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To: Members of X3T10

From: Rod DeKoning

Subject: **World Wide Names Usage for Volumes (Logical Units) Tutorial**

The following is a proposal to be inserted into X3T10/97-101r1 and X3T11/96-467 to provide further examples of how to use the IEEE registered extended identifier format. The tutorial will be formatted to be more consistent with the afore mentioned documents in revision 1 of the document.

The key to this discussion is that the IEEE WWN assigned to the Logical Unit must be treated as a permanent identifier of the logical unit (more aptly named Volume, since Logical Unit Numbers become nothing more than another component of the path to the storage volume.).

Furthermore, the 128 bit WWN must be considered as one 128 bit identifier rather than the two individual identifiers concatenated together. Another way to look at this is to view the controllers WWN (at the time the LUN is created) as the seed for the creation of the volume's (LUN's) WWN for the upper 64 bits. The Vendor Specific Identifier Extension (lower 64 bits of volume's (LUN's) WWN may be generated via any vendor unique manner (such as a time stamp, non repeating random number, etc.) that guarantees uniqueness. Once the volume has a WWN, the controller's WWN and its association with the volumes WWN becomes irrelevant.

I hope the following examples further illustrate the permanence of the WWN assigned to a volume (LUN)

EXAMPLE #1: Using one controller which is a FRU (borrowed from Bob Snively's (SUN) tutorial).

Originally we have the following configuration:

Controller Company ID = AC DE 48

Controller's Vendor Specified Identifier for THIS Controller =

B 17 34 F6 **2D**

Therefore, the WWN for this Controller (using the 64 bit format) would be:

5A CD E4 8B 17 34 F6 **2D**

Now lets say someone creates a volume (LUN) on this controller:

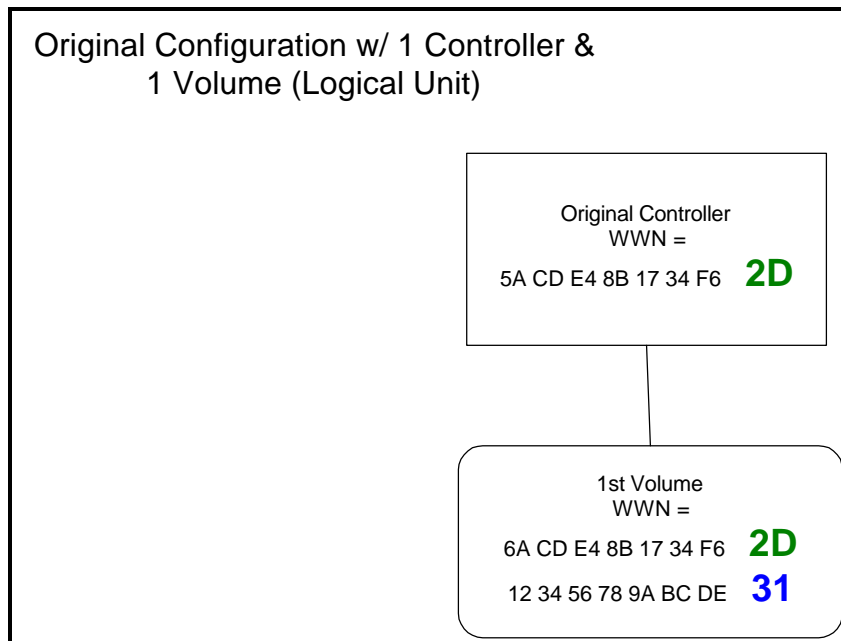
The controller chooses the following for THIS volumes Vendor Specified Region of the WWN:

12 34 56 78 9A BC DE **31**

Therefore, the WWN for this volume (LUN) connected to this controller is:

6A CD E4 8B 17 34 F6 **2D** 12 34 56 78 9A BC DE **31**

The following diagram represents what exists in the system:



Now lets say the controller as described above fails and a new controller is swapped in its place.

The new Controller Company ID remains the same in this example = AC DE 48
Controller's Vendor Specified Identifier for THIS Controller (note that I
only change the least significant byte for the example)

= B 17 34 F6 **95**

Therefore, the WWN for this Controller (using the 64 bit format) would be:

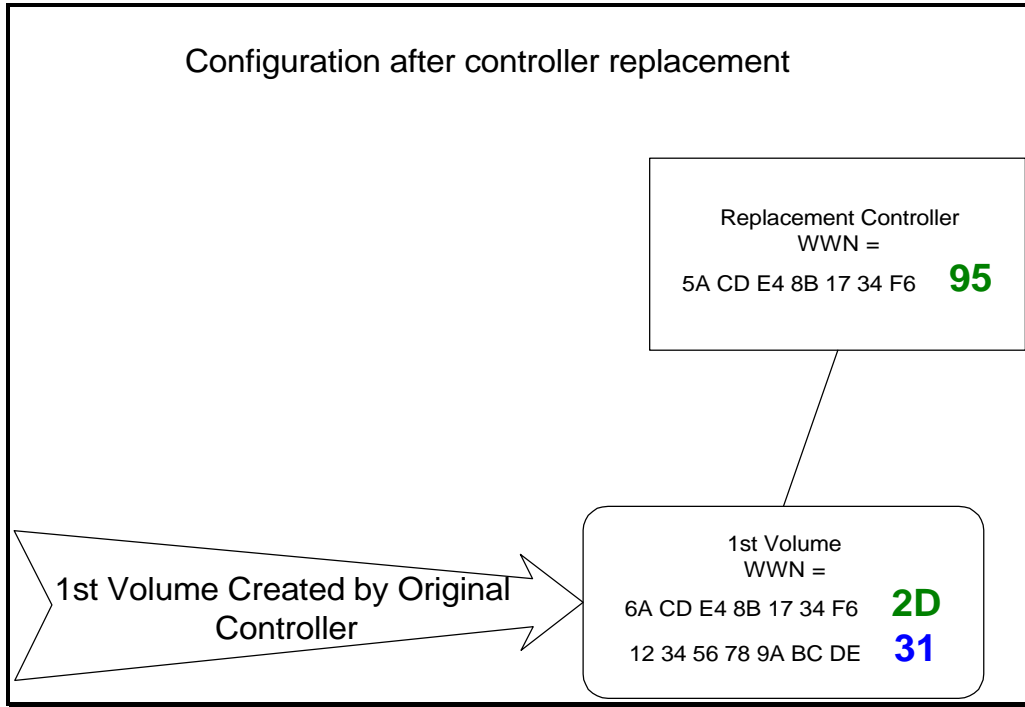
5A CD E4 8B 17 34 F6 **95**

The volume that previously was defined remains with the EXACT SAME WWN.

i.e. the WWN for this volume (LUN) connected to this controller is:

6A CD E4 8B 17 34 F6 **2D** 12 34 56 78 9A BC DE **31**

The system with the replacement controller attached to the original LUN appears as:



Note: The Volume continues to have the same WWN that was created with the original controller! This is absolutely required so that the volume can be correctly found by the system(s).

Now lets say someone creates a 2nd volume (LUN) on the replacement controller:

The controller chooses the following for THIS volumes Vendor Specified Region of the WWN:

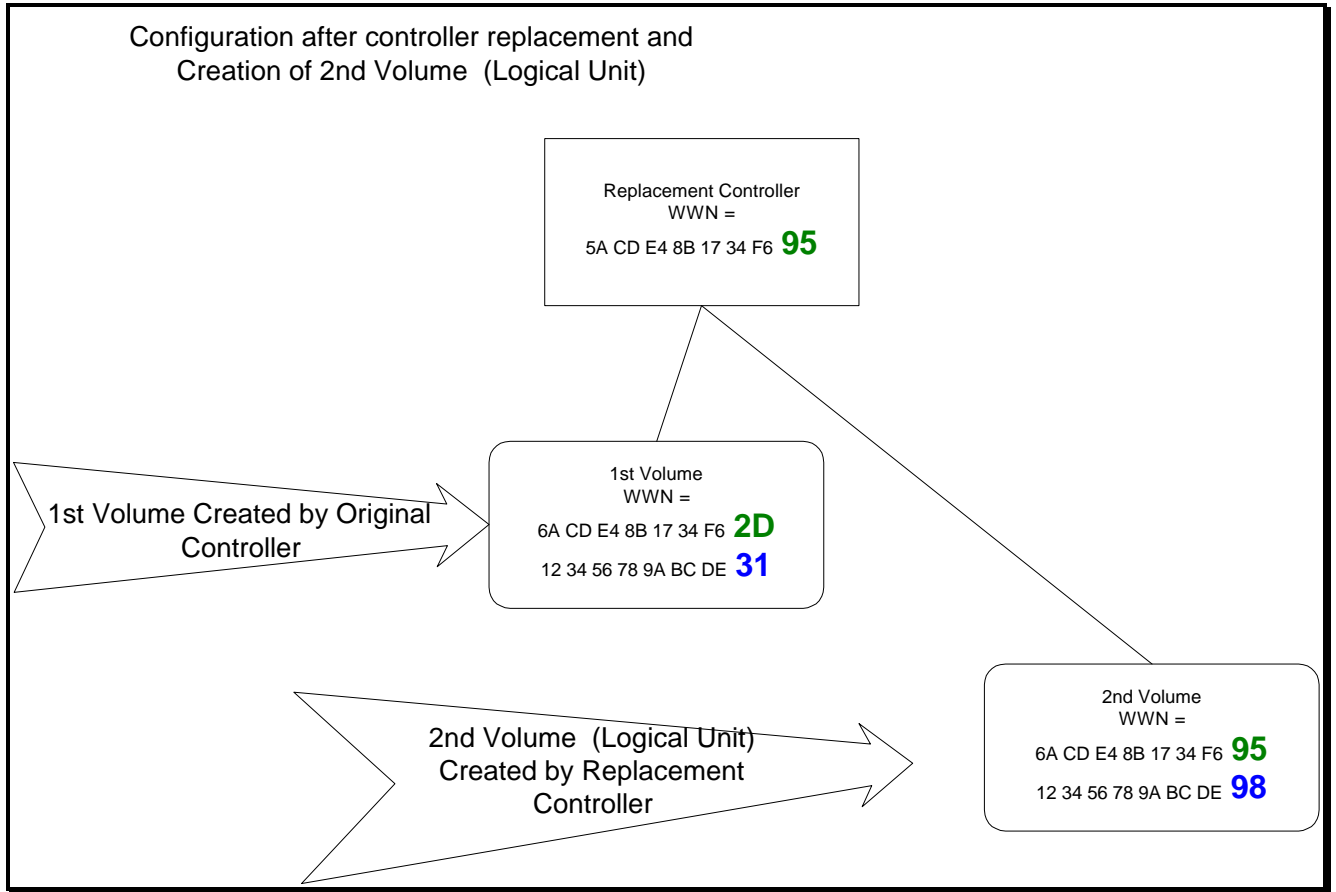
12 34 56 78 9A BC DE **98**

Therefore, the WWN for this 2nd volume (LUN) connected to this controller is:

6A CD E4 8B 17 34 F6 **95** 12 34 56 78 9A BC DE **98**

Note that the first LUN's WWN remains attached to this controller, and keeps its original WWN.

The system now appears as:



Note: The 2nd volume created is created with the WWN that is based on a value provided by the new controller. In this case, it is the new controller's WWN.

EXAMPLE #2 Dual Controller Management

Originally we have the following 2 controller configuration both attached to the same storage:

Controller #1 Company ID = AC DE 48

Controller's Vendor Specified Identifier for Controller #1 =

B 17 34 F6 **2D**

Therefore, the WWN for Controller #1 (using the 64 bit format) would be:

5A CD E4 8B 17 34 F6 **2D**

Controller #2 Company ID = AC DE 48

Controller's Vendor Specified Identifier for Controller #2 =

B 17 34 F6 **54**

Therefore, the WWN for Controller #2 (using the 64 bit format) would be:

5A CD E4 8B 17 34 F6 **54**

Now lets say someone creates a volume (LUN) using controller #1:

Controller #1 chooses the following for THIS volumes Vendor Specified Region of the WWN:

12 34 56 78 9A BC DE **63**

Therefore, the WWN for this volume (LUN) connected to BOTH controller #1 and controller #2 is:

6A CD E4 8B 17 34 F6 **2D** 12 34 56 78 9A BC DE **63**

Now lets say someone creates a 2nd volume (LUN) using controller #2:

Controller #2 chooses the following for THIS volumes Vendor Specified Region of the WWN:

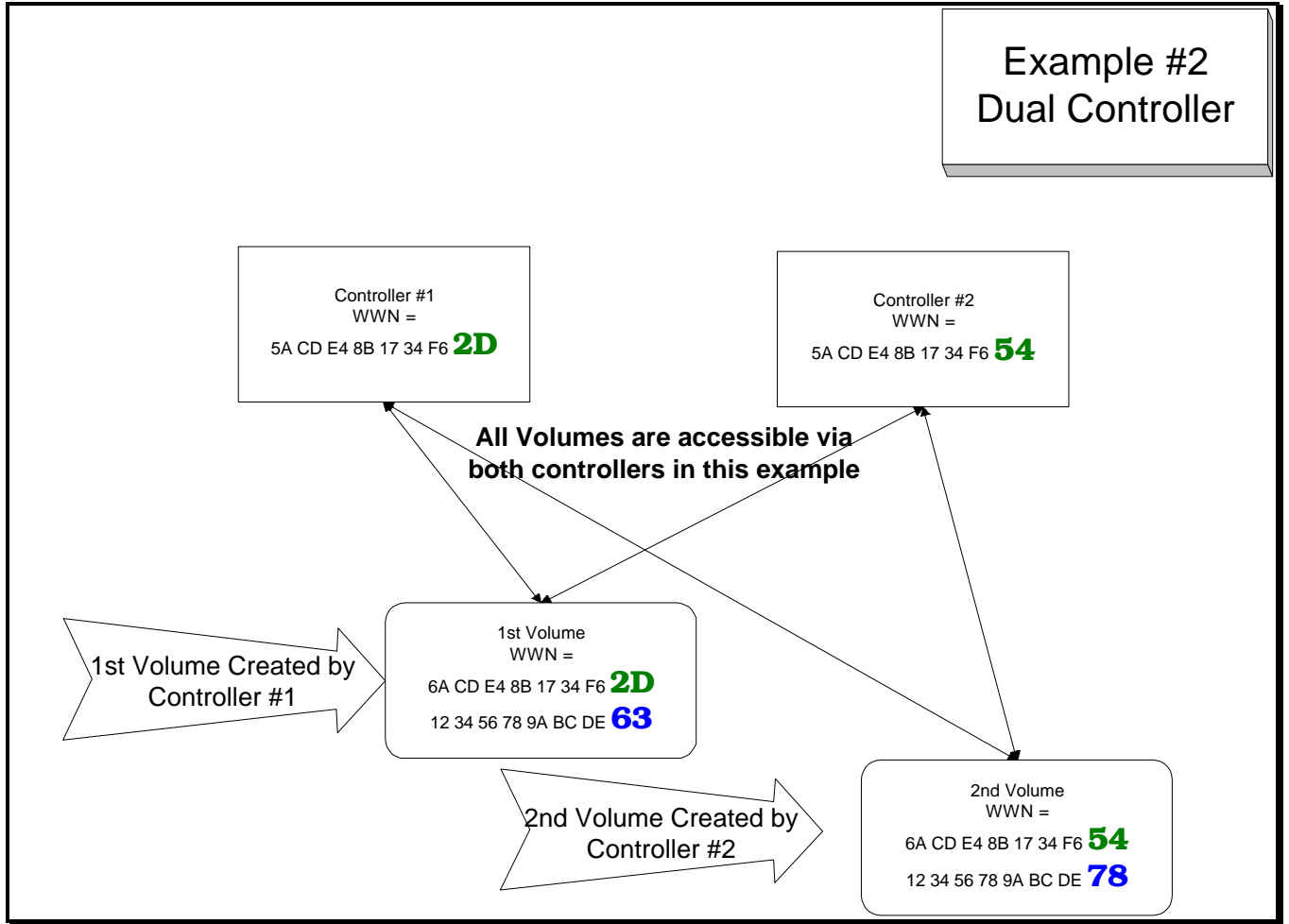
12 34 56 78 9A BC DE **78**

Therefore, the WWN for this volume (LUN) connected to BOTH controller #1 and controller #2 is:

6A CD E4 8B 17 34 F6 **54** 12 34 56 78 9A BC DE **78**

Volume #1 is still accessible through both controllers at its WWN.

This dual controller system looks like:



Note: Each Volume has the same WWN regardless of the path (controller) that it is accessed through. Furthermore, if either controller #1 or controller #2, the WWN for these volumes must NOT be changed.

END of Example