

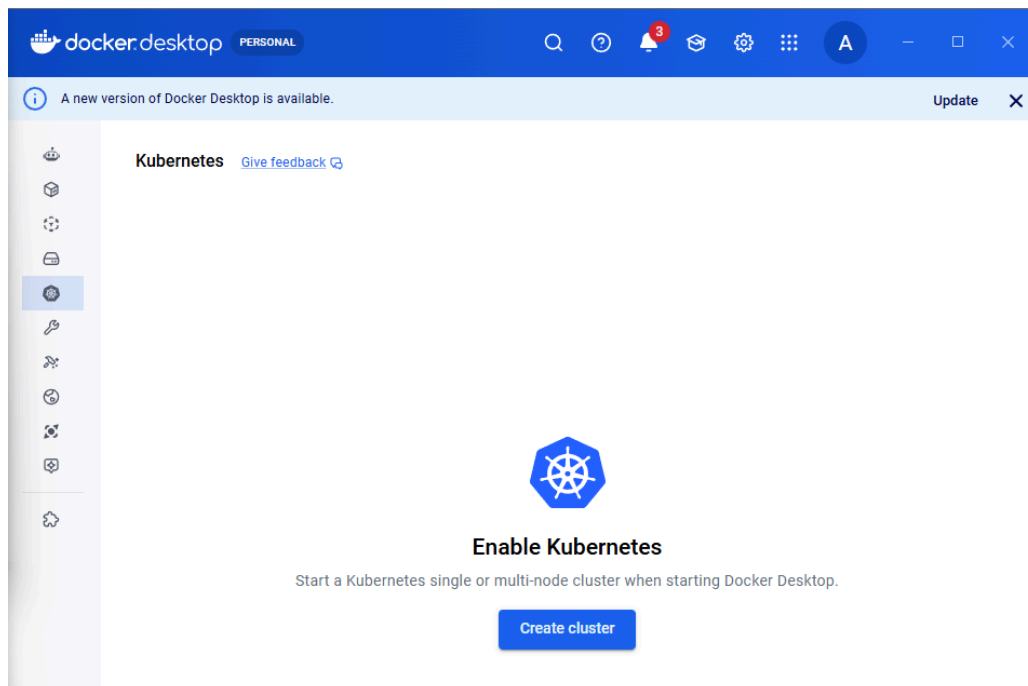
Chapitre 5 – Kubernetes : plateforme de déploiement des applications conteneurisées

Table des Matières :

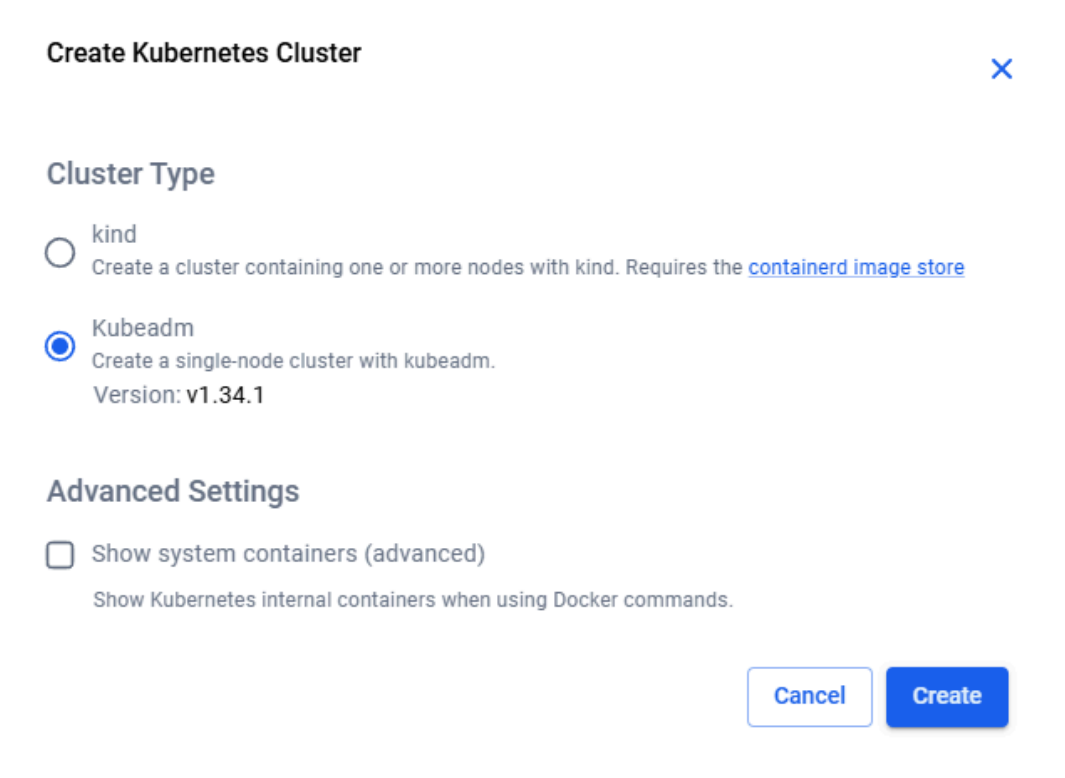
Chapitre 5 – Kubernetes : plateforme de déploiement des applications conteneurisées	1
1. Kubernetes avec Docker Desktop.....	2
2. Installation de Minikube.....	8
3. Le tableau de bord de Kubernetes.....	16
4. Créer un déploiement à l'aide de l'outil kubectl.....	27
5. Automatisation de déploiement par fichier YAML.....	34
6. Application.....	43
7. Suite Ingress (Mailpit) : hôtes virtuels et nom de domaine nip.io.....	45
8. Hôtes virtuels et nom de domaine nip.io : autre exemple.....	46
9. Cycle de vie d'un conteneur dans Kubernetes.....	48
10. Persistance des données.....	49
11. Hébergement d'un groupe de pods fonctionnant en cluster.....	59
12. Mises en place d'une réplication entre pods.....	77

1. Kubernetes avec Docker Desktop.

- Découverte de Kubernetes sur Docker :



- Création d'un cluster :




Create Kubernetes Cluster ✕

Cluster Type

kind
Create a cluster containing one or more nodes with kind. Requires the [containerd image store](#)

Node(s): 2
Changing the number of nodes resets the cluster. All stacks and resources are deleted.



Version: 1.34.3
Changing the Kubernetes version resets your cluster. All stacks and resources are deleted.

Kubernetes version

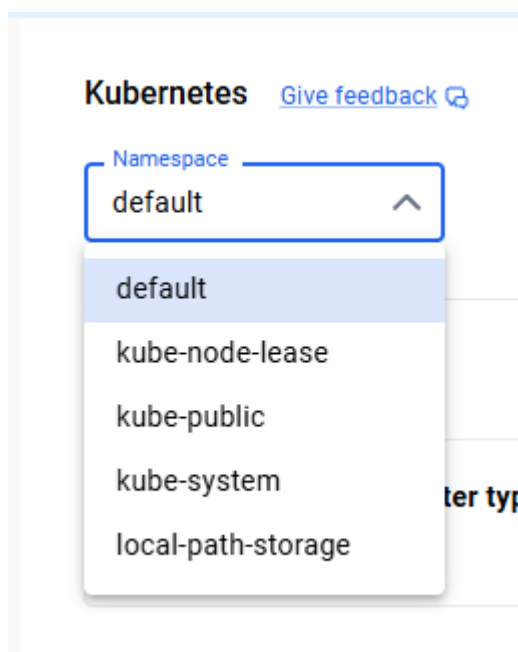
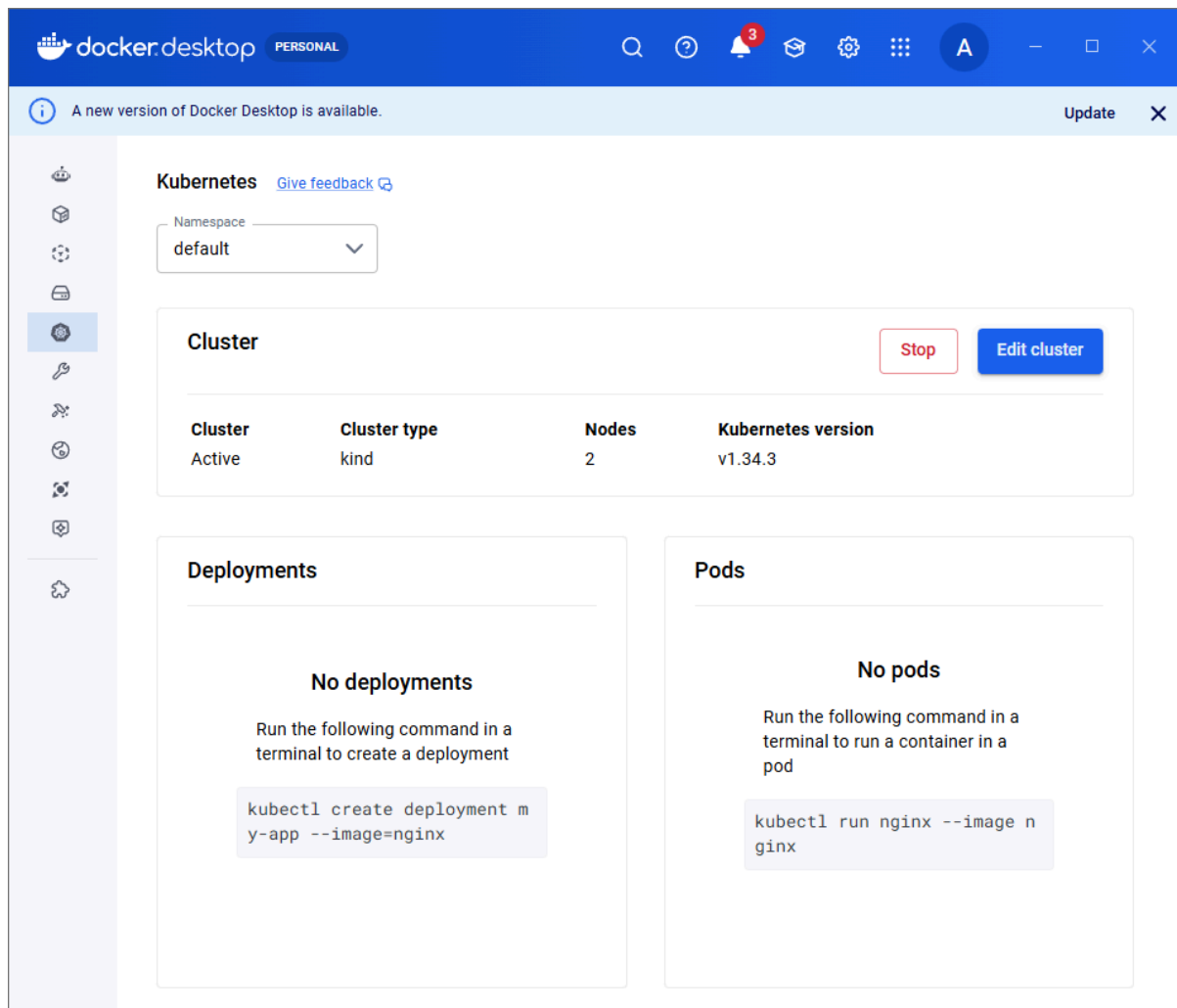
Kubeadm
Create a single-node cluster with kubeadm.
Version: v1.34.1

Advanced Settings

Show system containers (advanced)
Show Kubernetes internal containers when using Docker commands.

Kubernetes Cluster Installation

Installation takes a few minutes and requires an internet connection.



- Nous constatons l'état des machines

```
Administrateur : Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. Tous droits réservés.

Installez la dernière version de PowerShell pour de nouvelles fonctionnalités
S

PS C:\WINDOWS\system32> kubectl get nodes
NAME                 STATUS    ROLES    AGE   VERSION
desktop-control-plane Ready    control-plane   84s   v1.34.3
desktop-worker       Ready    <none>        73s   v1.34.3
PS C:\WINDOWS\system32>
```

Modify Kubernetes Cluster



Cluster Type

- kind
Create a cluster containing one or more nodes with kind. Requires the [containerd image store](#)

Node(s): 3

Changing the number of nodes resets the cluster. All stacks and resources are deleted.



Version: 1.34.3

Changing the Kubernetes version resets your cluster. All stacks and resources are deleted.

Kubernetes version
1.34.3

- Kubeadm
Create a single-node cluster with kubeadm.
Version: v1.34.1

Advanced Settings

- Show system containers (advanced)
Show Kubernetes internal containers when using Docker commands.

Cancel

Save changes

Change Kubernetes cluster configuration?

Changing the number of nodes deletes the current cluster and creates a new one.

Cancel Yes

The screenshot shows the Docker Desktop interface with the Kubernetes section selected. At the top, there is a notification: "A new version of Docker Desktop is available." The main content area is titled "Kubernetes" and includes a "Namespace" dropdown menu set to "default". Below this, there is a "Cluster" section with a "Stop" button and an "Edit cluster" button. A table lists the cluster details:

Cluster	Cluster type	Nodes	Kubernetes version
Active	kind	3	v1.34.3

Below the cluster table, there are two panels: "Deployments" and "Pods".

Deployments

No deployments

Run the following command in a terminal to create a deployment

```
kubect1 create deployment m  
y-app --image=nginx
```

Pods

No pods

Run the following command in a terminal to run a container in a pod

```
kubect1 run nginx --image n  
ginx
```

- Nous pouvons trouver ci-dessous un maître et deux workers :

```
Administrateur : Windows PowerShell
PS C:\WINDOWS\system32>
PS C:\WINDOWS\system32> kubectl get nodes
NAME                 STATUS    ROLES    AGE     VERSION
desktop-control-plane Ready    control-plane 6m11s  v1.34.3
desktop-worker       Ready    <none>      6m      v1.34.3
desktop-worker2      Ready    <none>      6m      v1.34.3
PS C:\WINDOWS\system32>
```

Containers [Give feedback](#)

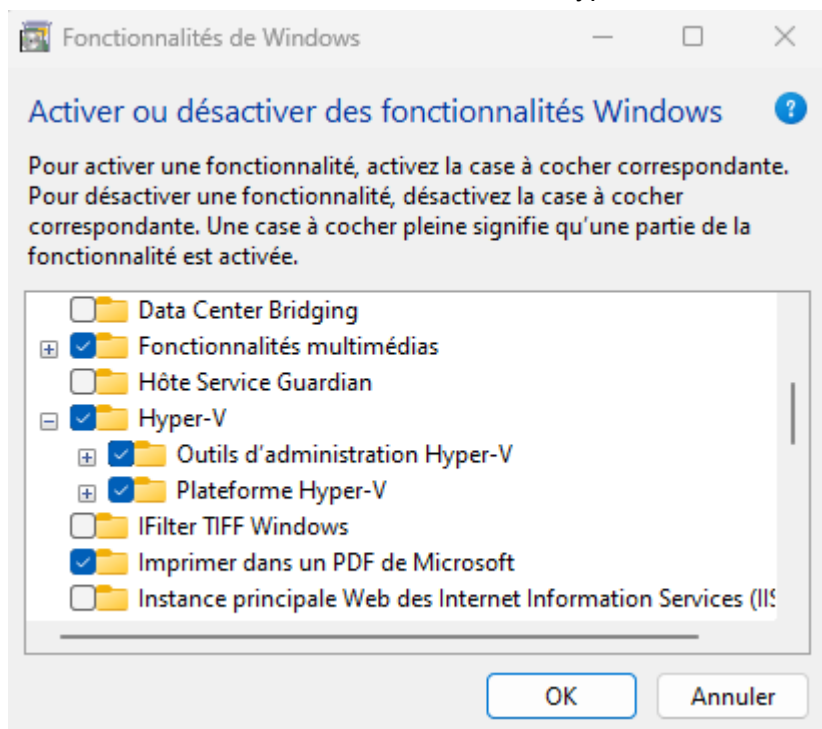
Container CPU usage 13.04% / 3200% (32 CPUs available) Container memory usage 847.08MB / 30.56GB [Show charts](#)

Search Only running

<input type="checkbox"/>	Name	Container ID	Image	Port(s)	Actions
<input type="checkbox"/>	desktop-worker2	3085a8f82475	kindest/no		
<input type="checkbox"/>	desktop-control-plane	e5cf7b87839e	kindest/no	62140:6443	
<input type="checkbox"/>	desktop-worker	e242e9ca85dd	kindest/no		
<input type="checkbox"/>	kind-registry-mirror	56dd401d6cb8	docker/des		
<input type="checkbox"/>	kind-cloud-provider	fec82b4cbe20	docker/des		
<input type="checkbox"/>	> <input type="radio"/> dockerdocker	-	-	-	

2. Installation de Minikube.

- Nous activons la fonctionnalité Windows Hyper-V :



▪ Nous installons minikube

The screenshot shows the minikube website's installation page. The navigation menu on the left includes 'Documentation', 'Get Started!', 'Handbook', and various sub-topics like 'Basic controls', 'Deploying apps', 'Kubectl', etc. The main content area has filters for 'Operating system' (Linux, macOS, Windows, Try in Browser), 'Architecture' (x86-64), 'Release type' (Stable), and 'Installer type' (.exe download, Windows Package Manager, Chocolatey). Below these filters, instructions are provided for installing the latest minikube stable release on x86-64 Windows using .exe download. A red box highlights the following steps:

- Download and run the installer for the latest release. Or if using PowerShell, use this command:


```
New-Item -Path 'c:\' -Name 'minikube' -ItemType Directory -Force
$ProgressPreference = 'SilentlyContinue'; Invoke-WebRequest -OutFile 'c:\minikube\minikube.exe' -Uri
```
- Add the minikube.exe binary to your PATH. Make sure to run PowerShell as Administrator.


```
$oldPath = [Environment]::GetEnvironmentVariable('Path', [EnvironmentVariableTarget]::Machine)
if ($oldPath.Split(';') -notcontains 'C:\minikube'){
  [Environment]::SetEnvironmentVariable('Path', $('{0};C:\minikube' -f $oldPath), [EnvironmentVariableTarget]::Machine)
}
```

This screenshot shows a Windows PowerShell terminal window with Administrator privileges. The user has executed the command to create a directory for minikube. The output shows the directory 'minikube' has been successfully created in the C:\ drive.

```
PS C:\WINDOWS\system32> New-Item -Path 'c:\' -Name 'minikube' -ItemType Directory -Force
Répertoire : C:\
Mode                LastWriteTime         Length Name
----                -
d-----          30/04/2020    09:43      minikube
PS C:\WINDOWS\system32> $ProgressPreference = 'SilentlyContinue'; Invoke-WebRequest -OutFile 'c:\minikube\minikube.exe' -Uri 'https://github.com/kubernetes/minikube/releases/latest/download/minikube-windows-amd64.exe' -UseBasicParsing
Invoke-WebRequest : Impossible de trouver une partie du chemin d'accès 'C:\minikube\minikube.exe'.
Le caractère ligne1 : 43
+ ~~~
+ ~~~ yContinue'; Invoke-WebRequest -OutFile 'c:\minikube\minikube.exe' -Ur ...
+ CategoryInfo          : NotSpecified (:) [Invoke-WebRequest], DirectoryNotFoundException
+ FullyQualifiedErrorId : System.IO.DirectoryNotFoundException,Microsoft.PowerShell.Commands.InvokeWebRequestCommand
PS C:\WINDOWS\system32> $ProgressPreference = 'SilentlyContinue'; Invoke-WebRequest -OutFile 'C:\minikube\minikube.exe' -Uri 'https://github.com/kubernetes/minikube/releases/latest/download/minikube-windows-amd64.exe' -UseBasicParsing
PS C:\WINDOWS\system32>
```

This screenshot shows a Windows PowerShell terminal window with Administrator privileges. The user has executed the PowerShell script to add the minikube.exe binary to the system PATH. The command is successful, and the PATH environment variable is updated to include the C:\minikube directory.

```
PS C:\Users\nmetreau> $oldPath = [Environment]::GetEnvironmentVariable('Path', [EnvironmentVariableTarget]::Machine)
PS C:\Users\nmetreau> if ($oldPath.Split(';') -notcontains 'C:\minikube'){
>>   [Environment]::SetEnvironmentVariable('Path', $('{0};C:\minikube' -f $oldPath), [EnvironmentVariableTarget]::Machine)
>> }
PS C:\Users\nmetreau>
```

- Nous lançons minikube à l'aide de la commande "minikube start" :

```
Administrateur : Invite de commandes
Microsoft Windows [version 10.0.22631.6199]
(c) Microsoft Corporation. Tous droits réservés.

C:\Windows\System32>cd C:\minikube

C:\minikube>minikube start
* minikube v1.38.1 sur Microsoft Windows 11 Pro 23H2
* Choix automatique du pilote hyperv. Autres choix: virtualbox, ssh
! Starting v1.39.0, minikube will default to "containerd" container runtime. See #21973 for more info.
* Téléchargement de l'image de démarrage de la VM...
  > minikube-v1.38.0-amd64.iso....: 65 B / 65 B [-----] 100.00% ? p/s 0s
  > minikube-v1.38.0-amd64.iso: 370.55 MiB / 370.55 MiB 100.00% 10.91 MiB p
* Démarrage du nœud "minikube" primary control-plane dans le cluster "minikube"
* Téléchargement du préchargement de Kubernetes v1.35.1...
  > preloaded-images-k8s-v18-v1...: 272.45 MiB / 272.45 MiB 100.00% 10.76 M
* Création de VM hyperv (CPUs=2, Mémoire=6144MB, Disque=20000MB)...
* Préparation de Kubernetes v1.35.1 sur Docker 28.5.2...
* Configuration de bridge CNI (Container Networking Interface)...
* Vérification des composants Kubernetes...
  - Utilisation de l'image gcr.io/k8s-minikube/storage-provisioner:v5
* Modules activés: storage-provisioner, default-storageclass
* Terminé ! kubectl est maintenant configuré pour utiliser "minikube" cluster et espace de noms "default" par défaut.

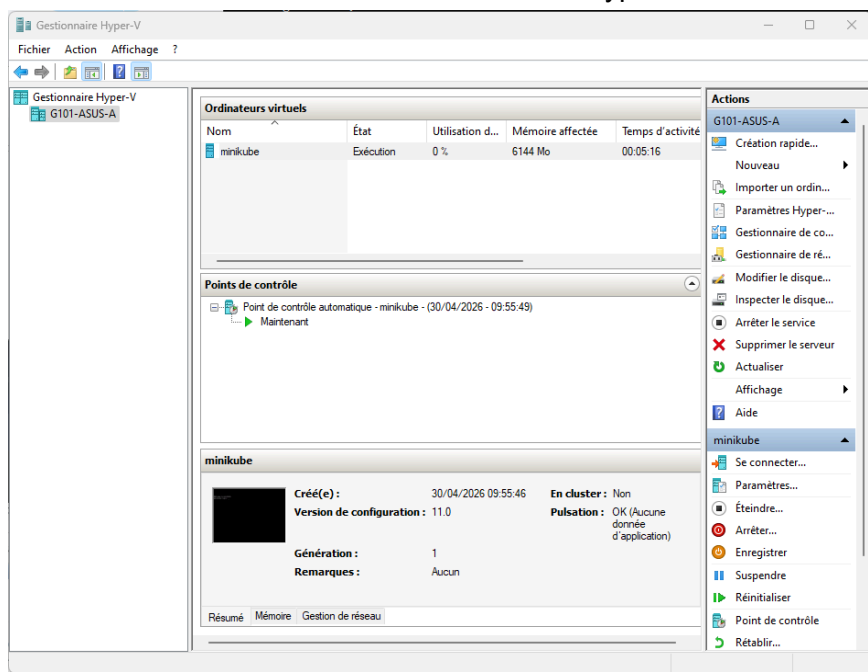
C:\minikube>
```

- Nous vérifions l'état de la machine :

```
C:\minikube>kubectl get nodes
NAME          STATUS    ROLES          AGE      VERSION
minikube     Ready    control-plane  3m33s   v1.35.1

C:\minikube>
```

- Nous constatons la création de la vm dans HyperV



- Commande pour lister les objets :

```
Invite de commandes
Microsoft Windows [version 10.0.22631.6199]
(c) Microsoft Corporation. Tous droits réservés.

C:\Users\nmetreau>kubectl get all
NAME                TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes  ClusterIP     10.96.0.1    <none>        443/TCP    7m6s

C:\Users\nmetreau>
```

- Création d'un pod nginx via kubectl :

```
C:\Users\nmetreau>kubectl run monpod --image=nginx:latest
pod/monpod created

C:\Users\nmetreau>
```

```
C:\Users\nmetreau>kubectl get pods
NAME        READY   STATUS    RESTARTS   AGE
monpod     1/1    Running   0           28s

C:\Users\nmetreau>
```

```
C:\Users\nmetreau>kubectl get all
NAME                READY   STATUS    RESTARTS   AGE
pod/monpod          1/1    Running   0           48s

NAME                TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
service/kubernetes  ClusterIP     10.96.0.1    <none>        443/TCP    8m47s

C:\Users\nmetreau>
```

- Nous consultons le log d'un pod :

```
C:\Users\nmetreau>kubectl logs pod/monpod
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2026/04/30 08:04:27 [notice] 1#1: using the "epoll" event method
2026/04/30 08:04:27 [notice] 1#1: nginx/1.29.8
2026/04/30 08:04:27 [notice] 1#1: built by gcc 14.2.0 (Debian 14.2.0-19)
2026/04/30 08:04:27 [notice] 1#1: OS: Linux 6.6.95
2026/04/30 08:04:27 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2026/04/30 08:04:27 [notice] 1#1: start worker processes
2026/04/30 08:04:27 [notice] 1#1: start worker process 29
2026/04/30 08:04:27 [notice] 1#1: start worker process 30
C:\Users\nmetreau>
```

- Les espaces de noms dans lesquels sont créés les objets :

```
C:\Users\nmetreau>kubectl get namespace
NAME                STATUS    AGE
default             Active   9m47s
kube-node-lease     Active   9m47s
kube-public         Active   9m47s
kube-system         Active   9m47s

C:\Users\nmetreau>
```

- Les objets : singulier ou pluriel, peu importe

```
C:\Users\nmetreau>kubectl get pods
NAME      READY   STATUS    RESTARTS   AGE
monpod    1/1     Running   0           2m29s

C:\Users\nmetreau>
```

```
C:\Users\nmetreau>kubectl get pod
NAME      READY   STATUS    RESTARTS   AGE
monpod    1/1     Running   0           2m46s

C:\Users\nmetreau>
```

```
C:\Users\nmetreau>kubectl get nodes
NAME      STATUS   ROLES    AGE   VERSION
minikube  Ready   control-plane  11m   v1.35.1

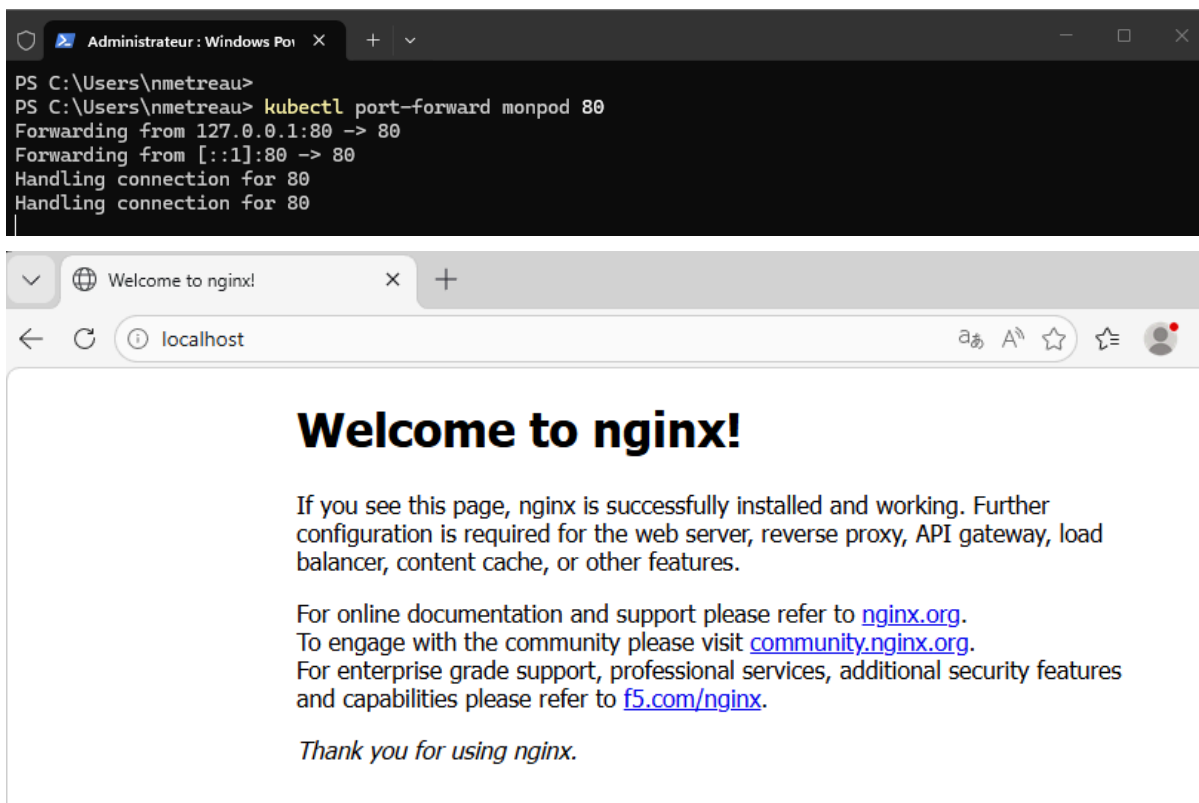
C:\Users\nmetreau>kubectl get node
NAME      STATUS   ROLES    AGE   VERSION
minikube  Ready   control-plane  11m   v1.35.1

C:\Users\nmetreau>
```

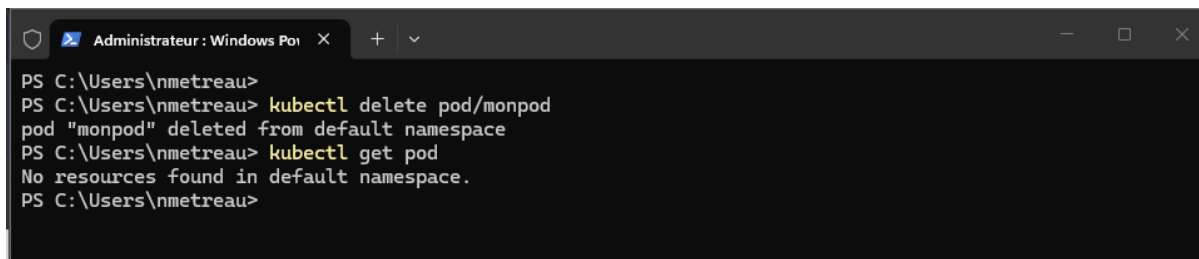
- Champs supplémentaires :

```
C:\Users\nmetreau>kubectl get node -o wide
NAME      STATUS   ROLES    AGE   VERSION   INTERNAL-IP   EXTERNAL-IP   OS-IMAGE
minikube  Ready   control-plane  11m   v1.35.1   192.168.220.57 <none>        Buildroot 2025.02
6.6.95    docker://28.5.2
```


- Nous accédons à l'application Nginx depuis l'extérieur du cluster Kubernetes (instruction port-forward) :



- Nous détruisons le pod nginx :



3. Le tableau de bord de Kubernetes.

- Nous activons le plugin :

```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> minikube addons enable dashboard
💡 dashboard est un addon maintenu par Kubernetes. Pour toute question, contactez minikube sur GitHub
.
Vous pouvez consulter la liste des mainteneurs de minikube sur : https://github.com/kubernetes/minikube/blob/master/OWNERS
  ▪ Utilisation de l'image docker.io/kubernetesui/dashboard:v2.7.0
  ▪ Utilisation de l'image docker.io/kubernetesui/metrics-scraper:v1.0.8
💡 Certaines fonctionnalités du tableau de bord nécessitent le module complémentaire metrics-server.
Pour activer toutes les fonctionnalités, veuillez exécuter :

    minikube addons enable metrics-server

🌟 Le module 'dashboard' est activé
PS C:\Users\nmetreau>
```

- Nous activons le serveur de métriques pour bénéficier de l'ensemble des fonctionnalités du tableau de bord :

```
PS C:\Users\nmetreau> minikube addons enable metrics-server
💡 metrics-server est un addon maintenu par Kubernetes. Pour toute question, contactez minikube sur GitHub.
Vous pouvez consulter la liste des mainteneurs de minikube sur : https://github.com/kubernetes/minikube/blob/master/OWNERS
  ▪ Utilisation de l'image registry.k8s.io/metrics-server/metrics-server:v0.8.1
🌟 Le module 'metrics-server' est activé
PS C:\Users\nmetreau>
```

- Nous accédons au tableau de bord :

```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> minikube dashboard
🐞 Vérification de l'état du tableau de bord...
🐞 Lancement du proxy...
🐞 Vérification de l'état du proxy...
🐞 Ouverture de http://127.0.0.1:62699/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/ dans votre navigateur par défaut...
```

Charges de travail

- Workloads N
 - Cron Jobs
 - Daemon Sets
 - Deployments
 - Jobs
 - Pods
 - Replica Sets
 - Replication Controllers
 - Stateful Sets
- Service
 - Ingresses N
 - Ingress Classes
 - Services N
- Config and Storage
 - Config Maps N
 - Persistent Volume Claims N
 - Secrets N
 - Storage Classes
- Cluster

Statut des charges de travail

Running: 1 Déploiements

Running: 2 Pods

Running: 1 Replica Sets

Déploiements

Nom	Images	Étiquettes	Pods
● mailpit	axllent/mailpit	k8s-app: mailpit	2 / 2

Pods

Nom	Images	Étiquettes	Noeud	Statut	Redémarr	Utilisation CPU (coeurs)	Utilisation mémoire (oct)
● mailpit-5d8c9cd4-4sp4r	axllent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4	minikube	Running	0	1,00m	7,07Mi
● mailpit-5d8c9cd4-gj5xq	axllent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4	minikube	Running	0	1,00m	7,32Mi

Replica Sets

Nom	Images	Étiquettes	Pods
● mailpit-5d8c9cd4	axllent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4	2 / 2

Services

Nom	Étiquettes	Type	IP cluster	Terminaisons internes	Terminaison externes
● kubernetes	component: apiserver provider: kubernetes	ClusterIP	10.96.0.1	kubernetes:443 TCP kubernetes:0 TCP	-

Config And Storage > Config Maps

Cron Jobs
 Daemon Sets
 Deployments
 Jobs
 Pods
 Replica Sets
 Replication Controllers
 Stateful Sets

Service
 Ingresses N
 Ingress Classes
 Services N

Config and Storage
 Config Maps N

Config Maps

Nom	Étiquettes	Date de création ↑
kube-root-ca.crt	-	33 minutes ago

kubernetes default Recherche +

Config And Storage > Secrets

Cron Jobs
 Daemon Sets
 Deployments
 Jobs
 Pods
 Replica Sets
 Replication Controllers
 Stateful Sets

Service
 Ingresses N
 Ingress Classes
 Services N

Config and Storage
 Config Maps N
 Persistent Volume Claims N
 Secrets N

Secrets

Il n'y a rien à afficher ici
 Aucune ressource trouvée.

kubernetes default Recherche +

Cluster > Espaces de noms

Workloads N
 Cron Jobs
 Daemon Sets
 Deployments
 Jobs
 Pods
 Replica Sets
 Replication Controllers
 Stateful Sets

Service
 Ingresses N
 Ingress Classes
 Services N

Espaces de noms

Nom	Étiquettes	Phase	Date de création ↑
	addonmanager.kubernetes.io/mod e: Reconcile		
● kubernetes-dashboard	kubernetes.io/metadata.name: kuber netes-dashboard kubernetes.io/minikube-addons: das hboard	Active	28 minutes ago
● default	kubernetes.io/metadata.name: defau lit	Active	35 minutes ago
● kube-node-lease	kubernetes.io/metadata.name: kube- node-lease	Active	35 minutes ago
● kube-public	kubernetes.io/metadata.name: kube- public	Active	35 minutes ago
● kube-system	kubernetes.io/metadata.name: kube- system	Active	35 minutes ago

Espaces de noms

Nom	Étiquettes	Phase
kubernetes-dashboard	addonmanager.kubernetes.io/mediate: Reconcile kubernetes.io/metadata.name: kubernetes-dashboard kubernetes.io/minikube-addons: dashboard	Active
default	kubernetes.io/metadata.name: default	Active
kube-node-lease	kubernetes.io/metadata.name: kube-node-lease	Active
kube-public	kubernetes.io/metadata.name: kube-public	Active
kube-system	kubernetes.io/metadata.name: kube-system	Active

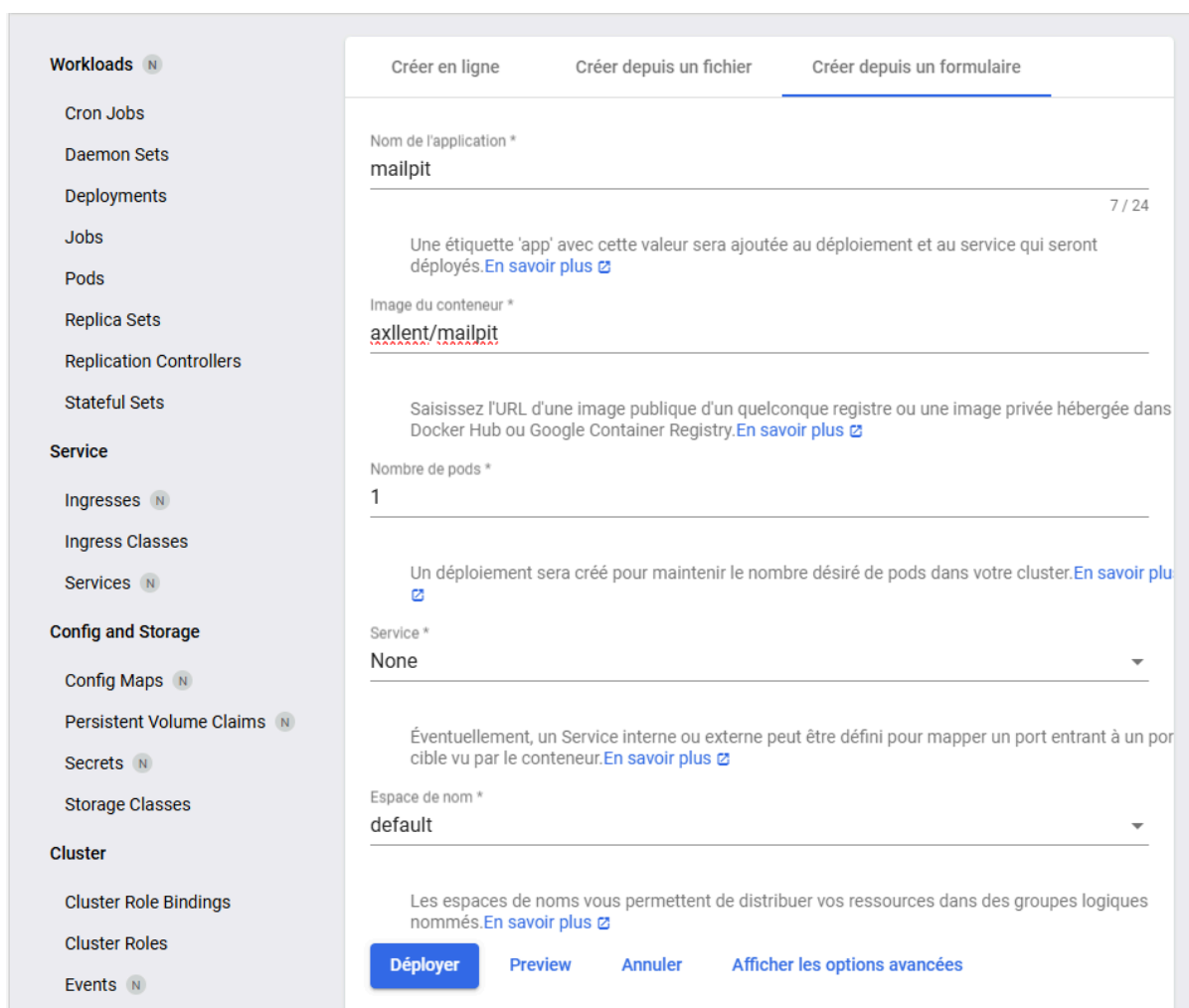
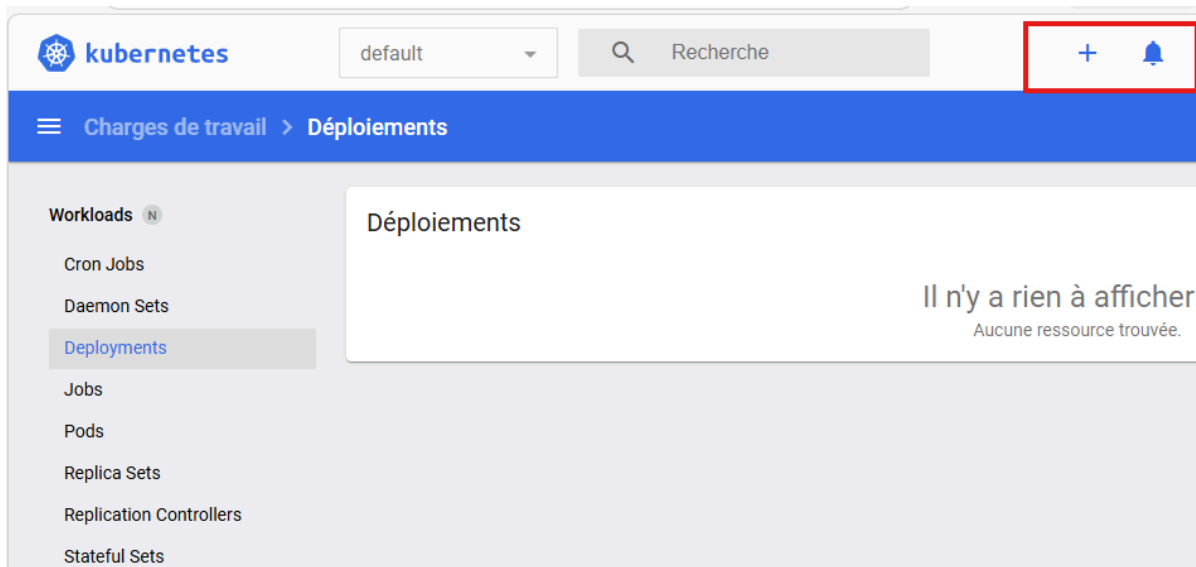
CPU Usage

Memory Usage


Noeuds

Nom	Étiquettes	Prêt	Requêtes CPU (coeurs)	Limites CPU (coeurs)	CPU capacity (coeurs)	Requêtes mémoire (octets)	Limites mémoire (octets)	Memory capacity (bytes)
minikube	beta.kubernetes.io/arch: amd64 beta.kubernetes.io/os: linux kubernetes.io/arch: amd64	True	850,00m (42,50%)	0,00m (0,00%)	2,00	370,00Mi (6,25%)	170,00Mi (2,87%)	5,78Gi

• Création d'un déploiement (mailpit) :




Statut des charges de travail




Running: 1

Déploiements



Running: 1

Pods



Running: 1

Replica Sets

Déploiements

Nom	Images	Étiquettes	Pods	Date de création
● mailpit	axllent/mailpit	k8s-app: mailpit	1 / 1	58 seconds ago

Pods

Nom	Images	Étiquettes	Noeud	Statut	Redémar	Utilisation CPU (coeurs)	Utilisation mémoire (octets)	Date de création
● mailpit-5d8c9cd4-gj5xq	axllent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4	minikube	Running	0	-	-	57 seconds ago

Charges de travail > **Déploiements**

Workloads

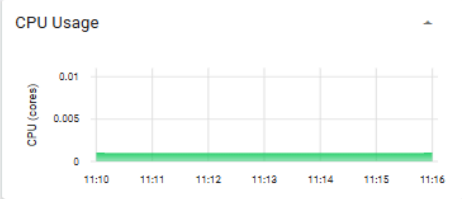
- Cron Jobs
- Daemon Sets
- Deployments**
- Jobs
- Pods
- Replica Sets
- Replication Controllers
- Stateful Sets

Service

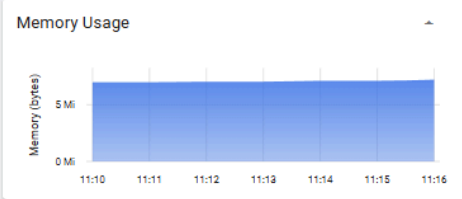
- Ingresses
- Ingress Classes
- Services

Config and Storage

CPU Usage



Memory Usage



Déploiements

Nom	Images	Étiquettes	Pods	Date de création
● mailpit	axllent/mailpit	k8s-app: mailpit	1 / 1	9 minutes ago

Statut des pods

Mis à jour	Total	Disponibles
1	1	1

Conditions

Type	Statut	Dernière sonde	Dernière transition	Motif	Message
Available	True	9 minutes ago	9 minutes ago	MinimumReplicasAvailable	Deployment has minimum availability.
Progressing	True	9 minutes ago	9 minutes ago	NewReplicaSetAvailable	ReplicaSet "mailpit-5d8c9cd4" has successfully progressed.

Nouveau Replica Set

Nom	Espace de nom	Âge	Pods
mailpit-5d8c9cd4	default	9 minutes ago	1 / 1

Étiquettes: k8s-app: mailpit, pod-template-hash: 5d8c9cd4
Images: axilent/mailpit

Métadonnées

Nom	Espace de nom	Date de création	Âge	UID
mailpit-5d8c9cd4	default	30 avr. 2026	10 minutes ago	920c5005-d471-4475-9c58-7c595571a8ba

Étiquettes: k8s-app: mailpit, pod-template-hash: 5d8c9cd4
Annotations: deployment.kubernetes.io/desired-replicas: 1, deployment.kubernetes.io/max-replicas: 2, deployment.kubernetes.io/revision: 1

Informations sur la ressource

Sélecteur: k8s-app: mailpit, pod-template-hash: 5d8c9cd4
Images: axilent/mailpit

Statut des pods

En fonctionnement	Désirés
1	1

Pods

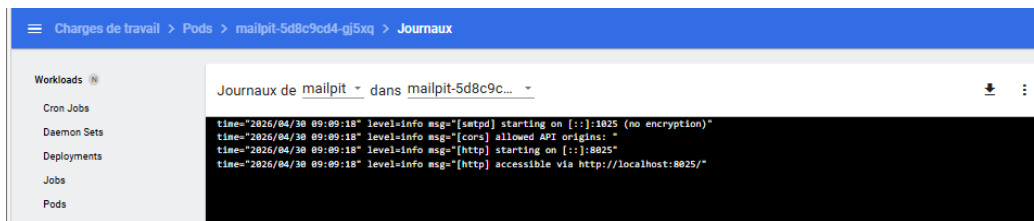
Nom	Images	Étiquettes	Noeud	Statut	Redémar	Utilisation CPU (coeurs)	Utilisation mémoire (octets)	Date de création
mailpit-5d8c9cd4-gj5xq	axilent/mailpit	k8s-app: mailpit, pod-template-hash: 5d8c9cd4	minikube	Running	0	1,80m	7,31Mi	10 minutes ago

Voir les journaux :

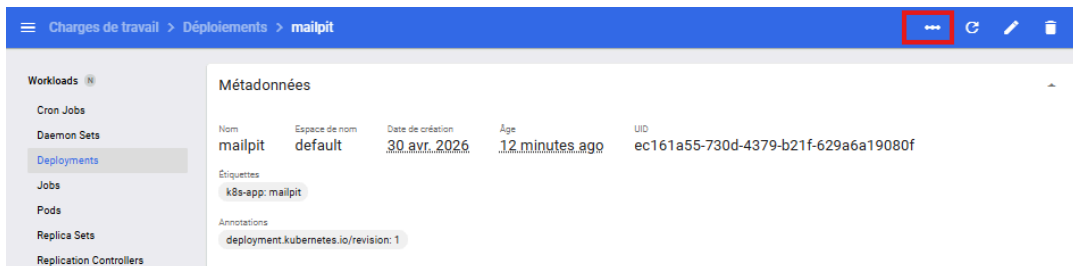
Charges de travail > Pods > mailpit-5d8c9cd4-gj5xq

CPU Usage

Memory Usage



▪ Scalabilité :



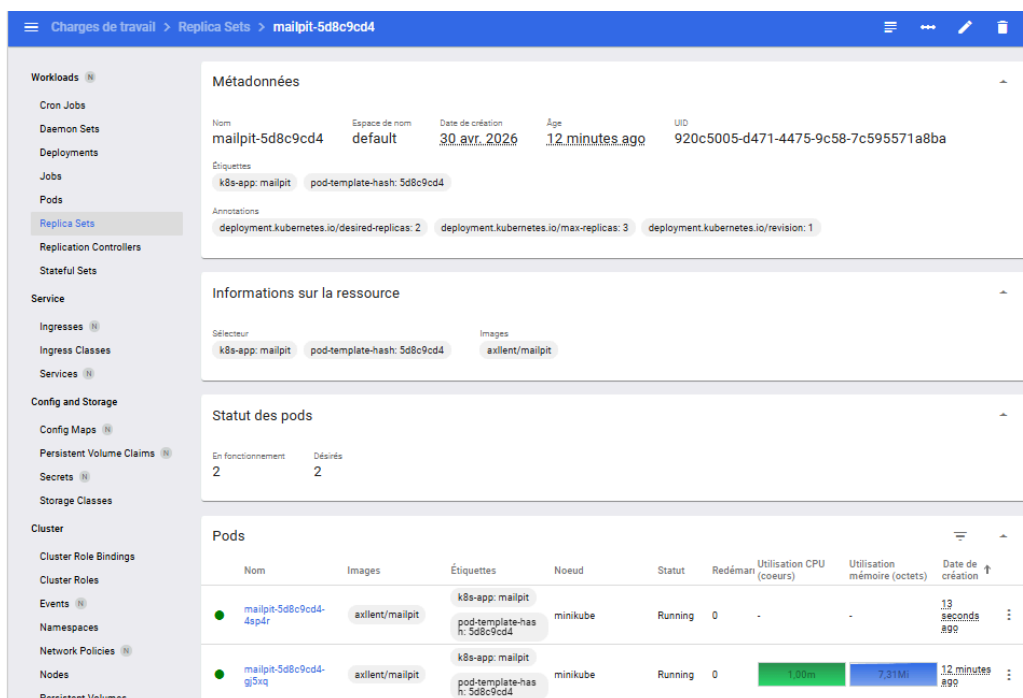
Mettre à l'échelle une ressource

Deployment mailpit will be updated to reflect the desired replicas count.

Répliques désirées *	Répliques actuelles
2	1

i Cette action est équivalente à : `kubectl scale -n default deployment mailpit --replicas=2`

[Mettre à l'échelle](#) [Annuler](#)



Mise à jour :

The screenshot shows the Kubernetes dashboard interface. The breadcrumb navigation at the top reads 'Charges de travail > Déploiements > mailpit'. On the left sidebar, the 'Deployments' section is selected. The main content area displays the 'Métadonnées' (Metadata) for the 'mailpit' deployment. A table lists the following information:

Nom	Espace de nom	Date de création	Âge	UID
mailpit	default	30 avr. 2026	13 minutes ago	ec161a55-730d-4379-b21f-629a6a19080f

Below the table, there are sections for 'Étiquettes' (Labels) showing 'k8s-app: mailpit' and 'Annotations' showing 'deployment.kubernetes.io/revision: 1'. A red box highlights the edit icon in the top right corner of the dashboard header.

Éditer une ressource

The screenshot shows the 'Edit Resource' interface with the 'YAML' tab selected. The configuration is as follows:

```
1 kind: Deployment
2 apiVersion: apps/v1
3 metadata:
4   name: mailpit
5   namespace: default
6   uid: ec161a55-730d-4379-b21f-629a6a19080f
7   resourceVersion: '1987'
8   generation: 2
9   creationTimestamp: '2026-04-30T09:09:14Z'
10 labels:
11   k8s-app: mailpit
12 annotations:
13   deployment.kubernetes.io/revision: '1'
14 managedFields:
15   - manager: dashboard
16     operation: Update
17     apiVersion: apps/v1
18     fieldsType: FieldsV1
19     fieldsV1:
20       f:spec:
21         f:replicas: {}
```

At the bottom, an information icon and text state: 'Cette action est équivalente à : kubectl apply -f <spec.yaml>'.

Éditer une ressource

YAML JSON

```
103 >spec:
104   replicas: 2
105   selector:
106     matchLabels:
107       k8s-app: mailpit
108   template:
109     metadata:
110       name: mailpit
111       labels:
112         k8s-app: mailpit
113     spec:
114       containers:
115       - name: mailpit
116         image: axllent/mailpit
117         resources: {}
118         terminationMessagePath: /dev/termination-log
119         terminationMessagePolicy: File
120         imagePullPolicy: Always
121       securityContext:
122         privileged: false
123       restartPolicy: Always
124       terminationGracePeriodSeconds: 30
```

i Cette action est équivalente à : `kubectl apply -f <spec.yaml>`

Mettre à jour Annuler

- Kubernetes va créer un nouveau ReplicaSet :

The screenshot shows the Kubernetes dashboard interface. At the top, there's a search bar and a navigation menu. The main content area is titled 'Replica Sets' and contains two graphs: 'CPU Usage' and 'Memory Usage'. The CPU Usage graph shows a very low, stable usage over time. The Memory Usage graph shows a steady, low memory consumption. Below the graphs is a table of Replica Sets.

Nom	Images	Étiquettes
mailpit-5d8c9cd4	axllent/mailpit	k8s-app: mailpit pod-template-hash: 5d8c9cd4

Charges de travail > Déploiements > mailpit

Type	Statut	Dernière sonde	Dernière transition
Progressing	True	14 minutes ago	14 minutes ago
Available	True	2 minutes ago	2 minutes ago

Nouveau Replica Set

Nom	Espace de nom	Âge	Pods
mailpit-5d8c9cd4	default	14 minutes ago	2 / 2

Étiquettes: k8s-app: mailpit, pod-template-hash: 5d8c9cd4

Images: axlent/mailpit

Anciens Replica Sets

Il n'y a rien à afficher ici
Aucune ressource trouvée.

Horizontal Pod Autoscalers

Éléments : 0

- Workloads N
- Cron Jobs
- Daemon Sets
- Deployments
- Jobs
- Pods
- Replica Sets
- Replication Controllers
- Stateful Sets
- Service
- Ingresses N
- Ingress Classes
- Services N
- Config and Storage
- Config Maps N
- Persistent Volume Claims N
- Secrets N
- Storage Classes
- Cluster

4. Créer un déploiement à l'aide de l'outil kubectl.

- Nous allons supprimer un déploiement :

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get deployment
NAME          READY  UP-TO-DATE  AVAILABLE  AGE
mailpit       2/2    2           2          20m
PS C:\Users\nmetreau>
```

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl delete deployment mailpit
deployment.apps "mailpit" deleted from default namespace
PS C:\Users\nmetreau>
```

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get deployment
No resources found in default namespace.
PS C:\Users\nmetreau>
```

- Création d'un déploiement

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl create deployment mailpit --image=axllent/mailpit
deployment.apps/mailpit created
PS C:\Users\nmetreau>
```

- Etat du déploiement

```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get deployment
NAME          READY   UP-TO-DATE   AVAILABLE   AGE
mailpit       1/1     1             1           25s
PS C:\Users\nmetreau> kubectl get deployment -o wide
NAME          READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES           SELECTOR
mailpit       1/1     1             1           31s   mailpit      axllent/mailpit  app=mailpit
PS C:\Users\nmetreau>
```

```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl describe deployment mailpit
Name:          mailpit
Namespace:    default
CreationTimestamp: Thu, 30 Apr 2026 11:31:39 +0200
Labels:       app=mailpit
Annotations:  deployment.kubernetes.io/revision: 1
Selector:     app=mailpit
Replicas:     1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType: RollingUpdate
MinReadySeconds: 0
RollingUpdateStrategy: 25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=mailpit
  Containers:
    mailpit:
      Image:          axllent/mailpit
      Port:           <none>
      Host Port:     <none>
      Environment:   <none>
      Mounts:        <none>
      Volumes:       <none>
      Node-Selectors: <none>
      Tolerations:   <none>
Conditions:
  Type           Status  Reason
  ----           -
  Available      True    MinimumReplicasAvailable
  Progressing    True    NewReplicaSetAvailable
OldReplicaSets: <none>
NewReplicaSet:  mailpit-7b96b48c5d (1/1 replicas created)
Events:
  Type           Reason          Age    From          Message
  ----           -
  Normal        ScalingReplicaSet   52s   deployment-controller  Scaled up replica set mailpit-7b96b48c5d from 0 to 1
PS C:\Users\nmetreau>
```

- Réplicas :

```

Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get replicaset
NAME          DESIRED  CURRENT  READY  AGE
mailpit-7b96b48c5d  1        1        1      79s
PS C:\Users\nmetreau> kubectl describe rs mailpit-7b96b48c5d
Name:          mailpit-7b96b48c5d
Namespace:    default
Selector:     app=mailpit,pod-template-hash=7b96b48c5d
Labels:       app=mailpit
              pod-template-hash=7b96b48c5d
Annotations:  deployment.kubernetes.io/desired-replicas: 1
              deployment.kubernetes.io/max-replicas: 2
              deployment.kubernetes.io/revision: 1
Controlled By: Deployment/mailpit
Replicas:    1 current / 1 desired
Pods Status: 1 Running / 0 Waiting / 0 Succeeded / 0 Failed
Pod Template:
  Labels:  app=mailpit
          pod-template-hash=7b96b48c5d
  Containers:
    mailpit:
      Image:          axllent/mailpit
      Port:           <none>
      Host Port:     <none>
      Environment:   <none>
      Mounts:        <none>
      Volumes:       <none>
      Node-Selectors: <none>
      Tolerations:   <none>
Events:
  Type      Reason          Age   From              Message
  ----      -
Normal    SuccessfulCreate 102s  replicaset-controller  Created pod: mailpit-7b96b48c5d-k86pd
PS C:\Users\nmetreau>

```

- Nous vérifions l'état du pod

```

Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get pods
NAME          READY  STATUS   RESTARTS  AGE
mailpit-7b96b48c5d-k86pd  1/1    Running  0          2m1s
PS C:\Users\nmetreau> kubectl describe pods mailpit-7b96b48c5d-k86pd
Name:          mailpit-7b96b48c5d-k86pd
Namespace:    default
Priority:      0
Service Account: default
Node:         minikube/172.19.129.198
Start Time:   Thu, 30 Apr 2026 11:31:39 +0200
Labels:       app=mailpit
              pod-template-hash=7b96b48c5d
Annotations:  <none>
Status:       Running
IP:           10.244.0.9
IPs:
  IP:         10.244.0.9
Controlled By: ReplicaSet/mailpit-7b96b48c5d
Containers:
  mailpit:
    Container ID:  docker://0edc0442f5bec878cbe22536c1d95aac37e6a98b49cc651ca1cb02d8d197de88
    Image:         axllent/mailpit
    Image ID:      docker-pullable://axllent/mailpit@sha256:757f22b56c1da03570afdb3d259effe5091018008a81bbbedc8158cee7e16fdbc
    Port:         <none>
    Host Port:    <none>
    State:        Running
      Started:    Thu, 30 Apr 2026 11:31:40 +0200
    Ready:        True
    Restart Count: 0
    Environment: <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-457rc (ro)
Conditions:
  Type                               Status
  PodReadyToStartContainers         True
  Initialized                        True
  Ready                              True
  ContainersReady                   True
  PodScheduled                       True
Volumes:
  kube-api-access-457rc:
    Type:          Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
    ConfigMapName:  kube-root-ca.crt
    Optional:      false
    DownwardAPI:   true
QoS Class:       BestEffort
Node-Selectors:  <none>
Tolerations:     node.kubernetes.io/not-ready:NoExecute op=Exists for 300s

```

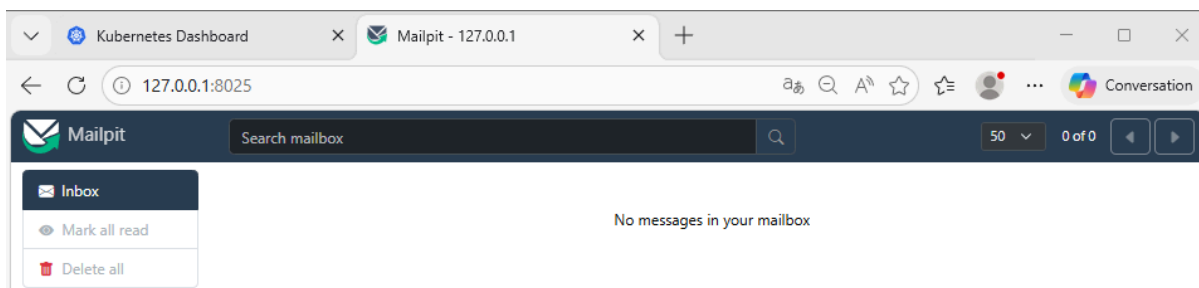
- Nous accédons aux logs du pod et des conteneurs

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl logs mailpit-7b96b48c5d-k86pd
time="2026/04/30 09:31:40" level=info msg="[smtpd] starting on [::]:1025 (no encryption)"
time="2026/04/30 09:31:40" level=info msg="[cors] allowed API origins: "
time="2026/04/30 09:31:40" level=info msg="[http] starting on [::]:8025"
time="2026/04/30 09:31:40" level=info msg="[http] accessible via http://localhost:8025/"
PS C:\Users\nmetreau> kubectl logs mailpit-7b96b48c5d-k86pd -c mailpit
time="2026/04/30 09:31:40" level=info msg="[smtpd] starting on [::]:1025 (no encryption)"
time="2026/04/30 09:31:40" level=info msg="[cors] allowed API origins: "
time="2026/04/30 09:31:40" level=info msg="[http] starting on [::]:8025"
time="2026/04/30 09:31:40" level=info msg="[http] accessible via http://localhost:8025/"
PS C:\Users\nmetreau>
```

- Accès à l'application Mailpit

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl port-forward mailpit-7b96b48c5d-k86pd 8025
Forwarding from 127.0.0.1:8025 -> 8025
Forwarding from [::1]:8025 -> 8025
```

```
PS C:\Users\nmetreau> kubectl port-forward deployment/mailpit 8025
Forwarding from 127.0.0.1:8025 -> 8025
Forwarding from [::1]:8025 -> 8025
Handling connection for 8025
Handling connection for 8025
Handling connection for 8025
```



- Création d'un service Mailpit

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl expose deployment/mailpit --port 1025,8025
service/mailpit exposed
PS C:\Users\nmetreau>
```

- Ouverture d'un terminal interactif à l'intérieur d'un pod Kubernetes :

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl exec -it mailpit-7b96b48c5d-k86pd -- sh
/ # getent hosts mailpit
10.99.241.99      mailpit.default.svc.cluster.local  mailpit.default.svc.cluster.local mailpit
/ #
```

- Lancement d'un pod de test :

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau> kubectl run -it --rm pod-test --image=alpine sh
All commands and output from this session will be recorded in container logs, including credentials and sensitive information passed through the command prompt.
If you don't see a command prompt, try pressing enter.
/ # nslookup mailpit
Server:      10.96.0.10
Address:    10.96.0.10:53

** server can't find mailpit.cluster.local: NXDOMAIN

Name:   mailpit.default.svc.cluster.local
Address: 10.99.241.99

** server can't find mailpit.cluster.local: NXDOMAIN

** server can't find mailpit.svc.cluster.local: NXDOMAIN

** server can't find mailpit.svc.cluster.local: NXDOMAIN

/ # exit
Session ended, resume using 'kubectl attach pod-test -c pod-test -i -t' command when the pod is running
pod "pod-test" deleted from default namespace
PS C:\Users\nmetreau>
```

- Nous modifions le nombre de pods = 2 :

```
Administrateur : Windows Po... x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl scale deployment mailpit --replicas=2
deployment.apps/mailpit scaled
PS C:\Users\nmetreau>
```

```
Administrateur : Windows Poi x + v - □ ×
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get deployment mailpit
NAME          READY  UP-TO-DATE  AVAILABLE  AGE
mailpit       2/2    2            2           10m
PS C:\Users\nmetreau> kubectl get pods -l app=mailpit
NAME                                READY  STATUS  RESTARTS  AGE
mailpit-7b96b48c5d-dmns9            1/1    Running  0          38s
mailpit-7b96b48c5d-k86pd            1/1    Running  0          10m
PS C:\Users\nmetreau>
```

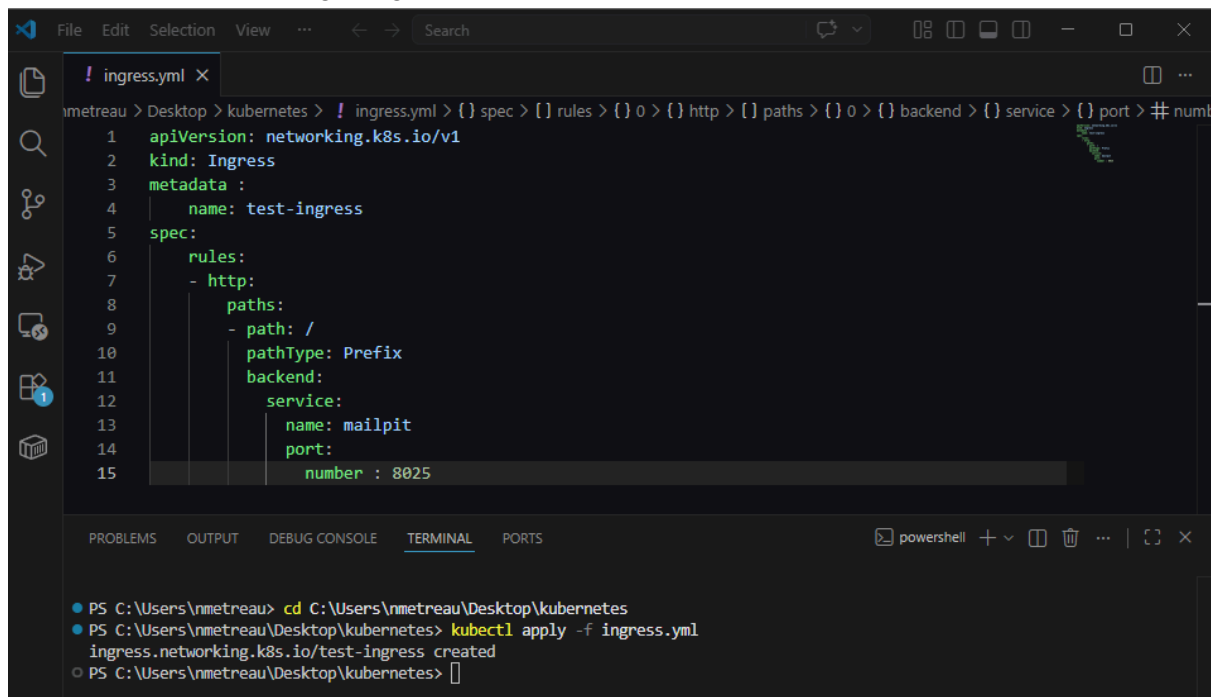
- Nous activons le contrôleur ingress dans minikube :

```
Administrateur : Windows Poi x + v - □ ×
PS C:\Users\nmetreau> minikube addons enable ingress
⚠ ingress est un addon maintenu par Kubernetes. Pour toute question, contactez minikube sur GitHub.
Vous pouvez consulter la liste des mainteneurs de minikube sur : https://github.com/kubernetes/minikube/blob/master/OWNERS
  ▪ Utilisation de l'image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.6.7
  ▪ Utilisation de l'image registry.k8s.io/ingress-nginx/controller:v1.14.3
  ▪ Utilisation de l'image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.6.7
🔍 Vérification du module ingress...
🌟 Le module 'ingress' est activé
PS C:\Users\nmetreau>
```

```
Administrateur : Windows Poi x + v - □ ×
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get namespace
NAME          STATUS  AGE
default       Active  50m
ingress-nginx Active  43s
kube-node-lease Active  50m
kube-public   Active  50m
kube-system   Active  50m
kubernetes-dashboard Active  42m
PS C:\Users\nmetreau>
```

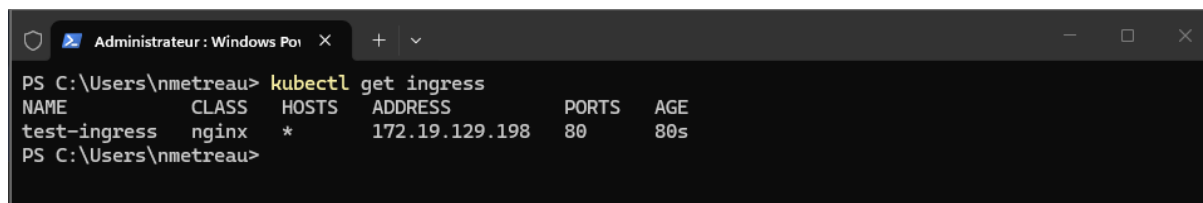
```
Administrateur : Windows Poi x + v - □ ×
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl -n ingress-nginx get pods -l app.kubernetes.io/name
NAME                                READY  STATUS  RESTARTS  AGE
ingress-nginx-admission-create-r8d7s  0/1    Completed  0          86s
ingress-nginx-admission-patch-zt8pw   0/1    Completed  0          86s
ingress-nginx-controller-596f8778bc-p2xtt 1/1    Running   0          86s
PS C:\Users\nmetreau>
```

- Nous déclarons une règle Ingress et prise en compte du fichier YAML :



```
1 apiVersion: networking.k8s.io/v1
2 kind: Ingress
3 metadata:
4   name: test-ingress
5 spec:
6   rules:
7   - http:
8     paths:
9     - path: /
10      pathType: Prefix
11      backend:
12        service:
13          name: mailpit
14          port:
15            number: 8025
```

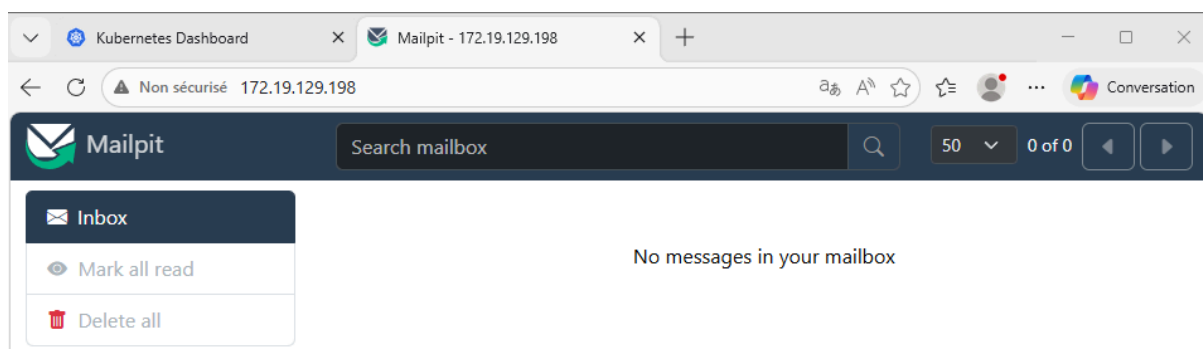
```
PS C:\Users\nmetreau> cd C:\Users\nmetreau\Desktop\kubernetes
PS C:\Users\nmetreau\Desktop\kubernetes> kubectl apply -f ingress.yaml
ingress.networking.k8s.io/test-ingress created
PS C:\Users\nmetreau\Desktop\kubernetes>
```



```
PS C:\Users\nmetreau> kubectl get ingress
NAME          CLASS  HOSTS          ADDRESS          PORTS  AGE
test-ingress  nginx  *              172.19.129.198  80     80s
```



```
PS C:\Users\nmetreau> minikube ip
172.19.129.198
```



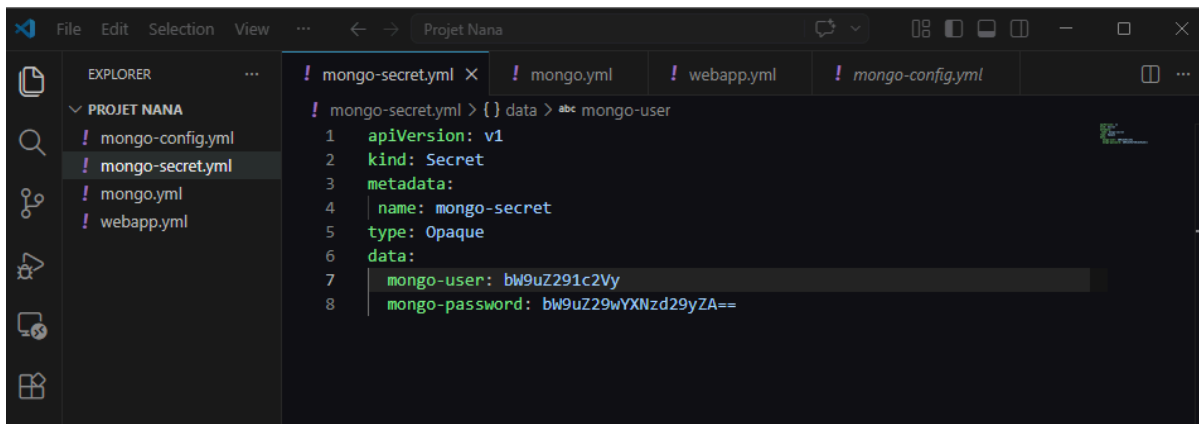
5. Automatisation de déploiement par fichier YAML.

- Création du fichier mongo-config.yml :



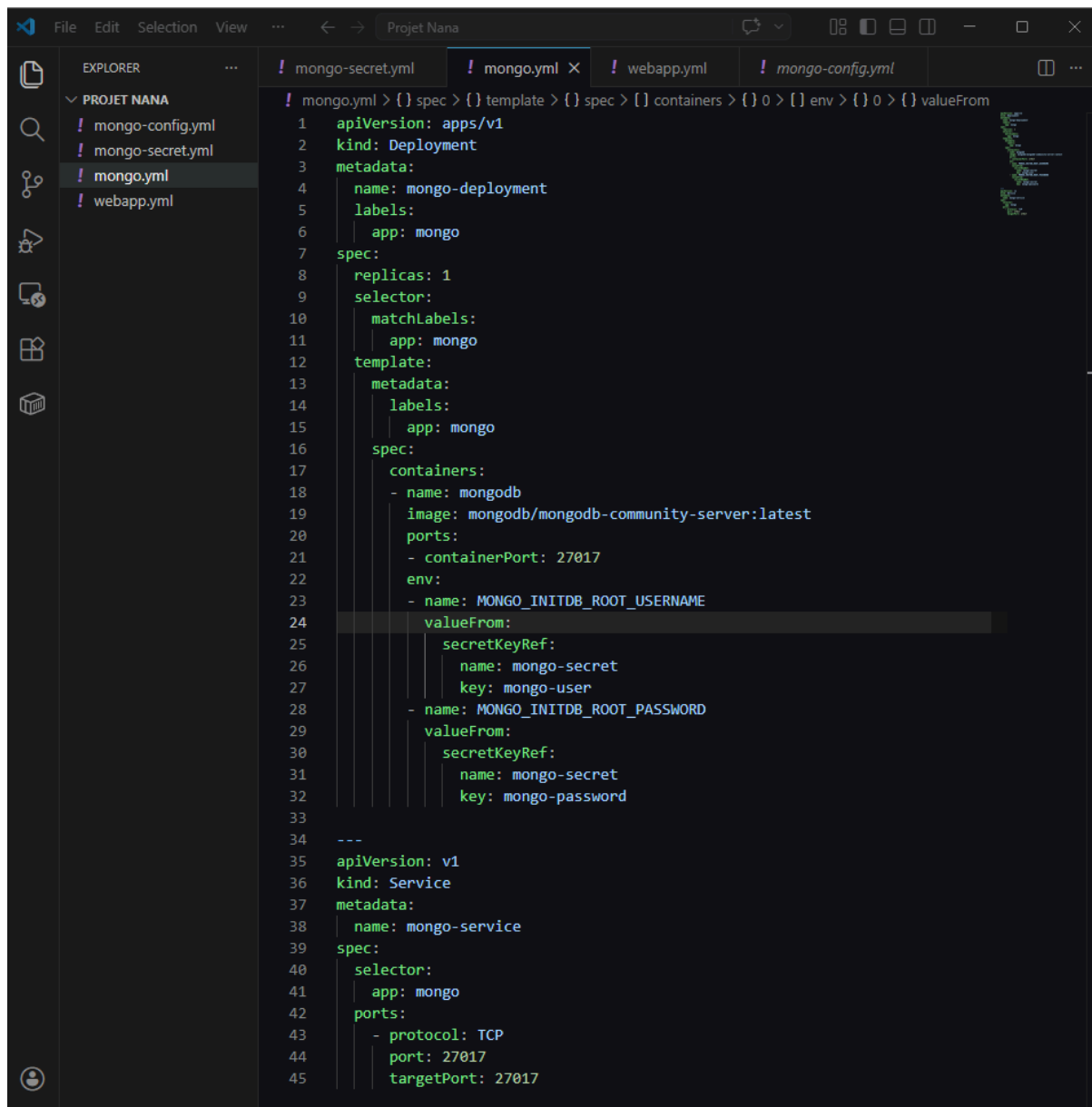
```
! mongo-config.yml
C: > Users > nmetreau > Desktop > Projet Nana > ! mongo-config.yml > {} data > abc mongo-url
1  apiVersion: v1
2  kind: ConfigMap
3  metadata:
4    name: mongo-config
5  data:
6    mongo-url: mongo-service
```

- Création du fichier mongo-secret.yml :



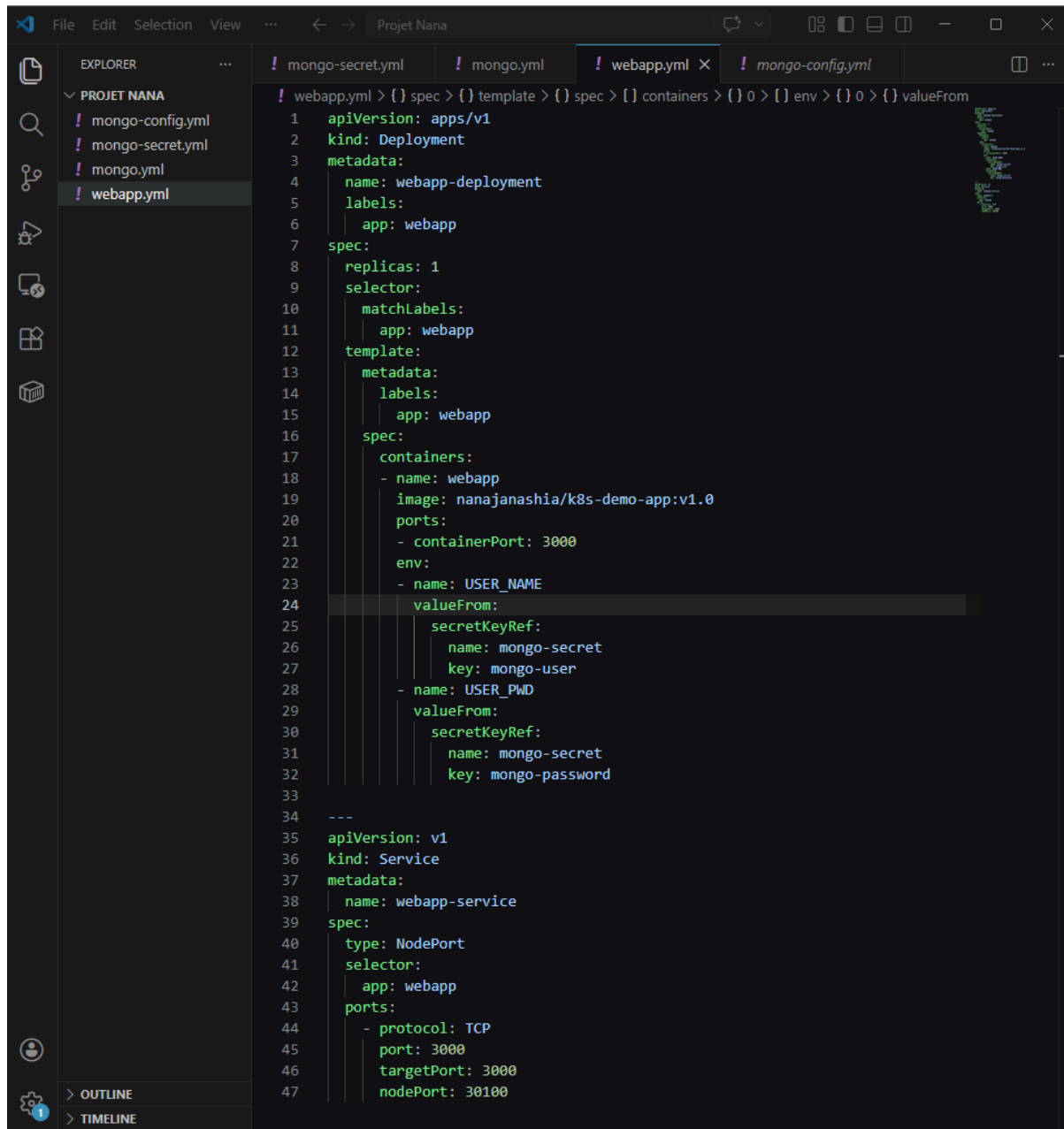
```
! mongo-secret.yml > {} data > abc mongo-user
1  apiVersion: v1
2  kind: Secret
3  metadata:
4    name: mongo-secret
5  type: Opaque
6  data:
7    mongo-user: bw9uZ291c2Vy
8    mongo-password: bw9uZ29wYXNzd29yZA==
```

▪ Création d'un service interne :



```
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    name: mongo-deployment
5    labels:
6      app: mongo
7  spec:
8    replicas: 1
9    selector:
10     matchLabels:
11       app: mongo
12   template:
13     metadata:
14       labels:
15         app: mongo
16     spec:
17       containers:
18         - name: mongodb
19           image: mongodb/mongodb-community-server:latest
20           ports:
21             - containerPort: 27017
22           env:
23             - name: MONGO_INITDB_ROOT_USERNAME
24               valueFrom:
25                 secretKeyRef:
26                   name: mongo-secret
27                   key: mongo-user
28             - name: MONGO_INITDB_ROOT_PASSWORD
29               valueFrom:
30                 secretKeyRef:
31                   name: mongo-secret
32                   key: mongo-password
33
34 ---
35 apiVersion: v1
36 kind: Service
37 metadata:
38   name: mongo-service
39 spec:
40   selector:
41     app: mongo
42   ports:
43     - protocol: TCP
44       port: 27017
45       targetPort: 27017
```

▪ Création d'un service externe



```
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    name: webapp-deployment
5    labels:
6      app: webapp
7  spec:
8    replicas: 1
9    selector:
10     matchLabels:
11       app: webapp
12   template:
13     metadata:
14       labels:
15         app: webapp
16     spec:
17       containers:
18         - name: webapp
19           image: nanajanashia/k8s-demo-app:v1.0
20           ports:
21             - containerPort: 3000
22           env:
23             - name: USER_NAME
24               valueFrom:
25                 secretKeyRef:
26                   name: mongo-secret
27                   key: mongo-user
28             - name: USER_PWD
29               valueFrom:
30                 secretKeyRef:
31                   name: mongo-secret
32                   key: mongo-password
33
34 ---
35 apiVersion: v1
36 kind: Service
37 metadata:
38   name: webapp-service
39 spec:
40   type: NodePort
41   selector:
42     app: webapp
43   ports:
44     - protocol: TCP
45       port: 3000
46       targetPort: 3000
47       nodePort: 30100
```

- Nous procédons à la création des composants en appliquant la commande kubectl apply -f aux 4 fichiers YAML dans l'ordre figurant ci-dessous :

```

! mongo-config.yml > {} data > abc mongo-url
1  apiVersion: v1
2  kind: ConfigMap
3  metadata:
4    name: mongo-config
5  data:
6    mongo-url: mongo-service

PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl apply -f mongo-config.yml
configmap/mongo-config unchanged
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl apply -f mongo-secret.yml
secret/mongo-secret unchanged
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl apply -f mongo.yml
deployment.apps/mongo-deployment unchanged
service/mongo-service unchanged
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl apply -f webapp.yml
deployment.apps/webapp-deployment created
service/webapp-service unchanged
PS C:\Users\nmetreau\Desktop\Projet Nana>

```

- Nous listons les objets créés :

```

PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl get all
NAME                                     READY   STATUS    RESTARTS   AGE
pod/mailpit-7b96b48c5d-dmns9            1/1     Running   0           48m
pod/mailpit-7b96b48c5d-k86pd            1/1     Running   0           58m
pod/mongo-deployment-744864fdd7-hmsbn   1/1     Running   0           2m19s
pod/webapp-deployment-5fb4b6fff9-1s54h  1/1     Running   0           37s

NAME                TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)          AGE
service/kubernetes  ClusterIP    10.96.0.1    <none>        443/TCP          96m
service/mailpit     ClusterIP    10.99.241.99 <none>        1025/TCP,8025/TCP 52m
service/mongo-service ClusterIP    10.99.118.86 <none>        27017/TCP        5m3s
service/webapp-service NodePort     10.100.91.192 <none>        3000:30100/TCP  111s

NAME                READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/mailpit  2/2     2             2           58m
deployment.apps/mongo-deployment  1/1     1             1           2m19s
deployment.apps/webapp-deployment  1/1     1             1           37s

NAME                DESIRED   CURRENT   READY   AGE
replicaset.apps/mailpit-7b96b48c5d  2         2         2       58m
replicaset.apps/mongo-deployment-744864fdd7  1         1         1       2m19s
replicaset.apps/webapp-deployment-5fb4b6fff9  1         1         1       37s
PS C:\Users\nmetreau\Desktop\Projet Nana>

```

- Nous listons les autres objets :

```
PS C:\Users\nmetreau\Desktop\Projet Nana>
PS C:\Users\nmetreau\Desktop\Projet Nana>
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl get configmap
NAME          DATA  AGE
kube-root-ca.crt  1      97m
mongo-config    1      13m
PS C:\Users\nmetreau\Desktop\Projet Nana>
```

- Nous décrivons le service webapp-service :

```
PS C:\Users\nmetreau\Desktop\Projet Nana>
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl describe service webapp-service
Name:          webapp-service
Namespace:     default
Labels:        <none>
Annotations:   <none>
Selector:      app=webapp
Type:          NodePort
IP Family Policy: SingleStack
IP Families:   IPv4
IP:            10.100.91.192
IPs:           10.100.91.192
Port:          <unset> 3000/TCP
TargetPort:    3000/TCP
NodePort:      <unset> 30100/TCP
Endpoints:     10.244.0.16:3000
Session Affinity: None
External Traffic Policy: Cluster
Internal Traffic Policy: Cluster
Events:        <none>
PS C:\Users\nmetreau\Desktop\Projet Nana>
```

- Nous décrivons le pod associé :

```
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl describe pod webapp-deployment-5fb4b6fff9-1s54h
Name:          webapp-deployment-5fb4b6fff9-1s54h
Namespace:     default
Priority:       0
Service Account: default
Node:          minikube/172.19.129.198
Start Time:    Thu, 30 Apr 2026 12:29:26 +0200
Labels:        app=webapp
               pod-template-hash=5fb4b6fff9
Annotations:   <none>
Status:        Running
IP:            10.244.0.16
IPs:           10.244.0.16
Controlled By: ReplicaSet/webapp-deployment-5fb4b6fff9
Containers:
  webapp:
    Container ID:  docker://3b5d5e164e74674f03f37c09262350e26ceeb1297b748bf464801a31e62c6130
    Image:          nanajanashia/k8s-demo-app:v1.0
    Image ID:       docker-pullable://nanajanashia/k8s-demo-app@sha256:6f554135da39ac00a1c2f43e44c2b0b54ca13d3d8044da969361e7781adb7f95
    Port:           3000/TCP
    Host Port:      0/TCP
    State:          Running
      Started:      Thu, 30 Apr 2026 12:29:35 +0200
      Ready:         True
      Restart Count: 0
    Environment:
      USER_NAME:    <set to the key 'mongo-user' in secret 'mongo-secret'> Optional: false
      USER_PWD:     <set to the key 'mongo-password' in secret 'mongo-secret'> Optional: false
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-gvsw5 (ro)
Conditions:
  Type                               Status
  PodReadyToStartContainers          True
  Initialized                         True
  Ready                               True
  ContainersReady                    True
  PodScheduled                        True
Volumes:
  kube-api-access-gvsw5:
    Type:          Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
```

- Nous consultons les logs de ce pod :

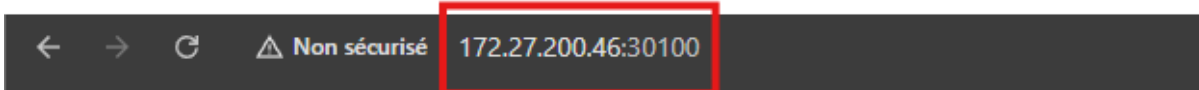
```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + v [ ] [ ] ... | [ ] [ ] X
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl get pod
NAME READY STATUS RESTARTS AGE
mailpit-7b96b48c5d-dmns9 1/1 Running 0 60m
mailpit-7b96b48c5d-k86pd 1/1 Running 0 70m
mongo-deployment-744864fdd7-hmsbn 1/1 Running 0 14m
webapp-deployment-5fb4b6fff9-1s54h 1/1 Running 0 12m
PS C:\Users\nmetreau\Desktop\Projet Nana> [ ]
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + v [ ] [ ] ... | [ ] [ ] X
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl get pod
NAME READY STATUS RESTARTS AGE
mailpit-7b96b48c5d-dmns9 1/1 Running 0 60m
mailpit-7b96b48c5d-k86pd 1/1 Running 0 70m
mongo-deployment-744864fdd7-hmsbn 1/1 Running 0 14m
webapp-deployment-5fb4b6fff9-1s54h 1/1 Running 0 12m
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl webapp-deployment-5fb4b6fff9-1s54h
error: unknown command "webapp-deployment-5fb4b6fff9-1s54h" for "kubectl"
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl logs webapp-deployment-5fb4b6fff9-1s54h
app listening on port 3000!
PS C:\Users\nmetreau\Desktop\Projet Nana> [ ]
```

```
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl logs webapp-deployment-5fb4b6fff9-1s54h -f
app listening on port 3000!
[ ]
```

- Nous listons les services :

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + v [ ] [ ] ... | [ ] [ ] X
PS C:\Users\nmetreau\Desktop\Projet Nana> kubectl get service
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
kubernetes ClusterIP 10.96.0.1 <none> 443/TCP 110m
mailpit ClusterIP 10.99.241.99 <none> 1025/TCP,8025/TCP 66m
mongo-service ClusterIP 10.99.118.86 <none> 27017/TCP 18m
webapp-service NodePort 10.100.91.192 <none> 3000:30100/TCP 15m
PS C:\Users\nmetreau\Desktop\Projet Nana> [ ]
```



User profile



Name: **Anna Smith**

Email: **anna.smith@example.com**

Interests: **coding**

Edit Profile

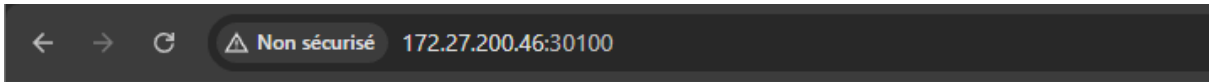
User profile



Name:

Email:

Interests:



User profile



Name: **Bison Futé**

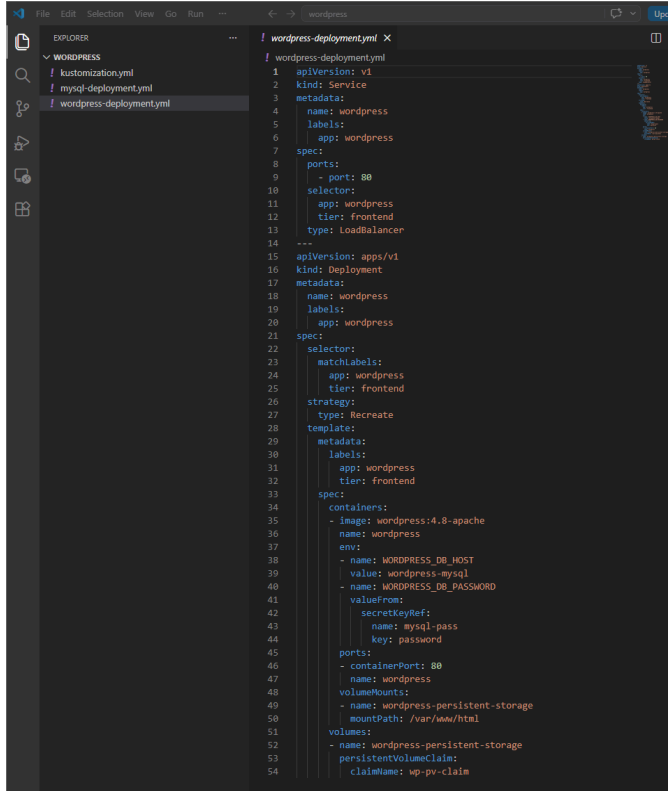
Email:

Interests: **DEVOPS**

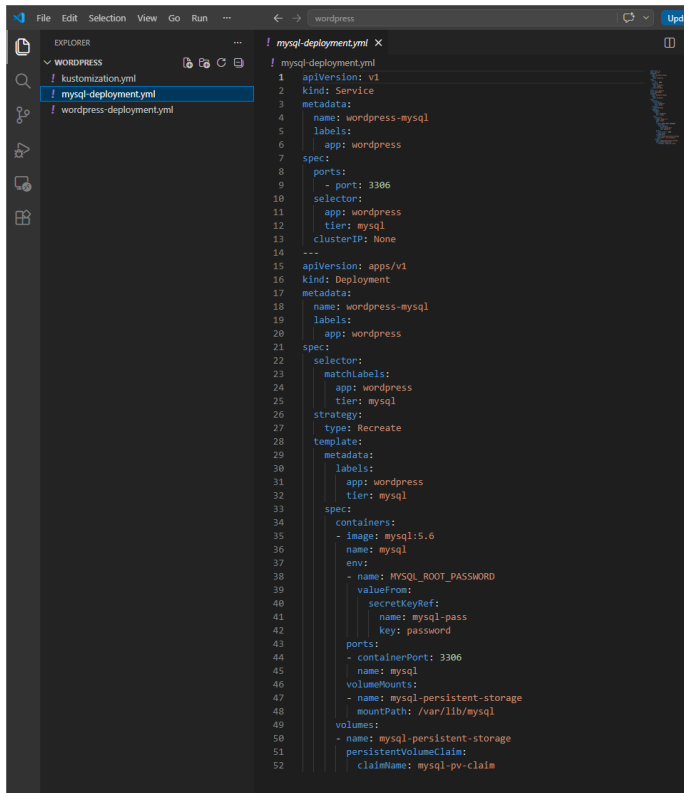
Edit Profile

6. Application.

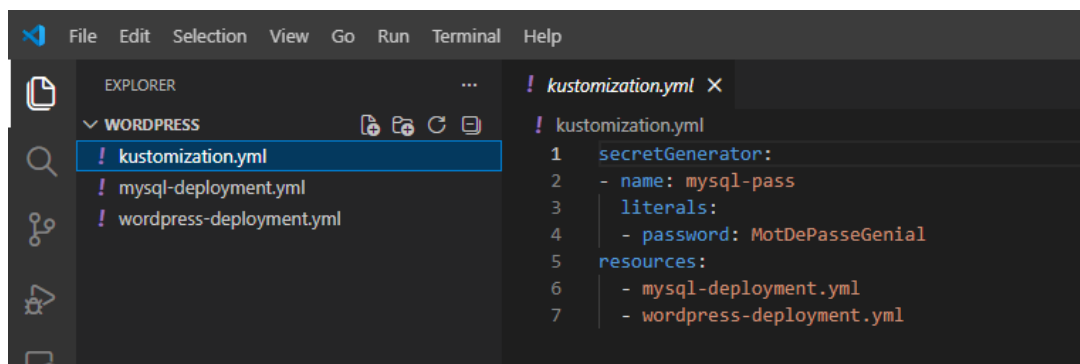
- Nous créons les différents fichiers nécessaire au déploiement de wordpress



```
1 apiVersion: v1
2 kind: Service
3 metadata:
4   name: wordpress
5   labels:
6     app: wordpress
7 spec:
8   ports:
9     - port: 80
10  selector:
11    app: wordpress
12    tier: frontend
13  type: LoadBalancer
14 ---
15 apiVersion: apps/v1
16 kind: Deployment
17 metadata:
18   name: wordpress
19   labels:
20     app: wordpress
21 spec:
22   selector:
23     matchLabels:
24       app: wordpress
25     tier: frontend
26   strategy:
27     type: Recreate
28   template:
29     metadata:
30       labels:
31         app: wordpress
32         tier: frontend
33     spec:
34       containers:
35         - image: wordpress:4.8-apache
36           name: wordpress
37           env:
38             - name: WORDPRESS_DB_HOST
39               value: wordpress-mysql
40             - name: WORDPRESS_DB_PASSWORD
41               valueFrom:
42                 secretKeyRef:
43                   name: mysql-pass
44                   key: password
45           ports:
46             - containerPort: 80
47             name: wordpress
48           volumeMounts:
49             - name: wordpress-persistent-storage
50               mountPath: /var/www/html
51           volumes:
52             - name: wordpress-persistent-storage
53               persistentVolumeClaim:
54                 claimName: wp-pv-claim
```

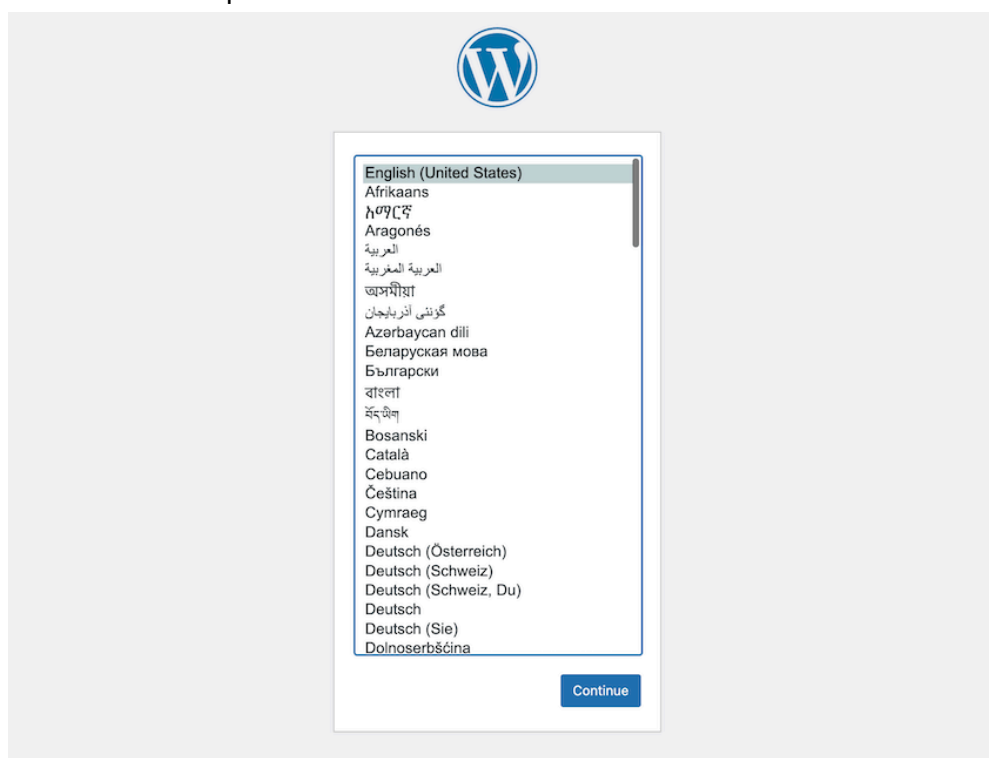


```
1 apiVersion: v1
2 kind: Service
3 metadata:
4   name: wordpress-mysql
5   labels:
6     app: wordpress
7 spec:
8   ports:
9     - port: 3306
10  selector:
11    app: wordpress
12    tier: mysql
13  clusterIP: None
14 ---
15 apiVersion: apps/v1
16 kind: Deployment
17 metadata:
18   name: wordpress-mysql
19   labels:
20     app: wordpress
21 spec:
22   selector:
23     matchLabels:
24       app: wordpress
25     tier: mysql
26   strategy:
27     type: Recreate
28   template:
29     metadata:
30       labels:
31         app: wordpress
32         tier: mysql
33     spec:
34       containers:
35         - image: mysql:5.6
36           name: mysql
37           env:
38             - name: MYSQL_ROOT_PASSWORD
39               valueFrom:
40                 secretKeyRef:
41                   name: mysql-pass
42                   key: password
43           ports:
44             - containerPort: 3306
45             name: mysql
46           volumeMounts:
47             - name: mysql-persistent-storage
48               mountPath: /var/lib/mysql
49           volumes:
50             - name: mysql-persistent-storage
51               persistentVolumeClaim:
52                 claimName: mysql-pv-claim
```



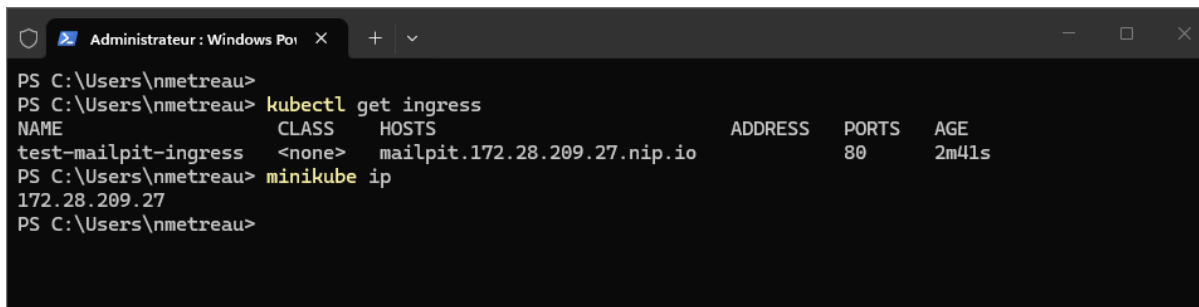
```
File Edit Selection View Go Run Terminal Help
EXPLORER
WORDPRESS
! kustomization.yaml
! mysql-deployment.yaml
! wordpress-deployment.yaml
! kustomization.yaml X
! kustomization.yaml
1 secretGenerator:
2 - name: mysql-pass
3   literals:
4     - password: MotDePasseGenial
5 resources:
6 - mysql-deployment.yaml
7 - wordpress-deployment.yaml
```

- Nous vérifions que cela marche



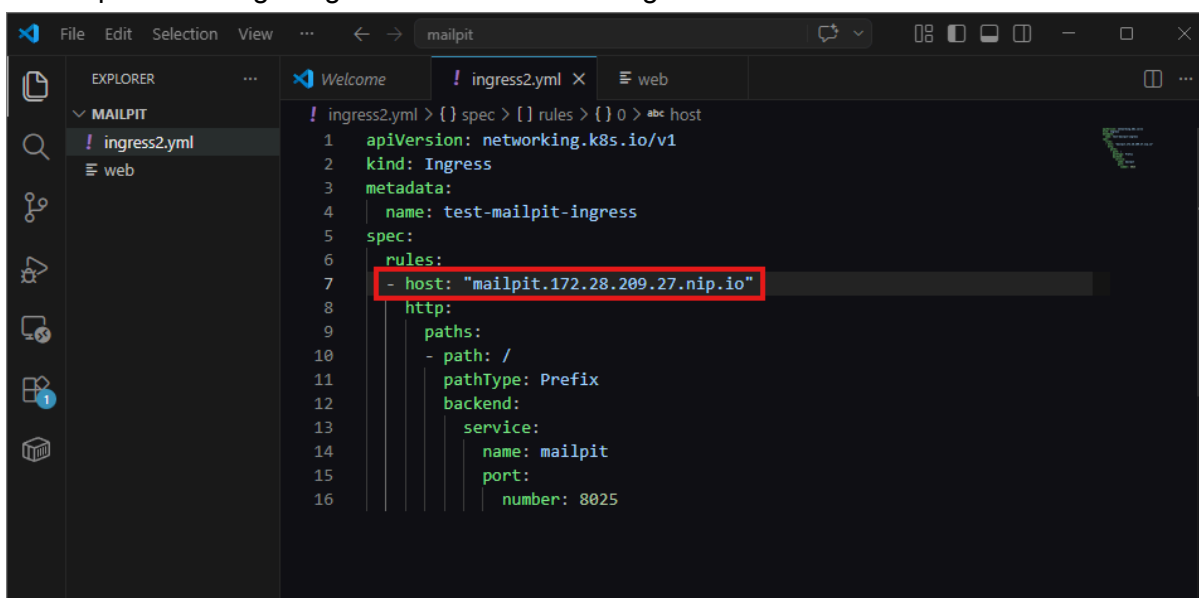
7. Suite Ingress (Mailpit) : hôtes virtuels et nom de domaine nip.io

- Récupération des informations sur les objets ingress :



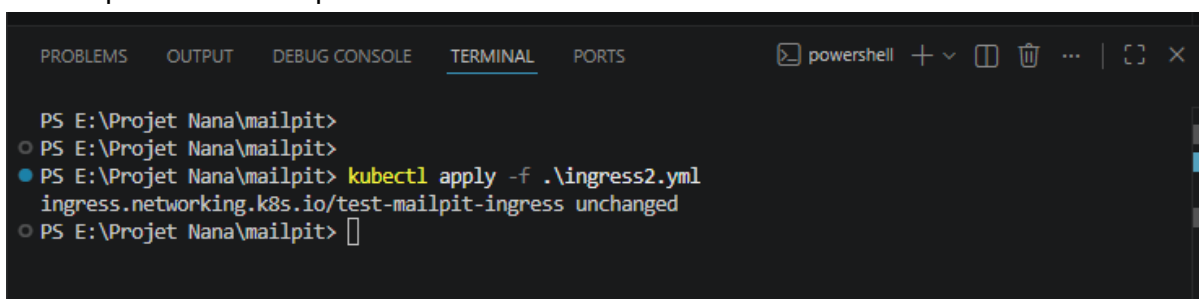
```
PS C:\Users\nmetreau> kubectl get ingress
NAME                CLASS    HOSTS                                ADDRESS    PORTS    AGE
test-mailpit-ingress <none>  mailpit.172.28.209.27.nip.io        172.28.209.27  80      2m41s
PS C:\Users\nmetreau> minikube ip
172.28.209.27
PS C:\Users\nmetreau>
```

- Nous créons un hôte virtuel pour Mailpit : modification du contenu du fichier ingress.yaml afin de pointer la règle Ingress sur l'entrée DNS figurant ci-dessus :



```
1  apiVersion: networking.k8s.io/v1
2  kind: Ingress
3  metadata:
4    name: test-mailpit-ingress
5  spec:
6    rules:
7    - host: "mailpit.172.28.209.27.nip.io"
8      http:
9        paths:
10       - path: /
11         pathType: Prefix
12         backend:
13           service:
14             name: mailpit
15             port:
16               number: 8025
```

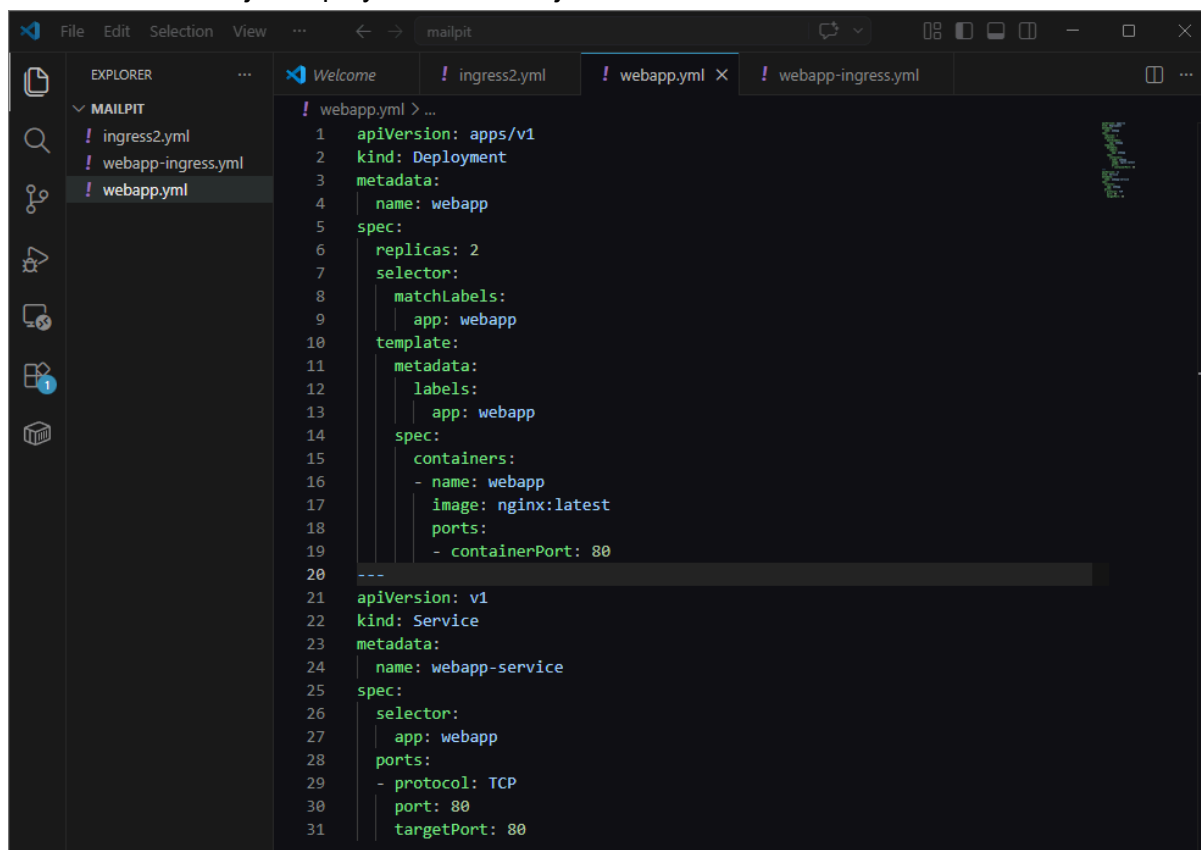
- Nous prenons en compte de la modification :



```
PS E:\Projet Nana\mailpit> kubectl apply -f .\ingress2.yaml
ingress.networking.k8s.io/test-mailpit-ingress unchanged
PS E:\Projet Nana\mailpit>
```

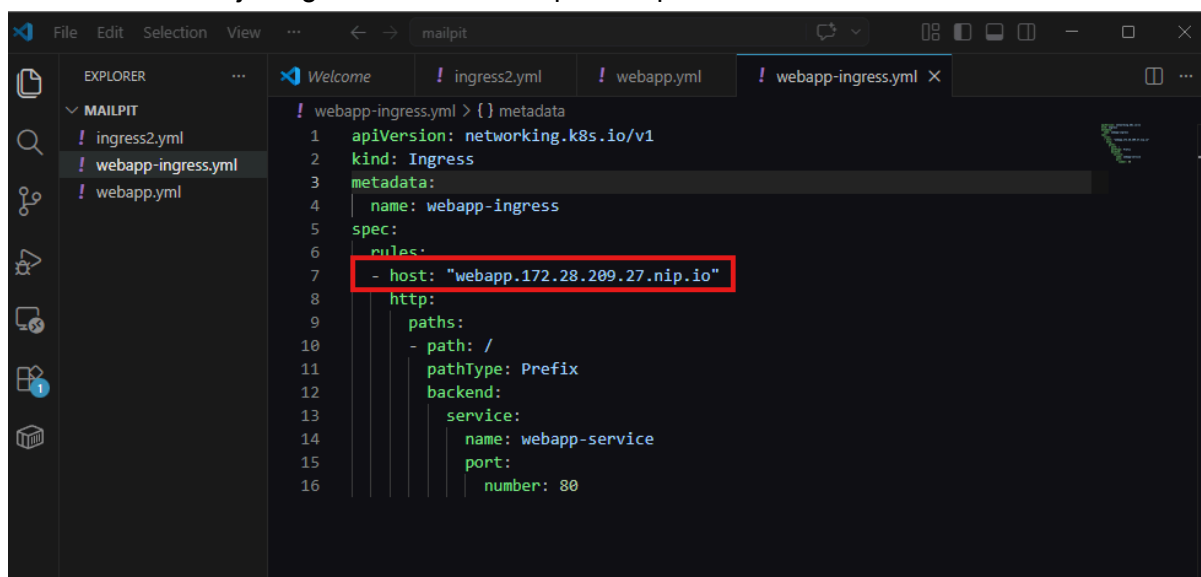
8. Hôtes virtuels et nom de domaine nip.io : autre exemple

- Création d'un objet Deployment et un objet Service :



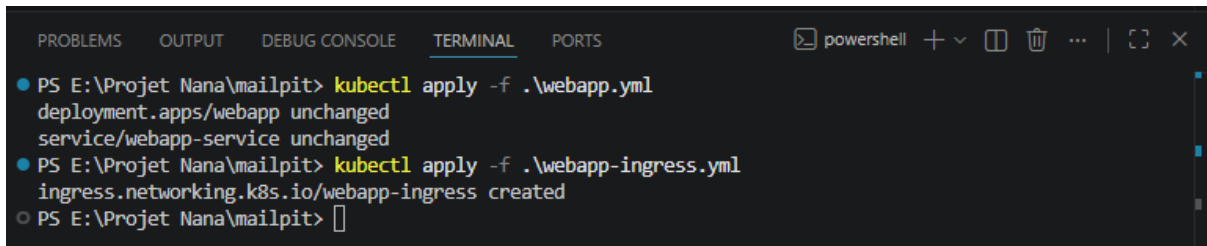
```
! webapp.yml > ...
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    name: webapp
5  spec:
6    replicas: 2
7    selector:
8      matchLabels:
9        app: webapp
10   template:
11     metadata:
12       labels:
13         app: webapp
14     spec:
15       containers:
16         - name: webapp
17           image: nginx:latest
18           ports:
19             - containerPort: 80
20 ---
21 apiVersion: v1
22 kind: Service
23 metadata:
24   name: webapp-service
25 spec:
26   selector:
27     app: webapp
28   ports:
29     - protocol: TCP
30       port: 80
31       targetPort: 80
```

- Création d'un objet Ingress avec le champ host spécifiant le nom d'hôte virtuel



```
! webapp-ingress.yml > {} metadata
1  apiVersion: networking.k8s.io/v1
2  kind: Ingress
3  metadata:
4    name: webapp-ingress
5  spec:
6    rules:
7      - host: "webapp.172.28.209.27.nip.io"
8      http:
9        paths:
10         - path: /
11           pathType: Prefix
12           backend:
13             service:
14               name: webapp-service
15               port:
16                 number: 80
```

- Nous prenons en compte de 2 fichiers YAML et test :



```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + - [ ] [ ] ... | [ ] [ ] X
● PS E:\Projet Nana\mailpit> kubectl apply -f .\webapp.yml
deployment.apps/webapp unchanged
service/webapp-service unchanged
● PS E:\Projet Nana\mailpit> kubectl apply -f .\webapp-ingress.yml
ingress.networking.k8s.io/webapp-ingress created
○ PS E:\Projet Nana\mailpit> [ ]
```

9. Cycle de vie d'un conteneur dans Kubernetes

- Nous consultons l'état des pods de l'application :

```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get pods -l app=mailpit
NAME                READY   STATUS    RESTARTS   AGE
mailpit-7b96b48c5d-6p4p2  1/1    Running   1 (3m40s ago)  45m
PS C:\Users\nmetreau>
```

- Nous consultons l'état des pods de l'application portant le label app=mailpit :

```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau> kubectl exec -it deployment/mailpit -- sh
/ # ps -ef
PID   USER     TIME   COMMAND
  1  root      0:00  /mailpit
 13  root      0:00  sh
 19  root      0:00  ps -ef
/ # mkdir /tmp/test
/ # ls -ld /tmp/test
drwxr-xr-x  2 root   root    4096 May  6 13:45 /tmp/test
/ # kill l
sh: invalid number 'l'
/ # kill 1
/ # command terminated with exit code 137
PS C:\Users\nmetreau>
```

- Nous consultons l'état des pods de l'application :

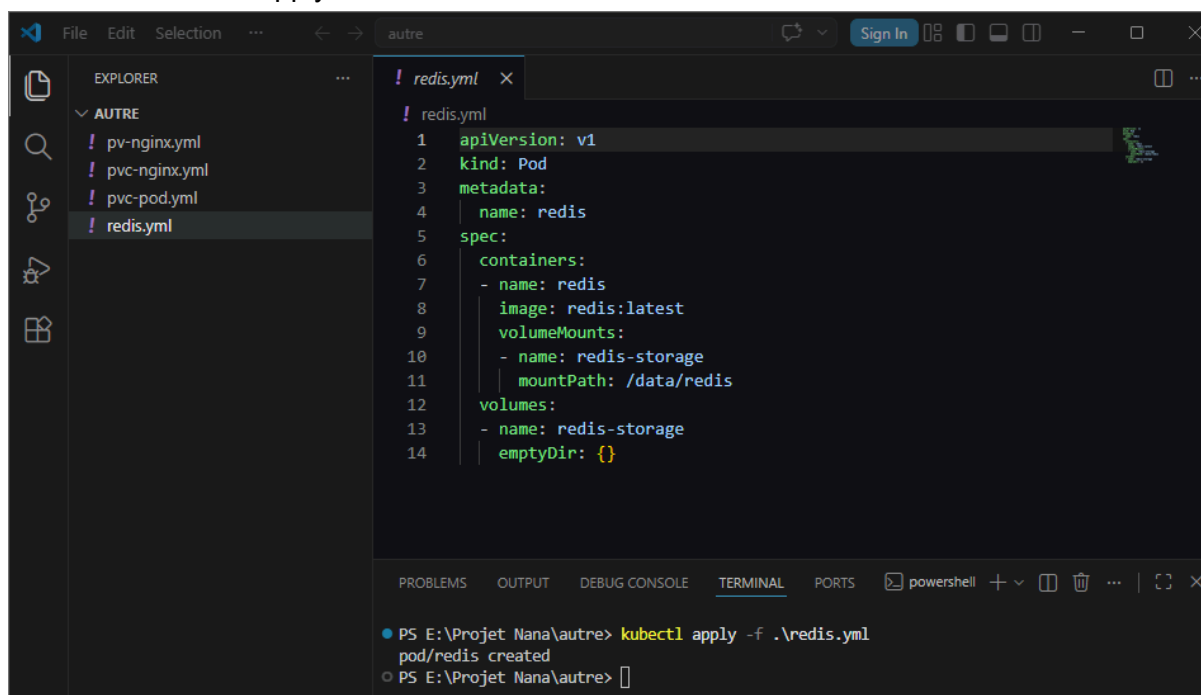
```
PS C:\Users\nmetreau> kubectl get pods -l app=mailpit
NAME                READY   STATUS    RESTARTS   AGE
mailpit-7b96b48c5d-wbbj5  1/1    Running   1 (53s ago)  104s
PS C:\Users\nmetreau>
```

- Nous lançons à nouveau une connexion sur le conteneur Mailpit. Le répertoire /tmp/test n'est plus présent :

```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl exec -it deployment/mailpit -- sh
/ # ls -ld /tmp/test
ls: /tmp/test: No such file or directory
/ # exit
command terminated with exit code 1
PS C:\Users\nmetreau>
```

10. Persistance des données

- Nous créons le fichier de configuration du Pod redis.yaml et nous créons le pod avec la commande kubectl apply -f :

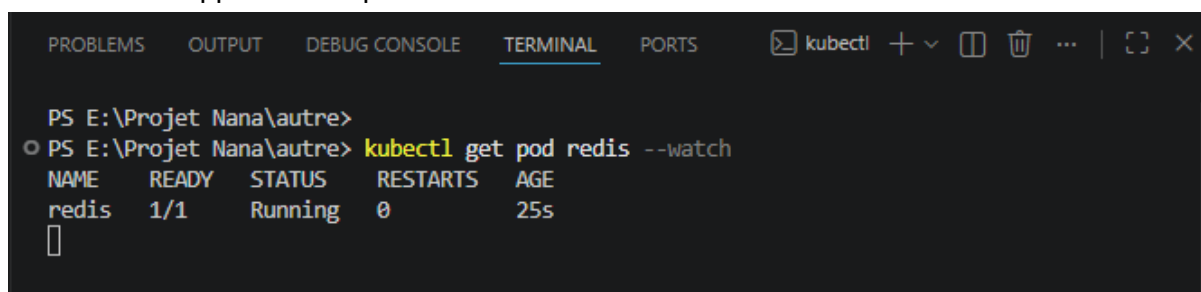


The screenshot shows the Visual Studio Code interface. The Explorer pane on the left shows a file named 'redis.yaml' under a folder named 'AUTRE'. The main editor displays the content of 'redis.yaml' with the following YAML configuration:

```
1 apiVersion: v1
2 kind: Pod
3 metadata:
4   name: redis
5 spec:
6   containers:
7     - name: redis
8       image: redis:latest
9       volumeMounts:
10        - name: redis-storage
11          mountPath: /data/redis
12   volumes:
13     - name: redis-storage
14       emptyDir: {}
```

The Terminal pane at the bottom shows the execution of the command `kubectl apply -f .\redis.yaml`, resulting in the output: `pod/redis created`.

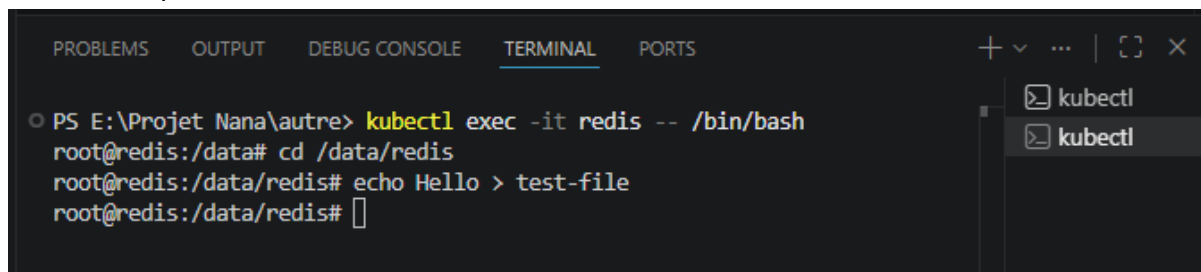
- Nous vérifions que le conteneur du pod soit en cours d'exécution puis nous surveillons les modifications apportées au pod :



The screenshot shows a terminal window with the following output:

```
PS E:\Projet Nana\autre> kubectl get pod redis --watch
NAME     READY   STATUS    RESTARTS   AGE
redis    1/1     Running   0           25s
```

- Dans un second terminal, nous accédons à la console shell du conteneur en cours d'exécution puis nous créons un fichier dans /data/redis/ :



The screenshot shows a terminal window with the following output:

```
PS E:\Projet Nana\autre> kubectl exec -it redis -- /bin/bash
root@redis:/data# cd /data/redis
root@redis:/data/redis# echo Hello > test-file
root@redis:/data/redis#
```

- Nous installons procps, puis listons les processus en cours d'exécution :

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS kubectl + - [ ] [ ] ... [ ] [ ] X
root@redis:/data/redis#
root@redis:/data/redis# apt-get update
Get:1 http://deb.debian.org/debian trixie InRelease [140 kB]
Get:2 http://deb.debian.org/debian trixie-updates InRelease [47.3 kB]
Get:3 http://deb.debian.org/debian-security trixie-security InRelease [43.4 kB]
Get:4 http://deb.debian.org/debian trixie/main amd64 Packages [9671 kB]
Get:5 http://deb.debian.org/debian trixie-updates/main amd64 Packages [5412 B]
Get:6 http://deb.debian.org/debian-security trixie-security/main amd64 Packages [132 kB]
Fetched 10.0 MB in 1s (9657 kB/s)
Reading package lists... Done
root@redis:/data/redis#
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS kubectl + - [ ] [ ] ... [ ] [ ] X
root@redis:/data/redis#
root@redis:/data/redis# apt-get install procps
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libgpm2 libncursesw6 libproc2-0 linux-sysctl-defaults psmisc
Suggested packages:
  gpm
The following NEW packages will be installed:
  libgpm2 libncursesw6 libproc2-0 linux-sysctl-defaults procps psmisc
0 upgraded, 6 newly installed, 0 to remove and 0 not upgraded.
Need to get 1370 kB of archives.
After this operation, 4163 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS kubectl + - [ ] [ ] ... [ ] [ ] X
root@redis:/data/redis#
root@redis:/data/redis#
root@redis:/data/redis# ps aux
USER      PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
redis     1  0.0  0.3 160376 23296 ?        Ssl   09:05   0:00 redis-server *:6379
root      29  0.0  0.0   4320  3712 pts/0    Ss    09:06   0:00 /bin/bash
root      71  0.0  0.0     0     0 pts/0    Z     09:07   0:00 [dpkg-preconfigu] <defun
root     161  0.0  0.0   6388  3712 pts/0    R+    09:07   0:00 ps aux
root@redis:/data/redis#
```


▪ Création d'un PersistentVolume de type hostpath

```
1 apiVersion: v1
2 kind: PersistentVolume
3 metadata:
4   name: pv-nginx
5   labels:
6     type: local
7 spec:
8   storageClassName: manual
9   capacity:
10    storage: 10Mi
11   accessModes:
12    - ReadWriteOnce
13   hostPath:
14    path: "/mnt/data"
```

```
PS E:\Projet Nana\autre> kubectl apply -f .\pv-nginx.yml
persistentvolume/pv-nginx created
PS E:\Projet Nana\autre>
```

```
PS E:\Projet Nana\autre> kubectl get pv pv-nginx
NAME          CAPACITY  ACCESS MODES  RECLAIM POLICY  STATUS   CLAIM   STORAGECLASS  VOLUMEATTRIBUTESCLASS  AGE
pv-nginx     10Mi     RWO           Retain          Available             manual                29s
```

▪ Création d'un PersistentVolumeClaim :

```
1 apiVersion: v1
2 kind: PersistentVolumeClaim
3 metadata:
4   name: task-pv-claim
5 spec:
6   storageClassName: manual
7   accessModes:
8    - ReadWriteOnce
9   resources:
10    requests:
11     storage: 10Mi
12   volumeName: pv-nginx
```

```
PS E:\Projet Nana\autre> kubectl apply -f .\pvc-nginx.yml
persistentvolumeclaim/task-pv-claim created
PS E:\Projet Nana\autre>
```

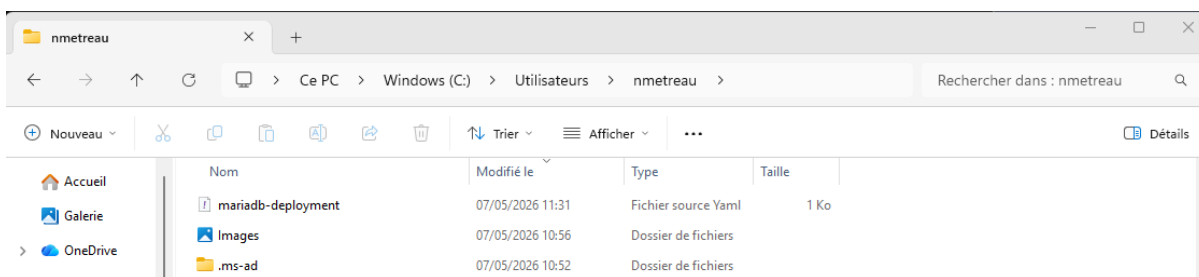


```
PS E:\Projet Nana\autre>
PS E:\Projet Nana\autre> kubectl describe pod task-pv-pod
Name:          task-pv-pod
Namespace:    default
Priority:      0
Service Account: default
Node:         minikube/172.28.158.3
Start Time:   Thu, 07 May 2026 11:24:35 +0200
Labels:       <none>
Annotations:  <none>
Status:       Running
IP:           10.244.0.8
IPs:
  IP: 10.244.0.8
Containers:
  task-pv-container:
    Container ID:  docker://0b3c866c7dd75695e7a5cb264afd7d1c282c00eeabab116cb8574a3eb1745fca
    Image:         nginx:latest
    Image ID:     docker-pullable://nginx@sha256:6e23479198b998e5e25921dff8455837c7636a67111a04a635cf1bb363d199dc
    Port:         80/TCP (http-server)
    Host Port:    0/TCP (http-server)
    State:        Running
      Started:    Thu, 07 May 2026 11:24:37 +0200
      Ready:      True
      Restart Count: 0
    Environment:  <none>
    Mounts:
      /usr/share/nginx/html from task-pv-storage (rw)
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-xt6nf (ro)
Conditions:
  Type                               Status
  PodReadyToStartContainers         True
  Initialized                         True
  Ready                              True
  ContainersReady                   True
  PodScheduled                       True
Volumes:
  task-pv-storage:
    Type: PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
    ClaimName: task-pv-claim
    ReadOnly: false
  kube-api-access-xt6nf:
    Type: Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
    ConfigMapName: kube-root-ca.crt
    Optional: false
    DownwardAPI: true
QoS Class:                           BestEffort
Node-Selectors:                       <none>
Tolerations:                          node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                                       node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
```


11. Hébergement d'un groupe de pods fonctionnant en cluster

- Version initiale du fichier de déploiement mariadb-deployment.yaml :

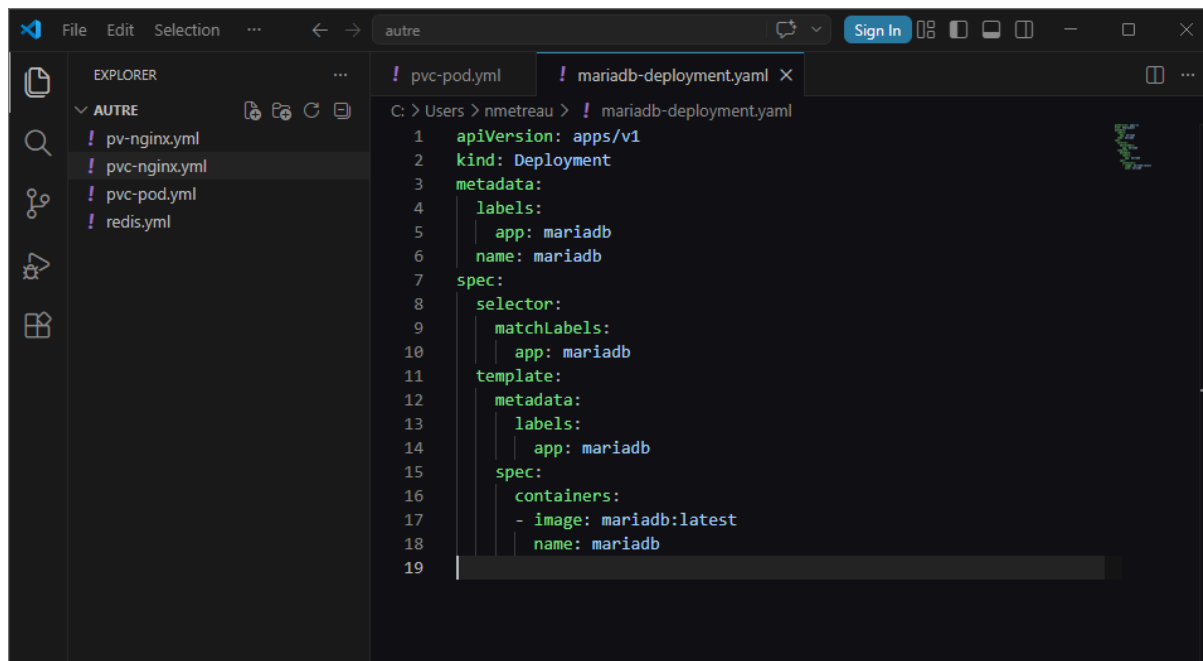
```
Administrateur : Windows Poi x + v
PS C:\Users\nmetreau> kubectl create deployment mariadb --image=mariadb:latest --dry-run=client --outp
ut yml > mariadb-deployment.yaml
PS C:\Users\nmetreau>
```



- Suppression des champs inutiles :

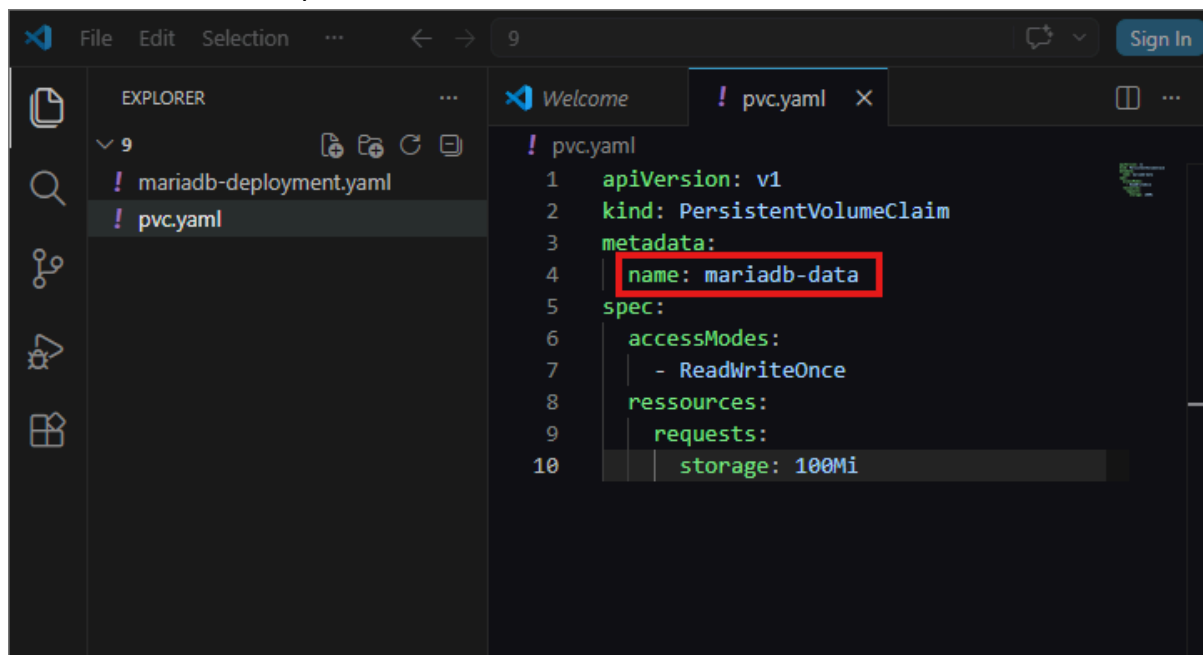
```
File Edit Selection ... autre Sign In
EXPLORER
AUTRE
! pv-nginx.yml
! pvc-nginx.yml
! pvc-pod.yml
! redis.yml
! mariadb-deployment.yaml x
C:\Users\nmetreau> ! mariadb-deployment.yaml
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    labels:
5      app: mariadb
6  name: mariadb
7  spec:
8    replicas: 1
9  selector:
10   matchLabels:
11     app: mariadb
12   strategy: {}
13  template:
14   metadata:
15     labels:
16       app: mariadb
17   spec:
18     containers:
19       - image: mariadb:latest
20         name: mariadb
21       resources: {}
22   status: {}
23
```

▪ Contenu après modification :

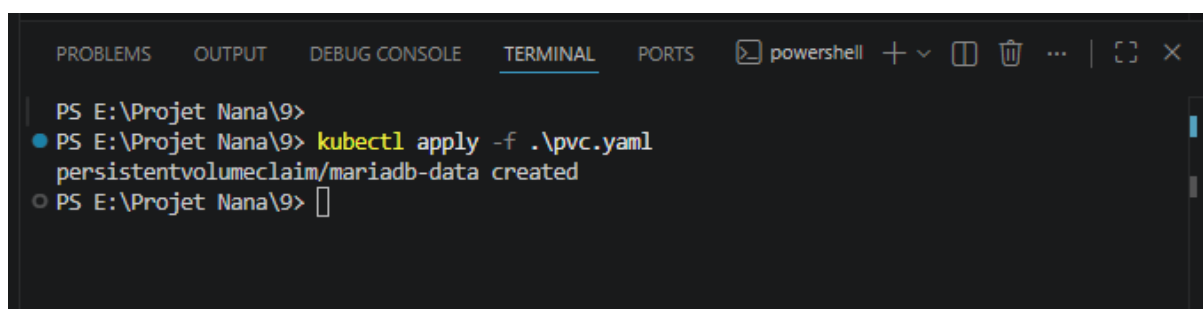


```
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    labels:
5      app: mariadb
6    name: mariadb
7  spec:
8    selector:
9      matchLabels:
10       app: mariadb
11  template:
12    metadata:
13      labels:
14        app: mariadb
15    spec:
16      containers:
17        - image: mariadb:latest
18          name: mariadb
19
```

▪ Demande de volume persistant :



```
1  apiVersion: v1
2  kind: PersistentVolumeClaim
3  metadata:
4    name: mariadb-data
5  spec:
6    accessModes:
7      - ReadWriteOnce
8    resources:
9      requests:
10       storage: 100Mi
```



```
PS E:\Projet Nana\9>
● PS E:\Projet Nana\9> kubectl apply -f .\pvc.yaml
persistentvolumeclaim/mariadb-data created
○ PS E:\Projet Nana\9>
```



```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS E:\Projet Nana\9>
PS E:\Projet Nana\9> kubectl logs -l app=mariadb
2026-05-07 09:51:44+00:00 [Note] [Entrypoint]: Entrypoint script for MariaDB Server 1:12.2.2+maria-ubu2404 started.
2026-05-07 09:51:45+00:00 [Warn] [Entrypoint]: /sys/fs/cgroup//memory.pressure not writable, functionality unavailable to MariaDB
2026-05-07 09:51:45+00:00 [Note] [Entrypoint]: Switching to dedicated user 'mysql'
2026-05-07 09:51:45+00:00 [Note] [Entrypoint]: Entrypoint script for MariaDB Server 1:12.2.2+maria-ubu2404 started.
2026-05-07 09:51:45+00:00 [ERROR] [Entrypoint]: Database is uninitialized and password option is not specified
You need to specify one of MARIADB_ROOT_PASSWORD, MARIADB_ROOT_PASSWORD_HASH, MARIADB_ALLOW_EMPTY_ROOT_PASSWORD and MARIADB_RANDOM_ROOT_PASSWORD
PS E:\Projet Nana\9>
```

- Lors du premier démarrage, MariaDB a besoin de connaître le mot de passe de l'administrateur (champ env dans la définition du conteneur) :

```
! pvc.yaml x ! mariadb-deployment.yaml x
! mariadb-deployment.yaml
1  apiVersion: apps/v1
2  kind: Deployment
3  metadata:
4    labels:
5      app: mariadb
6    name: mariadb
7  spec:
8    selector:
9      matchLabels:
10     app: mariadb
11   template:
12     metadata:
13       labels:
14         app: mariadb
15     spec:
16       volumes:
17         - name: mariadb-data
18           persistentVolumeClaim:
19             claimName: mariadb-data
20     containers:
21       - image: mariadb:latest
22         name: mariadb
23         volumeMounts:
24           - mountPath: /var/lib/mysql
25             name: mariadb-data
26         env:
27           - name: MARIADB_ROOT_PASSWORD
28             value: mot-de-pass-root
```

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
● PS E:\Projet Nana\9> kubectl apply -f .\mariadb-deployment.yaml
deployment.apps/mariadb configured
○ PS E:\Projet Nana\9>
```


▪ Surveillance de la base de données :

```
22     name: mariadb
23     volumeMounts:
24     - mountPath: /var/lib/mysql
25       name: mariadb-data
26     env:
27     - name: MARIADB_ROOT_PASSWORD
28       value: mot-de-pass-root
29     startupProbe: &probe
30     exec:
31     command:
32     - "sh"
33     - "-c"
34     - "mariadb-admin status -p$MARIADB_ROOT_PASSWORD"
35     livenessProbe: *probe
36     readinessProbe: *probe
```

```
PS E:\Projet Nana\9> kubectl apply -f .\mariadb-deployment.yaml
deployment.apps/mariadb configured
PS E:\Projet Nana\9>
```

```
PS E:\Projet Nana\9> kubectl get pod -l app=mariadb
NAME                                READY   STATUS    RESTARTS   AGE
mariadb-7b5b7797dd-fw6th           0/1     Running   3 (23s ago) 118s
mariadb-b5tt7tt4t-htj/2           1/1     Running   0             14m
PS E:\Projet Nana\9>
```

```
PS E:\Projet Nana\9> kubectl describe pods mariadb-7b5b7797dd-fw6th
Name:          mariadb-7b5b7797dd-fw6th
Namespace:     default
Priority:       0
Service Account: default
Node:          minikube/172.28.158.3
Start Time:    Thu, 07 May 2026 12:07:01 +0200
Labels:        app=mariadb
                pod-template-hash=7b5b7797dd
Annotations:   <none>
Status:        Running
IP:            10.244.0.11
IPs:
  IP:          10.244.0.11
Controlled By: ReplicaSet/mariadb-7b5b7797dd
Containers:
  mariadb:
    Container ID:  docker://a88b0402f5ec2eb235da14470243f7b108948965c2ac9e5f8ad63da44c45c3ed
    Image:         mariadb:latest
    Image ID:      docker-pullable://mariadb@sha256:e0236fc6386e7eacd9359e59d0a078bd7aa0d18280d36d13061121bedeae903
    Port:         <none>
    Host Port:    <none>
    State:        Waiting
      Reason:     CrashLoopBackOff
    Last State:   Terminated
      Reason:     Error
      Exit Code:  1
      Started:    Thu, 07 May 2026 12:09:09 +0200
      Finished:   Thu, 07 May 2026 12:09:40 +0200
    Ready:        False
    Restart Count: 4
    Liveness:     exec [sh -c mariadb-admin status -p$MARIADB_ROOT_PASSWORD] delay=0s timeout=1s
                  period=10s #success=1 #failure=3
    Readiness:    exec [sh -c mariadb-admin status -p$MARIADB_ROOT_PASSWORD] delay=0s timeout=1s
                  period=10s #success=1 #failure=3
    Startup:      exec [sh -c mariadb-admin status -p$MARIADB_ROOT_PASSWORD] delay=0s timeout=1s
                  period=10s #success=1 #failure=3
    Environment:
      MARIADB_ROOT_PASSWORD: mot-de-pass-root
    Mounts:
      /var/lib/mysql from mariadb-data (rw)
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-cn8mx (ro)
Conditions:
  Type                               Status
  PodReadyToStartContainers          True
  Initialized                         True
  Ready                              False
  ContainersReady                    False
  PodScheduled                       True
Volumes:
  mariadb-data:
```

```

Volumes:
  mariadb-data:
    Type:      PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
    ClaimName: mariadb-data
    ReadOnly:  false
  kube-api-access-cn8mx:
    Type:      Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
    ConfigMapName: kube-root-ca.crt
    Optional:    false
    DownwardAPI: true
QoS Class:      BestEffort
Node-Selectors: <none>
Tolerations:    node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                 node.kubernetes.io/unreachable:NoExecute op=Exists for 300s

Events:
  Type     Reason      Age          From          Message
  ----     -
  Normal   Scheduled   2m58s       default-scheduler Successfully assigned default/mariadb-7b5b7797dd-fw6th to minikube
  Normal   Pulled     2m57s       kubelet       Successfully pulled image "mariadb:latest" in 904ms (904ms including waiting). Image size: 335568219 bytes.
  Normal   Pulled     2m25s       kubelet       Successfully pulled image "mariadb:latest" in 847ms (847ms including waiting). Image size: 335568219 bytes.
  Normal   Pulled     113s       kubelet       Successfully pulled image "mariadb:latest" in 880ms (880ms including waiting). Image size: 335568219 bytes.
  Normal   Pulled     82s        kubelet       Successfully pulled image "mariadb:latest" in 849ms (849ms including waiting). Image size: 335568219 bytes.
  Normal   Pulling    51s (x5 over 2m58s) kubelet       Pulling image "mariadb:latest"
  Normal   Created    50s (x5 over 2m57s) kubelet       Container created
  Normal   Started    50s (x5 over 2m57s) kubelet       Container started
  Normal   Pulled     50s        kubelet       Successfully pulled image "mariadb:latest" in 882ms (882ms including waiting). Image size: 335568219 bytes.
  Warning  Unhealthy  28s (x15 over 2m48s) kubelet       Startup probe failed: mariadb-admin: connect to server at 'localhost' failed
  error: 'Can't connect to local server through socket '/run/mysqld/mysqld.sock' (2)'
  Check that mariadb is running and that the socket: '/run/mysqld/mysqld.sock' exists!
  Normal   Killing    28s (x5 over 2m28s) kubelet       Container mariadb failed startup probe, will be restarted
  Warning  BackOff    18s (x3 over 19s)   kubelet       Back-off restarting failed container mariadb in pod mariadb-7b5b7797dd-fw6th_default(858b59ef-931e-46d4-805b-125853884cd3)
PS E:\Projet Nana\9>

```

```

PS E:\Projet Nana\9>
● PS E:\Projet Nana\9> kubectl get pod -l app=mariadb
NAME                                READY  STATUS   RESTARTS   AGE
mariadb-7b5b7797dd-fw6th            0/1    Running  6 (12s ago) 4m17s
mariadb-b5ff7ff4f-hfj72             1/1    Running  0           16m
○ PS E:\Projet Nana\9>

```

```
PS E:\Projet Nana\9>
● PS E:\Projet Nana\9> kubectl get pod -l app=mariadb
NAME                                READY   STATUS             RESTARTS   AGE
mariadb-7b5b7797dd-fw6th           0/1    CrashLoopBackOff   6 (22s ago) 4m59s
mariadb-b5ff7ff4f-hfj72            1/1    Running            0           17m
● PS E:\Projet Nana\9> kubectl logs mariadb-7b5b7797dd-fw6th
2026-05-07 10:11:07+00:00 [Note] [Entrypoint]: Entrypoint script for MariaDB Server 1:12.2.2+maria
~ubu2404 started.
2026-05-07 10:11:07+00:00 [Warn] [Entrypoint]: /sys/fs/cgroup///memory.pressure not writable, func
tionality unavailable to MariaDB
2026-05-07 10:11:07+00:00 [Note] [Entrypoint]: Switching to dedicated user 'mysql'
2026-05-07 10:11:07+00:00 [Note] [Entrypoint]: Entrypoint script for MariaDB Server 1:12.2.2+maria
~ubu2404 started.
2026-05-07 10:11:07+00:00 [Note] [Entrypoint]: MariaDB upgrade not required
2026-05-07 10:11:07 0 [Note] Starting MariaDB 12.2.2-MariaDB-ubu2404 source revision d26a6f44c1f21
10377a79a9540886c6d8c01472f server uid d33plIDt4HH82x4hyBdRRDKEv0= as process 1
2026-05-07 10:11:07 0 [ERROR] mariadbd: Can't lock aria control file '/var/lib/mysql/aria_log_cont
rol' for exclusive use, error: 11. Will retry for 30 seconds
2026-05-07 10:11:37 0 [ERROR] mariadbd: Got error 'Could not get an exclusive lock; file is probab
ly in use by another process' when trying to use aria control file '/var/lib/mysql/aria_log_contro
l'
2026-05-07 10:11:37 0 [ERROR] Plugin 'Aria' registration as a STORAGE ENGINE failed.
2026-05-07 10:11:37 0 [Note] InnoDB: Compressed tables use zlib 1.3
2026-05-07 10:11:37 0 [Note] InnoDB: Number of transaction pools: 1
2026-05-07 10:11:37 0 [Note] InnoDB: Using crc32 + pclmulqdq instructions
2026-05-07 10:11:37 0 [Note] mariadbd: O_TMPFILE is not supported on /tmp (disabling future attemp
ts)
2026-05-07 10:11:37 0 [Note] InnoDB: Using io_uring
2026-05-07 10:11:37 0 [Note] InnoDB: innodb_buffer_pool_size_max=128m, innodb_buffer_pool_size=128
m
2026-05-07 10:11:37 0 [Note] InnoDB: Completed initialization of buffer pool
2026-05-07 10:11:37 0 [Note] InnoDB: File system buffers for log disabled (block size=512 bytes)
2026-05-07 10:11:37 0 [ERROR] InnoDB: Unable to lock ./ibdata1 error: 11
2026-05-07 10:11:37 0 [Note] InnoDB: Check that you do not already have another mariadbd process u
sing the same InnoDB data or log files.
2026-05-07 10:11:37 0 [ERROR] InnoDB: Plugin initialization aborted with error Generic error
2026-05-07 10:11:37 0 [Note] InnoDB: Starting shutdown...
2026-05-07 10:11:38 0 [ERROR] Plugin 'InnoDB' registration as a STORAGE ENGINE failed.
2026-05-07 10:11:38 0 [Note] Plugin 'FEEDBACK' is disabled.
2026-05-07 10:11:38 0 [Note] Plugin 'wsrep-provider' is disabled.
2026-05-07 10:11:38 0 [ERROR] Could not open mysql.plugin table: "Unknown storage engine 'Aria'".
Some plugins may be not loaded
2026-05-07 10:11:38 0 [ERROR] Failed to initialize plugins.
2026-05-07 10:11:38 0 [ERROR] Aborting
○ PS E:\Projet Nana\9> □
```

Le conteneur n'arrive pas à démarrer en raison de la présence d'un lock dans les fichiers de bdd. Ce lock s'explique en raison du fait qu'un pod est déjà démarré et que celui-ci utilise déjà ces fichiers.

- Mise en place d'un StatefulSet :
 - Augmentation du nombre de pods associés au déploiement et montée en charge automatique

```
Administrateur : Windows Po1 x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl scale deployment mariadb --replicas=2
deployment.apps/mariadb scaled
PS C:\Users\nmetreau> kubectl get pods -l app=mariadb --watch
NAME                                READY   STATUS    RESTARTS   AGE
mariadb-7b5b7797dd-6ktvc            0/1     Running  0           18s
mariadb-7b5b7797dd-fw6th            1/1     Running  7 (5m29s ago)  10m
mariadb-7b5b7797dd-6ktvc            0/1     Running  1 (2s ago)   34s
mariadb-7b5b7797dd-6ktvc            0/1     Running  2 (1s ago)   65s
```

- Le nouveau pod n'arrive pas à démarrer.

```
Administrateur : Windows Po1 x + v
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl describe pods mariadb-7b5b7797dd-6ktvc
Name:          mariadb-7b5b7797dd-6ktvc
Namespace:    default
Priority:      0
Service Account: default
Node:         minikube/172.28.158.3
Start Time:   Thu, 07 May 2026 12:16:49 +0200
Labels:       app=mariadb
              pod-template-hash=7b5b7797dd
Annotations:  <none>
Status:       Running
IP:           10.244.0.12
IPs:
  IP:         10.244.0.12
Controlled By: ReplicaSet/mariadb-7b5b7797dd
Containers:
  mariadb:
    Container ID:  docker://47306f24692c70b87b37e598729748f97deb2ee2fb9660f3223a93ffcad17cb5
    Image:         mariadb:latest
    Image ID:     docker-pullable://mariadb@sha256:e0236fc6386e7eacd9359e59d0a078bd7aa0d18280d36d13061121bedeae903
    Port:         <none>
    Host Port:    <none>
    State:        Running
      Started:    Thu, 07 May 2026 12:18:57 +0200
    Last State:   Terminated
      Reason:     Error
      Exit Code:  1
      Started:    Thu, 07 May 2026 12:18:25 +0200
      Finished:   Thu, 07 May 2026 12:18:56 +0200
    Ready:        False
    Restart Count: 4
    Liveness:     exec [sh -c mariadb-admin status -p$MARIADB_ROOT_PASSWORD] delay=0s timeout=1s per
iod=10s #success=1 #failure=3
    Readiness:    exec [sh -c mariadb-admin status -p$MARIADB_ROOT_PASSWORD] delay=0s timeout=1s per
iod=10s #success=1 #failure=3
    Startup:      exec [sh -c mariadb-admin status -p$MARIADB_ROOT_PASSWORD] delay=0s timeout=1s per
iod=10s #success=1 #failure=3
    Environment:
      MARIADB_ROOT_PASSWORD: mot-de-pass-root
    Mounts:
      /var/lib/mysql from mariadb-data (rw)
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-h7q7s (ro)
Conditions:
  Type                               Status
PodReadyToStartContainers            True
Initialized                           True
Ready                                 False
ContainersReady                       False
PodScheduled                           True
```

```

Conditions:
  Type                    Status
  PodReadyToStartContainers  True
  Initialized              True
  Ready                   False
  ContainersReady          False
  PodScheduled             True
Volumes:
  mariadb-data:
    Type:          PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
    ClaimName:    mariadb-data
    ReadOnly:     false
  kube-api-access-h7q7s:
    Type:          Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds: 3607
    ConfigMapName: kube-root-ca.crt
    Optional:     false
    DownwardAPI:  true
QoS Class:           BestEffort
Node-Selectors:     <none>
Tolerations:        node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                    node.kubernetes.io/unreachable:NoExecute op=Exists for 300s

Events:
  Type    Reason      Age          From          Message
  ----    -
Normal   Scheduled  2m10s       default-scheduler  Successfully assigned default/mariadb-7b5b7797dd-6ktvc to minikube
Normal   Pulled     2m9s        kubelet        Successfully pulled image "mariadb:latest" in 866ms (866ms including waiting). Image size: 335568219 bytes.
Normal   Pulled     97s         kubelet        Successfully pulled image "mariadb:latest" in 872ms (872ms including waiting). Image size: 335568219 bytes.
Normal   Pulled     34s         kubelet        Successfully pulled image "mariadb:latest" in 847ms (847ms including waiting). Image size: 335568219 bytes.
Warning  Unhealthy  10s (x12 over 2m) kubelet        Startup probe failed: mariadb-admin: connect to server at 'localhost' failed
error: 'Can't connect to local server through socket '/run/mysqld/mysqld.sock' (2)'
Check that mariadb is running and that the socket: '/run/mysqld/mysqld.sock' exists!
Normal   Killing    10s (x4 over 100s) kubelet        Container mariadb failed startup probe, will be restarted
Normal   Pulling   3s (x5 over 2m9s) kubelet        Pulling image "mariadb:latest"
Normal   Created   2s (x5 over 2m8s) kubelet        Container created
Normal   Started   2s (x5 over 2m8s) kubelet        Container started
Normal   Pulled    2s (x2 over 65s) kubelet        Successfully pulled image "mariadb:latest" in 841ms (841ms including waiting). Image size: 335568219 bytes.
PS C:\Users\nmetreau>

```

```

Administrateur : Windows Poi x
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl get pods -l app=mariadb
NAME                                READY   STATUS    RESTARTS   AGE
mariadb-7b5b7797dd-6ktvc            0/1     CrashLoopBackOff   4 (8s ago)    2m47s
mariadb-7b5b7797dd-fw6th            1/1     Running                7 (7m58s ago) 12m
PS C:\Users\nmetreau> kubectl logs mariadb-7b5b7797dd-6ktvc
2026-05-07 10:18:57+00:00 [Note] [Entrypoint]: Entrypoint script for MariaDB Server 1:12.2.2+maria~ubu
2404 started.
2026-05-07 10:18:57+00:00 [Warn] [Entrypoint]: /sys/fs/cgroup///memory.pressure not writable, function
ality unavailable to MariaDB
2026-05-07 10:18:57+00:00 [Note] [Entrypoint]: Switching to dedicated user 'mysql'
2026-05-07 10:18:57+00:00 [Note] [Entrypoint]: Entrypoint script for MariaDB Server 1:12.2.2+maria~ubu
2404 started.
2026-05-07 10:18:57+00:00 [Note] [Entrypoint]: MariaDB upgrade not required
2026-05-07 10:18:57+00:00 [Note] Starting MariaDB 12.2.2-MariaDB-ubu2404 source revision d26a6f44c1f211937
7e79a9540886c6d8c01472f server_uid oAVvGL13geeDwiqsqzWXd3lU4Xw= as process 1
2026-05-07 10:18:58+00:00 [ERROR] mariadbd: Can't lock aria control file '/var/lib/mysql/aria_log_control'
for exclusive use, error: 11. Will retry for 30 seconds
2026-05-07 10:19:28+00:00 [ERROR] mariadbd: Got error 'Could not get an exclusive lock; file is probably i
n use by another process' when trying to use aria control file '/var/lib/mysql/aria_log_control'
2026-05-07 10:19:28+00:00 [ERROR] Plugin 'Aria' registration as a STORAGE ENGINE failed.
2026-05-07 10:19:28+00:00 [Note] InnoDB: Compressed tables use zlib 1.3
2026-05-07 10:19:28+00:00 [Note] InnoDB: Number of transaction pools: 1
2026-05-07 10:19:28+00:00 [Note] InnoDB: Using crc32 + pclmulqdq instructions
2026-05-07 10:19:28+00:00 [Note] mariadbd: O_TMPFILE is not supported on /tmp (disabling future attempts)
2026-05-07 10:19:28+00:00 [Note] InnoDB: Using io_uring
2026-05-07 10:19:28+00:00 [Note] InnoDB: innodb_buffer_pool_size_max=128m, innodb_buffer_pool_size=128m
2026-05-07 10:19:28+00:00 [Note] InnoDB: Completed initialization of buffer pool
2026-05-07 10:19:28+00:00 [Note] InnoDB: File system buffers for log disabled (block size=512 bytes)
2026-05-07 10:19:28+00:00 [ERROR] InnoDB: Unable to lock ./ibdata1 error: 11
2026-05-07 10:19:28+00:00 [Note] InnoDB: Check that you do not already have another mariadbd process using
the same InnoDB data or log files.
2026-05-07 10:19:28+00:00 [ERROR] InnoDB: Plugin initialization aborted with error Generic error
2026-05-07 10:19:28+00:00 [Note] InnoDB: Starting shutdown...
2026-05-07 10:19:28+00:00 [ERROR] Plugin 'InnoDB' registration as a STORAGE ENGINE failed.
2026-05-07 10:19:28+00:00 [Note] Plugin 'FEEDBACK' is disabled.
2026-05-07 10:19:28+00:00 [Note] Plugin 'wsrep-provider' is disabled.
2026-05-07 10:19:28+00:00 [ERROR] Could not open mysql.plugin table: "Unknown storage engine 'Aria'". Some
plugins may be not loaded
2026-05-07 10:19:28+00:00 [ERROR] Failed to initialize plugins.
2026-05-07 10:19:28+00:00 [ERROR] Aborting
PS C:\Users\nmetreau>

```

- Purge de l'ancien déploiement de MariaDB :

```

Administrateur : Windows Poi x
PS C:\Users\nmetreau>
PS C:\Users\nmetreau>
PS C:\Users\nmetreau> kubectl delete deployment mariadb
deployment.apps "mariadb" deleted from default namespace
PS C:\Users\nmetreau> kubectl get pods -l app=mariadb
No resources found in default namespace.
PS C:\Users\nmetreau>

```


- La base est démarrée et prête à fonctionner.
 - Consultation de l'état des demandes de volumes persistants :

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + - [ ] [ ] ... | [ ] [ ] X
PS E:\Projet Nana\9>
● PS E:\Projet Nana\9> kubectl get pvc
NAME                               STATUS VOLUME                                     CAPACITY  ACCESS MOD
ES STORAGECLASS VOLUMEATTRIBUTESCLASS AGE
mariadb-data                        Bound  pvc-159e048e-88f7-47b0-bd54-49523a51f23b 100Mi     RWO
  standard <unset> 43m
mariadb-data-mariadb-0              Bound  pvc-2256fadc-cc25-452d-acb7-8bfcfb16c427 100Mi     RWO
  standard <unset> 42s
task-pv-claim                       Bound  pv-nginx                                     10Mi      RWO
  manual  <unset> 66m
○ PS E:\Projet Nana\9> [ ]
```

- Consultation de l'état des volumes persistants :

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + - [ ] [ ] ... | [ ] [ ] X
PS E:\Projet Nana\9>
● PS E:\Projet Nana\9> kubectl get pv
NAME                               CAPACITY  ACCESS MODES  RECLAIM POLICY  STATUS  CLA
IM STORAGECLASS VOLUMEATTRIBUTESCLASS REASON AGE
pv-nginx                           10Mi      RWO           Retain          Bound   def
ault/task-pv-claim                  manual    <unset>        68m           Bound   def
pvc-159e048e-88f7-47b0-bd54-49523a51f23b 100Mi     RWO           Delete          Bound   def
ault/mariadb-data                   standard  <unset>        44m           Bound   def
pvc-2256fadc-cc25-452d-acb7-8bfcfb16c427 100Mi     RWO           Delete          Bound   def
ault/mariadb-data-mariadb-0         standard  <unset>        61s
○ PS E:\Projet Nana\9> [ ]
```

- Scalabilité de l'objet StatefulSet :

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + - [ ] [ ] ... | [ ] [ ] X
PS E:\Projet Nana\9>
○ PS E:\Projet Nana\9>
● PS E:\Projet Nana\9> kubectl scale sts mariadb --replicas=2
statefulset.apps/mariadb scaled
○ PS E:\Projet Nana\9> [ ]
```

- Consultation des demandes de volumes persistants et des pods :

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell + v [ ] [ ] ... | [ ] [ ] X
```

```
PS E:\Projet Nana\9>
• PS E:\Projet Nana\9> kubectl get pvc -l app=mariadb
```

NAME	STATUS	VOLUME	CAPACITY	ACCESS MOD
mariadb-data-mariadb-0	Bound	pvc-2256fadc-cc25-452d-acb7-8bfcfb16c427	100Mi	RWO
standard	<unset>			
AGE				
114s				
mariadb-data-mariadb-1	Bound	pvc-98876a67-3972-474f-bcd1-0dc0e960f3da	100Mi	RWO
standard	<unset>			
25s				

```
• PS E:\Projet Nana\9> kubectl get pods -l app=mariadb
```

NAME	READY	STATUS	RESTARTS	AGE
mariadb-0	1/1	Running	0	2m6s
mariadb-1	1/1	Running	0	37s

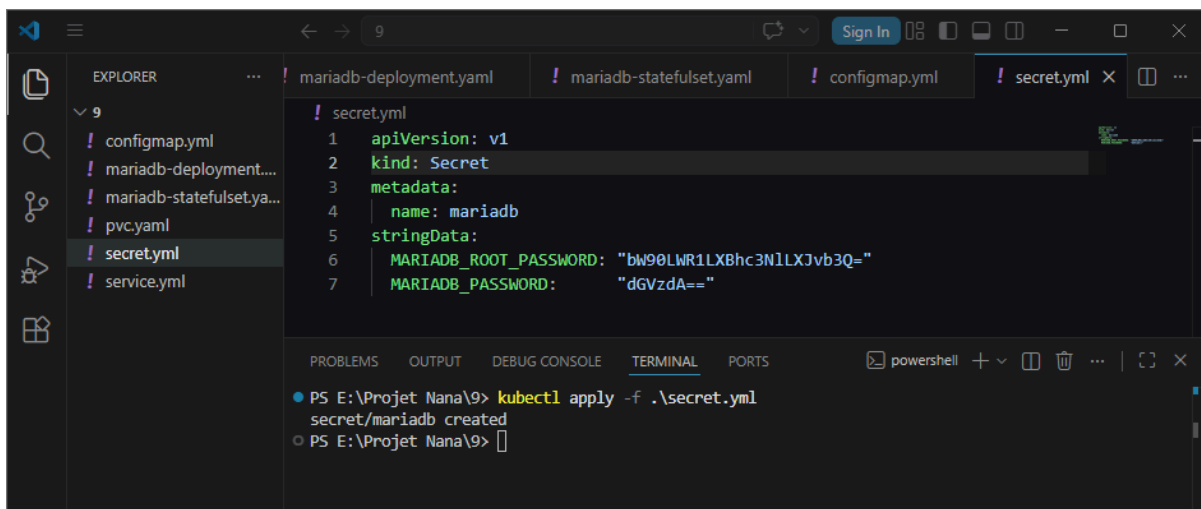
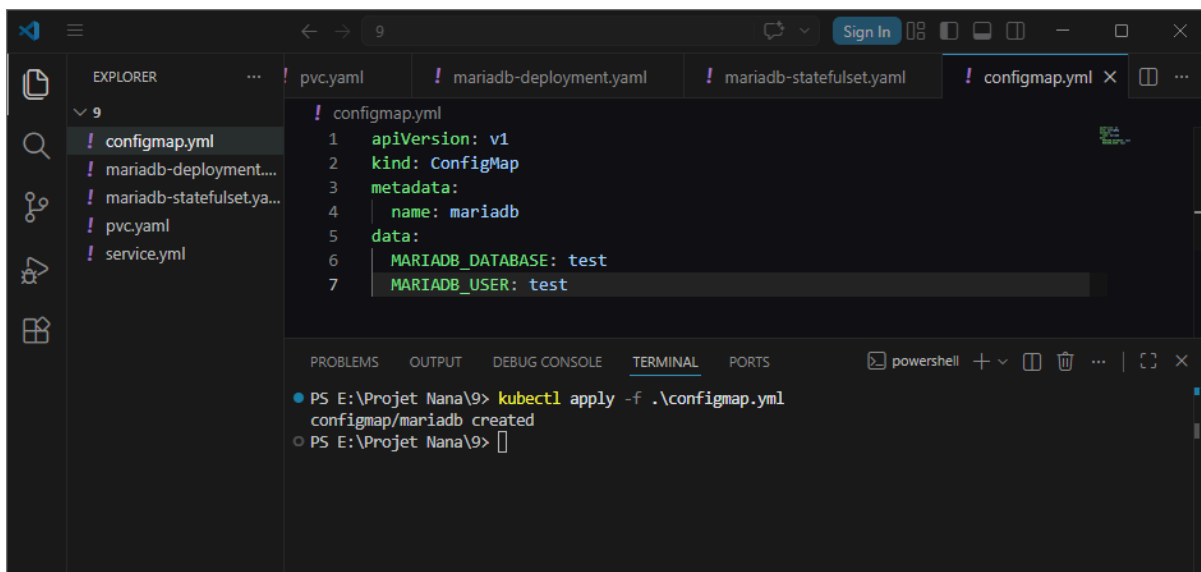
```
• PS E:\Projet Nana\9> kubectl get pods,pvc -l app=mariadb
```

NAME	READY	STATUS	RESTARTS	AGE
pod/mariadb-0	1/1	Running	0	2m19s
pod/mariadb-1	1/1	Running	0	50s

NAME	STATUS	VOLUME
persistentvolumeclaim/mariadb-data-mariadb-0	Bound	pvc-2256fadc-cc25-452d-acb7-8bfcfb16c427
100Mi	RWO	standard
<unset>		
2m19s		
persistentvolumeclaim/mariadb-data-mariadb-1	Bound	pvc-98876a67-3972-474f-bcd1-0dc0e960f3da
100Mi	RWO	standard
<unset>		
50s		

```
○ PS E:\Projet Nana\9> [ ]
```

- Afin de tester la réplication au paragraphe 12, une base et un compte de test vont être créés.



- Rattachement au conteneur :
 - Le référencement se fait à l'aide du champ envFrom.

```
1  apiVersion: apps/v1
2  kind: StatefulSet
3  metadata:
4    name: mariadb
5    labels:
6      app: mariadb
7  spec:
8    serviceName: mariadb
9    selector:
10     matchLabels:
11       app: mariadb
12   template:
13     metadata:
14       labels:
15         app: mariadb
16     spec:
17       containers:
18         - image: mariadb:latest
19           name: mariadb
20           volumeMounts:
21             - mountPath: /var/lib/mysql
22               name: mariadb-data
23           envFrom:
24             - configMapRef:
25                 name: mariadb
26             - secretRef:
27                 name: mariadb
28           startupProbe: &probe
29           exec:
30             command:
```

```
27     name: mariadb
28     startupProbe: &probe
29     exec:
30       command:
31         - "sh"
32         - "-c"
33         - "mariadb-admin status -p$MARIADB_ROOT_PASSWORD"
34     livenessProbe: *probe
35     readinessProbe: *probe
36   volumeClaimTemplates:
37     - metadata:
38         name: mariadb-data
39     spec:
40       accessModes:
41         - ReadWriteOnce
42       resources:
43         requests:
44           storage: 100Mi
```

PS E:\Projet Nana\9> kubectl apply -f .\mariadb-statefulset2.yaml
statefulset.apps/mariadb configured
PS E:\Projet Nana\9>

- La base est maintenant configurée.

12. Mises en place d'une réplication entre pods