Get started

Amazon FSx for NetApp ONTAP

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Learn about Amazon FSx for NetApp ONTAP in NetApp Workload Factory

Amazon FSx for NetApp ONTAP is a fully managed, cloud-based data storage service that provides advanced data management capabilities and highly scalable performance. FSx for ONTAP allows you to create and manage file systems as the storage backend for all your workloads within NetApp Workload Factory.

FSx for ONTAP provides the same features, performance, and administrative capabilities NetApp customers use on premises today, with the simplicity, agility, security, and scalability of a native AWS service.

FSx for ONTAP is the *Storage* component in Workload Factory.

Features

FSx for ONTAP offers the following features:

- **Fully-managed service**: provides a fully-managed service integrated with the Workload Factory console.
- **High availability**: provides high availability for each FSx for ONTAP file system, supporting Single and Multiple Availability Zones deployments.
- **Automated snapshots**: protects data with automated, efficient snapshots, which are near instantaneous, space efficient point-in-time read-only copies of the file system or volumes.
- **Volume replication**: provides disaster recovery with cross-region replication across Amazon Web Services.
- **Efficient backups**: adds an extra layer of protection with a copy of the data in another region for emergencies.
- **Fast cloning**: accelerates application development with fast cloning.
- **Multi-protocol support**: supports Network File System (NFS), Server Message Block (SMB), and Internet Small Computer Systems Interface (iSCSI) protocols.
- **High throughput**: delivers high throughput performance to ensure low latencies for workloads running on top of FSx for ONTAP file systems.
- **In-memory cache and NVMe cache**: includes a unique in-memory cache and NVMe cache, which boosts the performance of frequently accessed data.
- **Hundreds of thousands of IOPS**: provides hundreds of thousands of IOPS with SSD disks, ensuring that your storage and workloads receive timely results.
- **Thin Provisioning**: allows capacity provisioning in advance, saving costs until more capacity is needed.
- **Data deduplication and compression**: removes duplicate data and compresses data to reduce the amount of physical storage that is required for FSx for ONTAP file systems resulting in cost savings.
- **Data tiering**: allows storage cost reduction by moving less frequently accessed data from the primary, high performance SSD storage tier to the secondary capacity pool storage tier.

Additional features in Workload Factory

- **Storage cost comparison calculator**: compares your Amazon Elastic Block Store (EBS), Elastic File System (EFS) and FSx for Windows File Server storage costs with FSx for ONTAP. From the calculator, you can view how FSx for ONTAP storage configurations offer potential savings and plan your move to FSx for ONTAP storage.
- **Workload Factory user interface**: provides *Quick create* and *Advanced create* deployment mode options. Quick create includes AWS, NetApp, and industry standard best practices for your storage configurations.
- **Codebox**: provides developers with a code viewer for FSx for ONTAP operations, code templates for copy and download, and an automation catalog for code re-use.

Tools to use NetApp Workload Factory

You can use NetApp Workload Factory with the following tools:

- **Workload Factory console**: The Workload Factory console provides a visual, holistic view of your applications and projects.
- **NetApp Console**: The NetApp Console provides a hybrid interface experience so that you can use Workload Factory along with other NetApp data services.
- **Ask me**: Use the Ask me AI assistant to ask questions and learn more about Workload Factory without leaving the Workload Factory console. Access Ask me from the Workload Factory help menu.
- **CloudShell CLI**: Workload Factory includes a CloudShell CLI to manage and operate AWS and NetApp environments across accounts from a single, browser-based CLI. Access CloudShell from the top bar of the Workload Factory console.
- **REST API**: Use the Workload Factory REST APIs to deploy and manage your FSx for ONTAP file systems and other AWS resources.
- **CloudFormation**: Use AWS CloudFormation code to perform the actions you defined in the Workload Factory console to model, provision, and manage AWS and third-party resources from the CloudFormation stack in your AWS account.
- **Terraform NetApp Workload Factory provider**: Use Terraform to build and manage infrastructure workflows generated in the Workload Factory console.

Cost

AWS maintains your FSx for ONTAP account, not Workload Factory. Refer to Pricing for Amazon FSx for NetApp ONTAP.

Regions

Workload factory is supported in all commercial regions where FSx for ONTAP is supported. View supported Amazon regions.

The following AWS regions aren’t supported:

- China regions
- GovCloud (US) regions
- Secret Cloud
- Top Secret Cloud

Getting help

Amazon FSx for NetApp ONTAP is an AWS first-party solution. For questions or technical support issues associated with your FSx for ONTAP file system, infrastructure, or any solution using this service, use the Support Center in your AWS Management Console to open a support case with AWS. Select the “FSx for ONTAP” service and appropriate category. Provide the remaining information required to create your AWS support case.

For general questions about Workload Factory or Workload Factory applications and services, refer to Get help for FSx for ONTAP for Workload Factory.

Quick start for Amazon FSx for NetApp ONTAP in NetApp Workload Factory

With Amazon FSx for NetApp ONTAP in NetApp Workload Factory, you can get started immediately in *basic* mode.

If you’d like to use Workload Factory to create a file system, manage resources, and more, you can get started in a few steps. In this case, you need an AWS account and credentials to get started.

Follow these steps to get started.

Log in to Workload Factory

You’ll need to set up an account with Workload Factory and log in

Add credentials and permissions

Choose the permission policies to meet your needs.

If you choose not to grant permissions, you can start using Workload Factory for FSx for ONTAP to copy partially completed code samples.

If you choose to grant permissions, you’ll need to add credentials to an account manually that includes selecting workload capabilities, such as Databases and AI, and creating the IAM policies for the required permissions.

Create a file system

You’ll create an FSx file system to begin managing your storage and FSx for ONTAP resources in Workload Factory. In the Workload Factory console, in Storage, select **Create file system**. Learn how to create a file system.

You can also start with the storage savings calculator to compare the costs of your Amazon Elastic Block Store, Elastic File System, and FSx for Windows File Server storage environments to that of FSx for ONTAP. Explore savings with the storage savings calculator.

What’s next

With a file system in your Storage inventory, you can create volumes, manage your FSx for ONTAP file system, and set up data protection for your resources.

Create an FSx for ONTAP file system in NetApp Workload Factory

Using NetApp Workload Factory you can create first and second-generation FSx for ONTAP file systems to add and manage volumes and additional data services.

About this task

A storage VM and a security group are created as part of file system creation.

Before you begin

Before creating your FSx for ONTAP file system, you will need:

- Credentials with *file system creation and deletion* permissions to create an FSx for ONTAP file system. Learn how to grant permissions to an AWS account.
- The region and VPC information for where you will create the FSx for ONTAP instance.

Create an FSx for ONTAP file system

You can create an FSx for ONTAP file system using *Quick create* or *Advanced create*. 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.

Quick create

Quick create enables you to use a recommended best-practice configuration. You can change most settings after you create an FSx for ONTAP file system.

Second-generation FSx for ONTAP file systems are the default deployment type for quick create unless the selected region doesn't support second-generation FSx for ONTAP file systems.

Steps

1. Log in using one of the console experiences.
2. Select the menu and then select **Storage**.
3. From the Storage dashboard, select **Create file system**.
4. On the Create FSx for ONTAP file system page, select **Quick create**.

   You can also load a saved configuration.

5. Under File system general configuration, provide the following:
   a. **AWS credentials**: Select to add AWS credentials in Workload Factory or continue without credentials.
   b. **File system name**: Enter a name for the file system.
   c. **Region & VPC**: Select the region and VPC for the file system.
   d. **Deployment type**: Select a deployment type.
      - Single Availability Zone (Single-AZ) deployment: provides availability by monitoring for hardware failures and automatically replacing infrastructure components in the event of a failure. Achieves high durability by automatically replicating your data within an Availability Zone to protect it from component failure.

        This configuration is recommended for high performance workloads or when workloads start small and incrementally scale out to 72 GB/s of throughput and 2.4 million IOPS.

      - Multiple Availability Zones (Multi-AZ) deployment: provides continuous availability to data even when an Availability Zone is unavailable. A Multi-AZ file system is designed for business-critical production workloads that require high availability to shared ONTAP file data and need storage with built-in replication across Availability Zones.

        This single HA-pair configuration is recommended for workloads that require up to 6 GB/s of throughput or 200,000 IOPS.

   e. **Tags**: Optionally, you can add up to 50 tags.
6. Under **File system details**, provide the following:
   a. **SSD storage capacity**: Enter the storage capacity and select the storage capacity unit.
      - For first-generation deployments, you can't decrease capacity after file system creation.
      - For second-generation deployments, you can increase capacity after file system creation.
   b. **ONTAP credentials**: Optional. Enter your ONTAP user name and password. The password can be set now or later.

      If the user you provide is not the fsxadmin user, and later you need to reset the fsxadmin password, you'll be able to do this from the AWS console.

c. **SMB/CIFS setup**: Optional. If you plan to use SMB/CIFS protocol to access volumes, you must configure the Active Directory for the storage VM during file system creation. Provide the following details for the storage VM that is created for this file system.

   i. **Active Directory domain to join**: Enter the fully qualified domain name (FQDN) for the Active Directory.

   ii. **DNS IP addresses**: Enter up to three DNS IP addresses separated by commas.

   iii. **SMB server NetBIOS name**: Enter the SMB server NetBIOS name of the Active Directory computer object to create for your storage VM. This is the name of this storage VM in the Active Directory.

   iv. **User name**: Enter the user name of the service account in your existing Active Directory.

   Do not include a domain prefix or suffix. For `EXAMPLE\ADMIN`, use `ADMIN`.

   v. **Password**: Enter the password for the service account.

   vi. **Organization unit**: Optionally, enter the name of the Organizational Unit where you intend to create the computer account for FSx for ONTAP. The OU is the distinguished path name of the organizational unit to which you want to join the file system.

   vii. **Delegated administrators group**: Optionally, enter the name of the group in your Active Directory that can administer your file system.

   If you are using AWS Managed Microsoft AD, you must specify a group such as AWS Delegated FSx Administrators, AWS Delegated Administrators, or a custom group with delegated permissions to the OU.

   If you are joining to a self-managed AD, use the name of the group in your AD. The default group is `Domain Admins`.

7. Open the **Summary** to review the configuration that you defined. If needed, you can change any setting at this time before saving or creating the file system.
8. Save or create the file system.

If you created the file system, you can now view the FSx for ONTAP file system in the **Inventory** page.

Advanced create

With Advanced create, you set all of the configuration options, including availability, security, backups, and maintenance.

Steps

1. Log in using one of the console experiences.
2. In the Storage tile, select **Create FSx for ONTAP**.
3. On the Create FSx for ONTAP file system page, select **Advanced create**.

   You can also load a saved configuration.

4. Under File system general configuration, provide the following:
   a. **AWS credentials**: Select to add AWS credentials in Workload Factory or continue without credentials.
   b. **File system name**: Enter a name for the file system.

c. **Region & VPC**: Select the region and VPC for the file system.

d. **Deployment type**: Select a deployment type and file system generation. The availability of a second-generation file system depends on the selected region. If the selected region doesn't support second-generation FSx for ONTAP file systems, the deployment type switches to first-generation.

- Single Availability Zone (Single-AZ) deployment: provides availability by monitoring for hardware failures and automatically replacing infrastructure components in the event of a failure. Achieves high durability by automatically replicating your data within an Availability Zone to protect it from component failure.

  File system generation: Select one of the following:

  - **Second-generation**: This configuration is recommended for high performance workloads or when workloads start small and incrementally scale out to 72 GB/s of throughput and 2.4 million IOPS.
  - **First-generation**: This configuration is ideal for workloads that require up to 4 GB/s or 160,000 IOPS. First-generation file systems can only increase capacity.

- Multiple Availability Zones (Multi-AZ) deployment: provides continuous availability to data even when an Availability Zone is unavailable. A Multi-AZ file system is designed for business-critical production workloads that require high availability to shared ONTAP file data and need storage with built-in replication across Availability Zones.

  File system generation: Select one of the following:

  - **Second-generation**: This single HA-pair configuration is recommended for workloads that require up to 6 GB/s of throughput or 200,000 IOPS. In a Multi-AZ and second-generation file system, capacity can increase or decrease to match workload demands.
  - **First-generation**: This configuration is ideal for workloads that require up to 4 GB/s or 160,000 IOPS. First-generation file systems can only increase capacity.

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

5. Under File system details, provide the following:

a. **SSD storage capacity**: Enter the storage capacity and select the storage capacity unit.

- For first-generation deployments, you can't decrease capacity after file system creation.
- For second-generation deployments, you can adjust capacity.

b. **Throughput capacity per HA pair**: Select throughput capacity per number of HA pairs. First-generation file systems support only one HA pair.

c. **Provisioned IOPS**: Select one of the following options:

- **Automatic**: For automatic, for every GiB created, 3 IOPS are added.
- **User-provisioned**: For user-provisioned, enter the IOPS value.

d. **ONTAP credentials**: Optional. Enter your ONTAP user name and password. The password can be set now or later.

If the user you provide is not the fsxadmin user, and later you need to reset the fsxadmin password, you'll be able to do this from the AWS console.

e. **Storage VM Credentials**: Optional. Enter your user name. Password can be specific to this file system or you can use the same password entered for ONTAP credentials. The password can be set now or later.

f. **SMB/CIFS setup**: Optional. If you plan to use SMB/CIFS protocol to access volumes, you must configure the Active Directory for the storage VM during file system creation. Provide the following details for the storage VM that is created for this file system.

   i. **Active Directory domain to join**: Enter the fully qualified domain name (FQDN) for the Active Directory.

   ii. **DNS IP addresses**: Enter up to three DNS IP addresses separated by commas.

   iii. **SMB server NetBIOS name**: Enter the SMB server NetBIOS name of the Active Directory computer object to create for your storage VM. This is the name of this storage VM in the Active Directory.

   iv. **User name**: Enter the user name of the service account in your existing Active Directory.

   Do not include a domain prefix or suffix. For `EXAMPLE\ADMIN`, use `ADMIN`.

   v. **Password**: Enter the password for the service account.

   vi. **Organization unit**: Optionally, enter the name of the Organizational Unit where you intend to create the computer account for FSx for ONTAP. The OU is the distinguished path name of the organizational unit to which you want to join the file system.

   vii. **Delegated administrators group**: Optionally, enter the name of the group in your Active Directory that can administer your file system.

   If you are using AWS Managed Microsoft AD, you must specify a group such as AWS Delegated FSx Administrators, AWS Delegated Administrators, or a custom group with delegated permissions to the OU.

   If you are joining to a self-managed AD, use the name of the group in your AD. The default group is `Domain Admins`.

6. Under Network & security, provide the following:

   a. **Security group**: Create or use an existing security group.

   For a new security group, refer to security group details for a description of the security group protocols, ports, and roles.

   b. **Availability Zones**: Select availability zones and subnets.

   - For Cluster configuration node 1: Select an availability zone and subnet.
   - For Cluster configuration node 2: Select an availability zone and subnet.

   c. **VPC route tables**: Select the VPC route table to enable client access to volumes.

   d. **Endpoint IP address range**: Select **Floating IP address range outside your VPC** or **Enter an IP address range** and enter an IP address range.

   e. **Encryption**: Select the encryption key name from the dropdown.

7. Under Backup and maintenance, provide the following:

   a. **FSx for ONTAP Backup**: Daily automatic backups are enabled by default. Disable if desired.

   i. **Automatic backup retention period**: Enter the number of days to retain automatic backups.

   ii. **Daily automatic backup window**: Select either **No preference** (a daily backup start time is selected for you) or **Select start time for daily backups** and specify a start time.

   b. **Weekly maintenance window**: Select either **No preference** (a weekly maintenance window start time is selected for you) or **Select start time for 30-minute weekly maintenance window** and

specify a start time.

8. Save or create the file system.

If you created the file system, you can now view the FSx for ONTAP file system in the **Inventory** page.

Security group details

The following table provides security group details including protocols, ports, and roles.

Protocol	Port	Role
SSH	22	SSH access to the IP address of the cluster management LIF or a node management LIF
TCP	80	Web page access to the IP address of the cluster management LIF
TCP/UDP	111	Remote procedure call for NFS
TCP/UDP	135	Remote procedure call for CIFS
UDP	137	NetBIOS name resolution for CIFS
TCP/UDP	139	NetBIOS service session for CIFS
TCP	443	ONTAP REST API access to the IP address of the cluster management LIF or an SVM management LIF
TCP	445	Microsoft SMB/CIFS over TCP with NetBIOS framing
TCP/UDP	635	NFS mount
TCP	749	Kerberos
TCP/UDP	2049	NFS server daemon
TCP	3260	iSCSI access through the iSCSI data LIF
TCP/UDP	4045	NFS lock daemon
TCP/UDP	4046	Network status monitor for NFS
UDP	4049	NFS quota protocol
TCP	10000	Network data management protocol (NDMP) and NetApp SnapMirror intercluster communication
TCP	11104	Management of NetApp SnapMirror intercluster communication
TCP	11105	SnapMirror data transfer using intercluster LIFs

Protocol	Port	Role
TCP/UDP	161-162	Simple network management protocol (SNMP)
All ICMP	All	Pinging the instance

What's next

With a file system in your Storage inventory, you can create volumes, manage your FSx for ONTAP file system, and set up data protection for your resources.

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