Architecture and connectivity

Information Security for Workload Factory

NetApp
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Connectivity and trust paths for NetApp Workload Factory

NetApp Workload Factory communicates with AWS APIs, customer AWS account resources, AWS Lambda link, and Amazon Bedrock, each with its own protocols, ports, and authentication methods. These connections are organized into groups that separate the AWS management plane, the ONTAP data plane, and Lambda link traffic so you can evaluate trust boundaries independently.

Connectivity paths

Workload Factory establishes several distinct connectivity paths, each serving a specific purpose in discovering, provisioning, and managing your AWS and ONTAP resources. Some paths originate from Workload Factory itself using assumed AWS credentials, while others run through Lambda link, which operates inside your VPC to reach ONTAP management endpoints without exposing them publicly. An optional path to Amazon Bedrock supports AI-assisted diagnostics and is active only when your organization enables that feature.

The following sections describe each path, including the AWS or ONTAP APIs involved, the credentials or authentication used, and any conditions that determine whether the path is active. Understanding these paths helps you evaluate what network access and permissions Workload Factory requires, and where data crosses account or VPC boundaries.

Workload Factory to AWS APIs

Workload Factory uses `DescribeFileSystems`, `DescribeVolumes`, `CreateVolume`, `UpdateVolume`, `DeleteVolume`, `CreateFileSystem`, `CreateBackup`, `DescribeBackups`, and EC2/VPC APIs for subnet and security group discovery.

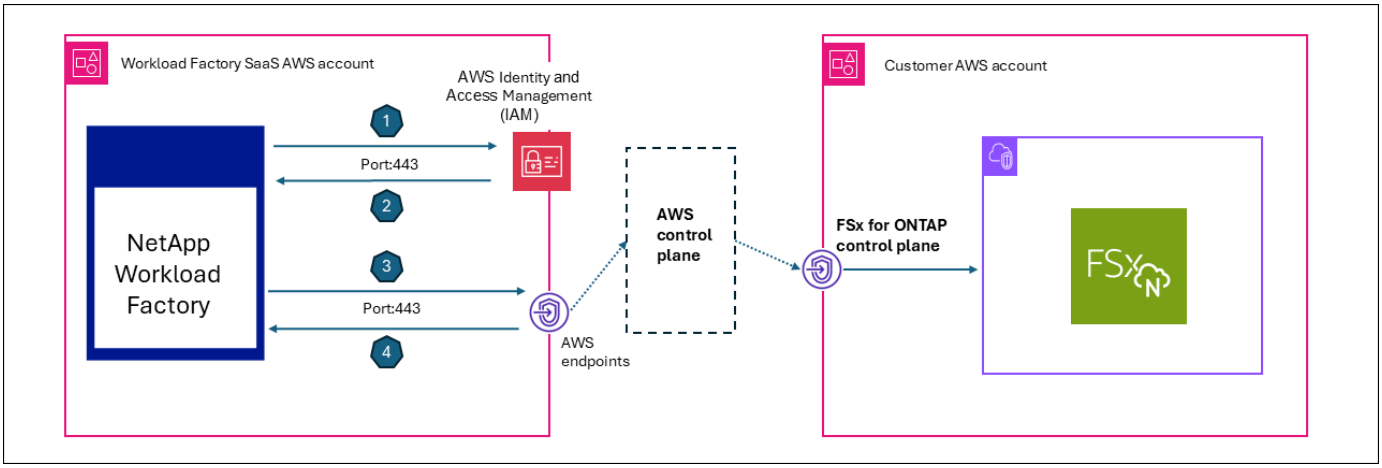
- Collector service scans about every five hours.
- CRUD operations run on demand.
- All calls use STS-assumed temporary credentials with an external ID.

Workload Factory to customer AWS account resources (orchestration and automation)

Workload Factory interacts with AWS to communicate and create resources. Orchestration and automation occurs in several ways.

- AWS CloudFormation templates: Workload Factory uses AWS CloudFormation templates to create resources like roles and file systems. For example, when you create a file system in the user interface, Workload Factory calls CloudFormation directly and redirects you to your AWS account.
- AWS API calls: Workload Factory uses AWS API calls (STS `AssumeRole`) to send API commands for FSx for ONTAP-related activities.
- AWS Lambda: Workload Factory uses CloudFormation to deploy an AWS Lambda function for the link that communicates with ONTAP.

The following diagram shows how Workload Factory uses a trust relationship between a NetApp AWS account and customer AWS accounts with FSx for ONTAP file systems.



1. Workload Factory requests AWS STS `AssumeRole`, using customer-specific external ID from the AWS IAM service.
2. AWS IAM service retrieves a role and creates a session.
3. Workload Factory issues an AWS API request with session permissions.
4. Workload Factory receives an AWS API response from the FSx for ONTAP control plane.

Lambda link to ONTAP management endpoint

Lambda links run inside the customer VPC for private subnet access without exposing ONTAP publicly. All connectivity from the link to the ONTAP management endpoint is outbound only, so no inbound connectivity or exposed endpoints are required. The link is used only for ONTAP-native operations that the Amazon FSx for NetApp ONTAP API doesn't expose.

Workload Factory uses the following protocols for volume, storage VM, and cluster operations, and for read-only diagnostics and performance data:

- HTTPS/443 (REST)
- SSH/22 (CLI)

Lambda link to AWS Secrets Manager (ONTAP credential retrieval)

Used only when ONTAP admin credentials are stored in AWS Secrets Manager (alternative: credentials encrypted in Workload Factory using envelope encryption).

- The proxy-forwarder passes `x-aws-secret-arn` (Base64-encoded) in headers.
- Lambda link calls `GetSecretValue` at execution time to retrieve the password.

This keeps the password within your account boundary and prevents transmission from Workload Factory.

Workload Factory and customer components to Amazon Bedrock (AI diagnostics)

This path is used only when AI diagnostics are enabled.

- Event Analyzer uses this path for EMS analysis and latency diagnostics.
- Bedrock runs with your assumed credentials and inference profile ARN, so data does not flow to NetApp's account.

Data sent to Bedrock can include EMS event JSON, QoS statistics, volume configuration, aggregate data, and node information. The path is active only when an inference profile is configured per organization (`ai_analyzer_config` table).

Connection groups (protocols, ports, and auth)

Group A — AWS management plane trust path (assumed credentials)

Connection	Protocol	Port	Direction	Auth	Justification
STS AssumeRole	HTTPS	443	WF → AWS STS (customer account)	IAM credentials + ExternalId	Obtain temporary cross-account credentials
FSx API (Describe/Create/Update/Delete)	HTTPS	443	WF → AWS FSx endpoint (customer region)	STS temporary credentials	File system and volume lifecycle management
EC2/VPC API	HTTPS	443	WF → AWS EC2 endpoint	STS temporary credentials	Security group, subnet, and VPC discovery
CloudFormation API	HTTPS	443	WF → AWS CFN endpoint	STS temporary credentials	Stack deployment for IAM roles and FSx provisioning
Secrets Manager GetSecretValue	HTTPS	443	WF → AWS Secrets Manager endpoint (customer account)	STS temporary credentials	Retrieve ONTAP admin password (when Secrets Manager-stored)
KMS Encrypt/Decrypt	HTTPS	443	WF → AWS KMS endpoint	STS temporary credentials	Volume encryption key operations

All AWS API calls use the customer's regional endpoint and can be routed through VPC endpoints if configured.

Group B — ONTAP data plane

The ONTAP data plane is always proxied through Lambda link; Workload Factory services never connect directly to ONTAP.

Connection	Protocol	Port	Direction	Auth	Justification
ONTAP REST API	HTTPS	443	Link (customer VPC) → ONTAP management LIF	Basic auth (username/password) or Secrets Manager ARN	Cluster, volume, and storage VM configuration; QoS; EMS events; ARP status
ONTAP SSH CLI	SSH	22	Link (customer VPC) → ONTAP management LIF	Password auth	Diagnostic commands (QoS stats, df, event logs, efficiency)

Routing strategy (priority order) for the proxy-forwarder:

1. Explicit `x-link-id` header: look up Lambda ARN from the database
2. Target ID (FSx file system ID): find the associated link
3. Console agent ID: route through the message broker to the Console agent

Group C — AWS Lambda link (deployed in your VPC)

Connection	Protocol	Port	Direction	Auth	Justification
Lambda Invoke	HTTPS (AWS SDK)	443	WF → AWS Lambda API (customer account)	IAM (`lambda:InvokeFunction`)	Execute ONTAP REST/SSH commands from within customer VPC
Lambda → ONTAP	HTTPS + SSH	443, 22	Lambda (customer VPC) → ONTAP management LIF	Basic auth / password	Private subnet access to ONTAP without public exposure

Group D — NetApp Console Agent (EC2 in your VPC, outbound-only)

Connection	Protocol	Port	Direction	Auth	Justification
Agent polling	HTTPS	443	Console agent (customer VPC) → WF message broker	Bearer token (occm-access scope)	Long-poll for pending ONTAP commands (7-second timeout; reconnects)
Agent response	HTTPS	443	Console agent (customer VPC) → WF message broker	Bearer token	Return ONTAP command results (optionally zlib-compressed)
Console agent → ONTAP	HTTPS + SSH	443, 22	Console agent (customer VPC) → ONTAP management LIF	Basic auth / password	Execute proxied ONTAP operations

Key design: Workload Factory never initiates inbound connections to the Console agent. Work is queued in Redis streams; the Console agent polls `GET /messagebroker/v1/requests` and responds with `POST /messagebroker/v1/responses`.

Group E — CloudFormation custom resource callbacks

Connection	Protocol	Port	Direction	Auth	Justification
CloudFormation → WF Lambda	HTTPS	443	CloudFormation (customer) → WF Lambda (NetApp)	JWT token + reference token	Report IAM role creation status and pass back role ARN

Connection	Protocol	Port	Direction	Auth	Justification
ONTAP CloudFormation Resource Provider → Link	HTTPS	443	CloudFormation resource Lambda (customer) → Link Lambda (customer)	IAM	Create/update/delete ONTAP resources during stack operations

Summary: network requirements for your VPC

Component	Inbound	Outbound
FSx for ONTAP	Port 443 and 22 from Link Lambda or Console agent security group	N/A
Link Lambda	None	Port 443 (ONTAP, AWS APIs) and port 22 (ONTAP SSH)
Console agent EC2	None	Port 443 (WF endpoints, ONTAP, AWS APIs) and port 22 (ONTAP SSH)
VPC endpoints (optional)	N/A	STS, FSx, S3, Secrets Manager, Lambda, CloudFormation

No inbound internet access is required for any component in the customer VPC. All connections are either outbound-initiated (Console agent polling) or invoked through AWS service APIs (Lambda Invoke).

ONTAP execution options for NetApp Workload Factory

Some NetApp Workload Factory workflows require ONTAP-native operations that aren’t exposed through AWS APIs. Workload Factory offers two execution options that keep these operations inside your AWS account boundary: a Lambda link that runs ONTAP operations from within your VPC, and a NetApp Console Agent that uses outbound-only connectivity from an EC2 instance. Both options let you perform required ONTAP operations while keeping network, credential, and lifecycle decisions within your security model.

Execution options

Lambda link (AWS Lambda in your VPC)

Executes ONTAP REST and read-only ONTAP CLI diagnostics from within your VPC, without exposing ONTAP publicly.

NetApp Console Agent (EC2 in your VPC, outbound-only)

Executes proxied ONTAP operations where the agent initiates outbound connections and Workload Factory never initiates inbound connections to the agent.

Security considerations

- Network boundaries: confirm required outbound ports (443/22) and destinations.
- Credential boundaries: decide whether ONTAP credentials are stored in Workload Factory (envelope encrypted) or referenced from AWS Secrets Manager.
- Auditability: confirm operational records for component activity and failures.
- Lifecycle management: confirm how updates and removal occur.

Related information

- Lambda link overview for NetApp Workload Factory
- Connectivity and trust paths for NetApp Workload Factory
- Encryption and key management for NetApp Workload Factory

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