Technical Report

StorageGRID search integration service

Configuration guide

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Abstract

This technical report provides detailed instructions for configuring NetApp® StorageGRID® 11.6 search integration service with either Amazon OpenSearch Service or on-premises Elasticsearch.

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Introduction

StorageGRID supports three types of platform services.

- **StorageGRID CloudMirror replication**. Mirror specific objects from a StorageGRID bucket to a specified external destination.
- **Notifications**. Per-bucket event notifications to send notifications about specific actions performed on objects to a specified external Amazon Simple Notification Service (Amazon SNS).
- **Search integration service**. Send Simple Storage Service (S3) object metadata to a specified Elasticsearch index where you can search or analyze the metadata by using the external service.

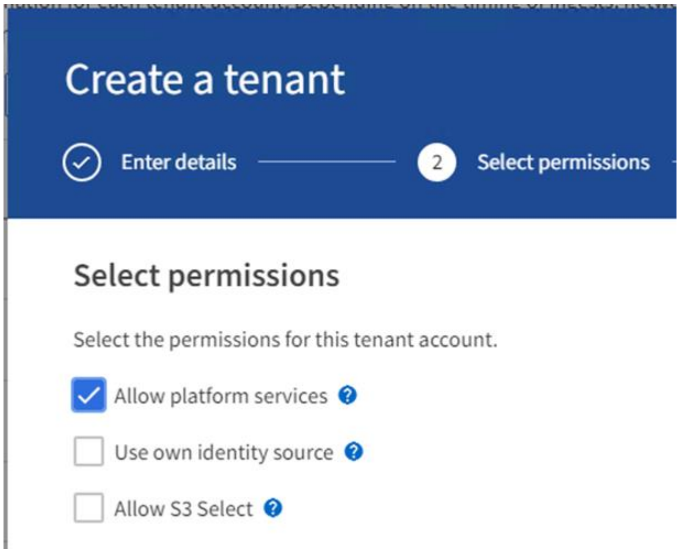
Platform services are configured by the S3 tenant through the Tenant Manager UI. For more information, see the section “Considerations for using platform services” in Manage S3 platform services.

This document serves as a supplement to the StorageGRID 11.6 Tenant Guide and provides step by step instructions and examples for the endpoint and bucket configuration for search integration services. The Amazon Web Services (AWS) or on-premises Elasticsearch setup instructions included here are for basic testing or demo purposes only.

Audiences should be familiar with Grid Manager, Tenant Manager, and have access to the S3 browser to perform basic upload (PUT) and download (GET) operations for StorageGRID search integration testing.

Create tenant and enable platform services

1. Create an S3 tenant by using Grid Manager, enter a display name, and select the S3 protocol.
2. On the Permission page, select the Allow Platform Services option. Optionally, select other permissions, if necessary.



Create a tenant

✓ Enter details — 2 Select permissions

Select permissions

Select the permissions for this tenant account.

☑ Allow platform services

☐ Use own identity source

☐ Allow S3 Select

3. Set up the tenant root user initial password or, if identify federation is enabled on the grid, select which federated group has root access permission to configure the tenant account.
4. Click Sign In As Root and select Bucket: Create and Manage Buckets.

   This takes you to the Tenant Manager page.
5. From Tenant Manager, select My Access Keys to create and download the S3 access key for later testing.

Search integration services with Amazon OpenSearch

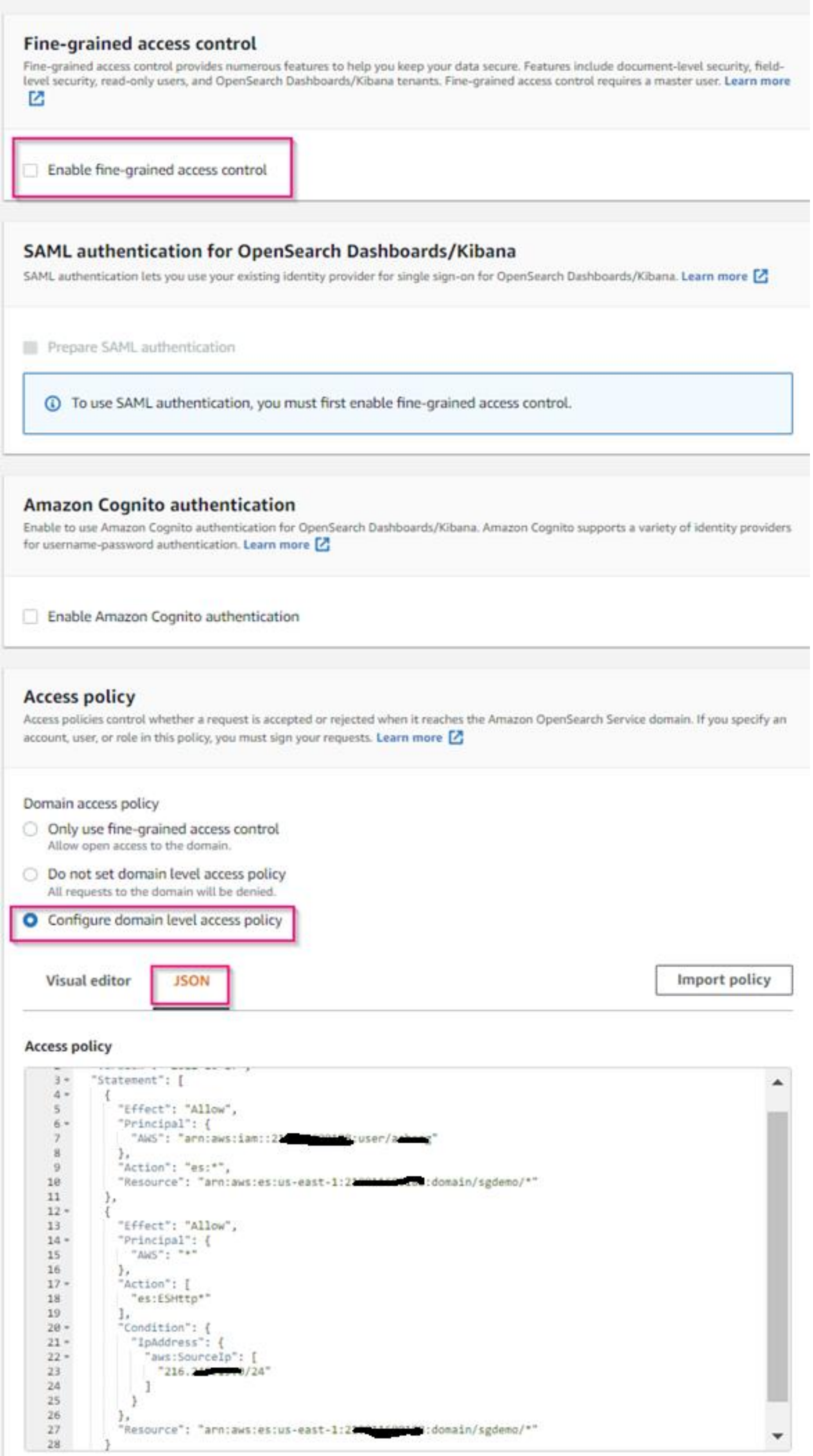
Amazon OpenSearch (formerly Elasticsearch) service setup

Use this procedure for a quick and simple setup of the OpenSearch service for testing/demo purposes only. If you are using on-premises Elasticsearch for search integration services, see the section “Search integration services with on premises Elasticsearch”.

Note: You must have a valid AWS console login, access key, secret access key, and permission to subscribe to the OpenSearch service.

1. Create a new domain using the instructions from AWS OpenSearch Service Getting Started, except for the following:
   - **Step 4**. Domain name: sgdemo
   - **Step 10**. Fine-grained access control: deselect the Enable Fine-Grained Access Control option.
   - **Step 12**. Access policy: select Configure Level Access Policy, select the JSON tab to modify the access policy by using the following example:
   - – Replace the highlighted text with your own AWS Identity and Access Management (IAM) ID and user name.
   - – Replace the highlighted text (the IP address) with the public IP address of your local computer that you used to access the AWS console.
   - – Open a browser tab to https://checkip.amazonaws.com/ to find your public IP.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam:: 210123456789:user/xyzabc"
      },
      "Action": "es:*",
      "Resource": "arn:aws:es:us-east-1:210123456789:domain/sgdemo/*"
    },
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "*"
      },
      "Action": [
        "es:ESHttp*"
      ],
      "Condition": {
        "IpAddress": {
          "aws:SourceIp": [
            "214.123.45.0/24"
          ]
        }
      },
      "Resource": "arn:aws:es:us-east-1:210123456789:domain/sgdemo/*"
    }
  ]
}
```



Fine-grained access control

Fine-grained access control provides numerous features to help you keep your data secure. Features include document-level security, field-level security, read-only users, and OpenSearch Dashboards/Kibana tenants. Fine-grained access control requires a master user. Learn more

□ Enable fine-grained access control

SAML authentication for OpenSearch Dashboards/Kibana

SAML authentication lets you use your existing identity provider for single sign-on for OpenSearch Dashboards/Kibana. Learn more

□ Prepare SAML authentication

ⓘ To use SAML authentication, you must first enable fine-grained access control.

Amazon Cognito authentication

Enable to use Amazon Cognito authentication for OpenSearch Dashboards/Kibana. Amazon Cognito supports a variety of identity providers for username-password authentication. Learn more

□ Enable Amazon Cognito authentication

Access policy

Access policies control whether a request is accepted or rejected when it reaches the Amazon OpenSearch Service domain. If you specify an account, user, or role in this policy, you must sign your requests. Learn more

Domain access policy

○ Only use fine-grained access control
Allow open access to the domain.

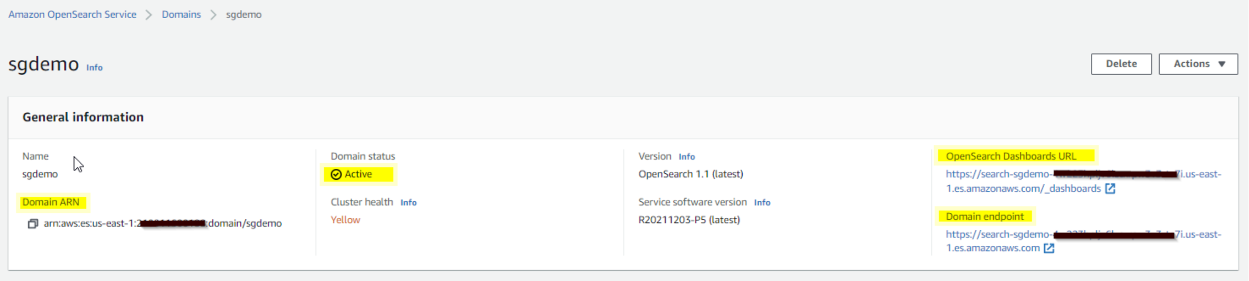
○ Do not set domain level access policy
All requests to the domain will be denied.

● Configure domain level access policy

Access policy

```
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::21[redacted]:user/a[redacted]"
      },
      "Action": "es:*",
      "Resource": "arn:aws:es:us-east-1:2[redacted]:domain/sgdemo/*"
    },
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "*"
      },
      "Action": [
        "es:ESHttp*"
      ],
      "Condition": {
        "IpAddress": {
          "aws:SourceIp": [
            "216.[redacted]/24"
          ]
        }
      },
      "Resource": "arn:aws:es:us-east-1:2[redacted]:domain/sgdemo/*"
    }
```

2. Wait 15 to 20 minutes for the domain to become active.



Amazon OpenSearch Service > Domains > sgdemo

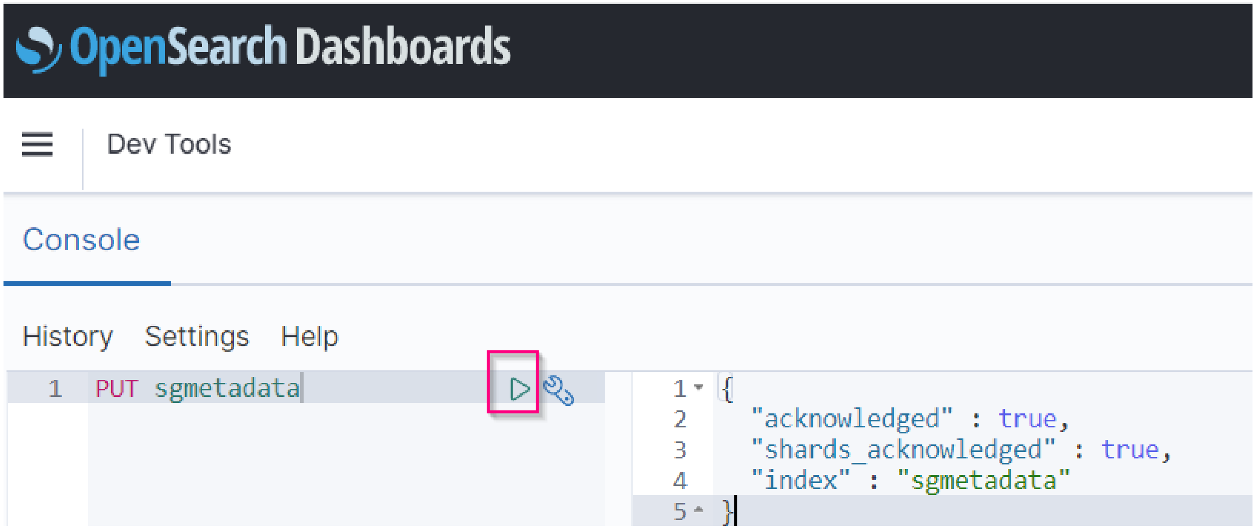
sgdemo Info

Delete | Actions ▼

General information

Name sgdemo	Domain status Active	Version Info OpenSearch 1.1 (latest)	OpenSearch Dashboards URL https://search-sgdemo-[redacted]i.us-east-1.es.amazonaws.com/_dashboards
Domain ARN arn:aws:es:us-east-1:2[redacted]:domain/sgdemo	Cluster health Info Yellow	Service software version Info R20211203-P5 (latest)	Domain endpoint https://search-sgdemo-[redacted]i.us-east-1.es.amazonaws.com

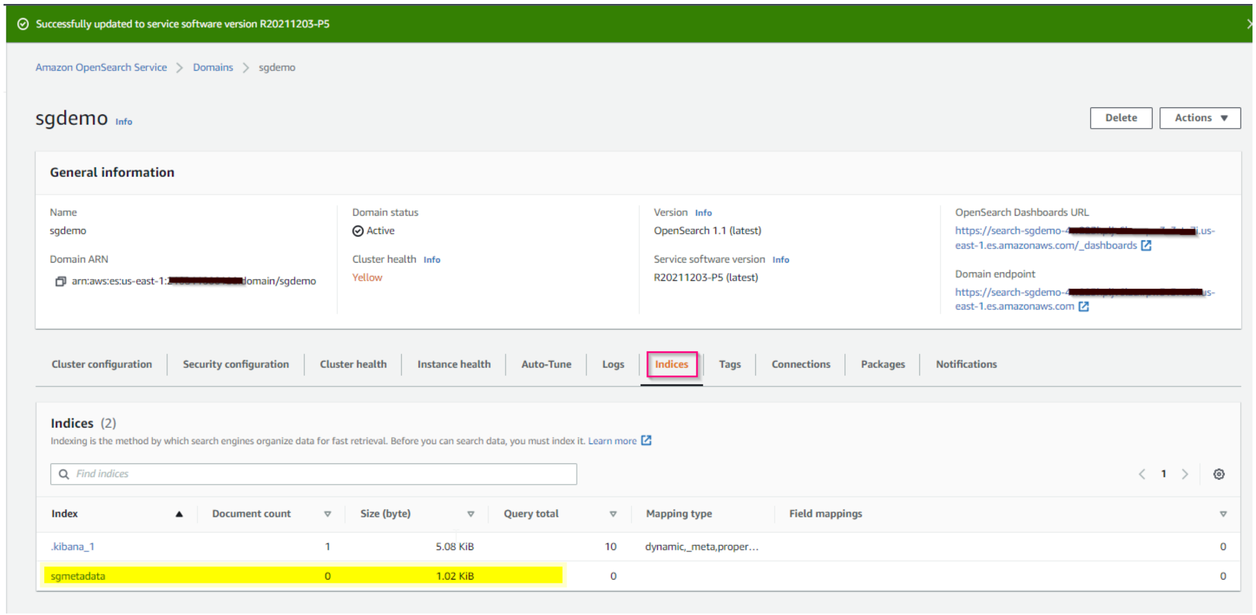
3. Click OpenSearch Dashboards URL to open the domain in a new tab to access the dashboard. If you get an access denied error, verify that the access policy source IP address is correctly set to your computer public IP to allow access to the domain dashboard.
4. On the dashboard welcome page, select Explore On Your Own. From the menu, go to Management → Dev Tools
5. Under Dev Tools → Console , enter `PUT <index>` where you use the index for storing StorageGRID object metadata. We use the index name `sgmetadata` in the following example. Click the small triangle symbol to execute the PUT command. The expected result displays on the right panel as shown in the following example screenshot.



```
PUT sgmetadata
```

```
{
  "acknowledged" : true,
  "shards_acknowledged" : true,
  "index" : "sgmetadata"
}
```

6. Verify that the index is visible from Amazon OpenSearch UI under sgdomain → Indices.


Successfully updated to service software version R20211203-P5

Amazon OpenSearch Service > Domains > sgdemo

sgdemo Info

General information

Name
sgdemo

Domain ARN
arn:aws:es:us-east-1:[redacted]domain/sgdemo

Domain status
Active

Cluster health Info
Yellow

Version Info
OpenSearch 1.1 (latest)

Service software version Info
R20211203-P5 (latest)

OpenSearch Dashboards URL
https://search-sgdemo-[redacted].us-east-1.es.amazonaws.com/_dashboards

Domain endpoint
https://search-sgdemo-[redacted]us-east-1.es.amazonaws.com

Indices (2)
Indexing is the method by which search engines organize data for fast retrieval. Before you can search data, you must index it. Learn more

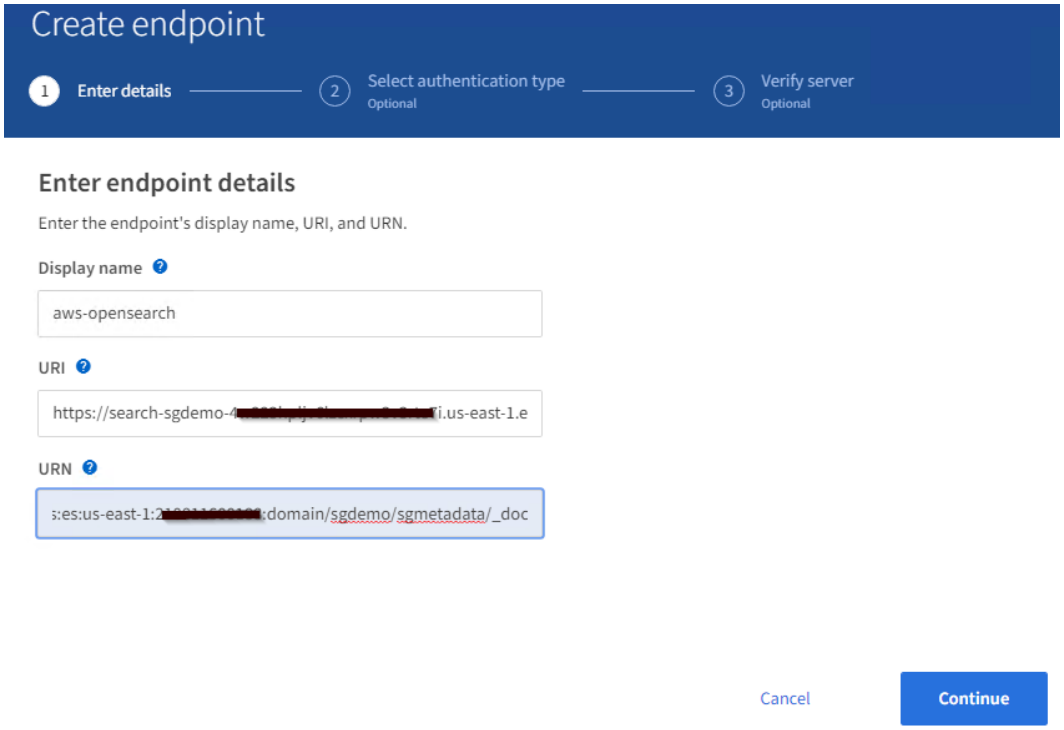
Index ▲	Document count	Size (byte)	Query total	Mapping type	Field mappings
.kibana_1	1	5.08 KiB	10	dynamic,_meta,proper…	0
sgmetadata	0	1.02 KiB	0		0

Platform services endpoint configuration

To configure the platform services endpoints, follow these steps:

1. In Tenant Manager, go to STORAGE(S3) → Platform services endpoints.
2. Click Create Endpoint, enter the following, and then click Continue:
    - Display name example `aws-opensearch`
    - The domain endpoint in the example screenshot under Step 2 of the preceding procedure in the URI field.
    - The domain ARN used in Step 2 of the preceding procedure in the URN field and add `/<index>/_doc` to the end of ARN.

      In this example, URN becomes `arn:aws:es:us-east-1:211234567890:domain/sgdemo/sgmedata/_doc`.



Enter endpoint details

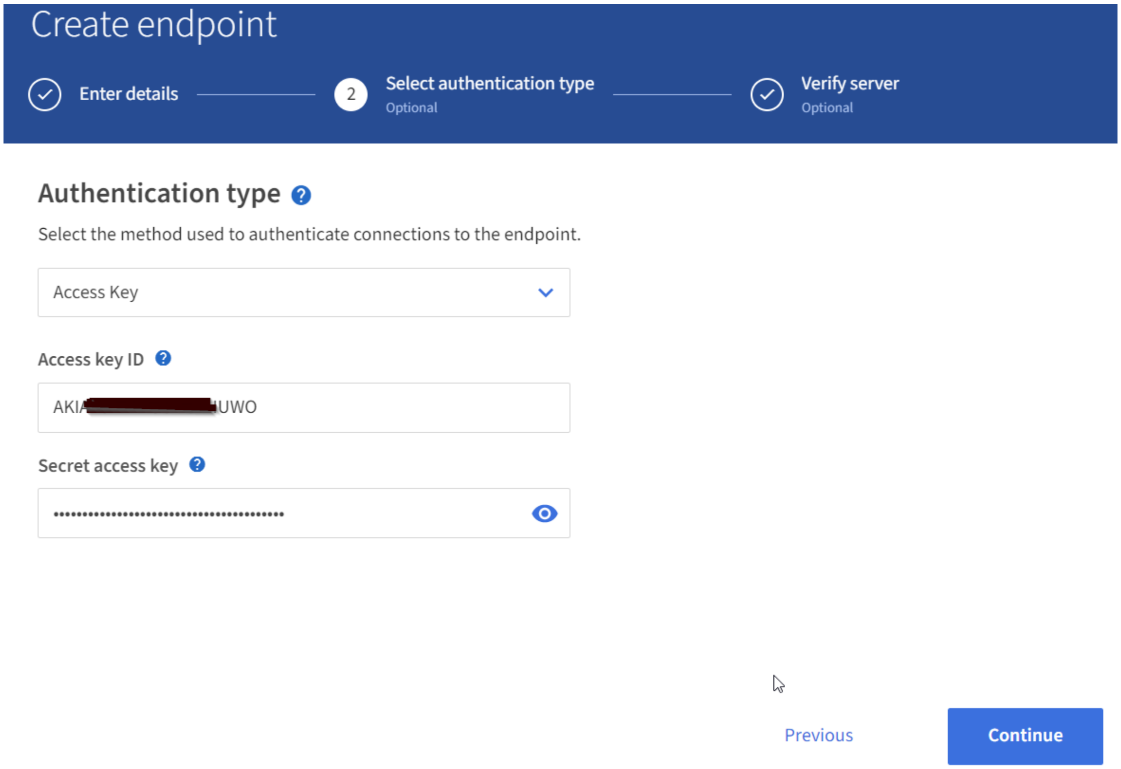
Enter the endpoint's display name, URI, and URN.

Display name: aws-opensearch

URI: https://search-sgdemo-4[redacted]i.us-east-1.e

URN: :es:us-east-1:2[redacted]:domain/sgdemo/sgmetadata/_doc

3. To access the Amazon OpenSearch sgdomain, choose Access Key as the authentication type and then enter the Amazon S3 access key and secret key. To go the next page, click Continue.



Authentication type

Select the method used to authenticate connections to the endpoint.

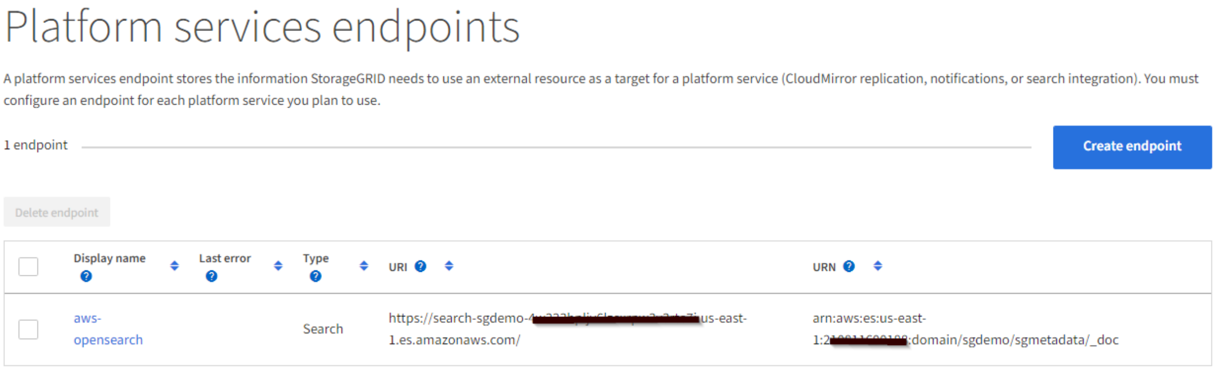
Access Key

Access key ID: AKI[redacted]UWO

Secret access key: ••

4. To verify the endpoint, select Use Operating System CA Certificate and Test and Create Endpoint. If verification is successful, an endpoint screen similar to the following figure displays. If verification

fails, verify that the URN includes `/<index>/_doc` at the end of the path and the AWS access key and secret key are correct.



Platform services endpoints

A platform services endpoint stores the information StorageGRID needs to use an external resource as a target for a platform service (CloudMirror replication, notifications, or search integration). You must configure an endpoint for each platform service you plan to use.

1 endpoint

□	Display name	Last error	Type	URI	URN
□	aws-opensearch		Search	https://search-sgdemo-[redacted]us-east-1.es.amazonaws.com/	arn:aws:es:us-east-1:2[redacted]:domain/sgdemo/sgmetadata/_doc

Search integration services with on premises Elasticsearch

On premises Elasticsearch setup

This procedure is for a quick setup of on premises Elasticsearch and Kibana using docker for testing purposes only. If the Elasticsearch and Kibana server already exists, go to Step 5.

1. Follow this Docker installation procedure to install docker. We use the CentOS Docker install procedure in this setup.

```
sudo yum install -y yum-utils
sudo yum-config-manager --add-repo https://download.docker.com/linux/centos/docker-ce.repo
sudo yum install docker-ce docker-ce-cli containerd.io
sudo systemctl start docker
```

   To start docker after reboot, enter the following.:

```
sudo systemctl enable docker
```

   Set the `vm.max_map_count` value to 262144:

```
sysctl -w vm.max_map_count=262144
```

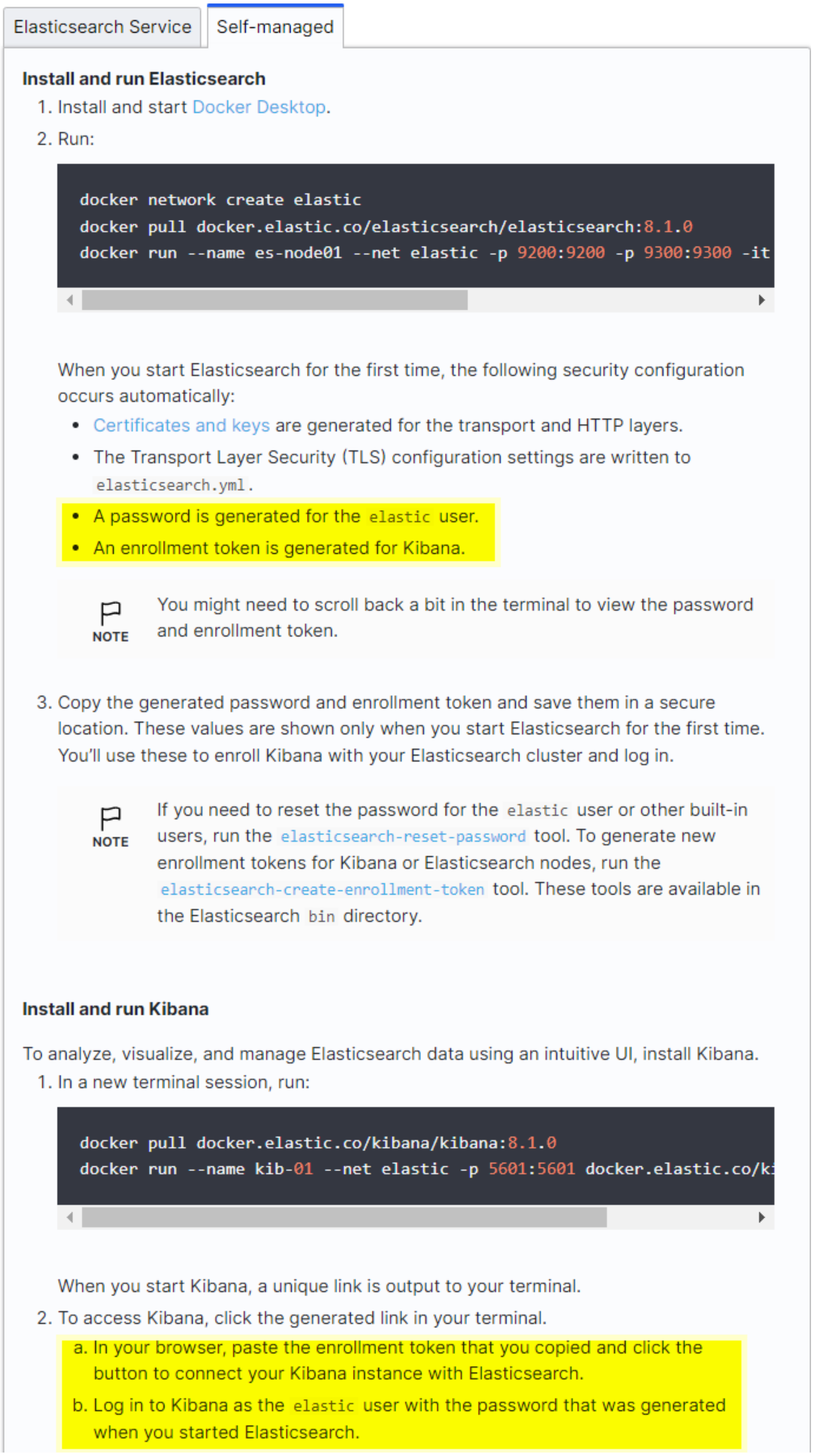
   To keep the setting after reboot, enter the following:

```
echo ‘vm.max_map_count=262144’ >> /etc/sysctl.conf
```

2. Follow the Elasticsearch Quick start guide self-managed section to install and run the Elasticsearch and Kibana docker. In this example, we installed version 8.1.

   Tip: Note down the user name/password and token created by Elasticsearch, you need these to start the Kibana UI and StorageGRID platform endpoint authentication.

   After the Kibana docker container has started, the URL link `https://0.0.0.0:5601` displays in the console. Replace 0.0.0.0 with the server IP address in the URL.



Install and run Elasticsearch

1. Install and start Docker Desktop.
2. Run:

```
docker network create elastic
docker pull docker.elastic.co/elasticsearch/elasticsearch:8.1.0
docker run --name es-node01 --net elastic -p 9200:9200 -p 9300:9300 -it
```

   When you start Elasticsearch for the first time, the following security configuration occurs automatically:

   - Certificates and keys are generated for the transport and HTTP layers.
   - The Transport Layer Security (TLS) configuration settings are written to `elasticsearch.yml`.
   - A password is generated for the `elastic` user.
   - An enrollment token is generated for Kibana.

   NOTE: You might need to scroll back a bit in the terminal to view the password and enrollment token.

3. Copy the generated password and enrollment token and save them in a secure location. These values are shown only when you start Elasticsearch for the first time. You'll use these to enroll Kibana with your Elasticsearch cluster and log in.

   NOTE: If you need to reset the password for the `elastic` user or other built-in users, run the `elasticsearch-reset-password` tool. To generate new enrollment tokens for Kibana or Elasticsearch nodes, run the `elasticsearch-create-enrollment-token` tool. These tools are available in the Elasticsearch `bin` directory.

Install and run Kibana

To analyze, visualize, and manage Elasticsearch data using an intuitive UI, install Kibana.

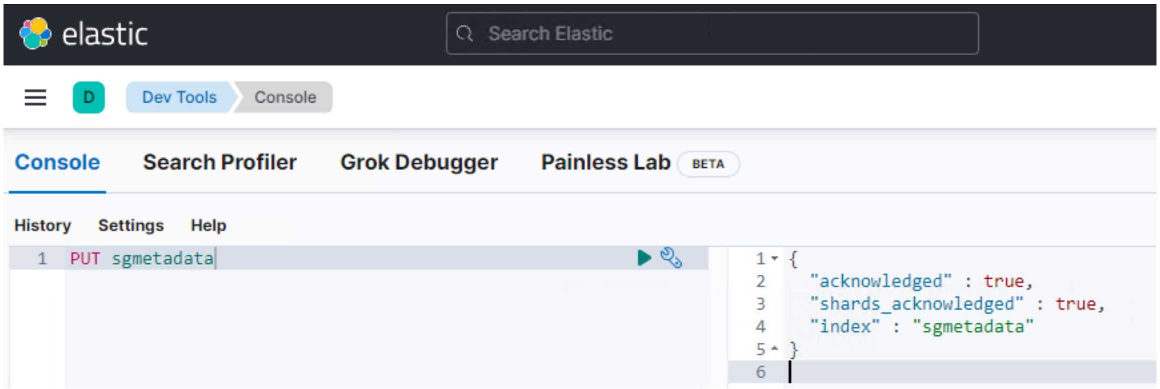
1. In a new terminal session, run:

```
docker pull docker.elastic.co/kibana/kibana:8.1.0
docker run --name kib-01 --net elastic -p 5601:5601 docker.elastic.co/ki
```

   When you start Kibana, a unique link is output to your terminal.

2. To access Kibana, click the generated link in your terminal.
   a. In your browser, paste the enrollment token that you copied and click the button to connect your Kibana instance with Elasticsearch.
   b. Log in to Kibana as the `elastic` user with the password that was generated when you started Elasticsearch.

3. Log in to the Kibana UI by using user name `elastic` and the password generated by Elastic in the preceding step.
4. For first time login, on the dashboard welcome page, select Explore On Your Own. From the menu, select Management → Dev Tools.
5. On the Dev Tools Console screen, enter `PUT <index>` where you use this index for storing StorageGRID object metadata. We use the index name `sgmetadata` in this example. Click the small triangle symbol to execute the PUT command. The expected result displays on the right panel as shown in the following example screenshot.



```
PUT sgmetadata
```

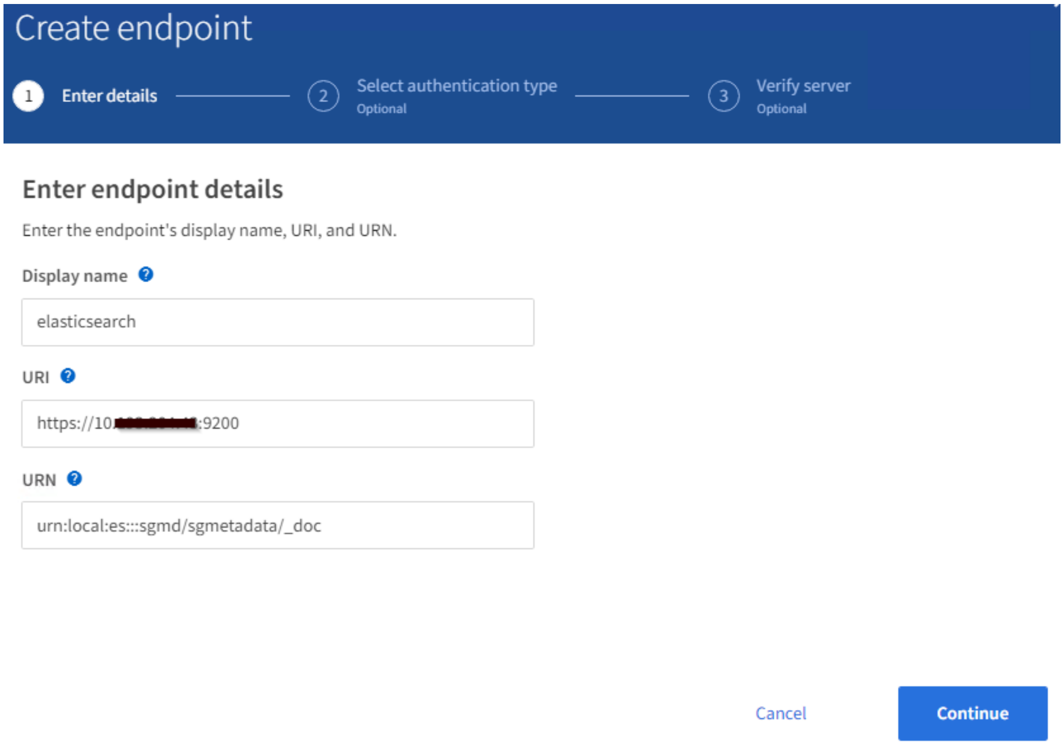
```
{
  "acknowledged" : true,
  "shards_acknowledged" : true,
  "index" : "sgmetadata"
}
```

Platform services endpoint configuration

To configure endpoints for platform services, follow these steps:

1. On Tenant Manager, go to STORAGE(S3) → Platform services endpoints
2. Click Create Endpoint, enter the following, and then click Continue:
   - Display name example: `elasticsearch`
   - URI: `https://<elasticsearch-server-ip or hostname>:9200`
   - URN: `urn:<something>:es:::<some-unique-text>/<index-name>/_doc` where the index-name is the name you used on the Kibana console.

     Example: `urn:local:es:::sgmd/sgmetadata/_doc`



Enter endpoint details

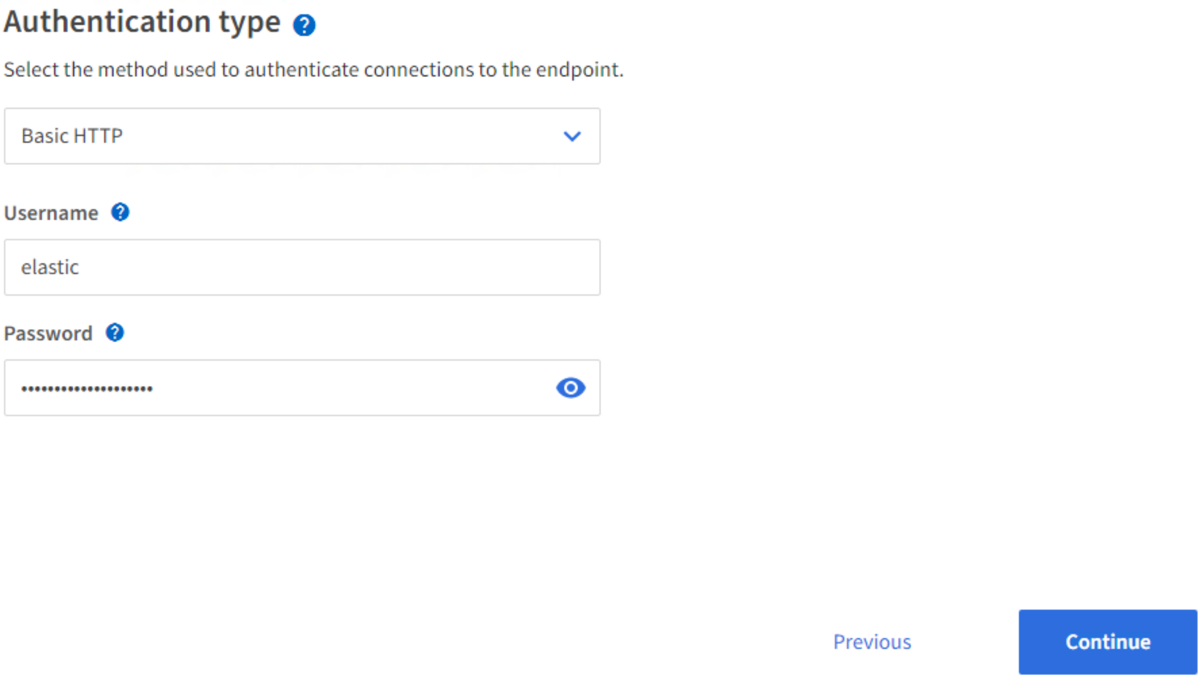
Enter the endpoint's display name, URI, and URN.

Display name: elasticsearch

URI: https://10[redacted]:9200

URN: urn:local:es:::sgmd/sgmetadata/_doc

3. Select Basic HTTP as the authentication type, enter the user name `elastic` and the password generated by the Elasticsearch installation process. To go to the next page, click Continue.



Authentication type

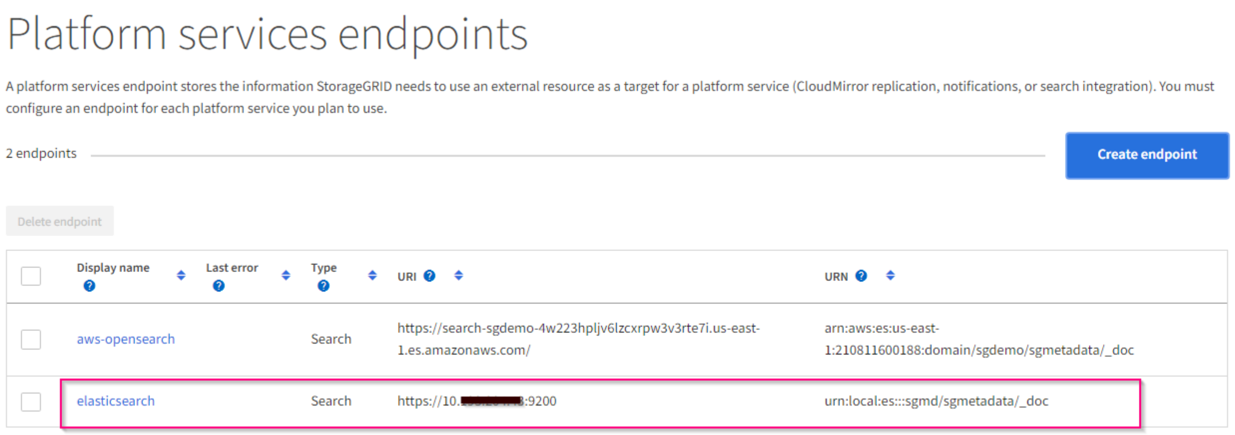
Select the method used to authenticate connections to the endpoint.

Basic HTTP

Username: elastic

Password: •••••••••••••••••••

4. Select Do Not Verify Certificate and Test and Create Endpoint to verify the endpoint. If verification is successful, an endpoint screen similar to the following screenshot displays. If the verification fails, verify the URN, URI, and username/password entries are correct.



Platform services endpoints

A platform services endpoint stores the information StorageGRID needs to use an external resource as a target for a platform service (CloudMirror replication, notifications, or search integration). You must configure an endpoint for each platform service you plan to use.

2 endpoints

□	Display name	Last error	Type	URI	URN
□	aws-opensearch		Search	https://search-sgdemo-4w223hpljv6lzcxrpw3v3rte7i.us-east-1.es.amazonaws.com/	arn:aws:es:us-east-1:210811600188:domain/sgdemo/sgmetadata/_doc
□	elasticsearch		Search	https://10.[redacted]:9200	urn:local:es:::sgmd/sgmetadata/_doc

Bucket search integration service configuration

After the platform service endpoint is created, the next step is to configure this service at bucket level to send object metadata to the defined endpoint whenever an object is created, deleted, or its metadata or tags are updated.

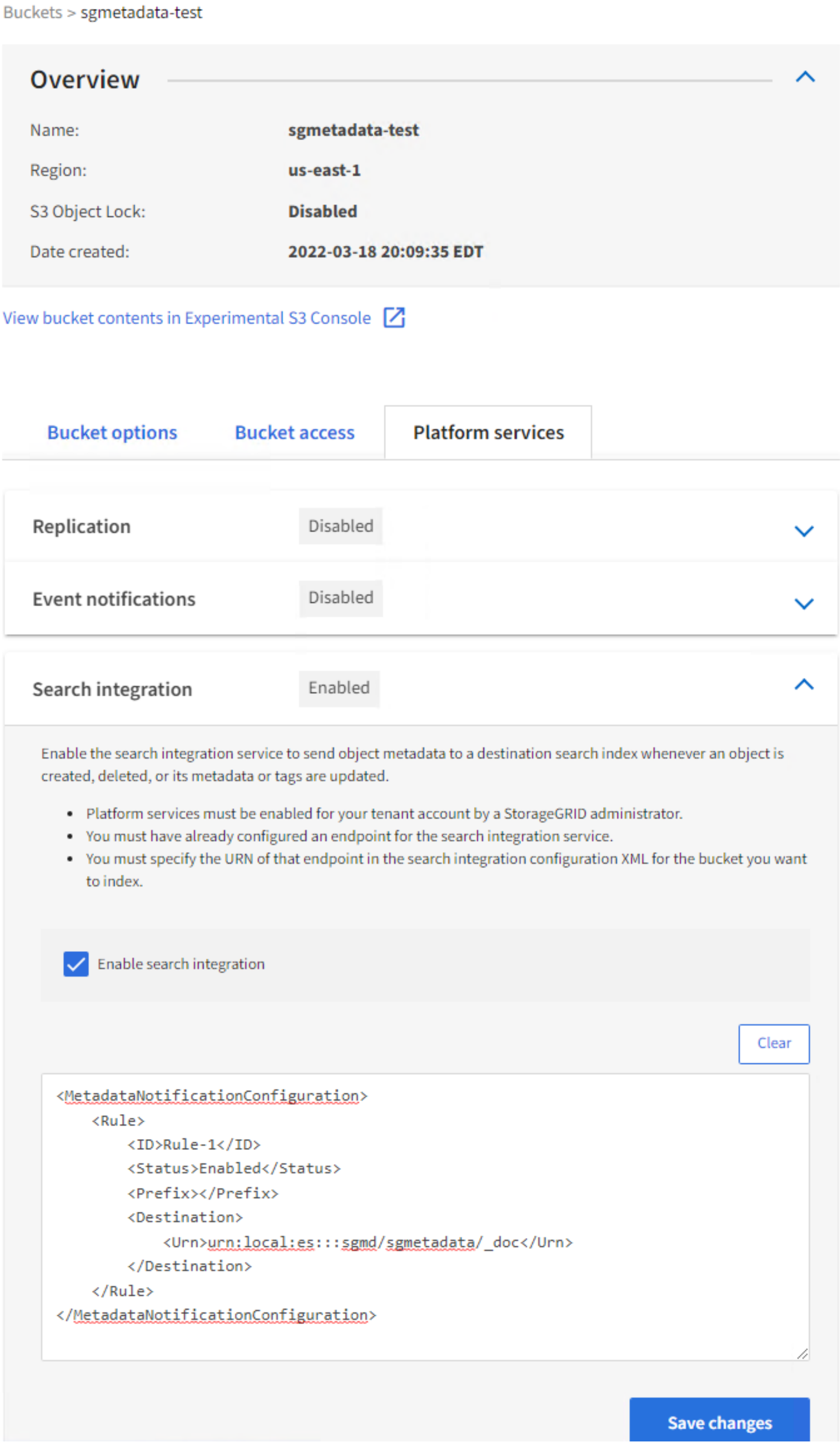
You can configure search integration by using Tenant Manager to apply a custom StorageGRID configuration XML to a bucket as follows:

1. In Tenant Manager, go to STORAGE(S3) → Buckets
2. Click Create Bucket, enter the bucket name (for example, `sgmetadata-test`) and accept the default `us-east-1` region.
3. Click Continue → Create Bucket.
4. To bring up the bucket Overview page, click the bucket name, then select Platform Services.
5. Select the Enable Search Integration dialog box. In the provided XML box, enter the configuration XML using this syntax.

   The highlighted URN must match the platform services endpoint that you defined. You can open another browser tab to access the Tenant Manager and copy the URN from the defined platform services endpoint.

   In this example, we used no prefix, meaning that the metadata for every object in this bucket is sent to the Elasticsearch endpoint defined previously.

```
<MetadataNotificationConfiguration>
    <Rule>
        <ID>Rule-1</ID>
        <Status>Enabled</Status>
        <Prefix></Prefix>
        <Destination>
            <Urn> urn:local:es:::sgmd/sgmetadata/_doc</Urn>
        </Destination>
    </Rule>
</MetadataNotificationConfiguration>
```



Buckets > sgmetadata-test

Overview

Name: **sgmetadata-test**

Region: **us-east-1**

S3 Object Lock: **Disabled**

Date created: **2022-03-18 20:09:35 EDT**

View bucket contents in Experimental S3 Console

Replication: Disabled

Event notifications: Disabled

Search integration: Enabled

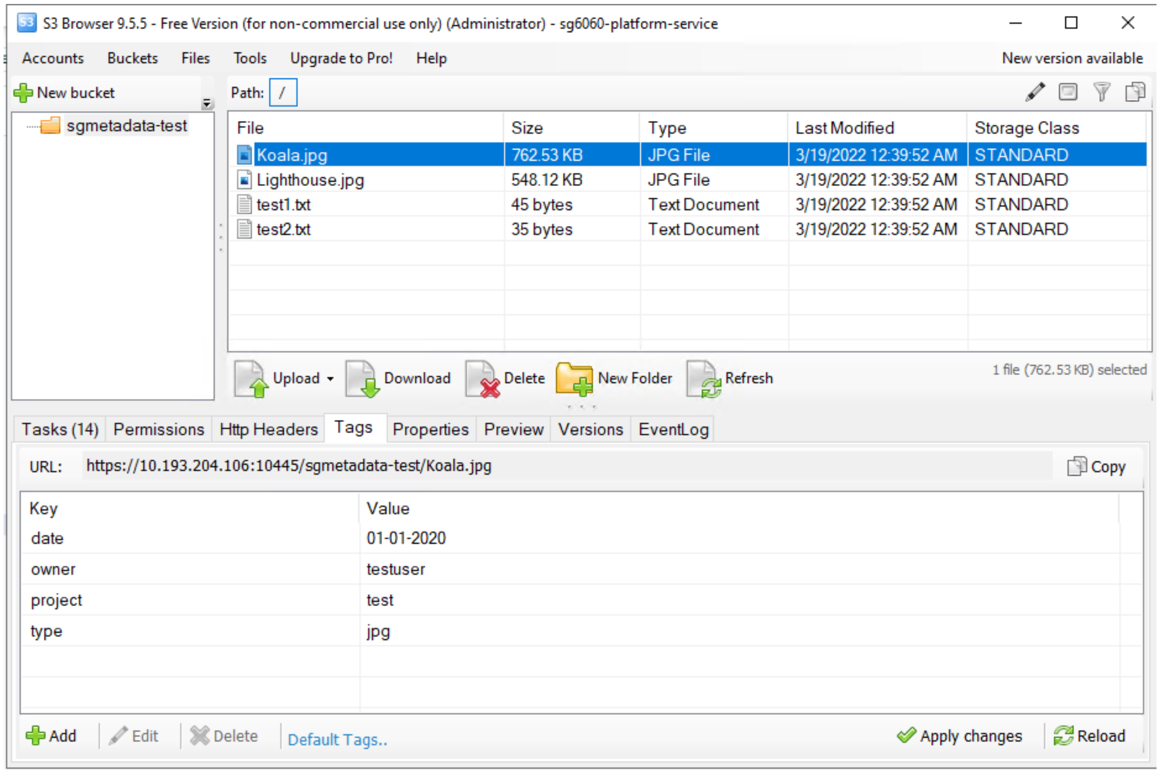
Enable the search integration service to send object metadata to a destination search index whenever an object is created, deleted, or its metadata or tags are updated.

- Platform services must be enabled for your tenant account by a StorageGRID administrator.
- You must have already configured an endpoint for the search integration service.
- You must specify the URN of that endpoint in the search integration configuration XML for the bucket you want to index.

☑ Enable search integration

```
<MetadataNotificationConfiguration>
    <Rule>
        <ID>Rule-1</ID>
        <Status>Enabled</Status>
        <Prefix></Prefix>
        <Destination>
            <Urn>urn:local:es:::sgmd/sgmetadata/_doc</Urn>
        </Destination>
    </Rule>
</MetadataNotificationConfiguration>
```

6. Use S3 Browser to connect to StorageGRID with the tenant access/secret key, upload test objects to `sgmetadata-test` bucket and add tags or custom metadata to objects.



File	Size	Type	Last Modified	Storage Class
Koala.jpg	762.53 KB	JPG File	3/19/2022 12:39:52 AM	STANDARD
Lighthouse.jpg	548.12 KB	JPG File	3/19/2022 12:39:52 AM	STANDARD
test1.txt	45 bytes	Text Document	3/19/2022 12:39:52 AM	STANDARD
test2.txt	35 bytes	Text Document	3/19/2022 12:39:52 AM	STANDARD

URL: https://10.193.204.106:10445/sgmetadata-test/Koala.jpg

Key	Value
date	01-01-2020
owner	testuser
project	test
type	jpg

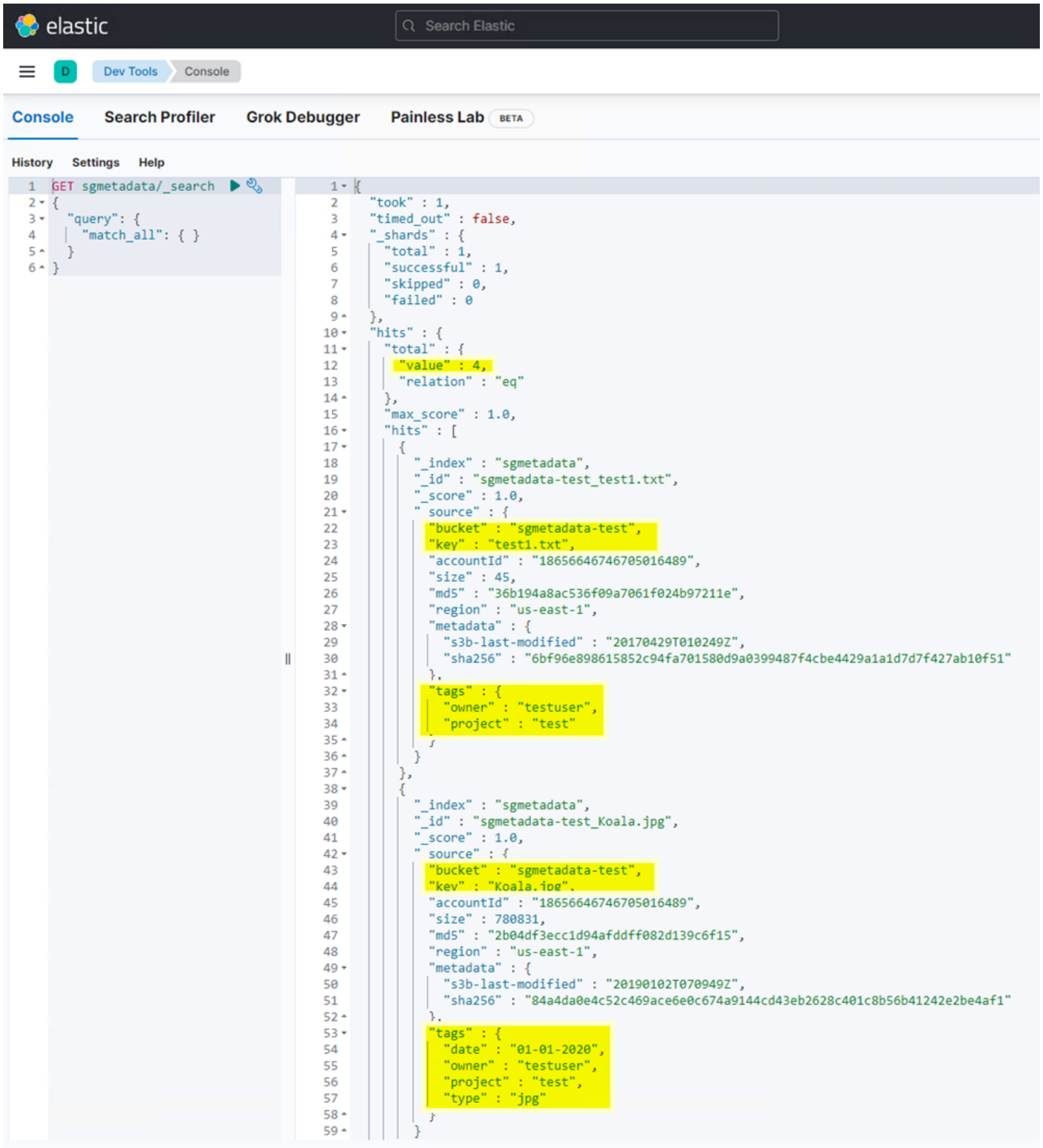
7. Use the Kibana UI to verify that the object metadata was loaded to sgmetadata’s index.

   a. From the menu, select Management → Dev Tools.

   b. Paste the sample query to the console panel on the left and click the triangle symbol to execute it.

   The query 1 sample result in the following example screenshot shows four records. This matches number of objects in the bucket.

```
GET sgmetadata/_search
{
  "query": {
    "match_all": { }
  }
}
```

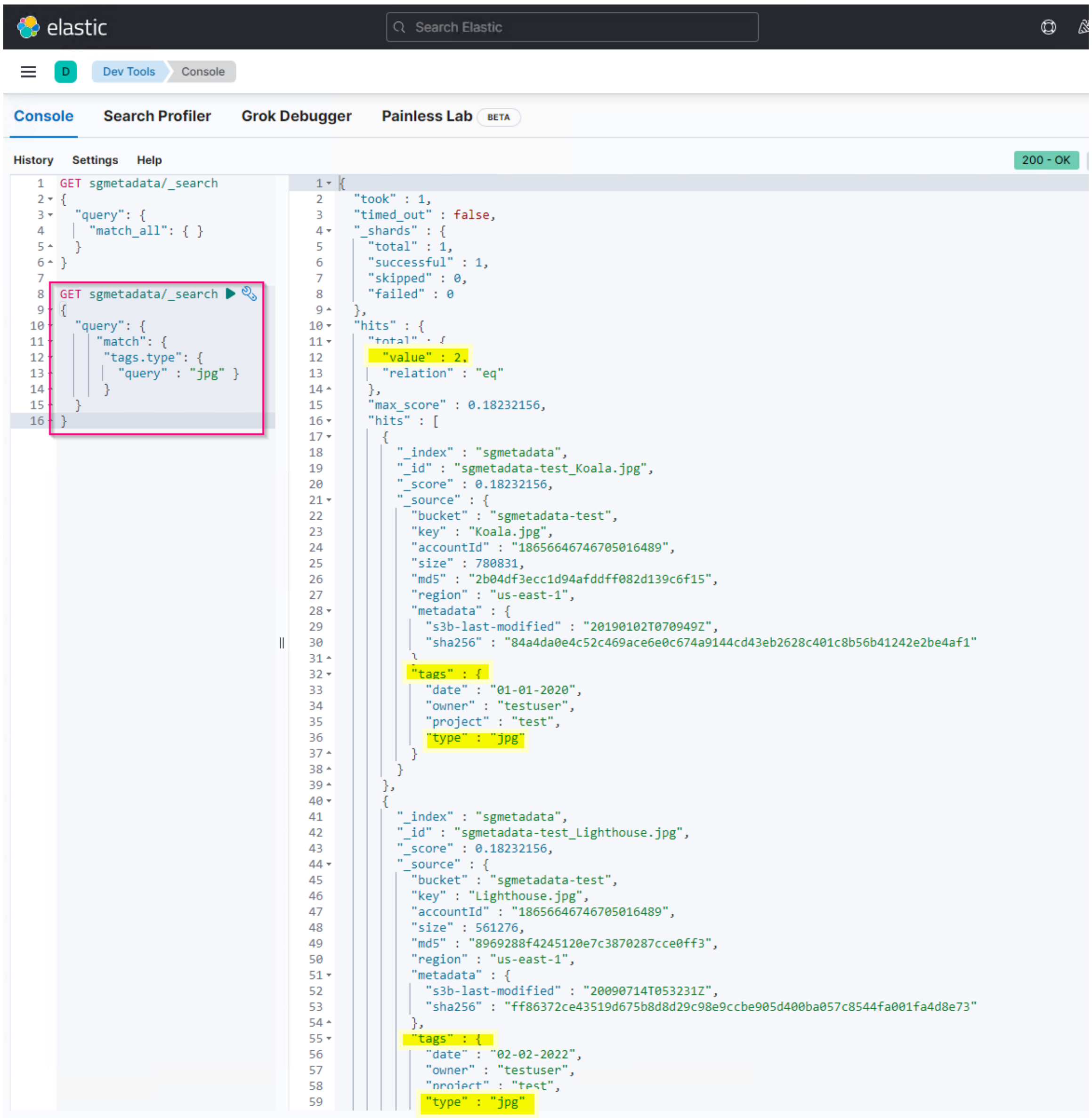


```
GET sgmetadata/_search
{
  "query": {
    "match_all": { }
  }
}
```

```
{
  "took" : 1,
  "timed_out" : false,
  "_shards" : {
    "total" : 1,
    "successful" : 1,
    "skipped" : 0,
    "failed" : 0
  },
  "hits" : {
    "total" : {
      "value" : 4,
      "relation" : "eq"
    },
    "max_score" : 1.0,
    "hits" : [
      {
        "_index" : "sgmetadata",
        "_id" : "sgmetadata-test_test1.txt",
        "_score" : 1.0,
        "_source" : {
          "bucket" : "sgmetadata-test",
          "key" : "test1.txt",
          "accountId" : "18656646746705016489",
          "size" : 45,
          "md5" : "36b194a8ac536f09a7061f024b97211e",
          "region" : "us-east-1",
          "metadata" : {
            "s3b-last-modified" : "20170429T010249Z",
            "sha256" : "6bf96e898615852c94fa701580d9a0399487f4cbe4429a1a1d7d7f427ab10f51"
          },
          "tags" : {
            "owner" : "testuser",
            "project" : "test"
          }
        }
      },
      {
        "_index" : "sgmetadata",
        "_id" : "sgmetadata-test_Koala.jpg",
        "_score" : 1.0,
        "_source" : {
          "bucket" : "sgmetadata-test",
          "key" : "Koala.jpg",
          "accountId" : "18656646746705016489",
          "size" : 780831,
          "md5" : "2b04df3ecc1d94afddff082d139c6f15",
          "region" : "us-east-1",
          "metadata" : {
            "s3b-last-modified" : "20190102T070949Z",
            "sha256" : "84a4da0e4c52c469ace6e0c674a9144cd43eb2628c401c8b56b41242e2be4af1"
          },
          "tags" : {
            "date" : "01-01-2020",
            "owner" : "testuser",
            "project" : "test",
            "type" : "jpg"
          }
        }
```

The query 2 sample result in the following screenshot shows two records with tag type `jpg`.

```
GET sgmetadata/_search
{
  "query": {
     "match": {
      "tags.type": {
        "query" : "jpg" }
      }
        }
}
```



```
GET sgmetadata/_search
{
  "query": {
    "match_all": { }
  }
}

GET sgmetadata/_search
{
  "query": {
    "match": {
      "tags.type": {
        "query" : "jpg" }
      }
  }
}
```

```
{
  "took" : 1,
  "timed_out" : false,
  "_shards" : {
    "total" : 1,
    "successful" : 1,
    "skipped" : 0,
    "failed" : 0
  },
  "hits" : {
    "total" : {
      "value" : 2,
      "relation" : "eq"
    },
    "max_score" : 0.18232156,
    "hits" : [
      {
        "_index" : "sgmetadata",
        "_id" : "sgmetadata-test_Koala.jpg",
        "_score" : 0.18232156,
        "_source" : {
          "bucket" : "sgmetadata-test",
          "key" : "Koala.jpg",
          "accountId" : "18656646746705016489",
          "size" : 780831,
          "md5" : "2b04df3ecc1d94afddff082d139c6f15",
          "region" : "us-east-1",
          "metadata" : {
            "s3b-last-modified" : "20190102T070949Z",
            "sha256" : "84a4da0e4c52c469ace6e0c674a9144cd43eb2628c401c8b56b41242e2be4af1"
          },
          "tags" : {
            "date" : "01-01-2020",
            "owner" : "testuser",
            "project" : "test",
            "type" : "jpg"
          }
        }
      },
      {
        "_index" : "sgmetadata",
        "_id" : "sgmetadata-test_Lighthouse.jpg",
        "_score" : 0.18232156,
        "_source" : {
          "bucket" : "sgmetadata-test",
          "key" : "Lighthouse.jpg",
          "accountId" : "18656646746705016489",
          "size" : 561276,
          "md5" : "8969288f4245120e7c3870287cce0ff3",
          "region" : "us-east-1",
          "metadata" : {
            "s3b-last-modified" : "20090714T053231Z",
            "sha256" : "ff86372ce43519d675b8d8d29c98e9ccbe905d400ba057c8544fa001fa4d8e73"
          },
          "tags" : {
            "date" : "02-02-2022",
            "owner" : "testuser",
            "project" : "test",
            "type" : "jpg"
```

Where to find additional information

To learn more about the information that is described in this document, review the following documents and/or websites:

- Manage S3 platform services—What are platform services?
  https://docs.netapp.com/us-en/storagegrid-116/tenant/what-platform-services-are.html
- NetApp StorageGRID 11.6 Documentation
  https://docs.netapp.com/us-en/storagegrid-116/

Version history

Version	Date	Document version history
Version 1.0	April 2022	Initial release— StorageGRID 11.6 search integration service.

Refer to the Interoperability Matrix Tool (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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