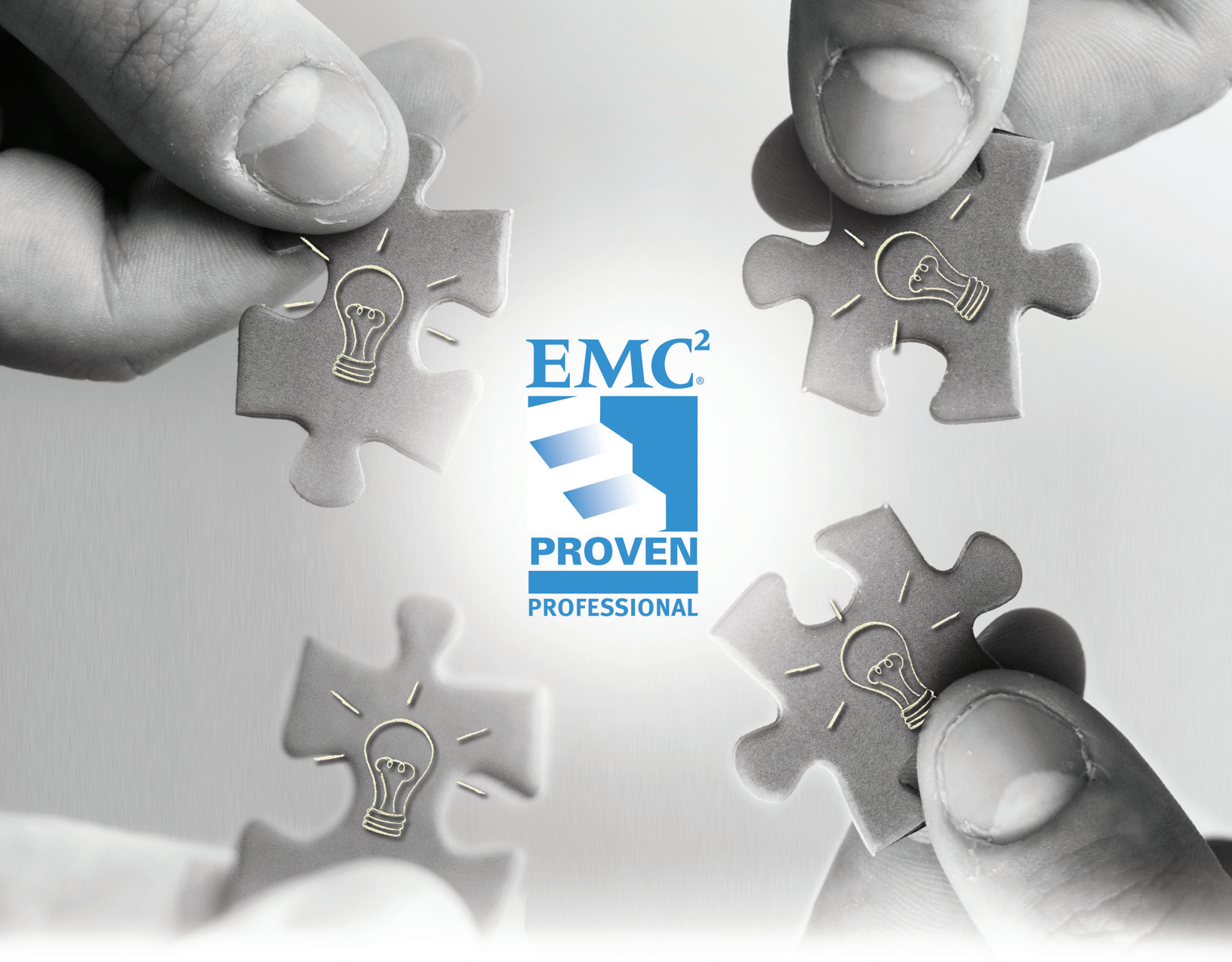


HEALTH CHECK AND CAPACITY REPORTING FOR HETEROGENEOUS SAN ENVIRONMENTS

Mumshad Mannambeth
Delivery Specialist
EMC Global Services

Sampath Salem
Advisory Solutions Architect
EMC Global Services

EMC²

Table of Contents

1. Introduction

Large service delivery accounts often find it difficult to perform health checks and monitor capacity on hundreds of arrays and switches spread across different environments, in various locations, across the globe. These may be Cloud delivery accounts supporting multiple SAN environments, either dedicated to a customer or shared between multiple customers; or multiple SAN environments resulting from a merger or acquisition. To guarantee Service Level Agreement (SLAs), a health check report is prepared several times a day, so that the arrays could be monitored closely and to ensure that all failures are handled appropriately. This is a time-consuming, tedious task that requires the effort of multiple engineers dedicated for this purpose. The complexity increases as the fabrics may be spread across different environments and locations. Moreover, due to the heterogeneity of the arrays and switches, a single tool may not serve the purpose of monitoring the entire environment.

While the EMC-dominated fabrics use EMC ControlCenter® (ECC) for monitoring, other fabrics are monitored using other vendor tools such as HP Service Manager (HPSM) or IBM monitoring tools. While the Cisco-dominated fabrics are monitored using Fabric Manager, the Brocade fabrics are monitored using Connectrix Manager or Brocade Web Tools. These varieties of tools pose a challenge for the administrators to prepare a collaborated report of all the assets in their environment. Figure 1 shows an example of one such typical environment.

This article describes the methodologies used in implementing a time-saving, automated, health check and capacity report generation process of large numbers of different types of arrays and switches in a shared cloud environment.

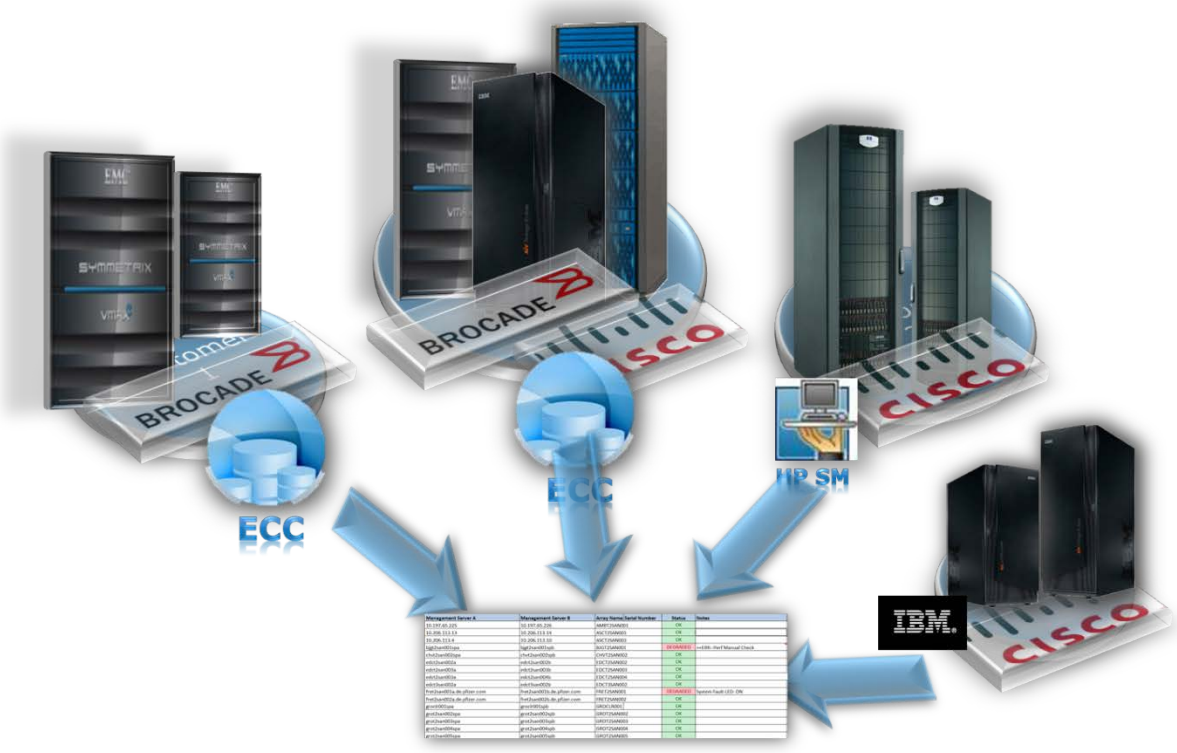


Figure 1: Typical SAN Enironment

2. Architecture

The reporting procedure utilizes a number of scripts developed in OS-specific shells and presentation tools, like Excel, to prepare reports in matter of minutes. The process eliminates the need for users to log in to each management workstation to inspect the array. Instead, health check scripts are run on the workstations using scheduled tasks and reports are automatically emailed to the administrators group. Different types of scripts are used for different types of arrays and all required information is collated into a single email. Once all reports from various environments and arrays are received at the administrators email, an Excel VBA solution can be used to read the emails from Outlook and turn it into useful reports. Figure 2 portrays the block diagram of this architecture.

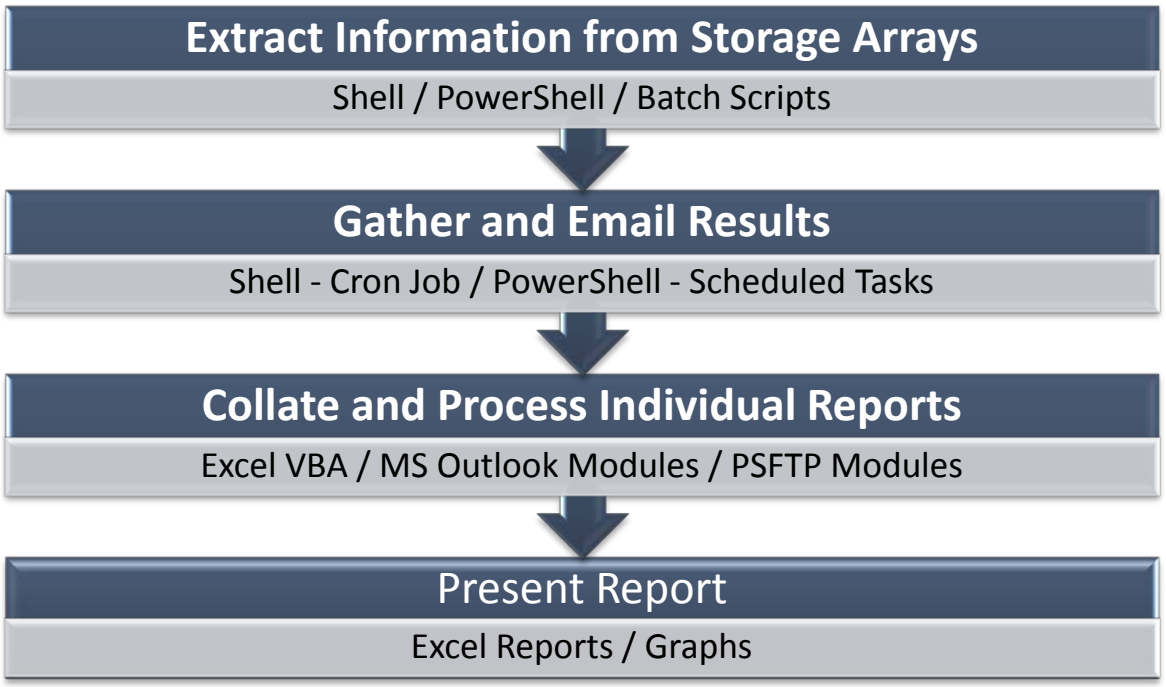


Figure 2: Architecture – Block Diagram

Next, we discuss health check routines for different types of arrays, and how these tasks can be automated using various tools.

3. Health Check Routine for Various Arrays

This section discusses the basic health check routines for various arrays. Once the health check routines are outlined, we discuss scripts to generate data automatically. A brief discussion of health check routines for heterogeneous arrays follows:

3.1 EMC Symmetrix Systems – DMX/VMAX

Health check for EMC Symmetrix® systems consists of checking the basic hardware status, environmental details, event logs and capacity consumption. This can be accomplished either through Unisphere® or SMC, or EMC Solutions Enabler (EMC SE). This article will discuss the health check routine using EMC SE, so that it can later be used for scripting.

3.1.1 Check Array Environmental Information

The first step is to check the basic environmental details of the array such as the status of the power supplies, enclosures, link control cards, FANs, management modules, and directors.

Command:

```
Symcfg –sid <symid> list –env_data
```

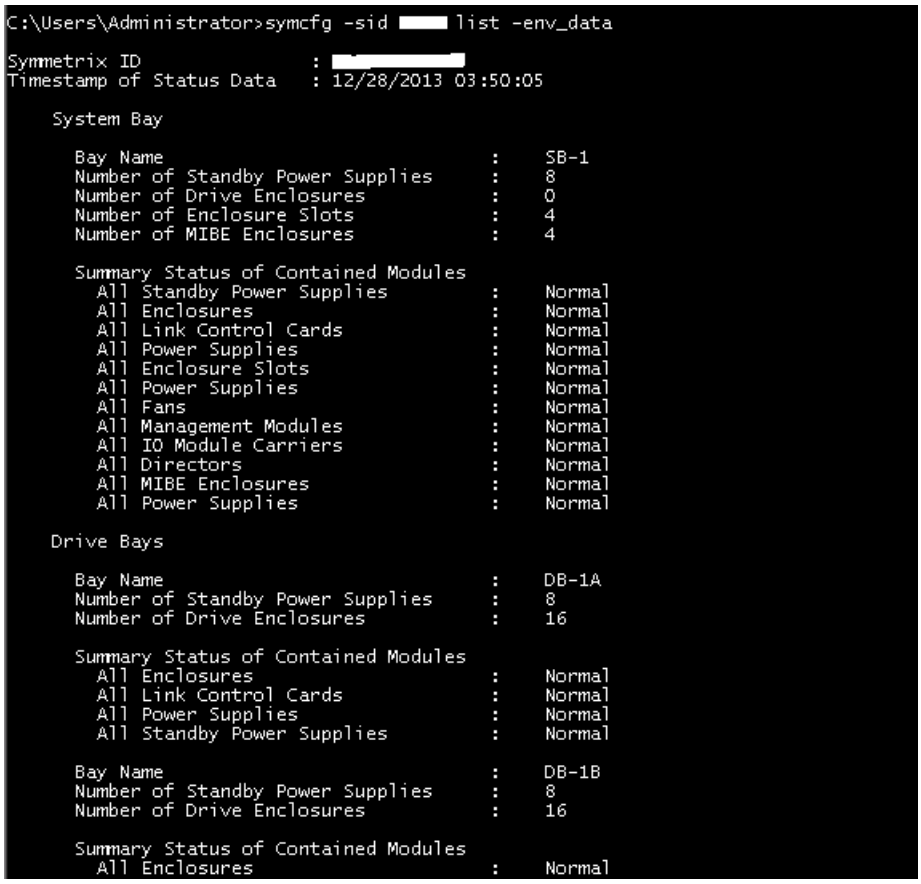


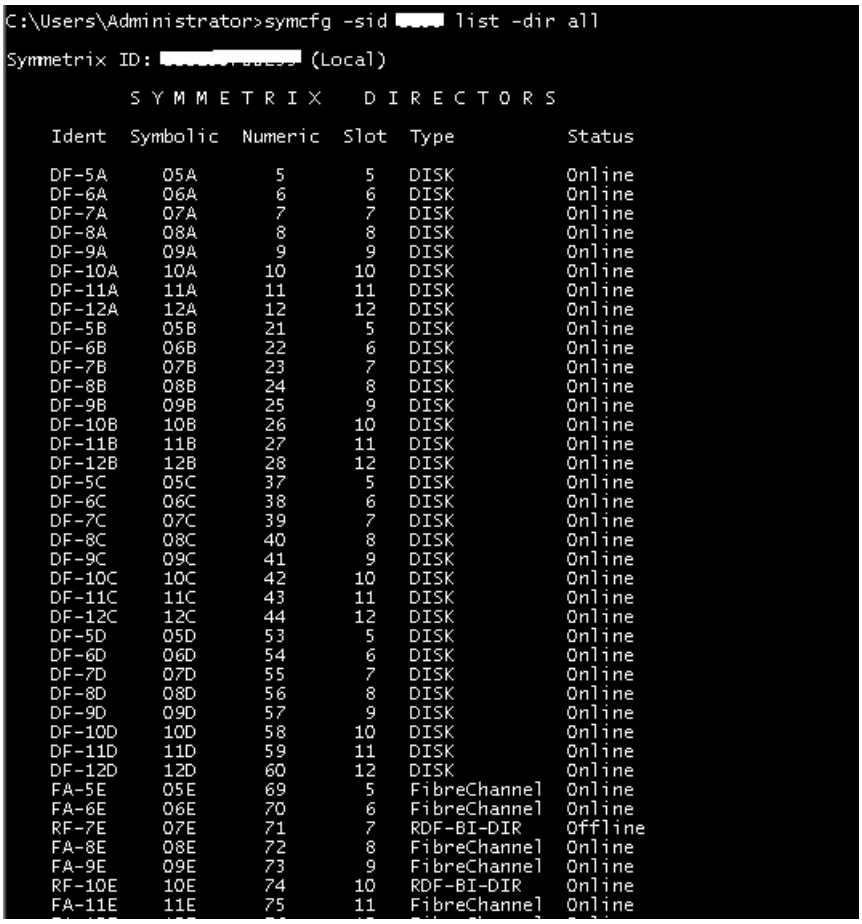
Figure 3: Screenshot – Environmental Information

3.1.2 Check director status

Next, check the status of all front-end, back-end and SRDF directors on the array.

Command:

```
symcfg –sid <symid> list -dir all
```



```
C:\Users\Administrator>symcfg -sid [redacted] list -dir all

Symmetrix ID: [redacted] (Local)

          S Y M M E T R I X   D I R E C T O R S

    Ident  Symbolic  Numeric  Slot  Type          Status

    DF-5A     05A        5       5   DISK          Online
    DF-6A     06A        6       6   DISK          Online
    DF-7A     07A        7       7   DISK          Online
    DF-8A     08A        8       8   DISK          Online
    DF-9A     09A        9       9   DISK          Online
    DF-10A    10A       10      10   DISK          Online
    DF-11A    11A       11      11   DISK          Online
    DF-12A    12A       12      12   DISK          Online
    DF-5B     05B       21       5   DISK          Online
    DF-6B     06B       22       6   DISK          Online
    DF-7B     07B       23       7   DISK          Online
    DF-8B     08B       24       8   DISK          Online
    DF-9B     09B       25       9   DISK          Online
    DF-10B    10B       26      10   DISK          Online
    DF-11B    11B       27      11   DISK          Online
    DF-12B    12B       28      12   DISK          Online
    DF-5C     05C       37       5   DISK          Online
    DF-6C     06C       38       6   DISK          Online
    DF-7C     07C       39       7   DISK          Online
    DF-8C     08C       40       8   DISK          Online
    DF-9C     09C       41       9   DISK          Online
    DF-10C    10C       42      10   DISK          Online
    DF-11C    11C       43      11   DISK          Online
    DF-12C    12C       44      12   DISK          Online
    DF-5D     05D       53       5   DISK          Online
    DF-6D     06D       54       6   DISK          Online
    DF-7D     07D       55       7   DISK          Online
    DF-8D     08D       56       8   DISK          Online
    DF-9D     09D       57       9   DISK          Online
    DF-10D    10D       58      10   DISK          Online
    DF-11D    11D       59      11   DISK          Online
    DF-12D    12D       60      12   DISK          Online
    FA-5E     05E       69       5   FibreChannel  Online
    FA-6E     06E       70       6   FibreChannel  Online
    RF-7E     07E       71       7   RDF-BI-DIR    Offline
    FA-8E     08E       72       8   FibreChannel  Online
    FA-9E     09E       73       9   FibreChannel  Online
    RF-10E    10E       74      10   RDF-BI-DIR    Online
    FA-11E    11E       75      11   FibreChannel  Online
```

Figure 4**: Screenshot – Director Status**

3.1.3 Check Events for Fatal Errors

Now, check the event logs for fatal errors. Examples of errors could be hardware failures, pool full conditions, CACA errors, etc.

Command:

```
symevent –sid <symid> list -error -fatal
```

Figure 5: Screenshot – Event Logs

3.1.4 Check for Failed Disks

Next, check for failed disks on the array. Although a dial home is automatically raised for the failed drives and an EMC CE is automatically engaged, it is a good practice to keep a check on the errors on the Symmetrix.

Command:

```
symdisk –sid <symevent> list -failed
```

```
Symmetrix ID                  : [redacted]
Disks Selected                : 65

                                                                Capacity(MB)
Ident  Symb Int TID Vendor     Type          Hypr    Total        Free       Actual
------ ---- --- --- ---------- ------------ ---- ---------- ---------- ----------
DF-1A  01A    C    E SEAGATE    T146155         7     140014      78769     140014
DF-2A  02A    C    7 SEAGATE    C146X15         7     140014      78769     140014
DF-2A  02A    C   1D SEAGATE    T300155         0          0          0     286102
DF-5A  05A    C    4 SEAGATE    T300155         0          0          0     286102
DF-5A  05A    D    7 SEAGATE    T300155         0          0          0     286102
```

Figure 6: Screenshot – Failed Disks

3.1.5 Check for Pool Capacity Utilization

Next, we check the capacity utilization of the thin pools. This is very important to prevent a pool full condition which may result in I/O errors on the hosts if sufficient space is not available in the pool.

Command:

```
Symcfg –sid <symid> list –thin –pools
```

```
C:\Users\Administrator>symcfg -sid [redacted] list -thin -pool

Symmetrix ID: [redacted]

                         S Y M M E T R I X   P O O L S

------------------------------------------------------------------------------
Pool          Flags  Dev             Usable       Free       Used Full Comp
Name          PTECSL Config          Tracks     Tracks     Tracks  (%)  (%)
------------- ------ ------------ ---------- ---------- ---------- ---- ----
TF62_TH3CF    TF9DEI 2-Way Mir        600960     600960          0    0    0
R1_TP1        TFFDEI 2-Way Mir        121176     120300        876    0    0
TF62_TH3CS    TS9DEI RAID-5(7+1)      450720     449376       1344    0    0
nkdpool       TFFDEI 2-Way Mir        262500     170712      91788   34    0
kmr           T--DD- Unknown               0          0          0    0    0
R5_TP1        TFFDEI RAID-5(3+1)     3177000    3027048     149952    4    0
hisham1       TFFDEI 2-Way Mir         12000      12000          0    0    0
varma_thin    TSFDEI RAID-5(3+1)      163848     163824         24    0    0
newpool_p     TSFDEI RAID-5(3+1)      163848     163764         84    0    0
vp_snap1      TSFDEI 2-Way Mir         49170      32718      16452   33    0
vp_snap2      TSFDEI 2-Way Mir         49170       4458      44712   90    0
SATA_TP1      TSFDEI RAID-6(6+2)      213048     181404      31644   14    0
VP_SATA       T--DD- Unknown               0          0          0    0    0
my_new        TSFDEI RAID-5(3+1)     2491584    2069916     421668   16    0
testing       TSFDEI 2-Way Mir       1440600    1439424       1176    0    0
CG61_TH3CF    TF9DEI 2-Way Mir        150192     150192          0    0    0
CG61_TH3CS    TS9DEI RAID-5(7+1)      150192     149664        528    0    0
SN62_TH3CF    TF9DEI 2-Way Mir        450720     450720          0    0    0
SN62_TH3CS    TS9DEI RAID-5(7+1)      450720     450048        672    0    0
sata_pool_yh  TSFDEI 2-Way Mir         75000      74952         48    0    0
MAHMOUD       TSFDEI 2-Way Mir         24360      24348         12    0    0
```

Figure 7: Screenshot – Pool Utilization

3.1.6 Check for Storage Group wise Allocated Capacity

Some customers may require the capacity report to reflect a host-based capacity utilization. For this, use the command below.

Command:

```
symaccess –sid <symid> list devinfo
```

3.2 EMC Unified Storage – CLARiiON/VNX Arrays

Health check routine for Clariion®/VNX® arrays is often performed through the Unisphere GUI. In this article, we discuss a CLI-oriented method. Using SecureCLI (naviseccli), we check the status of basic CLARiiON hardware, event logs, and capacity utilization. Secure CLI is a comprehensive Navisphere CLI solution that provides one application and one security model for all CLI commands. Secure CLI provides role-based authentication, audit trails of CLI events, and SSL-based data encryption. You do not need to install a JRE, to run Secure CLI[1]. Secure CLI commands run in a command window. Each command consists of the naviseccli command (and options) together with another subcommand (and its options). Please refer to *VNX for Block Command Line Interface CLI Reference 1.0* for more information on setting up authentication and security details for SecureCLI.

3.2.1 Check Faults on the Array

First, check for the faults on the array using the faults list command.

Command:

```
naviseccli -h <SP ip address> faults –list
```

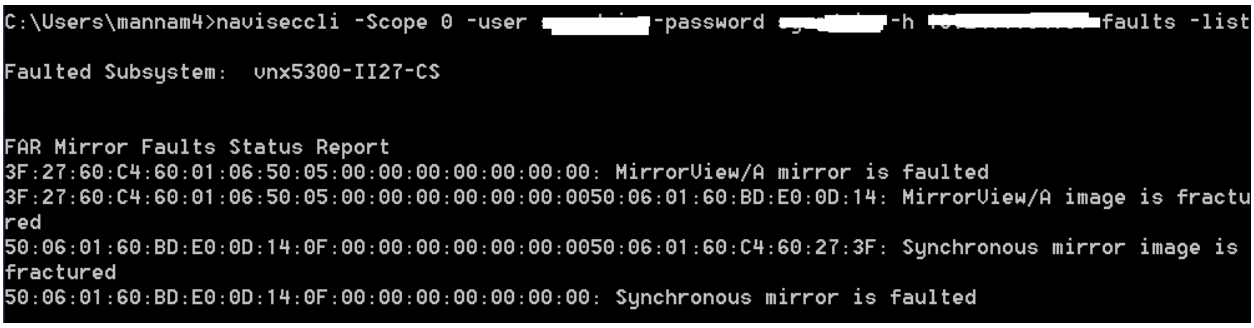


Figure 8: Screenshot – CLARiiON Faults List

3.2.2 Check Environmental Information

Next, check the environmental details of the array such as inlet air temperature and input power status and make sure they are all in a valid state.

Command:

```
naviseccli -h <SP ip address> environment –list -all
```

```
C:\Users\mannam4>naviseccli -Scope 0 -user [redacted] -password [redacted] -h [redacted] environment
-list -all

Array

Input Power
Status: Valid
Present(watts): 833
Rolling Average(watts): 833

DPE8 Bus 0 Enclosure 0

Input Power
Status: Valid
Present(watts): 436
Rolling Average(watts): 435

Air Inlet Temperature
Status: Valid
Present(degree C): 36
Rolling Average(degree C): 36

DAE6S Bus 1 Enclosure 0
```

Figure 9 Screenshot – Environmental Details

3.2.3 Check Backend Connectivity

Check the status of the backend connectivity cards.

Command:

```
naviseccli -h <SP ip address> backendbus –get -all
```

```
C:\Users\mannam4>naviseccli -Scope 0 -user [redacted] password [redacted] -h [redacted] backendbus -
get -all

Bus 0

Current Speed: 6Gbps.
Available Speeds:
             3Gbps.
             6Gbps.

SPA SFP State: N/A
SPB SFP State: N/A

I/O Module Slot: Onboard
Physical Port ID: 0


SPA Connector State: Mismatched
SPB Connector State: Mismatched
```

Figure 10: Screenshot Backend Connectivity

3.2.4 Check Cache Status

Check the status of the cache cards on the array.

Command:

```
naviseccli -h <SP ip address> cachecard -list
```

```
naviseccli -h ss1_spa cachecard -list
Total Memory: 512MB
Hardware State: Ok
```

3.2.5 Check Pool Utilization

Check the storage pool capacity utilization. This is very important to prevent a pool full condition which may result in I/O errors on the hosts if sufficient space is not available in the pool.

Command:

```
naviseccli -h <SP ip address> storagepool -list
```

```
C:\Users\mannam4>naviseccli -Scope 0 -user [redacted] -password [redacted] -h [redacted] storagepool
-list
Pool Name:  Pool 1
Pool ID:  1
Raid Type:  r_10
Percent Full Threshold:  70
Description:
Disk Type:  SAS
State:  Ready
Status:  OK(0x0)
Current Operation:  None
Current Operation State:  N/A
Current Operation Status:  N/A
Current Operation Percent Completed:  0
Raw Capacity (Blocks):  2251537208
Raw Capacity (GBs):  1073.617
User Capacity (Blocks):  1109458944
User Capacity (GBs):  529.031
Consumed Capacity (Blocks):  445464576
Consumed Capacity (GBs):  212.414
Available Capacity (Blocks):  663994368
Available Capacity (GBs):  316.617
Percent Full:  40.152
Total Subscribed Capacity (Blocks):  451768320
Total Subscribed Capacity (GBs):  215.420
Percent Subscribed:  40.720
Oversubscribed by (Blocks):  0
Oversubscribed by (GBs):  0.000
```

Figure 11: Screenshot – Storage Pool Utilization

3.3 EMC Avamar

Health check on an EMC Avamar® Grid is performed using a number of CLI commands available via the Avamar SSH terminal interface. After initiating an SSH to the Avamar terminal, execute the following commands:

3.3.1 Check status of the Nodes and Capacity Utilization

The status.dpn commands list the status of all the nodes in the Avamar Grid along with their capacity utilization percentage.

Command:

```
status.dpn
```

root@avmgrid:~/#: status.dpn

Node	IP Address	State	Disk	Suspend	Load	UsedMB	%Full
0.3	192.168.255.5	ONLINE	0	FALSE	4.03	32835200	23.50%
0.2	192.168.255.4	ONLINE	0	FALSE	4.14	32836936	23.50%
0.1	192.168.255.3	ONLINE	1	FALSE	4.06	32837892	23.40%
0	192.168.255.2	ONLINE	1	FALSE	4.3	32835760	23.50%

All reported states=(ONLINE), runlevels=(fullaccess), modes=(m000+0000+0000
System-Status: ok

Figure 12: Screenshot – Avamar Status.dpn

3.3.2 Check the status of services

Next, check the status of different services, such as gsan, mcs, ems, backup scheduler, dtlt, axionfs, and maintenance windows scheduler.

Command:

```
dpnctl status
```

root@avmgrid:~/#:dpnctl status

dpnctl	Type	Component	Status
dpnctl	INFO	gsan status	degraded
dpnctl	INFO	MCS status	up.
dpnctl	INFO	EMS status	up.
dpnctl	INFO	Backup scheduler status	up.
dpnctl	INFO	dtlt status	up.
dpnctl	INFO	axionfs status	up.
dpnctl	INFO	Maintenance windows scheduler status	enabled.

Figure 13: Screenshot – Avamar Services Status

3.3.3 Check the uptime of the grid

Check the uptime of the grid to ensure no unexpected reboots have occurred.

Command:

```
uptime
```

```
root@avmgrid:~/#:uptime
          7:17am  up 589 days 20:40,  2 users,  load average: 0.14, 0.16, 0.17
```

Figure 14: Screenshot – Avamar Uptime

3.4 Hitachi HDS Arrays

Most storage administrators operating Hitachi HDS arrays may be familiar with the Hitachi Device Manager or Storage Navigator consoles. Here, we discuss performing health check using Device Manager HiCommand CLI.

The Device Manager CLI provides a command line from which you can use Hitachi Command Suite Software to perform storage system operations and to manage storage resources. A request is sent to the storage system by submitting an entered command to the Device Manager server.

The Device Manager CLI enables you to create a script that runs several commands in order, and perform batch operation for the Device Manager server. Therefore, using the Device Manager CLI allows efficient operation by the system administrator when setting large volumes of predetermined content, such as when making initial settings for the storage system[2].
For more information on setting up HiCommand CLI, please refer to *Hitachi Command Suite Software CLI Reference Guide*.

3.4.1 Check Free Space on Array Groups

Check the capacity utilization on array groups.

Command:

```
HiCommandCLI GetStorageArray subtarget=FreeSpace model=HDS9980V
serialnum=10001
```

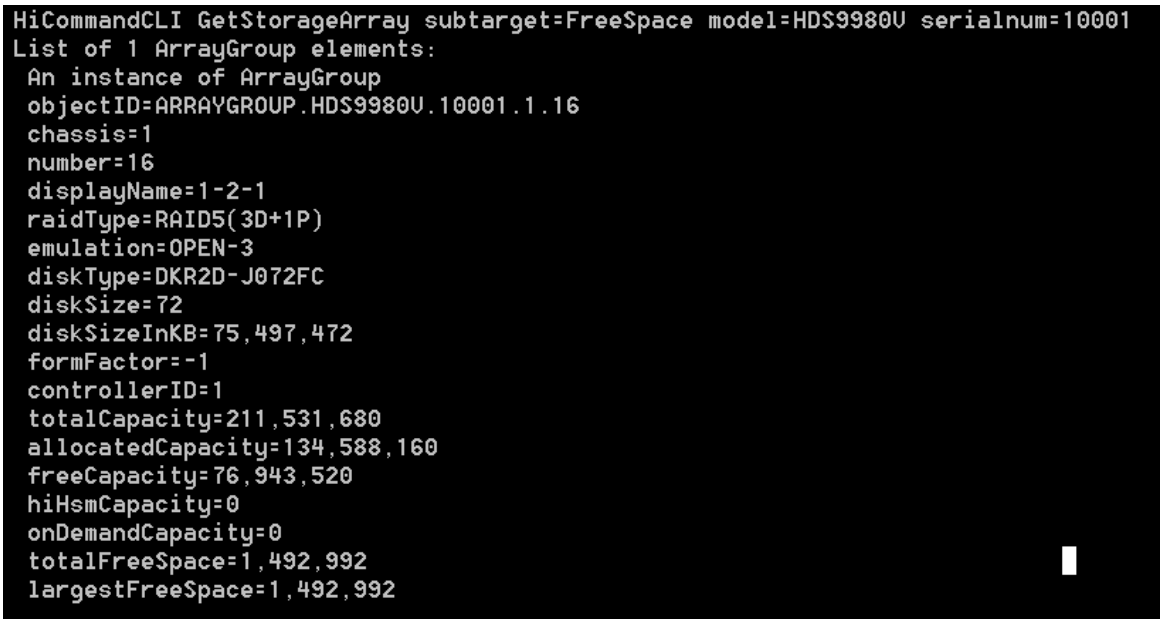


Figure 15: Screenshot – Hitachi FreeSpace

3.4.2 Check System Alerts

Check system generated alerts for any hardware failures or warnings as shown in Figure 16

Command:

```
HiCommandCLI GetAlerts
```

3.5 IBM XIV Arrays

The IBM XIV Storage System command-line interface (XCLI) provides a mechanism for issuing commands to manage and maintain the XIV systems. XCLI commands are entered on an XCLI client system (or XCLI client) supplied by the customer[3].

3.5.1 Check ATS Configuration

Check the status of the ATS (Automatic Transfer Switch) configuration. ATS switches between line cords to allow redundancy of external power.

```
HiCommandCLI GetAlerts
RESPONSE:
An instance of Alerts
 Contains 2Alert instances:
 An instance of Alert
 number=2
 type=Server
 source=ARRAY.HDS9970V.35001
 severity=3
 component=DKU drive
 description=Serious error detected on DKU drive.
 actionToTake=Contact Customer Support.
 data=Component has stopped.
 timeOfAlert=2003/01/06 20:13:56
 An instance of Alert
 number=1
 type=Server
 source=ARRAY.HDS9970V.35001
 severity=4
 component=DKC processor
 description=Moderate error detected on DKC processor.
 actionToTake=Contact Customer Support.
 data=Component does not function fully.
 timeOfAlert=2003/01/06 20:13:51
```

Figure 16: Screenshot – Hitachi Check Alerts

Command:

```
ats_list ats
```

Example:

```
ats_list ats
```

Output:

```
Component ID   Status   Currently Functioning   Model     L1 Input OK   L2 Input OK
-------------- -------- ----------------------- --------- ------------- -------------
1:ATS:1        OK       yes                     ATS-60A   no            yes


Cont.:


Outlet 1 State   Outlet 2 State   Outlet 3 State   Firmware Version
---------------- ---------------- ---------------- ------------------
J2               J2               J2               4


Cont.:

3-Phase   Dual Active
--------- -------------
no        no
```

Figure 17: Screenshot – XIV ATS Configuration

3.5.2 Check CF Status

Check the status of the Compact Flash (CF) cards on the array.

Command:

```
cf_list -f all
```

Example:

```
cf_list -f all
```

Output:

```
Component ID   Status   Currently Functioning   Hardware Status   Serial              Part #
-------------- -------- ----------------------- ----------------- ------------------- --------------------
1:CF:10:1      OK       yes                     OK                0_521134A5          TRANSCEND_20070418
1:CF:11:1      OK       yes                     OK                0_5211349C          TRANSCEND_20070418
1:CF:12:1      OK       yes                     OK                0_521133F1          TRANSCEND_20070418
1:CF:13:1      OK       yes                     OK                20080604_00003C44   TRANSCEND_20070418
1:CF:14:1      OK       yes                     OK                0_52113389          TRANSCEND_20070418
1:CF:15:1      OK       yes                     OK                0_521134AE          TRANSCEND_20070418
1:CF:1:1       OK       yes                     OK                0_5211347A          TRANSCEND_20070418
1:CF:2:1       OK       yes                     OK                0_521133C0          TRANSCEND_20070418
1:CF:3:1       OK       yes                     OK                0_521133B0          TRANSCEND_20070418
1:CF:4:1       OK       yes                     OK                0_52113568          TRANSCEND_20070418
1:CF:5:1       OK       yes                     OK                0_5211357D          TRANSCEND_20070418
1:CF:6:1       OK       yes                     OK                0_5211330F          TRANSCEND_20070418
1:CF:7:1       OK       yes                     OK                0_521133D6          TRANSCEND_20070418
1:CF:8:1       OK       yes                     OK                0_52113C99          TRANSCEND_20070418
1:CF:9:1       OK       yes                     OK                0_5211344C          TRANSCEND_20070418
```

Figure 18: Screenshot – XIV Compact Flash Status

3.5.3 Check for Failed System Components

List the failed system components.

Command:

```
component_list filter=FAILED|NOTOK
```

3.5.4 Check the status of the Maintenance Module

Check the status of the maintenance module as shown in Figure 19.

Command:

```
mm_list -f all
```

3.5.5 Check the modules internal temperature

Check the status of the internal temperature of modules as shown in Figure 20

Command:

```
module_temperature_list -f all
```

Example:

```
mm_list -f all
```

Output:

```
Component ID            Status   Currently Functioning   Enabled   Version
----------------------- -------- ----------------------- --------- ----------
1:MaintenanceModule:1   OK       yes                     yes       MGMT-4.5


Temperature   Serial       Original Serial   Part #       Original Part Number
------------- ------------ ----------------- ------------ --------------------
49            0123456789   0123456789        0123456789   0123456789


Total Memory   Free Memory   Free disk (/)   Free disk (/var)   Link#1
-------------- ------------- --------------- ------------------ --------
932172         602096        39031456        201873624          yes


Link#2   Requires Service
-------- ------------------
yes      None
```

Figure 19: Screenshot – XIV Check Maintenance Module

Example:

```
module_temperature_list -f all
```

Output:

```
Module       Ambient   Midplane   EM Card   Fan Controller   CPU 1   DIMM 2   DIMM 4   DIMM 6   PCIe   InfiniBand HCA   Fibre Channel
------------ --------- ---------- --------- ---------------- ------- -------- -------- -------- ------ ---------------- -------------
1:Module:13  24        23         28        19               34      32       31       31       34     77               <N/A>
1:Module:14  24        23         28        30               38      32       32       31       35     82               <N/A>
1:Module:2   21        23         27        33               33      31       31       31       34     77               <N/A>
1:Module:5   22        23         27        31               33      31       31       31       35     83               44
1:Module:8   22        23         27        24               36      31       31       30       35     79               49
```

Figure 20: Screenshot – XIV Check Module Templarature

3.5.6 Check Filesystems Health State

```
fs_check
```

3.5.7 Check status of FANs in the System

```
fan_list
```

Example:

```
xcli  -u  -c Nextral fan_list
```

Output:

```
Component ID   Status   Currently Functioning
------------ -------- ----------------------
1:Fan:1:1      OK       yes
1:Fan:1:10     OK       yes
1:Fan:1:2      OK       yes
1:Fan:1:3      OK       yes
1:Fan:1:4      OK       yes
1:Fan:1:5      OK       yes
1:Fan:1:6      OK       yes
1:Fan:1:7      OK       yes
1:Fan:1:8      OK       yes
1:Fan:1:9      OK       yes
```

Figure 21: Screenshot – XiV Check Fan Status

3.6 HP XP Arrays

The Command View XP Command Line Interface (CLI) is a text-based interface used to manage and retrieve information about XP disk arrays. Use the CLI if you prefer a text-based interface to the graphical user interface (GUI) or when it is more efficient to run scripts or batch files to manage your XP disk arrays[4]. For more information on setting up XP Command Line Interface, please refer to HP StorageWorks Command View XP Command Line Interface (CLI) reference guide.

3.6.1 Check Array Status

Check array locked status.

Command:

```
list array_status
```

Example:

```
Lock_State Lock_Status Refresh_State Refresh_Status Get_State
10033 UNLOCKED OK IDLE OK COMPLETE OK
20074 LOCKED OK IDLE OK OLD_DATA OK
```

3.6.2 Check Array Control Processor and Disk Adapter Status

Check the Array Control Processor (ACP) and Disk Adapter (DKA) status.

Command:

```
list acp_status
list dka_status
```

Example:

```
DKA# Name Status
1 1 DKA-1B Normal
1 2 DKA-1C Service
1 3 DKA-1D Acute
1 4 DKA-1E Serious
```

3.6.3 Check Channel Host Interface Processor and Channel Adpater Status

Check the status of Channel Host Interface Processor (CHIP) and channel adapters (CHA)

Command:

```
list chip_status
list cha_status
```

Example:

```
CHA# Name Status
1 1 CHA-1P Normal
1 2 CHA-1Q Service
1 3 CHA-1S Serious
Cluster# CHA# Name Status
1 6 CHA-1B Normal
2 5 MIX-2F Normal
2 6 CHA-2E Normal
```

3.6.4 Check Channel Processor Status

Check the status of Channel Processors (CHP)

Command:

```
list chp_status
```

Example:

```
Cluster# CHA# CHP# Name Status
1 1 1 CHP00-1P Normal
1 2 2 CHP00-1Q Service
1 3 3 CHP00-1R Acute
1 4 4 CHP00-1S Serious
```

3.6.5 Check Cache Status

Command:

```
list cm_status
list csw_status
```

Example:

```
Cluster# Cache# Name Status
1 0 Cache-1T Normal
Cluster# CSW# Name Status
1 0 CSW-1N Normal
1 0 CSW-1P Service
```

3.6.6 Check Backend Disk Status

Command:

```
list dkc_status
list dkp_status
list dku_status
```

Example:

```
Component, Status
Processor, Normal
CSW, Serious
Cache, Moderate
Shared Memory, Normal
Power Supply, Normal
Battery, Normal
Fan, Normal
Environment, Serious
Cluster# DKA# DKP# Name Status
1 1 1 DKP80-1B Normal
1 2 2 DKP80-1C Service
1 3 3 DKP80-1D Acute
1 4 4 DKP80-1E Serious
Component, Status
Power Supply, Normal
Fan, Normal
Environment, Serious
Drive, Acute
```

3.6.7 Check Shared Memory Details

Command:

```
list sm_status
```

Example:

```
Cluster# CHA# Name Status
1 5 MIX-1A Normal
1 6 CHA-1B Normal
2 5 MIX-2F Normal
2 6 CHA-2E Normal
```

3.6.8 Check Capacity Utlilzation

The commands below help to check the capacity utilization in parity groups and pools.

Command:

```
list pg_freespace_info
```

3.7 Brocade Switches

On Brocade switches, health check and capacity reporting is performed by accessing the switch via the SSH terminal. Some of the commands that may be run to retrieve information are given below.

3.7.1 Check for Errors

Look for errors on the switch.

Command:

```
errshow –a
```

Example:

```
2010/08/25-10:10:41, [SEC-1203], 9036, CHASSIS, INFO, \
Spir_67, Login information : Login successful via \
TELNET/SSH/RSH. IP Addr: 10.106.7.62
[Type <CR> to continue, Q<CR> to stop:
2010/08/25-10:13:41, [ZONE-1022], 9037, CHASSIS, INFO,\
Spir_67, The effective configuration has changed to meh.
[Type <CR> to continue, Q<CR> to stop:
2010/08/25-11:35:04, [FABR-1001], 9041, CHASSIS, WARNING, \
Spir_67, port 0, incompatible Long distance mode.
[Type <CR> to continue, Q<CR> to stop:
2010/08/25-11:39:35, [LOG-1000], 9043, CHASSIS, INFO, \
```

```
Spir_67, Previous message repeated 1 time(s)
        [Type <CR> to continue, Q<CR> to stop:
```

3.7.2 Check Hardware Components

Use the commands below to check the status of hardware components:

Command:

psshow

fanshow

chassisshow

slotshow

Example:

```
switch:admin> fanshow
Fan #1 is OK, speed is 2721 RPM
Fan #2 is OK, speed is 2657 RPM
Fan #3 is OK, speed is 2700 RPM
```

```
switch:admin> psshow
Power Supply #1 is OK
DELTA DPS-1001AB-1E 23000000601 S1 IXD0111000088
Power Supply #2 is faulty
DELTA DPS-1001AB-1E 23000000601 S1 IXD0111000162
Power Supply #3 is OK
DELTA DPS-1001AB-1E 23000000601 S1 IXD0111000120
Power Supply #4 is absent
```

```
switch:user> chassisshow
Chassis Family: DCX8510-8
Chassis Backplane Revision: 0
SW BLADE Slot: 1
Header Version: 2
Power Consume Factor: -180
Power Usage (Watts): -286
Factory Part Num: 60-1002144-02
Factory Serial Num: BQB0345F00G
Manufacture: Day: 9 Month: 11 Year: 2010
Update: Day: 19 Month: 2 Year: 2011
Time Alive: 41 days
Time Awake: 1 days
SW BLADE Slot: 2
Header Version: 2
Power Consume Factor: -180
Power Usage (Watts): -306
Factory Part Num: 60-1002144-02
Factory Serial Num: BQB0345F02R
Manufacture: Day: 21 Month: 11 Year: 2010
Update: Day: 19 Month: 2 Year: 2011
Time Alive: 41 days
```

```
Time Awake: 1 days
SW BLADE Slot: 3
Header Version: 2
Power Consume Factor: -180
Power Usage (Watts): -315
Factory Part Num: 60-1002144-02
Factory Serial Num: BQB0345F01N
Manufacture: Day: 16 Month: 11 Year: 2010
Update: Day: 19 Month: 2 Year: 2011
Time Alive: 39 days
Time Awake: 1 days
(output truncated)
```

```
switch:user> slotshow
Slot Blade Type ID Status
--------------------------------
1 SW BLADE 97 ENABLED
2 SW BLADE 96 ENABLED
3 SW BLADE 97 ENABLED
4 SW BLADE 96 ENABLED
5 CORE BLADE 98 ENABLED
6 CP BLADE 50 ENABLED
7 CP BLADE 50 ENABLED
8 CORE BLADE 98 ENABLED
9 SW BLADE 125 ENABLED
10 SW BLADE 126 ENABLED
11 SW BLADE 37 ENABLED
12 SW BLADE 55 ENABLED
```

3.7.3 Check Port Utilization

Check the number of used and unused ports to generate capacity report for switches.

Command:

```
switchshow
```

Example:

```
switch:admin> switchshow
switchName: Spirit_125
switchType: 66.1
switchState: Online
switchMode: Access Gateway Mode
switchWwn: 10:00:00:05:1e:85:95:d0
switchBeacon: OFF
FC Router: OFF
FC Router BB Fabric ID: 1
Area Port Media Speed State Proto
==================================
0 0 -- N8 No_Module FC
1 1 -- N8 No_Module FC
2 2 -- N8 No_Module FC
3 3 -- N8 No_Module FC
4 4 -- N8 No_Module FC
5 5 -- N8 No_Module FC
6 6 -- N8 No_Module FC
7 7 -- N8 No_Module FC
```

```
8 8 -- N8 No_Module FC
9 9 id N8 Online FC F-Port 10:00:00:05:1e:53:2c:54 0x690105 (AoQ)
```

3.8 Cisco Switches

Use the following commands to check the status of Cisco switches and to generate a capacity report.

3.8.1 Check basic hardware and environmental information

Use the below command to check basic hardware configuration.

Command:

```
show environment power
show environment fan
show environment temperature
```

Example:

```
MDS# show environment power
----------------------------------------------------
PS Model Power Power Status
(Watts) (Amp @42V)
----------------------------------------------------
1 DS-CAC-2500W 1153.32 27.46 ok
2 DS-CAC-2500W 1153.32 27.46 ok
Mod Model Power Power Power Power Status
Requested Requested Allocated Allocated
(Watts) (Amp @42V) (Watts) (Amp @42V)
--- ------------------ ------- ---------- --------- ---------- ----------
1 DS-X9016 210.00 5.00 210.00 5.00 powered-up
2 DS-X9308-SMIP 200.34 4.77 200.34 4.77 powered-up
5 DS-X9530-SF1-K9 209.16 4.98 209.16 4.98 powered-up
6 DS-X9530-SF1-K9 209.16 4.98 209.16 4.98 powered-up
7 DS-X9016 210.00 5.00 0.00 0.00 pwr-denied

MDS# show environment fan
----------------------------------------------------
Fan Model Hw Status
----------------------------------------------------
Chassis DS-9SLOT-FAN 1.2 ok
PS-1 -- -- ok
PS-2 -- -- ok
MDS# show environment temperature
-----------------------------------------------------------------
Module Sensor MajorThresh MinorThres CurTemp Status
(Celsius) (Celsius) (Celsius)
-----------------------------------------------------------------
1 Outlet 75 60 37 ok
1 Intake 65 50 31 ok
2 Outlet 75 60 36 ok
2 Intake 65 50 30 ok
. . .
```

3.8.2 Check Port Usage

Check port usage to generate capacity reports.

Command:

```
show interface brief
```

Example:

```
MDS# show flogi database
--------------------------------------------------------------------------------
INTERFACE VSAN FCID PORT NAME NODE NAME
--------------------------------------------------------------------------------
fc1/1 1 0x050001 50:06:04:8a:cc:c8:bd:a1 50:06:04:8a:cc:c8:bd:a1
fc1/3 1 0x050003 50:06:04:8a:cc:c8:bd:9e 50:06:04:8a:cc:c8:bd:9e
fc1/13 1 0x0501ef 50:06:01:62:3c:e0:16:7c 50:06:01:60:bc:e0:16:7c
```

4. Automating Health Check

Now that we have described the procedures for health check and capacity calculation on different arrays, our next step is to simplify and automate these tasks. In this section, we look at different approaches toward automation in various environments.

4.1 Automation in Linux Environment

As it is a well-equipped scripting platform, automation in Linux environment is primarily implemented using the basic shell scripts. The commands required to perform health checks and capacity reporting (as discussed in Chapter 3) is combined into a shell script.

4.2 Automation in Windows Environment

In this article, we discuss scripts written in Windows, since most of our management servers are based on Windows. When it comes to Windows environment, we have multiple possibilities for automation starting with the basic DOS CMD Batch scripts to advanced PowerShell scripts. This article discusses automation using PowerShell Scripts as it has the following advantages.

Advantages of PowerShell:

- PowerShell is built on .Net Framework and hence has full access to all .Net classes, COM, and WMI
- PowerShell provides a hosting API with which the Windows PowerShell runtime can be embedded inside other applications
- PowerShell can be integrated with Microsoft Office components such as Excel, PowerPoint, and Outlook.

This section covers some scripts that can be used for data collection from arrays and switches.

4.3 Data Collection from a Cisco Switch

As discussed in section 3.8, we can connect to the SSH terminal of a Cisco switch to collect information necessary to generate a health check and capacity report. A basic batch and PowerShell script can help automate this task. These scripts require two input files.

1. switch_info.txt – a file that contains information regarding the different switches, their IP addresses, and credentials.

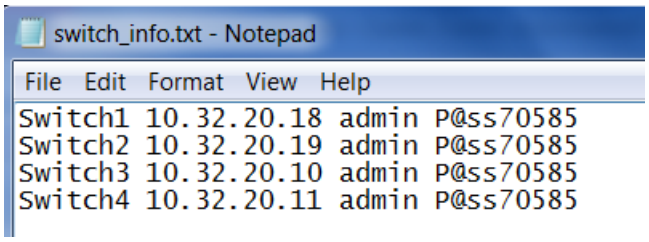


Figure 22: Input File – Switch_info

2. switch_commands.txt – a file that contains the basic commands that must be executed once a SSH connection is established to the switch.

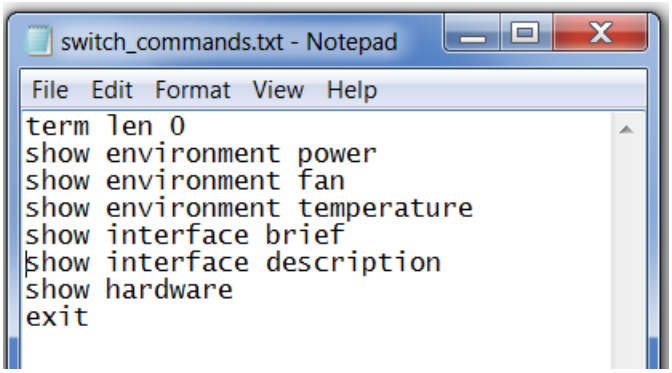


Figure 23: Input File – Switch_commands.txt

The scripts utilize Plink to establish a SSH terminal to a switch. Plink is a CLI version of Putty which can be used to automatically log in (via ssh) to a switch and execute a set of commands.

The batch version of the script looks like this:

```
FOR /F "tokens=1,2,3,4 delims=/ " %%a IN (switch_info.txt) DO (
plink -ssh %%b -l %%c -pw %%d < switch_commands.txt > %%a.txt
)
```

This script connects to each switch and executes the commands listed in the switch_commands.txt file. The output is redirected to a file named after the switch. A PowerShell version of the same script can be found below. The entire script can be found on EMC One - http://one.emc.com/clearspace/docs/DOC-89592. The advantages of using PowerShell over batch script will be discussed in the section, Gathering the Data. The same procedure can be used to collect data from Brocade switches, VPLEX, and EMC Avamar products.

Switch_Status_Check.ps1*

```
27  ###################################################################
28  # DEFINE FUNCTION - Process_Switch
29  ###################################################################
30
31  function Process_Switch($username, $password, $switchIp, $SwitchName){
32
33      $output = Get-Content cisco_commands4.sh | ./plink.exe -pw $password  $username@$switchIp -v
34
35  }
36
37  ###################################################################
38  # MAIN Program
39  ###################################################################
40
41   Get-Content .\switch_info.txt | select-string -NotMatch "^#" | %{
42   $username = ($_ -split "\s+")[2]
43   $password = ($_ -split "\s+")[3]
44   $SwitchIp = ($_ -split "\s+")[1]
45   $SwitchName = ($_ -split "\s+")[0]
46   Process_Switch $username $password $SwitchIp $SwitchName
47   }
```

Figure 24: Screenshot – PowerShell Script – Cisco Switch

The script results in multiple output files, one for each switch, which contains the output of the commands specified in input file switch_commands.txt.

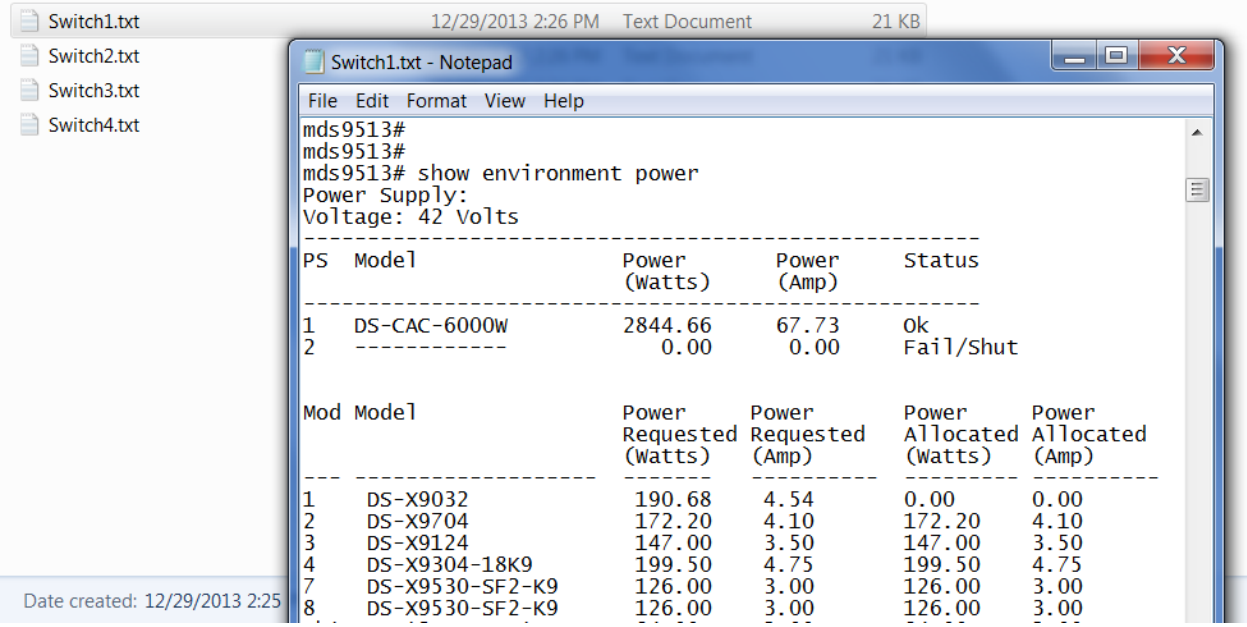


Figure 25: Screenshot – Script results

4.4 Data Collection from Symmetrix Arrays

Data collection from Symmetrix arrays can be automated by implementing scripts on the management host that hosts Solutions Enabler. Solutions Enabler commands may be put together into a batch script or PowerShell script to automatically collect information. Below we see one such PowerShell Script. The entire script can be found at this location on EMC One.

http://one.emc.com/clearspace/docs/DOC-89586

Symmetrix_Grabber.ps1

```
24
25  function Initialize(){
26  $symids = read-host "Enter Symmetrix ID for generating report. Or leave blank for all A
27
28      if (($symids -eq "")-or ($symids -eq $null)){
29          if ($dev_mode -eq "OFF"){
30          symcfg list > $symcfg_list_file
31          }
32          $symids = Get-Content $symcfg_list_file | %{$_.trim()} | select-string "Local"
33      }else{
34         $symids = @($symids -split ",")
35      }
36
37      foreach ($symid in $symids){
38          if($symid){
39          if ($dev_mode -eq "OFF"){
40              $file_name = ($symid+"_data.txt")
41              Remove-Item $file_name -ErrorAction silentlyContinue
42
43              #Health Check Section
44              "Collecting Data for $symid"
45              "Environmental Data.."
46              symcfg -sid $symid list -env_data >> $file_name
47              "Director Data.."
48              symcfg -sid $symid list -dir all >> $file_name
49              "Event Data.."
50              symevent -sid $symid list -error -fatal >> $file_name
51              "Failed Disks Data.."
52              symdisk -sid $symid list -failed >> $file_name
53              #Capacity Section
54              "Disk Group Capacity Data.."
55              symdisk -sid $symid list -dskgrp_summary  >> $file_name
56              "Thin Pool Capacity Data.."
57              symcfg -sid $symid list -thin -pools -mb -detail >> $file_name
58              symcfg -sid $symid list -thin -pools -mb -v -detail >> $file_name
59
60          }
61          }
```

Figure 26**: PowerShell Script – Symmetrix Data Collection**

This script results in multiple output files as shown in Figure 27, one for each Symmetrix array which contains information necessary to generate a health check and capacity report. In the Gathering the Data chapter, we discuss ways to gather this data and process it to generate meaningful reports.

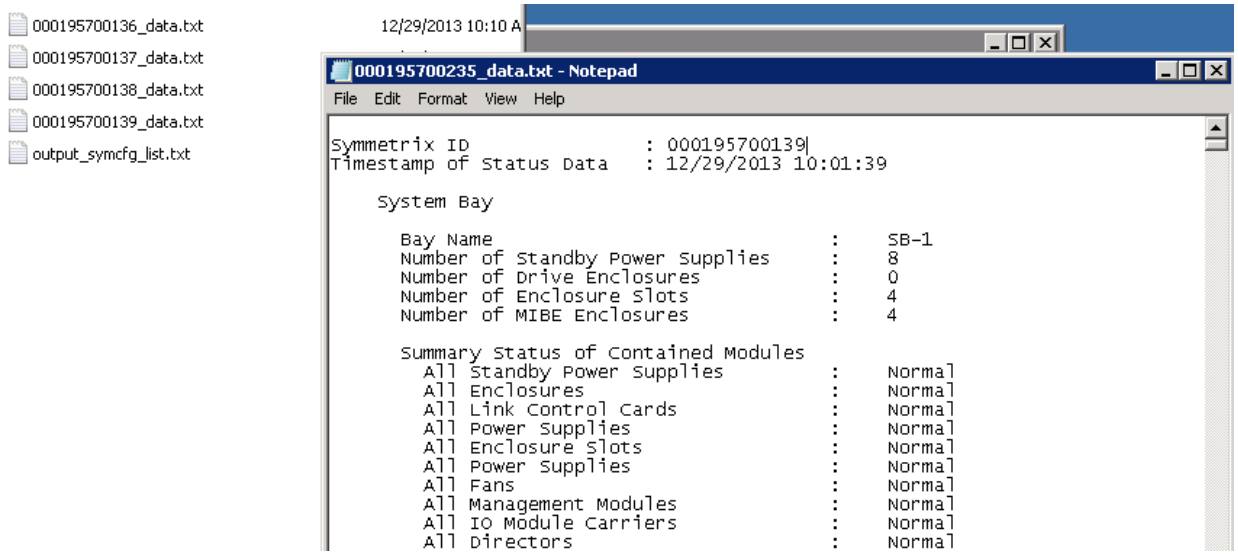


Figure 27: Screenshot – Chapter Symmetrix Reports

5. Gathering the Data

Once data is collected at individual management stations - which may be in different environments, different domains, different customer sites, different data centers or any location on the globe – we collate them to a single location to process and generate meaningful collaborated reports. In this Chapter we discuss various ways of collating this information and processing them.

5.1 Data Collection Approaches

Data may be gathered from various management hosts in three ways. Data may be sent to the administrators email ID through email, or output files may be redirected to a location on the common share via remote login. A third option is to automatically upload the files to a location on the FTP share so that the files may be available outside the organization's infrastructure. Graph in Figure 28 describes the three ways.

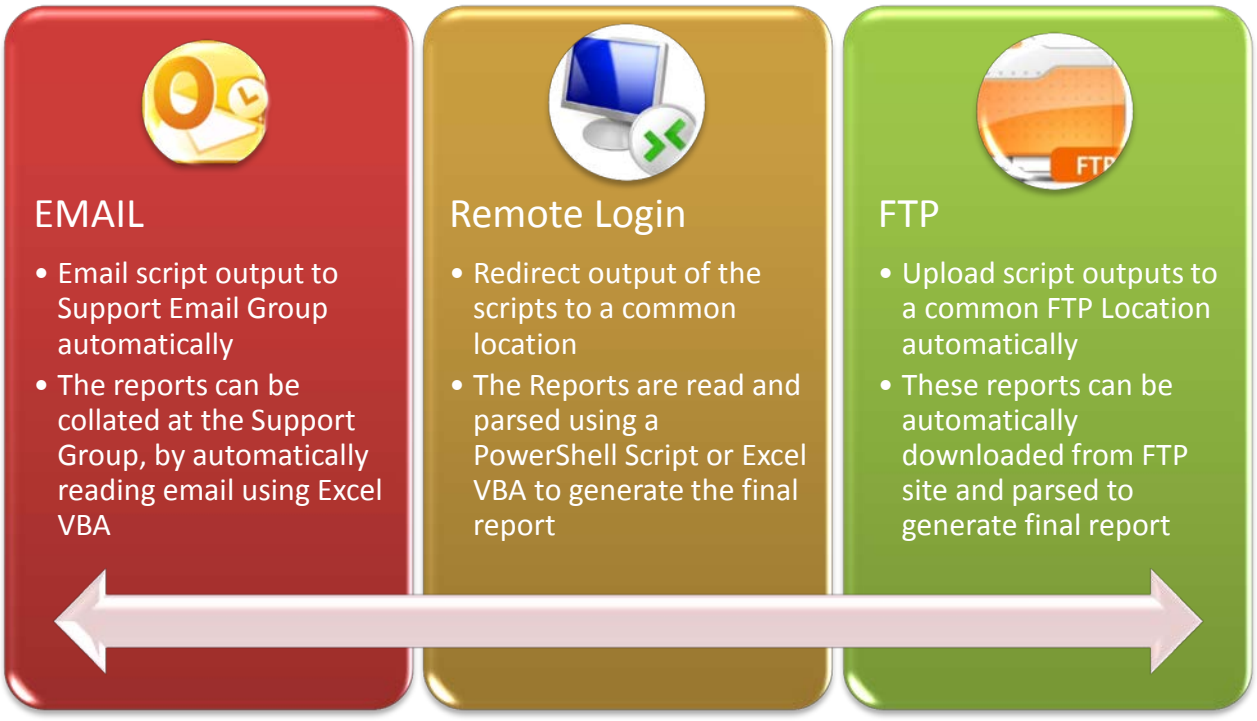


Figure 28: Data Collection Approaches

5.2 Advantages of using PowerShell over Batch Script

The advantage of using an enhanced scripting utility such as PowerShell is that it helps in implementing the above mentioned tasks.

- With PowerShell, we can easily send the results as an email using a local SMTP server
- The FTP Client module helps us to easily upload results to an FTP location
- PowerShell can also be integrated with API's of cloud service provides such as Amazon S3 or Google Drive to share the results via cloud

Each of these are described in detail below.

5.3 Email results using PowerShell

The built-in .Net classes in PowerShell helps to easily email results to administrators from any management station. Obviously, restrictions in the customer environment regarding emailing and SMTP issues must be taken care of first.

Pre-requisites:

- Contact network administrator must know if it is OK to automatically send email from the management servers to the destination email ID
- Get the SMTP Server details – address is sufficient in most cases
- Ensure the server firewall permits PowerShell to send email

Script:

Below is the PowerShell script that performs this task.

```
#####################################################################
# Email Results
#####################################################################
# Define Variables
$Send_Email = 1
$to_addr = "mumshad.mannambeth@emc.com"
$from_addr = "Switch_REPORT@emc.com"
$smtpServer = "smtp.emc.com"

# Global Output
$email_body = $global:All_Output | Out-String
if ($Send_Email -eq 1){
Send-MailMessage -To $to_addr -From $from_addr -Subject "Switch Report" -Body $email_body -
SmtpServer $smtpServer
}
```

5.4 Upload results to FTP Location using PowerShell

The PSFTP module helps us to easily connect to FTP location and upload or download files as necessary.

Pre-Requisites:

- Download PSFTP module from Microsoft Technet Website
- The server must have port open to connect to FTP site
- Firewall must allow PowerShell to connect to FTP site

Script:

Below is the PowerShell script that can upload results to a FTP location. This may be appended to the scripts that collect information from individual arrays:

```
#######################################
# UPLOAD TO FTP
#######################################
# Import PSFTP Module
Import-Module PSFTP

#Set FTP Target Upload Path
$url = "ftp://yKJiFAUoU:oJqJ6oqoB6@ftp.emc.com/"

#Set the location of the report file to be uploaded
$report = "c:\my_report_file.txt"

#Derive username and password from URL
    $pass = (($url -split "//")[1] -split "@")[0] -split ":")[1]
    $user = (($url -split "//")[1] -split ":")[0]
    $global:server = "ftp://" + (($url -split "/")[2] -split "@")[1]
    $path = ($url -split "/",4)[3]

#Set Credentials and Initiate connection to FTP site
    $password = ConvertTo-SecureString $pass -AsPlainText -Force
    $username = $user
    $cred = New-Object System.Management.Automation.PSCredential $username, $password
    Set-FTPConnection -Credentials $cred -Server $server -Session MyTestSession -UseBinary -
UsePassive

#Upload files to FTP
Add-FTPItem -Session $global:Session -Path $path -LocalPath $report
```

5.5 Set up Scheduled Tasks to automatically run the scripts

It is now time to set up and forget! Even though collecting information from individual SAN components has been automated, it is still a tedious task to run these scripts on 100s of management servers spread across the globe. Set up a task scheduler to automatically execute these scripts as per the customer requirement. Some customers may want a report weekly

while the others may need it on a monthly basis. Here are different ways to set up a scheduler in Windows and Linux Platforms.

5.5.1 Windows

Once we have deployed the script that would collect information from arrays and email the results to the administrators, we must set up a trigger for the script. The 'Task Scheduler' in Windows helps us achieve this. Open the task scheduler from Start-> All Programs -> Accessories -> System Tools -> Task Scheduler.

Once task scheduler is opened:

1. Select the wizard – Create Task
2. Give the task a meaningful name
3. Go to Triggers tab and select the interval to run the task – Daily, Weekly, Monthly
4. Go to Actions tab and select the script to run

5.5.2 Linux

In Linux, use Crone Tab to set up automatic script execution. Cron job are used to schedule commands to be executed periodically. You can set up commands or scripts, which will repeatedly run at a set time[5].

1. To edit your crontab file use command -> crontab –e
2. Append the script to be run along with arguments in the following format:

```
* * * * * command to be executed
- - - - -
| | | | |
| | | | ----- Day of week (0 - 7) (Sunday=0 or 7)
| | | ------- Month (1 - 12)
| | --------- Day of month (1 - 31)
| ----------- Hour (0 - 23)
------------- Minute (0 - 59)
```

Example:

```
0 3 * * * /root/backup.sh
```

6. Processing and Generating Report

Thus far, we have deployed scripts to collect information from the arrays. We have set up task schedulers to automatically run these scripts. The scripts collect information from the arrays and upload them to a central location. Once all the information needed is in a central location, the next step is to process this data and generate meaningful reports. This can be accomplished using various scripting techniques. The objective is to parse through the output of commands gathered and process it to generate reports. Since the final reports are best viewable in an Excel spreadsheet, we propose a method utilizing Excel VBA (Visual Basic for Applications) to process and present the data.

VBA enables building user defined functions (UDFs), automating processes and accessing Windows API and other low-level functionality through dynamic-link libraries (DLLs)[6]. With its seamless integration with Microsoft Excel, VBA provides a good platform for data analysis and presentation. A completely developed Excel spreadsheet with the VBA code can be found at EMC One - http://one.emc.com/clearspace/docs/DOC-89591. The sheet is explained in this section.

6.1 VBA Function to read information from Outlook Emails

Below is the code snippet of a function used to read the latest email containing a particular string in the subject line from Outlook:

```
Public Function get_latest_outlookmail(subject_line) As String

      Dim olApp As Outlook.Application
      Dim objNS As Outlook.Namespace
      Set olApp = Outlook.Application
      Set objNS = olApp.GetNamespace("MAPI")

      Set myINBOXFolder = objNS.GetDefaultFolder(olFolderInbox)

      If Worksheets("settings").Cells(2, 2) = "Inbox" Then
             Set myOlItems = myINBOXFolder.Items
      Else
             t = Worksheets("settings").Cells(2, 2)
             Set myNewFolder = myINBOXFolder.Folders(t)
             Set myOlItems = myNewFolder.Items
      End If

      Set myItem = myOlItems(1)
      Dim latest_date As Date

    For Each mail In myOlItems

        If mail.Subject = subject_line Then
```

```
                    If mail.CreationTime > latest_date Then
                          latest_date = mail.CreationTime
                          latest_body = mail.Body
                    End If
        End If
    Next mail
    get_latest_outlookmail = latest_body

End Function
```

6.2 VBA Function to read data from File

VBA also has the ability to read data directly from the files.

```
Function read_file(filename) As String

            Open filename For Input As #1
            WholeFile = Input$(LOF(1), #1)
            Close #1

            read_file = WholeFile

End Function
```

6.3 VBA Function to analyze Symmetrix Data

Once the data is read from the sources, it is analyzed by VBA and updated in the spreadsheet reports. A code snippet on data processing is shown below:

```
Public Function process_disk_section(section, array_id)

    disk_details = ""
    disk_details_section = False

        For Each Line In Split(section, vbLf)
            Line = Replace(Line, vbCr, "")

                If disk_details_section = True And Line <> "" And Line <> " " Then
                    disk_details = disk_details & vbLf & "DISK: " & Line
                End If

        Next Line

        If disk_details <> "" Then
        updateErrorNotes Worksheets("VMAX-DMX").Cells(array_id.Row, 5), disk_details
            If Worksheets("VMAX-DMX").Cells(array_id.Row, 4) = "OK" Then
                        Worksheets("VMAX-DMX").Cells(array_id.Row, 4) = "DEGRADED"
                        markRed Worksheets("VMAX-DMX").Cells(array_id.Row, 5)
            End If

        End If
End Function
```

6.4 Symmetrix Health Check Report

The Symmetrix Health Check report displays the basic health status of the array, and notes indicating the fault on it. Below is a sample Symmetrix Health Check report.

Management Serv	Array Name	Serial Number	Status	Notes
GSUN628	GROSYM009	0001 300	OK	
GSUN628	GROT1SAN011	0001 388	OK	
GSUN628	GROSAN300	0001 320	OK	
AMRNDHS041	NDHT1SAN001	0001 563	DEGRADED	ENVIRONMENT: SystemBay:All Standby Power Supplies : Failed (1)
AMRNDHS041	NDHT1SAN002	0001 371	DEGRADED	DIR: RF-3C 03C 35 3 RDF-BI-DIR Offline DIR: RF-3D 03D 51 3 RDF-BI-DIR Offline DIR: RF-14D 14D 62 14 RDF-BI-DIR Offline
AMRNDHS041	NDHT1SAN003	0001 382	DEGRADED	DIR: RF-3C 03C 35 3 RDF-BI-DIR Offline DIR: RF-3D 03D 51 3 RDF-BI-DIR Offline DIR: RF-14D 14D 62 14 RDF-BI-DIR Offline
AMRNDHS041	NDHT1SAN004	0001 553	DEGRADED	DISK: DF-1D 01D C 9 SEAGATE T300155 0 0 0 286102
AMRNDHS041	NDHSAN300	0001 121	DEGRADED	DIR: DF-6A 06A 6 6 DISK Dead
AMRNDHS041	NDHSAN301	0001 552	OK	
AMRNDHS041	NDHSAN303	0001 509	DEGRADED	DISK: DF-7A 07A C 4 SEAGATE EGC4515 0 0 0 418710
AMRNDHS041	NDHSAN304	0001 520	OK	
AMRNDHS041	NDHSAN302	0001 564	OK	
amrndhw2278	NDHSAN307	0001 038	OK	

Figure 29: Screenshot – Report Symmetrix Health Check

6.5 Symmetrix Capacity Report

Similarly, Symmetrix Capacity report displays total capacity and storage group-wise capacity.

VMax name	Serial number	Total capacity	Used capacity (Gb)	% used
SC9-VMAX2875	19 '5	684204	681605	99.6

Disk Groups

Disk group name	Type	% used	Capacity (GB)	Free (GB)
DISK_GROUP_001	FC	99	499399.8	2507.31
DISK_GROUP_002	SATA	99	149042.19	91.76
DISK_GROUP_003	EFD	100	17881.41	0.19
DISK_GROUP_004	EFD	100	17881.41	0.19

Thin Pools

Thin Pool Name	Enabled Capaci	Current Alloca	% Allocated	Free (GB)	Max subscripti	% subscribed
EFD_2875	30809.8	23768.59	77	7041.26	100%	80
FC_2875	365335.6	77429.63	21	287905.44	0%	33
SATA_2875	109861.92	85061.63	77	24800.30	0%	117

Figure 30: Screenshot – Symmetrix Capacity Reporting

6.6 Symmetrix Capacity report per Storage Group

The sheet also provides a Symmetrix Capacity report on a per storage group basis.

Storage Group	Total Avaialble GB
ALP_DST_APP_PROD_ESX_4-0_CLUS1_SG	13126.34
ALP_DST_APP_UAT_ESX_4-0_CLUS1_SG	2187.72
ALP_DST_APP_UAT_ESX_4-0_CLUS1_SG	2734.65
ALP_DST_APP_UAT_ESX_4-0_CLUS1_SG	2461.19
ALP_DST_DB_PROD_ESX_4-0_CLUS1_SG	1914.25
ALP_DST_DB_UAT_ESX_4-0_CLUS1_SG	1914.25
ALP_DST_DB_UAT_ESX_4-0_CLUS1_SG	1093.86
ALP_DST_DB_UAT_ESX_4-0_CLUS1_SG	1093.86
ALP_PROD_ESX_4-0_CLUS1_SG	820.39
ALP_PROD_BIZTALK_ESX_4-0_CLUS1_SG	820.39
ALP_PROD_BIZTALK_ESX_4-0_CLUS1_SG	820.39
ALP_PROD_BIZTALK_ESX_4-0_CLUS1_SG	820.39
ALP_PROD_CTX_ESX_4-0_CLUS1_SG	1367.32
ALP_PROD_CTX_ESX_4-0_CLUS2_SG	15040.6
ALP_PROD_FN_ESX_4-0_CLUS1_SG	5469.31
ALP_PROD_FN_ESX_4-0_CLUS1_SG	1914.25
ALP_PROD_ORACLE_DB_4-0_CLUS1_SG	1914.25

Figure 31**: Symmetrix Capacity Report per Storage Group**

6.7 VNX Health Check Report

The VNX Health Check report provides a list of VNX arrays and their general health status. If any array is degraded, detailed information on the error is given.

Management Server A	Array Name	Seri	Status	Notes	Incident Number	Incident Ov
10 225	AM	N001	OK			
10 .13	AS	001	OK			
10 .4	AS	002	OK			
bjg 1spa	BJ	001	DEGRADED	++ERR-:Perf Manual Check		
ch)2spa	CH	I002	OK			
fre 1a.de.pfizer.com	FRI	001	DEGRADED	System Fault LED: ON; Disk Failed	GRO20041088i	gantav
fre 2a.de.pfizer.com	FRI	002	OK			
gr( )a	GR	)1	OK			
gr( )2spa	GR	N002	OK			
gr( )8spa	GR	N008	OK			
gr( )9spa	GR	N009	DEGRADED	System Fault LED: ON	GRO20022057i	Vummak
ich 1a	ICH	001	OK		JPN20057589i	JAINA76
ich 2a	ICH	002	OK			

Faulted Subsystem: GROT2SAN009

Bus 3 Enclosure 1 : Faulted
Bus 3 Enclosure 1 Disk 5 : Removed

Figure 32: Screenshot – VNX Health Check Report

6.8 VNX Capacity Report

The VNX Capacity Report provides detailed information regarding the overall capacity utilization. Capacity utilization per host as well as raw capacity information is displayed.

WDC-VNX7500-0889	
Server Name (Masking View)	**Size (GB)**
VPLEX_0150	208776
wdc-dr-prod-vmg2-3	36936
wdc-dr-prod-vmg3-4	114912
wdc-dr-prod-vmg5-1	2052
wdc-dr-prod-vmg5-2	2052
wdc-dr-prod-vmg5-3	30780
wdc-dr-prod-vmg5-4	2052
wdc-dr-prod-vmg6-2	16416
wdc-drsp-prod-vmg1,	16384
wdc-dr-srm1,	24612
WDC-RPA2-DR	10106
WDC-RPA3-DR	2249
WDC-RPA4-DR	6858
Logical Capacity Summary	
Total Lun Capacity	6,505.84
Total Allocated LUN Capacity	873
Total UnAllocated LUN Capacity	632.84
Raw Disk Space	68729

WDC-VNX7500-0889	
Server Name (Masking View)	**Size (GB)**
wdc-dr-prod-vmg6-2	16416
wdc-dr-srm1	28708
wdc-dr-prod-vmg3-2	114912
wdc-drsp-prod-vmg1	16384
wdc-dr-prod-vmg2-1	36936
wdc-dr-prod-vmg2-3	36936
WDC-RPA4-DR	68386
WDC-RPA2-DR	190662
wdc-dr-prod-vmg5-1	30780
wdc-dr-prod-vmg3-4	114912
wdc-dr-prod-vmg3-5	114912
Logical Capacity Summary	
Total Lun Capacity	506,505.84
Total Allocated LUN Capacity	470,873
Total UnAllocated LUN Capacity	35,632.84
Raw Disk Space	588729

Figure 33: Screenshot – VNX Capacity Report

6.9 XIV Health Check Report

The XIV Sheet provides XIV Health Check Report and detailed information on the failure on the array.

Array Name	Status	Notes	Incident Number	Incid
N ...100	OK			
N ...101	OK			
N ...102	OK			
N ...103	OK			
N ...104	DEGRADED	Health Checks FAILED		
SC ...100	OK			
SC ...101	OK			
SU ...100	OK			
N ...01	OK			
SC ...01	OK			

"1:Disk:5:3","Failed","no"

Figure 34: Screenshot – XIV Health Check Report

6.10 Switch Health Check Report

The Switch sheet displays health check report on the switches. Details regarding the errors are also displayed.

Switch Name	Serial Number	Status	Notes	Incident Number
Brocade_Switch1	XYZ10245	OK		
Brocade_Switch2	XYZ10246	OK		
Cisco_Switch1	XYZ10247	DEGRADED	SFP Failure	
Cisco_Switch2	XYZ10248	DEGRADED	Port Down, High Error Count on Port fc1/2	
Cisco_Switch3	XYZ10249	OK		
Cisco_Switch4	XYZ10250	OK		

Figure 35**: Screenshot – Switch Health Check**

6.11 Switch Capacity Report

The Switch capacity page displays capacity information about the switches.

Switch Name	Total Port	st Allocated	Max Por	Use	Vendo	Model
Grl-bcd-01	32	15	32	Shared Backup	Brocade	5000
Grl-bcd-02	32	15	32	Shared Backup	Brocade	5000
Msl-mcd-13	32	31	32	Shared Backup	Mcdata	Sphereon 4700
Msl-mcd-14	32	31	32	Shared Backup	Mcdata	Sphereon 4700
Prl-mcd-03	24	18	32	Shared Backup		
Prl-mcd-04	24	18	32	Shared Backup		
Swi-csc-01	40	36	48	Shared Backup	cisco	Cisco MDS 9148
Swi-csc-02	40	37	48	Shared Backup	cisco	Cisco MDS 9148
Wat-mcd-09	32	27	32	Shared Backup	Mcdata	DS-4700M
Wat-mcd-10	32	28	32	Shared Backup	Mcdata	DS-4700M
Grl-dir-01	40	10	144	Shared SAN	Mcdata	ED-140M
Grl-dir-02	40	14	144	Shared SAN	Mcdata	ED-140M
Grl-mcd-01	24	5	24	Shared SAN	Mcdata	DS-24M2
Grl-mcd-02	24	6	24	Shared SAN	Mcdata	DS-24M2
Grl-mcd-03	24	10	24	Shared SAN	Mcdata	DS-24M2

Figure 36: Screenshot – Switch Capacity Report

6.12 Consolidated Health Check Report Graph of SAN Environment

The dashboard also displays a consolidated graph of all the arrays and their general health status.

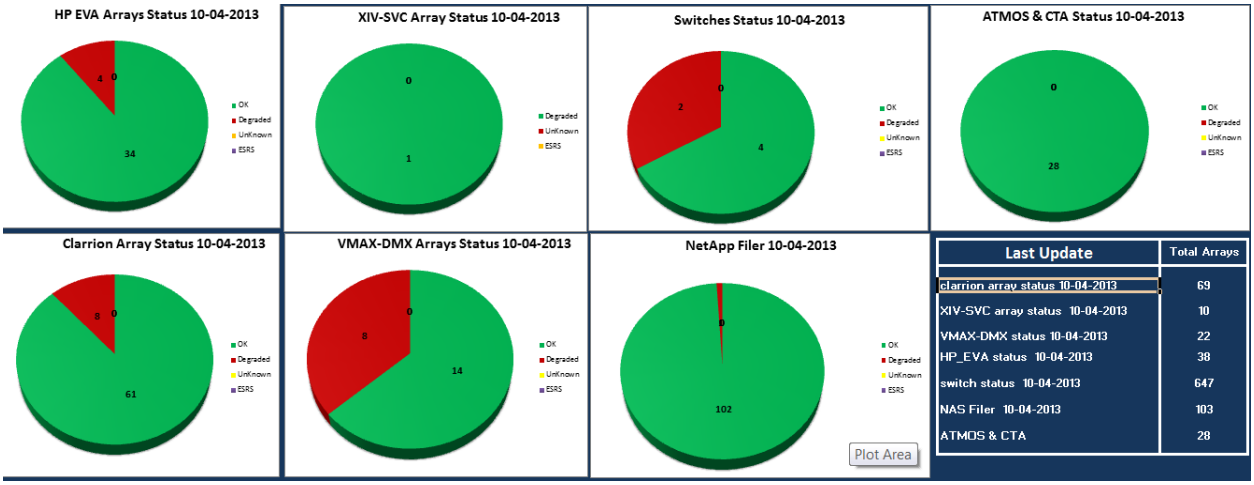


Figure 37: Screenshot – Dash Board – Consolidated Graph

7. Advantages

The tools and techniques described in the previous few sections help us to perform health check and capacity reporting for any number of arrays from any vendor, in an easy, fast manner.

- This procedure can be used to perform reporting on any array from any vendor. By inserting modules for each array we are able to integrate any type of array into the Excel Reporting tool.
- Risk of missing information due to human error when done manually can be eliminated.
- It took multiple engineers to log on to 100s of management stations each time to collect information from the arrays. Now, with the tasks scheduled to run automatically, array information is automatically collated in a central location.
- Administrators no longer need to go through the output of each command and analyze the health of the array; instead Excel VBA performs this task and updates the spreadsheet.
- Time savings for such a solution is significant. Table 1 Time Savings with Automation shows the time saved with this approach in a large account with storage arrays from multiple vendors. As shown, up to 64 hours' worth of human effort can be saved with the entire process for reporting on a large data center with 263 components.

Array Type	Time / Array	Total Arrays	Total Time	Automation
Symmetrix	15 Minutes	22	330 Minutes	5 Minutes
CLARiiON/VNX	20 Minutes	69	1380 Minutes	5 Minutes
XIV	15 Minutes	10	150 Minutes	5 Minutes
Switch	10 Minutes	124	1240 Minutes	5 Minutes
HP EVA	20 Minutes	38	760 Minutes	5 Minutes
Total	**100 Minutes (~1.6 Hours)**	**263**	**3860 Minutes (~64 Hours)**	**30 Minutes**

Table 1: Time Savings with Automation

To generate a consolidated report that can be presented to top management would require multiple administrators working in parallel for a couple of days to perform health checks and capacity reporting on all the components of the SAN infrastructure. However, with automation implemented, most of these tasks wouldn't even require human intervention. The reports automatically arrive at the administrator's email ID or are accumulated in a common place. Once the reports arrive, it is only a matter of seconds for Excel to combine it.

8. Conclusions

This article discussed new techniques that may be implemented in various stages of health check and capacity reporting for a variety of arrays in a SAN environment. Health check routines for multiple arrays were discussed in detail and scripts are deployed to automate these tasks. The tools and scripts deployed help in automatically collating information from the arrays and generating reports without human intervention. These were deployed in various projects in EMC Managed Services and resulted in significant time savings. In a large account consisting of approximately 250 components in a SAN network, this procedure resulted in a time saving of up to 64 hours. Reporting is now an easy and automated task requiring almost zero human effort. Additional modules may be added to the VBA solution to include support for other multi-vendor arrays and SAN components not discussed in this article.

9. Appendix

Cisco Status Check Script http://one.emc.com/clearspace/docs/DOC-89592

Symmetrix Grabber Script http://one.emc.com/clearspace/docs/DOC-89586

Excel VBA Solution for consolidated reporting http://one.emc.com/clearspace/docs/DOC-89591

10. References

[1] VNX for Block Command Line Interface Reference -1.0

[2] Hitachi Command Suite Software CLI Reference Guide available at [http://www.hds.com/assets/pdf/hitachi-command-suite-software-cli-reference-guide.pdf]

[3] Overview of the IBM XIV Storage System Command-line interface

[4] HP StorageWorks Command View XP Command Line Interface (CLI) reference available at http://h20564.www2.hp.com/portal/site/hpsc/template.PUBLIC_SP4TS_REDIRECTOR/bc/docs/support/SupportManual/c00595566/c00595566.pdf]

[5] HowTo: Add Jobs To cron Under Linux or UNIX? http://www.cyberciti.biz/faq/how-do-i-add-jobs-to-cron-under-linux-or-unix-oses/

[6] Visual Basic for Applications http://en.wikipedia.org/wiki/Visual_Basic_for_Applications

11. Bibliography

1. Unisphere for VNX User Guide
2. EMC SPEED Guru community
3. VNX for Block Command Line Interface Reference -1.0
4. Hitachi Command Suite Software CLI Reference Guide
5. Fabric OS Command Reference Manual v7.0
6. PowerShell Pro!, www.PowerShellPro.com, Jesse Hamrick
7. PSFTP Module for PowerShell, MichalGajda, http://gallery.technet.microsoft.com/scriptcenter/PowerShell-FTP-Client-db6fe0cb
8. Microsoft Excel VBA Programming for the absolute Beginners, Duane Birnbaum, Andy Harris, 2002