Use Amazon FSx for NetApp ONTAP

Amazon FSx for NetApp ONTAP

NetApp
September 02, 2024

Table of Contents

Use Amazon FSx for NetApp ONTAP 1
Explore savings in FSx for ONTAP 1
Use links 5
Manage volumes 11
Create a storage VM for an FSx for ONTAP file system 13
Protect your data 14

Use Amazon FSx for NetApp ONTAP

Explore savings in FSx for ONTAP

Explore savings for your storage workloads which use Amazon Elastic Block Store (EBS), Elastic File System (EFS), and FSx for Windows File Server against FSx for NetApp ONTAP.

Workload Factory has a built-in storage savings calculator so that you can compare your Amazon storage environments to FSx for ONTAP. You can explore savings with or without providing your AWS credentials and customize configuration settings for your storage environment. When you provide AWS credentials, you can select one or more instances of Amazon Elastic Block Store, for example, and let Workload Factory make the comparison automatically. Whether manually or automatically, the calculator determines which storage service provides the lowest cost for your storage needs.

If the storage calculator determines that the most cost-effective storage is FSx for ONTAP, you can create or save FSx for ONTAP configurations and use the Codebox to generate Infrastructure-as-Code templates regardless of the permissions you grant to Workload Factory.

Calculator options

Two calculator options are available for making the cost comparison between your systems and FSx for ONTAP — customization and automatic detection for your Amazon storage environments.

Explore savings via customization: You provide the configuration settings for a storage environment including the use case, region, number of volumes or file systems, storage amount, snapshot frequency, amount changed per snapshot, provisioned IOPS, throughput, and more.

Explore savings for detected storage environments: Workload Factory links to your existing AWS storage environments and pulls in the details to the calculator for automatic comparison. You'll need to grant automate permissions to use automatic mode. You can change the use case, but all other details are automatically determined in the calculation.

Explore savings via customization

Follow the steps under the tab for your storage selection.

Amazon Elastic Block Store (EBS)

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Explore savings** then **Amazon Elastic Block Store (EBS)**.
3. In the Storage savings calculator, provide the following details:
    a. **Use case**: Required. Select a use case from the dropdown menu. The selected use case determines the FSx for ONTAP file system characteristics for comparison.
    b. **Region**: Optional. Select the region for your EBS configuration from the dropdown menu.
    c. **Select EBS volume type**: Optional. Select the EBS volume type used for your configuration.
    d. **Number of volumes**: Optional. Enter the number of volumes in your EBS configuration.
    e. **Storage amount per volume (TiB)**: Optional. Enter the storage amount per volume in TiB.
    f. **Snapshot frequency**: Optional. Select the snapshot frequency for your EBS configuration.
    g. **Amount changed per snapshot (GiB)**: Optional. For snapshot storage only. Enter the amount changed per snapshot in GiB.
    h. **Provisioned IOPS per volume**: Optional. For gp3, io1, and io2 volumes. Enter the provisioned IOPS per volume.
    i. **Throughput (MiB/s)**: Optional. For gp3 volumes only. Enter throughput in MiB/s per volume.

Amazon FSx for Windows File Server

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Explore savings** then **Amazon FSx for Windows File Server**.
3. In the Storage savings calculator, provide the following details:
    a. **Use case**: Required. Select a use case from the dropdown menu. The selected use case determines the FSx for ONTAP file system characteristics for comparison.
    b. **Region**: Optional. Select the region for your FSx for Windows File Server configuration from the dropdown menu.
    c. **Deployment type**: Optional. Select **Single Availability Zone** or **Multiple Availability Zones**.
    d. **Storage type**: SSD storage type is selected by default.
    e. **Storage capacity (TiB)**: Optional. Enter the storage capacity for the configuration.
    f. **Deduplication savings (%)**: Optional. Enter the capacity savings percentage you expect from deduplication.
    g. **Snapshot frequency**: Optional. Select the snapshot frequency for your configuration.
    h. **Amount changed per snapshot (GiB)**: Optional. For snapshot storage only. Enter the amount changed per snapshot in GiB.
    i. **Provisioned SSD IOPS**: Optional. Enter the provisioned SSD IOPS.
    j. **Throughput (MiB/s)**: Optional. Enter throughput in MiB/s.

Amazon Elastic File System (EFS)

Steps

1. Log in to the Workload Factory console

2. In Storage, select **Explore savings** then **Amazon Elastic File System (EFS)**.
3. In the Storage savings calculator, provide the following details:
    a. **Use case**: Required. Select a use case from the dropdown menu. The selected use case determines the FSx for ONTAP file system characteristics for comparison.
    b. **Region**: Optional. Select the region for your FSx for Windows File Server configuration from the dropdown menu.
    c. **File System Type**: Optional. Select **Regional** or **One zone**.
    d. **Storage capacity (TiB)**: Optional. Enter the storage capacity of the EFS configuration.
    e. **Data frequently accessed (%)**: Optional. Enter the percentage of data that is frequently accessed.
    f. **Throughput mode**: Optional. Select **Provisioned throughput** or **Elastic throughput**.
    g. **Throughput (MiB/s)**: Optional. Enter the throughput in MiB/s.

After you provide details for your storage system configuration, review the calculations and recommendations provided on the page.

Additionally, scroll down to the bottom of the page to **Export PDF** or **View the calculations**.

To switch to FSx for ONTAP, follow the instructions to deploy FSx for ONTAP file systems.

Explore savings for detected storage environments

Before you begin

For Workload Factory to detect Amazon Elastic Block Store (EBS), Elastic File System (EFS), and FSx for Windows File Server storage environments in your AWS account, make sure you grant *automate* permissions in your AWS account.

> This calculator option doesn't support calculations for EBS snapshots and FSx for Windows File Server shadow copies. When exploring savings via customization, you can provide EBS and FSx for Windows File Server snapshot details.

Follow the steps under the tab for your storage selection.

Amazon Elastic Block Store (EBS)

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the Storage inventory, select the **Elastic Block Store (EBS)** tab.
4. Select the instance(s) to compare with FSx for ONTAP and click **Explore savings**.
5. The Storage savings calculator appears. The following storage system characteristics are pre-filled based on the instance(s) you selected:
    a. **Use case**: The use case for your configuration. You can change the use case if needed.
    b. **Selected volumes**: the number of volumes in the EBS configuration
    c. **Total storage amount (TiB)**: the storage amount per volume in TiB
    d. **Total provisioned IOPS**: for gp3, io1, and io2 volumes
    e. **Total throughput (MiB/s)**: for gp3 volumes only

Amazon FSx for Windows File Server

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the Storage inventory, select the **FSx for Windows File Server** tab.
4. Select the instance(s) to compare with FSx for ONTAP and click **Explore savings**.
5. The Storage savings calculator appears. The following storage system characteristics are pre-filled based on the deployment type of the instance(s) you selected:
    a. **Use case**: The use case for your configuration. You can change the use case if needed.
    b. *Selected file systems
    c. **Total storage amount (TiB)**
    d. **Provisioned SSD IOPS**
    e. **Throughput (MiB/s)**

Amazon Elastic File System (EFS)

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the Storage inventory, select the **Elastic File System (EFS)** tab.
4. Select the instance(s) to compare with FSx for ONTAP and click **Explore savings**.
5. The Storage savings calculator appears. The following storage system characteristics are pre-filled based on the instance(s) you selected:
    a. **Use case**: The use case for your configuration. You can change the use case if needed.
    b. **Total file systems**
    c. **Total storage amount (TiB)**
    d. **Total provisioned throughput (MiB/s)**

e. **Total elastic throughput - read (GiB)**

f. **Total elastic throughput – write (GiB)**

After you provide details for your storage system configuration, review the calculations and recommendations provided on the page.

Additionally, scroll down to the bottom of the page to **Export PDF** or **View the calculations**.

Deploy FSx for ONTAP file systems

If you'd like to switch to FSx for ONTAP to realize cost savings, click **Create** to create the file system(s) directly from the Create an FSx for ONTAP file system wizard or click **Save** to save the recommended configuration(s) for later.

Deployment methods

In *automate* mode, you can deploy the FSx for ONTAP file system directly from Workload Factory. You can also copy the content from the Codebox window and deploy the system using one of the Codebox methods.

In *basic* mode, you can copy the content from the Codebox window and deploy the FSx for ONTAP file system using one of the Codebox methods.

Use links

Learn about Workload Factory links

A Workload Factory link creates a trust relationship and connectivity between a Workload Factory account and one or more FSx for ONTAP file systems. This enables you to monitor and manage certain file system features directly from the ONTAP REST API calls that are not available through the Amazon FSx for ONTAP API.

You don't need a link to get started with Workload Factory, but in some cases you'll need to create a link to unlock all Workload Factory features and workload capabilities.

How links work

Links leverage AWS Lambda. Lambda executes code in response to events and automatically manages the computing resources required by that code. The links that you create are part of your NetApp account and they are associated with an AWS account.

After you have created a link you can associate it with one, or many, FSx for ONTAP file systems. Each file system can be associated only to one link in the same NetApp account. If you have multiple NetApp accounts, a single file system can be associated with additional links under different NetApp accounts.

You create links from the FSx for ONTAP file system pages in Workload Factory. Learn how to create links for details.

Costs

Each transaction that Lambda performs incurs a charge. Since Lambda acts as a proxy between the two systems, there is a charge when Lambda sends a request to the ONTAP REST API on a file system, and when it sends the response back to Workload Factory.

Learn more about the costs related to using AWS Lambda

When a link is required

Workload Factory requires a link to display some information and to perform some tasks. If you attempt to perform an operation that requires a link and you haven't associated a link with the FSx for ONTAP file system, you will see a message that the operation requires a link. You can add a new link, or associate the FSx for ONTAP file system with an existing link at that time so you can perform the operation.

The features that require a link include:

- Display the version of ONTAP that is installed on an FSx for ONTAP file system
- Manage iSCSI volumes on the system
- Enable and disable the autogrow feature for volumes
- Create and manage snapshot policies
- Configure replication relationships and replicate volumes between file systems
- Configure backup relationships and back up volume data to cloud storage
- Clone volumes within a file system
- Display additional metrics directly from ONTAP (default metrics are collected by Amazon CloudWatch)
- Management of NFS Export policies

Create a link

You can create and manage links to provide a trust relationship and connectivity between a Workload Factory account and one or more FSx for ONTAP file systems. This enables you to monitor and manage certain features directly from the FSx for ONTAP file system that are not available through the AWS FSx for ONTAP API.

Learn more about links.

About this task

Links leverage AWS Lambda to execute code in response to events and automatically manage the computing resources required by that code. The links that you create are part of your NetApp account and they are associated with an AWS account.

You can create a link in your account when defining an FSx for ONTAP file system. That link will be used for that file system, and it can be used by other FSx for ONTAP file systems.

You'll need to launch an AWS CloudFormation stack in your AWS account to create the link.

Before you begin

- You must have credentials to log in to your AWS account.
- You must have the following permissions in your AWS account when adding a link using a CloudFormation stack:

```
"cloudformation:GetTemplateSummary",
"cloudformation:CreateStack",
"cloudformation:DeleteStack",
"cloudformation:DescribeStacks",
"cloudformation:ListStacks",
"cloudformation:DescribeStackEvents",
"cloudformation:ListStackResources",
"ec2:DescribeSubnets",
"ec2:DescribeSecurityGroups",
"ec2:DescribeVpcs",
"iam:ListRoles",
"iam:GetRolePolicy",
"iam:GetRole",
"iam:DeleteRolePolicy",
"iam:CreateRole",
"iam:DetachRolePolicy",
"iam:PassRole",
"iam:PutRolePolicy",
"iam:DeleteRole",
"iam:AttachRolePolicy",
"lambda:AddPermission",
"lambda:RemovePermission",
"lambda:InvokeFunction",
"lambda:GetFunction",
"lambda:CreateFunction",
"lambda:DeleteFunction",
"lambda:TagResource",
"codestar-connections:GetSyncConfiguration",
"ecr:BatchGetImage",
"ecr:GetDownloadUrlForLayer"
```

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, select the three dots menu of the file system to associate a link to and then select **Manage**.
4. In the file system overview, select **Associate link**.
5. In the Associate link dialog, select **Create a new link** and select **Continue**.
6. On the Create Link page, provide the following:
   a. **Link name**: Enter the name that you want to use for this link. The name must be unique within your account.

b. **Tags**: Optionally, add any tags that you want to associate with this link so you can more easily categorize your resources. For example, you could add a tag that identifies this link as being used by FSx for ONTAP file systems.

   The AWS account and the additional information for Account, Location, and Security group are retrieved automatically based on the FSx for ONTAP file system.

7. Select **Redirect to CloudFormation**.

   A dialog that explains how to create the link from the AWS CloudFormation service is displayed.

8. Select **Continue** to open the AWS Management Console, and then log in to the AWS account for this FSx for ONTAP file system.
9. On the Quick create stack page, under Capabilities, select **I acknowledge that AWS CloudFormation might create IAM resources**.

   Note that three permissions are granted to Lambda when you launch the CloudFormation template. Workload Factory uses these permissions when using links.

```
"lambda:InvokeFunction",
"lambda:GetFunction",
"lambda:UpdateFunctionCode"
```

10. Select **Create stack** and then select **Continue**.

    You can monitor the link creation status from the Events page. This should take no more than 5 minutes.

11. Return to the Workload Factory interface and you'll see that the link is associated with the FSx for ONTAP file system.

Result

The link you created is associated with the FSx for ONTAP file system.

Manage links

Manage links you've associated with your Workload Factory account.

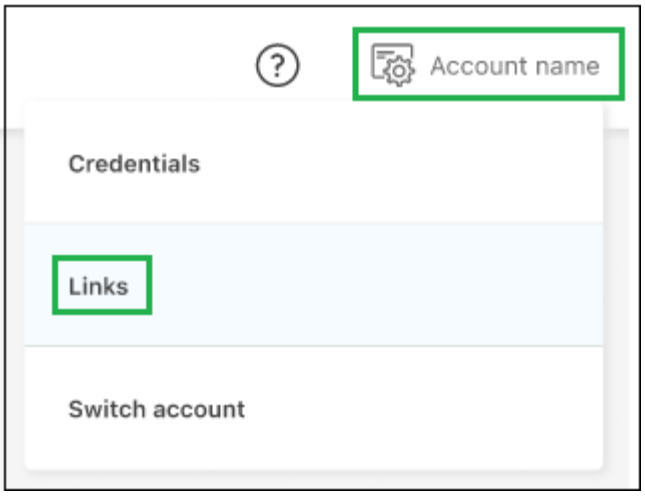
Learn more about links or create a link.

View the links associated with your account

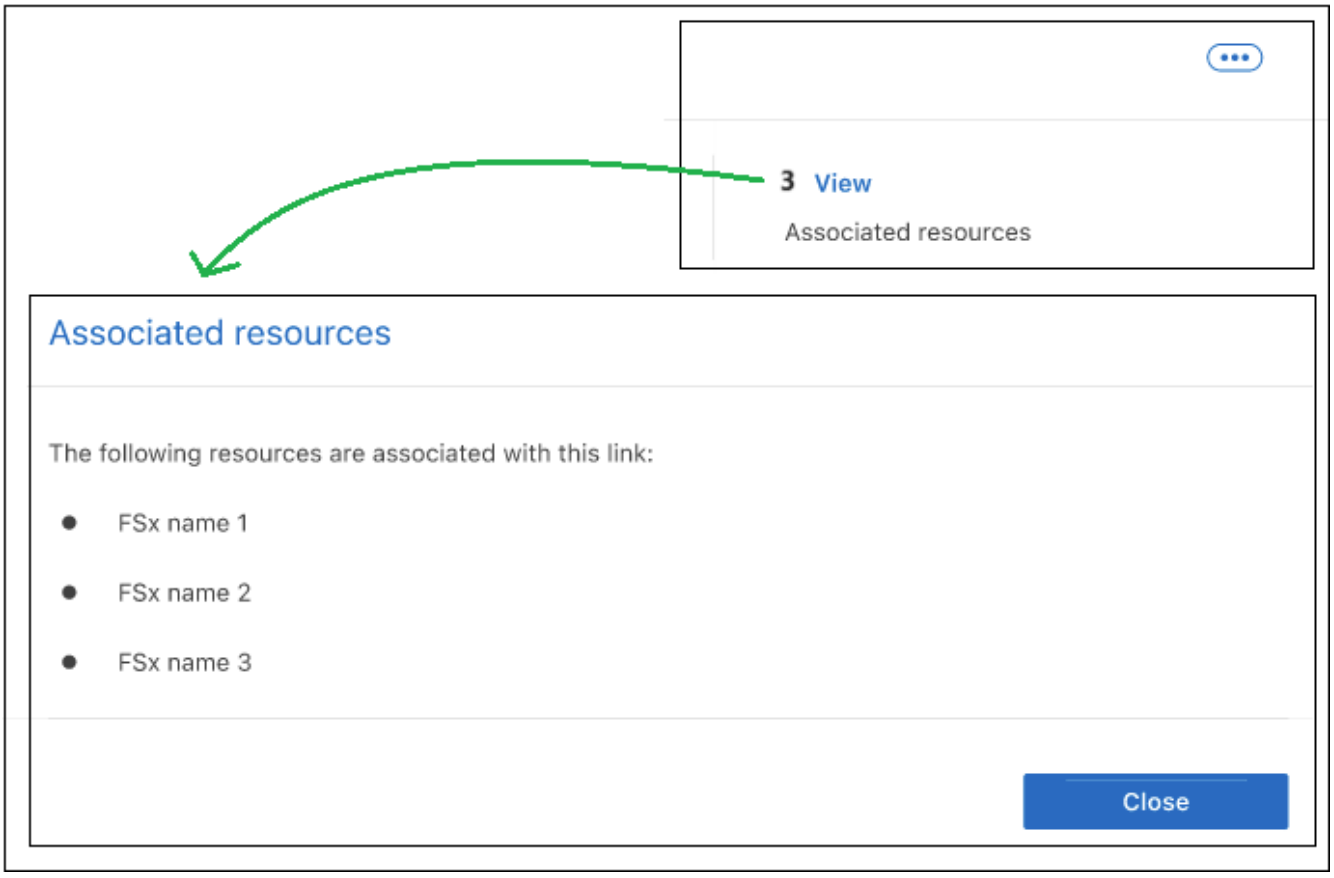
You can view the links that are currently associated with your account.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. From the Account menu, select **Links**.



4. If any links exist, the overview page provides the information.
5. To view the FSx for ONTAP file systems that are associated with a link, select the **View** button in the Associated resources section.



6. If you need the Amazon Resource Name (ARN) for the link, you can select the *copy* icon next to the ARN field.

Associate a link with an FSx for ONTAP file system

After you create a link, you can associate it with your FSx for ONTAP file systems. Each file system can be associated to only one link in a single NetApp account, but a link can be associated with many file systems.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, select the three dots menu of the file system to associate a link to and then select **Manage**.
4. In the file system overview, select **Associate link**.
5. In the Associate link page, select **Associate an existing link**, select the link, and select **Apply**.

Result

The link is associated with the FSx for ONTAP file system and you can perform advanced ONTAP operations.

Edit a link

You can't edit a link from the Workload Factory interface. If you need to make a change to a link, you'll need to create a new link and then associate that link to your file system.

> You can edit the Lambda network configuration (for example VPC, subnets, and security groups) using the AWS console and the changes will be reflected in links management UI; however, these changes can lead to connectivity issues between Lambda and ONTAP, and are not recommended.

Remove a link

You can remove a link that you're no longer using in your environment. Any FSx for ONTAP file systems or other resources that were using the link will be unable to use certain functionality after the link is removed.

Note that the link is only deleted from Workload Factory - it is not deleted from your AWS environment. You must delete the Lambda function from your AWS account after removing the link in Workload Factory.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. From the Account menu, select **Links**.
4. From the Links page, select the menu button and select **Remove**.

5. If you are sure, select **Remove** again.

Refer to the AWS documentation to delete the Lambda function.

Manage volumes

Create an FSx for ONTAP volume

After you set up your FSx for ONTAP file system, you can create FSx for ONTAP volumes.

About this task

FSx for ONTAP volumes are virtual resources used for grouping data, determining how data is stored, and determining the type of access to your data. Volumes don't consume file system storage capacity. The data that is stored in a volume primarily consumes SSD storage. Depending on the volume's tiering policy, the data might also consume capacity pool storage. You set a volume's size when you create it, and you can change its size later.

The following protocols may be used for your volumes:

- CIFS: file storage protocol for Windows operating systems
- NFS: file storage protocol for Unix operating systems
- iSCSI: block storage protocol

Before you begin

Review the following prerequisites before you create a volume:

- You must have an FSx for ONTAP file system in Workload Factory.
- You must have a storage VM.
- For protocol access, complete the following:
  - To configure access to the volume, you must associate a link. If you don't have an existing link, create a link. To associate a link in the file system, click **Associate link** under **Account name**. Once the link associates, return to this operation.
  - You must configure access for the protocol you select, either CIFS, NFS, or iSCSI.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, select the three dots menu of the file system you want to create a volume in, and select **Manage**.
4. From the **Overview** tab, click **Create volume**.
5. On the Create volume page under General details, provide the following details:
   a. **Volume name**: Enter a name for the volume.
   b. **Storage VM name**: Optionally, enter a storage VM name.
   c. **Volume style**: Select **FlexVol** or **FlexGroup** volume.

      FlexVol volume style is selected by default.

      FlexGroup volume size depends on the number of constituents. 100 GiB is required per constituent.

d. **Volume size**: Enter the volume size and unit.

   Optionally, enable volume autogrow. This option is available when you select **File access** as the volume access type.

e. **Tags**: Optionally, you can add up to 50 tags.

6. Under Access (only for file systems with associated links), provide the following details:

   a. **Access type**: Select **File access** or **Block access**. Additional fields to configure volume access differ depending on your selection.

      - **File access**: allows multiple authorized users and devices access to the volume using SMB/CIFS, NFS, or dual (SMB/NFS) protocols.

        Complete the following fields to set up file access to the volume.

        i. **NFS export policy**: Provide the following details to provide NFS access:

           A. **Access control**: Select a **Custom export policy**, **Existing export policy**, or **No access to the volume** from the dropdown menu.

           B. **Export policy name**:

              If you selected a custom export policy, select an existing policy name from the dropdown menu.

              If you selected an existing export policy, enter a new policy name.

           C. **Add Export Policy Rule**: Optionally, for a custom export policy, you can add export policy rules to the policy.

        ii. **CIFS share**: Enter the CIFS share name to provide SMB access.

      - **Block access**: allows hosts running critical business applications access to the volume using the iSCSI protocol.

        Complete the following fields to set up block access to the volume.

        i. **iSCSI configuration**: Provide the following details to configure iSCSI for block access to the volume.

           A. Select **Create a new initiator group** or **Map an existing initiator group**.

           B. Select the **Host operating system** from the dropdown menu.

           C. Enter an **Initiator group name** for a new initiator group.

           D. Under Host Initiators, add one or more iSCSI qualified name (IQN) host initiators.

7. Under Efficiency and protection, provide the following details:

   a. **Storage efficiency**: Disable or enable storage efficiency.

      Storage efficiency is achieved by utilizing the deduplication and compression features from ONTAP. Deduplication eliminates duplicate data blocks. Data compression compresses the data blocks to reduce the amount of physical storage that is required.

   b. **Snapshot policy**: Select the snapshot policy to specify the frequency and retention of snapshots.

      The following are default policies from AWS. For custom snapshot policies, you must associate a link.

`default`

This policy automatically creates snapshots on the following schedule, with the oldest snapshot copies deleted to make room for newer copies:

- A maximum of six hourly snapshots taken five minutes past the hour.
- A maximum of two daily snapshots taken Monday through Saturday at 10 minutes after midnight.
- A maximum of two weekly snapshots taken every Sunday at 15 minutes after midnight.

> Snapshot times are based on the file system's time zone, which defaults to Coordinated Universal Time (UTC). For information about changing the time zone, refer to Displaying and setting the system time zone in the NetApp Support documentation.

`default-1weekly`

This policy works in the same way as the `default` policy, except that it only retains one snapshot from the weekly schedule.

`none`

This policy doesn't take any snapshots. You can assign this policy to volumes to prevent automatic snapshots from being taken.

c. **Tiering policy**: Select the tiering policy for the data stored in the volume.

Auto is the default tiering policy when creating a volume using the user interface. For more information about volume tiering policies, refer to Volume storage capacity in AWS FSx for NetApp ONTAP documentation.

8. Under Advance configuration, provide the following:
   a. **Junction path**: Enter the location in the storage VM's namespace where the volume gets mounted. The default junction path is `/<volume-name>`.
   b. **Aggregates list**: Only for FlexGroup volumes. Add or remove aggregates. The minimum number of aggregates is one.
   c. **Number of constituents**: Only for FlexGroup volumes. Enter the number of constituents per aggregate. 100 GiB is required per constituent.
9. Click **Create**.

Result

Volume creation is initiated. Once created, the new volume will appear in the Volumes tab.

Create a storage VM for an FSx for ONTAP file system

Create a storage VM (SVM) for an FSx for ONTAP file system to access storage and data services virtually for your workloads in Workload Factory.

About this task

Storage VMs are isolated file servers that you can use to access the data from each workload in Workload Factory Storage. Each SVM has its own administrative credentials and endpoints for administering and

accessing data.

With SVMs, when you access data in FSx for ONTAP, your clients and workstations mount a volume, CIFS/SMB share, or iSCSI LUN hosted by an SVM using the SVM's endpoint (IP address).

Before you begin

Verify the supported number of storage VMs per file system. Refer to Managing FSx for ONTAP storage virtual machines in AWS documentation for the maximum number of SVMs per file system.

Create a storage VM

You can create a storage VM from the Workload Factory console. You can also use the following tools available in the Codebox: REST API, CloudFormation, and Terraform. Learn how to use Codebox for automation.

When using Terraform from Codebox, the code you copy or download hides `fsxadmin` and `vsadmin` passwords. You'll need to re-enter the passwords when you run the code.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the FSx for ONTAP tab, click the three dots menu of the file system to create a storage VM for and select **Manage**.
4. From the file system overview, select **Create a storage VM**.
5. On the Storage VM page, under Storage VM configuration, provide the following:
   a. **Name**: Enter a name for the storage VM.
   b. **Storage VM credentials**: Provide a password for this storage VM's `vsadmin` user or use the file system's `fsxadmin` user credentials.
   c. **Root volume security style**: Select the root volume security style depending on the type of clients that access your data - UNIX (Linux clients), NTFS (Windows clients), or Mixed.
   d. **Tags**: Optionally, you can add up to 50 tags.
6. Click **Create**.

Protect your data

Data protection overview

FSx for ONTAP supports snapshots to create read-only, point-in-time images of a volume, volume backups to create offline backups with long retention of your volumes, and volume replication to create asynchronous mirrors of your volume in different regions.

Types of data protection

Data protection for your workloads helps ensure that you can recover from any data loss at any time. Learn about the types of data protection before you select the features you'll use.

Snapshots

A snapshot creates a read-only, point-in-time image of a volume within the source volume as a snapshot copy. You can use the snapshot copy to recover individual files, or to restore the entire contents of a volume. Snapshots are the basis of all the backup methods. The snapshot copy that is created on your volume is used to keep the replicated volume and backup file synchronized with changes made to the source volume.

Backups

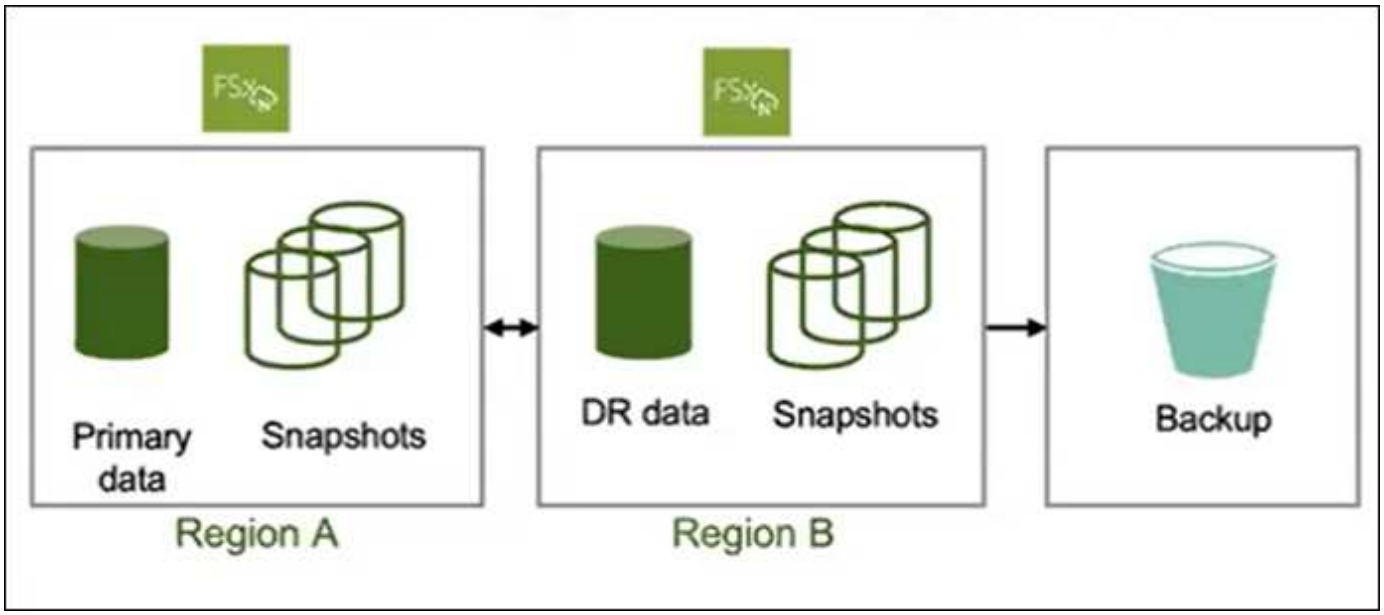
You can create backups of your data to the cloud for protection and for long-term retention purposes. If necessary, you can restore a volume, folder, or individual files from the backup to the same, or different, working file system.

Replication

Replication creates a secondary copy of your data on another FSx for ONTAP file system and continually updates the secondary data. Your data is kept current and remains available whenever you need it, such as for disaster recovery.

You can choose to create both replicated volumes on another FSx for ONTAP file system and backup files in the cloud. Or you can choose just to create replicated volumes or backup files - it's your choice.

The following diagram shows a visual representation of data protection for FSx for ONTAP storage using snapshots, replication across regions, and backup to object storage.



Best practices for protecting your workload data

FSx for ONTAP offers multiple data protection options which can be combined to achieve your selected recovery point and time objectives. For the best possible protection, we recommend that you use both volume snapshots and volume backups.

A recovery point objective (RPO) describes how recent the latest copy of your data is guaranteed to be, which depends on how frequently the copies are made. A recovery time objective (RTO) defines how long it takes to restore your data.

Protect your workload data with snapshots

Snapshots are virtual point-in-time versions of a volume that are taken on a scheduled basis. You can access snapshots using standard file system commands. Snapshots provide an RPO of as little as one hour. RTO depends on the amount of data to restore and is primarily limited by the volume throughput limit. Snapshots

also allow users to restore specific files and directories, which decreases RTO even further. Snapshots only consume additional volume space for changes made to the volume.

Protect your workload data with backups

Volume backups provide independent point-in-time copies of your volume. They can be used to store old backups and provide the necessary second copy of your data. Daily, weekly, and monthly backup schedules allow for RPOs starting at one day. Volume backups can only be restored as a whole. Creating a volume from a backup (RTO) can take hours to many days, depending on the size of the backup.

Protect your workload data with volume replication

Volume replication creates a copy of the latest data of a volume including all its snapshots in a different region. If you cannot afford multi-hour RTOs of a full volume restore operation from a volume backup, consider performing a volume replication. While volume replication makes sure recent data is available in a different region for you to use, you need to adjust your clients to use the volume in the other region.

Recommendations for protecting your workload data

Consider the following recommendations for protecting your workload data.

- Use volume backups in conjunction with snapshots: using the two features together ensures that you're able to restore your files from snapshots and perform full restores in case of volume loss using backups.
- Define a volume backup policy: make sure that the backup policy satisfies your company requirements for backup age and frequency. We recommend keeping a minimum of two daily backups for each volume.
- Define a snapshot schedule: older snapshots are less likely to be used to restore data. We recommend that you define a snapshot schedule that takes into consideration the diminishing returns of keeping older snapshots against the cost for additional snapshot capacity.

Manage snapshots

Create a manual snapshot of an FSx for ONTAP volume

Create a manual snapshot of an FSx for ONTAP volume. Snapshots are point-in-time versions of your volume's content.

Snapshots are resources of volumes and are instant captures of your data that consume space only for modified data. Because data changes over time, snapshots usually consume more space as they get older.

FSx for ONTAP volumes use just-in-time copy-on-write so that any unmodified files in snapshots don't consume any of the volume's capacity.

> Snapshots aren't copies of your data. If you want to make copies of your data, consider using the FSx for ONTAP backups or volume replication features.

Before you begin

You must associate a link to create a snapshot. If you don't have an existing link, create a link. To associate a link in the file system, click **Associate link** under **Account name**. Once the link associates, return to this operation.

Steps

1. Log in to the Workload Factory console

2. In **Storage**, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, click the three dots menu of the file system with the volume and then select **Manage**.
4. In the file system overview, select the **Volumes** tab.
5. From the **Volumes** tab, select the three dots menu for the volume to protect.
6. Select **Data protection actions**, **Snapshots**, then **Create volume from a snapshot**.
7. In the Create volume from a snapshot dialog, in the **Snapshot name** field, enter a snapshot name.
8. Click **Create**.

Create a snapshot policy for FSx for ONTAP volumes

Create a custom snapshot policy for FSx for ONTAP volumes. A snapshot policy defines how the system creates snapshots for a volume.

About this task

You can create a custom snapshot policy that differs from the three built-in snapshot policies for FSx for ONTAP:

- `default`
- `default-1weekly`
- `none`

By default, every volume is associated with the file system's `default` snapshot policy. We recommend using this policy for most workloads.

Customizing a policy lets you specify when to create snapshots, how many copies to retain, and how to name them.

Before you begin

- Consider the following about snapshot capacity before you use snapshots:
  - For most datasets, an additional capacity of 20% is enough to keep snapshots for up to four weeks. As data gets older, its use for restorations becomes less likely.
  - Overwriting all the data in a snapshot consumes significant volume capacity, which factors into provisioning volume capacity.
- To create a custom snapshot policy, you must associate a link. If you don't have an existing link, create a link. To associate a link in the file system, click **Associate link** under **Account name**. Once the link associates, return to this operation.

Steps

1. Log in to the Workload Factory console
2. In **Storage**, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, click the three dots menu of the file system with the volume and then select **Manage**.
4. In the file system overview, select the **Volumes** tab.
5. From the **Volumes** tab, select the three dots menu for the volume to protect with scheduled snapshots.

6. Select **Data protection actions**, **Snapshots**, then **Manage snapshot policies**.
7. On the Snapshot policy management page, select **Create a new snapshot policy**.
8. In the **Snapshot policy name** field, enter a name for the snapshot policy.
9. Optional: in the **Description** field, enter a description for the snapshot policy.
10. Under **Schedule**, select when to create snapshots. For example, every minute or hourly.

    You can select more than one frequency.

11. Under **Number of copies**, enter the number of copies to retain.

    The maximum number of copies is 1,023.

12. Optional: Under **Naming convention**, enter a **Prefix** for the policy.
13. **Retention label** is automatically populated.

    This label refers to the SnapMirror, or replication label, used to select only specified snapshots for replication from the source to the target file system.

14. Click **Apply**.

Restore a volume from a snapshot

Restore an FSx for ONTAP volume from a snapshot when the volume contains deleted or corrupted files.

About this task

This operation restores data from a snapshot to a new volume.

Before you begin

You can only restore a volume from a snapshot if you have an existing snapshot copy of the volume.

Make sure you have enough capacity to complete this operation.

Steps

1. Log in to the Workload Factory console
2. In **Storage**, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, click the three dots menu of the file system with the volume and then select **Manage**.
4. In the file system overview, select the **Volumes** tab.
5. From the **Volumes** tab, select the three dots menu for the volume to restore from a snapshot.
6. Select **Data protection actions**, **Snapshots**, then **Restore volume from a snapshot**.
7. In the Restore volume from a snapshot dialog, in the **Snapshot name** field, select the snapshot to restore from the dropdown menu.
8. In the **Restored volume name** field, enter a unique name for the volume to restore.
9. Click **Restore**.

Create a new FSx for ONTAP volume from a snapshot

Create a new FSx for ONTAP volume from a snapshot to enable point-in-time recovery.

About this task

A snapshot is a read-only image of an FSx for ONTAP volume taken at a point in time. The creation of a new volume from a snapshot makes a copy of an entire volume within a few seconds independent of volume size. The newly created copy represents a new volume.

Before you begin

Consider the following limitations before you create a volume from a snapshot:

- Changes to permission models: If you use this operation to switch the network-attached storage (NAS) protocol type, it might also switch the permission model that the security style provides. You might experience file access permission issues, which you can only fix manually with administrator access using the NAS client tools for permissions setting.
- Increased volume consumption: After you create a volume from a snapshot, you have two independent volumes, and both consume capacity from the host file system.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, click the three dots menu of the file system with the volume snapshot and then select **Manage**.
4. In the file system overview, select the **Volumes** tab.
5. In the Volumes tab, click the three dots menu for the volume that has the snapshot you want to create a volume of.
6. Select **Data protection actions**, **Snapshots**, and then **Create a volume from a snapshot**.
7. In the Create volume from a snapshot dialog, enter the snapshot name.
8. Click **Create**.

Manage backups to object storage

Create a manual backup of a volume

Create a manual backup of a volume outside regularly scheduled backups.

About this task

FSx for ONTAP backups are per volume, so each backup contains only the data in a particular volume.

FSx for ONTAP backups are incremental which means that only the data on the volume that has changed after your most recent backup is saved. This minimizes the time required to create the backup and the storage required for the backup, which saves on storage costs by not duplicating data.

Before you begin

To take backups of your volumes, both your volume and your file system must have enough available SSD storage capacity to store the backup snapshot. When taking a backup snapshot, the additional storage capacity consumed by the snapshot cannot cause the volume to exceed 98% SSD storage utilization. If this happens, the backup will fail.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, click the three dots menu of the file system with the volume and then select **Manage**.
4. In the file system overview, select the **Volumes** tab.
5. From the **Volumes** tab, click the three dots menu for the volume to back up.
6. Select **Data protection actions**, **FSx for ONTAP backup**, and then **Manual backup**.
7. In the Manual backup dialog, enter a name for the backup.
8. Click **Back up**.

Restore a volume from a backup

Restore a volume from a backup to any FSx for ONTAP file system in your AWS account.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, click the three dots menu of the file system with the volume and then select **Manage**.
4. In the file system overview, select the **Volumes** tab.
5. From the **Volumes** tab, click the three dots menu for the volume to restore from a backup.
6. Select **Data protection actions**, **FSx for ONTAP backup**, and then **Restore from a backup**.
7. In the Restore from a backup dialog, provide the following:
   a. **Target file system**: Select the target file system from the dropdown menu.
   b. **Target storage VM**: Select the target storage VM from the dropdown menu.
   c. **Backup name**: Select the backup name from the dropdown menu.
   d. **Restored volume name**: Enter the restored volume name.
8. Click **Restore**.

Manage replication

Create a replication relationship

Create a replication relationship for an FSx for ONTAP file system to avoid data loss in case of an unforeseen disaster.

About this task

Replication is an added layer of data protection which is essential in case the region where your data resides experiences a disaster. Data loss can be avoided if you use cross-region replication.

This operation creates a replication relationship for one or all source volumes in an FSx for ONTAP file system.

Replicated volumes in the target file system follow the naming format: `{OriginalVolumeName}_copy`.

Before you begin

Make sure you meet the following prerequisites before you begin.

- You must have two available file systems in your storage inventory to create a replication relationship.
- The two file systems you use for the replication relationship must have an associated link. If the file systems don't have existing links, first create a link. To associate a link in the file systems, click **Associate link** under **Account name**. Once the link associates in both file systems, return to this operation.

Complete the following steps to replicate a single volume or replicate all volumes in a file system.

Replicate a single volume

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, select the three dots menu of the file system that contains the volume to replicate and then select **Manage**.
4. From the Volumes tab, select the three dots menu of the volume to replicate.
5. Select **Data protection actions** then **Replicate volume data**.
6. On the Create replication page, under Replication target, provide the following:
   a. **FSx for ONTAP file system**: Select credentials, region, and FSx for ONTAP file system name for the target FSx for ONTAP file system.
   b. **Storage VM name**: Select the storage VM from the dropdown menu.
   c. **Volume name**: The target volume name is generated automatically with the following format `{OriginalVolumeName}_copy`. You can use the auto-generated volume name or enter another volume name.
   d. **Tiering policy**: Select the tiering policy for the data stored in the target volume.

      Auto is the default tiering policy when creating a volume using the Workload Factory FSx for ONTAP user interface. For more information about volume tiering policies, refer to Volume storage capacityin AWS FSx for NetApp ONTAP documentation.

   e. **Max transfer rate**: Select **Limited** and enter the max transfer limit in MB/s. Alternatively, select **Unlimited**.

      Without a limit, network and application performance may decline. Alternatively, we recommend an unlimited transfer rate for FSx for ONTAP file systems for critical workloads, for example, those that are used primarily for disaster recovery.
7. Under Replication settings, provide the following:
   a. **Replication interval**: Select the frequency that snapshots are transferred from the source volume to the target volume.
   b. **Long-term retention**: Optionally, enable snapshots for long-term retention.

      If you enable long-term retention, then select an existing policy or create a new policy to define the snapshots to replicate and the number to retain.

      i. For **Choose an existing policy**, select an existing policy from the dropdown menu.
      ii. For **Create a new policy**, provide the following:
         A. **Policy name**: Enter a policy name.
         B. **Snapshot policies**: In the table, select the snapshot policy frequency and the number of copies to retain. You can select more than one snapshot policy.
8. Click **Create**.

Replicate all volumes in a file system

Steps

1. Log in to the Workload Factory console

2. In Storage, select **Go to storage inventory**.
3. In the FSx for ONTAP tab, click the three dots menu of the file system with the volumes and then select **Manage**.
4. From the file system overview, select **Create replication**.
5. On the Create replication page, under Replication target, provide the following:
    a. **FSx for ONTAP file system**: Select credentials, region, and FSx for ONTAP file system name for the target FSx for ONTAP file system.
    b. **Storage VM name**: Select the storage VM from the dropdown menu.
    c. **Volume name**: The target volume name is generated automatically with the following format `{OriginalVolumeName}_copy`.
    d. **Tiering policy**: Select the tiering policy for the data stored in the target volume.

        Auto is the default tiering policy when creating a volume using the Workload Factory FSx for ONTAP user interface. For more information about volume tiering policies, refer to Volume storage capacityin AWS FSx for NetApp ONTAP documentation.

    e. **Max transfer rate**: Select **Limited** and enter the max transfer limit in MB/s. Alternatively, select **Unlimited**.

        Without a limit, network and application performance may decline. Alternatively, we recommend an unlimited transfer rate for FSx for ONTAP file systems for critical workloads, for example, those that are used primarily for disaster recovery.

6. Under Replication settings, provide the following:
    a. **Replication interval**: Select the frequency that snapshots are transferred from the source volume to the target volume.
    b. **Long-term retention**: Optionally, enable snapshots for long-term retention.

        If you enable long-term retention, then select an existing policy or create a new policy to define the snapshots to replicate and the number to retain.

        i. For **Choose an existing policy**, select an existing policy from the dropdown menu.
        ii. For **Create a new policy**, provide the following:
            A. **Policy name**: Enter a policy name.
            B. **Snapshot policies**: In the table, select the snapshot policy frequency and the number of copies to retain. You can select more than one snapshot policy.
7. Click **Create**.

Result

The replication relationship appears in the **Replication relationships** tab.

Initialize a replication relationship

Initialize a replication relationship between source and target volumes.

About this task

Initialization performs a *baseline* transfer: it makes a snapshot of the source volume, then transfers the

snapshot and all the data blocks it references to the target volume.

Before you begin

Consider when you choose to complete this operation. Initialization can be time-consuming. You might want to run the baseline transfer in off-peak hours.

Steps

1. Log in to the Workload Factory console
2. In Storage, select **Go to storage inventory**.
3. In the **FSx for ONTAP** tab, click the three dots menu of the file system to update and then select **Manage**.
4. From the file system overview, select the **Replication relationships** tab.
5. In the Replication relationships tab, click the three dots menu of the replication relationship to initialize.
6. Select **Initialize**.
7. In the Initialize relationship dialog, click **Initialize**.

Copyright information

Trademark information