

Requirements

[Kyma](#)(*kee-ma*) is a platform to develop and deploy applications with serverless functions and microservices. We use SAP BTP, Kyma Runtime, to extend DME Next Number generation functionality by implementing In-App Extensions.

This document guides through the steps needed to execute to implement a serverless function in SAP BTP, Kyma Runtime to extend standard batch number generation DME functionality based on requirements:

- Periodic resetting of batch number ranges based on configuration rules defined in Environment Variables - Yearly, Monthly, Daily, and Never
- Define replaceable parameters for next number Pattern in Environment Variables.
- MongoDB usage in SAP BTP, Kyma Runtime development to store the sequence number
- Usage of extension parameters passed from DME next numbering micro-service business logic to extension service

The Kyma serverless function should have flexible behavior that can be configured at runtime without massive re-implementations; for this purpose, the environment variables described below were added. They can be considered as "runtime configuration rules".

1. PATTERN environment variable - defines custom numbering pattern, it should support the following replaceable parameters:

- PLANT - current plant where batch number generation was triggered
- DD - two-digit numeric representation for the Day (from 01 to 31)
- MM - two-digit numeric representation for the Month (from 01 to 12)
- YYYY - four-digit representation for the current Year
- YY - the last two digits of the current year
- LL - work center name
- NNNNN generated sequence in base-10 (decimal) or base-16 (hexadecimal) format. The generated sequence should be completed with leading zeros to have five numbers in total. For example, 5 will be converted to 00005.

The default pattern value is PLANTYYYYDDMMLLNNNNN.

It can be a combination of replaceable parameters in any order, for example, MMLLYYYNNNNN, PLANTDDMMYYYYNNNNN. Or even can include literal string, for example, SAP-YYNNNNN.

2. NUMBER_BASE environment variable is a number base for generated sequence.

Should support the base-10 or base-16 number system. Default is base-10 format for the sequence number.

Supported values: 10 and 16.

3. RESET_MODE environment variable - controls when sequence value can be reset back to initial value based on reset mode settings - Yearly, Monthly, Daily, and Never

Default value – Never.

Supported values: NONE, DAY, MONTH, YEAR

Warning: when using reset mode DAY, MONTH, YEAR, ensure appropriate replaceable parameters are included to avoid duplicates.

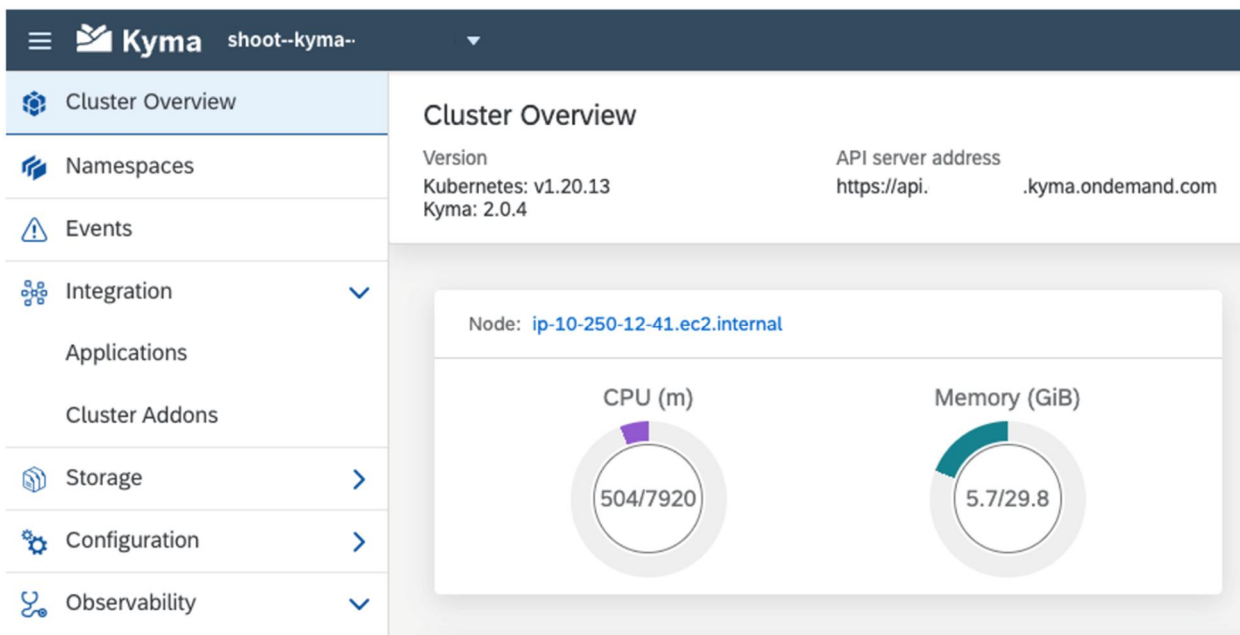
Prerequisites

If you want to follow the steps and deploy the project by yourself, you have to do some preparations:

1. SAP BTP, Kyma runtime environment should be enabled.

Follow the steps from this tutorial: <https://developers.sap.com/tutorials/cp-kyma-getting-started.html>

2. Verify that you can access the Kyma Runtime console to manage deployments, traceability, scalability, etc.



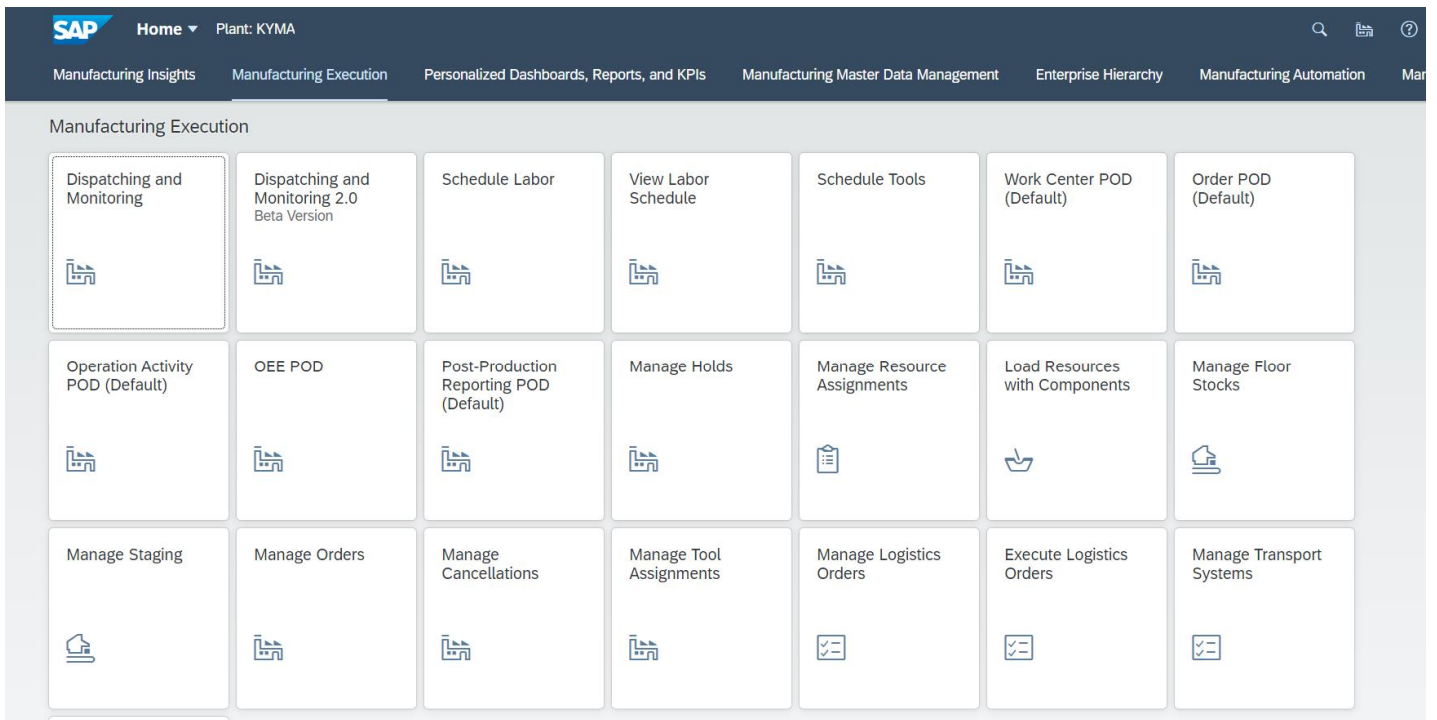
3. Install the Kubernetes Command Line Tool, which allows access to the SAP BTP, Kyma runtime via the command line.

Follow the steps from this tutorial: <https://developers.sap.com/tutorials/cp-kyma-download-cli.html>

4. Create a Kyma service account

Follow the steps from this tutorial: <https://developers.sap.com/tutorials/kyma-create-service-account.html>

5. Request access to DME and applications, such as:
 - Manage Service Registry
 - Manage Next Number
 - Order POD



6. Clone the Git repository

In your browser, go to <https://github.com/SAP-samples/digital-manufacturing-extension-samples>.

Choose the Code button and choose one of the options to download the code locally or simply run the following command within your CLI at your desired folder location:

`git clone https://github.com/SAP-samples/digital-manufacturing-extension-samples`

7. Open the `DMC_NextNumber_InAppExtensions/batch-nn-mongo-db` directory in your desired editor, it contains two folders: documentation for technical tutorials and `code_solution` for the implementation part.

Installation Steps

1. Test the kubectl command-line tool to make sure it is installed correctly by running the following command in your CLI: `kubectl version --client`

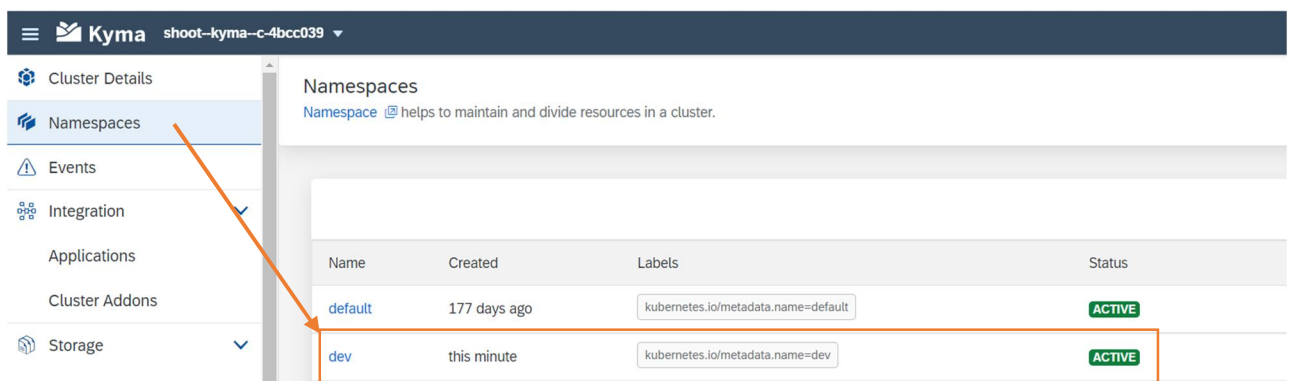
This should return a list of version properties, for example:

```
Client Version: version.Info{Major:"1", Minor:"22", GitVersion:"v1.22.1",  
GitCommit:"632ed300f2c34f6d6d15ca4cef3d3c7073412212", GitTreeState:"clean",  
BuildDate:"2021-08-19T15:45:37Z", GoVersion:"go1.16.7", Compiler:"gc",  
Platform:"windows/amd64"}
```

2. Run the following commands from the DMC_NextNumber_InAppExtensions/batch-nn-mongo-db/code_solution directory using CLI.
 - Create the `dev` Namespace if it doesn't already exist: `kubectl create namespace dev`

The command should return: `namespace/dev created`

Verify that Namespace was created in Kyma Runtime Console UI



- Deploy MongoDB and nn-seqgen function to `dev` Namespace: `kubectl apply -f . -n dev`

The command should return:

```
deployment.apps/mongo-client created  
deployment.apps/mongo created  
service/mongo-nodeport-svc created  
persistentvolumeclaim/mongo-data created  
secret/mongo-creds created  
secret/nn-seqgen-user-creds created  
apirule.gateway.kyma-project.io/nn-seqgen-api created  
configmap/nn-seqgen created  
function.serverless.kyma-project.io/nn-seqgen created
```

Wait few minutes, so all deployments are finalized inside Kyma!

Verify deployments were successful in Kyma Console UI, navigate to "dev" Namespace.

Kyma shoot-kyma--c-4bcc039

Namespaces / dev

Labels: kubernetes.io/metadata.name=dev

Created: 9 minutes ago

Status: ACTIVE

Healthy Resources

Pods: 4/4

Deployments: 3/3

Resource Consumption

Memory Requests: 0/0

- Navigate to Workload à Functions to verify that nn-seqgen function in Running status

Kyma shoot-kyma--c-4bcc039

Functions

Function is a simple code snippet that you can run without provisioning or managing servers.

Name	Created	Labels	Runtime	Source Type	Status
nn-seqgen	5 minutes ago	app=nn-seqgen	Node.js 14	Inline Editor	RUNNING

- Navigate to Workload à Deployments to verify that mongo and mongo-client has green Pods status

Kyma shoot-kyma--c-4bcc039 dev

Deployments

Deployment is a Kubernetes object that represents a replicated application running on your cluster.

Name	Created	Labels	Controlled By	Images	Pods
mongo	10 minutes ago	app=mongo	-	mongo	1/1
mongo-client	10 minutes ago	app=mongo-client	-	mongo	1/1
nn-seqgen-87f9j	10 minutes ago	app=nn-seqgen serverless.kyma-project.io/function-name=nn-seqgen serverless.kyma-project.io/managed-by=function-controller serverless.kyma-project.io/uid=23fc775-0552-4e00-a3a1-2414...	Function	registry.c-4bcc039.kyma.shoot.live.k8s-hana.ondemand.com/dev- nn-seqgen:c671cb8b12dbb1d712f51d2f69eae6fc5b74d8af1674682bc 51a379eb2f2561	1/1

- Navigate to Discovery and Network à Services to check deployed Services

Name	Created	Labels	Controlled By	Service Type	Cluster IP	Ports	External IPs
mongo-nodeport-svc	12 minutes ago	app=mongo	-	NodePort	100.71.221.171	27017/TCP	-
nn-seqgen	12 minutes ago	app=nn-seqgen serverless.kyma-project.io/function-name=nn-seqgen serverless.kyma-project.io/managed-by=function-controller serverless.kyma-project.io/uuid=23fc7f75-0552-4e00-a3a1-24f4...	Function	ClusterIP	100.70.71.137	80:8080/TCP	-

- Navigate to Discovery and Network à API Rules to find nn-seqgen-api rule in OK status

Name	Created	Labels	Host	Service Name	Status
nn-seqgen-api	14 minutes ago	-	https://nn-seqgen.c-4bcc039.kyma.shoot.live.k8s-hana.ondemand.com	nn-seqgen (port: 80)	OK

- Run the following commands to access MongoDB and create user with password that is required for nn-seqgen serverless function execution.

- Use `kubect exec` to open a bash command shell where you can execute commands:
`kubect exec -n dev deployment/mongo-client -it -- /bin/bash`

The command should return similar to that: `root@mongo-client-69bfd49fdd-f65tj:/#`

- Login into the MongoDB shell:
`mongosh --host mongo-nodeport-svc --port 27017 -u adminuser -p password123`

The command should return:

```
Current Mongosh Log ID: 61cb050e3834a953a14edc4a
Connecting to:      mongodb://mongo-nodeport-svc:27017/?directConnection=true
Using MongoDB:      5.0.5
Using Mongosh:      1.1.6
test>
```

- Use target database indent-db, execute the command: `use indent-db`

Command returns: `switched to db indent-db`

```
test> use indent-db
switched to db indent-db
indent-db> █
```

- Create user at the ident-db database. Execute the following command:

```
db.createUser(  
  {  
    user: "nn_seqgen_user",  
    pwd: "password123456789@",  
    roles: [ { role: "readWrite", db: "ident-db" }, { role: 'dbOwner', db: 'ident-db' } ]  
  }  
)
```

Command returns: { ok: 1 }

```
test> use ident-db  
switched to db ident-db  
ident-db> db.createUser(  
...  {  
.....  user: "nn_seqgen_user",  
.....  pwd: "password123456789@",  
.....  roles: [ { role: "readWrite", db: "ident-db" }, { role: 'dbOwner', db: 'ident-db' } ]  
.....  }  
... )  
{ ok: 1 }  
ident-db> _
```

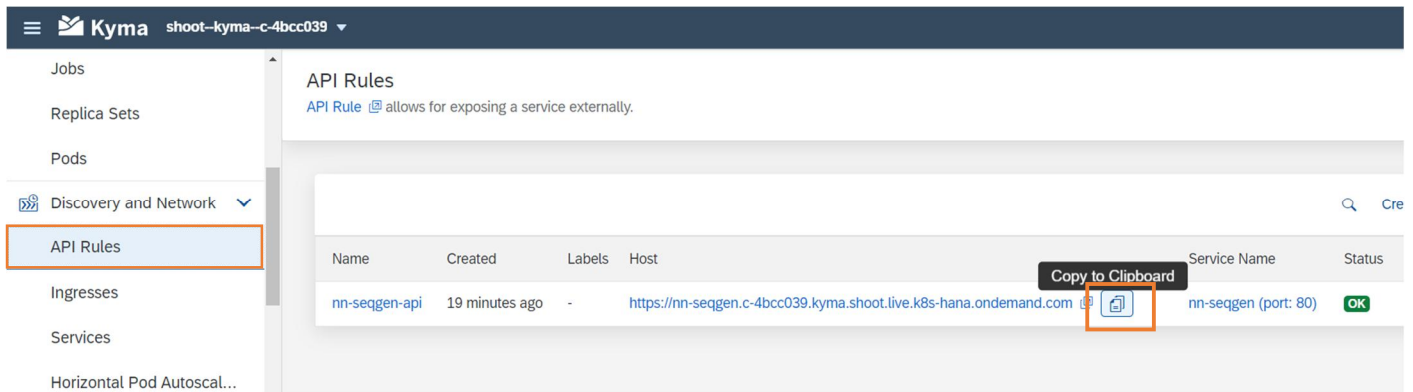
- Execute the command: `show users`

Command returns created user `nn_seqgen_user`, verify that it was created at ident-db.

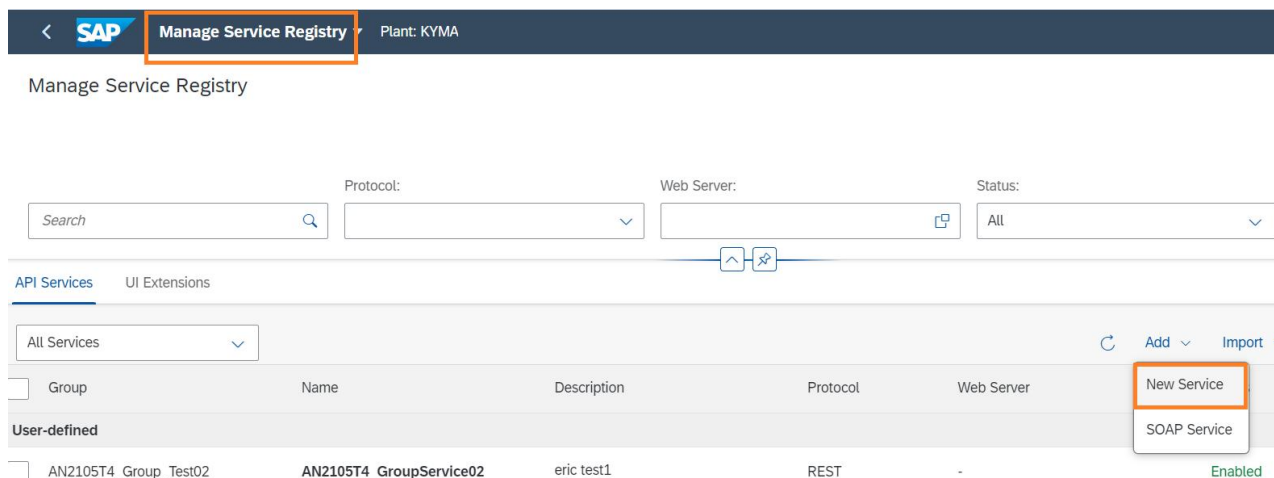
```
ident-db> show users  
[  
  {  
    _id: 'ident-db.nn_seqgen_user',  
    userId: UUID("55695a68-7c7a-461a-bec5-2419adeed0d1"),  
    user: 'nn_seqgen_user',  
    db: 'ident-db',  
    roles: [  
      { role: 'dbOwner', db: 'ident-db' },  
      { role: 'readWrite', db: 'ident-db' }  
    ],  
    mechanisms: [ 'SCRAM-SHA-1', 'SCRAM-SHA-256' ]  
  }  
]  
ident-db>
```

Configuration Steps

1. Open Kyma Runtime console UI
2. Go to dev Namespace
3. Navigate to Workloads à API Rules
4. Copy to clipboard API Rule URL for nn-seqgen-api name



5. Login to DMC and open the Manage Service Registry application
6. Click on Add button and choose New Service option from the menu



7. Define new service with the following settings below

New Service

Delete
Switch to Code

Header
General Information
Parameters
Request Body
Response

Service Name: *

nn_seqgen

Description:

Extension for Next Number Generation

Display Name:

Extension for Next Number Generation

Status:

☒ Enabled

Group:

Use API Rule URL from clipboard and then click Create button.

General Information

Type:

HTTP

Protocol:

REST

Method:

POST

Web Server:

URL / Path: *

https://nn-seqgen.c-4bcc039.kyma.shoot.live.k8s-hana....

Is Extension:

Yes

Parameters

Add
Edit
Delete

Create

Cancel

8. Open Manage Next Numbers application
9. Choose Batch Number type and choose Details

SAP
Manage Next Numbers
Plant: KYMA

Release
SFC Serialize
Incident Number
Batch Number
Inventory Receipt
Packing Unit Number
Tool Number

Next Number Type (1)

Type	Matches On	Source
BATCH_NUMBER	*	Local

10. Define nn_seqgen for the Extension field and click the Save button

Maximum Sequence:

Increment By:

Current Sequence: *

Source:

Next Number Sample: 000236

Extension:

11. Open Order POD. Choose order.

12. Chose Create Batch option from Create

Order POD for Production Orders ▾ Plant: KYMA

15:00:55

MA_ORDER1

1 - MATERIAL1
3, 2021

Goods Receipt Quantity:
0 of 10.000 EA

Create ▾

- Goods Receipt
- Create Batch

Status

Operation Details Work Instruction List Quantity Confirmation Material Consumption Activity Confirmation Data Collection List

The new batch number was successfully generated in Kyma Runtime serverless function. The generated number is displayed to the user at Create New Batch screen.

Create New Batch

Material:

Description: MATERIAL1

Success

A new batch has been created successfully.
The newly created batch ID:

13. Open and login to SAP BTP, Kyma Runtime console UI

14. Open dev Namespace

15. Navigate to Workload à Functions and click on “nn-seqgen” function name

Functions
Function is a simple code snippet that you can run without provisioning or managing servers.

Name	Created	Labels	Runtime	Source Type	Status
nn-seqgen	1 hour ago	app=nn-seqgen	Node.js 14	Inline Editor	RUNNING

16. Click on Edit Environment Variable icon if you need to change PATTERN, RESET_MODE, or NUMBER_BASE runtime configuration rules. Save changes.

Environment Variables

Variable Name	Value	Source Controlled By	Source	Key
PATTERN	→ YYYYDDMMLLNNNNN	-	CUSTOM	N/A
RESET_MODE	→ DAY	-	CUSTOM	N/A
NUMBER_BASE	→ 10	-	CUSTOM	N/A
MONGODB_HOST	→ nn-seqgen	-	CONFIG MAP	host
MONGODB_PORT	→ nn-seqgen	-	CONFIG MAP	port
MONGO_USER	→ nn-seqgen-user-creds	-	SECRET	username
MONGO_PASSWORD	→ nn-seqgen-user-creds	-	SECRET	password

CONFIG MAP source is used to store non-confidential data in key-value pairs, such as host and port for Mongo DB.

SECRET source stores confidential data in key-value pairs, such as user name and password.

Configuration

Variable Name	Value	Source Controlled By	Source	Key
PATTERN	→ YYYYDDMMLLNNNNN	-	CUSTOM	N/A
RESET_MODE	→ DAY	-	CUSTOM	N/A
NUMBER_BASE	→ 10	-	CUSTOM	N/A
MONGODB_HOST	→ nn-seqgen	-	CONFIG MAP	host
MONGODB_PORT	→ nn-seqgen	-	CONFIG MAP	port
MONGO_USER	→ nn-seqgen-user-creds	-	SECRET	username
MONGO_PASSWORD	→ nn-seqgen-user-creds	-	SECRET	password

Secrets

Secret “nn-seqgen-user-creds” stores confidential data in key-value pairs, such as mongo database user name and password.

Secrets

Name	Type	Age	Labels
default-token-x6n2c	kubernetes.io/service-account-token	a day ago	-
mongo-creds	Opaque	a day ago	-
nn-seqgen-user-creds	Opaque	a day ago	-

Config Maps

ConfigMap “nn-seqgen” is used to store non-confidential data in key-value pairs, such as mongo database host and port.

Config Maps				
Secrets				
Subscriptions				
Roles				
Role Bindings				
OAuth2 Clients				
Git Repositories				
Legal Disclosure				
Privacy				
Copyright				
Trademark				

dockerfile-python-38	1 hour ago	serverless.kyma-project.io/runtime=python38
dockerfile-python-39	1 hour ago	app.kubernetes.io/managed-by=Helm reconciler.kyma-project.io/managed-by=Helm reconciler.kyma-project.io/origin-version=2.0.4 serverless.kyma-project.io/runtime=python39
istio-ca-root-cert	1 hour ago	istio.io/config=true
kube-root-ca.crt	1 hour ago	-
nn-seqgen	1 hour ago	app=nn-seqgen
nn-seqgen-hq9dg	1 hour ago	app=nn-seqgen serverless.kyma-project.io/function-name=nn-seqgen serverless.kyma-project.io/managed-by=function-controller