NetApp, Inc.

Clustered Data ONTAP® 8.3.1

Security Target

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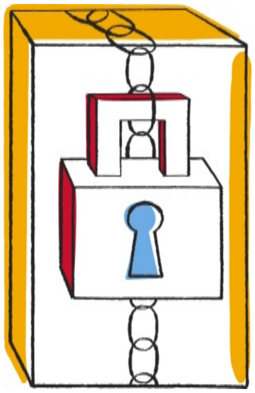

Revision History

Version	Modification Date	Modified By	Description of Changes
0.1	2015-04-27	Garrett Cooper	Initial draft.
0.2	2015-06-12	Garrett Cooper	Following changes made: • Minor format changes in Section 1 • Clarify scope of OCI in TOE • Additions to Table 2 describing TSF User Data Security Attributes • Modifications to Section 1.5… • Additions and modifications to Section 5 (Extended Components) • Modify Section 6.2.1 to clarify OnCommand components exclusion from auditing • Modify Section 6.2.2 to clarify OnCommand components exclusion • Modify Table 14 to remove erroneous data • Section 6 - rework format of Tables 16 and 17. Add rule numbering in Table 17 • Modify FMT_MSA.1.1 description • Modify Table 29 FMT_MSA.1 description
0.3	2015-06-26	Mike Scanlin	Following changes made: • Added descriptions for "TOE User UID" and "TOE User Primary GID" to 7.1.2.1.1.1 (NFSv3 UNIX-Style File Security Attribute Description) • Added "TOE User UID" and "TOE User Primary GID" to FMT_MSA.1.1 • Modified Section 6.2.1 (FAU) to read "The TSF *Security Audit* requirements…" (versus "The TSF *Data Protection* requirements…")
0.4	2015-07-21	Garrett Cooper	Following changes made: • Corrections to section 7.1.2.1.1.1 • Limit evaluation of management workstation operating system to Microsoft Windows 7 • Limit evaluation of web browsers for management workstation use to Microsoft Internet Explorer and Google Chrome

Version	Modification Date	Modified By	Description of Changes
0.5	2015-09-30	Garrett Cooper	Following changes made: • Minor modification to section 7.1.2.1.1.1 • Addition of FAS models to section 1.5.1.2
0.6	2015-10-30	Garrett Cooper	Following changes made: • Update version on title page and page headings • Corrections to section 1.5.2.3 • Corrections to tables 9, 27, and 29
0.7	2015-12-4	Garrett Cooper	Following changes made: • Update OnCommand® component release versions and documentation references
0.8	2015-12-11	Garrett Cooper	Update OnCommand® Workflow Automation to version 3.1P1
0.9	2016-03-10	Garrett Cooper	Note patch release version of Clustered Data ONTAP used for evaluation.
0.10	2016-03-15	Garrett Cooper	Correction to Table 1
0.11	2016-05-13	Garrett Cooper	Corrections to Table 20 Breakup portions of Table 20 into 2 additional tables (21 and 22). Corrections to section 7.1.6.
0.12	2016-06-01	Garrett Cooper	Indicate Data ONTAP patch version in Table 1.
0.13	2016-06-02	Garrett Cooper	Correction to section 1.5.3
0.14	2016-06-03	Garrett Cooper	Make revision and header dates consistent

Preface

This document provides the basis for an evaluation of a specific Target of Evaluation (TOE), NetApp® Clustered Data ONTAP® 8.3.1.

This Security Target (ST) defines a set of assumptions about the aspects of the environment, a list of threats that the product intends to counter, a set of security objectives, a set of security requirements, and the Information Technology (IT) Security Functions provided by the TOE which meet the set of requirements.

Note: A patch release version of Clustered Data ONTAP 8.3.1 (version 8.3.1P2) is used for the evaluation and security functionality testing.

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1 Introduction

This section identifies the Security Target (ST), Target of Evaluation (TOE), and the ST organization. The TOE is the NetApp® Clustered Data ONTAP® 8.3.1 Operating System, and will hereafter be referred to as the TOE or Data ONTAP® throughout this document. The TOE includes the kernel operating system that supports multi-protocol services and advanced data management capabilities for consolidating and protecting data for enterprise applications and users as well as the hardware appliances on which it runs. The TOE includes integrated management capabilities via CLI[1] and GUI[2] interfaces. These CLI and GUI interfaces are used to manage the TOE security functionality (TSF).

1 - The management CLI is accessible via a serial connection to the FAS controller console interface or an SSH session via the management network. The GUI (OCSM) is accessible through an HTTP/HTTPS session via the management network using a supported web browser.
2 - The management GUI interface was formerly an external software-only component, but is still known as NetApp® OnCommand® System Manager (OCSM). This component is now integral to Clustered Data ONTAP® as of version 8.3.

Note: A patch release version of Clustered Data ONTAP 8.3.1 (version 8.3.1P2) is used for the evaluation and security functionality testing.

The TOE also includes separate software-only NetApp® OnCommand® monitoring and diagnostic components:

- OnCommand® Unified Manager v6.3 (OCUM)
- OnCommand® Performance Manager v2.0 (OPM)
- OnCommand® Insight v7.1.1 (OCI)

These components allow administrators to quickly identify and troubleshoot problems that arise in the monitored storage cluster.

The final component in the TOE is the software-only

- NetApp® OnCommand® Workflow Automation v3.1P1 (WFA)

A product which allows administrators to define and execute tasks related to routine storage provisioning, storage migration, and storage decommissioning.

1.1 Purpose

This ST is divided into nine sections, as follows:

- **Introduction** (Section 1) – Provides a brief summary of the ST contents and describes the organization of other sections within this document. It also provides an overview of the TSF and describes the physical and logical scope for the TOE, as well as the ST and TOE references.
- **Conformance Claims** (Section 2) – Provides the identification of any Common Criteria (CC), Protection Profile, and Evaluation Assurance Level (EAL) package conformance claims. It also identifies whether the ST contains extended security requirements.

[1] CLI - Command Line Interface
[2] GUI - Graphical User Interface

- **Security Problem** (Section 3) – Describes the threats, organizational security policies, and assumptions that pertain to the TOE and its environment.
- **Security Objectives** (Section 4) – Identifies the security objectives that are satisfied by the TOE and its environment.
- **Extended Components** (Section 5) – Identifies new components (extended Security Functional Requirements (SFRs) and extended Security Assurance Requirements (SARs)) that are not included in CC Part 2 or CC Part 3.
- **Security Requirements** (Section 6) – Presents the SFRs and SARs met by the TOE.
- **TOE Security Specification** (Section 7) – Describes the security functions provided by the TOE that satisfy the security functional requirements and objectives.
- **Rationale** (Section 8) – Presents the rationale for the security objectives, requirements, and SFR dependencies as to their consistency, completeness, and suitability.
- **Acronyms** (Section 9) – Defines the acronyms used within this ST.

1.2 Security Target and TOE References

Table 1) ST and TOE References

ST Title	NetApp Clustered Data ONTAP® 8.3.1 Security Target
ST Version	Version 0.14
ST Author	NetApp Inc.
Publication Date	2016-06-03
TOE Reference	NetApp® Clustered Data ONTAP® 8.3.1, including: • Data ONTAP® 8.3.1P2 Software, • FAS Appliance (as specified in Section 1.5.1.2) NetApp® OnCommand® components including: • OnCommand® Unified Manager 6.3 • OnCommand® Performance Manager 2.0 • OnCommand® Insight 7.1.1 • OnCommand® Workflow Automation 3.1P1

1.3 Product Overview

The Product Overview provides a high-level description of the product that is the subject of the evaluation.

NetApp® Clustered Data ONTAP® 8.3.1 is a proprietary operating system developed by NetApp, Inc. Clustered Data ONTAP® 8.3.1 provides data management functions that include providing secure data storage and multi- protocol access.

Clustered Data ONTAP® 8.3.1 is distributed with the following NetApp storage solution products:

- **FAS** – NetApp's FAS systems offer seamless access to a full range of enterprise data for users on a variety of platforms. FAS systems support NFS[3] and CIFS[4] for file access, as well as FC[5] and iSCSI[6] for block-storage access.

As shown in Figure 1, a typical clustered ONTAP system consists of two or more individual NetApp® storage controllers with attached disks. The storage controllers are also called nodes. The basic building block is the High Availability (HA) pair. An HA pair consists of two identical controllers; each controller actively provides data services and has redundant cabled paths to the other controller's disk storage. If either controller is down for any planned or unplanned reason, it's HA partner can take over its storage and maintain access to the data. When the downed system rejoins the cluster, the partner will give back the storage resources. A single node cluster is a special implementation of a cluster running on a standalone node. In a single node cluster, the HA mode is set to standalone. This configuration does not require a cluster network, and enables you to use the cluster ports to serve data traffic. In this document, the HA pair is usually not shown, for clarity.

Multiple HA pairs are combined together into a cluster to form a shared pool of physical resources available to applications, SAN hosts, and NAS clients. The shared pool appears as a single system image for management purposes. This means there is a single common point of management for the entire cluster, whether through the CLI or GUI tools. While the members of each HA pair must be the same controller type, the cluster can consist of heterogeneous HA pairs. Over time, as the cluster grows and new controllers are released, it is likely to evolve into a combination of several different node types. All cluster capabilities are supported, regardless of the underlying controllers in the cluster.

A Clustered Data ONTAP® 8.3.1 system can scale from one to 24 nodes, supporting up to 61.4 PB[7] of raw drive capacity. A cluster hosts virtualized storage systems called Storage Virtual Machines (SVMs). SVMs provide SAN and NAS data access to hosts and clients. SVMs provide complete isolation from one another allowing the implementation of secure multi-tenancy within the same Data ONTAP® cluster.

Figure 1 also shows the underlying network architecture of Clustered Data ONTAP®. Three networks are shown:

- **Cluster Interconnect** - A 10 Gbps[8], private, dedicated, redundant, high-throughput network used for communication between the cluster nodes and for data motion within the cluster. The cluster interconnect infrastructure is provided with every Clustered Data ONTAP® 8.3.1 configuration to support this network.
- **Management Network** - All management traffic passes over this network. Management network switches can be included in a Clustered Data ONTAP® 8.3.1 configuration, or customer- provided switches can be used. The integrated OnCommand® System Manager (OCSM), built into the Clustered Data ONTAP, is available for management, and configuration of Clustered Data ONTAP systems. OCSM provides GUI management, including a number of easy-to-use wizards for common tasks. In addition, a CLI is available.

[3] NFS -Network File System

[4] CIFS - Common Internet File System

[5] FC - Fibre Channel Protocol

[6] iSCSI - Internet Small Computer System Interface

[7] PB - Petabyte

[8] Gbps - Gigabits per second

- **Data Networks** - Provide data access services over Ethernet or Fibre Channel to the SAN hosts and NAS clients. These networks are customer provided according to requirements and could also include connections to other clusters acting as volume replication targets for data protection.

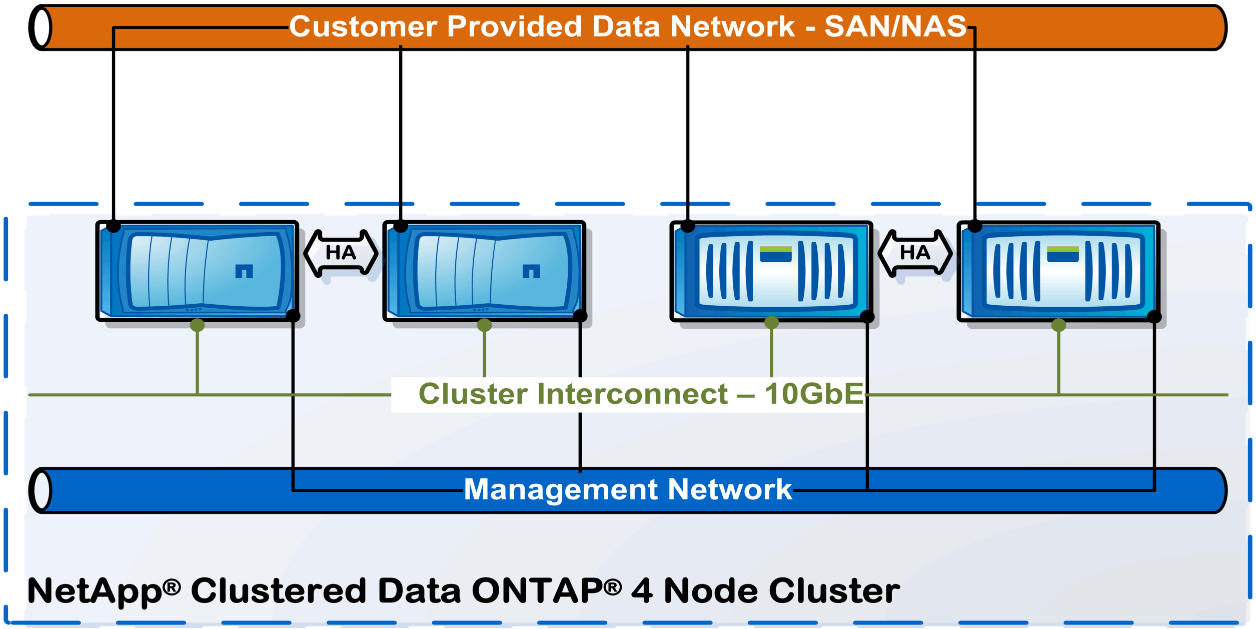

Customer Provided Data Network - SAN/NAS
HA
HA
Cluster Interconnect – 10GbE
Management Network
NetApp® Clustered Data ONTAP® 4 Node Cluster

Figure 1) Clustered Data ONTAP® Overview

Storage controllers, while they can be of different types, are by default considered equivalently in the cluster configuration in that they are all presented and managed as cluster nodes. Individual disks are managed by defining them into aggregates: groups of disks of a particular type that are protected using NetApp RAID-DP®.

NICs[9], CNAs[10] and HBAs[11] provide physical ports (Ethernet and Fibre Channel) for connection to the management and data networks. The physical components are visible only to cluster administrators, and not directly to the applications and hosts that are using the cluster. The physical components constitute a pool of resources from which are constructed the logical cluster resources.

Applications and hosts access data only through SVMs that contain data volumes and logical interfaces (LIFs).

The primary logical cluster component is the SVM. Clustered ONTAP supports from one to hundreds of SVMs in a single cluster. Each SVM is configured for the client and host access protocols it will support – any combination of SAN and NAS. Each SVM contains at least one volume and at least one logical interface. The administration of each SVM can also be delegated if desired, so that separate

[9] NIC - Network Interface Card
[10] CNA - Converged Network Adapter
[11] HBA - Host Bus Adapter

administrators could be responsible for provisioning volumes and other SVM-specific operations. This is particularly appropriate for multi-tenancy environments or where workload separation is desired.

For more information on NetApp Storage Controllers, see section 1.5.1.2. The products support both single controller and High Availability controller pairs as Storage Controller options on some models.

NetApp® Clustered Data ONTAP® v8.3.1 supports multiple authentication mechanisms:

- For CIFS sharing, Clustered Data ONTAP® 8.3.1 can authenticate end users with Kerberos[12] or New Technology Local Area Network Manager (NTLM [12]) against an Active Directory (AD) domain, with NTLM against an Windows NT-style domain, or locally using NT-style NTLM authentication against a local user database.
- For NFS sharing, the TOE can authenticate end users with Kerberos against both an Active Directory domain and a Network Information Service (NIS) domain, or locally against User Identifiers (UID) and passwords in local UNIX identity stores.
- For administration, the TOE authenticates administrators against a local user repository or a Microsoft Active Directory (AD) domain.

NetApp® OnCommand® Unified Manager v6.3 (OCUM) is a separate storage monitoring and diagnostic interface designed to give administrators an overview of cluster health from a graphical dashboard. Using OCUM, administrators can assess the overall capacity, availability, and protection health of the managed storage clusters. Using this information, administrators can locate, diagnose, and troubleshoot any issues that arise within the storage cluster. OCUM provides the same capabilities via a callable API that third party applications can use for integration.

NetApp® OnCommand® Performance Manager v2.0 (OPM) is the data acquisition and statistical analysis package for OnCommand® Unified Manager 6.3 designed for Clustered Data ONTAP® environments. OPM provides:

- Automated detection of performance issues
- Analysis of the cause of the issues
- Alerting to inform administrators of the issues
- Recommendations on how to resolve the issues

OPM monitors the performance of storage-specific resources (i.e. it does not monitor the performance of VMs, hosts, or apps). This package creates a continuous performance baseline that adjusts to workflow changes. Dynamic thresholds are used to adjust to changes in the infrastructure of the storage system. OPM identifies workloads that monopolize resources from other tasks so that allocations can be adjusted.

NetApp® OnCommand® Insight v7.1.1 (OCI) is designed to simplify operational management of complex private cloud and virtual IT environments. OCI is a single solution to enable cross-domain, multi-vendor resource management and analysis across networks, storage, and servers in physical and virtual environments.

[12] Off-box Identification and Authentication to a NIS or AD domain either NTLM or Kerberos is a functionality provided by the IT environment. Identification and Authentication of end-users is not a claimed security functionality of the TOE whether local or remote.

OCI provides a "single pane of glass" for reporting on storage costs and provides the transparency needed to make decisions about performance and efficiency. Version 7.1.1 includes these key enhancements:

- Usability – New web-based user interface (UI) enables better visualization of the IT infrastructure relationships and provides simpler and easier installation, upgrade process, and product administration.
- Scalability – Scale across multiple data centers.
- Flexibility – New dashboard and improved asset search and navigation enable quicker troubleshooting.
- Interoperability – Most comprehensive multi-vendor support in the industry, including enhanced NetApp Clustered Data ONTAP configuration and performance monitoring.

OCI has three (3) components:

- OnCommand® Insight Server
- OnCommand® Data Warehouse and Reporting Server
- OnCommand® Remote Acquisition Server

Note: Of the three (3) OCI components, only OnCommand® Insight Server is evaluated and within the scope of this TOE.

NetApp® OnCommand® Workflow Automation v3.1P1 (WFA) is designed to provide storage policy automation. Workflow Automation allows storage administrators to predefine common cloud-based storage workflows and enable them automatically, without having to go through the entire setup process each time. These workflows can automate common tasks, such as:

- Provisioning, migrating, or decommissioning storage
- Setting up a new virtualization environment
- Setting up storage for an application as part of an orchestration process.

Figure 2 shows a complete two node (HA pair) cluster deployment with the OnCommand® components.

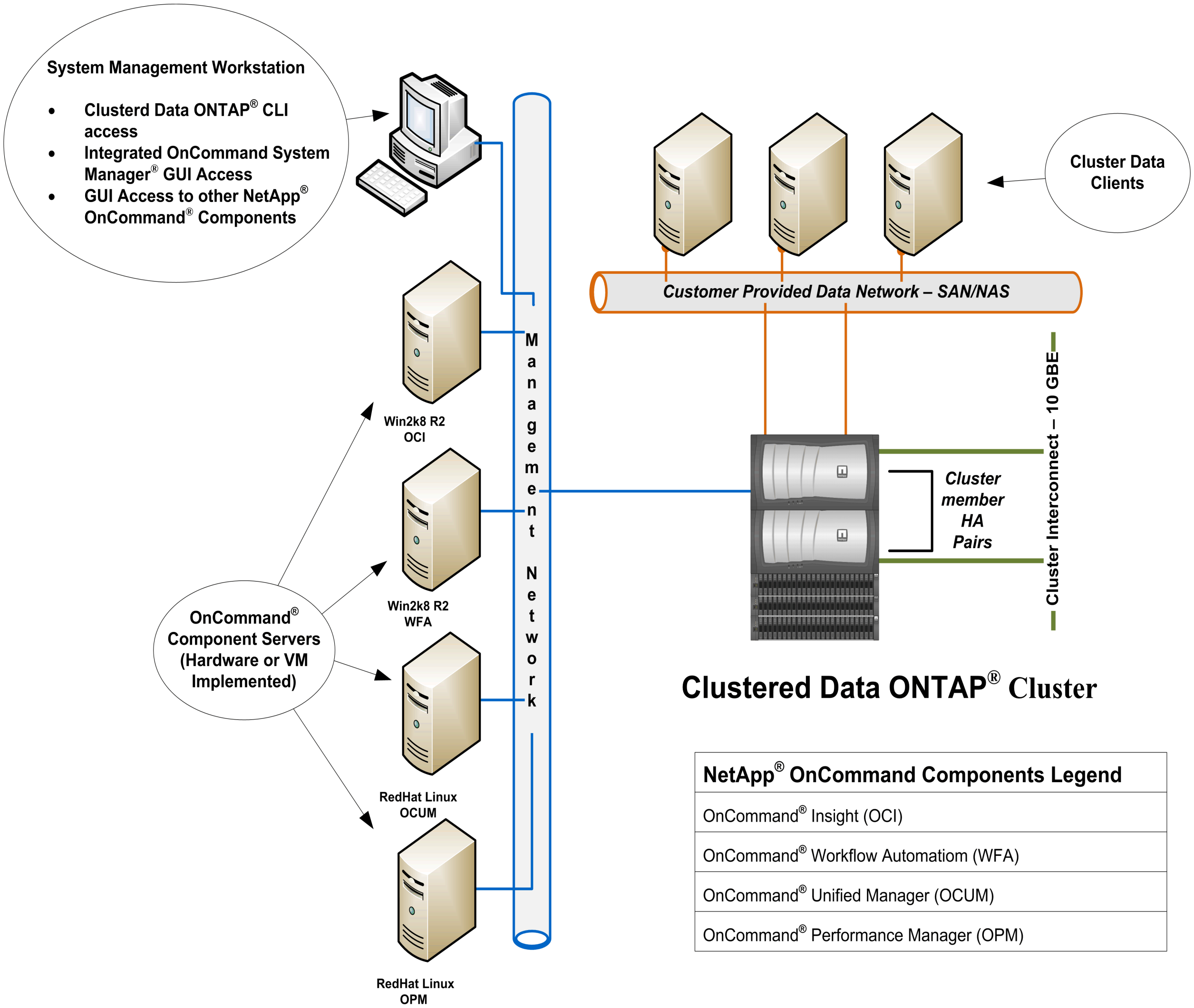

System Management Workstation
Clusterd Data ONTAP® CLI access
Integrated OnCommand System Manager® GUI Access
GUI Access to other NetApp® OnCommand® Components
Cluster Data Clients
Customer Provided Data Network – SAN/NAS
Management Network
Win2k8 R2 OCI
Win2k8 R2 WFA
RedHat Linux OCUM
RedHat Linux OPM
OnCommand® Component Servers (Hardware or VM Implemented)
Cluster member HA Pairs
Cluster Interconnect – 10 GBE
Clustered Data ONTAP® Cluster
NetApp® OnCommand Components Legend
OnCommand® Insight (OCI)
OnCommand® Workflow Automation (WFA)
OnCommand® Unified Manager (OCUM)
OnCommand® Performance Manager (OPM)

Figure 2) Data ONTAP Two Node (HA Pair) Cluster Deployment

1.4 TOE Overview

The TOE Overview summarizes the usage and major security features of the TOE. The TOE Overview provides a context for the TOE evaluation by identifying the TOE type, describing the product, and defining the specific evaluated configuration. The TOE is a data storage system. It is a hardware and software TOE. Functionality included in the logical software components of the TOE boundary includes:

- **Secure Multi-Protocol Data Storage Access** – Secure storage is provided by the TOE by implementing strict access control rules to data managed by the TOE. Multi-protocol access support is provided by the TOE by supporting both NFS and CIFS clients and providing transparent access to data.
- **Identification and Authentication** – The TOE supports on-box Identification and Authentication of administrators against a local user repository or off-box Authentication to a Microsoft® Active Directory (AD) domain.

- **Domain Separation** – The TOE can function as a storage server for multiple groups of users within the TOE's control that must remain isolated from one another through the implementation of NetApp's Storage Virtual Machine (SVM) technology.
- **Management** – The Management functionality included in the TOE's logical boundary enables administrative users to modify TOE data and TSF security functional behavior.
- **Audit** – The Audit functionality provided by the TOE generates audit records for administrator logins and configuration changes.

1.4.1 Brief Description of the Components of the TOE

The software component of the Clustered Data ONTAP® 8.3.1 TOE is divided into eight primary components: Write Anywhere File Layout® (WAFL), System Administration, the Operating System Kernel, the Management Host, the OnCommand® Unified Manager (OCUM), the OnCommand® Performance Manager (OPM), the OnCommand® Insight (OCI), and the OnCommand® Workflow Automation (WFA). The eight components are described below. Their relationship to the IT Environment-supplied components is depicted in Figure 4.

- **WAFL** - The TOE's WAFL component is responsible for implementing the TOE's Discretionary Access Control (DAC) Security Function Policy (SFP). The DAC SFP includes enforcing access rules to user data based on client type, client security attributes, file types, file security attributes and access request (create, read, write, execute, delete, change permission, and change owner).
- **System Administration** - The System Administration component provides an administrator with an interface supporting operator functions including enforcing identification and authentication, user roles, and providing the necessary user interface commands that enable an operator to support the TOE's security functionality. The System Administration function is performed by a user with the admin role, and this functionality is available locally and remotely via a Command Line Interface (CLI), or remotely via one of several management interfaces detailed in section 7.1.4. System Administration functions are audited by default.
- **Operating System Kernel** - The Kernel facilitates communication between the components of the Operating System. The Kernel is a small portion of the operating system through which all references to information and all changes to authorizations must pass.
- **Management Host** - Host the management and services applications for the node. One of the functions of the Management Host (M-Host) is the Cluster Admin which is responsible for the CLI interface for the cluster and the Volume Location Data Base (VLDB) which locate the physical location of volumes in a node.
- **OnCommand® Unified Manager** - The OnCommand® Unified Manager component provides an authorized administrator with a web-based GUI, and an exposed API. Together, these interfaces provide an authorized administrator the ability to view the status for capacity, availability, and protection relationships of the monitored systems in the storage cluster.
- **OnCommand® Performance Manager** - The OnCommand® Performance Manager acts as a companion to the OnCommand® Unified Manager. It provides an authorized administrator the ability to view the following:
    - Automated detection of performance issues
    - Analysis of the cause of the issues
    - Recommendations on how to resolve the issues
- **OnCommand® Insight Server** - The OnCommand® Insight Server component is a versatile datacenter monitoring and management tool. Its use, in respect to Clustered Data ONTAP, is for monitoring only. Other functionality within OnCommand® Insight Server is outside the scope of this TOE.
- **OnCommand® Workflow Automation** - OnCommand® Workflow Automation allows authorized administrators the ability to define and perform routine management tasks such as:

- provisioning, migrating, or decommissioning storage
- setting up a new virtualization environment
- setting up storage for an application as part of an orchestration process

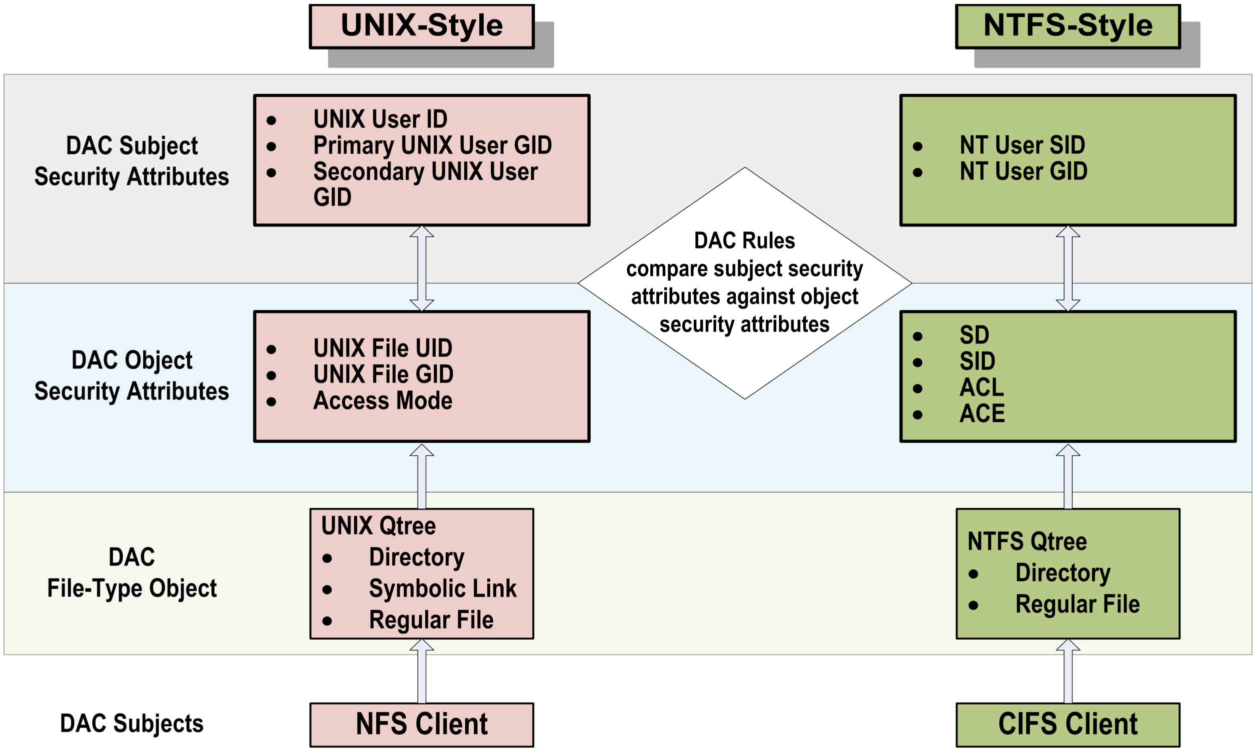
1.4.1.1 WAFL Functionality Detail

The TOE's WAFL Component protects User data. The TOE uses the subject, subject's security attributes, the object, the object's security attributes and the requested operation to determine if access is granted. The subjects are end users on remote systems that access the TOE via NFS or CIFS. **Error! Reference source not found.** depicts the WAFL functionality.

The following acronyms not yet defined appear in **Error! Reference source not found.** below:

- ACL – Access Control List
- ACE – Access Control Entry
- GID – Group Identifier
- NTFS – New Technology File System
- SD – Security Descriptor
- SID – Security Identifier

Figure 3) WAFL Functionality Detail



1.4.1.1.1 User Data

The User Data that is covered by the DAC SFP are the user files on NetApp disks attached to a FAS appliance or FlexArray SANs attached to a FAS appliance. Each file maintained by the TOE has a file style associated with it. The TOE maintains three styles of files: NFSv3 UNIX-Style files, NFSv4 UNIX-Style files, and NTFS-Style files. NFSv3 UNIX-Style files have UNIX-Style security attributes, NFSv4

UNIX-Style files have NFSv4 security attributes, and NTFS-Style files have NTFS-Style security attributes.

In addition to a file style, each file has a file type. The file types may be directories, symbolic links, or regular files. UNIX-Style files may be a directory, a symbolic link or a regular file. NTFS-Style files do not have symbolic links; therefore the file type will be either a directory or a regular file.

A Qtree is a disk space partition. In addition to the file type, the TOE maintains three different storage types: UNIX Qtrees, NTFS Qtrees and Mixed Qtrees. UNIX Qtrees store UNIX-Style files with UNIX-Style security attributes. NTFS Qtrees store NTFS-Style files with NTFS Style security attributes. Mixed Qtrees store both styles of files. Files stored in Mixed Qtrees always have the security attributes associated with the client that was last used to change their access permissions or ownership. Mixed Qtrees are not part of the evaluated configuration.

A file's security attributes are determined when the file is created. The TOE will create UNIX-Style security attributes for a file stored in a UNIX Qtree. The TOE will create NTFS-Style security attributes for a file stored in an NTFS Qtree. These security attributes are outlined in Table 2.

Table 2) TSF User Data Security Attribute Descriptions

Security Attribute	Description
Access Control Entry	A data structure associated with NTFS-Style files. Each ACE explicitly allows or denies access to a user or group for a specific NTFS-Style supported operation.
	A data structure associated with NFSv4-Style and NFSv4.1-Style files. Each ACE explicitly allows or denies access to a user or group for a specific NFSv4.x-Style supported operation.
Access Control List	A data structure associated with NTFS-Style files. Each ACL includes one or more ACEs.
	A data structure associated with NFSv4-Style and NFSv4.1-Style files. Each ACL includes one or more ACEs.
Access Mode	A data structure associated with a UNIX-Style Files. An access mode string is the last nine characters of a UNIX-Style File Permission string (drwxrwxrwx). The nine characters represent the access mode for the file in three sets of rwx triplets. The first triplet specifies the permission for the file's owner (UID). The next triplet specifies the permissions for the group associated with the file (UNIX file GID). The last three characters specify the permission for the users who are neither the owner nor members of the file's group (other). The rwx triplet identifies the permission for that set (owner, group, other). The three characters represent read, write or execute privileges. If the character is a dash, the set does not have permissions to perform the specific action.
File Permission String	A data structure associated with a UNIX-Style file. The file permission string is represented in ten characters common to all UNIX files (e.g. drwxrwxrwx). The first character contains one of three characters that identify the file type: d for directory, l for a symbolic link, or a dash (-) indicates the file is a regular file. The following 9 characters represent the access mode for the file in three sets of rwx triplets.
Security Descriptor	A data structure associated with NTFS-Style files. An SD contains a SID and an ACL.
Security Identifier	The CIFS User SID of the file's owner.
Group Identifier	A UNIX File GID identifies the groups associated with the UNIX-Style file.
User Identifier	The UNIX User UID of the file's owner.

1.4.1.1.2 TOE Clients

End-user access to TSF data is possible through the use of at either the NFS or CIFS client protocol. In a typical deployment as depicted in Figure 2, end user workstations or the file, web, mail, or application servers of the IT Environment connect to the TOE that hosts the TSF data residing on the storage arrays. The TOE is positioned between these workstations and servers, and the storage arrays, facilitating seamless NFS or CIFS connectivity between them while adding increased performance, efficiency, manageability, scalability, security, redundancy, and fault tolerance.

End-system workstations and the file, web, mail, or application servers authenticate with the TOE according to the operating procedures of the organization and IT Environment. Typical scenarios include the file, web, mail, or application servers prompting end users for credentials as they attempt to access a web page, e- mail system, or standalone application or the TOE prompting end users for credentials as they attempt to access shared network directories (NFS or CIFS). The TOE facilitates server and end-user authentication of the end users attempting to access the TSF data via NFS or CIFS.

To determine if file access is allowed, the TOE compares a client’s security attributes with the file’s security attributes, listed in Table 3. The type of client security attributes (UNIX-Style or NTFS-Style) required by the TOE depends on the type of security attributes maintained by the file and the operation requested. The file or operation will require UNIX-Style subject security attributes (NFSv3 or NFSv4), NTFS-Style subject security attributes or both. If the file or operation requires UNIX-Style security attributes for a client, the TOE will attempt to obtain the client’s UNIX User UID and UNIX User GID. If the file or operation requires NTFS-Style subject security attributes, the TOE will attempt to acquire the client’s Windows User SID and a Windows User GID. Because of the native operating systems of the two clients, NFS clients are associated with UNIX-Style security attributes and CIFS Clients are associated with NTFS-Style security attributes.

The resolution of client security attributes is processed differently by the TOE for each type of client because the two protocols are different. NTFS-Style security attributes for a CIFS client are resolved when the CIFS client logs into the remote system and joins the Windows domain (of which the TOE is a member). Therefore, NTFS-Style security attributes for a CIFS client is completed before the TOE receives a CIFS request. Alternatively, NFS client security attributes are resolved per NFS request. The UNIX User UID is passed in each NFS request and this UID is used to resolve the required client security attributes.

Table 3) TOE Client Security Attribute Descriptions

Security Attribute	Description
Windows User SID	The Windows user ID number. Each user in a Windows system is assigned a unique Windows User SID.
Windows User GID	The Windows group ID number. Each user in a Windows system is assigned to a group and that group is assigned a unique GID.
UNIX User UID	The UNIX user ID number. Each user in a UNIX system is assigned a unique UNIX User UID.
UNIX User GID	The UNIX group ID number. Each user in an UNIX system is assigned to a group and that group is assigned a unique GID.

1.4.2 TOE Environment Hardware

The IT Environment Hardware includes the servers or VMs used for hosting the OnCommand® components, a Management Workstation capable of running a supported web browser and an SSH capable terminal emulator client. The Storage array, using FC, SAS, or SATA disk drives is also a required IT environment component. The product functionality provided by the FAS products is supplied by the IT Environment.

Hardware Requirements for Installation of* NetApp® *OnCommand® Unified Manager

The NetApp® OnCommand® Unified Manager has the following minimum hardware requirements when hosted on a physical server or the functional equivalent if hosted on an ESXi or Microsoft Hyper-V virtual machine (VM):

- Architecture capable of supporting Red Hat Enterprise Linux version 6.5 or later
- Reserved CPU cycle capacity: 9572 MHz
- Reserved RAM: 12 GB
- Reserved free hard disk space: 150 GB, where the capacity is allocated as follows:
  - 50 GB allotted to the root partition of the target (host) system
  - 100 GB of free disk space allotted to the ***/data*** directory, which is mounted on an LVM drive or on a separate local disk attached to the target (host) system

Hardware Requirements for Installation of* NetApp® *OnCommand® Performance Manager

The NetApp® OnCommand® Performance Manager has the following minimum hardware requirements when hosted on a physical server or the functional equivalent if hosted on an ESXi or Microsoft Hyper-V virtual machine (VM):

- Architecture capable of supporting Red Hat Enterprise Linux version 6.5 or later
- Reserved CPU cycle capacity: 9572 MHz
- Reserved RAM: 12 GB
- Reserved free hard disk space: 300 GB, where the capacity is allocated as follows:
  - 50 GB allotted to the root partition of the target (host) system
  - 250 GB of free disk space allotted to the ***/data*** directory, which is mounted on an LVM drive or on a separate local disk attached to the target (host) system

Hardware Requirements for Installation of* NetApp® *OnCommand® Insight

The NetApp® OnCommand® Insight Server has the following minimum hardware requirements when hosted on a physical server or the functional equivalent if hosted on an ESXi or Microsoft Hyper-V virtual machine (VM):

- Architecture capable of supporting 64 bit Microsoft Windows Server 2003 and later
- 2 or more or more CPU cores
- 8 or more GB RAM
- 100 GB available free hard disk space

Note: Larger environments may require larger values. See appropriate product documentation for specifics.

Hardware Requirements for Installation of* NetApp® *OnCommand® Workflow Automation

The NetApp® OnCommand® Workflow Automation server has the following minimum hardware requirements when hosted on a physical server or the functional equivalent if hosted on an ESXi or Microsoft Hyper-V virtual machine (VM):

- Architecture capable of supporting 64 bit Microsoft Windows Server 2008 and later
- 2 or more or more CPU cores (2.27 GHz or faster)
- 4 or more GB RAM
- 20 GB available free hard disk space

1.4.3 TOE Environment Software

The following functionality is used by the TOE, however is not evaluated as part of the TOE:

- Web Browser Software, SSH capable Terminal Emulator, and SNMPv3 Protocol

Before an authorized administrator begins the software setup process, he must ensure that the network and storage environment for the new storage system has been prepared according to the Guidance Documentation.

Once the proper configuration has been met, the administrator must gather the appropriate configuration items from the network and storage environment and keep them handy for proper installation of the TOE.

System Requirements for a Workstation used to Access and Manage the TOE Components (as evaluated)

- Microsoft Windows 7

User Interface Requirements for use of OnCommand® Components and CLI Access

The following table lists the web browser and terminal emulation software requirements for administrative communication to the various NetApp® OnCommand® components:

Table 4) Web Browser and Terminal Emulation Compatibility Matrix

TOE Component	Internet Explorer Versions	Google Chrome Versions	Terminal Emulator (SSHv2 capable)
Clustered Data ONTAP® CLI	n/a	n/a	Putty or equivalent
OnCommand® System Manager	10 or later	40 or later	n/a
OnCommand® Unified Manager	10 or later	36 or later	n/a
OnCommand® Performance Manager	10 or later	36 or later	n/a
OnCommand® Insight Server	10 or later	29 or later	n/a
OnCommand® Workflow Automation	10 or later	36 or later	n/a

1.5 TOE DESCRIPTION

This section primarily addresses the physical and logical components of the TOE included in the evaluation.

1.5.1 Physical Scope

Figure 4 illustrates the physical scope and the physical boundary of the overall solution, its deployment in a networked environment, and ties together all of the components of the TOE and the constituents of the TOE Environment. The essential physical component for the proper operation of the TOE in the evaluated configuration is the Clustered Data ONTAP® 8.3.1 operating system and the NetApp Appliance Hardware. The Clustered Data ONTAP® 8.3.1 operating system consists of:

- **WAFL** – TOE's WAFL component is responsible for implementing the TOE's DAC SFP.
- **System Administration** – Service supporting management of the node.
- **Operating System Kernel** – Provides messaging between individual components of Data ONTAP
- **Management Host** – An administrator may directly communicate to the Cluster through a connection to the Management Host. When commands are directed to a node on another storage controller, the request is forwarded to the specific node's System Administration service through the Management Network shown in Figure 4.
- **OnCommand® Components** – The OnCommand® components provides an authorized administrator with a web-based GUI, and an exposed API. Together, these interfaces provide an authorized administrator the ability to view the status for capacity, availability, performance, and protection relationships of the monitored systems in the storage cluster. In addition, the OnCommand® Workflow Automation component allowed the administrator to implement routine tasks for storage provisioning and/or decommissioning.

The TOE components are depicted in Figure 4.

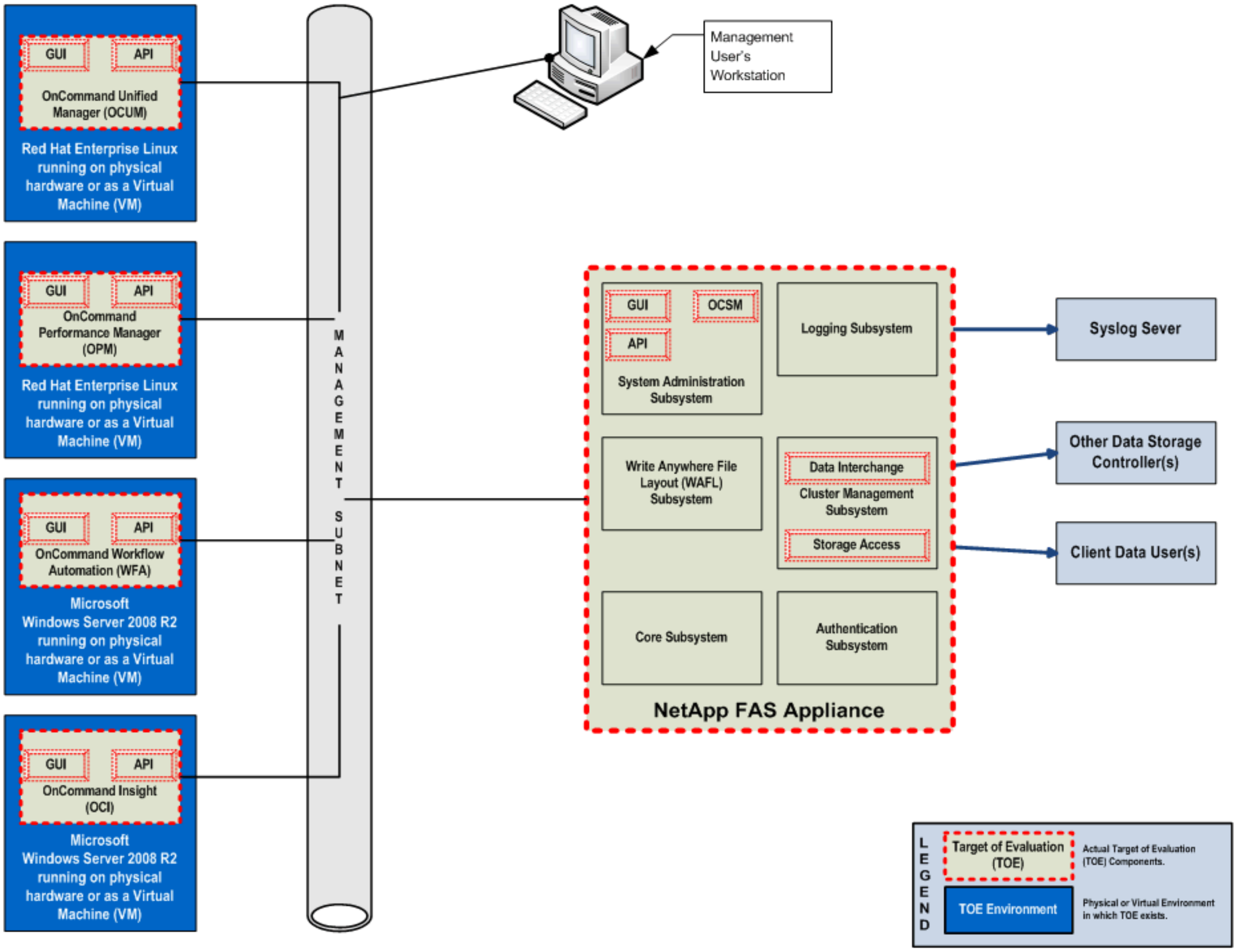

GUI
API
OnCommand Unified Manager (OCUM)
Red Hat Enterprise Linux running on physical hardware or as a Virtual Machine (VM)
GUI
API
OnCommand Performance Manager (OPM)
Red Hat Enterprise Linux running on physical hardware or as a Virtual Machine (VM)
GUI
API
OnCommand Workflow Automation (WFA)
Microsoft Windows Server 2008 R2 running on physical hardware or as a Virtual Machine (VM)
GUI
API
OnCommand Insight (OCI)
Microsoft Windows Server 2008 R2 running on physical hardware or as a Virtual Machine (VM)
MANAGEMENT SUBNET
Management User's Workstation
GUI
OCSM
API
System Administration Subsystem
Logging Subsystem
Write Anywhere File Layout (WAFL) Subsystem
Data Interchange
Cluster Management Subsystem
Storage Access
Core Subsystem
Authentication Subsystem
NetApp FAS Appliance
Syslog Sever
Other Data Storage Controller(s)
Client Data User(s)
LEGEND
Target of Evaluation (TOE)
Actual Target of Evaluation (TOE) Components.
TOE Environment
Physical or Virtual Environment in which TOE exists.

Figure 4) Physical TOE Boundary

The TOE Environment includes the following components:

- Clustered ONTAP® Clients – SAN/NFS/SMB clients talking to Clustered ONTAP® volumes through SAN or NAS protocols
- Storage Array – Disk Aggregate managed by Raid Manager

1.5.1.1 TOE Software

The Clustered Data ONTAP portion of the TOE software is a kernel operating system which runs on a subset of NetApp's proprietary 64-bit x86- based storage controller platforms listed in section 1.5.1.2.

1.5.1.1.1 Administration Users

Cluster administrators are identified by user-account names registered locally on the ONTAP cluster. Each user-account may have one (1) or more login method(s) defined. Each method determines how the admin-user will access the cluster (-application) and which type of account authentication (-authmethod) is appropriate for that particular access. The following table lists the valid access applications and relevant authentication methods.

Table 5) Access Methods and Relevant Authentication Methods

Access Application	Relevant Authentication Methods	Comments
console	password	Must authenticate to a local account.
http	password, domain, nsswitch, cert	“domain” refers to MS Active Directory domain and requires CIFS service running on an SVM. For cluster access, a domain-tunnel must be defined linking a CIFS SVM. “nsswitch” refers to NIS/LDAP running in an SVM. **“nsswitch” cannot be used to authenticate cluster administrators.**
ontapi	password, domain, nsswitch, cert	“domain” refers to MS Active Directory domain and requires CIFS service running on an SVM. For cluster access, a domain-tunnel must be defined linking a CIFS SVM. “nsswitch” refers to NIS/LDAP running in an SVM. **“nsswitch” cannot be used to authenticate cluster administrators.**
rsh	password	By default is disabled. Do not use as rsh is not secure.
snmp	community, usm	
service-processor	password	Access is only available by serial console and/or ssh to FAS controller management interface.
ssh	password, publickey, domain, nsswitch	“domain” refers to MS Active Directory domain and requires CIFS service running on an SVM. For cluster access, a domain-tunnel must be defined linking a CIFS SVM. “nsswitch” refers to NIS/LDAP running in an SVM. **“nsswitch” cannot be used to authenticate cluster administrators.**
telnet	password	By default is disabled. Do not use as telnet is not secure.

Once an admin-user has been identified and authenticated, then the specific role assigned to that admin-user account will determine the actual functionality authorized for that user account.

1.5.1.1.2 Administrative Command Auditing

The CLI command `security audit modify` is used to enable administrative command auditing on the Clustered Data ONTAP portion of the TOE. At least one of the following parameters should be provided with this command:

- -cliset {on | off} — sets the auditing state for any CLI commands that modify any current configuration values. (Recommended to be set to **on**. Set to **on** for this TOE evaluation)
- -ontapiset {on | off} — sets the auditing state for any API commands that modify any current configuration values. (Recommended to be set to **on**. Set to **on** for this TOE evaluation)
- -cliget {on | off} — sets the auditing state for any CLI commands that query any current configuration values. If set to on, may overinflate auditing (log) files if CLI command activity level is high. (Recommended to be set to **off**. Set to **off** for this TOE evaluation)
- -ontapiget {on | off} — sets the auditing state for any API commands that query any current configuration values. If set to on, may overinflate auditing (log) files if API command activity level is high. (Recommended to be set to **off**. Set to **off** for this TOE evaluation)

1.5.1.1.3 NFS Configuration for TOE's Evaluation

The following commands set the TOE's evaluated NFS configuration on any SVM exporting NFS data:

`set -privilege advanced` - This privilege level is required to set the -chown-mode option for a SVM's NFS configuration.

The `vserver nfs modify – chown-mode` option for the evaluated configuration is set to "*unrestricted*". When set to "*restricted*", only a "superuser" has permission to change the owner of a file. When set to "*unrestricted*", the vserver nfs modify –chown-mode option enables the "*owner*" of a file or a "*superuser*" to change ownership of a file.

1.5.1.2 **TOE Hardware**

The Clustered Data ONTAP® 8.3.1 runs on the NetApp's storage appliances; including the 8000 family, and the 2500 family appliances. The TOE includes the following hardware appliances, each one running one instances of the TOE software components:

- FAS8080 EX
- AFF8080 EX
- FAS8060
- AFF8060
- FAS8040
- AFF8040
- FAS8020
- AFF8020
- FAS2554
- FAS2552
- FAS2520
- FAS2240-4

For a complete list of NetApp Storage Controllers on which the TOE operates, refer to the "New and changed platform and hardware support" section of the release notes for Clustered Data ONTAP® 8.3.1.

1.5.1.3 **Guidance Documentation**

The following guides are required reading and part of the TOE:

- Clustered Data ONTAP® 8.3.1 Guidance Documentation Supplement
- Clustered Data ONTAP® 8.3 Commands: Manual Page Reference
- Clustered Data ONTAP® 8.3 System Administration Guide For Cluster Administrators
- Clustered Data ONTAP® 8.3 System Administration Guide for SVM Administrators
- Clustered Data ONTAP® 8.3 File Access and Protocols Management Guide for NFS
- Clustered Data ONTAP® 8.3 File Access and Protocols Management Guide for CIFS
- Clustered Data ONTAP® 8.3 Software Setup Guide
- Clustered Data ONTAP® 8.3 High-Availability Configuration Guide
- Clustered Data ONTAP® 8.3 Network Management Guide
- Clustered Data ONTAP® 8.3 Physical Storage Management Guide
- Clustered Data ONTAP® 8.3 Logical Storage Management Guide
- Clustered Data ONTAP® 8.3 Data Protection Tape Backup and Recovery Guide
- Clustered Data ONTAP® 8.3.1 Release Notes
- OnCommand® Unified Manager 6.3 Administration Guide
- OnCommand® Unified Manager 6.3 Installation and Setup Guide for Red Hat® Enterprise Linux®

- OnCommand® Performance Manager 2.0 User Guide
- OnCommand® Performance Manager 2.0 Installation and Setup Guide for Red Hat® Enterprise Linux®
- OnCommand® Workflow Automation 3.1 Workflow Developer's Guide
- OnCommand® Workflow Automation 3.1 Installation and Setup Guide for Windows
- OnCommand® Insight 7.1 OnCommand Insight Installation Guide for Microsoft Windows®
- OnCommand® Insight 7.1 OnCommand Insight Configuration and Administration Guide

1.5.2 Logical Scope

The logical boundary of the TOE will be broken down into the following security classes which are further described in sections 6 and 7 of this ST. The logical scope also provides the description of the security features of the TOE. The security functional requirements implemented by the TOE are usefully grouped under the following Security Function Classes:

1.5.2.1 **Security Audit**

The TOE keeps track of auditable events through the "mgwd.log" files, stored in /etc/log/mlog/ on each cluster node. An audit log is a record of "get" and "set" commands executed at the console or a secure shell (SSH) via the cluster management CLI. Administrative Hypertext Transfer Protocol (HTTP) "ontapi" operations, such as those resulting from the use of OnCommand® System Manager, are also logged. All login attempts to access the storage system, with success or failure, are also logged. In addition, there are "command-history.log" files in the same /etc/log/mlog/ location on each cluster node.

For commands executed through the console, an SSH shell, or the HTTP/HTTPS "ontapi", the audit log shows the following information:

- What commands were executed
- Source of the executed the commands
- When the commands were executed (Time stamp)

The TOE ensures that the audit trail storage is protected by rotating log files as they reach an administrator- configurable maximum size, and overwriting the oldest log file when the audit trail reaches an administrator - configurable maximum size. In addition, the log files are accessible for viewing by an authorized administrator via NFS, CIFS, or HTTPS.

The node audit files are available for read-access or download via the Service Processor Infrastructure (SPI). Access is accomplished via HTTP/HTTPS by pointing a supported browser to the following URL:

http://<*cluster-management-ip-address*>/spi

or

https://<*cluster-management-ip-address*>/spi (recommended)

where the *cluster-management-ip-address* is the address assigned to the cluster's management LIF.

For more information on the Security Audit functionality of the TOE, see section 7.1.1.

1.5.2.2 **User Data Protection**

User data protection defines how clients (users) connecting to the TOE are allowed to perform operations on objects.

User access to objects controlled by the TOE is governed by the enforcement of the DAC SFP. Access to NTFS-Style files via a CIFS share is authorized locally by file ACEs. Access to NFSv3 UNIX-Style files via an NFSv3 export is authorized locally by file/directory ownership and UNIX-Style security attributes. Access to NFSv4 UNIX-Style files via an NFSv4 export is authorized locally by file ACEs.

The TOE provides authorized administrators with several management interfaces outlined in section 1.5.2.4 to configure end-user network access. The management interfaces provide for the creation of rules that define actions the TOE is to take are based on a set of conditions. The conditions and actions affect either the allowed access to user data by end-users (DAC SFP), or the way administrators interact with the TOE.

For more information on the User Data Protection functionality of the TOE, see section 7.1.2.

1.5.2.3 Identification and Authentication

The Identification and Authentication (I&A) functionality of the TOE forces human administrators to identify and authenticate themselves to the TOE before allowing any modifications to TOE managed TSF Data. Authentication credentials are maintained by the TOE in a local registry or a MS AD Domain, if so configured.

The TOE enforces minimum password strength requirements. The security login role config create and modify commands offer parameters to specify the minimum number of alphabetic characters, a mix of alphabetic with numeric, and the number of special characters that a password must contain. Passwords must have a length of at least 8 characters and contain at least one numeric character and at least one alphabetic character. Special characters are optional.

The TOE will lock out an administrator account if the user fails to enter the proper credentials after –max-failed-login-attempts failed login attempts set by the security login role config modify or create command.

For more information on the I&A functionality of the TOE, see section 7.1.3.

1.5.2.4 Security Management

The TSF management functionality provides the necessary functions to allow a NetApp administrator to manage and support the TSF. Included in this functionality are the rules enforced by the TOE that define access to TOE-maintained TSF Data and its corresponding security attributes, and TSF Functions.

The security attributes include authentication data (used to authenticate end users), roles, security attribute data (used for DAC SFP enforcement) and other TSF data (used for DAC SFP subject security attribute resolution).

The TOE maintains the following roles for cluster management CLI and OnCommand® System Manager users:

- admin
- autosupport
- backup
- readonly
- none

The TOE also maintains the following roles for SVM administrators:

- vsadmin
- vsadmin-volume
- vsadmin-protocol
- vsadmin-backup
- vsadmin-readonly

The following roles for OCUM and OPM users (stored locally with the application):

- operator
- storage administrator
- OnCommand administrator

The following roles for WFA users:

- guest
- operator
- architect
- admin
- backup

And the following roles for OCI users:

- admin
- guest
- user

A "NetApp Administrator" is defined to be any human user who is assigned any of the administrative roles (except for none) listed above.

The TSF Functions are managed using the following capabilities (which are defined in detail in Table 28):

- Command Directory Access
- Access
- Query

For more information on the TSF management functionality, see section 7.1.4.

1.5.2.5 Protection of TOE Security Functionality

The TOE protects the TSF via the implementation of domain separation made possible by Secure Multi-Tenancy (SMT) functionality.

For more information on domain separation and Protection of the TSF, see section 7.1.5.

1.5.2.6 TOE Access

The TOE mitigates unauthorized administrator access by automatically terminating administrator sessions after 30 minutes of inactivity at the CLI.

For more information on the TOE Access functionality of the TOE, see section 7.1.6.

1.5.3 Product Physical and Logical Features and Functionality not included in the TOE

Physical Features that are **not** part of the evaluated configuration of the TOE are:

- Physical hardware (servers and/or workstations) and installed Operating Systems on which OnCommand® components are hosted
- Physical hardware (servers and/or workstations) and installed Operating Systems on which management access web browsers and SSH terminal emulators are hosted

Logical Features and Functionality that are **not** part of the evaluated configuration of the TOE are:

- Management access using insecure protocols (i.e.: Telnet[13], RSH[14], HTTP[15], FTP[16])
- Remote resolution of authentication data via UNIX LDAP
- Cross-protocol support (NFS access to NTFS-Style files, CIFS access to UNIX-Style files)
- Mixed security style models on user data volumes and qtrees
- Share level ACLs
- Bypass traverse checking option
- Microsoft Windows Group Policy Objects
- Clustered Data ONTAP API interface
- Clustered Data ONTAP - Data Interchange Interface

Other Features and Functionality not evaluated:

- Supported workstation operating systems:
  - Microsoft Windows Vista
  - Microsoft Windows 8
  - Red Hat Enterprise Linux 6 or higher
  - SUSE Linux Enterprise Desktop 11 or higher
  - Macintosh OS X 10.8
- Supported web browsers:
  - Mozilla Firefox
  - Apple Safari

[13] Telnet - Protocol for network connection
[14] RSH - Remote Shell
[15] HTTP - Hyper Text Transport Protocol
[16] FTP - File Transfer Protocol

2 Conformance Claims

This section provides the identification for any CC, Protection Profile (PP), and EAL package conformance claims. Rationale is provided for any extensions or augmentations to the conformance claims. Rationale for CC and PP conformance claims can be found in Section 8.1.

Table 6) CC and PP Conformance

Common Criteria (CC) Identification and Conformance	Common Criteria for Information Technology Security Evaluation, Version 3.1, Revision 4, September 2012; CC Part 2 extended; CC Part 3 conformant; PP claim (none); Parts 2 and 3 Interpretations of the CEM[17] as of 06/14/2013 were reviewed, and no interpretations apply to the claims made in this ST
PP Identification	None
Evaluation Assurance Level	EAL2+ (Augmented with Flaw Remediation (ALC_FLR.3))

[17] CEM - Common Evaluation Methodology

3 Security Problem

This section describes the security aspects of the environment in which the TOE will be used and the manner in which the TOE is expected to be employed. It provides the statement of the TOE security environment, which identifies and explains:

- All known and presumed threats countered by either the TOE or by the security environment
- All organizational security policies with which the TOE must comply
- All assumptions about the secure usage of the TOE, including physical, personnel and connectivity aspects

3.1 THREATS TO SECURITY

This section identifies the threats to the IT assets against which protection is required by the TOE or by the security environment. The threat agents are divided into three categories:

- Attackers who are not TOE users: They have public knowledge of how the TOE operates and are assumed to possess a low skill level, limited resources to alter TOE configuration settings or parameters, and no physical access to the TOE.
- TOE users: They have extensive knowledge of how the TOE operates and are assumed to possess a high skill level, moderate resources to alter TOE configuration settings or parameters and physical access to the TOE. (TOE users are, however, assumed not to be willfully hostile to the TOE.)
- Agents or processes working either on behalf of attackers or autonomously: They may or may not have knowledge of the public or proprietary TOE configuration. These agents and processes can take many forms, such as bots or botnets designed to exploit common vulnerabilities or deny others access to IT products and services.

All three are assumed to have a low level of motivation. The IT assets requiring protection are the TSF and user data resident in the TOE and the hosts on the protected network. Removal, diminution and mitigation of the threats are through the objectives identified in Section 4 Security Objectives. The following threats are applicable:

Table 7) Threats

Name	Description
T.MASQUERADE	A TOE user or process may masquerade as another entity in order to gain unauthorized access to data or TOE resources.
T.TAMPER	A TOE user or process may be able to bypass the TOE’s security mechanisms by tampering with the TOE or TOE environment.
T.UNAUTH	A TOE user may gain access to security data on the TOE, even though the user is not authorized in accordance with the TOE SFP.
T.DATALOSS	Threat agents may attempt to remove or destroy data collected and produced by the TOE.
T.NO_AUDIT	Threat agents may perform security-relevant operations on the TOE without being held accountable for it.
T.IA	Threat agents may attempt to compromise the TOE or network resources controlled by the TOE by attempting actions that it is not authorized to perform on the TOE or network resources.

3.2 ORGANIZATIONAL SECURITY POLICIES

An Organizational Security Policy (OSP) is a set of security rules, procedures, or guidelines imposed by an organization on the operational environment of the TOE. No OSPs are presumed to be imposed upon the TOE or its operational environment by any organization implementing the TOE in the CC evaluated configuration.

3.3 ASSUMPTIONS

This section describes the security aspects of the intended environment for the evaluated TOE. The operational environment must be managed in accordance with assurance requirement documentation for delivery, operation, and user guidance. The specific conditions in Table 8 are required to ensure the security of the TOE and are assumed to exist in an environment where this TOE is employed.

Table 8) Assumptions

Name	Description
A.PEER	Any other systems with which the TOE communicates are assumed to be under the same management control and use a consistent representation for specific user and group identifiers.
A.NETWORK	Security Management shall be provided to protect the Confidentiality and Integrity of transactions on the network.
A.MANAGE	There will be one or more competent individuals assigned to manage the TOE and the security of the information it contains.
A.NO_EVIL_ADM	The system administrative personnel are not hostile and will follow and abide by the instructions provided by the administrator documentation.
A.COOP	Authorized users possess the necessary authorization to access at least some of the information managed by the TOE and are expected to act in a cooperating manner in a benign environment.
A.PROTECT	The processing resources of the TOE critical to the SFP enforcement will be protected from unauthorized physical modification by potentially hostile outsiders.
A.ADMIN_ACCESS	Administrative functionality shall be restricted to authorized administrators.
A.NTP	The IT Environment will be configured to provide the TOE to retrieve reliable time stamps by implementing the Network Time Protocol (NTP).
A.PHYSICAL	Physical security of the TOE and network, commensurate with the value of the TOE and the data it contains, is assumed to be provided by the environment.

4 Security Objectives

Security objectives are concise, abstract statements of the intended solution to the problem defined by the security problem definition (see Section 3). The set of security objectives for a TOE form a high-level solution to the security problem. This high-level solution is divided into two part-wise solutions: the security objectives for the TOE, and the security objectives for the TOE's operational environment. This section identifies the security objectives for the TOE and its supporting environment.

4.1 Security Objectives for the TOE

The specific security objectives for the TOE are as follows:

Table 9) Security Objectives for the TOE

Name	Description
O.ADMIN_ROLES	The TOE will provide administrative roles to isolate administrative actions.
O.AUDIT	The TOE will audit all administrator authentication attempts, whether successful or unsuccessful, as well as TOE user account configuration changes.
O.DAC_ACC	TOE users will be granted access only to user data for which they have been authorized based on their user identity and group membership.
O.ENFORCE	The TOE is designed and implemented in a manner that ensures the SFPs can't be bypassed or interfered with via mechanisms within the TOE's control.
O.IA	The TOE will require users to identify and authenticate themselves.
O.MANAGE	The TSF will provide functions and facilities necessary to support the authorized administrators that are responsible for the management of TOE security.
O.STRONG_PWD	The TOE must ensure that all passwords will be at least 8 characters in length and will consist of at least one number and at least one alphabetic character. Special characters are optional. Password construction will be complex enough to avoid use of passwords that are easily guessed or otherwise left vulnerable, e.g. names, dictionary words, phone numbers, birthdays, etc. should not be used.
O.INACTIVE	The TOE will terminate an inactive management session after a configurable interval of time.
O.TIME STAMP	The TOE will provide a reliable time stamp for use by the TOE.

4.2 SECURITY OBJECTIVES FOR THE OPERATIONAL ENVIRONMENT

4.2.1 IT Security Objectives

The following IT security objectives are to be satisfied by the environment:

Table 10) IT Security Objectives

Name	Description
OE.ACCESS	The IT Environment will ensure that users gain only authorized access to the data the IT Environment manages.

Name	Description
OE.ADMIN_ROLES	The IT Environment will provide administrative roles to isolate administrative actions.
OE.ENFORCE	The IT Environment will support the TOE by providing mechanisms to ensure the TOE is neither bypassed nor interfered with via mechanisms outside the TOE's control.
OE.IA	The IT Environment must require authorized CIFS and NFS Clients to successfully I&A before allowing access to the TOE.
OE.NETWORK	The network path between the TOEs is a trusted channel. The network path between the CLI client and the TOE is a trusted channel.
OE.NTP	The IT Environment will enable the TOE to provide reliable time stamps by implementing NTP.
OE.SUBJECTDATA	The IT Environment will provide the TOE with the appropriate subject security attributes.

4.2.2 Non-IT Security Objectives

The following non-IT environment security objectives are to be satisfied without imposing technical requirements on the TOE. That is, they will not require the implementation of functions in the TOE hardware and/or software. Thus, they will be satisfied largely through application of procedural or administrative measures.

Table 11) Non-IT Security Objectives

Name	Description
ON.CREDEN	Those responsible for the TOE must ensure that all access credentials, such as passwords, are protected by the users in a manner that maintains IT security objectives.
ON.INSTALL	Those responsible for the TOE and hardware required by the TOE must ensure that the TOE is delivered, installed, configured, managed, and operated in a manner which maintains IT security objectives.
ON.PHYSICAL	Those responsible for the TOE and the network on which it resides must ensure that those parts of the TOE and the IT Environment critical to SFP are protected from any physical attack that might compromise the IT security objectives.
ON.TRAINED	Those responsible for the TOE will be properly trained and provided the necessary information that ensures secure management of the TOE and the IT Environment.

5 Extended Components

This section defines the extended SFRs and extended SARs met by the TOE. These requirements are presented following the conventions identified in Section 6.1.

5.1 EXTENDED TOE SECURITY FUNCTIONAL COMPONENTS

This section specifies the extended SFRs for the TOE. The extended SFRs are organized by class. Table 12 identifies all extended SFRs implemented by the TOE

Table 12) Extended TOE Security Functional Requirements

Name	Description
FPT_SEP_EXT.1	TSF domain separation for software TOEs

5.1.1 Class FPT: Extended Protection of the TSF

Families in this class address the requirements for functions to implement domain separation functionality as defined in CC Part 2

5.1.1.1 Family FPT_SEP_EXT: TSF Domain Separation for Software TOEs

Family Behavior

This family defines the requirements for domain separation of TSF data. This section defines the extended components for the FPT_SEP_EXT family.

Component Leveling

TSF Domain Seperation for Software TOEs
1

Figure 5) TSF Domain Separation for Software TOEs family decomposition

Note: The extended FPT_SEP_EXT.1 component is considered to be part of the FPT_SEP_EXT family.

FPT_SEP_EXT.1: **TSF Domain Separation for Software TOEs**

Provides the capability of the TOE to maintain a separate security domain to protect it from untrusted objects under the TOE's control. The extended family "FPT_SEP_EXT" was modeled after other Class FPT SFRs.

Management:

The following actions could be considered for the management functions in FPT_SEP_EXT.1:

- Physical storage system administrators performing maintenance (deletion, modification, addition) of Vserver units, volumes, users, and groups of users, and their assignment to various Vservers within the TOE's control.
- Vserver (security domain) administrators performing maintenance (deletion, modification, addition) of volumes, users, and groups of users within the Vserver unit (virtual storage controller).

Audit:

The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

- Maintenance (deletion, modification, addition) of Vserver units, users, and groups of users, and their assignment to various security domains within the TOE's control.

Hierarchical to: No other components

Dependencies: No Dependencies

FPT_SEP_EXT.1.1 The TSF shall maintain a security domain that protects it from interference and tampering by untrusted subjects in the TOE's control.

FPT_SEP_EXT.1.2 The TSF shall enforce separation between the security domains of subjects in the TOE's control.

5.2 EXTENDED TOE SECURITY ASSURANCE COMPONENTS

There are no extended TOE Security Assurance Components for this ST.

6 Security Requirements

This section defines the SFRs and SARs met by the TOE. These requirements are presented following the conventions identified in Section 6.1.

6.1 Conventions

There are several font variations used within this ST. Selected presentation choices are discussed here to aid the Security Target reader.

The CC allows for assignment, refinement, selection and iteration operations to be performed on security functional requirements. All of these operations are used within this ST. These operations are performed as described in Part 2 of the CC, and are shown as follows:

- Completed assignment statements are identified using [*italicized text within brackets*].
- Completed selection statements are identified using [underlined text within brackets].
- Refinements are identified using bold text. Any text removed is stricken (Example: ~~TSF Data~~) and should be considered as a refinement.
- Extended Functional and Assurance Requirements are identified using "_EXT" at the end of the short name.
- Iterations are identified by appending a letter in parentheses following the component title. For example, FAU_GEN.1(a) Audit Data Generation would be the first iteration and FAU_GEN.1(b) Audit Data Generation would be the second iteration.

6.2 SECURITY FUNCTIONAL REQUIREMENTS

This section specifies the SFRs for the TOE. This section organizes the SFRs by CC class. Table 13 identifies all SFRs implemented by the TOE and indicates the ST operations performed on each requirement.

Table 13) TOE Security Functional Requirements

Name	Description	S	A	R	I
FAU_GEN.1	Audit data generation	✓	✓		
FAU_GEN.2	User Identity Association				
FAU_SAR.1	Audit review		✓		
FAU_SAR.2	Restricted audit review				
FAU_STG.1	Protected audit trail storage	✓			
FAU_STG.4	Prevention of audit data loss	✓	✓		
FDP_ACC.1	Subset access control		✓		
FDP_ACF.1	Security attribute based access control		✓		
FIA_AFL.1	Authentication failure handling	✓	✓		
FIA_ATD.1	User attribute definition		✓		

Name	Description	S	A	R	I
FIA_SOS.1	Verification of secrets		✓		
FIA_UAU.2	User authentication before any action			✓	
FIA_UID.2	User identification before any action			✓	
FMT_MOF.1	Management of security function behaviour	✓	✓	✓	
FMT_MSA.1	Management of security attributes	✓	✓		
FMT_MSA.3	Static attribute initialisation	✓	✓		
FMT_MTD.1(a)	Management of TSF data	✓	✓		✓
FMT_MTD.1(b)	Management of TSF data	✓	✓		✓
FMT_SMF.1	Specification of management functions		✓		
FMT_SMR.1	Security roles		✓		
FPT_SEP_EXT.1	TSF domain separation for software TOEs				
FPT_STM.1	Reliable time stamps				
FTA_SSL.3	TSF-initiated termination		✓		

Note: S=Selection; A=Assignment; R=Refinement; I=Iteration

6.2.1 Class FAU: Security Audit

Note: The TSF Security Audit requirements do not apply to the OCUM, OPM, and OCI application components. These applications do not audit TSF data.

FAU_GEN.1 **Audit Data Generation**

Hierarchical to: No other components.

Dependencies: FPT_STM.1 Reliable time stamps

FAU_GEN.1.1 The TSF shall be able to generate an audit record of the following auditable events:

a) Start-up and shutdown of the audit functions;

b) All auditable events, for the [not specified] level of audit; and

c) [*The events specified in Table 14*].

FAU_GEN.1.2 The TSF shall record within each audit record at least the following information:

a) Date and time of the event, type of event, subject identity (if applicable), and the outcome (success or failure) of the event; and

b) For each audit event type, based on the auditable event definitions of the functional components included in the PP/ST, [*the additional event information specified in Table 14*].

Table 14) FAU_GEN.1.2 Audit Generation Details

SFR Addressed	Auditable Events	Additional Event Information
FIA_UAU.2 FIA_UID.2	Successful local logon	User identity, security domain
FIA_UAU.2 FIA_UID.2	Unsuccessful local logon	User identity supplied, security domain
FMT_SMF.1	Local User created	User ID[18] created, User ID of the administrator performing the action, security domain
FMT_SMF.1	Local User deleted	User ID deleted, User ID of the administrator performing the action, security domain
FMT_SMF.1	Active Directory User or Group created	Group created, User ID of the administrator performing the action, security domain
FMT_SMF.1	Active Directory User or Group deleted	Group deleted, User ID of the administrator performing the action, security domain

FAU_GEN.2 **User Identity Association**

Hierarchical to: No other components.

Dependencies: FAU_GEN.1 Audit data generation
FIA_UID.1 Timing of identification

FAU_GEN.2.1 For audit events resulting from actions of identified users, the TSF shall be able to associate each auditable event with the identity of the user that caused the event.

FAU_SAR.1 **Audit review**

Hierarchical to: No other components.

Dependencies: FAU_GEN.1 Audit data generation

FAU_SAR.1.1 The TSF shall provide [*authorized administrators*] with the capability to read [all audit information] from the audit records.

FAU_SAR.1.2 The TSF shall provide the audit records in a manner suitable for the user to interpret the information.

FAU_SAR.2 **Restricted audit review**

Hierarchical to: No other components.

Dependencies: FAU_SAR.1 Audit review

FAU_SAR.2.1 The TSF shall prohibit all users read access to the audit records, except those users that have been granted explicit read-access

[18] ID - Identifier

FAU_STG.1	**Protected audit trail storage**
Hierarchical to:	No other components.
Dependencies:	FAU_GEN.1 Audit data generation
FAU_STG.1.1	The TSF shall protect the stored audit records in the audit trail from unauthorized deletion.
FAU_STG.1.2	The TSF shall be able to [prevent] unauthorized modifications to the stored audit records in the audit trail.

FAU_STG.4	**Prevention of audit data loss**
Hierarchical to:	FAU_STG.3 Action in case of possible audit data loss
Dependencies:	FAU_STG.1 Protected audit trail storage
FAU_STG.4.1	The TSF shall [overwrite the oldest stored audit records] and [*no other actions*] if the audit trail is full.

6.2.2 Class FDP: User Data Protection

Note: The User Data Protection requirements do not apply to the OCUM, OPM, WFA, and OCI. These applications do not access user data, they only monitor the storage array resources used to contain that data.

FDP_ACC.1	**Subset access control**
Hierarchical to:	No other components.
Dependencies:	FDP_ACF.1 Security attribute based access control
FDP_ACC.1.1	The TSF shall enforce the [*DAC SFP*] on [*the subjects, objects, and operations among subjects and objects listed in* Table 15].

Table 15) FDP_ACC.1.1 Detail

Subject	Object (Files on the Storage Appliance)			Operation among Subject and Object covered by the DAC SFP
	File Style	File Type	Qtree Type	
NFSv3 Client	NFSv3 UNIX-Style File	Directory, Symbolic Link, Regular File	UNIX Qtree	Create, read, write, execute, delete, change permissions, change ownership
NFSv4 Client	NFSv4 Unix-Style File	Directory, Symbolic Link, Regular File	UNIX Qtree	Create, read, write, execute, delete, change permissions, change ownership
CIFS Client	NTFS-Style File	Directory, Regular File	NTFS Qtree	Create, read, write, execute, delete, change permissions, change ownership

FDP_ACF.1	**Security attribute based access control**
Hierarchical to:	No other components.
Dependencies:	FDP_ACC.1 Subset access control FMT_MSA.3 Static attribute initialization

FDP_ACF.1.1 The TSF shall enforce the [*DAC SFP*] to objects based on the following: [*the subjects, objects, operations, and associated security attributes listed in Table 16*) FDP_ACF.1.1 Detail

Operation	Subject	Object (File)	Subject		Ob (F Sec Attr
			Security Attribute	Other TSF Data	
Create	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	UNIX Username	N/A
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	UNIX Username	N/A
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	N/A
Read, Write, Execute	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	None	UNIX UID, U file GI acces mode
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	None	UNIX UID, A
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	SID a ACEs
Delete	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	UNIX Username	None
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	None	UNIX UID, A
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	SID a ACEs
Change Permission	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	UNIX Username	None
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	None	UNIX UID, A
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	SID a ACEs
Change Owner	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID	None	UNIX UID
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID	None	UNIX UID

FDP_ACF.1.2 The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: [*access is granted if one of the following conditions listed in Table 17 is true*].

FDP_ACF.1.3 The TSF shall explicitly authorize access of subjects to objects based on the following additional rules: [*access is granted if the object is a UNIX-style file and the subject is root*].

FDP_ACF.1.4 The TSF shall explicitly deny access of subjects to objects based on the following additional rule: [*access is denied if the subject does not have an Administrative Role*].

Table 16) FDP_ACF.1.1 Detail

Operation	Subject	Object (File)	Subject		Object (File) Security Attribute	Other Objects and Security Attributes used for DAC SFP
			Security Attribute	Other TSF Data		
Create	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	UNIX Username	N/A	UNIX Parent Directory UID, UNIX Parent Directory GID and access mode
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	UNIX Username	N/A	UNIX Parent Directory UID, UNIX Parent Directory ACEs
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	N/A	Qtree type, Parent directory's SID and ACEs
Read, Write, Execute	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	None	UNIX file UID, UNIX file GID, access mode	None
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	None	UNIX User UID, ACEs	None
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	SID and ACEs	None
Delete	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	UNIX Username	None	UNIX Parent Directory UID, UNIX Parent Directory GID and access mode
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	None	UNIX User UID, ACEs	UNIX Parent Directory UID, UNIX Parent Directory ACEs
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	SID and ACEs	Parent directory's SID and ACEs

Operation	Subject	Object (File)	Subject		Object (File) Security Attribute	Other Objects and Security Attributes used for DAC SFP
			Security Attribute	Other TSF Data		
Change Permission	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID, UNIX User GID	UNIX Username	None	UNIX Parent Directory UID, UNIX Parent Directory GID and access mode
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID, UNIX User GID	None	UNIX User UID, ACEs	UNIX Parent Directory UID, UNIX Parent Directory ACEs
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	Windows Username	SID and ACEs	Parent directory's SID and ACEs
Change Owner	NFSv3 Client	NFSv3 UNIX-Style File	UNIX User UID	None	UNIX User UID	None
	NFSv4 Client	NFSv4 UNIX-Style file	UNIX User UID	None	UNIX User UID	None
	CIFS Client	NTFS-Style File	Windows User SID, Windows User GID	None	SID and ACEs	None

Table 17) FDP_ACF.1.2 Detail

Operation	Subject	Object (File)	Rule #	= DAC Rule
Create	NFSv3 Client	NFSv3 UNIX-Style File	1	The subject is the owner of the parent directory and the owner has been granted Write and Execute access (UNIX-Style security attributes).
			2	The subject is not the owner of the parent directory but is a member of the parent directory's group and the group has Write and Execute access (UNIX-Style security attributes).

Operation	Subject	Object (File)	Rule #	= DAC Rule
			3	The subject is neither the owner of the parent directory nor a member of the parent directory's group but Write and Execute access has been granted to all subjects (UNIX-Style security attributes).
	NFSv4 Client	NFSv4 UNIX-Style File	4	The subject is the owner of the parent directory and the owner has been granted Write and Execute access (UNIX-Style security attributes).
			5	There is no parent directory ACE that denies Write or Execute access to the subject and parent directory ACEs exist that grant Write and Execute permission to the subject (NFSv4-Style security attributes).
			6	There is no parent directory ACE that denies Write or Execute access to any group that the subject is a member of and parent directory ACEs exist that grant Write and Execute permission to any group the subject is a member of (NFSv4-Style security attributes).
	CIFS Client	NTFS-Style File	7	There is no parent directory ACE that denies Write or Execute access to the subject and parent directory ACEs exist that grant Write and Execute permission to the subject (NTFS-Style security attributes).
			8	There is no parent directory ACE that denies Write or Execute access to any group that the subject is a member of and parent directory ACEs exist that grant Write and Execute permission to any group the subject is a member of (NTFS-Style security attributes).
Read, Write, Execute	NFSv3 Client	NFSv3 UNIX-Style File	9	The subject is the owner of the file and the owner has been granted access for the specific operation (UNIX-Style security attributes).
			10	The subject is not the owner of the file but is a member of the object's group and the object's group has access for the specific operation (UNIX-Style security attributes).
			11	The subject is neither the owner of the file nor a member of the object's group but the specific access request has been granted to all subjects (UNIX-Style security attributes)
	NFSv4 Client	NFSv4 UNIX-Style File	12	The subject is the owner of the file and the owner has been granted access for the specific operation (UNIX-Style security attributes).
Read, Write, Execute	NFSv4 Client		13	There is no ACE that denies access to the subject for the specific operation and an ACE exists that grants permission to the subject for the specific operation (NFSv4-Style security attributes).
			14	There is no ACE that denies access for the specific operation to any group that the subject is a member of and an ACE exists that grants permission to any group the subject is a member of for the specific operation (NFSv4-Style security attributes).

Operation	Subject	Object (File)	Rule #	= DAC Rule
	CIFS Client	NTFS-Style File	15	There is no ACE that denies access to the subject for the specific operation and an ACE exists that grants permission to the subject for the specific operation (NTFS-Style security attributes).
			16	There is no ACE that denies access for the specific operation to any group that the subject is a member of and an ACE exists that grants permission to any group the subject is a member of for the specific operation (NTFS-Style security attributes).
Delete	NFSv3 Client	NFSv3 UNIX-Style File	17	Rule 1, 2 or 3 above is true (subject has Write and Execute UNIX-Style permission for parent directory).
	NFSv4 Client	NFSv4 UNIX-Style File	18	Rule 12, 13, or 14 above is true (subject has Delete NFSv4-style permission or is UNIX owner for parent directory)
	CIFS Client	NTFS-Style File	19	Rule 15 or 16 above is true for Delete operation (subject has Delete NTFS-Style permission for object).
			20	The subject is not the owner and Rule 21 or 22 below are true (subject has Delete Child NTFS-Style permission for parent directory)
			21	There is no parent directory ACE that denies Delete Child access to the subject and a parent directory ACE exists that grants Delete Child permission to the subject (NTFS-Style security attribute).
			22	There is no parent directory ACE that denies Delete Child access to any group that the subject is a member of and an object ACE exists that grants Delete Child permission to a group the subject is a member of (NTFS-Style security attribute).
Change Permission	NFSv3 Client	NFSv3 UNIX-Style File	23	Rule 1, 2 or 3 above is true (subject has Write and Execute UNIX-Style permission for parent directory) and rule 9, 10 or 11 above is true for Write operation (UNIX-Style permission for object).
	NFSv4 Client	NFSv4 UNIX-Style File	24	Rule 4, 5, or 6 above is true (subject has Write and Execute NFSv4-Style permission for parent directory) and rule 12, 13, or 14 above is true for Change Permission operation (UNIX and NFSv4 Style permission for object)
	CIFS Client	NTFS-Style File	25	Rule 7 or 8 above is true (subject has Write and Execute NTFS-Style permission for parent directory) and rule 15 or 16 above is true for Change Permission operation (NTFS-Style permission for object).
Change Owner	NFSv3 Client	NFSv3 UNIX-Style File	26	If the UNIX UID is root, or the owner of the file, the operation is allowed.
	NFSv4 Client	NFSv4 UNIX-Style File	27	Rule 12, 13, or 14 above is true for Change Ownership operation (subject has Change Owner NFSv4-Style permission or is UNIX-Style owner for object)

Operation	Subject	Object (File)	Rule #	= DAC Rule
	CIFS Client	NTFS-Style File	28	Rule 15 or 16 above is true for Change Ownership operation (subject has Change Owner NTFS-Style permission for object).

6.2.3 Class FIA: Identification and Authentication

Note: The Identification and Authentication requirements of FIA_AFL.1, FIA_ATD.1, and FIA_SOS.1 do not apply to the OCUM, OPM, WFA, and OCI.

FIA_AFL.1 **Authentication failure handling**

Hierarchical to: No other components.

Dependencies: FIA_UAU.1 Timing of authentication

FIA_AFL.1.1 The TSF shall detect when an administrator configurable positive integer within [*6*] unsuccessful authentication attempts occur related to [login attempts].

FIA_AFL.1.2 When the defined number of unsuccessful authentication attempts has been [met], the TSF shall [*lock the user, except for the root account, out of the system*].

FIA_ATD.1 **User attribute definition**

Hierarchical to: No other components.

Dependencies: No dependencies

FIA_ATD.1.1 The TSF shall maintain the following list of security attributes belonging to individual users: [*TOE username, password, group membership, UNIX User UID and GID; Windows User SID and GID*].

FIA_SOS.1 **Verification of secrets**

Hierarchical to: No other components.

Dependencies: No dependencies

FIA_SOS.1.1 The TSF shall provide a mechanism to verify that secrets meet [*the following criteria: at least 8 characters in length and consist of at least one number and at least one alphabetic character*].

FIA_UAU.2 **User authentication before any action**

Hierarchical to: FIA_UAU.1 Timing of authentication

Dependencies: FIA_UID.1 Timing of identification

FIA_UAU.2.1 The TSF shall require each administrator to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that ~~user~~ administrator.

FIA_UID.2 **User identification before any action**

Hierarchical to: FIA_UID.1 Timing of identification

Dependencies: No dependencies

FIA_UID.2.1 The TSF shall require each ~~user~~ administrator to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

6.2.4 Class FMT: Security management

Note: The Security Management requirements of FMT_MSA.1, FMT_MSA.3, FMT_MTD.1(b), and FMT_SMF.1 do not apply to the OCUM, OPM, WFA, and OCI.

FMT_MOF.1 **Management of security functions behavior**

Hierarchical to: No other components.

Dependencies: FMT_SMF.1 Specification of management functions
FMT_SMR.1 Security roles

FMT_MOF.1.1 The TSF shall restrict the ability to [~~*determine the behavior of, disable, enable, modify the administration of*~~ ***perform***] the functions [*Default command access in Table 18*] to [*the roles listed in Table 18*].

Table 18) Cluster Administrator Roles Maintained by the TOE

Cluster Administrator Role	Level of access…	to command directory or directories
admin	all	All command directories (DEFAULT)
autosupport	all	• set • system node autosupport
backup	all	• security login password • set • vserver services ndmp
	readonly	• volume
readonly	readonly	All command directories (DEFAULT)
none	none	All command directories (DEFAULT)

Table 19) SVM Administrator Roles Maintained by the TOE

SVM Administrator Role	Level of access…

SVM Administrator Role	Level of access…
vsadmin	This role is the super user role for a Vserver and is assigned by default. A Vserver administrator with this role has the following capabilities: • Managing own user account local password and key information • Managing volumes, quotas, qtrees, Snapshot copies, and files. • Managing LUNs • Configuring protocols: NFS, CIFS, iSCSI, and FC (FCoE included) • Configuring services: DNS, LDAP, and NIS • Monitoring jobs • Monitoring network connections and network interface • Monitoring the health of a Vserver
vsadmin-volume	A Vserver administrator with this role has the following capabilities: • Managing own user account local password and key information • Managing volumes, quotas, qtrees, Snapshot copies, and files. • Managing LUNs • Configuring protocols: NFS, CIFS, iSCSI, and FC (FCoE included) • Configuring services: DNS, LDAP, and NIS • Monitoring network interface • Monitoring the health of a Vserver
vsadmin-protocol	A Vserver administrator with this role has the following capabilities: • Managing own user account local password and key information • Configuring protocols: NFS, CIFS, iSCSI, and FC (FCoE included) • Configuring services: DNS, LDAP, and NIS • Managing LUNs • Monitoring network interface • Monitoring the health of a Vserver
vsadmin-readonly	A Vserver administrator with this role has the following capabilities: • Managing own user account local password and key information • Monitoring the health of a Vserver • Monitoring network interface • Viewing volumes and LUNs • Viewing services and protocols
vsadmin-backup	A Vserver administrator with this role has the following capabilities: • Managing NDMP operations • Making a restored volume as read-write • Viewing volumes and LUNs **Note**: A Vserver administrator with vsadmin-backup role cannot manage own user account local password and key information

Table 20) OnCommand® Roles (OCUM and OPM) Maintained by the TOE

Roles applicable to OCUM and OPM	Level of access…
operator	View all data, assign and resolve events.
storage administrator	All operator access plus: • manage storage service objects • define alerts • manage storage management options • manage storage management policies
OnCommand administrator	All storage administrator access plus: • manage users • manage administrative options • manage database access • configure network access for OCUM • upgrade the OCUM software • increase data disk or swap disk size • change the time zone • send on-demand AutoSupport messages to technical support • send periodic AutoSupport messages to technical support • generate support bundles to send to technical support
event publisher	Applies to OCUM only. Is used to receive performance events from OPM

Table 21) OnCommand Roles (WFA) Maintained by the TOE

Roles applicable to WFA	Level of access…
Guest	This user can only view the status of a workflow execution or can be notified of a change in the status of a workflow execution.
Operator	This user is allowed to preview and execute workflows for which the user is provided access.
Architect	This user has full access to create workflows, but is restricted from modifying global WFA server settings.
Admin	This user has complete access to the WFA server. **Note**: You must configure at least one admin user.
Backup	This user is the only user who can remotely generate backups of the WFA server; however, this user is restricted from all other access.

Table 22) OnCommand Roles (OCI) Maintained by the TOE

Roles applicable to OCI	Level of access…
guest	Guest permits you to log into Insight and to view the various pages. If your user account is defined to the OnCommand Insight local user database (and not through LDAP), you can also modify your own password. This account type does not allow you to perform actions such as identifying generic devices and defining the policies in the Java UI.
user	User permits all guest-level privileges, as well as access to Insight operations such as defining policy and identifying generic devices. The User account type does not allow you to perform data source operations, nor to add or edit any user accounts other than your own.
administrator	Administrator permissions vary depending on whether you use LDAP: If you authenticate and authorize users through LDAP, this level of permission allows you manage data sources. If you use only the local database to manage users, this level of permission allows you perform any operation, including adding new users and managing data sources.

FMT_MSA.1 **Management of Security Attributes**

Hierarchical to: No other components.

Dependencies: FDP_ACC.1 Subset access control
FMT_SMF.1 Specification of management functions
FMT_SMR.1 Security roles

FMT_MSA.1.1 The TSF shall enforce the [*DAC SFP*] to restrict the ability to [modify, delete, add] the security attributes [*TOE User UID and TOE User Primary GID maintained locally by the TOE and described in 7.1.2.1.1.1*] to [*an authorized administrator*].

FMT_MSA.3 **Static Attribute Initialization**

Hierarchical to: No other components.

Dependencies: FMT_MSA.1 Management of security attributes FMT_SMR.1 Security roles

FMT_MSA.3.1 The TSF shall enforce the [*DAC SFP*] to provide [restrictive] default values for security attributes that are used to enforce the SFP.

FMT_MSA.3.2 The TSF shall allow the [*no authorized identified roles*] to specify alternative initial values to override the default values when an object or information is created.

FMT_MTD.1(a) **Management of TSF data**

Hierarchical to: No other components.

Dependencies: FMT_MSA.1 Management of security attributes
FMT_SMR.1 Security roles

FMT_MTD.1(a).1 The TSF shall restrict the ability to [query, modify, delete] the [*local user account repository] to [authorized administrators with the Admin or OnCommand administrator role*].

FMT_MTD.1(b)	**Management of TSF data**
Hierarchical to:	No other components.
Dependencies:	FMT_SMF.1 Specification of management functions FMT_SMR.1 Security roles
FMT_MTD.1(b).1	The TSF shall restrict the ability to [modify] the [*state of the TOE] to [authorized administrators with the Admin role*].

FMT_SMF.1	**Specification of Management Functions**
Hierarchical to:	No other components.
Dependencies:	No dependencies
FMT_SMF.1.1	The TSF shall be capable of performing the following management functions: [*management of security functions behavior, management of security attributes, and management of TSF data*].

FMT_SMR.1	**Security roles**
Hierarchical to:	No other components.
Dependencies:	FIA_UID.1 Timing of identification
FMT_SMR.1.1	The TSF shall maintain the roles [*Cluster Administrator, SVM Administrator, and OnCommand® roles as identified in* Table 18].
FMT_SMR.1.2	The TSF shall be able to associate users with roles.

6.2.5 Class FPT: Protection of the TSF

Note: The Protection of the TSF requirements do not apply to the OCUM, OPM, WFA, OCI.

FPT_SEP_EXT.1	**TSF Domain Separation for Software TOEs**
Hierarchical to:	No other components.
Dependencies:	No dependencies
FPT_SEP_EXT.1.1	The TSF shall maintain a security domain that protects it from interference and tampering by untrusted subjects in the TOE's control
FPT_SEP_EXT.1.2	The TSF shall enforce separation between the security domains of subjects in the TOE's control

FPT_STM.1	**Reliable time stamps**
Hierarchical to:	No other components.
Dependencies:	No dependencies
FPT_STM.1.1	The TSF shall be able to provide reliable time stamps.

6.2.6 Class FTA: TOE Access

Application Note: the TOE Access requirements do not apply to the OCUM.

FTA_SSL.3 **TSF-initiated termination**

Hierarchical to: No other components.

Dependencies: No dependencies

FTA_SSL.3.1 The TSF shall terminate an interactive session after a [*configurable time interval of user inactivity at the CLI, defaulting to 30 minutes*].

6.3 Security Assurance Requirements

This section defines the assurance requirements for the TOE. Assurance requirements are taken from the CC Part 3 and are EAL2 augmented with ALC_FLR.3. Table 23 - Assurance Requirements summarizes the requirements.

Table 23) Assurance Requirements

Assurance Requirements	
Class ASE: Security Target evaluation	ASE_CCL.1 Conformance claims
	ASE_ECD.1 Extended components definition
	ASE_INT.1 ST introduction
	ASE_OBJ.2 Security objectives
	ASE_REQ.2 Derived security requirements
	ASE_SPD.1 Security problem definition
	ASE_TSS.1 TOE summary specification
Class ALC : Life Cycle Support	ALC_CMC.2 Use of a CM system
	ALC_CMS.2 Parts of the TOE CM coverage
	ALC_DEL.1 Delivery procedures
	ALC_FLR.3 Systematic flaw remediation
Class ADV: Development	ADV_ARC.1 Security architecture description
	ADV_FSP.2 Security-enforcing functional specification
	ADV_TDS.1 Basic design
Class AGD: Guidance documents	AGD_OPE.1 Operational user guidance
	AGD_PRE.1 Preparative procedures
Class ATE: Tests	ATE_COV.1 Evidence of coverage
	ATE_FUN.1 Functional testing
	ATE_IND.2 Independent testing – sample
Class AVA: Vulnerability assessment	AVA_VAN.2 Vulnerability analysis

7 TOE Security Specification

This section presents information to detail how the TOE meets the functional requirements described in previous sections of this ST.

7.1 TOE SECURITY FUNCTIONALITY

Each of the security requirements and the associated descriptions correspond to a security functionality. Hence, each security functionality is described by how it specifically satisfies each of its related requirements. This serves to both describe the security functionality and rationalize that the security functionality satisfies the necessary requirements. Table 24 lists the security functionality and their associated SFRs.

Table 24) Mapping of TOE Security Functionality Requirements

TOE Security Functionality	SFR ID	Description
Security Audit	FAU_GEN.1	Audit data generation
	FAU_GEN.2	User Identity Association
	FAU_SAR.1	Audit review
	FAU_SAR.2	Restricted audit review
	FAU_STG.1	Protected audit trail storage
	FAU_STG.4	Prevention of audit data loss
User Data Protection	FDP_ACC.1	Subset access control
	FDP_ACF.1	Security attribute based access control
Identification and Authentication	FIA_AFL.1	Authentication failure handling
	FIA_ATD.1	User attribute definition
	FIA_SOS.1	Verification of secrets
	FIA_UAU.2	User authentication before any action
	FIA_UID.2	User identification before any action
Security Management	FMT_MOF.1	Management of security function behaviour
	FMT_MSA.1	Management of security attributes
	FMT_MSA.3	Static attribute initialisation
	FMT_MTD.1(a)	Management of TSF data
	FMT_MTD.1(b)	Management of TSF data
	FMT_SMF.1	Specification functions
	FMT_SMR.1	Security roles
Protection of the TSF	FPT_SEP_EXT.1	TSF domain separation software TOEs
	FPT_STM.1	Reliable time stamps
TOE Access	FTA_SSL.3	TSF-initiated termination

7.1.1 Security Audit

The TOE generates audit event records for events involving administrator logons as well as configuration changes, specifically for locally-defined users and groups. The audit function is normally executing any time the TOE is operational and the security audit modify command parameters are set to “on”. If the audit function is started or stopped, an audit event record is generated. All audit event records include a reliable time stamp.

The TOE ensures that the audit trail storage is protected by rotating log files as they reach an administrator- configurable maximum size, and overwriting the oldest log file when the audit trail reaches an administrator- configurable maximum size. The TOE can also ensure audit trail storage by periodically starting a new audit file based upon specifying a time schedule. Administrators are protected by the flexibility given by Data ONTAP, since the audit trail may be rotated under multiple conditions, which can fit most organizations' procedural requirements.

The maximum size of the audit-log file is specified by the vserver audit create and modify commands using their –rotate-size parameter. The individual Vserver audit configuration may specify when its consolidated audit log is rotated. Based upon a flexible schedule configuration, the /etc/log/auditlog file is copied to /etc/log/auditlog.0, /etc/log/auditlog.0 is copied to /etc/log/auditlog.1, and so on. This also occurs if the audit-log file reaches the maximum size specified by rotate-size parameter.

The system saves audit-log files for a configurable number of files. This is set using the –rotate-limit parameter of the vserver audit create and modify commands.

Administrators can access the audit-log files using the NFS or CIFS clients, or using HTTPS. The TOE ensures that the audit trail storage is protected from unauthorized deletion or modification by enforcing role- based permissions to the audit trail as described in Table 25:

Table 25) Audit Trail Storage Access by Role

Role	Permission
admin	create, read, write, execute, delete, change permission, change owner
autosupport	read
backup	read
readonly	read
none	read

To access the log files via NFS, the administrator must mount the root directory

<system_name>:/vol/vol0) to a desired mount point on the management workstation (where

<system_name> is the short name, Fully Qualified Domain Name (FQDN), or IP address of the storage system). The administrator can then change directories to <mount point>/etc/log/ to view log files in a XML viewing tool (where <mount point> is the desired mount point on the management workstation).

To access the log files via CIFS, the administrator must mount the \\<system_name>\C$ share to a desired drive letter on the management workstation (where <system_name> is the short name, FQDN, or IP address of the storage system). The administrator can then change directories to <drive letter>\etc\log\ to view log files in a XML viewing tool (where <drive letter> is the desired drive letter on the management workstation).

To access the log files via HTTPS, the administrator must ensure that the vserver services web – enabled command is set to true to allow administrative access. The administrator can then point the web browser on the management workstation to https://<system_name>/na_admin/logs/ to download log files to the management workstation (where <system_name> is the short name, FQDN, or IP address of the storage system).

Administrators can also configure auditing for specific file access protocols, and forward audit logs to a remote Syslog log host.

The OnCommand® System Manager generates audit records based on the audit logging level configured in the OnCommand® System Manager. The OnCommand® System Manager enables an authorized administrator to refine the logging output by selecting which type of log statements are output. By default, system logging is set to INFO. An authorized administrator can choose one of the following log levels:

- TRACE
- DEBUG
- INFO
- WARN
- ERROR
- FATAL
- OFF

These levels function hierarchically. If the log level is set to OFF indicates no logging of messages. In the evaluated configuration, the audit level cannot be set to OFF. The TRACE level logging includes all logs ranging from DEBUG to FATAL. These audit records include the date and time of the event, the type of event, and the outcome (success or failure) of the event. The OnCommand® System Manager associates each auditable event (command executed) with the identity of the administrator that initiated the event. The OnCommand® System Manager stores the log files on the local machine where the OnCommand® System Manager is installed. The OnCommand® System Manager only displays the following ONTAP logs through the OnCommand® System Manager:

- Sys Log
- Audit Log
- SnapMirror Log

All the logs that are displayed via the OnCommand® System Manager are read only. An authorized administrator cannot modify or delete any logs from the OnCommand® System Manager interface.

TOE Security Functional Requirements Satisfied: FAU_GEN.1, FAU_GEN.2, FAU_SAR.1, FAU_SAR.2, FAU_STG.1, FAU_STG.4

7.1.2 User Data Protection

The TSF mediates access of subjects and objects. The subjects covered by the DAC SFP are NFS Clients and CIFS Clients. The objects covered by the DAC SFP are files (user data). The TOE maintains files with either NTFS-Style security attributes or UNIX-Style security attributes. The access modes covered by the DAC SFP are: create, read, write, execute, delete, change permission and change owner.

The DAC SFP is detailed below:

7.1.2.1 Discretionary Access Control Security Function Policy

The DAC SFP protects user data (FDP_ACC.1). The DAC SFP uses the subject type, subject's security attributes, the object, the object's security attributes and the access mode (operation) to determine if access is granted. For some operations, the security attributes of the object's parent directory are also used. The following sections describe the DAC SFP and provide the Security Functional Requirements that meet the Security Function.

7.1.2.1.1 DAC SFP Object Security Attributes

The User Data that is covered by the DAC SFP are files (objects). Each file maintained by the TOE has a file style associated with it. The type of security attributes associated with the file defines a file style. The TOE maintains two styles of files: UNIX-Style files and NTFS-Style files. UNIX-Style files have UNIX-Style security attributes and NTFS-Style files have NTFS-Style security. Each file style is assigned different security attributes that are used by the DAC SFP to determine if access is granted for a subject.

In addition to a file style, each file has a file type. The file types may be directories, symbolic links or regular files. UNIX-Style files may be a directory, a symbolic link or a regular file (FDP_ACC.1). NTFS-Style files do not have symbolic links; therefore, the file type will be either directory or regular file (FDP_ACC.1).

In addition to the file type, the TOE maintains three different storage types: UNIX Qtrees, NTFS Qtrees or mixed Qtrees. A Qtree is a disk space partition. UNIX Qtrees store UNIX-Style files with UNIX-Style security attributes. NTFS Qtrees store NTFS-Style files with NTFS-Style security attributes. Mixed Qtrees store both styles of files. Any file may have either UNIX-Style security attributes or NTFS-Style security attributes associated with them. Mixed Qtrees will not be part of the evaluated configuration. The following sections describe the security attributes associated with the objects.

7.1.2.1.1.1 NFSv3 UNIX-Style File Security Attribute Description

A UNIX-Style file managed by the TOE has twelve security attributes that are used to determine file access. The security attributes include a UNIX File UID, a UNIX file GID, a file type character, and a nine character access mode string. The UNIX File UID is the UID of the file's owner. The UNIX file GID is the GID associated with the file. The access mode is a subset of characters within the file's file permission string. The file permission string is represented in ten characters common to all UNIX files (e.g. drwxrwxrwx). The first character contains one of three characters that identify the file type: d for directory, l for a symbolic link, or a dash (-) indicates the file is a regular file. The following 9 characters represent the access mode for the file in three sets of rwx triplets. The first triplet specifies the permission for the file's owner (UID). The next triplet specifies the permissions for the group associated with the file (UNIX file GID). The last three characters specify the permission for the users who are neither the owner nor members of the file's group (other). The rwx triplet identifies the permission for that set (owner, group, other). The three characters represent read, write or execute privileges. If the character is a dash, the set does not have permissions to perform the specific action (FDP_ACF.1). A directory's permission string may also contain a "sticky bit" represented at the end of the nine character access mode string by a "T" (e.g. drwxrwxrwxT). A sticky bit-enabled directory signifies that files or folders created within this directory can only be deleted by the file owner.

To determine if a client user has read, write or execute permission for a UNIX-Style file, the TOE first compares the client's UNIX User UID with the file's UID. The UNIX User UID is a unique positive integer assigned by the UNIX system administrator to each user. If a match occurs (the client is the owner) and the file's access mode specifies permission for the specific access request (rwx), the request is allowed. If the owner does not have permission to perform the request, the request is denied. If the client is not the file's owner, the TOE determines if the client is a member of the file's group by comparing the client's UNIX User's Primary Group ID (GID) to the file's GID. The UNIX administrator assigns each User a unique Primary GID during account creation or modification. If the client is a member of the file's group and the access mode specifies permission for the specific access request, the request is allowed. If the group does not have permission to perform the request, the request is denied. If the client user is not the file's owner or a member of the file's group, the TOE then determines if all others (the last triplet) have permission to perform the request. If all others have permission, the request is honored. Otherwise the request is denied (FDP_ACF.1).

For the remainder of this document, when the DAC SFP rules state that the TOE determines if a client, using UNIX-Style security attributes, has access, the above steps are what the TOE performs: the TOE walks through the owner, group and other attributes to determine access.

7.1.2.1.1.2 NFSv4 UNIX-Style File Security Attribute Description

The TOE's NFSv4 UNIX-Style file security attributes are NFSv4 ACLs. Each file has a data structure associated with it containing the file owner's UID and an ACL. Each ACL consists of one or more ACE(s). Each ACE explicitly allows or denies access to a single user or group. Access is allowed if there is no

ACE that denies access to the user or any group that the user is a member of and if an ACE exists that grants permission to the user or any group the user is a member of.

This determination is made by consulting the ownership, permissions, and ACEs on the file or directory and comparing against the UID and GID of the requesting user. The group memberships (and possibly username to UID number mapping) are obtained from local files or a directory service, while the file permissions and ACLs are stored in the file system.

For the remainder of this document, when the DAC SFP rules state that the TOE determines if a client, using NFSv4 UNIX-Style security attributes, has access, the above steps are what the TOE performs to determine access.

7.1.2.1.1.3 NTFS-Style File Security Attributes Description

The TOE's NTFS-Style file security attributes are standard Windows file security attributes. Each file has a data structure associated with an SD. This SD contains the file owner's SID, group's SID, DACL[19], and SACL[20]. Each ACL consists of one or more ACEs. Each ACE explicitly allows or denies access to a single user or group. Access is allowed if there is no ACE that denies access to the user or any group that the user is a member of and if an ACE exists that grants permission to the user or any group the user is a member of.

For the remainder of this document, when the DAC SFP rules state that the TOE determines if a client, using NTFS-Style security attributes, has access, the above steps are what the TOE performs to determine access.

7.1.2.1.2 DAC SFP Access Requests

Access requests define what operation a subject requests to perform on an object. The TOE's DAC SFP addresses seven access requests: create, read, write, execute, delete, change permissions, and change owner (FDP_ACC.1). The following sections define the operations.

7.1.2.1.2.1 UNIX-Style Access Requests

The following Table 26 identifies the operations of subjects on UNIX-Style files (objects) covered by the DAC SFP and explains what each of the file access request means.

Table 26) UNIX-Style File Access Requests

DAC SFP Operation	UNIX-Style File Types		
	Directory	Symbolic Link	Normal File
Create	Create a directory.	Create a symbolic link.	Create a file.
Read	Get info about the directory or its contents.	Read the file the symbolic link contains the name of.	Read the file.
Write	Add a file in the directory.	Write to the file the symbolic link contains the name of.	Append/write/truncate the file.

[19] DACL - Discretionary ACL; Used to determine permissions.
[20] SACL - System ACL; Used for auditing purposes.

DAC SFP Operation	UNIX-Style File Types		
	Directory	Symbolic Link	Normal File
Execute	Traverse the directory; change the working directory or access a file or subdirectory in the directory.	Execute the file the symbolic link contains the name of.	Execute the file.
Delete	Delete the directory.	Delete the symbolic link.	Delete the file.
Change Permission	Change the permission of the directory.	Change the permission of the symbolic link.	Change the permission of the file.
Change Owner	No effect.	Become the symbolic link's owner.	Become the file's owner.

7.1.2.1.2.2 NTFS-Style File Access Requests

The NTFS-Style file security attributes define more access modes than UNIX does. There are, however, no symbolic links in NTFS-Style files. The following Table 27 identifies the operations of subjects on NTFS-Style files (objects) covered by the DAC SFP and explains what each of the basic file access request means.

Table 27) NTFS-Style File Access Requests

DAC SFP Operation	NTFS-Style File Types	
	Directory	Normal File
Create	Create a directory	Create a file.
Read	Get info about the directory or its contents	Read the file.
Write	Add a file in the directory	Truncate, append, or overwrite the file.
Execute	No effect	If the file has an extension of .exe or .com, attempt to execute it as a native binary. If it has an extension of .bat or .cmd, attempt to execute it as a batch or command file using the command interpreter.
Delete	Delete the directory. Delete privilege must be explicitly granted on the contained files and subdirectories before they can be deleted. A directory may not be deleted unless it is empty.	Delete the file.
Change Permission	Change the permissions on the directory (change the directory's ACL)	Change the file's ACL.
Change Owner	Become the directory's owner	Become the file's owner.

7.1.2.1.3 DAC Operations and Rules

In general the TOE supports access to all objects from all subjects. However, the following exceptions apply:

- Client – The DAC SFP supports client protocol-specific support for create, read, write, execute, delete, change permission and change owner operations.

- File Style – The file style (UNIX-Style or NTFS-Style) is considered in the TOE's DAC SFP Rules because the type of security attributes maintained by the object aids in determining the type of security attributes required by the client.
- File Type – The file type (directory, symbolic link or regular file) is considered when determining if object access is allowed for a subject. The CIFS protocol does not know about symbolic links. Therefore, CIFS Clients will not request an operation for a symbolic link; the only operations for objects with file type of symbolic link applicable to the DAC SFP are NFS Client operations for UNIX-Style files.
- Additional Data – As well as client security attributes and object security attributes, certain operations require the TOE to examine the security attributes of other objects to determine if access is allowed, specifically, the object's parent directory. The TOE examines the security attributes of an object's parent directory for create, delete and change permission operations.
- Operation – The operations supported by the DAC are: Create, Read, Write, Execute, Delete, Change Permissions, and Change Owner. The execute command is treated differently for the different file styles and file types. Executing an NTFS directory has no effect. Executing a UNIX-Style directory means to traverse the directory, change the working directory, or access a file or subdirectory in the directory.

7.1.2.1.4 DAC SFP Subject Security Attributes

The subjects that apply to the DAC SFP are subjects with or without administrative roles; they access the TOE as NFS Clients and CIFS Clients (FDP_ACC.1). To determine if access is permitted for an object, the TOE requires the security attributes associated with the client. These security attributes may be resolved by the TOE or the IT Environment.

The subject security attributes required by the DAC SFP depend on the type of security attributes maintained by the object; the object will require either UNIX-Style subject security attributes or NTFS-Style subject security attributes to determine if access is permitted. Based on the native systems, NFS clients are typically associated with UNIX-Style security attributes and CIFS Clients are associated with NTFS-Style security attributes. The following sections describe the TOE's subject security attribute resolution used to enforce the DAC SFP.

7.1.2.1.4.1 Derivation of UNIX-Style Client Subject Security Attributes

If the TOE determines that NFSv3 UNIX-Style security attributes should be used to determine access for an object, the TOE requires a client's (subject's) UNIX User UID and UNIX User GID (FDP_ACF.1).

If the TOE determines that the NFSv4 UNIX-Style security attributes should be used to determine access for an object, the TOE requires a client's (subject's) UNIX User UID and GID with permission matching the file's ACL (FDP_ACF.1).

If the access request is initiated by an NFS Client, the TOE received the NFS Client's UNIX User UID in the NFS request (IT Environment). The TOE then searches the IT Environment to get the UNIX User GID and UNIX username (FDP_ACF.1).

7.1.2.1.4.2 Derivation of NTFS-Style Client Subject Security Attributes

If the TOE determines that NTFS-Style security attributes should be used to determine access for an object, the TOE requires two subject security attributes: a Windows User SID and a Windows User GID.

If the access request is initiated by a CIFS Client, the TOE obtained the CIFS Client's username (Windows username) when the client logged onto the remote system and joined the Windows Domain. In addition to this, the IT Environment queried the domain controller to obtain the Windows User SID and the Windows User GID.

7.1.2.1.5 DAC SFP Rules

The DAC SFP rules that apply depend on the subject, the operation, and the object. In addition, the objects file type (directory, symbolic link and regular) is used to determine access and the type of Qtree the file is stored in. The five access modes under the control of the TOE DAC SFP are described below.

CREATE ACCESS REQUEST

To determine if a client has permissions to create a file, the TOE first looks at the parent directory's security attributes.

If the parent directory is NTFS-Style, the TOE uses NTFS-Style security attributes for both subject and object to determine if access is permitted. If the client does not have write and execute privileges to the parent directory, the request is denied. If the client has write and execute privileges for the parent directory, the file is created (FDP_ACF.1). In an NTFS Qtree, the new file inherits the NTFS-Style security attributes from the parent directory (FMT_MSA.3).

If the parent directory is NFSv3 UNIX-Style, the TOE uses NFSv3 UNIX-Style security attributes for both subject and object to determine access. If the client does not have write and execute privileges to the parent directory, the request is denied. If the client has write and execute privileges for the parent directory, the file is created (FDP_ACF.1). In a UNIX Qtree, the new file's NFSv3 UNIX-Style security attributes are determined by the file mode creation mask, also known as the User Mask (umask) of the user-owned process creating the file (FMT_MSA.3).

If the parent directory is NFSv4 UNIX-Style, the TOE uses NFSv4-Style ACL security attributes for the object, and UNIX user UID and GID for the subject. If the client has write and execute privileges for the parent directory, the file is created (FDP_ACF.1). In an NFSv4 UNIX-Style Qtree, the new file inherits the NFSv4 UNIX-Style security attributes from the parent directory (FMT_MSA.3).

READ, WRITE, EXECUTE ACCESS REQUESTS

To determine if a client has permission to read, write or execute a file, the TOE first examines the client type. If a client requests access to a file with NFSv3 UNIX-style security attributes, the TOE uses NFSv3 UNIX- Style security attributes for both subject and object to determine if read, write or execute access request is permitted. If the client has read, write or execute permission for the file, access is permitted (FDP_ACF.1). If the client does not have access, the request is denied.

Otherwise, the TOE uses the file's ACL to determine if read, write or execute permission is allowed. The TOE uses NFSv4 or NTFS-Style security attributes for both subject and object to determine access. The TOE determines if the file's ACEs allow permission for the specific request. If they do, access is granted (FDP_ACF.1). If the ACEs do not grant permission, access is denied.

CLIENT DELETE ACCESS REQUEST

To determine if a client has permission to delete a file, the TOE looks at the styles of the file and parent directory.

NFSv3 UNIX-Style File stored in a UNIX-Style Parent Directory

The TOE, using NFSv3 UNIX-Style security attributes for both subject and object, determines if the client has write and execute access for the file's parent directory. If the client does, the delete access is permitted (FDP_ACF.1). Otherwise, access is denied.

NFSv4 and NTFS-Style File stored in an NTFS-Style Parent Directory

The TOE, using NFSv4 and NTFS-Style security attributes for both subject and object, first determines if the file's ACL grants the client delete access to the file. If so, access is granted (FDP_ACF.1). If the file's

ACEs do not grant delete permission for the client, the TOE determines if the parent directory has a DC (Delete Child) ACE that grants access for the subject. If the parent does, delete access is permitted (FDP_ACF.1). Otherwise, access is denied.

CHANGE PERMISSION ACCESS REQUESTS

To determine if a client has permission to change the permissions of a file, the TOE looks at the styles of the file and parent directory.

NFSv3 UNIX-Style File stored in a UNIX-Style Parent Directory

The TOE, using NFSv3 UNIX-Style security attributes for both subject and object, determines if the client has write and execute access for the file's parent directory. If the client does, and the client also has write access for the file, the change permission access is permitted (FDP_ACF.1). Otherwise, access is denied.

NFSv4 and NTFS-Style File stored in an NTFS-Style Parent Directory

The TOE, using NFSv4 and NTFS-Style security attributes for both subject and object, determines if the file's ACL grants the client change permission access to the file. If so, the TOE determines if the parent directory's ACL grants write and execute access for the subject. If so, change permission access is permitted (FDP_ACF.1). Otherwise, access is denied.

CHANGE OWNER ACCESS REQUESTS

The DAC SFP distinguishes between the NFS Client Change Owner (chown) UNIX command and the CIFS Client Change Owner (Change Ownership) command.

NFSv3 Clients

If an NFSv3 Client requests a Change Owner request (chown) for an NTFS-Style file, the request is denied (FDP_ACF.1). If an NFS Client sends a Change Owner request (chown) for an NFSv3 UNIX-Style directory, the request is denied. For other UNIX-Style file types, the TOE determines if the client is root (UNIX User UID is root UID) or the file owner. If the client is root or the file owner, access is allowed (FDP_ACF.1) and the TOE changes the object's owner to the owner specified in the chown request. If the object had an ACL, the TOE removes the ACL.

NFSv4 Clients

If an NFSv4 Client requests a Change Owner request for an NTFS-Style file, the request is denied (FDP_ACF.1). If the file is an NFSv4 UNIX-Style file, the TOE determines if the client has Change Owner ACE privileges for the file. If the client does, access is allowed (FDP_ACF.1). The TOE will replace the existing owner ACE with the new ACE sent in the command. If the NFSv4 Client does not have Change Owner privileges, the request is denied.

CIFS Client

If a CIFS Client requests a Change Owner request for a UNIX-Style file, the request is denied (FDP_ACF.1). If the file is an NTFS-Style file, the TOE determines if the client has Change Owner ACE privileges for the file. If the client does, access is allowed (FDP_ACF.1). The TOE will replace the existing owner ACE with the new ACE sent in the command. If the CIFS Client does not have Change Owner privileges, the request is denied.

TOE Security Functional Requirements Satisfied: FDP_ACC.1, FDP_ACF.1

7.1.3 Identification and Authentication

The TOE's I&A functionality enforces human administrators to identify and authenticate themselves to the TOE before allowing any modifications to TOE managed TSF Data (FIA_UID.2, FIA_UAU.2).

Administrators' authentication credentials are maintained by the TOE in a local registry. The file contains the username, password, full name, password aging, role, and other similar characteristics for each administrator. Authentication credentials are maintained by the TOE in a local registry. Several roles exist for administrator authentication: *admin, autosupport, backup, readonly,* and *none*.

The Clustered Data ONTAP portion of the TOE enforces minimum password strength requirements. Passwords must have a length of at least 8 characters and contain at least one numeric character and at least one alphabetic character (FIA_SOS.1). The TOE also maintains the following attributes for administrative accounts: TOE username, password, group membership, UNIX User UID and GID, and Windows User SID and GID (FIA_ATD.1).

The TOE enforces minimum password strength requirements. The security login role config create and modify commands offer parameters to specify the minimum number of alphabetic characters, a mix of alphabetic with numeric, and the number of special characters that a password must contain. The parameters setting password requirements are:

- **-passwd-minlength** – This specifies the required minimum length of a password. Possible values range from 3 to 64 characters. The default setting is 8 characters.
- **-passwd-alphanum** – This specifies whether a mix of alphabetic and numeric characters is required in the password. If this parameter is enabled, a password must contain at least one letter and one number. This needs to be enabled.
- **-passwd-min-special-chars** – This specifies the minimum number of special characters required in a password. Possible values range from 0 to 64 special characters.

The TOE will lock out an administrator account if the user fails to enter the proper credentials after **–max-failed-login-attempts** *failed login attempts* set by the security login role config modify or create command. (FIA_AFL.1). Recommended value for this attribute is 6.

TOE Security Functional Requirements Satisfied: FIA_AFL.1, FIA_ATD.1, FIA_SOS.1, FIA_UAU.2, FIA_UID.2

7.1.4 Security Management

The Administrative Security Function provides the necessary functions, or capabilities, to allow NetApp cluster and Vserver administrators to manage and support the TSF. Included in this functionality are the rules enforced by the TOE that define access to TOE-maintained TSF Data and TSF Functions. The TSF Functions are categorized into the groups of capabilities listed in Table 28:

Table 28) Security Function Capabilities

Role Configurable Capability	Capabilities
Command Directory Access	Grants the specified role specific command capabilities. This specifies the command or command directory to which the role has access. This includes permission for all variations of the security command.
Access	The possible access level settings are none, read-only, and all. The default setting is all.
Query	This optionally specifies the object that the role is allowed to access. The query object must be applicable to the command or directory name specified by the –cmddirname parameter. The query object must be enclosed in double quotation marks (""), and it must be a valid field name.

Only end users associated with the specific roles as outlined in Table 18 for Cluster Administrator may modify the association between users, groups, and any of the above capabilities.

For OnCommand® components, the management functionality available to a user is dependent on the assigned role; the assigned role may be operator, storage administrator, or OnCommand administrator. Each role has access to an increasing set of functionality available via the OCUM web diagnostic interface or API.

The TOE provides several interfaces for administrators to use to manage the behavior of the TSFs. The various management interfaces available to administrators are outlined below:

CLI

Local CLI available via a serial terminal connected to the console port of the appliance Remote CLI available via a secure shell program, such as SSH, OpenSSH, PuTTY, etc.

(See section 1.5.3 for a list of other methods of accessing the CLI which are not included in the evaluated configuration of the TOE)

OnCommand® System Manager GUI

The OnCommand® System Manager GUI is integral to Data ONTAP®. The OnCommand® System Manager GUI makes API calls to the System Administration TOE component for management of the TOE security functions.

OCUM, OPM, and OCI Web Interfaces and API

The OnCommand® components (OCUM, OPM, and OCI) are applications installed on separate management application servers (standalone or VMs). The external interfaces of OCUM, OPM, and OCI provide diagnostics based on storage availability, capacity, performance, and protection and allow for operators, storage administrators, and OnCommand administrators to analyze collected data and take corrective or preventative actions if necessary.

7.1.4.1 Management of Security Attributes

The TOE protects TSF data via the implementation of the DAC SFP as described in section 7.1.2.1 above. The security attributes upon which the DAC SFP relies for access control are configurable only by users who are owners of the object or users who are assigned the admin role.

The management of security attributes is performed by editing the attributes of individual objects such as the SD of NTFS-style files, the ACL of NFSv4 UNIX-style files, or the nine character access mode string of NFSv3 UNIX-style files, by editing the file's group membership, or by editing a user's membership in a group. For more information on the security attributes of TSF data, see section 7.1.2.1.1 and its subsections above.

7.1.4.2 Management of TSF Data

The TOE's Administration Security Function includes TSF Data Management. The TSF Data Management includes management of both authentication data and security attributes. The following data is managed by the TOE:

- TOE Username Management.
- Deny unauthorized administrative login attempts via Data ONTAP.
- Implement a "Sleep Mode" function call to Data ONTAP to deny access and initiate a time out period for further login attempts, to counter brute force password guessing.

TOE USERNAME MANAGEMENT

The TOE maintains authentication data locally that is used to authenticate the NetApp Administrators. This authentication database can only be accessed through the security command.

7.1.4.3 **Management of Roles**

Within System Manager, the TOE maintains the following roles for users: admin, autosupport, backup, readonly, none, vsadmin, vsadmin-volume, vsadmin-protocol, vsadmin-backup, and vsadmin-readonly. The admin role has the default capability to administratively access the TOE and modify security attributes. The other administrative roles have varying functionality as defined in Table 18. Within Unified Manager, the TOE maintains the following roles for users: OnCommand administrator, storage administrator, and operator. The OnCommand administrator role has the capability to administer users and perform the generic maintenance tasks required for TOE operation. The other roles have varying functionality as defined in the latter half of Table 18.

NetApp Administrators are required to identify and authenticate themselves to the TOE. The authentication data used for I&A, username and password, is maintained locally by the TOE or to a Microsoft Active Directory Domain if so configured. NetApp Administrators are allowed to modify TOE-managed TSF data including locally stored authentication data, security attributes and other TSF Data.

Non-administrators are users who access the TOE via a remote system using NFS or CIFS client software (process acting on behalf of a user). Non-administrators have access to TOE managed user data, but do not have authority to modify TOE managed TSF data. Access to TOE managed user data by non - administrators is covered by the TOE’s DAC SFP.

TOE Security Functional Requirements Satisfied: FMT_MOF.1, FMT_MSA.1, FMT_MSA.3, FMT_MTD.1(a), FMT_MTD.1(b), FMT_SMF.1, FMT_SMR.1

7.1.5 Protection of the TSF

The TOE protects the TSF via the implementation of SMT (i.e., domain separation) made possible by SVM functionality.

Secure Multi-Tenancy is the use of secure virtual partitions within a shared physical storage environment for the purpose of sharing the physical environment among multiple distinct tenants. SMT allows the consolidation of tenants into shared resources, at the same time providing assurance that tenants cannot access resources not explicitly assigned to them.

Clustered Data ONTAP is an inherently multi-tenant storage operating system and is architect to provide data access through secure virtual storage partitions. A cluster can be a single partition representing the resources of the entire cluster, or can be divided into multiple partitions, each representing specific subset of cluster resources. These secure virtual storage partitions are called Storage Virtual Machines (SVMs).

A cluster serves data through one of more SVMs. An SVM provides logical abstraction that represents a set of physical resources on the cluster. Data volumes and network logical interfaces (LIFs) are created and assigned to an SVM and may reside on any node in the cluster to which the SVM has been given access. An SVM may own resources on multiple nodes concurrently, and those resources can be moved from one node to another without disruption.

An SVM is capable of supporting multiple protocols concurrently. Volumes within the SVM can be appended together to form a single NAS namespace, which makes all of an SVM’s data available through a single share or mount point to NFS and CIFS clients. SVMs also support block-based protocols, and LUNs can be created and exported using iSCSI, Fibre Channel, or Fibre Channel over Ethernet. Any or all of these data protocols may be configured for use within a given SVM.

SVM, being a secure entity, is only aware of the resources that have been assigned to it and has no knowledge of other SVMs and their respective resources. Each SVM operates as a separate and distinct entity with its own security domain. Tenants manage resources allocated to them through a delegated SVM administration account. Each SVM connects to unique authentication zones such as Active Directory®, LDAP, or NIS. An SVM is effectively isolated from other SVMs that share the same physical hardware.

As illustrated in **Error! Reference source not found.**, an SVM's configuration allows it to store and retrieve data in the correct context in its storage units. This information also allows the SVM to correctly interpret the access control and security-related meta-information embedded in its storage.

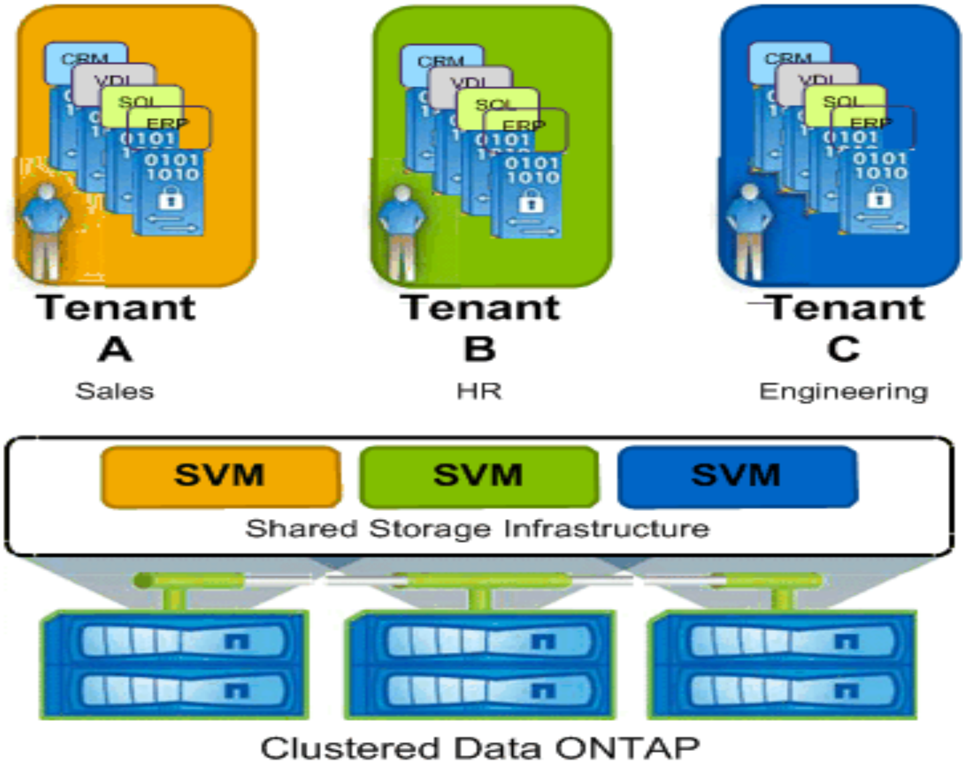


Figure 6) Storage Virtual Machines enable Secure Multi-tenancy for Shared Storage Implementations

For more information on SVM and its components including LIFs, Flexible Volumes, Namespace, and Infinite Volume, please refer to NetApp document "Secure Multi-Tenancy in Clustered Data ONTAP – Overview and Design Considerations, April 2013".

The system clock is set at boot via the Network Time Protocol and provides reliable time stamps for use by the TOE.

TOE Security Functional Requirements Satisfied: FPT_SEP_EXT.1, FPT_STM.1

7.1.6 TOE Access

The TOE mitigates unauthorized administrator access by automatically terminating administrator sessions after a configurable time interval of inactivity at the CLI, defaulting to 30 minutes. Administrators configure the time interval using the system timeout modify -timeout command.

TOE Security Functional Requirements Satisfied: FTA_SSL.3

8 Rationale

8.1 CONFORMANCE CLAIMS RATIONALE

This Security Target extends Part 2 and conforms to Part 3 of the Common Criteria Standard for Information Technology Security Evaluations, version 3.1, revision 3. The extended SFR contained within this ST is FPT_SEP_EXT.1. This SFR was included to define the security functionality provided by the use of SVM.

There are no protection profile claims for this Security Target.

8.2 SECURITY OBJECTIVES RATIONALE

This section provides a rationale for the existence of each threat, OSP statement, and assumptions that compose the Security Target. Sections 8.2.1 and 8.2.2 demonstrate the mappings between the threats and assumptions to the security objectives are complete. The following discussion provides detailed evidence of coverage for each threat and assumption. There are no OSPs presumed for the TOE as mentioned previously in Section 3.2.

8.2.1 Security Objectives Rationale Relating to Threats

Table 29) Threats: Objectives Mapping

Threats	Objectives	Rationale
T.MASQUERADE A TOE user or process may masquerade as another entity in order to gain unauthorized access to data or TOE resources.	**O.ADMIN_ROLES** The TOE will provide administrative roles to isolate administrative actions.	Access to the TOE or network resources controlled by the TOE will only be granted to user accounts associated with the root, admin, power, backup, compliance, or audit role. This prevents threat agents from gaining unauthorized access to the TOE or network resources.
	O.DAC_ACC TOE users will be granted access only to user data for which they have been authorized based on their user identity and group membership.	The TOE will prevent access to TSF data by users masquerading as other entities by implementing discretionary access control. Users shall be granted access only to data for which they have been authorized based on their user identity and group membership.
T.TAMPER A TOE user or process may be able to bypass the TOE's security mechanisms by tampering with the TOE or TOE environment.	**O.ADMIN_ROLES** The TOE will provide administrative roles to isolate administrative actions.	The TOE will monitor attempts to access configuration data or other trusted data that could result in system failure resulting in unauthorized access to trusted data. Authorized roles are required for users to perform administrative procedures, thus isolating the amount of damage a user can perform.
	O.IA The TOE will require users to identify and authenticate themselves.	The TOE will monitor attempts to access configuration data or other trusted data that could result in system failure resulting in unauthorized access to trusted data. Users are required to identify and authenticate themselves to the TOE before attempting to modify TSF data or administrative functions.

Threats	Objectives	Rationale
	O.MANAGE The TSF will provide functions and facilities necessary to support the authorized administrators that are responsible for the management of TOE security.	The TOE will have defined methods and permissions for modification of configuration data.
	O.STRONG_PWD The TOE must ensure that all passwords will be at least 8 characters in length and will consist of at least one number and at least one alphabetic character. Special characters are optional. Password construction will be complex enough to avoid use of passwords that are easily guessed or otherwise left vulnerable, e.g. names, dictionary words, phone numbers, birthdays, etc. should not be used.	The TOE will have defined password rules that require strong passwords. The default password rules require passwords that are at least 8 characters in length and consist of at least one numeric and at least one alphabetic characters.
	OE.ACCESS The IT Environment will ensure that users gain only authorized access to the data the IT Environment manages.	The IT Environment will monitor attempts to access configuration data or other trusted data that could result in system failure resulting in unauthorized access to trusted data.
	OE.ADMIN_ROLES The IT Environment will provide administrative roles to isolate administrative actions.	The IT Environment will monitor attempts to access configuration data or other trusted data that could result in system failure resulting in unauthorized access to trusted data. Authorized roles are required for users to perform administrative procedures, thus isolating the amount of damage a user can perform.
T.UNAUTH A TOE user may gain access to security data on the TOE, even though the user is not authorized in accordance with the TOE SFP.	**O.ADMIN_ROLES** The IT Environment will provide administrative roles to isolate administrative actions.	The TOE will require authorized roles for users to perform administrative procedures therefore, isolating the amount of damage a user can perform.
	O.ENFORCE The TOE is designed and implemented in a manner the ensures that it can't be bypassed or interfered with via mechanisms within the TOE's control.	The TOE will ensure the SFP enforcement of the TOE is invoked and not interfered with inside the TOE.

Threats	Objectives	Rationale
	O.IA The TOE will require users to identify and authenticate themselves.	The TOE will require users to identify and authenticate themselves before attempting to modify TSF data or security attributes.
	O.MANAGE The TSF will provide functions and facilities necessary to support the authorized administrators that are responsible for the management of TOE security.	The TOE will have defined methods and permissions for modification of configuration data.
	O.INACTIVE The TOE will terminate an inactive management session after a configurable interval of time.	The TOE will prevent users from gaining access to security data on the TOE, even though the user is not authorized in accordance with the TOE SFP, by terminating an inactive management session after a configurable interval of time.
	OE.ACCESS The IT Environment will ensure that users gain only authorized access to the data the IT Environment manages.	The IT Environment will enforce restrictive access and modification rules for security attributes and TSF Data managed by the IT Environment and used by the TOE to enforce the DAC SFP.
	OE.ADMIN_ROLES The IT Environment will provide administrative roles to isolate administrative actions.	The IT Environment will require authorized roles for users to perform administrative procedures thus, isolating the amount of damage a user can perform.
	OE.ENFORCE The IT Environment will support the TOE by providing mechanisms to ensure the TOE is neither bypassed nor interfered with via mechanisms outside the TOE's control.	The IT Environment will ensure the SFP enforcement of the TOE is invoked and not interfered with outside the TOE.
T.DATALOSS Threat agents may attempt to remove or destroy data collected and produced by the TOE.	**O.IA** The TOE will require users to identify and authenticate themselves.	The TOE will mitigate unauthorized attempts to remove or destroy data collected and produced by the TOE by requiring that access to subject data is granted only after a user has been identified and authenticated.

Threats	Objectives	Rationale
T.NO_AUDIT Threat agents may perform security-relevant operations on the TOE without being held accountable for it.	**O.AUDIT** The TOE will audit all administrator authentication attempts, whether successful or unsuccessful, as well as TOE user account configuration changes.	The TOE will prevent a threat agent from performing a security- related action without being held accountable by auditing all security-related activity on the TOE and associating users with those activities.
	O.TIME STAMP The TOE will provide a reliable time stamp for use by the TOE.	The TOE will prevent a threat agent from performing a security- related action without being held accountable by auditing all security-related activity on the TOE and recording the time those activities were performed.
	OE.NTP The IT Environment will enable the TOE to provide reliable time stamps by implementing NTP.	The IT Environment will ensure that the TOE is able to perform reliable auditing by ensuring that the time stamp is reliable through the implementation of the Network Time Protocol.
T.IA Threat agents may attempt to compromise the TOE or network resources controlled by the TOE by attempting actions that it is not authorized to perform on the TOE or network resources.	**O.ADMIN_ROLES** The TOE will provide administrative roles to isolate administrative actions.	The TOE will prevent attempts to compromise the TOE or network resources controlled by the TOE by threat agents attempting actions that they are not authorized to perform by providing an administrator role and restricting access to the resources to users associated with that role.
	O.DAC_ACC TOE users will be granted access only to user data for which they have been authorized based on their user identity and group membership.	The TOE will prevent attempts to compromise the TOE or network resources controlled by the TOE by threat agents attempting actions that they are not authorized to perform by only granting users access to user data for which they have been authorized based on the identity of users and groups of users.
	O.IA The TOE will require users to identify and authenticate themselves.	The TOE will prevent attempts to compromise the TOE or network resources controlled by the TOE by threat agents attempting actions that they are not authorized to perform by requiring users to identify and authenticate themselves.
	OE.IA The IT Environment must require authorized CIFS and NFS Clients to successfully I&A before allowing access to the TOE.	The IT Environment will prevent attempts to compromise the TOE or network resources controlled by the TOE by threat agents attempting actions that they are not authorized to perform by requiring users to identify and authenticate themselves.

Every Threat is mapped to one or more Objectives in the Table 29. This complete mapping demonstrates that the defined security objectives counter all defined threats.

8.2.2 Security Objectives Rationale Relating to Assumptions

Table 30) Assumptions: Objectives Mapping

Threats	Objectives	Rationale
A.PEER Any other systems with which the TOE communicates are assumed to be under the same management control and use a consistent representation for specific user and group identifiers.	**OE.SUBJECTDATA** The IT Environment will provide the TOE with the appropriate subject security attributes.	The security attributes provided by the IT Environment will be meaningful because the representations between the TOE and IT Environment systems are consistent.
A.NETWORK Security Management shall be provided to protect the Confidentiality and Integrity of transactions on the network.	**OE.NETWORK** The network path between the TOEs is a trusted channel. The network path between the CLI client and the TOE is a trusted channel.	The channel between the TOEs which are partners in an HA pair, and the channel between the TOE and the CLI client are trusted channels.
A.MANAGE There will be one or more competent individuals assigned to manage the TOE and the security of the information it contains.	**ON.INSTALL** Those responsible for the TOE and hardware required by the TOE must ensure that the TOE is delivered, installed, configured, managed, and operated in a manner which maintains IT security objectives.	The TOE will be managed appropriately by one or more competent individuals.
	ON.TRAINED Those responsible for the TOE will be properly trained and provided the necessary information that ensures secure management of the TOE and the IT Environment.	Those responsible for the TOE will be properly trained and provided the necessary information that ensures secure management of the TOE and the IT Environment.
A.NO_EVIL_ADM The system administrative personnel are not hostile and will follow and abide by the instructions provided by the administrator documentation.	**ON.INSTALL** Those responsible for the TOE and hardware required by the TOE must ensure that the TOE is delivered, installed, configured, managed, and operated in a manner which maintains IT security objectives.	The TOE will be delivered, installed, managed, and operated by a non- hostile administrator in a manner which maintains IT security objectives.
A.COOP Authorized users possess the necessary authorization to access at least some of the information managed by the TOE and are expected to act in a cooperating manner in a benign environment.	**ON.CREDEN** Those responsible for the TOE must ensure that all access credentials, such as passwords, are protected by the users in a manner that maintains IT security objectives.	Authorized users will provide for the physical protection of the TOE's access credentials.

Threats	Objectives	Rationale
A.PROTECT The processing resources of the TOE critical to the SFP enforcement will be protected from unauthorized physical modification by potentially hostile outsiders.	**ON.PHYSICAL** Those responsible for the TOE and the network on which it resides must ensure that those parts of the TOE and the IT Environment critical to SFP are protected from any physical attack that might compromise the IT security objectives.	The security critical components of the TOE are protected from physical attacks by ensuring that the TOE is protected from unauthorized physical modification by hostile outsiders.
A.ADMIN_ACCESS Administrative functionality shall be restricted to authorized administrators.	**OE.ACCESS** The IT Environment will ensure that users gain only authorized access to the data the IT Environment manages.	Only authorized users will have access to administrative functionality.
	OE.ADMIN_ROLES The IT Environment will provide administrative roles to isolate administrative actions.	Authorized administrators will be restricted to administrative functionality based on their assigned role(s).
A.NTP The IT Environment will be configured to provide the TOE to retrieve reliable time stamps by implementing the Network Time Protocol (NTP).	**OE.NTP** The IT Environment will enable the TOE to provide reliable time stamps by implementing NTP.	The IT Environment will provide the TOE to synchronize a reliable time stamp through NTP.
A.PHYSICAL Physical security of the TOE and network, commensurate with the value of the TOE and the data it contains, is assumed to be provided by the environment.	**ON.PHYSICAL** Those responsible for the TOE and the network on which it resides must ensure that those parts of the TOE and the IT Environment critical to SFP are protected from any physical attack that might compromise the IT security objectives.	The TOE and the network on which it resides are protected from physical attacks commensurate with the value of the TOE and the data it protects such that physical attacks are mitigated.

Every assumption is mapped to one or more Objectives in the Table 30 above. This complete mapping demonstrates that the defined security objectives uphold all defined assumptions.

8.3 RATIONALE FOR EXTENDED SECURITY FUNCTIONAL REQUIREMENTS

The TOE contains the following explicitly stated security functional requirements:

- FPT_SEP_EXT.1

FPT_SEP_EXT.1 is an explicitly-stated functional requirement. The SFR family “TSF Domain Separation for Software TOEs” was created to specifically address the separation of virtual storage from each other when running within the TOE, as opposed to separation of the TOE’s domain of execution from outside entities. The SFR in this family has no dependencies since the stated requirement embodies all necessary security functions. This requirement exhibits functionality that can be easily documented in the ADV assurance evidence and thus do not require any additional Assurance Documentation.

8.4 RATIONALE FOR EXTENDED TOE SECURITY ASSURANCE REQUIREMENTS

There are no Extended SARs defined for this ST.

8.5 SECURITY REQUIREMENTS RATIONALE

The following discussion provides detailed evidence of coverage for each security objective.

8.5.1 Rationale for Security Functional Requirements of the TOE Objectives

Table 31) Objectives: SFRs Mapping

Objective	Requirements Addressing the Objective	Rationale
O.ADMIN_ROLES The TOE will provide administrative roles to isolate administrative actions.	**FMT_SMR.1** Security roles	Defines the user roles implemented by the DAC SFP requiring authorized roles for NetApp Administrators to perform administrative procedures.
O.AUDIT The TOE will audit all administrator authentication attempts, whether successful or unsuccessful, as well as TOE user account configuration changes.	**FAU_GEN.1** Audit data generation	Requires the TOE to generate audit event records for administrator logons and configuration changes, and defines the information saved in these records.
	FAU_GEN.2 User Identity Association	Requires the TOE to associate a specific user with the audit event records.
	FAU_SAR.1 Audit review	Requires the TOE to allow users to review audit event records.
	FAU_SAR.2 Restricted audit review	Requires the TOE to only allow administrators to review audit event records.
	FAU_STG.1 Protected audit trail storage	Requires the TOE to restrict the ability to modify or delete the audit trail to administrators, and to detect any such behavior by auditing all management operations.
	FAU_STG.4 Prevention of audit data loss	The TOE will continue to audit management activity if the audit trail is full by backing up the current audit trail, deleting the oldest audit trail file, and creating a new audit trail file.
O.DAC_ACC TOE users will be granted access only to user data for which they have been authorized based on their user identity and group membership.	**FDP_ACC.1** Subset access control	Identifies the subjects, objects, and operation of subjects on objects covered by the DAC SFP.
	FDP_ACF.1 Security attribute base access control	Identifies the subject and object security attributes used to enforce the DAC SFP, and defines the DAC rules enforced by the TOE that define access rules for TOE managed user data.
	FMT_MSA.3 Static attribute initialisation	Ensures restrictive default values are defined for the TOE's object security attributes used to enforce the DAC SFP.

Objective	Requirements Addressing the Objective	Rationale
O.ENFORCE The TOE is designed and implemented in a manner the ensures the SFPs can't be bypassed or interfered with via mechanisms within the TOE's control.	**FPT_SEP_EXT.1** TSF domain separation software TOEs	The TOE tracks user sessions individually and enforces the SFPs appropriately for each session. User sessions cannot interfere with one another within the TOE. Without this assurance, there would not be assurance that the TOE could not be interfered with.
O.IA The TOE will require users to identify and authenticate themselves.	**FIA_AFL.1** Authentication failure handling	Protects the TOE from malicious brute-force and dictionary password attacks by locking out accounts after a configurable number of failed login attempts.
	FIA_UAU.2 User authentication before any action	Ensures that users must authenticate themselves before any TSF mediated access to the TOE functions or TSF data is allowed.
	FIA_UID.2 User identification before any action	Ensures that users must identify themselves before any TSF mediated access to the TOE functions or TSF data is allowed.
O.MANAGE The TSF will provide functions and facilities necessary to support the authorized administrators that are responsible for the management of TOE security.	**FIA_ATD.1** User attribute definition	Identifies the TOE maintained subject security attributes of TOE maintained objects.
	FMT_MOF.1 Management of security function behaviour	Defines the restrictions enforced by the DAC SFP to modify roles associated with administrators managed by the TOE and used to enforce the DAC SFP.
	FMT_MSA.1 Management of security attributes	Only authorized NetApp Administrators responsible for the management of TOE security may modify, delete or add the security attributes maintained locally by the TOE and used to enforce the DAC SFP.
	FMT_MTD.1(a) Management of TSF data	Defines the restrictions enforced by the DAC SFP to modify user accounts and roles managed by the TOE and used to enforce the DAC SFP.
	FMT_MTD.1(b) Management of TSF data	Defines the restrictions enforced by the DAC SFP to modify the listening state of the TOE.
	FMT_SMF.1 Specification of	Defines the TSF management functions provided by the TOE that ensures the TOE's SFPs can be enforced.

Objective	Requirements Addressing the Objective	Rationale
O.STRONG_PWD The TOE must ensure that all passwords will be at least 8 characters in length and will consist of at least one number and at least one alphabetic character. Special characters are optional. Password construction will be complex enough to avoid use of passwords that are easily guessed or otherwise left vulnerable, e.g. names, dictionary words, phone numbers, birthdays, etc. should not be used.	**FIA_SOS.1** Verification of secrets	The TOE ensures that all passwords will be at least 8 characters in length and will consist of at least one number and at least one alphabetic character. Special characters are optional.
O.INACTIVE The TOE will terminate an inactive management session after a configurable interval of time.	**FTA_SSL.3** TSF-initiated termination	The TOE will terminate an administrator's session after a configurable interval of time.
O.TIME STAMP The TOE will provide a reliable time stamp for use by the TOE.	**FPT_STM.1** Reliable time stamps	The Operating System Kernel will provide a reliable time stamp for use by the TOE.

8.5.2 Security Assurance Requirements Rationale

EAL2 was chosen to provide a low to moderate level of assurance that is consistent with good commercial practices. As such, minimal additional tasks are placed upon the vendor assuming the vendor follows reasonable software engineering practices and can provide support to the evaluation for design and testing efforts. The chosen assurance level is appropriate with the threats defined for the environment. While the System may monitor a hostile environment, it is expected to be in a non-hostile position and embedded in or protected by other products designed to address threats that correspond with the intended environment. At EAL2, the System will have incurred a search for obvious flaws to support its introduction into the non - hostile environment. The augmentation of ALC_FLR.3 was chosen to give greater assurance of the developer's on-going flaw remediation processes.

8.5.3 Dependency Rationale

This ST does satisfy all the requirement dependencies of the Common Criteria. Table 32 lists each requirement to which the TOE claims conformance with a dependency and indicates whether the dependent requirement was included. As the Table 32 indicates, all dependencies have been met.

Table 32) Functional Requirements Dependencies

SFR ID	Dependencies	Dependency Met	Rationale
FAU_GEN.1	FPT_STM.1	✓	
FAU_GEN.2	FAU_GEN.1	✓	

SFR ID	Dependencies	Dependency Met	Rationale
	FIA_UID.2	✓	Although FAU_GEN.2 is dependent on FIA_UID.1 which is not claimed, the dependency SFR is substituted by FIA_UID.2 which is hierarchical to FIA_UID.1 and claimed because the TOE does not permit any TSF- mediated actions before users are identified.
FAU_SAR.1	FAU_GEN.1	✓	
FAU_SAR.2	FAU_SAR.1	✓	
FAU_STG.1	FAU_GEN.1	✓	
FAU_STG.4	FAU_STG.1	✓	
FDP_ACC.1	FDP_ACF.1	✓	
FDP_ACF.1	FDP_ACC.1	✓	
	FMT_MSA.3	✓	
FIA_AFL.1	FIA_UAU.2	✓	Although FIA_AFL.1 is dependent on FIA_UAU.1 which is not claimed, the dependency SFR is substituted by FIA_UAU.2 which is hierarchical to FIA_UAU.1 and claimed because the TOE does not permit any TSF- mediated actions before users are authenticated.
FIA_ATD.1	No dependencies		
FIA_SOS.1	No dependencies		
FIA_UAU.2	FIA_UID.2	✓	Although FIA_UAU.2 is dependent on FIA_UID.1 which is not claimed, the dependency SFR is substituted by FIA_UID.2 which is hierarchical to FIA_UID.1 and claimed because the TOE does not permit any TSF- mediated actions before users are identified.
FIA_UID.2	No dependencies		
FMT_MOF.1	FMT_SMF.1	✓	
	FMT_SMR.1	✓	
FMT_MSA.1	FDP_ACC.1	✓	
	FMT_SMF.1	✓	
	FMT_SMR.1	✓	
FMT_MSA.3	FMT_MSA.1	✓	
	FMT_SMR.1	✓	
FMT_MTD.1(a)	FMT_SMF.1	✓	
	FMT_SMR.1	✓	
FMT_MTD.1(b)	FMT_SMR.1	✓	
	FMT_SMF.1	✓	
FMT_SMF.1	No dependencies		

SFR ID	Dependencies	Dependency Met	Rationale
FMT_SMR.1	FIA_UID.2	✓	Although FMT_SMR.1 is dependent on FIA_UID.1 which is not claimed, the dependency SFR is substituted by FIA_UID.2 which is hierarchical to FIA_UID.1 and claimed because the TOE does not permit any TSF- mediated actions before users are identified.
FPT_SEP_EXT.1	No dependencies		
FPT_STM.1	No dependencies		
FTA_SSL.3	No dependencies		

9 Acronyms

This section describes the acronyms.

Table 33) Acronyms

Acronym	Definition
ACE	Access Control Entry
ACL	Access Control List
API	Application Programming Interface
BMC	Baseboard Management Controller
CC	Common Criteria
CIFS	Common Internet File System
CLI	Command Line Interface
CM	Configuration Management
DAC	Discretionary Access Control
EAL	Evaluation Assurance Level
EVT	Microsoft Windows Event Viewer format
FAS	Fabric Attached Storage
FC	Fibre Channel
FCP	Fibre Channel Protocol
FQDN	Fully Qualified Domain Name
GID	Group ID
HTTP	Hypertext Transfer Protocol
I&A	Identification and Authentication
ID	Identifier
IP	Internet Protocol
iSCSI	Internet Small Computer System Interface
IT	Information Technology
KDC	Key Distribution Center
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol
LIF	Logical Interface
LUN	Logical Unit Number
MAN	Manual
NFS	Network File System
NIS	Network Information Service
NTFS	New Technology File System
NTLM	New Technology Local Area Network Manager
NTP	Network Time Protocol
OS	Operating System

Acronym	Definition
PAM	Pluggable Authentication Module
RAID	Redundant Array of Independent Disks
RLM	Remote LAN Management
RSH	Remote Shell
SAN	Storage Area Network
SAR	Security Assurance Requirement
SAS	Serial Attached Small Computer System Interface
SATA	Serial Advanced Technology Attachment
SD	Security Descriptor
SFP	Security Function Policy
SFR	Security Functional Requirement
SID	Security Identifier
SMT	Secure Multi-Tenancy
SSH	Secure Shell
SVM	Storage Virtual Machine
ST	Security Target
TCP	Transport Control Protocol
TFTP	Trivial File Transfer Protocol
TOE	Target of Evaluation
TSF	TOE Security Functionality
UDP	User Datagram Protocol
UID	User ID
UMASK	User Mask
VLDB	Volume Location Data Base
WAFL	Write Anywhere File Layout®

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