVSA            Physloc                                    Client Partition ID
--------------- ------------------------------------------ ------------------
vhost0          U9119.590.12A345B-V1-C10                   0x00000018

VTD             Adalapora00003
LUN             0x8100000000000000
Backing device  hdisk3
Physloc         U5791.001.91800X0-P2-C08-T1-W50060E8003294B22-L3000000000

$ lsmap -vadapter vhost1

SVSA            Physloc                                    Client Partition ID
--------------- ------------------------------------------ ------------------
vhost1          U9119.590.12A345B-V1-C12                   0x00000018

VTD             Vorapdmx001010
LUN             0x8100000000000000
Backing device  hdisk10
Physloc         U5791.001.91800X0-P2-C08-T1-W50060E8003294B22-L3000000000

VTD             Vorapdmx001011
LUN             0x8100000000000000
Backing device  hdisk11
Physloc         U5791.001.91800X0-P2-C08-T1-W50060E8003294B22-L3000000000

VTD             Vorapdmx001012
LUN             0x8100000000000000
Backing device  hdisk12
Physloc         U5791.001.91800X0-P2-C08-T1-W50060E8003294B22-L3000000000
```

If the "mkviolpar" script (from Part 2 of this series of articles) was used to define dual VIO servers, then the opposite VIO server will provision the same numbered vhost adapters to the same client LPAR, however the associated slot numbers will be "C11" for the operating system disks, and "C13" for the application storage disks.

The VTD naming standard provided here uniquely identifies each hdisk on the VIO server and associates it with a resource group and volume group. It does not associate the application storage hdisks with a client LPAR because the business continuity methodology used here does not tie a resource group to a specific LPAR. This is because resource groups can move between LPAR's as in a high availability cluster, or between data centers as in a disaster recovery fail over. So to define a VTD using specific client LPAR information may not be accurate if a fail over occurs and should be avoided.

The VTD naming standard for the operating system storage hdisks does use the client LPAR node name, because the business continuity methodology defined here assumes the OS disks do not move during a high availability or disaster recovery fail over.

The Business Continuity policies, guidelines, standards, and procedures to be learned from this article are as follows:

## *Policies:* *Those tasks that must be implemented*

- One or more resource groups will be defined for each business function provisioned.
- Each Resource Group Name will be an enterprise wide unique identifier.

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- Each Virtual Target Device Name will be an enterprise wide unique identifier.
- Client LPAR volume groups will be planned and storage requirements will be determined before an LPAR is created.

## *Guidelines:* *Those tasks that should be implemented*

- Disks used to provide operating system storage for client LPARs should have VTD names that indicate that usage, and identify the client LPAR node name, and the VIO server hdisk used to provide that storage.
- Disks used to provide non - operating system storage for client LPARs should have VTD names that indicate that usage, and identify the client LPAR volume group name, and the VIO server hdisk used to provide that storage.

## *Standards:* *Technical specifications derived from the policies and guidelines*

- This article defines a resource group naming standard.
- This article defines a VIO server virtual target device naming standard for operating system disks being presented to client LPARs.
- This article defines a VIO server virtual target device naming standard for non - operating system disks being presented to client LPARs.

## *Procedures:* *Step-by-step implementation instructions of the standards*

- The procedure to define VTD names on the VIO server is provided by the "mkvdev" command in the IOS command set.  The VTD name can be manually defined by the system administrator or automated using shell scripts or other mechanisms.


The next article in this series will discuss customization settings for the "mkviolpar" script that include CPU, memory, and various environment variables.  Also discussed will be the settings for the physical I/O adapters and devices assigned to the VIO servers.


Dana French
President, Mt Xia, Inc.
http://www.mtxia.com
615.556.0456