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TECHNICAL WHITE PAPER

Purity ActiveCluster over Fibre Channel

Experience simple and effective business continuity with Pure Storage FlashArray Fibre Channel support.

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Introduction

As innovation increasingly means using data to drive results, being able to handle the complexity of ensuring the high availability of data is more crucial than ever to business continuity and success. The costs of business downtime are enormous—often as much as $1,000,000 per hour, according to recent studies. And, there are further inestimable costs in employee productivity and company reputation.[1] These potentially crippling outages occur far too often, with 76% of companies surveyed experiencing a disaster-recovery (DR) incident in the past two years.[2] More than 50% of these companies experienced at least two such incidents.[3]

Unfortunately, business continuity solutions that prevent storage downtime tend to be complex and lacking in the flexibility and agility that businesses require. Organizations today are looking for business continuity alternatives that are flexible enough to support their existing infrastructures, are intuitive enough for IT generalists to handle, and can effectively prevent any business disruption. As many as 29% of organizations target a recovery-time objective (RTO) of one hour or less for all tiers of IT services.[4]

Pure Storage® Purity ActiveCluster™ answers this need. ActiveCluster is an easy-to-configure, fully symmetric, active-active, bidirectional replication feature of Pure Storage FlashArray™. It provides synchronous replication between two arrays in close proximity for zero recovery-point objective (RPO) and automatic transparent failover for zero RTO. ActiveCluster also enables active-active asynchronous replication to a remote site anywhere in the world and the cloud by using Pure Cloud Block Store™.

For more than three years, ActiveCluster has delivered rock-solid availability for FlashArray over Ethernet/IP-based storage networks. And now, in response to customer demand, Pure Storage is also offering ActiveCluster array-to-array replication for FlashArray over your existing Fibre Channel (FC) infrastructure. The support for FC, which begins with the Purity operating environment version 6.1, extends the reach of this business continuity feature of FlashArray to support the storage network infrastructure of most enterprise environments.

What Is ActiveCluster?

ActiveCluster is a built-in business continuity feature of the Purity operating environment. It enables synchronous and asynchronous replication between Pure Storage FlashArrays. ActiveCluster enables clustered arrays and hosts to be deployed in various configurations.

Synchronous replication between two FlashArrays is supported in environments with very low roundtrip latency (11 milliseconds or less), typically within a single data center, campus, or metro region. Arrays configured for synchronous replication enable automatic, non-disruptive failover (zero RPO and zero RTO), in addition to automatic resync and recovery (transparent failover).

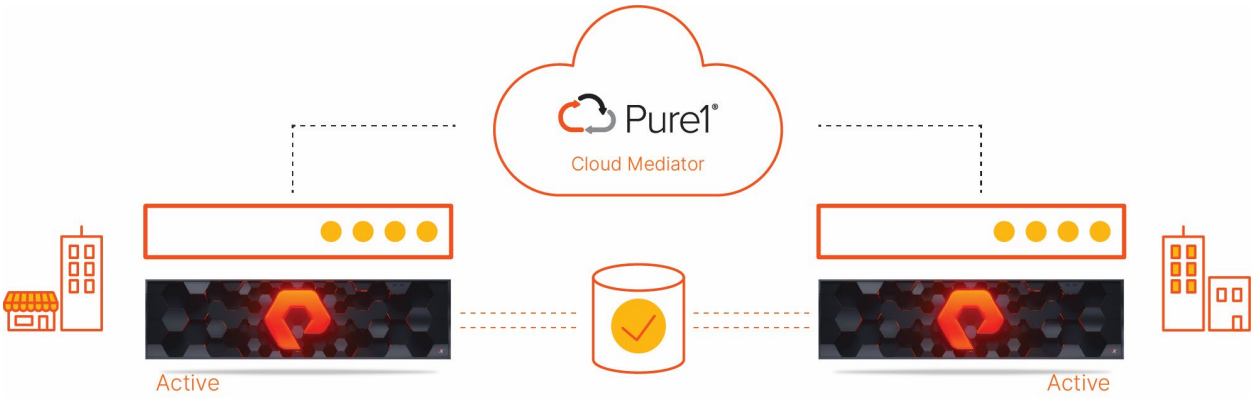

Figure 1. ActiveCluster delivers business continuity to FlashArray storage arrays. The feature is configured through the Purity operating environment, which runs on each array.

ActiveCluster also supports a third asynchronous replication site anywhere in the world with no latency restrictions, to achieve near-zero RPO and RTO. Transparent failover between arrays in ActiveCluster is automatic and requires no intervention from the storage administrator.

The active-active nature of ActiveCluster allows all replicas to serve writes in addition to reads. For optimal performance, input/output (I/O) requests are automatically served by the closest available replica. Storage administrators don't need to worry about configuring virtual machine (VM) or database-instance affinity to a site. ActiveCluster also helps ensure replication efficiency with inline compression on the wire.

ActiveCluster requires no licenses or additional hardware to purchase or deploy beyond two FlashArrays. It is extremely simple to set up and manage, well within the skill set of IT generalists.

There are many benefits of using ActiveCluster, including:

- It prevents a "split-brain" condition from occurring in a stretched cluster, in which both arrays could independently allow access to data without any synchronization between the FlashArrays.
- It determines which FlashArray will continue to service I/O to synchronously replicated volumes in the event of a FlashArray failure, replication link outage, or site outage.
- It enables replication to the cloud for additional redundancy using Pure Cloud Block Store.

Core Components

ActiveCluster relies on three primary components (Figure 2).

- **Pure1® Cloud Mediator (transparent failover mediation):** This component determines which FlashArray will continue to provide data access if an outage occurs in the environment. More specifically, Pure1 Cloud Mediator is a software-as-a-service (SaaS)-based quorum mechanism that provides the following functions for ActiveCluster:
- **Active-active clustered FlashArrays:** Physical storage arrays that perform replication and maintain a copy of data.
- **Stretched storage containers (pods):** Management containers that collect storage objects such as volumes. The pods are stretched between two arrays. Stretched pods provide consistent I/O behavior for the storage objects within them.

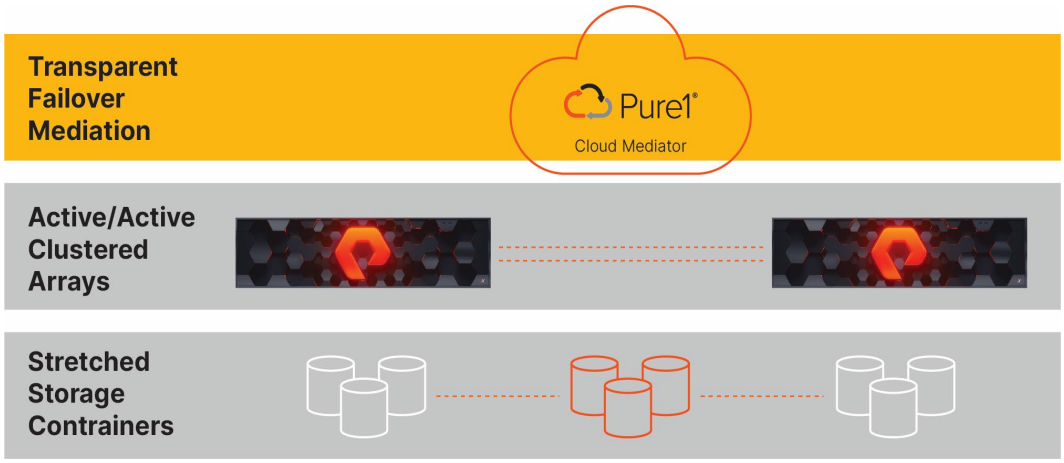

Figure 2. ActiveCluster depends on a cloud mediator, clustered storage arrays, and stretched storage containers (pods).

Business Continuity through Pure Cloud Block Store

ActiveCluster can also be configured to add business continuity to cloud resources. Pure Cloud Block Store is a software-defined enterprise storage solution that runs on Amazon Web Services (AWS) or Microsoft Azure and that is managed through the Purity operating environment. Pure Cloud Block Store enhances cloud-native storage by delivering the same enterprise resiliency you experience in your data center, along with excellent cost efficiency through industry-leading data compression, thin provisioning, and deduplication. Pure Cloud Block Store can also help ensure high availability for cloud-based applications by using ActiveCluster technology stretched between multiple availability zones in multiple regions.

Pure Cloud Block Store enhances ActiveCluster in your data center by leveraging the cloud as an asynchronous DR target for Pure FlashArrays. This design helps to further ensure high availability of applications and data on-premises. This option is especially useful for organizations that lack a secondary site for stretched clusters.

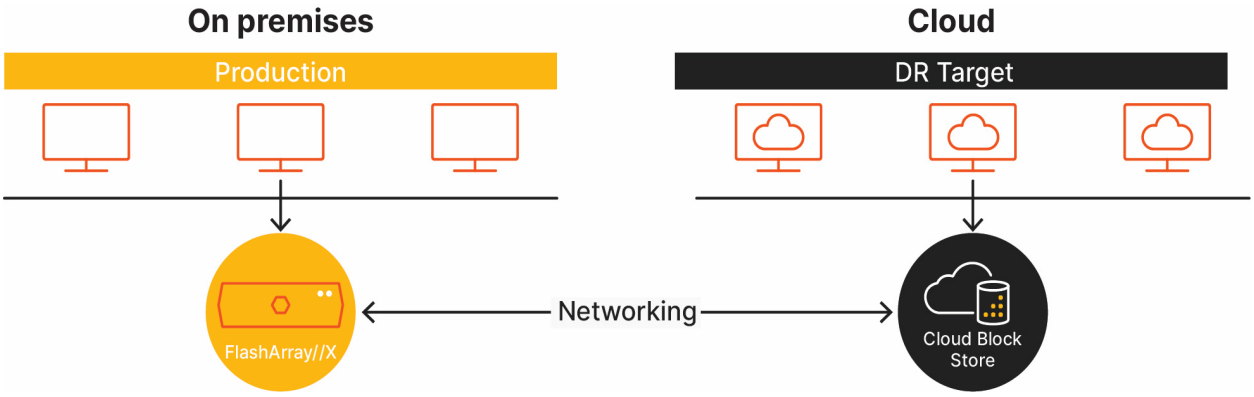

Figure 3. Through the Purity operating environment, you can configure ActiveCluster to replicate data from your data center to Pure Cloud Block Store as a DR target.

ActiveCluster over Fibre Channel

Existing versions of ActiveCluster support dedicated Ethernet networks connecting Pure FlashArrays. Now, Pure Storage has extended ActiveCluster support to FC infrastructure, expanding its benefits to all enterprises, along with a consistent user experience provided by Purity.

Solution Requirements

ActiveCluster over FC requires the following hardware:

- Two FlashArrays
  - Supported at original release: FlashArray//XR2 and FlashArray//XR3, including //X20, //X50, //X70, and //X90
  - Two dedicated FC ports per controller
- Gen 5 (16Gbps) and Gen 6 (32Gbps) switches
  - Network latency requirements: <11ms (roundtrip)

Supported Topologies

ActiveCluster over FC supports synchronous replication between two arrays within a data center or across campus and metro distances with up to 5ms round trip time latency. Additionally, when two arrays are configured to perform synchronous replication over FC, then asynchronous replication to a third site must be conducted through IP over Ethernet network connections (Figure 4).

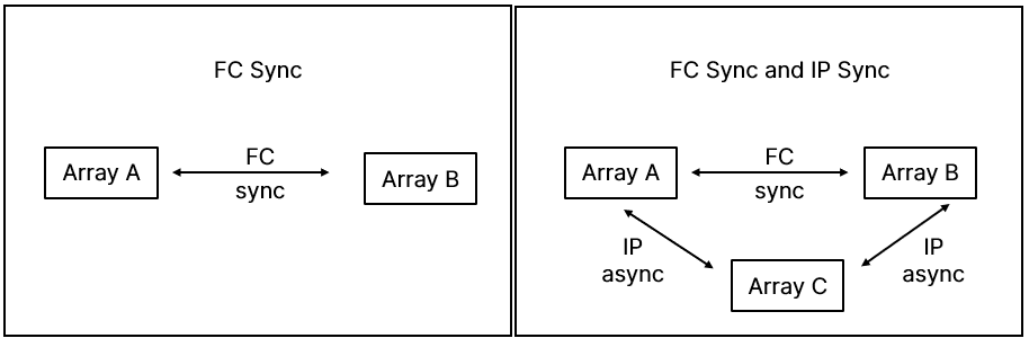

Figure 4. ActiveCluster over FB configuration and deployment options.

Overview of the ActiveCluster over Fibre Channel Setup

Setting up ActiveCluster over FC requires you to first enable replication service on the FC ports. You might also want to configure FC zones according to your switch manufacturer specifications. (FC zones delineate management domains and define traffic flow among FC storage targets.)

Within the Purity operating environment, the `purearray connect` command-line interface (CLI) command now includes the option `--protocol FC` and `--protocol IP`. These options are used to specify the protocol for ActiveCluster.

The steps required to configure ActiveCluster over FC can be summarized as follows:

1. Configure the FlashArray FC ports to have replication service. This requires elevated privileges and a controller reboot.
2. Make the zones (optional).
3. Use `purearray connect` with the new `--protocol FC` option (as opposed to the `--protocol IP` option for IP/Ethernet).

4. Perform an FC link check to verify connectivity.
5. Follow the normal procedure to create pods, create volumes in pods, and stretch the pods.

Frequently Asked Questions

Will a switched fabric be required? Yes.

What impact will this have on my infrastructure? If you have been using Ethernet, then you will no longer need Ethernet switches for ActiveCluster replication. You will use FC switches instead.

What changes in my environment do I need to make to implement FC over ActiveCluster? There is no impact for existing SAN infrastructures using modern switching infrastructure. It may require a firmware update on the SAN switch or a software setting depending on the specific switch. For customers using ActiveCluster over Ethernet who wish to switch to ActiveCluster over FC, qualified SAN switches will be required based on the desired deployment configuration.

Do I need to add FC switches? If your current FC switches have ports available, then no additional switches are required.

Do interfaces change? What are the impacts on availability?
If you are currently using ActiveCluster with Ethernet, then you will have to add FC ports to the arrays. There is no impact on application availability, and all changes can be done without a service outage.

Which FlashArray hardware models will support ActiveCluster over FC?
ActiveCluster over FC requires FlashArray//XR2 or a newer FlashArray model because it requires the same FC host port cards that ship with these models. (These port cards are the Broadcom Emulex Gen 6 cards.)

Bring Simple Business Continuity to Your Fibre Channel Infrastructure

Business continuity is crucial to business success, but complex business continuity solutions are fraught with risk. ActiveCluster gives you truly intuitive business continuity and helps prevent any downtime or data loss through the synchronous replication of read/write volumes. ActiveCluster is easy to set up and manage, and it requires no extra licensing or fees.

Business continuity solutions that require separate storage topologies require multiple skill sets and are time-consuming to manage. Storage admins want to focus on a single storage fabric and spend less time managing a separate fabric dedicated to storage replication and availability. Also, multiple skill sets aren't required; any IT or storage admin can use ActiveCluster.

If you have FC SANs in your data centers, now you no longer have to purchase, deploy, or maintain an Ethernet network for replication services in an ActiveCluster environment. Available starting with Purity 6.1, ActiveCluster over FC extends the reach of simple business continuity in FlashArrays. ActiveCluster enables you to protect your organization's data and preserve business continuity with the consistent interface of the Purity operating environment, regardless of topology or the location of your data—whether on-premises, in the cloud, in a hybrid cloud, or in a multicloud environment.

Additional Resources

Learn more about Purity ActiveCluster.

[1] "Forty Percent of Enterprises Say Hourly Downtime Costs Top $1Million," Information Technology Intelligence Consulting (ITIC), June 2020.

[2] "Survey Analysis: IT Disaster Recovery Trends and Benchmarks," Gartner, April 2020.

[3] **Ibid.**

[4] **Ibid.**

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