Exercise 2: Exploring RAID-TEC

Objectives

This exercise focuses on enabling you to do the following:

- Create a RAID-TEC type aggregate on cluster2
- Verify the operability of a degraded RAID-TEC aggregate

Case Study

Mr. Zarrot is skeptical of the resiliency of erasure encoding to data loss. Mr. Zarrot wants you to prove that an aggregate that is created with RAID-TEC technology can withstand the loss of three drives and still successfully serve data.

Lab Equipment

Use the following equipment to complete the exercise:

System	Host Name	IP Addresses	User Name	Password
Windows Server	jumphost	192.168.0.5	DEMO\Administrator	Netapp1!
ONTAP cluster-management LIF (cluster2)	cluster2	192.168.0.102	admin (case-sensitive)	Netapp1!

Task 1: Create a RAID-TEC Type Aggregate on cluster2

Use the CLI to create an aggregate with triple parity RAID groups.

Step	Action
1-1	Open a PuTTY session for **cluster2**.
1-2	Display a list of the currently configured aggregates in the cluster. `storage aggregate show`
1-3	*i* You can see only aggr0_n1 and aggr0_n2, which are the root aggregates for your two cluster nodes.

1-4	Use the `disk show-spare-disks` command to identify the number of spare disks.
	`storage disk`
	`show-spare-disks`

Step	Action
1-5	Create an aggregate with the following settings:
	• Name: **n1_hdd_1**
	• Disk Type: **FCAL**
	• Number of Disks: **7**
	• RAID Configuration: **RAID-TEC**
	`storage aggregate create -aggregate n1_hdd_1 -raidtype raid_tec -disktype FCAL -diskcount 7`
	Sample output:

```
cluster2::storage disk> storage aggregate create -aggregate n1_hdd_1 -raidtype
raid_tec -disktype FCAL -diskcount 7

Info: The layout for aggregate "n1_hdd_1" on node "cluster2-01" would be:

      First Plex

        RAID Group rg0, 7 disks (block checksum, raid_tec)
                                                      Usable Physical
          Position    Disk                      Type    Size     Size
          ----------  ------------------------- ----------- -------- --------
          tparity     NET-1.3                   FCAL        -        -
          dparity     NET-1.13                  FCAL        -        -
          parity      NET-1.4                   FCAL        -        -
          data        NET-1.17                  FCAL     3.91GB   3.93GB
          data        NET-1.18                  FCAL     3.91GB   3.93GB
          data        NET-1.19                  FCAL     3.91GB   3.93GB
          data        NET-1.20                  FCAL     3.91GB   3.93GB

      Aggregate capacity available for volume use would be 14.06GB.

Do you want to continue? {y|n}:
```

Step	Action
1-6	Verify that the proposed aggregate matches the requirements, and type **y** to confirm.
1-7	Answer the following question:
	In a real-world environment, would the specified allocation be an efficient use of disks? _____

Step	Action
1-8	Examine the new aggregate: **`storage disk show -aggregate n1_hdd_1`** Sample output: ``` cluster2::storage disk> storage disk show -aggregate n1_hdd_1 Usable Disk Container Container Disk Size Shelf Bay Type Type Name Owner ---------------- ---------- ----- --- ------ ----------- --------- -------- NET-1.3 3.93GB - 18 FCAL aggregate n1_hdd_1 cluster2-01 NET-1.4 3.93GB - 19 FCAL aggregate n1_hdd_1 cluster2-01 NET-1.13 3.93GB - 21 FCAL aggregate n1_hdd_1 cluster2-01 NET-1.17 3.93GB - 22 FCAL aggregate n1_hdd_1 cluster2-01 NET-1.18 3.93GB - 24 FCAL aggregate n1_hdd_1 cluster2-01 NET-1.19 3.93GB - 25 FCAL aggregate n1_hdd_1 cluster2-01 NET-1.20 3.93GB - 26 FCAL aggregate n1_hdd_1 cluster2-01 7 entries were displayed. ```

Task 2: Verify the Operability of a Degraded RAID-TEC Aggregate

Step	Action
2-1	Start a PuTTY session with **cluster2**.
2-2	Verify that your RAID-TEC aggregate is in a normal state (your list of disks might be different): **`storage aggregate show-status -aggregate n1_hdd_1`** Sample output: ``` Owner Node: cluster2-01 Aggregate: n1_hdd_1 (online, raid_tec) (block checksums) Plex: /n1_hdd_1/plex0 (online, normal, active, pool0) RAID Group /n1_hdd_1/plex0/rg0 (normal, block checksums) Usable Physical Position Disk Pool Type RPM Size Size Status -------- -------------------------- ---- ----- ------ -------- -------- ---------- tparity NET-1.3 0 FCAL 15000 3.93GB 3.93GB (normal) dparity NET-1.13 0 FCAL 15000 3.93GB 3.93GB (normal) parity NET-1.4 0 FCAL 15000 3.93GB 3.93GB (normal) data NET-1.17 0 FCAL 15000 3.93GB 3.93GB (normal) data NET-1.18 0 FCAL 15000 3.93GB 3.93GB (normal) data NET-1.19 0 FCAL 15000 3.93GB 3.93GB (normal) data NET-1.20 0 FCAL 15000 3.93GB 3.93GB (normal) 7 entries were displayed. ```
2-3	Identify one of the disks that is used for the aggregate data and fail that disk (the name of your data disk might be different): **`storage disk fail -immediate true -disk NET-1.17`**
2-4	When you are prompted, type y: Sample output: ``` Warning: The system will not copy contents of the disk to a replacement before failing the disk. Do you want to fail out the disk immediately? {y|n}: y ```

Step	Action
2-5	Verify that the failed disk has been replaced, the new disk is reconstructing the contents of the failed disk, and the aggregate is still in a normal state:

`storage aggregate show-status -aggregate n1_hdd_1`

Sample output:

```
Owner Node: cluster2-01
 Aggregate: n1_hdd_1 (online, raid_tec, reconstruct) (block checksums)
  Plex: /n1_hdd_1/plex0 (online, normal, active, pool0)
   RAID Group /n1_hdd_1/plex0/rg0 (reconstruction 14% completed, block checksums)
                                                    Usable Physical
     Position Disk                       Pool Type   RPM    Size     Size Status
     -------- -------------------------- ---- ----- ------ -------- -------- ----------
     tparity  NET-1.3                     0   FCAL  15000  3.93GB   3.93GB (normal)
     dparity  NET-1.13                    0   FCAL  15000  3.93GB   3.93GB (normal)
     parity   NET-1.4                     0   FCAL  15000  3.93GB   3.93GB (normal)
     data     NET-1.24                    0   FCAL  15000  3.93GB   3.93GB (reconstruction
14% completed)
     data     NET-1.18                    0   FCAL  15000  3.93GB   3.93GB (normal)
     data     NET-1.19                    0   FCAL  15000  3.93GB   3.93GB (normal)
     data     NET-1.20                    0   FCAL  15000  3.93GB   3.93GB (normal)
7 entries were displayed.
```

Step	Action
2-6	Identify a second disk that is used for the aggregate data and fail that disk (the name of your data disk might be different):

`storage disk fail -disk NET-1.18 -immediate true`

Step	Action
2-7	When you are prompted, type **y**:

Sample output:

```
Warning: The system will not copy contents of the disk to a replacement before
         failing the disk. Do you want to fail out the disk immediately?
           {y|n}: y
```

Step	Action
2-8	Verify that the failed disk was replaced and that the aggregate is still in a normal state:

`storage aggregate show-status –aggregate n1_hdd_1`

Sample output:

```
Owner Node: cluster2-01
 Aggregate: n1_hdd_1 (online, raid_tec, reconstruct) (block checksums)
  Plex: /n1_hdd_1/plex0 (online, normal, active, pool0)
   RAID Group /n1_hdd_1/plex0/rg0 (double reconstruction 27% completed, block checksums)
                                                    Usable Physical
     Position Disk                       Pool Type   RPM    Size     Size Status
     -------- -------------------------- ---- ----- ------ -------- -------- ----------
     tparity  NET-1.3                     0   FCAL  15000  3.93GB   3.93GB (normal)
     dparity  NET-1.13                    0   FCAL  15000  3.93GB   3.93GB (normal)
     parity   NET-1.4                     0   FCAL  15000  3.93GB   3.93GB (normal)
     data     NET-1.24                    0   FCAL  15000  3.93GB   3.93GB (reconstruction
47% completed)
     data     NET-1.25                    0   FCAL  15000  3.93GB   3.93GB (reconstruction
8% completed)
     data     NET-1.19                    0   FCAL  15000  3.93GB   3.93GB (normal)
     data     NET-1.20                    0   FCAL  15000  3.93GB   3.93GB (normal)
7 entries were displayed.
```

Step	Action
2-9	Fail a third disk that is used for the aggregate data (the name of your data disk might be different):

`storage disk fail -disk NET-1.19 -immediate true`

Step	Action
2-10	When you are prompted, type **y**: Sample output: ``` Warning: The system will not copy contents of the disk to a replacement before failing the disk. Do you want to fail out the disk immediately? {y|n}: y ```
2-11	Verify that the failed disk was replaced and that the RAID group is now in a triple reconstruction state (because of the three rebuilds of failed disks): **`storage aggregate show-status -aggregate n1_hdd_1`** Sample output: ``` Owner Node: cluster2-01 Aggregate: n1_hdd_1 (online, raid_tec, reconstruct) (block checksums) Plex: /n1_hdd_1/plex0 (online, normal, active, pool0) RAID Group /n1_hdd_1/plex0/rg0 (triple reconstruction 35% completed, block checksums) Usable Physical Position Disk Pool Type RPM Size Size Status -------- ------------------------- ---- ----- ------ -------- -------- ---------- tparity NET-1.3 0 FCAL 15000 3.93GB 3.93GB (normal) dparity NET-1.13 0 FCAL 15000 3.93GB 3.93GB (normal) parity NET-1.4 0 FCAL 15000 3.93GB 3.93GB (normal) data NET-1.24 0 FCAL 15000 3.93GB 3.93GB (reconstruction 70% completed) data NET-1.25 0 FCAL 15000 3.93GB 3.93GB (reconstruction 31% completed) data NET-1.26 0 FCAL 15000 3.93GB 3.93GB (reconstruction 4% completed) data NET-1.20 0 FCAL 15000 3.93GB 3.93GB (normal) 7 entries were displayed. ```
2-12	Answer the following question: What happens if you try to fail another disk? _____

End of exercise