Dell PowerMax: Data Protector for z Systems (zDP) Best Practices

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White Paper

Abstract

This document provides best practices for Dell Data Protector for z Systems (zDP), a tool that automates data preservation and recovery.

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Finding new and creative ways to preserve data in a digital age requires thorough planning before production implementation. Organizations must also consider the legal and financial ramifications by not providing safety for their data assets.

Since 2016, Dell Data Protector for z Systems (zDP) has provided automated data preservation that enables organizations to restore their data in the event of logical corruption. zDP is built upon Dell TimeFinder SnapVX and can create space-efficient snapsets using a fraction of the storage (based on data change rate).

Although environments may vary, this document provides suggestions and best practices for organizations to consider before, during, and after zDP implementation.

Audience

This document is intended for information technology professionals, z/OS systems architects, and IT storage administrators. This document assumes the reader has a basic knowledge of Dell PowerMax systems. Readers should also review the document Dell PowerMax: Data Protector for z Systems (zDP) Essentials before reading this paper.

Revisions

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We value your feedback

Dell Technologies and the authors of this document welcome your feedback on this document. Contact the Dell Technologies team by email.

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Introduction

Overview

Data Protector for z Systems (zDP) is a mainframe software solution that provides continuous data protection for your mainframe data assets. Deployed upon the Dell TimeFinder SnapVX space-efficient volume-snap capability, your environment can increase the granularity of application recovery. zDP uses three main components to increase granularity: versioned data groups (VDG), snapsets, and target sets. To assist with zDP, customers can manage, operate, and monitor zDP using JCL, Mainframe Enablers (MFE) SCF commands, and zDP ISPF panels. These components work together to provide seamless integration and enable customers to use zDP.

Terminology

Table 1. zDP terminology

Term	Definition
Data Protector for z Systems	Dell software that provides granular data backups
TimeFinder SnapVX	Local replication technology that is built on virtual provisioning and enables customers to take snapshots of Dell source volumes on PowerMax arrays
Local Snapshot	Data copy that is taken at the source PowerMax array
Remote Snapshot	Data copy that is taken at the target or remote PowerMax array
Versioned Data Group (VDG)	Logical group of source volumes that associates volumes and settings for creating multiple point-in-time images
Snapshot	Pointer-based, point-in-time image of a single volume
Snapset	Named point-in-time consistent image of all source-volumes snapshot in a VDG
Target Set	Group of devices which has been defined to zDP as the specified link targets to a snapset (VDG)
Secure VDG	Secured snapset that cannot be deleted. You can delete a secure snapset by following an approved procedure with the help from Dell Support.

Configuring zDP for ISPF

Overview

When configuring zDP, you must configure the zDP ISPF REXX by editing your EIPCLIST parmlib member in the Dell Mainframe Enablers SAMPLIB dataset. This dataset is created and populated during the SMP/e install of MFE.

Update the following fields within EIPCLIST:

DS_PREFIX: Provide the HLQ.qualifer of your Mainframe Enablers datasets. For example, if your dataset for SAMPLIB is ICO.MFE10.SAMPLIB, the DS_PREFIX would be ICO.MFE10.

SCF_SUFFIX: Provide this setting in the address-space-parameter library for the running EMCSCF instance. It is specified in the SCF.INI.CPFX setting for your running SCF address space.

SCF_JOBNAME: This is the name of the running EMCSCF address space. To get the list of started tasks, perform the command **/D A,L in z/OS SYSLOG**.

UNIT: Input the esoteric that is used in your environment for disk. Examples are SYSDA, 3390, SYSALLDA. We recommend checking with your z/OS Systems Programmer or equivalent job function at your organization.

EIP_LOAD_LIBRARY: This setting is the LOADLIB of your Mainframe Enablers software product.

zDP ISPF best practices

zDP delivers the ISPF panel in the HLQ.SAMPLIB > member EIPCLIST. After customizing EIPCLIST, run the REXX to configure, manage, and monitor the zDP environment through ISPF panels. Here are a few best practices for setting up and working with the zDP ISPF panels:

After installing Mainframe Enablers software, copy the member into a new member, and update the copy EIPCLIST. This way preserves the original EIPCLIST that is delivered by Dell Technologies if you inadvertently mistype information when editing EIPCLIST.

After starting zDP ISPF, you must update the **Set Options** panel. Do this by entering **S** in the zDP ISPF panel.

In the Set Options panel (option S), note the VDG Member Library and TGT Member Library for future use. This dataset preserves all VDG or TGT definitions if you save them while in the zDP ISPF panel.

Use the ISPF panel to create the VDG or TGT JCL control statements. After the ISPF preserves the JCL in the VDG or TGT Member Library, go to the respective library and copy the statements in your batch job. This ensures that you are using the most up-to-date parameters and defaults when creating your VDG and target groups.

Use the zDP ISPF Help panels to raise awareness for the zDP components. In the zDP ISPF panels, press **F1** to access the help panels.

zDP naming best practices

Ensure that the Volume Data Group (VDG) and Target Set names meet the naming standards of your environment. Ensure that the VDG name is meaningful and represents the reason for the VDG. We do not recommend using timestamps in the name because each snapset will have its own unique date and timestamp. You may also use the application name in the VDG name to represent which application exists in the VDG.

zDP definition best practices

zDP can take snapsets with a five-minute granularity at minimum. You must evaluate your data-retention needs to preserve data if there is a logical corruption. These deployment practices are suggestions to provide direction and can help you consider the impacts of data retention and recoverability.

If your storage environment is sized correctly to maintain 240 snapsets, the following implementation provides granularity and increased security with your zDP snapsets.

Set your VDG to take a snapset every 12 minutes through the CYCLE_TIME that spans over 48 hours. This practice ensures that you have 240 snapsets before the oldest nonsecure, nonpersistent snapset is terminated.

Set the VDG definition so that the first Snapset at the top of the hour is secure.

Here is a sample VDG definition that may assist you with setting up your definition:

```
DEFINE VDG TESTVDG,
   CYCLE_TIME(12,0,SECURE,1,4),
   MAX_SNAPSETS(240),
   SRP_TERM(80),
   SRP_WARN(60),
   TERMINATE_POLICY(OLDEST)
MODIFY VDG TESTVDG,ADD,
     CCUU(770F,
          7710,7711)
```

This definition does the following:

- Defines a VDG called TESTVDG
- Instructs zDP to create a snapset every 12 minutes through the CYCLE_TIME(12…)
- Secures the first snapset and makes the next four snapsets nonsecure through the (…SECURE,1,4),
- Starts rolling the oldest nonsecure snapsets off at 240

zDP locking best practices

If you would like to IPL your LPAR and you did not stop zDP from running, zDP preserves the device locks for the devices in the VDG. The preservation of a device lock fails any subsequent zDP operations against those devices. Messages in SCF and SYSLOG will be displayed, preventing customers from shutting the SCF address space down. To investigate if device locking within zDP is causing the issue, consider the following:

- Get the Symmetrix ID of the devices:

  ```
  F EMCSCF,DEV,DIS DEV(ucb)
  ```

  - EMCSCF is the address space of your SCF address space.
  - ‘ucb’ is the four-digit UCB address of the device to get the Symmetrix ID for.
- Query the devices:

  ```
  F EMCSCF,REC,QRYDLOCK,TF,DE20,3,LCL,030,06
  ```

  - DE20 is any CUU on the array.
  - LCL indicates any local device on the array.
  - 030 is the Symmetrix ID to query.
  - 06 is the starting device number.

  If the device is locked, the query returns the result SCF0723I the device is locked.
- Free the locks on the devices:

  ```
  F EMCSCF,REC,RELDLOCK,TF,DE20,3,RMT,030,06
  ```

- RELDLOCK is the option that releases the device lock. Once all the device locks are removed, the SCF should gracefully shut down, allowing customers to continue the shutdown of their z/OS environment.

zDP monitoring best practices

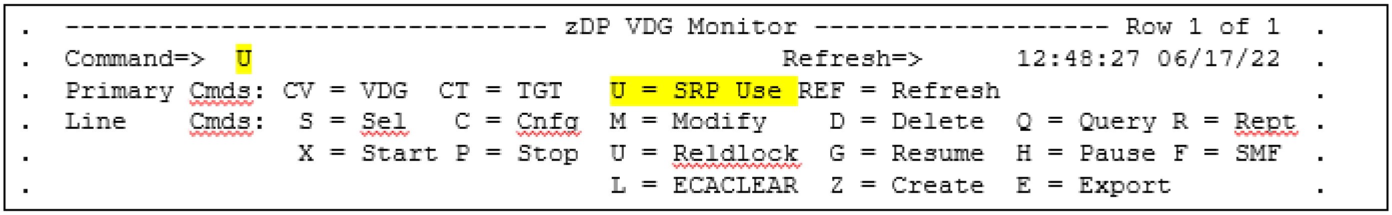
Use the following best practices for zDP monitoring:

To monitor the storage resource pool (SRP) for your zDP/SnapVX, use the zDP ISPF panel **M;U**. M stands for monitor under the **VDG Functions** section. U is the primary command that provides SRP Use.

Note: You must have an active VDG to access the monitor panel with zDP ISPF panels.

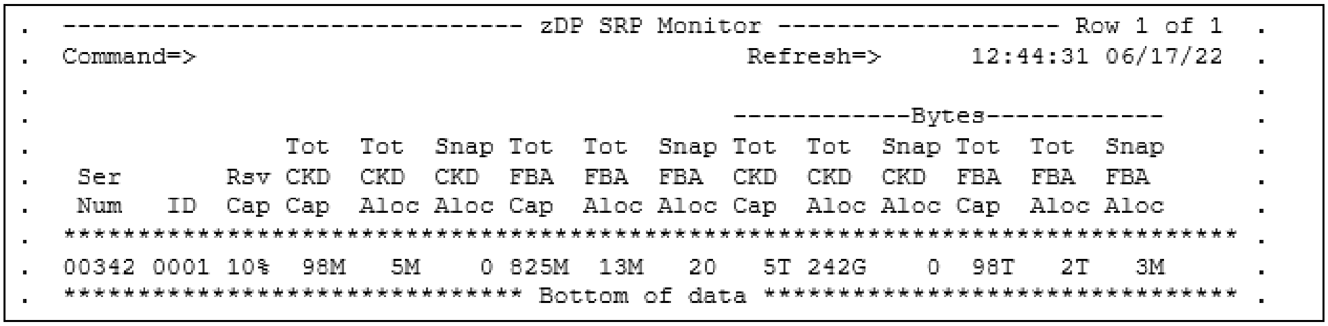
This action gives you both CKD and FBA information within the PowerMax.

Option **M** from the zDP ISPF panel enables you to view SRP usage through option **U** shown here:



```
.  ------------------------------- zDP VDG Monitor -------------------- Row 1 of 1  .
.  Command=>  U                                  Refresh=>       12:48:27 06/17/22  .
.  Primary Cmds: CV = VDG  CT = TGT   U = SRP Use REF = Refresh                     .
.  Line    Cmds:  S = Sel   C = Cnfg  M = Modify     D = Delete  Q = Query R = Rept .
.                 X = Start P = Stop  U = Reldlock   G = Resume  H = Pause F = SMF  .
.                                     L = ECACLEAR   Z = Create  E = Export         .
```

Here is the output from the option **U** within the zDP ISPF panel:

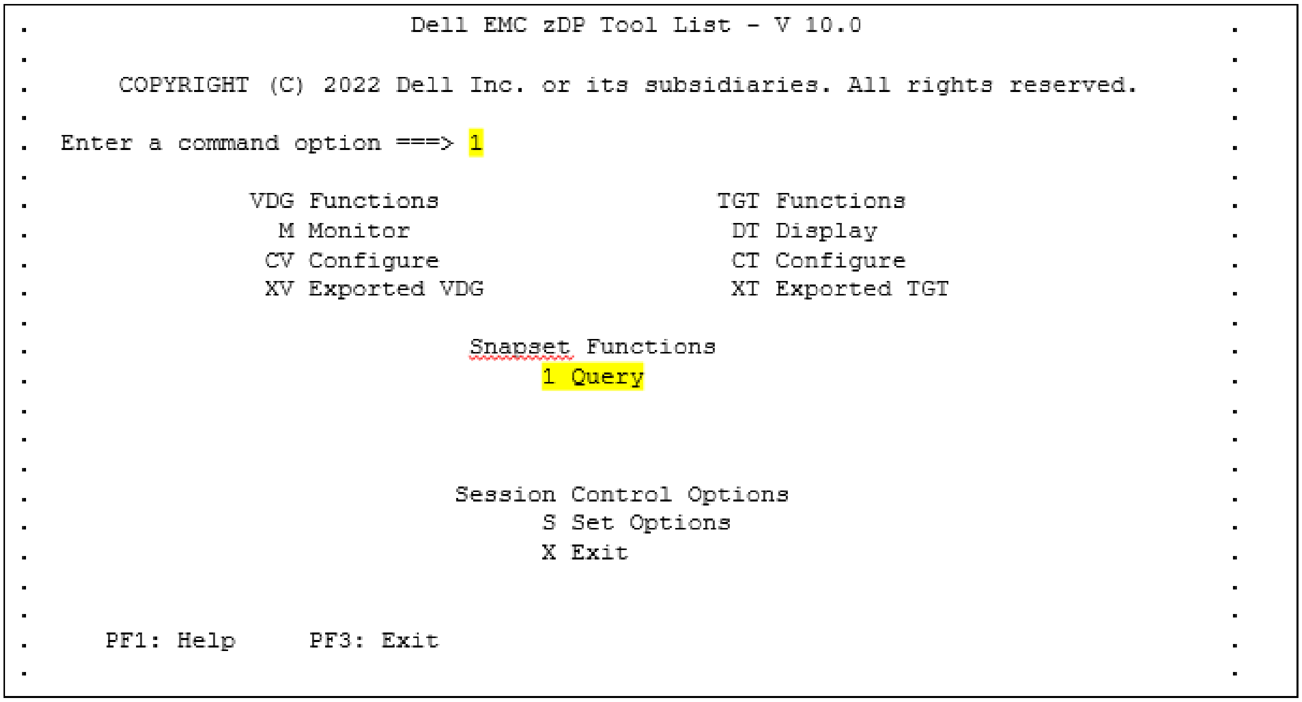


```
.  ------------------------------- zDP SRP Monitor ------------------- Row 1 of 1   .
.  Command=>                                     Refresh=>      12:44:31 06/17/22   .
.                                                                                   .
.                                               ------------Bytes------------       .
.                 Tot  Tot  Snap Tot  Tot  Snap Tot  Tot  Snap Tot  Tot  Snap       .
.   Ser       Rsv CKD  CKD  CKD  FBA  FBA  FBA  CKD  CKD  CKD  FBA  FBA  FBA        .
.   Num   ID  Cap Cap  Aloc Aloc Cap  Aloc Aloc Cap  Aloc Aloc Cap  Aloc Aloc       .
.  *******************************************************************************  .
.  00342 0001 10%  98M   5M    0 825M  13M   20   5T 242G    0  98T   2T   3M       .
.  ******************************* Bottom of data ********************************  .
```

The following list includes a summary of the steps to view the snapset information. Detailed steps are provided below the summary.

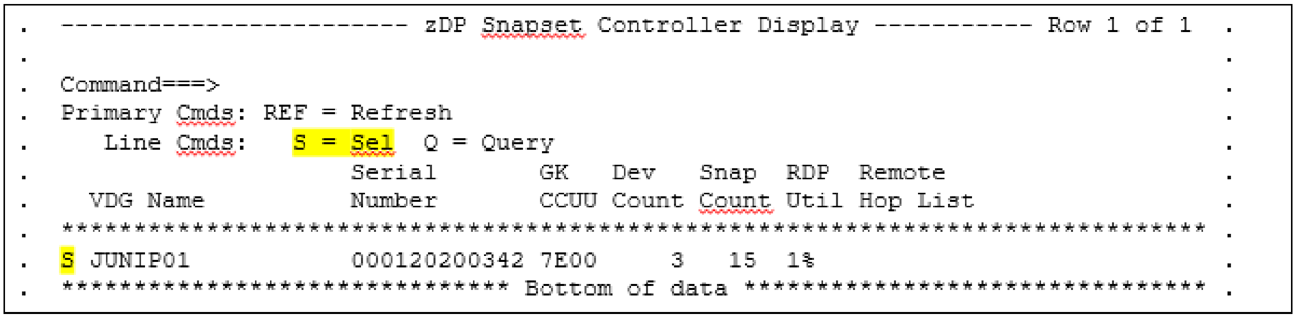
1. In the zDP Snapset Functions section, select the option **1 Query**.
2. Go to your VDG, and press **S** to select it.
3. Go to the CCUU, and press the **S** that is next to it. This action provides the source device and snapset information.
4. Press **F1** to review the help content, and view the Src Trk unique (UNI) column. This column displays the amount of space you should expect returned to the SRP if you terminate the snapset.

Step 1: 1 Query



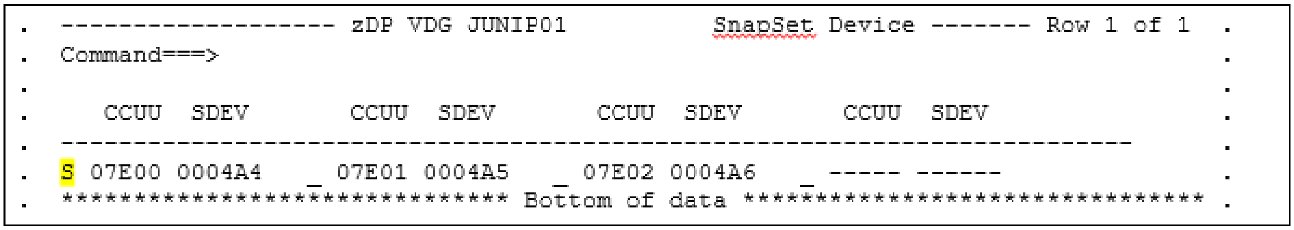
```
.                         Dell EMC zDP Tool List - V 10.0                      .
.                                                                              .
.     COPYRIGHT (C) 2022 Dell Inc. or its subsidiaries. All rights reserved.   .
.                                                                              .
. Enter a command option ===> 1                                                .
.                                                                              .
.             VDG Functions                   TGT Functions                    .
.               M Monitor                      DT Display                      .
.              CV Configure                    CT Configure                    .
.              XV Exported VDG                 XT Exported TGT                 .
.                                                                              .
.                              Snapset Functions                               .
.                                   1 Query                                    .
.                                                                              .
.                                                                              .
.                                                                              .
.                             Session Control Options                          .
.                                   S Set Options                              .
.                                   X Exit                                     .
.                                                                              .
.                                                                              .
.    PF1: Help     PF3: Exit                                                   .
.                                                                              .
```

Step 2: **S** VDG



```
.  ------------------------ zDP Snapset Controller Display ----------- Row 1 of 1  .
.                                                                                  .
.  Command===>                                                                     .
.  Primary Cmds: REF = Refresh                                                     .
.     Line Cmds:    S = Sel   Q = Query                                            .
.                        Serial       GK   Dev   Snap  RDP  Remote                 .
.    VDG Name            Number       CCUU Count Count Util Hop List               .
.  ******************************************************************************* .
.  S JUNIP01             000120200342 7E00     3    15   1%                         .
.  ******************************* Bottom of data ******************************** .
```

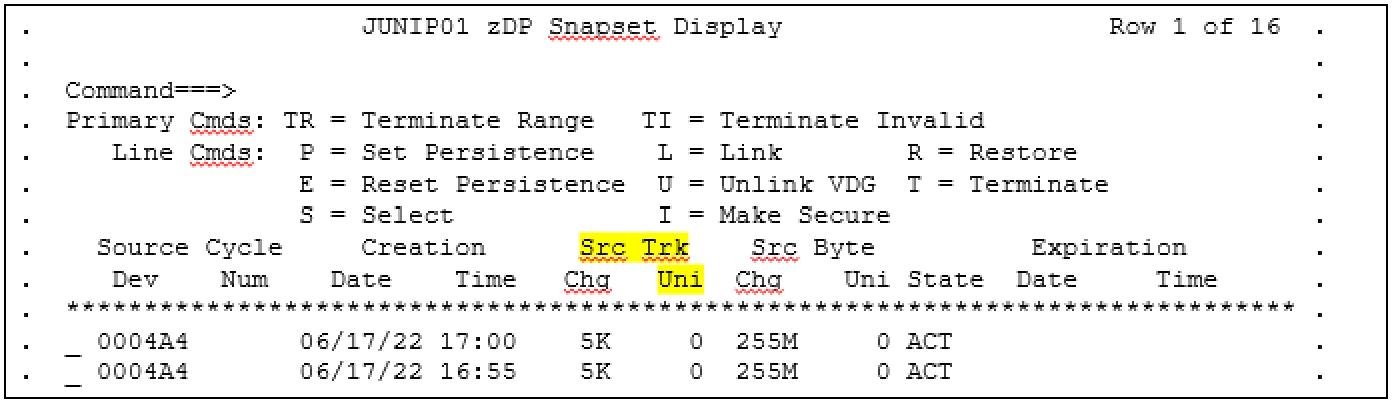
Step 3: **S** CCUU



```
.  ------------------- zDP VDG JUNIP01          SnapSet Device ------- Row 1 of 1  .
.  Command===>                                                                     .
.                                                                                  .
.     CCUU  SDEV        CCUU  SDEV        CCUU  SDEV        CCUU  SDEV             .
.  ---------------------------------------------------------------------------     .
.  S 07E00 0004A4    _ 07E01 0004A5    _ 07E02 0004A6    _ ----- ------            .
.  ******************************* Bottom of data ******************************** .
```

Step 4: View the **SRC TRK** > **UNI** (unique) fields

- As data is written to the volumes in the display, the customer can press **Enter**, and zDP updates the fields.



```
.                     JUNIP01 zDP Snapset Display                      Row 1 of 16  .
.                                                                                   .
.  Command===>                                                                      .
.  Primary Cmds: TR = Terminate Range   TI = Terminate Invalid                      .
.     Line Cmds:  P = Set Persistence    L = Link          R = Restore              .
.                 E = Reset Persistence  U = Unlink VDG    T = Terminate            .
.                 S = Select             I = Make Secure                            .
.    Source Cycle     Creation       Src Trk     Src Byte          Expiration       .
.     Dev     Num     Date     Time  Chg    Uni  Chg      Uni State  Date      Time .
.  ******************************************************************************  .
.  _ 0004A4       06/17/22 17:00     5K      0   255M      0 ACT                    .
.  _ 0004A4       06/17/22 16:55     5K      0   255M      0 ACT                    .
```

To monitor zDP Snapsets within Unisphere, one of the Volumes in a VDG must reside in a Symmetrix Storage Group. Here are two common ways to add volumes to a Symmetrix Storage Group:

- Use the MFE functionality to align your SMS Storage Group to a Symmetrix Storage Group (reference the CREATE SYMSG command in the Dell Mainframe Enablers ResourcePak Base for z/OS)
- Identify the volume on z/OS you would like to add, and add the volume in Unisphere to an existing (or new) Symmetrix Storage Group

Space considerations

Overview

When planning for a TimeFinder SnapVX and zDP implementation, storage space is the primary resource consideration. A PowerMax Storage Resource Pool (SRP) is a collection of disk groups that are configured into a thin-data pools. The default setting for the PowerMax back-end SRP pool reserve capacity (PRC) is 10%. When space consumption reaches the PRC (which is strictly used for new host writes), you cannot create snapshots, and existing nonsecure snapshots are failed. Due to this behavior, all SnapVX and zDP implementations should accommodate for at least some of the snapshots to be secure.

When the SRP is 100% full, SRDF replication stops if the array is an SRDF target. Also, all local host I/O stops, which has an operational impact. It is critical to design proper space alerting to warn customers well before the 90% SRP full is reached. Space-reclamation procedures should be well understood, tested, and documented to relieve the space shortage condition should they arise.

Space-reclamation procedures include the following:

- Terminating nonsecure snapshots
- Linking a more-recent snapshot with fewer snapshot deltas
- Issuing a free command to an unused snapshot target

- Running thin reclaim utility (TRU), which returns space to the SRP from a host perspective

Deploying local-array SnapVX and zDP

Overview

SnapVX and zDP run in the SCF address space that is delivered by Mainframe Enablers software. The SCF address space runs on a z/OS LPAR. This SCF address space has connectivity to the PowerMax through gatekeeper devices. Besides the space consumption-risk that is mentioned previously in this paper, the primary consideration when using SnapVX and zDP on the local (DC1) storage environment is the host performance impact. Snapshot creation is not free from a z/OS-host-response-time perspective. Even though snapshot intervals may be as short as five minutes, it may be preferable to use rolling small-interval snapshots for cyber protection in a remote-array (DC2) deployment. The ideal environment for the local array (production site) includes daily full-volume backup applications. In this environment, the snapshot only ages for 24 hours before it can be terminated after the backup has completed. Typically, the space usage is far lower than a full clone would require.

There are two main reasons to implement SnapVX and zDP locally (DC1 environment):

- Protection against a massive cyber event
- To surgically LINK the snapshot or zDP snapset to a subset of target volumes to recover data

TimeFinder SnapVX can be used selectively to link a subset of the volumes in a zDP snapset using the **ZDP(YES)** parameter in the TimeFinder SnapVX LINK job. This practice provides another option to surgically select volumes to recover data from.

Deploying remote-array TimeFinder SnapVX and zDP

Overview

Customers can use SnapVX and zDP to support traditional disaster recovery (DR) testing at the DR site which formerly used full volume copies (clones or BCV). Ideally, the DR test should not affect the rolling protection of zDP during the test. A linked snapshot for the DR test consumes space as the snapshot ages. You should determine how long a DR test snapshot needs to live to accurately plan the space consumption.

There are multiple reasons why the DR site array can be used for short-interval SnapVX zDP cyber protection. You can IPL (for testing purposes) the entire set of volumes in your DR test LPARs. Also, the consequences of an array SRP reaching unsafe operational levels are much lower if the snapshots are in the SRDF distance array. SRDF replication protection may be at risk, but host outages that are due to the SRP being 100% full are impossible if the snapshots are in the distance array.

You can create SnapVX snapshots and zDP snapsets in remote arrays that are connected by SRDF by using a local instance of Mainframe Enablers software that is running on a z/OS LPAR. TimeFinder SnapVX can communicate with the remote array. The RMT (remote) parameter with CREATE, LINK, UNLINK, and TERMINATE functions enable controlling snapshots on the remote array.

With zDP, when the VDG and TGT constructs are created at the local (production) site using Mainframe Enablers, use the MODIFY command to ADD devices and populate the VDG or TGT. Using the RMT(GP) parameter in the MODIFY, ADD device list allows you to create zDP snapsets at the array that is attached to the remote array in SRDF group GP (in the example above). This configuration method is deployed when there is no active z/OS LPAR running at the DR site.

The host-performance impact that is mentioned in Deploying local-array SnapVX and zDP does not apply if the SRDF replication method is synchronous. If the replication is synchronous mode, this configuration causes a host-performance impact (ECA enabled) if you create a consistent snapshot of an SRDF R2 group. If the replication method is SRDF/Asynchronous, ECA is not required, and the host impact at the production site is negligible.

Secure snapshots

Overview

Secure snapshots survive the previously mentioned SRP full events that compromise nonsecure snapshots. At 90% SRP full, all new snapshot creation, whether secure or not, stops. SnapVX-created snapshot jobs fail, and zDP stops. Worse, at 90% SRP usage, the array fails any existing nonsecure snapshots as it sacrifices snapshots to keep host I/O or SRDF functioning. Secure snapshots do not fail when the SRP% reaches the 90% threshold.

Nonsecure snapshots exist indefinitely until they are terminated. If zDP stops or is stopped, the existing snapshots are not terminated until zDP is restarted. Secure snapshots behave differently. The secure attribute is specified at creation time, but you can also add it after the snapshot is created. The unit of time that a snapshot must exist is measured in days. When it is associated with an expiration date and time, the snapshot cannot be terminated. Also, the snapshot cannot be destroyed by a command or by an array-full condition as mentioned previously. Secure snapshots expire, but they are not terminated. For example, if zDP stops or is stopped on Friday, and zDP was creating secure snapsets with a time to live of two days, on Monday, all zDP snapshots are expired. As a result, individuals who have access to the zDP environment can delete the snapsets because they are no longer secure. This behavior means that it is more important to monitor zDP more closely if secure snapshots are being created to avoid having gaps in snapshot protection.

Secure snapshots behave like nonsecure snapshots and can be linked and unlinked, but they cannot be terminated until expiration (also called time to live). Secure snapshots that are in a linked status can expire, but they do not terminate. Secure snapshots do not change the space consumption of a snapshot. Changes made to the snapshot source volume accumulate SRP space, and this behavior is no different than nonsecure snapshot behavior. This operational difference is present because secure snapshots cannot be terminated if an SRP space shortage becomes critical. The sizing headroom should be more conservative when planning for secure snapshots.

zDP can SKIP intervals of secure snapshots to easily provide a mix of secure and nonsecure snapshots using the CYCLE parameter. The following example shows a VDG definition that specifies snapshots taken every hour for 48 hours, and every other snapshot is secure with a lifespan of 2 days.

```
CYCLE_TIME(12,0,SECURE,1,4),
```

The SKIP feature (represented by **4** in the above cycle definition) was developed to enable reclaiming SRP space by terminating nonsecure snapsets, should SRP space usage reach critically low levels. If zDP stops at any time, the nonsecure snapsets remain indefinitely which reduces the risk of losing cyber protection. Be careful when using the SKIP parameter, and choose a value that is consistent with the secure lifespan expiration. As a best practice, use the following formula:

```
SNAPSHOT INTERVAL MIN * MAX_SNAPSETS / 60 MIN PER HR = AGE OF
OLDEST SNAPSHOT (HRS)
```

The age of the oldest snapshot should be an even number of days so that zDP terminates nonsecure snapshots at the same frequency as the secure snapshot expiration.

Here is an example of a definition that may cause issues:

```
10 MIN INTERVAL * 256 MAX_SNAPSHOTS / 60 = 42.7 HOURS which is not
an even multiple of days.
```

A more suitable definition would be as follows:

```
12 MIN INTERVAL * 240 MAX_SNAPSHOTS / 60 = 48 HOURS with a two-day
SECURE attribute.
```

Operational best practices

Overview

We recommend the following zDP operational best practices:

Define a zDP VDG that aligns with the SRDF groups. With SRDF groups, only create groups if required since it is easier to manage fewer groups.

Consider using the NOSORT attribute when creating and adding devices (MODIFY,ADD) to the VDG and TGT to avoid zDP changing the SOURCE-to-TARGET pair relationship. Specify NOSORT to ensure that zDP maintains the required SOURCE-to-TARGET mapping. Without NOSORT, zDP does not always obey the specified sequence of devices that are added to the VDG and TGT. The result could cause unpredictable UCB mapping. For example, not following this process can cause confusion where a customer believes that the RES volume is at one UCB, and when the LINK occurred without NOSORT specified, zDP linked the RES volume to a different UCB address.

While zDP is active within SCF, SRDF actions (SC commands) are blocked because zDP puts a lock on the devices. Stop zDP to perform host-component SC commands. A sample stop command is as follows:

```
'/F <scf address space>,ZDP STOP <vdg name>'
```

With Mainframe Enablers versions before 8.4, zDP definitions do not persist beyond IPLs. The snapshots persist, but the VDG and TGT definitions and device lists do not. These definitions must be re-created and MODIFIED, and devices must be added after an IPL. As of MFE 8.5, customers can preserve the zDP VDG and TGT definitions to avoid having to re-create and modify VDGs and TGTs after an IPL. If you have MFE versions 8.4 or earlier, stop zDP before performing an IPL for the controlling LPAR and re-creating the VDG and TGT definitions.

Conclusion

Summary

SnapVX and zDP for mainframe local replication technology was introduced with the VMAX3 generation of Symmetrix family in early 2016. Before VMAX3 local replication was full volume BCV or Clones that largely restricted customer usage to one or two local copies. Initially, SnapVX allowed a maximum of 256 snapshots of a device. As of 2019, the number of zDP snapsets per device is enhanced to allow up to 1,024 snapshots. Today, we see customers using TimeFinder SnapVX snapshots and zDP Snapsets for these business reasons:

- Traditional disaster recovery site point in time (PIT) copy for DR testing
- PIT copy for full-volume backups
- Rolling small-interval snapshots for cyber protection

Implementation of zDP can provide a level of protection from pervasive logical corruption that was previously unavailable to mainframe customers. Having a copy of data available that was close to the point of corruption enables rapid recovery and faster resumption of normal processing. Data restoration from tape media can be eliminated, and recovery processing can be performed far more rapidly since very recent data can be used in the recovery process.

zDP has helped to usher in a new discipline within business continuity planning: cyber recovery. Like its cousin, disaster recovery, cyber recovery uses extra copies of data to provide business value but does so to provide protection from a new risk, cyberattack. zDP was the first product to provide this protection, and solutions to aid in rapid recovery will continue to evolve to meet changing requirements for business continuity.

References

Dell Technologies documentation

The following Dell Technologies documentation provides other information related to this document. Access to these documents depends on your login credentials. If you do not have access to a document, contact your Dell Technologies representative.

- PowerMax and VMAX Info Hub