Use links

Amazon FSx for NetApp ONTAP

NetApp
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Use links

Learn about NetApp Workload Factory links

A NetApp Workload Factory link creates a trust relationship and connectivity between a Workload Factory account and one or more FSx for ONTAP file systems. This allows 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.

Why links are beneficial

Links are beneficial because they allow Workload Factory to perform operations that are not natively available through the Amazon FSx for ONTAP API. Links enable advanced ONTAP capabilities and automations, which enhance the management of FSx for ONTAP file systems.

Here are some benefits of using links:

- The link enables the NetApp Console to send ONTAP commands directly to your FSx for ONTAP file system, bringing advanced ONTAP features beyond what AWS offers natively.
- Links leverage AWS Lambda to execute code in response to events. This serverless approach removes the dependency of an instance running in your VPC.

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 creating 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 and associate links from the Storage workload in Workload Factory.

You can authenticate links using credentials stored in the Workload Factory credentials service or with your credentials stored in AWS Secrets Manager. Workload factory doesn’t support changing authentication modes.

Costs

Each transaction that Lambda performs incurs a charge. Because 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, Workload Factory notifies you that the operation requires a link.

The features that require a link include:

- Well-architected status of FSx for ONTAP file system configurations for proactive maintenance, reliability, and cost-performance optimization
- ONTAP EMS event monitoring and alerting
- NetApp Autonomous Ransomware Protection (ARP/AI)
- Enhanced holistic capacity observability across FSx for ONTAP file systems
- Volume and storage VM data replication, management, and monitoring
- SMB/CIFS shares and NFS export policy provisioning and management
- Management of iSCSI volumes on an FSx for ONTAP file system
- Creation and management of snapshot policies for custom protection SLA
- Inode management enhancements for automatic capacity management
- Volume autogrow for elastic scaling
- Clone creation and management, for instant, in-place, data cloning
- Displaying additional metrics directly from ONTAP such as the ONTAP version

Learn how to connect a link to an FSx for ONTAP file system.

Connect to an FSx for ONTAP file system with a Lambda link

To perform advanced ONTAP management operations, set up a connection between your Workload Factory account and one or more FSx for ONTAP file systems. This involves associating new and existing Lambda links, and authenticating the links. Link association lets you monitor and manage certain features directly from the FSx for ONTAP file system that are unavailable through the Amazon 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. The link is used for that file system, and it can be used for other FSx for ONTAP file systems. You can also associate a link for a file system later.

Links require authentication. You can authenticate links using credentials stored in the Workload Factory credentials service or with your credentials stored in AWS Secrets Manager. Only one authentication method is supported per link. For example, if you select link authentication with AWS Secrets Manager, you can't change the authentication method later.

AWS Secrets Manager isn't supported when using a Console agent.

Associate a new link

Associating a new link includes link creation and association.

You have two options for creating links in this workflow - automatically or manually. You'll need to launch an AWS CloudFormation stack in your AWS account to create the link.

- Automatically: Creates a link with automatic registration via Workload Factory. A link created automatically requires tokens for Workload Factory automation and the CloudFormation code is short-lived. It can only be used for up to six hours.
- Manually: Creates a link with manual registration using either CloudFormation or Terraform from the Codebox. The code persists giving you more time to complete the operation. This is useful when working with different teams like Security and DevOps that might first need to grant the permissions necessary to complete link creation.

Before you begin

- You should consider which link creation option you'll use.
- You need to have at least one FSx for ONTAP file system in Workload Factory. To discover FSx for ONTAP file systems, you must have an AWS account with permissions for FSx for ONTAP instances and add credentials in Workload Factory with *view, planning, and analysis* permissions for Storage management.
- The following ports must be open in the security group associated with the FSx for ONTAP file system for link connectivity.
  - For the Workload Factory console: port 443 (HTTPS)
  - For CloudShell and FSx for ONTAP Emergency Management System (EMS) events analysis: port 22 (SSH)
- The link must be able to connect to the following endpoint: https://api.workloads.netapp.com. The web-based console contacts this endpoint to interact with the Workload Factory APIs to manage and operate FSx for ONTAP workloads.
- 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"
```

Create automatically

Use CloudFormation to automatically create and register the link within Workload Factory.

Steps

1. Log in using one of the console experiences.
2. Select the menu and then select **Storage**.
3. From the Storage menu, select **FSx for ONTAP**.
4. From **FSx for ONTAP**, select the actions menu of the file system to associate a link to and then 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. **AWS Secrets Manager**: Optional. Allows Workload Factory to fetch FSx for ONTAP access credentials from your AWS Secrets Manager.

      The link deployment stack automatically adds the following default secret manager ARN regex to the Lambda permission policy: `arn:aws:secretsmanager:<link_deployment_region>:<link_deployment_account_id>:secret:FSxSecret*`.

      You can either create secrets in alignment with the default permissions or assign your custom permissions for the link policy.

      Configure VPC private endpoint to AWS Secrets Manager is disabled by default. Selecting this option stores the secret using the VPC private endpoint instead of storing it locally.

   c. **Link permissions**: Select one of the following options for link permissions:
      - **Automatic**: Select this option so that AWS CloudFormation code automatically creates the Lambda permission policy and execution role.
      - **User-provided**: Select this option to assign a specified Lambda execution role and its attached policies to the Lambda link. The following permissions are required for the Lambda permission policy. The `secretsmanager:GetSecretValue` permission is required only if you enabled AWS Secrets Manager.

        ```
        "ec2:CreateNetworkInterface",
        "ec2:DescribeNetworkInterfaces",
        "ec2:DeleteNetworkInterface",
        "ec2:AssignPrivateIpAddresses",
        "ec2:UnassignPrivateIpAddresses",
        "secretsmanager:GetSecretValue"
        ```

        Enter the Lambda execution role ARN in the text box.

   d. **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.

Workload factory automatically retrieves the AWS account, location, and security group based on the FSx for ONTAP file system.

7. Select **Create**.

   The Redirect to CloudFormation dialog appears and explains how to create the link from the AWS CloudFormation service.

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 on 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.

Create manually

You can create a link using two Infrastructure-as-Code (IaC) tools from the Codebox: CloudFormation or Terraform. With this option, you extract the ARN for the link from AWS CloudFormation and report it here. Workload factory manually registers the link for you.

Steps

1. Log in using one of the console experiences.
2. Select the menu and then select **Storage**.
3. From the Storage menu, select **FSx for ONTAP**.
4. From **FSx for ONTAP**, select the actionsenu of the file system to associate a link to and then select **Associate link**.
5. In the Associate link dialog, select **Create a new link** and select **Continue**.
6. On the Create Link page, select CloudFormation or Terraform from the Codebox, and then 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. **AWS Secrets Manager**: Optional. Allows Workload Factory to fetch FSx for ONTAP access credentials from your AWS Secrets Manager.

The link deployment stack automatically adds the following default secret manager ARN regex to the Lambda permission policy: `arn:aws:secretsmanager:<link_deployment_region>:<link_deployment_account_id>:secret:FSxSecret*`.

You can either create secrets in alignment with the default permissions or assign your custom permissions for the link policy.

Configure VPC private endpoint to AWS Secrets Manager is disabled by default. Selecting this option stores the secret using the VPC private endpoint instead of storing it locally.

c. **Link permissions**: Select one of the following options for link permissions:

- **Automatic**: Select this option so that AWS CloudFormation code automatically creates the Lambda permission policy and execution role.
- **User-provided**: Select this option to assign a specified Lambda execution role and its attached policies to the Lambda link. The following permissions are required for the Lambda permission policy. The `secretsmanager:GetSecretValue` permission is required only if you enabled AWS Secrets Manager.

```
"ec2:CreateNetworkInterface",
"ec2:DescribeNetworkInterfaces",
"ec2:DeleteNetworkInterface",
"ec2:AssignPrivateIpAddresses",
"ec2:UnassignPrivateIpAddresses"
"secretsmanager:GetSecretValue"
```

Enter the Lambda execution role ARN in the text box.

d. **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.

e. **Link registration**: Select CloudFormation or Terraform for the instructions for how to register the link, and follow the instructions.

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"
```

After you successfully create the stack, paste the Lambda ARN in the text box.

f. Workload factory automatically retrieves the AWS account, location, and security group based on the FSx for ONTAP file system.

7. Select **Create**.

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

minutes.

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

Result

Workload factory associates the link with the FSx for ONTAP file system. You can perform advanced ONTAP operations.

Associate an existing link with an FSx for ONTAP file system

After you create a link, associate it with one or more FSx for ONTAP file system.

Steps

1. Log in using one of the console experiences.
2. Select the menu and then select **Storage**.
3. From the Storage menu, select **FSx for ONTAP**.
4. From **FSx for ONTAP**, select the actions menu of the file system to associate a link to and then select **Associate link**.
5. In the Associate link page, select **Associate an existing link**, select the link, and select **Continue**.
6. Select the authentication mode.
   - Workload Factory: enter the password twice.
   - AWS Secrets Manager: enter the secret ARN.

     Ensure that the secret ARN contains the following key valid pairs, though the *filesystemID* is optional.

     - filesystemID = FSx_filesystem_id (optional)
     - user = FSx_user
     - password = user_password

     Authentication with AWS Secrets Manager requires a user, either the *FSx_user* that you provide or another user that was created on the FSx for ONTAP file system. The default user is `fsxadmin` if you don't provide a user.
7. Select **Apply**.

Result

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

Troubleshoot issues with AWS Secrets Manager link authentication

Issue

The link lacks permissions to retrieve the secret.

Resolution: Add permissions after the link is active. Log in to the AWS console, locate the Lambda link, and edit the attached permission policy.

Issue

The secret isn't found.

Resolution: Provide the correct secret ARN.

Issue

The secret isn't in the right format.

Resolution: Go to AWS Secrets Manager and edit the format.

The secret should contain the following key valid pairs:

- filesystemID = FSx_filesystem_id
- username = FSx_user
- password = user_password

Issue

The secret doesn't contain valid ONTAP credentials for file system authentication.

Resolution: Provide credentials that can authenticate FSx for ONTAP file systems in AWS Secrets Manager.

Manage Workload Factory links

Manage links that you've associated with your Workload Factory account. You can view links that are associated with an FSx for ONTAP file system, provide passwords used for link authentication, and remove links from the Workload Factory console.

Learn more about links or create and associate a link.

View the links associated with your account

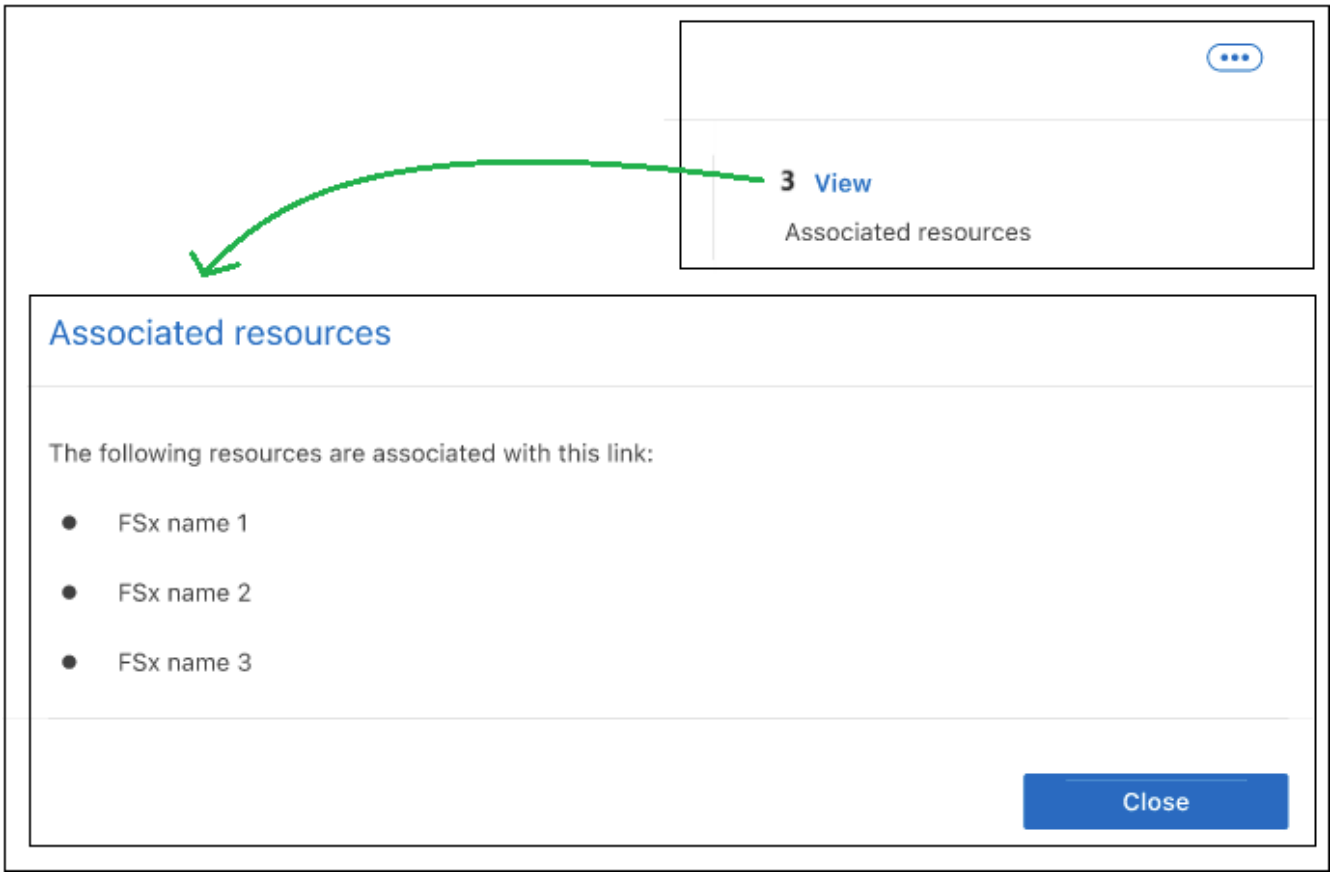
You can view the links that are currently associated with your account.

Steps

1. Log in using one of the console experiences.
2. From the Storage menu, select **Administration** and then **Links**.

   Existing links appear on the Links page.

3. To view the FSx for ONTAP file systems that are associated with a link, select the **View** button in the Associated resources section.



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

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.

Authenticate a link

Provide an administrative user password for Workload Factory credentials or an AWS Secrets Manager secret ARN to connect the link to an FSx for ONTAP file system.

AWS Secrets Manager isn't supported when using a Console agent.

Only one authentication method is supported per link. For example, if you select link authentication with AWS Secrets Manager, you can't change the authentication method later.

Steps

1. Log in using one of the console experiences.
2. Select the menu and then select **Storage**.

3. From the Storage menu, select **FSx for ONTAP**.
4. From **FSx for ONTAP**, select the actions menu of the file system to associate a link to and then select **Manage**.
5. In the file system overview, select **Authenticate the link**.
6. In the Authenticate link page, select an authenticate mode:
   - Workload Factory: enter the password twice.
   - AWS Secrets Manager: enter the secret ARN.
7. Select **Apply**.

Result

The link is authenticated, and you can perform advanced ONTAP operations

Update the password for link authentication

When the administrative password is invalid, update the password to connect the link to the FSx for ONTAP file system.

Steps

1. Log in using one of the console experiences.
2. Select the menu and then select **Storage**.
3. From the Storage menu, select **FSx for ONTAP**.
4. From **FSx for ONTAP**, select the actions menu of the file system to associate a link to and then select **Manage**.
5. In the file system overview, select **Update password**.
6. In the Authenticate link page, enter the new password twice.
7. Select **Apply**.

Result

The password is updated, and the link is now connected to the FSx for ONTAP file system.

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 using one of the console experiences.
2. Select the menu and then select **Storage**.
3. From the Storage menu, select **Administration** and then **Links**.

   Existing links appear on the Links page.

4. From the Links page, select the actions menu of the link to remove and then select **Remove**.

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

Refer to the AWS documentation to delete the Lambda function.

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