Simplifying Storage Administration with 3PAR Autonomic Groups

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Document Abstract:

3PAR® Autonomic Groups is software that enables 3PAR InServ® Storage Servers administrators to create host and volume groups that automate and expedite storage provisioning, monitoring, and data protection with clustered and virtual server deployments. This paper describes how to use 3PAR Autonomic Groups to further simplify and automate storage provisioning with 3PAR Utility Storage, particularly in large and dynamic environments.

Part Number: autong-wp-10.0

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1   Introduction

3PAR® is a leader in making storage solutions simple and efficient by bringing not just automation, but intelligence to storage self-management. 3PAR Autonomic Groups is new software that enables 3PAR InServ® Storage Servers users to create host and volume groups (or "sets") that automate and expedite storage provisioning, monitoring, and data protection in clustered and virtual server environments.

The 3PAR InServ Storage Server is a highly virtualized, tightly clustered, dynamically tiered storage array built for utility computing. Massive parallelization of all available controller nodes, physical disks, and other system resources, combined with wide striping of volumes allows for optimal performance and resource utilization. The 3PAR InForm® Operating System features built-in autonomic storage capabilities that automate the process of provisioning these widely striped and massively scalable virtual volumes (VVs).

The combined ease-of-use and automated provisioning capabilities of the 3PAR Utility Storage platform yield a highly scalable, extremely adaptable, and easily manageable storage infrastructure. This paper focuses on using 3PAR Autonomic Groups to further simplify and automate storage provisioning with the 3PAR Utility Storage platform, particularly in large and dynamic environments.

2   About 3PAR Autonomic Groups

The 3PAR InForm® Operating System provides a simple, two-step process for the common task of provisioning VVs and exporting them to application servers as VLUNs. While much simpler than provisioning with traditional storage arrays, when multiplied by the numerous hosts which are characteristic of virtualized utility computing environments, the repetition of even the simplest provisioning tasks can consume significant resources and leave room for human error.

3PAR Autonomic Groups takes autonomic storage management a step further by allowing both hosts and VVs to be combined into "groups" or "sets" which can then be managed as a single object. Adding an object to an autonomic group applies all previously performed provisioning actions to the new member. For example, when a new host is added to a group, all volumes are autonomically exported to that group with absolutely no administrative intervention. Similarly, when a new volume is added to a group, that volume is also autonomically exported to all hosts in the group—intelligently and without requiring administrator action.

3   Simplified Storage Administration for Virtualized Computing

Virtualized computing environments usually involve multiple storage volumes, all shared by a cluster of host servers which run numerous virtual machines. Additional host servers are added to the cluster as computing demands grow. For each additional host, all shared storage volumes must be exported to the new server. With 3PAR Autonomic Groups, you can simply add a new host to an existing group and all VVs exported to that host group are automatically made available to the new host without any further action required by the storage administrator.

The following sections illustrate how to use 3PAR Autonomic Groups via both the 3PAR InForm Management Console and the 3PAR InForm Command Line Interface (CLI) to simplify the creation of a VMware ESX server cluster initially composed of three application servers with two

VMFS volumes. The same approach can be used with other types of clustered servers that share storage, including clustered database servers and clustered file systems such as Symantec VxFS.

3.1 Creating an Autonomic Host Group

Hosts can be combined into autonomic groups, which are sets that can be managed as a single object. To create an autonomic host group, one must specify a name for the host set and the hosts to be included in that set. If the hosts are part of a Virtual Domain, then the Virtual Domain containing the hosts must also be specified.

Figure 1 illustrates the host selection process using the InForm Management Console.
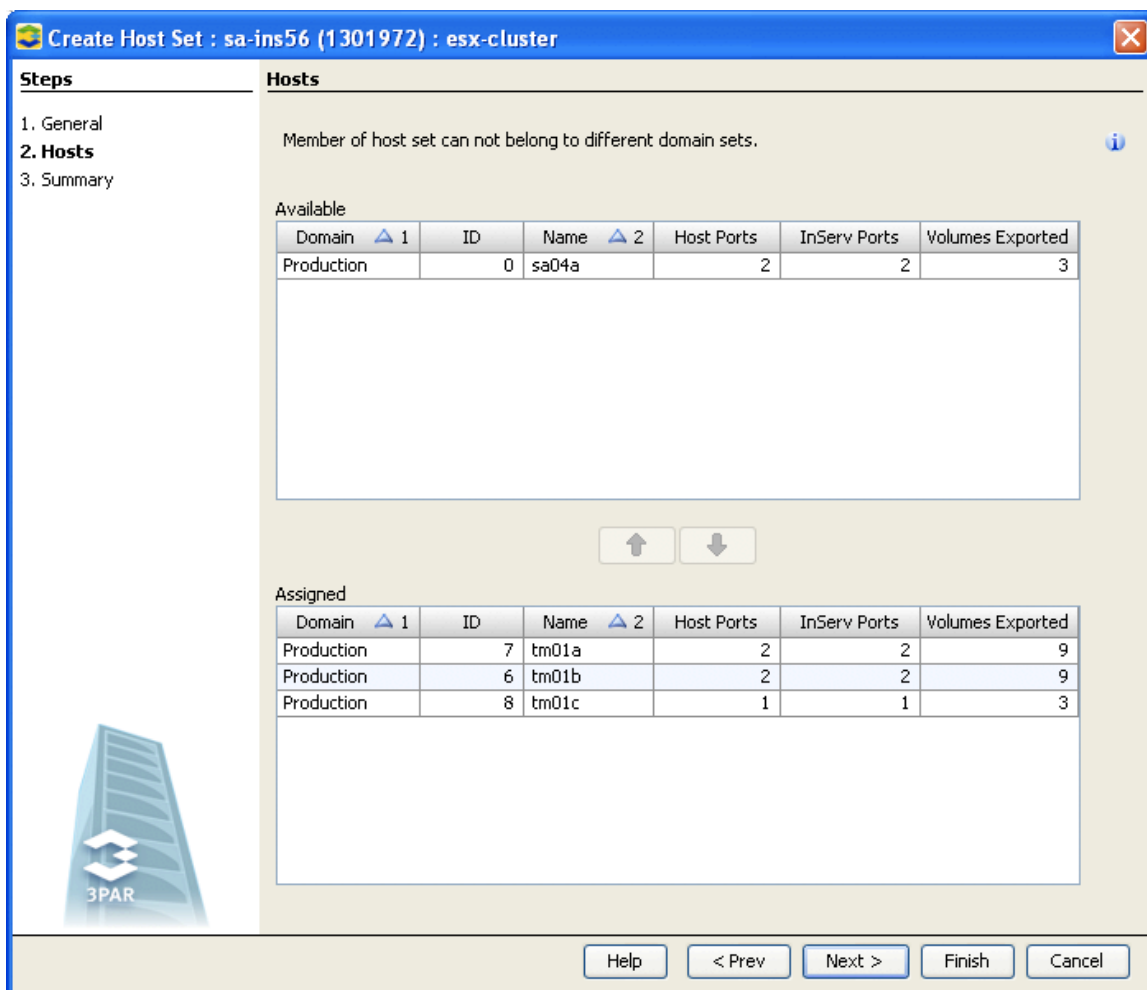

Figure 1: Creating an autonomic host group using the InForm Management Console

Using the InForm CLI, creating a host set named `esx-cluster` consisting of all hosts matching a specified pattern is accomplished with a single command as shown in the following example:

```
InServ cli% createhostset -domain Production esx-cluster tm01*
InServ cli% showhostset esx-cluster
Id Name          Members
42 esx-cluster tm01a
                tm01b
                tm01c
```

3.2 Creating a Virtual Volume Autonomic Group

Virtual Volumes (VVs) can also be combined into autonomic groups, or sets, that can be managed as a single object. Creating a VV set is much like creating a host set.

Figure 2 illustrates the VV selection step using the 3PAR InForm Management Console.
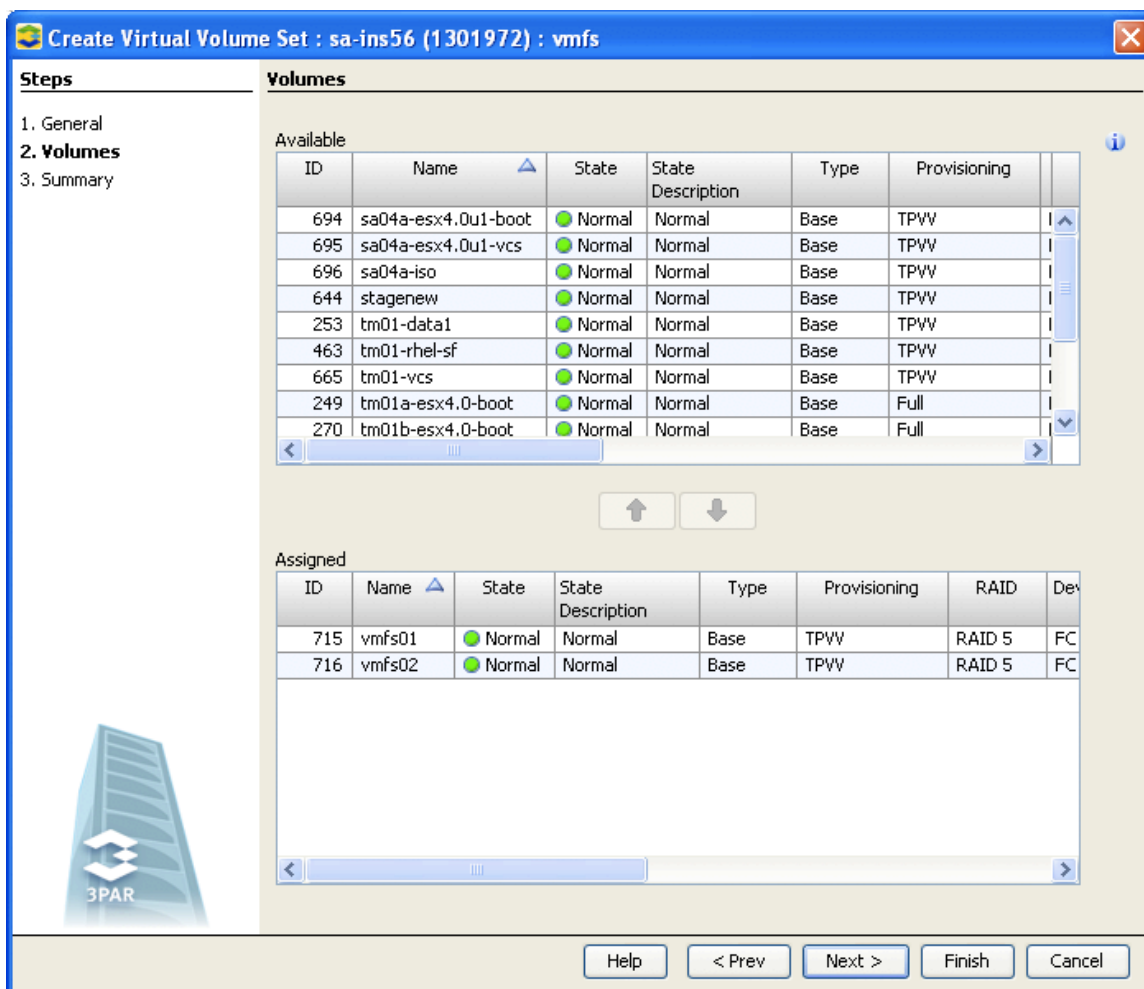

Figure 2: Creating an autonomic volume group using the InForm Management Console

The following example shows how to create a VV set using the InForm CLI:

```
InServ cli% createvvset -domain Production vmfs vmfs*
InServ cli% showhostset esx-cluster
Id Name Members
43 vmfs vmfs01
        vmfs02
```

3.3 Exporting a VV Group to a Host Group

A VV is made available to a host, or *exported*, by creating a VLUN. Autonomic groups may be used for both VVs and hosts, allowing a set of VVs to be exported to a set of hosts with a single operation. Continuing our ESX cluster example, the steps for exporting the VV set created previously (containing the VMFS volumes) to the host set created in a previous example (consisting of the ESX servers) is illustrated in Figure 3.
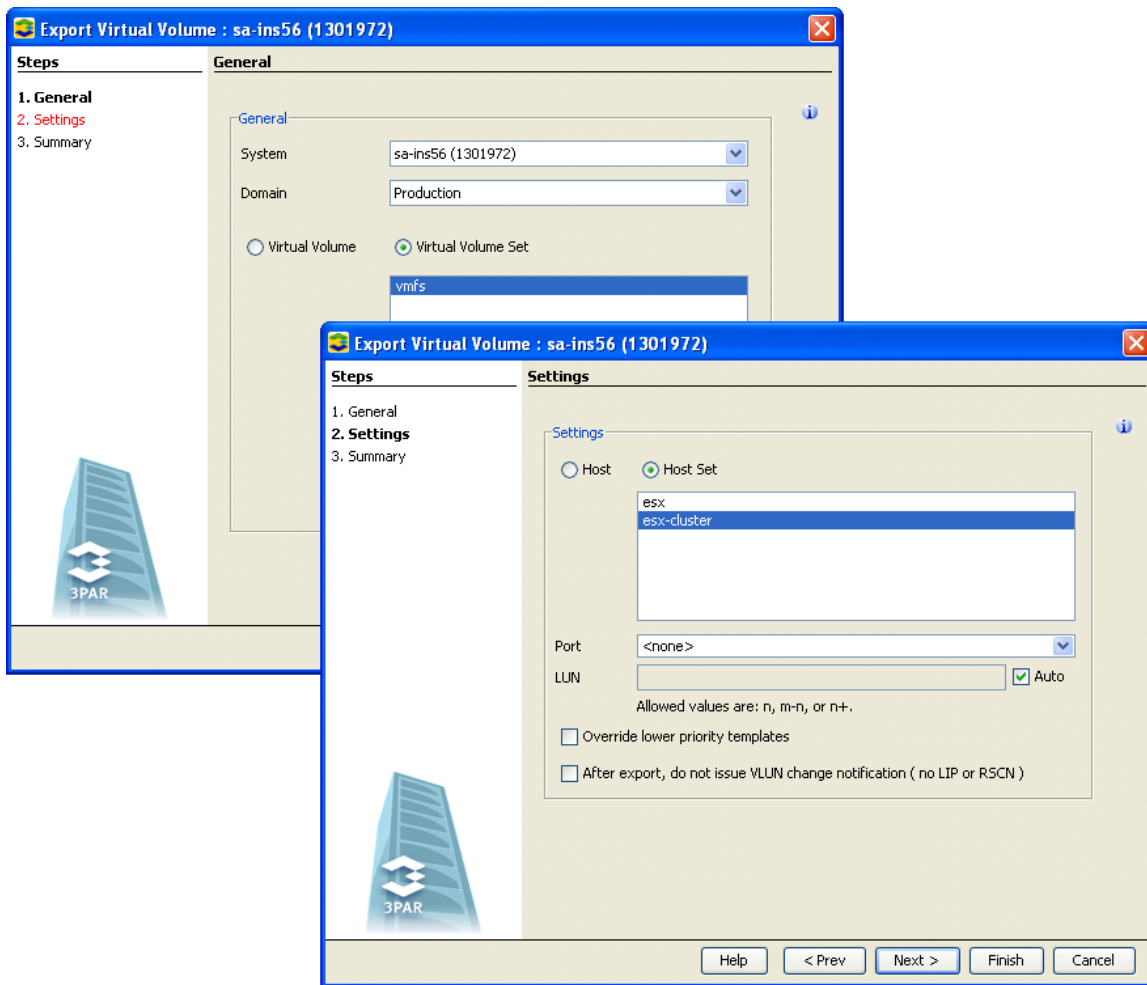

Figure 3: Exporting an autonomic volume group to an autonomic host group

The equivalent command, using `auto` to indicate that the LUN should be auto-assigned, is as follows:

```
InServ cli% createvlun set:vmfs auto set:esx-cluster
InServ cli% showvlun -host set:esx-cluster
Active VLUNs
no vluns listed

VLUN Templates
Lun VVName   HostName           -Host_WWN/iSCSI_Name- Port      Type
  1 set:vmfs set:esx-cluster ----------------         --- host set
```

As seen in the output of the `showvvlun` command, these examples actually create a VLUN template. If an additional VV is created and added to set `vmfs`, it will be exported to the hosts in set `esx-cluster` without any other action. Similarly, if a new host is added to set `esx-cluster`, it will see all of the VVs in set `vmfs`.

Note: it is not necessary to use both VV sets and host sets. A single VV could be exported to a host set, or a set of VVs could be exported to a single host.

4 Bridging Virtual Domains Using Autonomic Groups

3PAR Virtual Domains is a feature for providing virtual private arrays within a single InServ Storage Server. Using Virtual Domains, a user group may be granted administrative rights for VVs within a domain—including creation of VLUNs for hosts assigned to the domain—without being able to view or alter array resources outside of their domain.

The strict segregation of domain resources provides security, but occasionally there are reasons to share resources across domains. For example, it might be desirable to have several domains share a single backup server. 3PAR Autonomic Groups provides a mechanism to accomplish this in the form of virtual domain sets.

As its name suggests, a *virtual domain set* consists of a group of virtual domains. The domain to which a host belongs may be either a simple virtual domain or a virtual domain set. A host belonging to a virtual domain set may access VVs from any virtual domain contained by the virtual domain set.

For example, consider an InServ which has "Production" and "Staging" virtual domains. A virtual domain set named "Backup" is created which contains these two virtual domains:

```
InServ cli% createdomainset Backup Production Staging
InServ cli% showdomainset Backup
Id Name    Members
44 Backup Production
           Staging
```

A backup server is added to the "Backup" virtual domain set. Figure 4 shows the hosts in the environment and which domains they belong to.
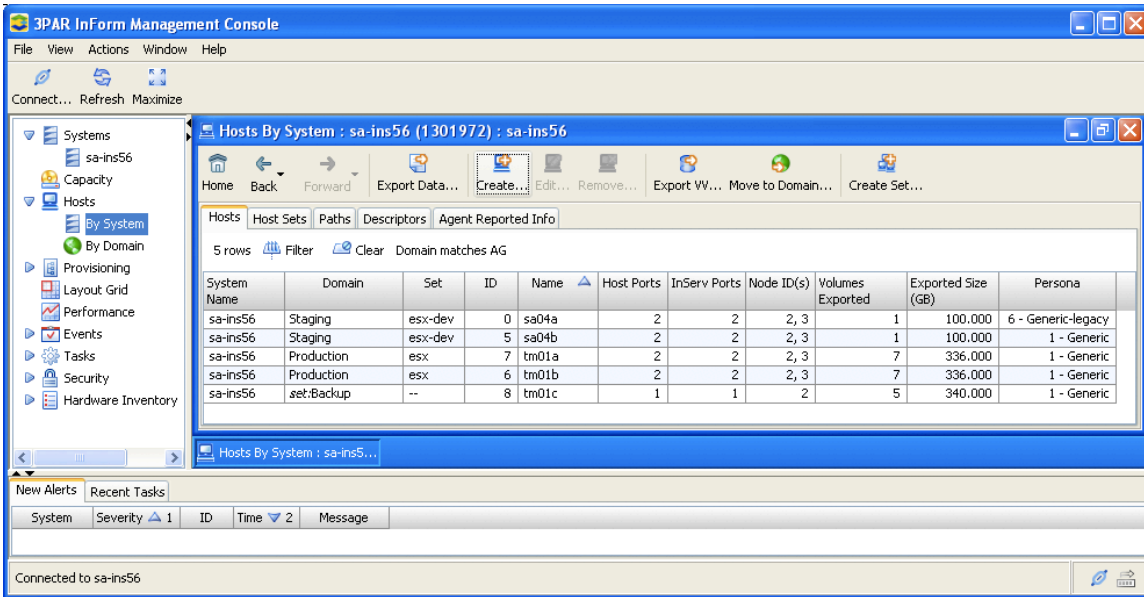
Figure 4: Hosts in virtual domains and autonomic virtual domain groups

The backup server may have VLUNs associated with VVs in both the "Production" and "Staging" virtual domains (Figure 5).
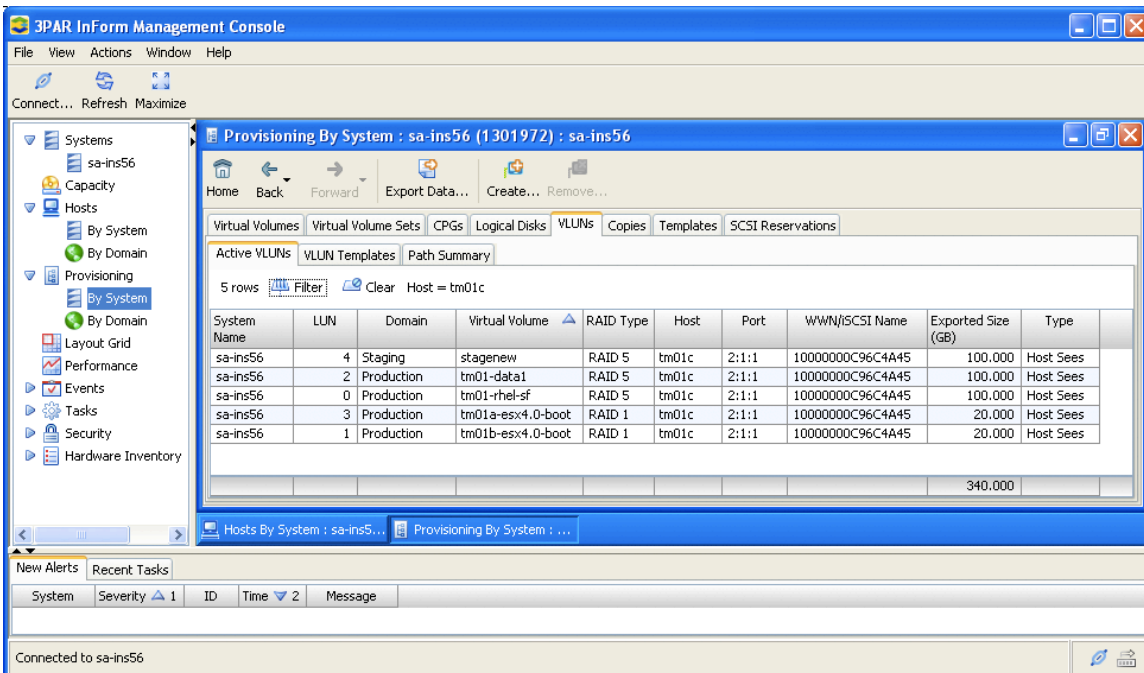

Figure 5: Backup server with VLUNs mapped to Production and Staging VVs

5 Using Autonomic Groups with Virtual Copies

Autonomic groups have several uses with virtual copies, or *snapshots*, created with 3PAR Virtual Copy. The following sections describe how to use autonomic groups to create a consistent set of snapshots of a group of volumes and to simplify the administration of recurrent snapshots.

5.1 Creating a Consistent Group Snapshot

Autonomic groups may be used when creating a virtual copy snapshot to form a consistent group snapshot of all VVs in the set. Each snapshot is created at the same point in time, so related structures in different volumes within the set remain consistent within the snapshot.

For example, the use of autonomic groups simplifies the task of performing an online backup of an Oracle database that spans multiple ASM volumes. Once the database has been placed in `ARCHIVELOG` mode, read-only snapshots of the ASM VVs can be created with one command, as illustrated in the following example:

```
InServ cli% createsv -ro @vvname@-backup set:ASM
```

As soon as the `createsv` command completes, `ARCHIVELOG` mode can be exited. The read-only snapshot VVs can be copied to backup storage without further impact on database operation.

5.2 Creating Nightly Snapshots of Home Directory Volumes

Another use of VV sets is with the scheduled periodic creation of virtual copy snapshots. For example, nightly snapshots of all volumes containing user home directories could be scheduled as follows:

```
InServ cli% createsched "createsv -ro -exp 7d @vvname@.%s%.nightly set:Homes"
@nightly nightly
```

When additional home directory VVs are created, adding them to VV set "Homes" will cause them to be included in the nightly backups without modifying the scheduled task.

6 Using Autonomic Groups to Filter Reports

Another use of 3PAR Autonomic Groups is to group VVs or hosts for reporting via the InForm CLI. For example, the storage usage for ESX boot volumes can be displayed by using a VV set with the `showvv` command as follows:

```
InServ cli% showvv set:esx-boot
                                            --Rsvd(MB)--- -(MB)-
 Id Name         Prov Type CopyOf BsId Rd -Detailed_State- Adm Snp   Usr VSize
249 tm01a-boot cpvv base ---     249 RW normal          128 512 20480 20480
270 tm01b-boot cpvv base ---     270 RW normal            0   0 20480 20480
-----------------------------------------------------------------------------
  2 total                                               128 512 40960 40960
```

VVs may belong to multiple sets so set-based reporting need not be confined to the same sets used to export volumes to hosts.

Autonomic groups may also be used with InForm Management Console filters to expand on the already rich filtering capability.

7   Summary

Autonomic storage isn't something new to 3PAR. For almost a decade, 3PAR has been a leader in making storage solutions simple and efficient by building in autonomic policy management features that deliver increased reliability and reduce storage administration time by up to 90%. With 3PAR, storage management isn't just automatic, but intelligent, taking place at a sub-system level and without administrator intervention, so it just works.

With the introduction of 3PAR Autonomic Groups, this simplicity is extended to groups of volumes accessed by groups of hosts without the combinatorial complexity of traditional solutions. The ease of use of the 3PAR InServ platform, combined with high and scalable performance levels, creates an ideal storage foundation for virtualized server deployments and other utility computing environments.

3PAR Autonomic Groups brings a new provisioning paradigm to clustered and virtual server environments that effectively eliminate the storage management overhead associated with server clusters of all kinds: virtual servers, database servers, and high availability server clusters. Autonomic Groups not only streamlines the provisioning process by reducing it from days to minutes, but it also increases the agility of clustered environments by handling changes autonomically—intelligently, at a sub-system level, without administrator intervention.

About 3PAR

3PAR® (NYSE: PAR) is the leading global provider of utility storage, a category of highly virtualized and dynamically tiered storage arrays built for public and private cloud computing. Our virtualized storage platform was built from the ground up to be agile and efficient to address the limitations of traditional storage arrays for utility infrastructures. As a pioneer of thin provisioning and other storage virtualization technologies, we design our products to reduce power consumption to help companies meet their green computing initiatives, and to cut storage total cost of ownership. 3PAR customers have used our self-managing, efficient, and adaptable utility storage systems to reduce administration time and provisioning complexity, to improve server and storage utilization, and to scale and adapt flexibly in response to continuous growth and changing business needs. For more information, visit the 3PAR Website at: www.3PAR.com.