



HAMMERSPACE

Configuring Hammerspace in AWS

Revision 1

Hammerspace Version 5.2





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Hammerspace 5.2

This document covers how to deploy Hammerspace in Microsoft Azure Marketplace. Hammerspace software is available in two consumption models, namely Pay-As-You-Go (PAYGO) and Bring Your Own License (BYOL).

Hammerspace BYOL (Bring Your Own License)

BYOL licensing is a software subscription model that is activated by contacting Hammerspace. This is often a suitable choice for customers who have a mix of cloud and on-premises deployments and a desire to consolidate licensing.

Hammerspace PAYGO (Pay-As-You-Go)

PAYGO licensing is a standard cloud consumption model in which usage is metered and billed to the cloud provider on an hourly, monthly, or yearly basis.

Solution Overview

Hammerspace Global Data Environment consists of two main software components, a metadata node (Anvil) and a data services node (DSX).

Anvil

The Anvil instance(s) provides the following services:

- Management GUI & CLI
- Metadata management.
- Mount point for Parallel NFS (NFSv4.2).

DSX

The Data Services instance(s) provides the following services:

- Global Namespace.
- Global File System.
- Mount point for NFSv3, SMB, and S3.
- Data Mobility
- Storage and volume management



Hammerspace System Requirements

Deployment Prerequisites

Anvil must be given sufficient resources to deliver low-latency performance for applications and end users. Anvil metadata nodes take full advantage of allocated resources. It is not unusual for Anvil to operate at 40% or higher CPU utilization even with a relatively modest metadata workload in a large file system. Metadata performance may suffer if the system becomes resource constrained. Therefore, it is crucial to ensure that Anvil metadata nodes have sufficient system resources.

Listed below are the minimum system resource recommendations for Anvil and DSX in a bare minimum deployment. Please note that production environments or environments requiring high performance need substantially more than the listed minimum recommendation.

	Anvil Metadata Node	DSX Data Node
Azure Virtual Machine	2 x Standard E4as v4	1 x Standard F2s v2
CPU Cores	16 vCPU	8 vCPU
RAM	32 GiB (more recommended)	16 GiB (more recommended)
Boot disk	200 GB (if memory is larger than 160 GB multiply by 1.3 for sizing).	200 GB minimum
Additional disk drives for metadata storage	2 x 400 GB (minimum) backed by SSD or NVMe	As needed for DSX data storage
Network adapter	2 x 10 Gbps Ethernet. One link is dedicated to HA services	1 x 10 Gbps Ethernet

IMPORTANT: The choices of virtual machine sizes, as well as disk types and sizes, require careful planning. A metadata disk size of 200 GB will accommodate approximately 25-50 million files. For small-to-medium environments or lab/demo scenarios, the default settings are typically adequate. For large or workload-intensive environments, please consult with Hammerspace before deployment. This is particularly important where metadata performance is critical.

IMPORTANT: For environments with more than 500 clients using the SMB protocol to access the solution, a larger-sized virtual machine type and/or additional DSX nodes are strongly recommended. Additional Data Store disks can be added non-disruptively and without downtime post-deployment.

Accessing the Command-Line Interface

Log in to the Hammerspace Admin CLI.

```
$ ssh -i keyname.pem admin@<anvil-node>
```

Helpful Commands	Explanation
--help	Shows how to use the CLI
?	Lists all available commands when used by itself. Append to any command for detail -ed options.
dns-config --view	Displays DNS configuration
node-list	Shows all Hammerspace nodes in a deployment
ntp-config --view	Displays how to update NTP configuration
share-list	Lists all shares and related details
system-view	Provides overview of system health
volume-list	Displays all volumes and related data

Table 1. Quick list of Hammerspace Admin CLI commands

NOTE: This is an extremely abbreviated list only to show examples. For a full explanation of all commands and options, please refer to the *Hammerspace 5.2 CLI Reference*.

Configuration Examples

This section covers various tasks by example.

Example 1: Changing the admin user password

Use the following procedure to reset the **admin** user password.

1. Navigate to Administration.
2. Select the **Users** tab.
3. Click **Reset Password**.

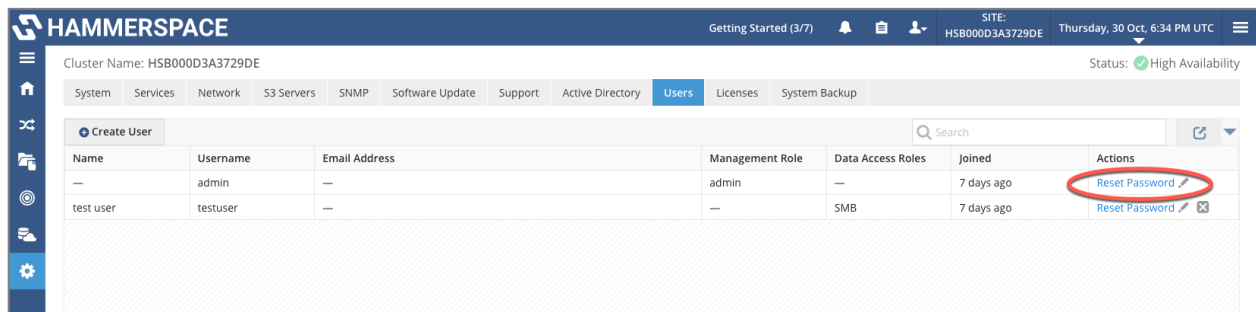


Figure 1. User management

Example 2: Using the Hammerspace Admin CLI to configure DNS Server Settings

View the DNS server settings:

```
> dns-config --view
```

Removing DNS server configuration:

```
> dns-config --servers-clear
```

Adding DNS server configuration:

```
> dns-config --servers 192.168.1.101, 192.168.2.102
```

Example 3: Using the CLI to configure NTP server settings

Viewing NTP server settings:

```
> ntp-config --view
```

Removing NTP server configuration:

```
> ntp-config --servers-clear
```

Adding NTP server configuration:

```
> ntp-config --servers 0.north-america.pool.ntp.org
```

Example 4: Creating a Share

Use the following procedure to create a share.

1. From the left navigation pane, select **Data** (file folder icon).

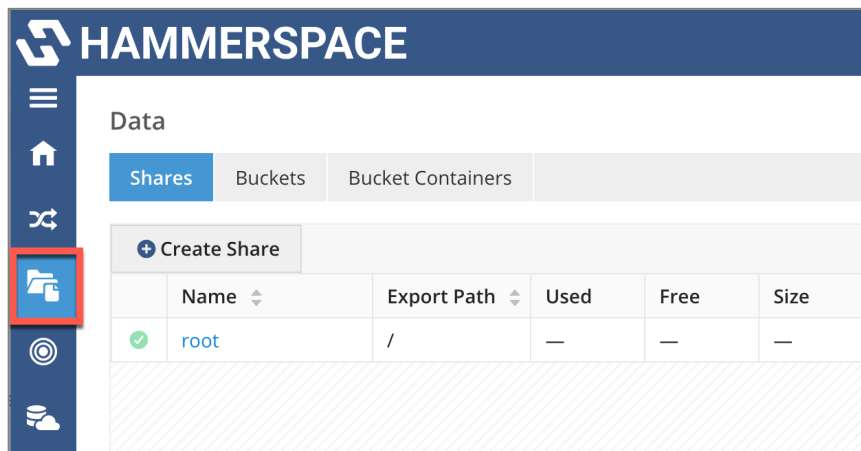
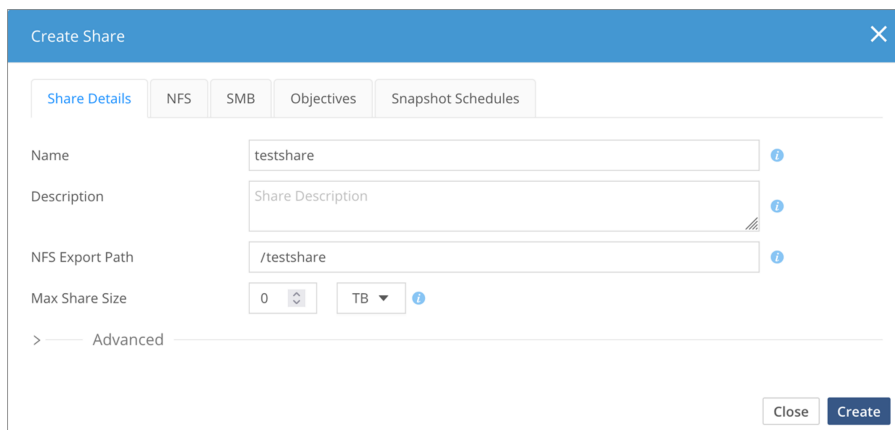


Figure 2. Create share

2. Enter share details in the Create Share wizard:



The screenshot shows the 'Create Share' wizard interface. At the top, there's a blue header bar with the title 'Create Share' and a close button. Below the header, there are four tabs: 'Share Details' (selected), 'NFS', 'SMB', and 'Snapshot Schedules'. The 'Share Details' tab contains the following fields:

- Name:** A text input field containing 'testshare'.
- Description:** A text input field containing 'Share Description'.
- NFS Export Path:** A text input field containing '/testshare'.
- Max Share Size:** A field with a numeric input '0', a unit dropdown menu showing 'TB', and an information icon.

At the bottom right of the wizard, there are two buttons: 'Close' and 'Create'.

Figure 3. Create Share wizard



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- a. In the Share Details tab, enter the information requested. Table 2 describes the information requested in the tab.

Item	Value
Name	Name the share
Description	Optional description of the share
NFS Export Path	The NFS export path for the root of this share. Must start with /
Max Share Size	This implements a soft quota. A zero (0) denotes no quota.
Advanced (optional) – See Hammerspace Admin Guide for more information	
ABE	Lists files and directories based on the user's permissions.
Access time update	Uncheck disables A-time updates.
Retain deleted files	Check to retain deleted files across the share.
Create versioned files	Check to implement event-based file retention.
File conflict resolution	Please consult Admin Guide for more information.
WORM	Implements Write Once Read Many on the share.

Table 2. Share details

- b. If your share is an NFS share, enter the information requested in the NFS tab. Table 3 describes the information requested in the tab.

Item	Value
Client Specification	IP, CIDR Subnet, Hostname, Subdomain, @netgroup.
Permissions	Read-Only or Read-Write
Root Squash	If checked, maps NFS client 'root' (uid 0) to the anonymous uid.
Secure Port	Unselecting this option disables the requirement that NFS client connections must originate from a privileged source port < 1024

Table 3. NFS details



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- c. If your share is an SMB share, enter the information requested in the SMB tab. Table 4 describes the information requested in the tab.

Item	Value
Alias	SMB Share Alias Name
Path	SMB Alias Path
Browsable	Controls whether the share is browsable by clients

Table 4. SMB details

- d. Add Objectives. Objectives provide powerful declarative control over your data throughout its lifecycle. Key aspects of data management, such as availability, durability, placement, movement, protection, workflow, and custom criteria can be controlled with ease on a file-granular level. Refer to the *Hammerspace 5.2 Administration Guide*, available in the Hammerspace Licensing and Download Portal, and the *Hammerspace Objectives Guide*, available in the Support Portal, to learn more about how to use Objectives.
- e. Add Snapshots Schedules. Snapshots can be scheduled directly upon share creation from this tab, by either creating a new schedule, adding a pre-defined schedule, or copying an existing snapshot schedule from another share, as shown below.

Create Share

Share Details NFS SMB Objectives Snapshot Schedules

+ New Schedule + Add Pre Defined Schedules Copy From Share Search

Schedule Name	Schedule	Retention Name	Retention	Last Run	Actions
There are no snapshot schedules to display					

Close Create

Figure 4. Adding snapshot schedule for a share



Example 5: Adding Amazon S3 as a Storage System

1. Go to the **Infrastructure > Storage Systems** tab in the Hammerspace Management GUI.

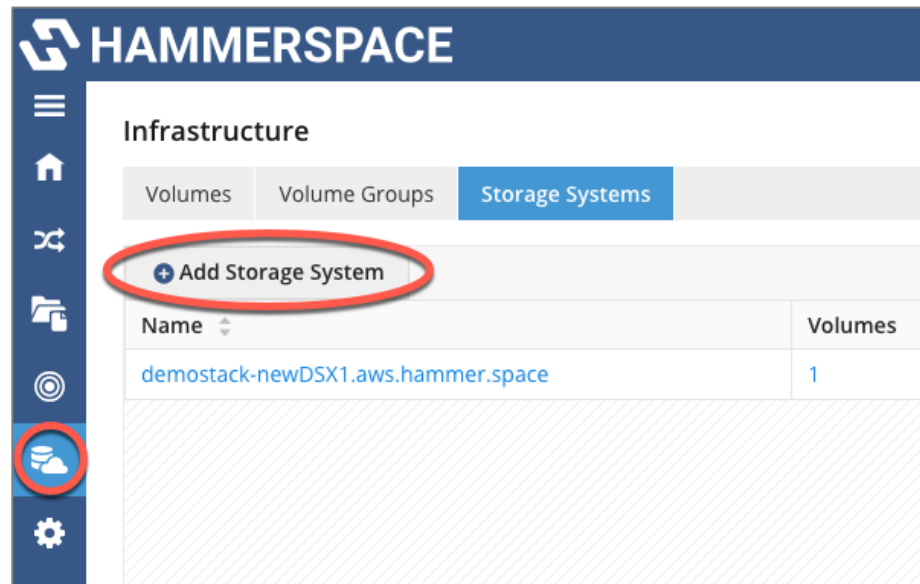


Figure 5. Storage Systems tab

2. Select **Storage Type** and enter the requested information. Table 5, below, describes the information requested in the tab.

Add Storage System

1 Details

Storage System Details

Provide storage system details.

* Name:

Description:

* Storage Type: ☐ NAS Storage ☒ Object Storage

* Type:

Access details

Close Add Storage System

Figure 6

OPTION: Select to use configured IAM instance policy to access S3 resources. Applicable only for a cluster deployed in AWS

Item	Value
Name	Provide a meaningful name
Storage Type	Object Storage
Type	Amazon S3
Access Key	Enter the Access Key
Secret Key	Enter the Secret Key
Endpoint	Select Auto Select radio button or enter a specific Endpoint
Proxy Host	If Proxy is used
Proxy Port	If Proxy is used
Proxy Username	If Proxy is used
Proxy Password	If Proxy is used

Table 5. Storage-type values

Example 6: Creating Volumes

1. Go to **Infrastructure > Storage Systems** tab in the Hammerspace Management GUI. Click the **+ Volume** button to open the **Add Volumes** wizard.

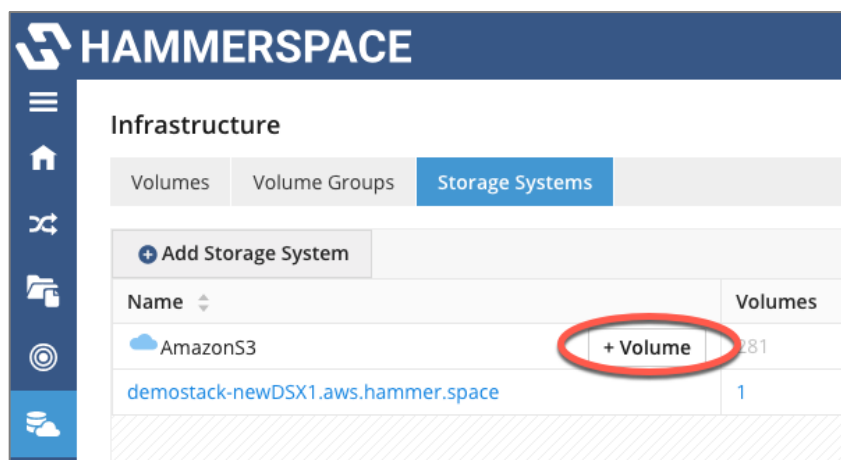


Figure 7. Location of the + Volumes button

2. Select the S3 bucket(s) you wish to add as Hammerspace volumes and select Next Step.



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Type	Name	Total	Used	Free	Percentage Used	Storage Type	Browse
☒	Volume	AmazonS3::ballin-demo3	Add volume to view information				<
☐	Volume	AmazonS3::ballin-shared	Add volume to view information				<
☐	Volume	AmazonS3::ballin-temp...	Add volume to view information				<

Figure 8. Select volumes

- Click through each tab of the wizard. Use the volume-configuration settings shown in Table 6.

Item	Value
Shared Volume	Uncheck (leave checkbox empty)
Capacity	Default: Auto (choose a size to apply a quota)
Durability	Default: Auto
Availability	Default: Auto
Objectives	Check to automatically create placement Objectives

Table 6. Volume configuration settings

- Review your selections and, if satisfied, press **Add Volume** to finalize.



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5. Navigate to the **Volumes** tab to view the newly created volume.

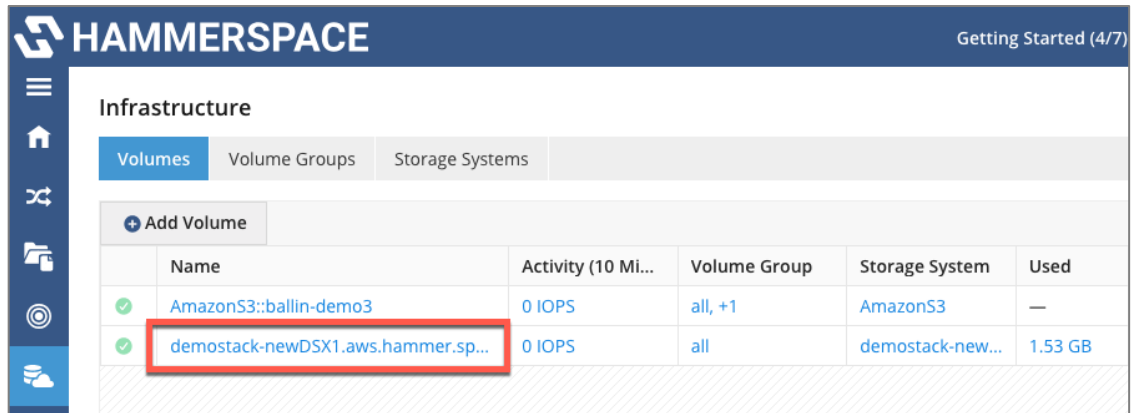


Figure 9. Your newly added volume is visible in the Volumes tab.

Example 7: Local user configuration

Navigate to **Administration** by clicking the gear icon at the bottom of the left-side navigation pane. Select the **Users** tab and then click **+ Create User** and enter details as shown in Table 7.

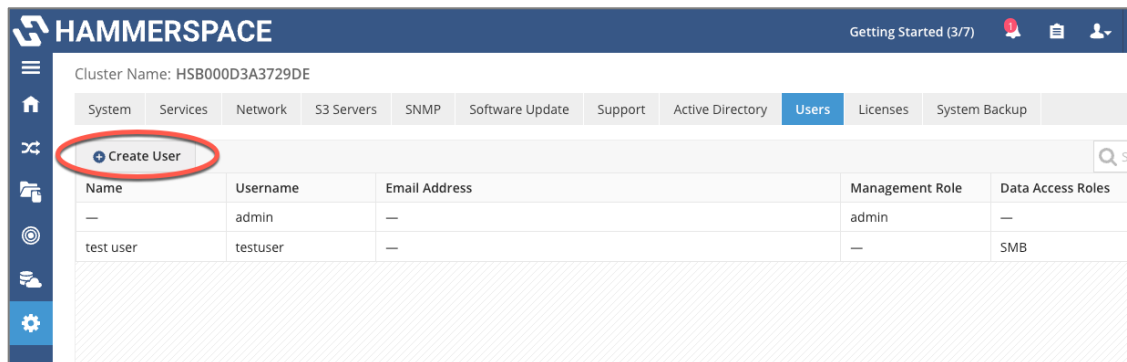


Figure 10. Location of the + Create User button in the Management GU

I

Create-user details

Item	Value
First Name	Enter the first name (optional)
Last Name	Enter the last name (optional)
Email	Enter an email address (optional)
Username	Create a name for the user (or service)



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Password	Enter a password
Confirm Password	Confirm the password
Role Type	Select the Data Access radio button
Data Access Role	Select the SMB or/and S3 checkboxes

Table 7. Create-user details

Example 8: Active Directory Integration

1. Go to **Administration** (gear icon) > **Active Directory** tab.

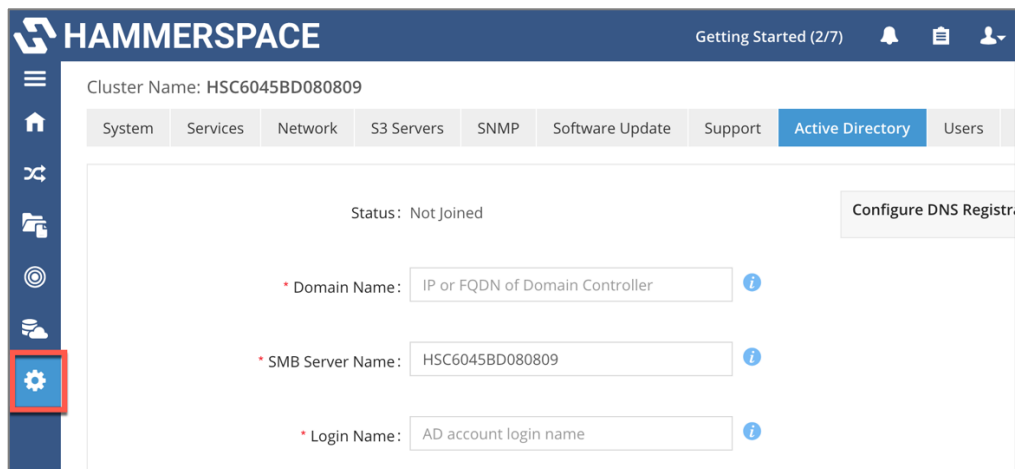


Figure 11. Location of the Active Directory tab in the Management GUI

2. Enter the requested information using Table 8 as a guide.

Item	Value
Domain Name	Enter the IP address or FQDN of Domain Controller
SMB Server Name	Enter the name desired for AD account registration
Login Name	Enter the AD account name
Password	Enter the AD account password
Organizational Unit	Optionally add the OU to which this machine should be added



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AD Servers	Select Auto or Manual discovery of AD servers
SMB – NFS User Mapping	Select the Data Access radio button

Table 8. Active Directory details

3. Optionally, add and configure Windows DNS registration.

Example 9: Upgrading the System

Step 1: Access the Hammerspace Admin CLI and navigate to Administration > Software Update.

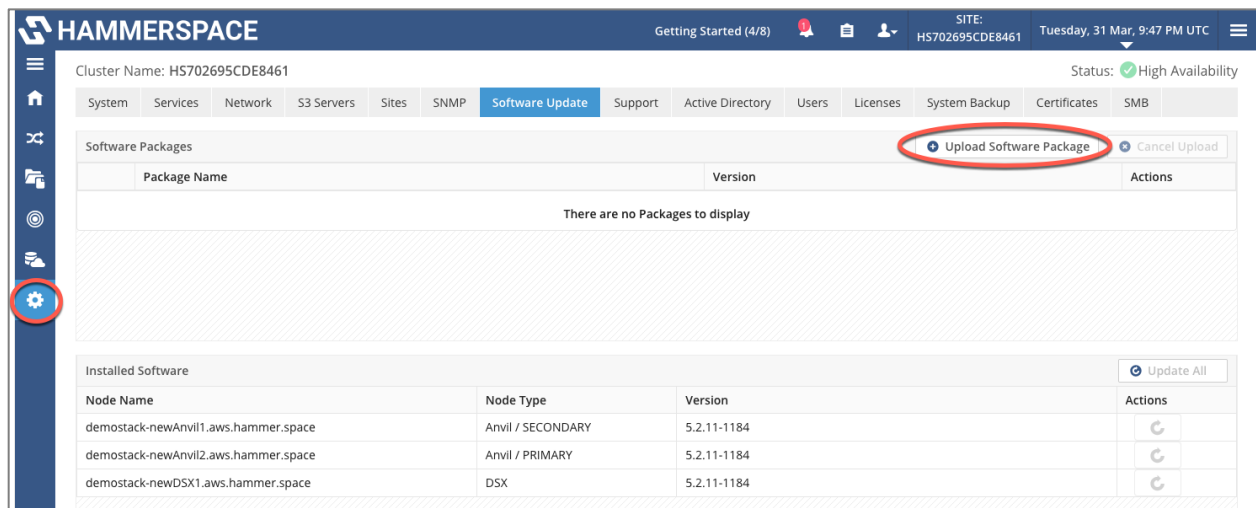


Figure 12

Step 2: Upload the software upgrade package from either a local file share or a URL.

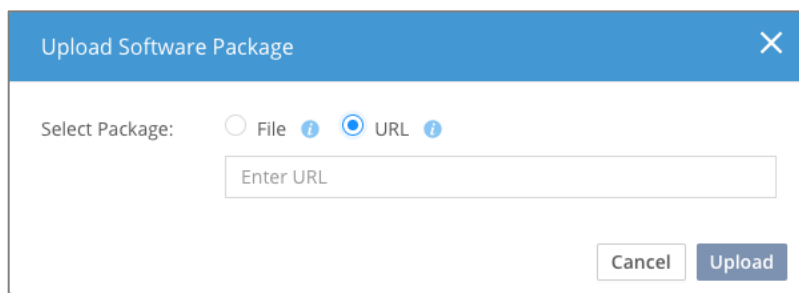
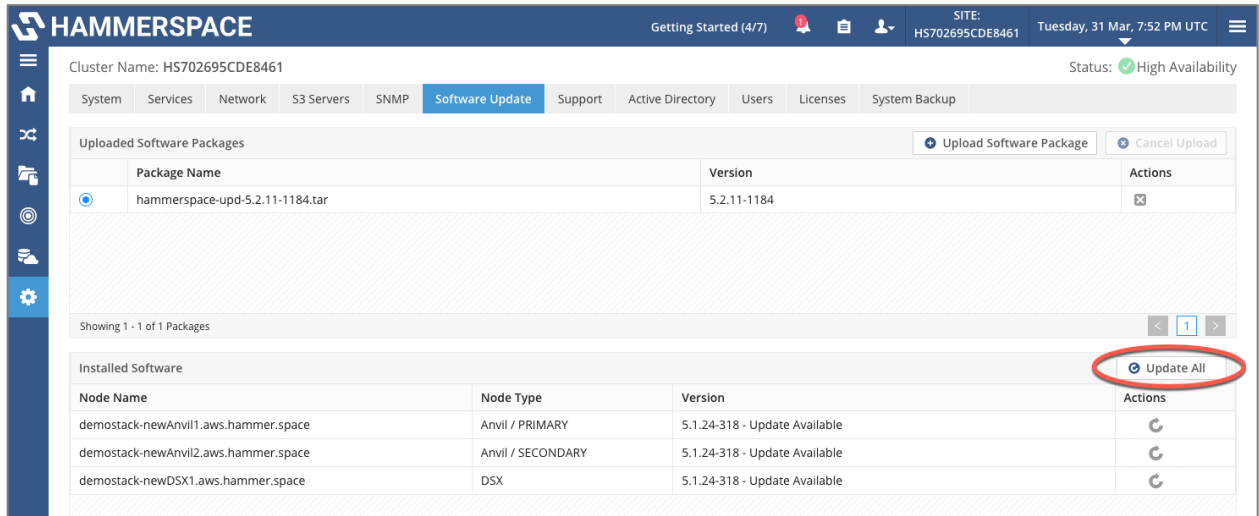


Figure 13

NOTE: Software upload packages can be obtained from Hammerspace. They can be identified by the file type extension name *.upd.

Step 3: Once the software package has uploaded, select its radio button, and press the Update All button.



Cluster Name: HS702695CDE8461 Status: ✔ High Availability

System Services Network S3 Servers SNMP **Software Update** Support Active Directory Users Licenses System Backup

Uploaded Software Packages Upload Software Package Cancel Upload

Package Name	Version	Actions
hammerspace-upd-5.2.11-1184.tar	5.2.11-1184	✕

Showing 1 - 1 of 1 Packages

Installed Software Update All

Node Name	Node Type	Version	Actions
demostack-newAnvil1.aws.hammer.space	Anvil / PRIMARY	5.1.24-318 - Update Available	↻
demostack-newAnvil2.aws.hammer.space	Anvil / SECONDARY	5.1.24-318 - Update Available	↻
demostack-newDSX1.aws.hammer.space	DSX	5.1.24-318 - Update Available	↻

Figure 14

Client Access

The Hammerspace Global File System is fully multiprotocol. Applications and end-users can simultaneously access shares via SMB and NFS from Windows, MacOS, and Linux clients, as described below.

Accessing Shares from Windows

1. Open Windows File Explorer, right-click the computer icon, and then select **Map network drive...** as shown in Figure 15.

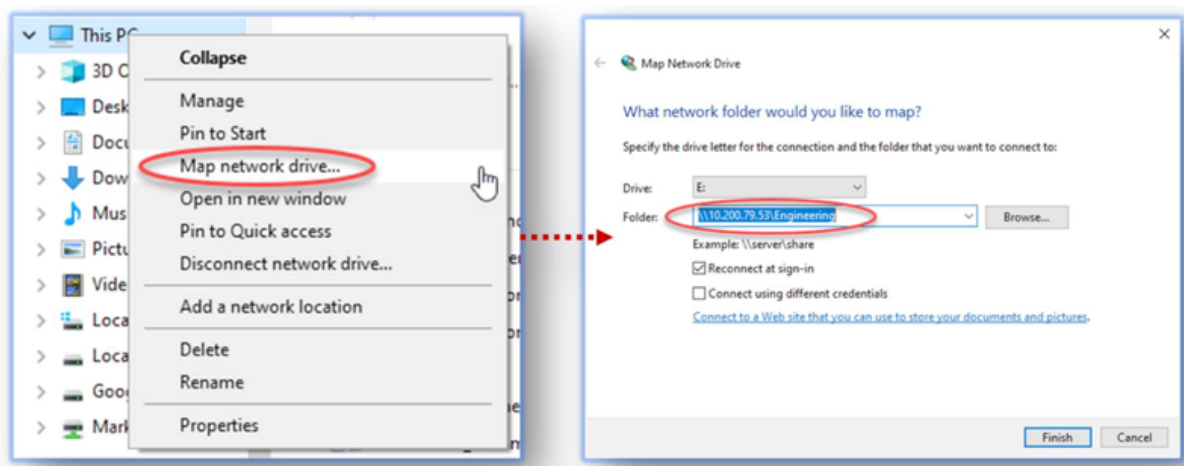


Figure 15. Location of **Map Network drive**

2. Enter the IP address or hostname followed by the share name and select the appropriate options.

Accessing Shares from MacOS

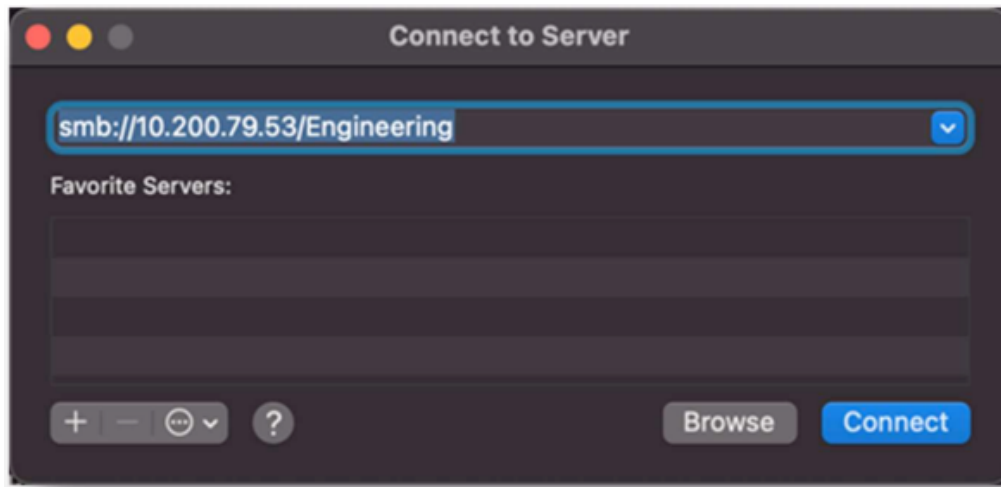


Figure 16. MacOS Connect to Server popup

Mounting NFS Exports from Linux

Depending on the Linux distribution, there may be a preference for using the **mount** command with options or the **mount.nfs** command, as shown below.

```
# mount.nfs <DSX node>:/<export path> <mount path>
```

Or...

```
# mount -t nfs -o vers=3 <DSX node>:/<export path> <mount path>
```

NOTE: Some client systems may require additional NFS options, such as ``no1ock`` and/or ``rw``. Consult the documentation for each distribution.

Using Parallel NFS (v4.2) for High Performance Workloads

Mounting shares using NFS v4.2 is slightly different from NFS v3 and SMB. NFS v4.2 exports are available from the Hammerspace Metadata Server (Anvil) while NFS v3/SMB exports/shares are available from any of the DSX nodes.



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How To Mount Anvil Using NFSv4.2

```
# mount -t nfs -o vers=4.2 <anvil node>:<export path> <mount path>
```

NFS v4.2 is a more modern protocol with significant performance improvements. This means that only relatively recent Linux versions (for example, RHEL/CentOS 7.5 and later) have the most recent fixes. For some older Red Hat/CentOS Linux versions, Hammerspace has done the work to backport the upstream fixes.

NOTE: Most Linux versions available in the cloud are capable of mounting NFS v4.2. For more information, refer to [RFC 5661](#) and [RFC 8434](#), or contact Hammerspace at support@hammerspace.com.

Appendix I: Architectural Reference Diagrams

Data Path: SMB and NFS v3

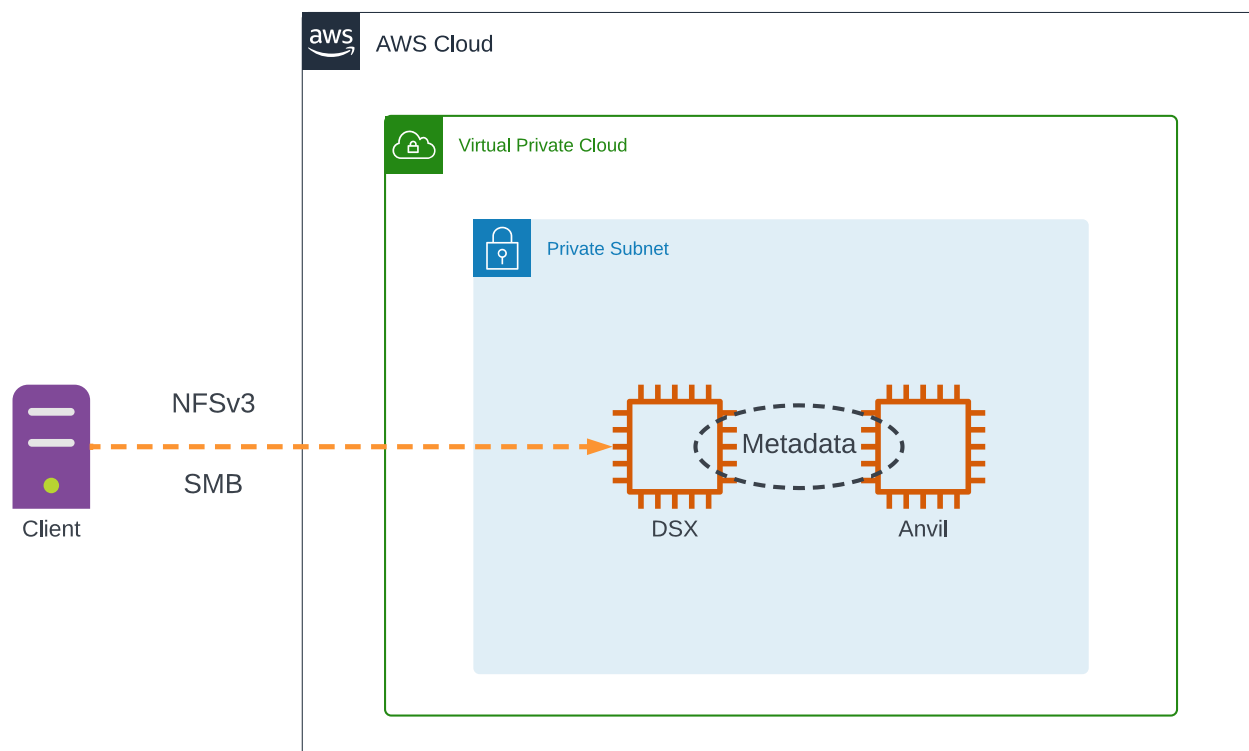


Figure 17. Diagram of the data path from SMB/NFS v3 to the client

SMB and NFS v3 clients mount DSX while metadata is managed by Anvil.

Standalone Anvil and DSX

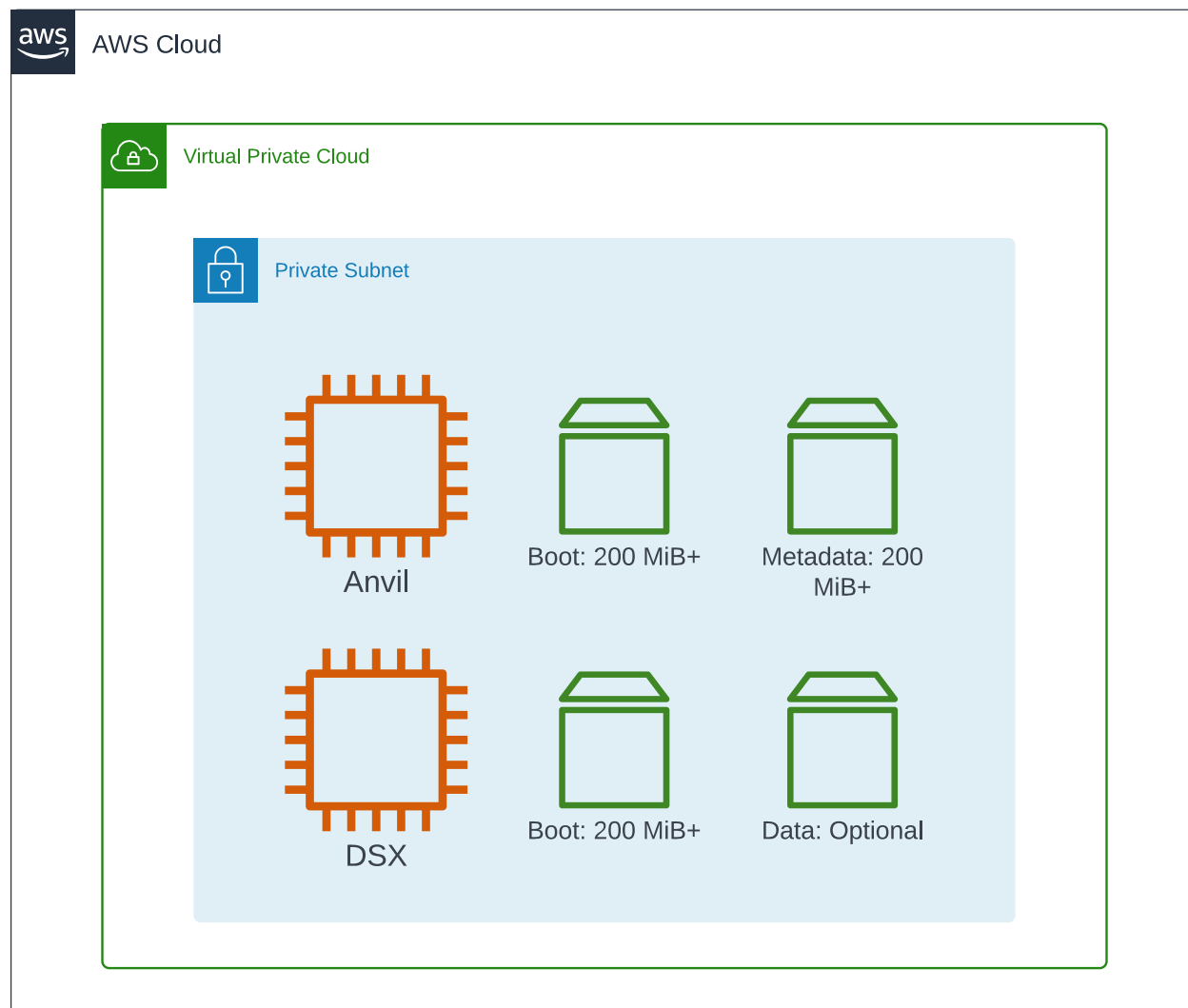


Figure 13. Diagram of a single Anvil/single DSX cluster

The minimum configuration of a Hammerspace solution consists of a single Anvil and a single DSX. Each instance requires, at a minimum of two disks: one for the boot partition and the second to hold data or metadata, respectively.

High Availability Anvil

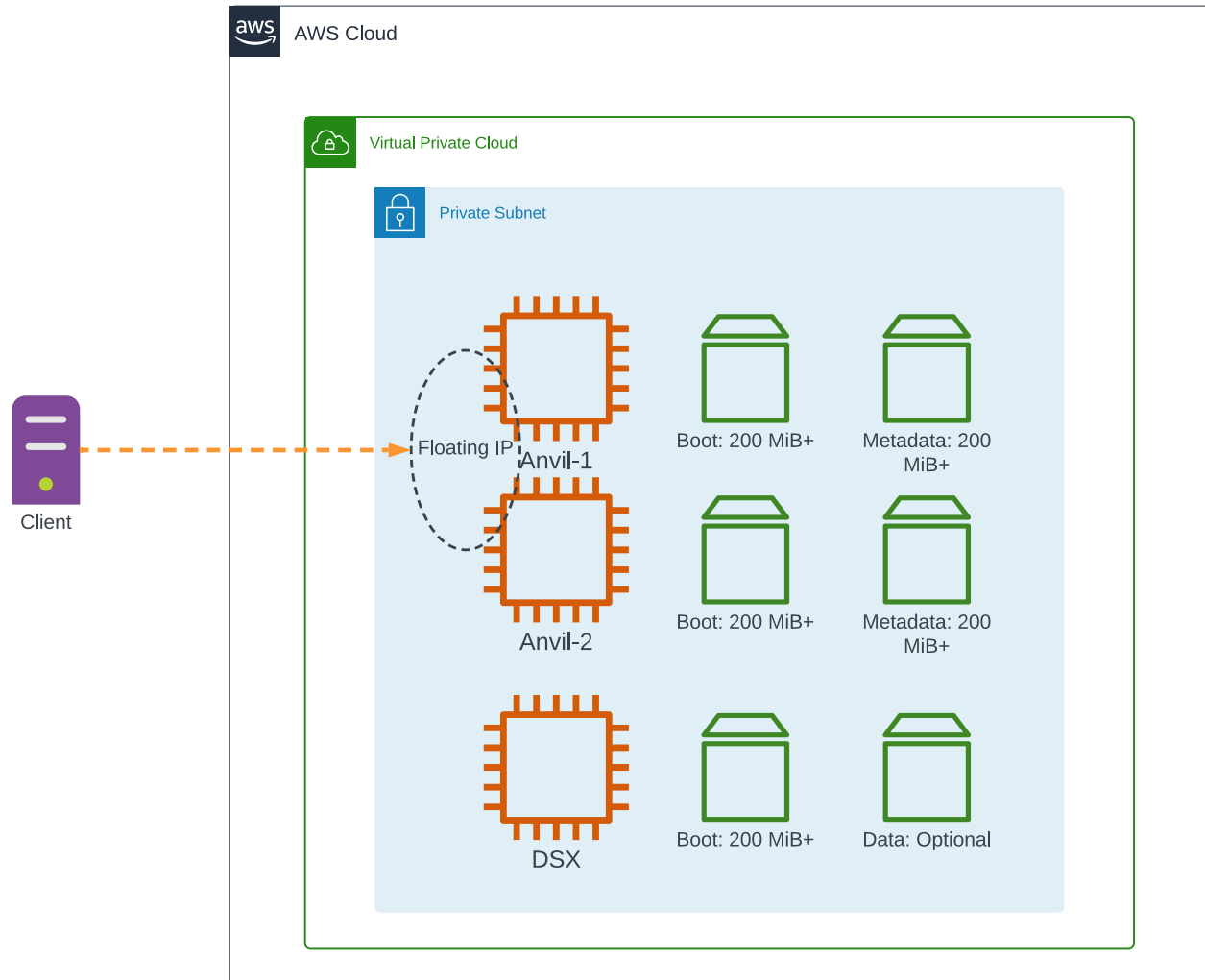


Figure 18

This diagram illustrates highly available access to the Anvil metadata node. This also covers an NFSv4.2 scenario.



Highly Available Anvil and DSX

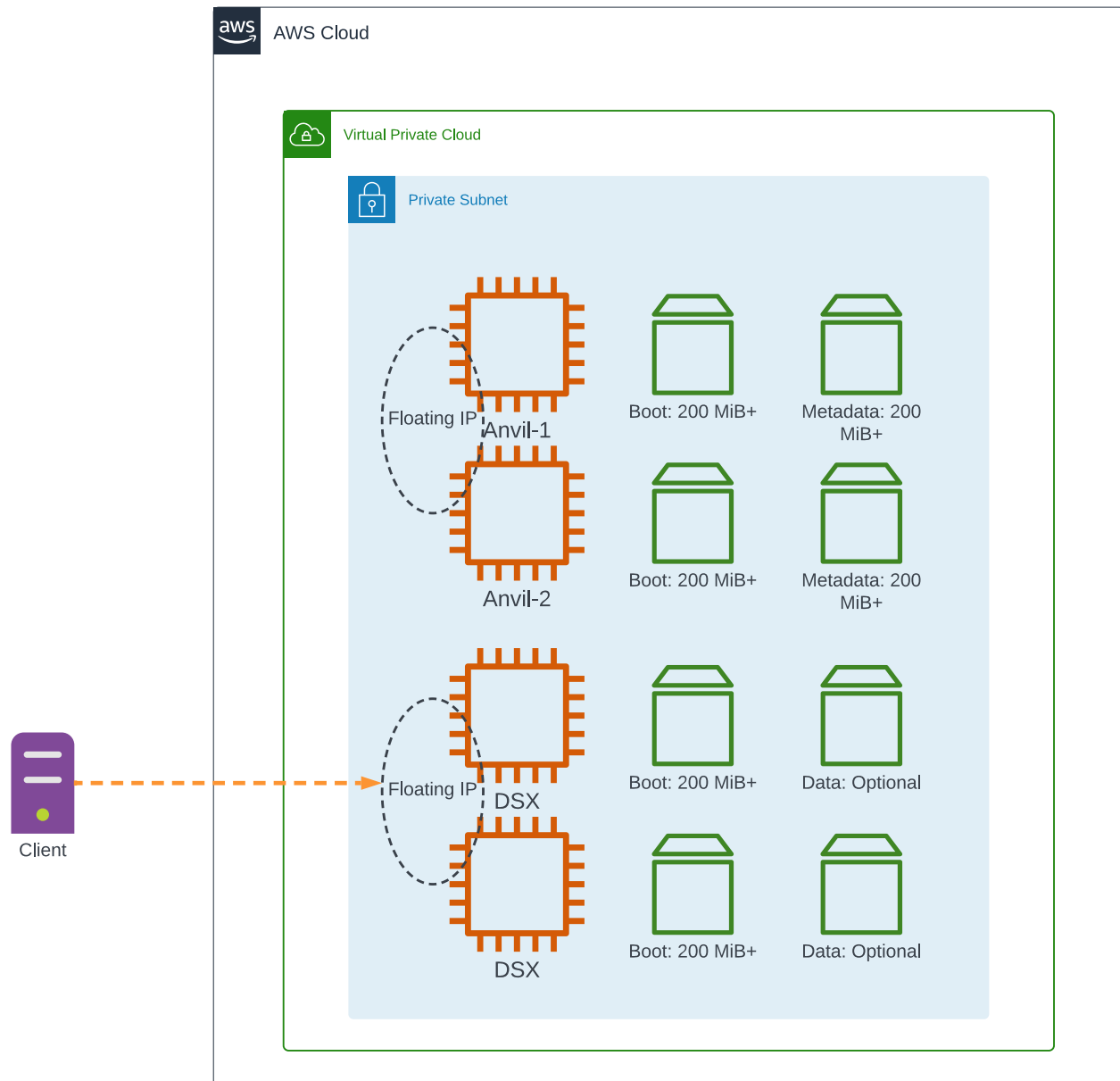


Figure 19

The diagram above illustrates highly available NFSv3 and SMB access.

Data Path: Parallel NFS (NFSv4.2)

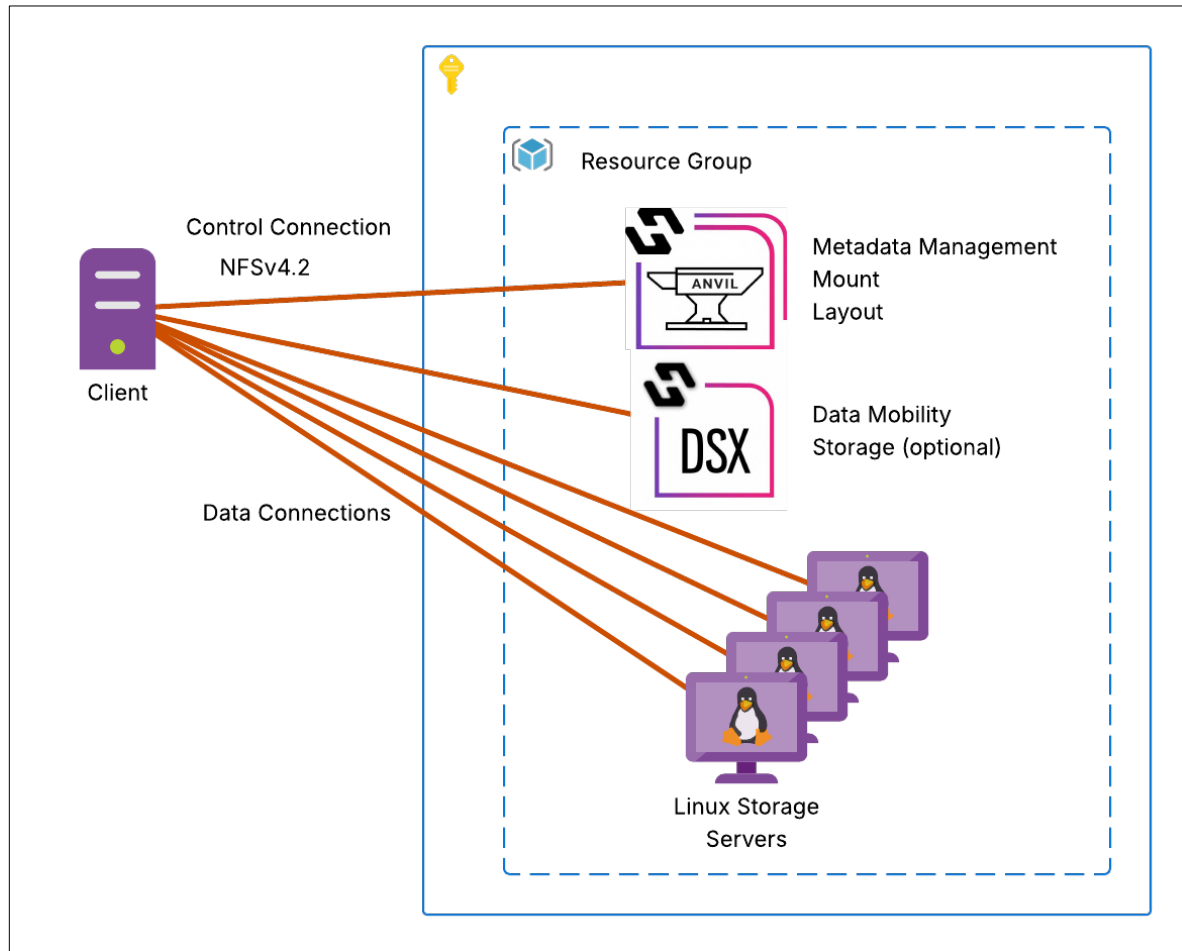


Figure 20. Diagram of a Parallel NFS (v4.2) architecture

NFSv4.2 is used for the highest performance requirements, including AI/ML workloads. Connections are parallelized from client to multiple backend Linux Servers. For more information on Parallel NFS, refer to the following documentation:

- [RFC 5661](#)
- [RFC 8434](#)

Appendix II: Documentation and Support

AWS References

User Guides, Developer Guides, API References, Tutorials, and more:

<https://docs.aws.amazon.com/>

Amazon CloudFormation

<https://aws.amazon.com/cloudformation/>

AWS Command Line Interface:

<https://docs.aws.amazon.com/cli/>

Amazon EC2

<https://aws.amazon.com/ec2/>

Amazon S3

<https://aws.amazon.com/s3/>

<https://docs.aws.amazon.com/AmazonS3/latest/userguide/access-control-overview.html>

<https://docs.aws.amazon.com/AmazonS3/latest/userguide/access-control-best-practices.html>

Disaster Recovery Objectives

<https://docs.aws.amazon.com/wellarchitected/latest/reliability-pillar/disaster-recovery-dr-objectives.html>

Hammerspace References

<https://hammerspace.com/aws/>

<https://hammerspace.com/resources/>

<https://hammerspace.com/support/>

support@hammerspace.com