



Architecture and components

Element Software

NetApp
June 11, 2021

Table of Contents

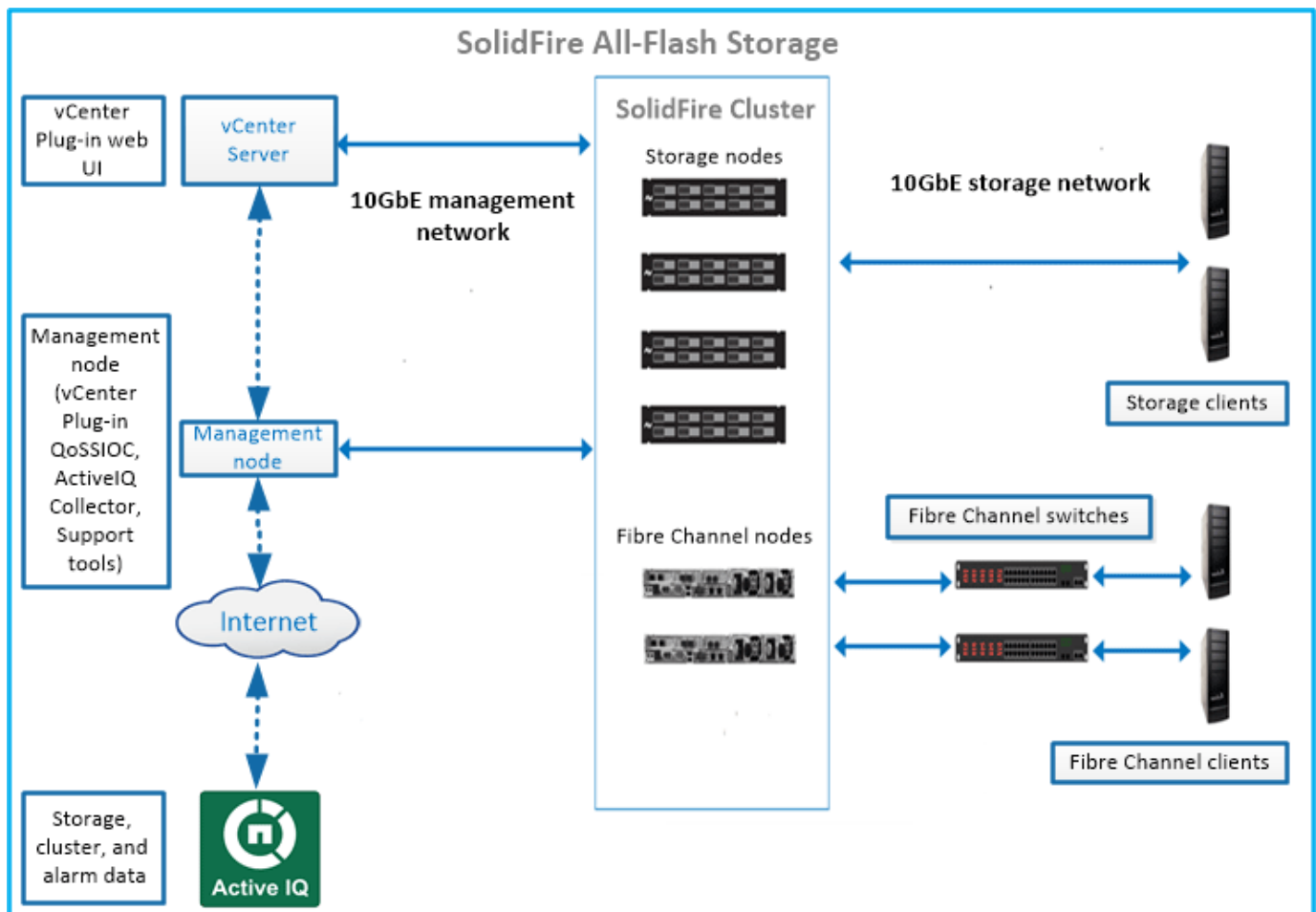
- SolidFire architecture overview 1
- Common URLs 2
- Find more information 2
- SolidFire software interfaces 2
- SolidFire Active IQ 4
- Management node for Element software 5
- Management services for SolidFire all-flash storage 5

SolidFire architecture overview

A SolidFire all-flash storage system is comprised of discrete hardware components (drive and nodes) that are combined into a pool of storage resources with NetApp Element software running independently on each node. This single storage system is managed as a single entity by using the Element software UI, API and other management tools.

A SolidFire storage system includes the following hardware components:

- **Cluster:** The hub of the SolidFire storage system that is a collection of nodes.
- **Nodes:** The hardware components grouped into a cluster. There are two types of nodes:
 - Storage nodes, which are servers containing a collection of drives
 - Fibre Channel (FC) nodes, which you use to connect to FC clients
- **Drives:** Used in storage nodes to store data for the cluster. A storage node contains two types of drives:
 - Volume metadata drives store information that defines the volumes and other objects within a cluster.
 - Block drives store data blocks for volumes.



You can manage, monitor, and update the system using the Element web UI and other compatible tools:

- [SolidFire software interfaces](#)
- [SolidFire Active IQ](#)

- [Management node for Element software](#)
- [Management services](#)

Common URLs

These are the common URLs you use with a SolidFire all-flash storage system:

URL	Description
<code>https://[storage cluster MVIP address]</code>	Access the NetApp Element software UI.
<code>https://activeiq.solidfire.com</code>	Monitor data and receive alerts to any performance bottlenecks or potential system issues.
<code>https://[management node IP address]</code>	Access NetApp Hybrid Cloud Control to upgrade, manage, and monitor your storage installation, and update management services. Learn more.
<code>https://[IP address]:442</code>	From the per-node UI, access network and cluster settings and utilize system tests and utilities. Learn more.
<code>https://[management node IP address]/mnode</code>	Use management services REST API and other functionality from the management node. Learn more.
<code>https://[management node IP address]:9443</code>	Register the vCenter Plug-in package in the vSphere Web Client. Learn more.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

SolidFire software interfaces

You can manage a SolidFire storage system using different NetApp Element software interfaces and integration utilities.

Options

- [NetApp Element software user interface](#)
- [NetApp Element software API](#)
- [NetApp Element Plug-in for vCenter Server](#)
- [NetApp Hybrid Cloud Control](#)
- [Management node UIs](#)
- [Additional integration utilities and tools](#)

NetApp Element software user interface

Enables you to set up Element storage, monitor cluster capacity and performance, and manage storage activity across a multi-tenant infrastructure. Element is the storage operating system at the heart of a SolidFire

cluster. Element software runs independently on all nodes in the cluster and enables the nodes of the cluster to combine resources that are presented as a single storage system to external clients. Element software is responsible for all cluster coordination, scale and management of the system as a whole. The software interface is built upon the Element API.

[Manage storage with Element software](#)

NetApp Element software API

Enables you to use a set of objects, methods, and routines to manage Element storage. The Element API is based on the JSON-RPC protocol over HTTPS. You can monitor API operations in the Element UI by enabling the API Log; this enables you to see the methods that are being issued to the system. You can enable both requests and responses to see how the system replies to the methods that are issued.

[Manage storage with the Element API](#)

NetApp Element Plug-in for vCenter Server

Enables you to configure and manage storage clusters running Element software using an alternative interface for the Element UI within VMware vSphere.

[NetApp Element Plug-in for vCenter Server](#)

NetApp Hybrid Cloud Control

Enables you to upgrade Element storage and management services and manage storage assets using the NetApp Hybrid Cloud Control interface.

[Manage storage with the NetApp Hybrid Cloud Control](#)

Management node UIs

The management node contains two UIs: a UI for managing REST-based services and a per-node UI for managing network and cluster settings and operating system tests and utilities. From the REST API UI, you can access a menu of service-related APIs that control service-based system functionality from the management node.

Additional integration utilities and tools

Although you typically manage your storage with NetApp Element, NetApp Element API, and NetApp Element Plug-in for vCenter Server, you can use additional integration utilities and tools to access storage.

Element CLI

[Element CLI](#) enables you to control a SolidFire storage system using a command-line interface without having to use the Element API.

Element PowerShell Tools

[Element PowerShell Tools](#) enable you to use a collection of Microsoft Windows PowerShell functions that use the Element API to manage a SolidFire storage system.

Element SDKs

[Element SDKs](#) enable you to manage your SolidFire cluster using these tools:

- Element Java SDK: Enables programmers to integrate the Element API with the Java programming language.
- Element .NET SDK: Enables programmers to integrate the Element API with the .NET programming platform.
- Element Python SDK: Enables programmers to integrate the Element API with the Python programming language.

SolidFire Postman API testing suite

Enables programmers to use a collection of [Postman](#) functions that test Element API calls.

SolidFire Storage Replication Adapter

[SolidFire Storage Replication Adapter](#) integrates with the VMware Site Recovery Manager (SRM) to enable communication with replicated SolidFire storage clusters and execute supported workflows.

SolidFire vRO

[SolidFire vRO](#) provides a convenient way to use the Element API to administer your SolidFire storage system with VMware vRealize Orchestrator.

SolidFire VSS Provider

[SolidFire VSS Provider](#) integrates VSS shadow copies with Element snapshots and clones.

Find more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)

SolidFire Active IQ

[SolidFire Active IQ](#) is a web-based tool that provides continually updated historical views of cluster-wide data. You can set up alerts for specific events, thresholds, or metrics. SolidFire Active IQ enables you to monitor system performance and capacity, as well as stay informed about cluster health.

You can find the following information about your system in SolidFire Active IQ:

- Number of nodes and status of the nodes: healthy, offline, or fault
- Graphical representation of CPU and memory usage
- Details about the node, such as serial number, slot location in the chassis, model, and version of NetApp Element software running on the storage node
- CPU and storage-related information about the virtual machines

For more information

- [SolidFire and Element Resources page](#)
- [NetApp Element Plug-in for vCenter Server](#)
- [NetApp Support Site > Tools for Active IQ](#)

Management node for Element software

The [management node \(mNode\)](#) is a virtual machine that runs in parallel with one or more Element software-based storage clusters. It is used to upgrade and provide system services including monitoring and telemetry, manage cluster assets and settings, run system tests and utilities, and enable NetApp Support access for troubleshooting.

The management node interacts with a storage cluster to perform management actions, but is not a member of the storage cluster. Management nodes periodically collect information about the cluster through API calls and report this information to Active IQ for remote monitoring (if enabled). Management nodes are also responsible for coordinating software upgrades of the cluster nodes.

As of the Element 11.3 release, the management node functions as a microservice host, allowing for quicker updates of select software services outside of major releases. These microservices or [management services](#) are updated frequently as service bundles.

Management services for SolidFire all-flash storage

As of the Element 11.3 release, **management services** are hosted on the [management node](#), allowing for quicker updates of select software services outside of major releases.

Management services provide central and extended management functionality for SolidFire all-flash storage. These services include [NetApp Hybrid Cloud Control](#), Active IQ system telemetry, logging, and service updates, as well as the QoSSIOC service for the Element Plug-in for vCenter.



Learn more about [management services releases](#).

Copyright Information

Copyright © 2021 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system- without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.