



NetApp Verified Architecture

NetApp HCI H615C Compute Node with EF280 NVA Design

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Abstract

This document describes in detail how to design an appliance-like solution using a NetApp® HCI compute node with a NetApp EF280 all-flash array.

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Executive Summary

Businesses face tremendous pressure to harness the power of artificial intelligence (AI) to improve operational efficiencies, to extract untapped value from their data, and to transform their customers' experience – all with limited time, skills, and budget. Until now, the cost and complexity of implementing AI has made the potential benefits out of reach for all but the most tech savvy.

This document presents an overview of a high-performance, cost-effective, appliance-like solution using the NetApp® HCI H615C compute node with the NetApp EF280 all-flash storage array. The H615C requires just 1U of rack space and the EF280 just 2U of rack space. Combined, these capabilities offer optimal price /performance, configuration flexibility, and simplicity in a compact package to help you accelerate your journey to AI. In addition, the solution provides a one-stop shop for compute and storage needs, allowing customers to purchase both the compute rack server and E-Series storage array directly from NetApp.

Solution Overview

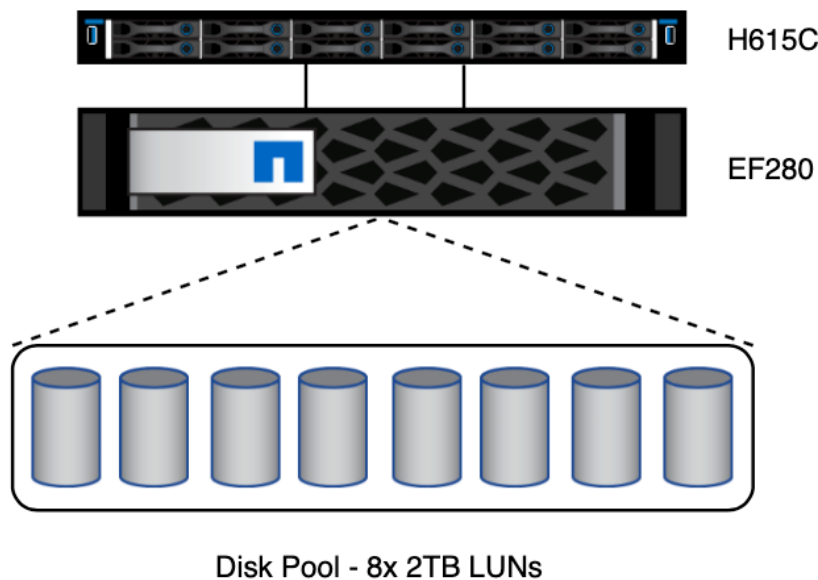
The solution in this design guide consisted of two configurations. The first was a single NetApp H615C server direct connected to a NetApp EF280 array via the included SFP28 (10/25GbE) ports. The protocol used was iSCSI. The second configuration used the same H615C server, but with the addition of two QLogic 16Gb Fibre Channel adapters. The server was then direct connected to the NetApp EF280 array.

Additionally, we added a 10Gb Intel network adapter for host management. In situations where this is not possible, NetApp recommends using an additional switch, configuring available ports in trunk mode, and creating a management VLAN. NetApp also offers Mellanox Ethernet switches for fabric-connected configurations.

For iSCSI, the EF280 array was configured with 25Gb host interface cards (HICs). For Fibre Channel, the baseboard FC ports of the EF280 array were used.

Figure 1 shows the technical components of the solution.

Figure 1) H615C Direct connected to an EF280.



Use Case Summary

This solution fits modern workloads such as artificial intelligence, machine learning, and deep learning. It's ideal for the following use cases:

- [Robotic process automation:](#)
 - Healthcare
 - Finance and banking
 - Manufacturing
 - Customer service
 - Automotive
 - Operations (Splunk)
- Backup and recovery:
 - NetApp StorageGRID®
 - Veeam
 - Commvault
 - Rubrik
- Databases:
 - SQL and NOSQL
 - Oracle

Technology Requirements

Hardware Used

The H615C models offer various CPU and RAM configurations but have identical, dual-port (2 SFP28) Ethernet adapters and are identical in terms of base networking configuration and iSCSI compatibility.

Server: NetApp HCI H615C (Model H615-75031)

- Two Intel Xeon Gold 6242 processors @ 2.8GHz
- 512GB RAM
- iSCSI protocol used the base networking 2x 10/25Gbe (Mellanox Connect-X 4)
- FC protocol used two QLogic 16Gb Fibre Channel adapters (custom option)

Storage: NetApp EF280 all-flash array

- 25Gb iSCSI HICs for the iSCSI solution
- Built-in 16Gb FC baseboard ports for the FC solution
- 24 MZILS15THMLS-0G4 - 15TB SSD drives
- One disk pool spanning all drives
- 8 volumes presented to host

Table 1 lists the hardware components that were used to implement the solution. The hardware components that are used in any particular implementation of the solution might vary based on customer requirements.

Table 1) Hardware used.

Hardware	Quantity
NetApp HCI H615C	1

NetApp EF280 all-flash array	1
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Software Used

We chose RHEL 7.8 as the operating system for this design guide, but any OS supported on the NetApp IMT could be used. (To review interoperability for H615 (OS) and E-Series (iSCSI host), see the [Interoperability Matrix Tool](#). Because the H615C node comes with ESXi installed, you should submit an FPVR when using operating systems other than ESXi.)

Table 2 lists the software components that were used to implement the solution. The software components that are used in any particular implementation of the solution might vary based on customer requirements.

Table 2) Software used.

Software	Quantity
RHEL 7.8	1
NetApp SANtricity® 11.60	1

This document uses the EF280 and iSCSI protocol, but you can use other E-Series models and other protocols as well. Table 3 shows the other E-Series products that you can connect behind NetApp HCI H615C.

We tested this combination using direct attached storage, but you can also connect the NetApp HCI H615C compute node to an E-Series storage system through a protocol switch. For supported protocol switches, refer to the [NetApp Interoperability Matrix Tool \(IMT\)](#),

Table 3) Other supported E-Series products with NetApp HCI H615C.

Component	Supported Options	Details
Storage arrays	E57xx E28xx EFxx	We tested with the EF280 in this document, but all the other E-Series products are supported as well.
Protocol	Fibre Channel iSCSI InfiniBand	We tested with iSCSI and FC protocols in this document, but other options are supported as well with custom configurations.

Solution Verification

To test this solution, we used the open source I/O workload generator vdbench to measure solution performance.

A single disk pool was created, spanning all 24 disks in the EF280. Within the disk pool, 8 volumes were created and presented to the host.

For iSCSI, jumbo frames were enabled on the host and array. One iSCSI connection was created per direct-connected port, with two iSCSI sessions per connection.

For FC, one connection to each controller was made from each host adapter.

Vdbench was then instructed to read or write I/O workloads to the 8 raw, multipathed volumes.

Vdbench Results

The vdbench results prove that the H615C can achieve nearly the maximum rates that the EF280 is capable of. (See the datasheet [NetApp EF280 All-Flash Array](#).) The only limitation is in read throughput, because this solution uses either a single 25Gb link to each controller or two 16Gb direct connections to each controller, essentially maxing out the line rate of each connection.

Table 4) VdBench results.

I/O Profile	100% Reads	100% Writes
iSCSI Large Sequential	5.4GBps	3.5GBps
iSCSI Random 4k	300,000 IOPs	50,000 IOPs
FC Large Sequential	6GBps	3.5GBps
FC Random 4k	275,000 IOPs	50,000 IOPs

Conclusion

Cost and complexity shouldn't be barriers to accessing the power of AI. The NetApp H615C compute node with the E-Series EF280 storage system provides extreme performance at an extreme value, with a single purchase point for compute, networking, and storage hardware.

Where to Find Additional Information

To learn more about the information that is described in this document, review the following documents and/or websites:

- NetApp EF280 Datasheet:
<https://www.netapp.com/pdf.html?item=/media/8118-ds-3927.pdf>
- NetApp EF-Series all-flash arrays:
<https://www.netapp.com/data-storage/ef-series/>
- NetApp HCI:
<https://www.netapp.com/pdf.html?item=/media/7977-ds-3881.pdf>
- NetApp Product Documentation
<https://docs.netapp.com>
- [NetApp Interoperability Matrix Tool](#)

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Version History

Version	Date	Document Version History
Version 1.0	November 2020	Initial Release

Refer to the [Interoperability Matrix Tool \(IMT\)](#) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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