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DOF307 - Troubleshooting K8s

Contenu du Module

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LAB #1 - Le Serveur API

1.1 - Connexion Refusée

Quand il n'est pas possible de se connecter au serveur API de K8s, on obtient une erreur telle que :

```
trainee@kubemaster:~$ kubectl get pods
The connection to the server localhost:8080 was refused - did you specify the right host or port?
```

En règle générale, cette erreur est due à une des trois situations suivantes :

Le Service kubelet

Vérifiez que le service kubelet est activé et en cours d'exécution sur le contrôleur :

```
trainee@kubemaster:~$ su -
Mot de passe : fenestros

root@kubemaster:~# systemctl status kubelet
● kubelet.service - kubelet: The Kubernetes Node Agent
   Loaded: loaded (/lib/systemd/system/kubelet.service; enabled; vendor preset: enable
   Drop-In: /etc/systemd/system/kubelet.service.d
            └─10-kubeadm.conf
   Active: active (running) since Fri 2022-09-16 09:29:34 CEST; 1 weeks 4 days ago
     Docs: https://kubernetes.io/docs/home/
  Main PID: 550 (kubelet)
    Tasks: 17 (limit: 4915)
   Memory: 129.6M
     CPU: 4h 16min 54.676s
   CGroup: /system.slice/kubelet.service
            └─550 /usr/bin/kubelet --bootstrap-kubeconfig=/etc/kubernetes/bootstrap-kub

Warning: Journal has been rotated since unit was started. Log output is incomplete or
lines 1-14/14 (END)
[q]
```

La Variable KUBECONFIG

Si vous utilisez le compte root pour interagir avec K8s, vérifiez que la variable **KUBECONFIG** est renseignée correctement :

```
root@kubemaster:~# echo $KUBECONFIG
/etc/kubernetes/admin.conf
```

Le Fichier \$HOME/.kube/config

Si vous utilisez un compte d'un utilisateur normal pour interagir avec K8s, vérifiez que le fichier **\$HOME/.kube/config** est renseigné correctement et qu'il possède les bonnes permissions :

```
root@kubemaster:~# exit
déconnexion
trainee@kubemaster:~$

trainee@kubemaster:~$ cat $HOME/.kube/config
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data:
LS0tLS1CRUdJTiBDRVJUSUZJQ0FURSB0tLS0tCk1JSUMvakNDQWVhZ0F3SUJBZ0lCQURBTklna3Foa2lHOXcwQkFRc0ZBREWFwTVJNd0VRWURWUWFER
XdwcmRXSmwKY201bGRHVnpNQjRYFRFJeU1Ea3d0REEzTXpVek5sb1hEVE15TURrd01UQTNNelV6Tmxvd0ZURVRNQkVHQTFVRQpBeE1LYTNWaVpYSn
VaWFJsY3pDQ0FTSXdEUVlKS29aSWh2Y05BUUVCQlFBRGdnRVBIBRENDQVFvQ2dnRUJBS2RICm9PbXpsd2xEdXdsWhPdEk5aEVVYXpMwJjNhNExDVVR
yZDlIdlBSWDBYzGZGS2w3S290S3RXYVhjK1pBbFNBazAKaXVZYZE1NXlIQ3ViYUEyU1FmYzZFMElIZ25ISlFqSy9WSTI1Szc1Zjg5NHk5dGlvZVo
c1dDemdodUhtkEwTgpyZmhzblPMHBHU0dEdStrR1lpN25lQVZwZUwyL2JjYy8xdzVyaEh4bGFackNsaFNsaVJQcWFqcFyVWNSWm5lCk9XS09TW
jN0bi9neTRGUktlRXpz0TlLNU140Xp2Y0JxwC9zSTRqYjJoRwQ0NnBuTG10MlM4NEFjQzR6R01iRHEKSHY0aDMra1lkbmE5YUJwN3hSWGNHNWRlZV
l1Yzhrant1dEhGUlNMYUllSszBYa2lCbEtB0HR0YU1tSkYrczRMdgp1blhDTEpYd1RCWwtGd3RMemc4Q0F3RUFBU5aTUZjd0RnWURWUjBQQVFIL0J
BUURBZ0trTUE4R0ExVWRFd0VCCi93UUZNQU1CQWY4d0hRWURWUjBPQkJZRUZ0dCtn0EJtVWNoekY4My9ZSEcveWlxaVdmc0lNQLVHQTFVZEVURU8K
TUF5Q0NtdDFZbVZ5Ym1WMFpYTXdEUVlKS29aSWh2Y05BUUVMQlFBRGdnRUJBRWZ0MHoyVnl6dUxieK5Y0C9pcAp0VFFGV2Q4TDJvMUV6L0FKZzR2a
kpMTG9VcmVKTHhtckpMcw1Yc3JU02hCYXYz0DJxcHRjeDhqNktRRjMwZzIyCnJxSUxuNzN5NFdBVYJKNFgWm2dtUGlhwWmZzdYOHFNaEpjbmtqRl
N3Vy92VUtl1YwkvcdDpWkFQMUUVCL1FtUFgKNXphUEZIT1d3QWlVqzU2ZmxrMmpJcVe3bmRvL2Vp0FRsdTI5MG1JYUdGSFRPU0hCYk1ReEE3RjVUV3Z
```

```
XQ0l5aQpPdTA5REFZdnU3dGFSZlA1SkhVdFlQL0Vady9KMUXlaWxrL3ZMbStTSXV0L0puR2hvTDJUdWVQUnd3TCtXRWswClNrS3RKQkVFQ2hVYkdz
ZVN2RNdEdS96NlgvQXFtSXRyQXJnVy9mTlV1TW9GRHo0MXFLYll4ekZuZ2hkSTN5WGsKQ25NPQotLS0tLUV0RCBDRVJUSUZJQ0FURS0tLS0tCg==
  server: https://192.168.56.2:6443
  name: kubernetes
contexts:
- context:
  cluster: kubernetes
  user: kubernetes-admin
  name: kubernetes-admin@kubernetes
current-context: kubernetes-admin@kubernetes
kind: Config
preferences: {}
users:
- name: kubernetes-admin
  user:
    client-certificate-data:
LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSURJVENDQWdtZ0F3SUJBZ0lJZDVaTG10Yng1ODh3RFFZSkvtWklodmN0QVFFTEJRQXdGVEVUT
UJFR0ExVUUKQXhNS2EzVmIawEp1WlhSbGN6QWVGdzB5TWpBNU1EUx0ek0xTXpaYUZ3MHlNekE1TURReE1ESTRNakJhTURReApGekFWQmd0VkJBb1
REbk41YzNSbGJUcHRZWE4wWlhhKek1Sa3dGd1lEVlFRREV4QnJkV0psY201bGRHVnpMV0ZrCmJXbHVNSUlcSWpBTkNa3Foa2lHOXcwQkFRRUZBQU9
DQVE4QU1JSUJDZ0tDQVFFQZLLy8zREhnczZ1c2VBAiKwItVdFZxekRSRERIMUt5RjB2VlhtUml6aWVhR3dEh3S3NKV3dUcVprS3BMB2hMSndN
VUEyeVlrS04xWXpLRwpjVWc4N2VvcGJBcWRTS3dFclB0dHZ5WlBPK2VrQ3AxQVo1dXA5T3cxM1FVQkZHZVpkR2haVkJHV1paaWNsMkQzCnRjY3dqc
mhDS3pUcmVhMTF0WkZiWZGZqTmxnaXNlYk4rbGZEcDM4K3l3cVBDQXNrWkdYUUFZcFlvSXlqRlQwSS8KNDAA2dXlpeUI1OHdxaE1zQjU3S1NWWko3K0
1ncGR0SjVCcmZ0eE5lNng3cmQ3TXNwb0VWeXlBUlBMdk50WTdWago0VGVMsm9aNDYwci81cG5EWjlxYFgrMnN2VXRFRjVJcmdoMnZhU3pLNHBWaeJ
RS2M3S2dSdXVtZjBFYnphWxhWcmQ5eUVDUULlEQVFBQm8xWXdwREFPQmd0VkhR0EJBZjhFQkFNQ0JhQXdfD1lEVlIwbEJBd3dDZ1lJS3dZQkJRUVGk
QXdJd0RBWURWUjBUQVFIL0JBXSdBREUmd0VkhTUUVHREFFXZ0JUyYmZvUEFabEhJY3hmTi8yQnh20G05WwXUNwpDREF0QmdrcWhraUc5dzBCQVFzR
kFBT0NBUEVBUmVhMTF0WkZiWZGZqTmxnaXNlYk4rbGZEcDM4K3l3cVBDQXNrWkdYUUFZcFlvSXlqRlQwSS8KNDAA2dXlpeUI1OHdxaE1zQjU3S1NWWko3K0
h1ZXV6Um160GI2Ny8zNW4rVUp0SlZoRfGKdmdaejJkQmFSQ3ZtVStoV1RueW5CUU9lRDlEQ2RuQXA2ZlJCNE9oN1pEOXNXZGxoOEMrbTBMaXE1UzV
5Uy92SQpVeWVQZ096aWlZMlF5ajdwTjhqcZd50G9Ia2lG0TM2Nlh3V0VoK1lWeGgxcG9iMGhIa1ZBUEZVS25Ed0xKS2N1CmY4MlBSU0dSwVZoaVlW
ZFM2ZTg1TFhXRkkwMvdqd2txVVo4NHhPVVYyekVCSGLIZ0lKN09VbjArbEYrQW8wVkoKZ1l2L2kzYW9IcUsxc21kejVjWwNXTlPaW1xalZ5RWV6c
zhjS0xYbFRnZ2VQM2kr0VE9PQotLS0tLUV0RCBDRVJUSUZJQ0FURS0tLS0tCg==
    client-key-data:
LS0tLS1CRUdJTiB0EgUJFJkFURSBLRVktLS0tLQpNSU1Fb3dJQkFBS0NBUEVBNksvLzNESGdzNnVzZUFoMl0rVXRWcXpEUKRESDFLeUYwdlZYb
VJpempXMR0d3RICmNlc0pXd1RxxWmtLcExvaExKd01VQTJ5WwtLTjFZektHY1Vn0Ddlb3BiQXFkU0t3RXJQTnR2eVpQTytla0NwMUEKwVjV1cDlPdZ
EzUVVCRkd1WmRHafpWRkdXWlppY2wyRDN0Y2N3anJoQ0t6VHJlYExTlpGSFhmak5sZ2l2ZWJOKwpsZkRwMzgreXdxUENBc2taR2VhQVlww9Jewp
```

```

GVDBJLzQwNnV5aXlCNTh3cWhNc0I1N0tTVlpKNytNZ3BkdEo1CkJyZk54TmU2eDdyZDdNc3BvRVZ5eUFSUEx2TnRZN1ZqNFRlTEpvWjQ2MHIvNXBu
RFo5V2xYKzJzdLV0RUY1SXI KZ2gydmFTeks0cFZoQlFLYzdLZ1J1dW1mMEViemFZeFzk0XlFQ1FJREFRQUJBb0lCQUNHTVpwNXZ6bzc1SEll0Qo2S
ng0TFg1R3NHeWZmK0JJODQ2RDh4cE90bXlZdE9oNlJ0V1d3Mld0SXVLvmorRDJvNmMvU1Y1cEJPSXR2eG9MClNka0JhazkvS0hPOFlBci9TamxKYT
dSWXFLbmhid1Jjd2RGdVh5WEIvTTRLRDViS2pSUjhp3lS3NvQkkrcXIKZjJ1RkNabzZ0TWdYL0M5eDgrbENSZ0RsZzNhekNRQm1wVW9CM2Zmbjd
paDRic3MzMkR6K29FcEx2TnkyS2o0RgpUTFVgQ0pTcTFKTXVQN2tVaXI1WUpzUTFySfcrUlNiNEZVNlJpTzkzSjJNdStWvmcxR0dxMEI4c3o5eSt0
SDNXClhJY3B1MGNt0XN2MzBUZG10cGRWRnZq0XR6ZzJlbW1wZTNFcmdQak1LQjFUWdDtT3BrVXVsZjNKQ1VRYk1JS1UKVDdaajg3VUNnWUVBNlg3V
np5ZmprU3hFVU0xbEFQbG1DNjJkUFJPajQxQjA5M2dYaHUyQ3hIQLRKUzdrYVhsSgpT0HFFcjlrv1FvRFVoM1N5RldhSkhNZy9l0WJRdHhBRWl5aL
FvbE4vSEZ2aEdrWGNVmlpMXE3ZFdUVjM3aEVCCmExekNpCfVtZWR40WszanpKUKx3b1VanUtySTR0WkJy0XNwQXltTEZPb09oMm16NEtYSXo4ZWN
DZ1lFQS94MDYKclJ2NzJGNXI3UmllSG45cHUyUHJEYkdlsFVGZ01tZHI0MW9NqnlHem5ZY3E2M2FmM3RacWFEEVGS1SnBDTFlDeQpvUEk1UlyvQWdv
QmNmeDhLVzRpdW0rVTZh0TN2R1FCWkxJY2o3c1k1SnBFSysvYnZTUGNDTzJlU214c3JhZ01PCm5odjV0ZUxYSlpTelZwcERzZ2hmQXJ3NDUxQmZFc
lVW0EVwZi9J0ENnWUJQbnh5eHcxeHFpTG5UQS9kSl djSmUKZ1JsNVZsVXdrCU1RTURkMW4xQlVSQ2xXS0t0akJDVG1YMnpYdWl0SkvqMW00M2hHcS
t4ZGtEdDFzMDhBM2NsdQoyc0FvV21haCtRTE52cnpUWjBtTUE1MGZhb2cyK2oyTnF0Zmd1ak9nb250LzZtS2ZaZELBYk5Pc3A1R0crSFNZCmQyZVl
uQTI5WwWyeTZpM0ZsRmY2U1FLQmdRRFdFdDd6K0hHREJPaW4wbG5FY2NKMW5zaLZldUJsu0VEQ3l3bzcKZzRwb1NaMkjhTFZaVlBlZWRHcGgrMUMv
aTdwUW1KaE1la1lZd3Rxmko2UjJmOE9mUddqVjFLc0xiUGFBRWt6QwpFncpTVnNBS1h0Zkt5MUhM0W9xRzhzaVJJmKZ3MmhQZ0ZUV2JyVGhBcnVFM
m9NaUJrb2kzc041SExLZzYrSDNxClgxN2dmUUtCZ0ZYUuw5TzBq0WNYM3FzVU00K0pyL3JwUXJ1L2t4b1YydFpQZzljVEplN3p2dVYrazE2ZFhaTi
sKS202L0tQNWN5UnIzYnFrUXZBYjZHK2xlUh0QTVvTk9SalI5bDI0SjNnNnl5YlBrakR2eU8rRVgrUlNDV203QwpiZ2NxeE16Q1BJYmtWSEpsYXd
qcZJKaWp5YTh00UV6N09YcWFXyU8yakptK2pVvZdsaStmCi0tLS0tRU5EIFJTQSBQUklWQVRFIEtFWS0tLS0tCg==

```

```

trainee@kubemaster:~$ ls -l $HOME/.kube/config
-rw----- 1 trainee sudo 5636 sept. 28 12:56 /home/trainee/.kube/config

```

```

trainee@kubemaster:~$ su -
Mot de passe :
root@kubemaster:~#

```

1.2 - Journaux des Pods Système

Si, à ce stade, vous n'avez pas trouvé d'erreurs apparentes, il convient de regarder le journal du pod **kube-system_kube-apiserver-xxxxxxxxxxxxx** :

```

root@kubemaster:~# ls -l /var/log/pods
total 28
drwxr-xr-x 6 root root 4096 sept. 4 09:44 kube-system_calico-node-dc7hd_3fe340ed-6df4-4252-9e4e-8c244453176a

```

```
drwxr-xr-x 3 root root 4096 sept.  4 13:00 kube-system_coredns-565d847f94-tqd8z_d96f42ed-
ebd4-4eb9-8c89-2d80b81ef9cf
drwxr-xr-x 3 root root 4096 sept.  4 12:36 kube-system_etcd-
kubemaster.ittraining.loc_ddbb10499877103d862e5ce637b18ab1
drwxr-xr-x 3 root root 4096 sept.  4 12:36 kube-system_kube-apiserver-
kubemaster.ittraining.loc_ec70600cac9ca8c8ea9545f1a42f82e5
drwxr-xr-x 3 root root 4096 sept.  4 12:36 kube-system_kube-controller-manager-
kubemaster.ittraining.loc_0e3dcf54223b4398765d21e9e6aaebc6
drwxr-xr-x 3 root root 4096 sept.  4 12:31 kube-system_kube-proxy-x7fpc_80673937-ff21-4dba-a821-fb3b0b1541a4
drwxr-xr-x 3 root root 4096 sept.  4 12:36 kube-system_kube-scheduler-
kubemaster.ittraining.loc_c3485d2a42b90757729a745cd8ee5f7d
```

```
root@kubemaster:~# ls -l /var/log/pods/kube-system_kube-apiserver-
kubemaster.ittraining.loc_ec70600cac9ca8c8ea9545f1a42f82e5
total 4
drwxr-xr-x 2 root root 4096 sept. 16 09:31 kube-apiserver
```

```
root@kubemaster:~# ls -l /var/log/pods/kube-system_kube-apiserver-
kubemaster.ittraining.loc_ec70600cac9ca8c8ea9545f1a42f82e5/kube-apiserver
total 2420
-rw-r----- 1 root root 1009731 sept. 16 08:19 0.log
-rw-r----- 1 root root 1460156 sept. 28 12:22 1.log
```

```
root@kubemaster:~# tail /var/log/pods/kube-system_kube-apiserver-
kubemaster.ittraining.loc_ec70600cac9ca8c8ea9545f1a42f82e5/kube-apiserver/1.log
2022-09-28T11:22:18.406048353+02:00 stderr F Trace[1595276047]: [564.497826ms] [564.497826ms] END
2022-09-28T11:22:18.406064364+02:00 stderr F I0928 09:22:18.405784      1 trace.go:205] Trace[1267846829]: "Get"
url:/apis/coordination.k8s.io/v1/namespaces/kube-system/leases/kube-scheduler,user-agent:kube-scheduler/v1.25.0
(linux/amd64) kubernetes/a866cbe/leader-election,audit-id:1b71bbbb-49ad-4f40-b859-
f40b06416452,client:192.168.56.2,accept:application/vnd.kubernetes.protobuf, */*,protocol:HTTP/2.0 (28-Sep-2022
09:22:17.899) (total time: 505ms):
2022-09-28T11:22:18.406072365+02:00 stderr F Trace[1267846829]: ---"About to write a response" 505ms
(09:22:18.405)
2022-09-28T11:22:18.406079291+02:00 stderr F Trace[1267846829]: [505.988424ms] [505.988424ms] END
```

```

2022-09-28T12:17:17.854768983+02:00 stderr F I0928 10:17:17.854660      1 alloc.go:327] "allocated clusterIPs"
service="default/service-netshoot" clusterIPs=map[IPv4:10.107.115.28]
2022-09-28T12:22:18.832566527+02:00 stderr F I0928 10:22:18.831876      1 trace.go:205] Trace[338168453]:
"List(recursive=true) etcd3" audit-id:8acb508c-5121-4d18-8f8a-
ed87d01f33b8,key:/pods/default,resourceVersion:,resourceVersionMatch:,limit:500,continue: (28-Sep-2022
10:22:18.063) (total time: 768ms):
2022-09-28T12:22:18.83263296+02:00 stderr F Trace[338168453]: [768.168206ms] [768.168206ms] END
2022-09-28T12:22:18.832893075+02:00 stderr F I0928 10:22:18.832842      1 trace.go:205] Trace[238339745]: "List"
url:/api/v1/namespaces/default/pods,user-agent:kubectl/v1.25.0 (linux/amd64) kubernetes/a866cbe,audit-
id:8acb508c-5121-4d18-8f8a-
ed87d01f33b8,client:192.168.56.2,accept:application/json;as=Table;v=v1;g=meta.k8s.io,application/json;as=Table;v=
v1beta1;g=meta.k8s.io,application/json,protocol:HTTP/2.0 (28-Sep-2022 10:22:18.063) (total time: 769ms):
2022-09-28T12:22:18.832902737+02:00 stderr F Trace[238339745]: ---"Listing from storage done" 768ms
(10:22:18.831)
2022-09-28T12:22:18.832908995+02:00 stderr F Trace[238339745]: [769.149103ms] [769.149103ms] END

```

A noter que quand le serveur API redevient fonctionnel, il est possible de consulter le journal en utilisant la commande **kubectl logs** :

```

root@kubemaster:~# kubectl get pods -n kube-system
NAME                                READY   STATUS    RESTARTS   AGE
calico-kube-controllers-6799f5f4b4-2tgpq  1/1     Running   0           42m
calico-node-5htrc                      1/1     Running   1 (12d ago) 24d
calico-node-dc7hd                      1/1     Running   1 (12d ago) 24d
calico-node-qk5kt                      1/1     Running   1 (12d ago) 24d
coredns-565d847f94-kkpbp              1/1     Running   0           42m
coredns-565d847f94-tqd8z              1/1     Running   1 (12d ago) 23d
etcd-kubemaster.ittraining.loc        1/1     Running   1 (12d ago) 23d
kube-apiserver-kubemaster.ittraining.loc 1/1     Running   1 (12d ago) 23d
kube-controller-manager-kubemaster.ittraining.loc 1/1     Running   12 (5d3h ago) 23d
kube-proxy-ggmt6                      1/1     Running   1 (12d ago) 23d
kube-proxy-x5j2r                      1/1     Running   1 (12d ago) 23d
kube-proxy-x7fpc                      1/1     Running   1 (12d ago) 23d
kube-scheduler-kubemaster.ittraining.loc 1/1     Running   14 (29h ago) 23d

```

```
metrics-server-5dbb5ff5bd-vh5fz          1/1      Running   1 (12d ago)    23d
```

```
root@kubemaster:~# kubectl logs kube-apiserver-kubemaster.ittraining.loc -n kube-system | tail
Trace[1595276047]: [564.497826ms] [564.497826ms] END
I0928 09:22:18.405784          1 trace.go:205] Trace[1267846829]: "Get"
url:/apis/coordination.k8s.io/v1/namespaces/kube-system/leases/kube-scheduler,user-agent:kube-scheduler/v1.25.0
(linux/amd64) kubernetes/a866cbe/leader-election,audit-id:1b71bbbb-49ad-4f40-b859-
f40b06416452,client:192.168.56.2,accept:application/vnd.kubernetes.protobuf,*/,protocol:HTTP/2.0 (28-Sep-2022
09:22:17.899) (total time: 505ms):
Trace[1267846829]: ---"About to write a response" 505ms (09:22:18.405)
Trace[1267846829]: [505.988424ms] [505.988424ms] END
I0928 10:17:17.854660          1 alloc.go:327] "allocated clusterIPs" service="default/service-netshoot"
clusterIPs=map[IPv4:10.107.115.28]
I0928 10:22:18.831876          1 trace.go:205] Trace[338168453]: "List(recursive=true) etcd3" audit-
id:8acb508c-5121-4d18-8f8a-
ed87d01f33b8,key:/pods/default,resourceVersion:,resourceVersionMatch:,limit:500,continue: (28-Sep-2022
10:22:18.063) (total time: 768ms):
Trace[338168453]: [768.168206ms] [768.168206ms] END
I0928 10:22:18.832842          1 trace.go:205] Trace[238339745]: "List" url:/api/v1/namespaces/default/pods,user-
agent:kubectl/v1.25.0 (linux/amd64) kubernetes/a866cbe,audit-id:8acb508c-5121-4d18-8f8a-
ed87d01f33b8,client:192.168.56.2,accept:application/json;as=Table;v=v1;g=meta.k8s.io,application/json;as=Table;v=
v1beta1;g=meta.k8s.io,application/json,protocol:HTTP/2.0 (28-Sep-2022 10:22:18.063) (total time: 769ms):
Trace[238339745]: ---"Listing from storage done" 768ms (10:22:18.831)
Trace[238339745]: [769.149103ms] [769.149103ms] END
```

LAB #2 - Les Nœuds

2.1 - Le Statut NotReady

Quand un nœud du cluster démontre un problème, il convient de regarder la section **Conditions** dans la sortie de la commande **kubectl describe node** du nœud concerné :

```
root@kubemaster:~# kubectl describe node kubenode1.ittraining.loc
...
Conditions:
  Type                Status  LastHeartbeatTime             LastTransitionTime            Reason
  Message
  ----                -
  NetworkUnavailable  False   Fri, 16 Sep 2022 09:35:05 +0200  Fri, 16 Sep 2022 09:35:05 +0200  CalicoIsUp
  Calico is running on this node
  MemoryPressure      False   Wed, 28 Sep 2022 09:17:21 +0200  Sun, 04 Sep 2022 13:13:02 +0200
  KubeletHasSufficientMemory  kubelet has sufficient memory available
  DiskPressure        False   Wed, 28 Sep 2022 09:17:21 +0200  Sun, 04 Sep 2022 13:13:02 +0200
  KubeletHasNoDiskPressure  kubelet has no disk pressure
  PIDPressure         False   Wed, 28 Sep 2022 09:17:21 +0200  Sun, 04 Sep 2022 13:13:02 +0200
  KubeletHasSufficientPID  kubelet has sufficient PID available
  Ready               True    Wed, 28 Sep 2022 09:17:21 +0200  Thu, 15 Sep 2022 17:57:04 +0200  KubeletReady
  kubelet is posting ready status
...
```

En règle générale, le statut de NotReady est créé par la panne du service **kubelet** sur le nœud, comme démontre l'exemple suivant :

```
root@kubemaster:~# ssh -l trainee 192.168.56.3
trainee@192.168.56.3's password: trainee
Linux kubenode1.ittraining.loc 4.9.0-19-amd64 #1 SMP Debian 4.9.320-2 (2022-06-30) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Sep 16 18:07:39 2022 from 192.168.56.2
trainee@kubenode1:~$ su -
Mot de passe : fenestros
```

```
root@kubenode1:~# systemctl stop kubelet

root@kubenode1:~# systemctl disable kubelet
Removed /etc/systemd/system/multi-user.target.wants/kubelet.service.

root@kubenode1:~# exit
déconnexion
trainee@kubenode1:~$ exit
déconnexion
Connection to 192.168.56.3 closed.

root@kubemaster:~# kubectl get nodes
NAME                STATUS    ROLES    AGE   VERSION
kubemaster.ittraining.loc  Ready    control-plane  24d   v1.25.0
kubenode1.ittraining.loc  NotReady <none>    24d   v1.25.0
kubenode2.ittraining.loc  Ready    <none>    24d   v1.25.0
```

En activant et en démarrant le service, le nœud retrouve son statut de **Ready** :

```
root@kubemaster:~# ssh -l trainee 192.168.56.3
trainee@192.168.56.3's password: trainee
Linux kubenode1.ittraining.loc 4.9.0-19-amd64 #1 SMP Debian 4.9.320-2 (2022-06-30) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Wed Sep 28 09:20:14 2022 from 192.168.56.2
trainee@kubenode1:~$ su -
Mot de passe : fenestros

root@kubenode1:~# systemctl enable kubelet
```

```
Created symlink /etc/systemd/system/multi-user.target.wants/kubelet.service →  
/lib/systemd/system/kubelet.service.
```

```
root@kubenode1:~# systemctl start kubelet
```

```
root@kubenode1:~# systemctl status kubelet
```

```
● kubelet.service - kubelet: The Kubernetes Node Agent
```

```
Loaded: loaded (/lib/systemd/system/kubelet.service; enabled; vendor preset: enable
```

```
Drop-In: /etc/systemd/system/kubelet.service.d
```

```
└─10-kubeadm.conf
```

```
Active: active (running) since Wed 2022-09-28 09:54:49 CEST; 7s ago
```

```
Docs: https://kubernetes.io/docs/home/
```

```
Main PID: 5996 (kubelet)
```

```
Tasks: 18 (limit: 4915)
```

```
Memory: 32.1M
```

```
CPU: 555ms
```

```
CGroup: /system.slice/kubelet.service
```

```
└─5996 /usr/bin/kubelet --bootstrap-kubeconfig=/etc/kubernetes/bootstrap-ku
```

```
sept. 28 09:54:51 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:51.572692 599  
sept. 28 09:54:52 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:52.181515 599  
sept. 28 09:54:52 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:52.239266 599  
sept. 28 09:54:52 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:52.289189 599  
sept. 28 09:54:52 kubenode1.ittraining.loc kubelet[5996]: E0928 09:54:52.289617 599  
sept. 28 09:54:52 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:52.289652 599  
sept. 28 09:54:54 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:54.139010 599  
sept. 28 09:54:56 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:56.138812 599  
sept. 28 09:54:56 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:56.241520 599  
sept. 28 09:54:57 kubenode1.ittraining.loc kubelet[5996]: I0928 09:54:57.243967 599
```

```
root@kubenode1:~#
```

```
root@kubenode1:~# exit
```

```
déconnexion
```

```
trainee@kubenode1:~$ exit
```

```
déconnexion
Connection to 192.168.56.3 closed.

root@kubemaster:~# kubectl get nodes
NAME                                STATUS    ROLES    AGE   VERSION
kubemaster.ittraining.loc          Ready    control-plane   24d   v1.25.0
kubenode1.ittraining.loc           Ready    <none>         24d   v1.25.0
kubenode2.ittraining.loc           Ready    <none>         24d   v1.25.0
```

LAB #3 - Les Pods

Quand un pod du cluster démontre un problème, il convient de regarder la section **Events** dans la sortie de la commande **kubectl describe pod** du pod concerné.

3.1 - L'Erreur ImagePullBackOff

Commencez par créer le fichier **deployment-postgresql.yaml** :

```
root@kubemaster:~# vi deployment-postgresql.yaml
root@kubemaster:~# cat deployment-postgresql.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: postgresql
  labels:
    app: postgresql
spec:
  replicas: 1
  selector:
    matchLabels:
      app: postgresql
```

```
template:
  metadata:
    labels:
      app: postgresql
  spec:
    containers:
      - image: bitnami/postgresql:10.12.10
        imagePullPolicy: IfNotPresent
        name: postgresql
```

Déployez ensuite l'application :

```
root@kubemaster:~# kubectl apply -f deployment-postgresql.yaml
deployment.apps/postgresql created
```

En consultant le pod créé, vous verrez qu'il y a une erreur de type **ImagePullBackOff** :

```
root@kubemaster:~# kubectl get pods
NAME                                READY   STATUS              RESTARTS   AGE
postgresql-6778f6569c-x84xd        0/1    ImagePullBackOff   0           25s
sharedvolume                        2/2    Running            0           8d
volumepod                          0/1    Completed          0           8d
```

Consultez la section **Events** de la sortie de la commande **describe** pour voir ce que se passe :

```
root@kubemaster:~# kubectl describe pod postgresql-6778f6569c-x84xd | tail
node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type     Reason      Age           From          Message
  ----     -
  Normal   Scheduled   74s          default-scheduler   Successfully assigned default/postgresql-6778f6569c-x84xd to kubenode1.ittraining.loc
  Normal   Pulling     28s (x3 over 74s)  kubelet         Pulling image "bitnami/postgresql:10.12.10"
  Warning  Failed     27s (x3 over 72s)  kubelet         Failed to pull image "bitnami/postgresql:10.12.10":
```

```
rpc error: code = NotFound desc = failed to pull and unpack image "docker.io/bitnami/postgresql:10.12.10": failed
to resolve reference "docker.io/bitnami/postgresql:10.12.10": docker.io/bitnami/postgresql:10.12.10: not found
Warning   Failed      27s (x3 over 72s) kubelet      Error: ErrImagePull
Normal    BackOff     12s (x3 over 72s) kubelet      Back-off pulling image "bitnami/postgresql:10.12.10"
Warning   Failed      12s (x3 over 72s) kubelet      Error: ImagePullBackOff
```

Comme vous pouvez constater, il existe trois avertissements

```
Warning   Failed      27s (x3 over 72s) kubelet      Failed to pull image "bitnami/postgresql:10.12.10":
rpc error: code = NotFound desc = failed to pull and unpack image "docker.io/bitnami/postgresql:10.12.10": failed
to resolve reference "docker.io/bitnami/postgresql:10.12.10": docker.io/bitnami/postgresql:10.12.10: not found

Warning   Failed      27s (x3 over 72s) kubelet      Error: ErrImagePull

Warning   Failed      12s (x3 over 72s) kubelet      Error: ImagePullBackOff
```

Le premier des trois avertissements nous dit clairement qu'il y a un problème au niveau du tag de l'image spécifié dans le fichier **deployment-postgresql.yaml** : **docker.io/bitnami/postgresql:10.12.10: not found**.

Modifiez donc le tag dans ce fichier à **10.13.0** :

```
root@kubemaster:~# vi deployment-postgresql.yaml
root@kubemaster:~# cat deployment-postgresql.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: postgresql
  labels:
    app: postgresql
spec:
  replicas: 1
  selector:
    matchLabels:
      app: postgresql
```



```
Normal    Scheduled    4m3s                default-scheduler    Successfully assigned
default/postgresql-6668d5d6b5-swr9g to kubenode1.ittraining.loc
Normal    Pulling      4m2s                kubelet              Pulling image "bitnami/postgresql:10.13.0"
Normal    Pulled       3m22s              kubelet              Successfully pulled image
"bitnami/postgresql:10.13.0" in 40.581665048s
Normal    Created      90s (x5 over 3m21s) kubelet              Created container postgresql
Normal    Started      90s (x5 over 3m21s) kubelet              Started container postgresql
Normal    Pulled       90s (x4 over 3m20s) kubelet              Container image "bitnami/postgresql:10.13.0"
already present on machine
Warning   BackOff      68s (x9 over 3m19s) kubelet              Back-off restarting failed container
```

Cette fois-ci, la section **Events** nous donne aucune indication concernant le problème !

Pour obtenir plus d'information concernant le problème, on peut utiliser la commande **logs** :

```
root@kubemaster:~# kubectl logs postgresql-6668d5d6b5-swr9g | tail
postgresql 08:43:48.60
postgresql 08:43:48.60 Welcome to the Bitnami postgresql container
postgresql 08:43:48.60 Subscribe to project updates by watching
https://github.com/bitnami/bitnami-docker-postgresql
postgresql 08:43:48.60 Submit issues and feature requests at
https://github.com/bitnami/bitnami-docker-postgresql/issues
postgresql 08:43:48.60
postgresql 08:43:48.62 INFO ==> ** Starting PostgreSQL setup **
postgresql 08:43:48.63 INFO ==> Validating settings in POSTGRESQL_* env vars..
postgresql 08:43:48.63 ERROR ==> The POSTGRESQL_PASSWORD environment variable is empty or not set. Set the
environment variable ALLOW_EMPTY_PASSWORD=yes to allow the container to be started with blank passwords. This is
recommended only for development.
postgresql 08:43:48.63 ERROR ==> The POSTGRESQL_PASSWORD environment variable is empty or not set. Set the
environment variable ALLOW_EMPTY_PASSWORD=yes to allow the container to be started with blank passwords. This is
recommended only for development.
```

La sortie de la commande **logs** nous indique clairement que le problème est lié au contenu de la variable **POSTGRESQL_PASSWORD** qui est vide. Elle nous indique aussi que nous pourrions fixer la valeur de la variable **ALLOW_EMPTY_PASSWORD** à **yes** pour contourner ce problème :

```
...
postgresql 08:43:48.63 ERROR ==> The POSTGRESQL_PASSWORD environment variable is empty or not set. Set the
environment variable ALLOW_EMPTY_PASSWORD=yes to allow the container to be started with blank passwords. This is
recommended only for development.
```

Mettez à jour donc le fichier **deployment-postgresql.yaml** :

```
root@kubemaster:~# vi deployment-postgresql.yaml
root@kubemaster:~# cat deployment-postgresql.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: postgresql
  labels:
    app: postgresql
spec:
  replicas: 1
  selector:
    matchLabels:
      app: postgresql
  template:
    metadata:
      labels:
        app: postgresql
    spec:
      containers:
      - image: bitnami/postgresql:10.13.0
        imagePullPolicy: IfNotPresent
        name: postgresql
        env:
        - name: POSTGRESQL_PASSWORD
          value: "VerySecurePassword:-)"
```

Appliquez la configuration :

```
root@kubemaster:~# kubectl apply -f deployment-postgresql.yaml
deployment.apps/postgresql configured
```

Constatez l'état du Pod ainsi que le deployment :

```
root@kubemaster:~# kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
postgresql-6f885d8957-tnlbb        1/1     Running   0           29s
sharedvolume                        2/2     Running   0           8d
volumepod                          0/1     Completed 0           8d

root@kubemaster:~# kubectl get deployments
NAME          READY   UP-TO-DATE   AVAILABLE   AGE
postgresql   1/1     1             1           14m
```

Utilisez maintenant l'option **-f** de la commande logs pour voir les traces en continu :

```
root@kubemaster:~# kubectl logs postgresql-6f885d8957-tnlbb -f
postgresql 08:48:35.14
postgresql 08:48:35.14 Welcome to the Bitnami postgresql container
postgresql 08:48:35.14 Subscribe to project updates by watching
https://github.com/bitnami/bitnami-docker-postgresql
postgresql 08:48:35.14 Submit issues and feature requests at
https://github.com/bitnami/bitnami-docker-postgresql/issues
postgresql 08:48:35.15
postgresql 08:48:35.16 INFO ==> ** Starting PostgreSQL setup **
postgresql 08:48:35.17 INFO ==> Validating settings in POSTGRESQL_* env vars..
postgresql 08:48:35.18 INFO ==> Loading custom pre-init scripts...
postgresql 08:48:35.18 INFO ==> Initializing PostgreSQL database...
postgresql 08:48:35.20 INFO ==> pg_hba.conf file not detected. Generating it...
postgresql 08:48:35.20 INFO ==> Generating local authentication configuration
postgresql 08:48:47.94 INFO ==> Starting PostgreSQL in background...
postgresql 08:48:48.36 INFO ==> Changing password of postgres
postgresql 08:48:48.39 INFO ==> Configuring replication parameters
```

```
postgresql 08:48:48.46 INFO ==> Configuring fsync
postgresql 08:48:48.47 INFO ==> Loading custom scripts...
postgresql 08:48:48.47 INFO ==> Enabling remote connections
postgresql 08:48:48.48 INFO ==> Stopping PostgreSQL...
postgresql 08:48:49.49 INFO ==> ** PostgreSQL setup finished! **

postgresql 08:48:49.50 INFO ==> ** Starting PostgreSQL **
2022-09-28 08:48:49.633 GMT [1] LOG:  listening on IPv4 address "0.0.0.0", port 5432
2022-09-28 08:48:49.633 GMT [1] LOG:  listening on IPv6 address ":::", port 5432
2022-09-28 08:48:49.699 GMT [1] LOG:  listening on Unix socket "/tmp/.s.PGSQL.5432"
2022-09-28 08:48:49.817 GMT [106] LOG:  database system was shut down at 2022-09-28 08:48:48 GMT
2022-09-28 08:48:49.852 GMT [1] LOG:  database system is ready to accept connections
^C
```



Important : Notez l'utilisation de **^C** pour arrêter la commande **kubectl logs postgresql-6f885d8957-tnlbb -f**.

LAB #4 - Les Conteneurs

4.1 - La Commande exec

La commande **exec** peut être utilisée pour exécuter une commande à l'intérieur d'un conteneur dans un pod. Imaginons que vous souhaitez vérifier le contenu du fichier de configuration de PostgreSQL, **postgresql.conf** :

```
root@kubemaster:~# kubectl exec postgresql-6f885d8957-tnlbb -- cat /opt/bitnami/postgresql/conf/postgresql.conf |
more
# -----
# PostgreSQL configuration file
# -----
```

```
#
# This file consists of lines of the form:
#
#   name = value
#
# (The "=" is optional.)  Whitespace may be used.  Comments are introduced with
# "#" anywhere on a line.  The complete list of parameter names and allowed
# values can be found in the PostgreSQL documentation.
#
# The commented-out settings shown in this file represent the default values.
# Re-commenting a setting is NOT sufficient to revert it to the default value;
# you need to reload the server.
#
# This file is read on server startup and when the server receives a SIGHUP
# signal.  If you edit the file on a running system, you have to SIGHUP the
# server for the changes to take effect, run "pg_ctl reload", or execute
# "SELECT pg_reload_conf()".  Some parameters, which are marked below,
# require a server shutdown and restart to take effect.
#
# Any parameter can also be given as a command-line option to the server, e.g.,
# "postgres -c log_connections=on".  Some parameters can be changed at run time
# with the "SET" SQL command.
#
# Memory units:  kB = kilobytes          Time units:  ms = milliseconds
#                MB = megabytes          s = seconds
#                GB = gigabytes          min = minutes
#                TB = terabytes          h = hours
#                                       d = days

#-----
# FILE LOCATIONS
#-----
```

```
# The default values of these variables are driven from the -D command-line
# option or PGDATA environment variable, represented here as ConfigDir.

#data_directory = 'ConfigDir'           # use data in another directory
                                         # (change requires restart)
#hba_file = 'ConfigDir/pg_hba.conf'     # host-based authentication file
                                         # (change requires restart)
#ident_file = 'ConfigDir/pg_ident.conf' # ident configuration file
                                         # (change requires restart)

# If external_pid_file is not explicitly set, no extra PID file is written.
#external_pid_file = ''                 # write an extra PID file
                                         # (change requires restart)

#-----
# CONNECTIONS AND AUTHENTICATION
#-----

--More--
```

Dernièrement, Il est évidemment possible de rentrer dans le conteneur lui-même afin de procéder à des recherches de problèmes éventuels :

```
root@kubemaster:~# kubectl exec postgresql-6f885d8957-tnlbb --stdin --tty -- /bin/bash
I have no name!@postgresql-6f885d8957-tnlbb:/$ exit
exit
root@kubemaster:~#
```

LAB #5 - Le Réseau

5.1 - kube-proxy et le DNS

Utilisez la commande **kubectl get pods** pour obtenir les noms des pods **kube-proxy** et **coredns** :

```
root@kubemaster:~# kubectl get pods -n kube-system
NAME                                READY   STATUS    RESTARTS      AGE
calico-kube-controllers-6799f5f4b4-2tgpq  1/1     Running   0              160m
calico-node-5htrc                       1/1     Running   1 (12d ago)    24d
calico-node-dc7hd                       1/1     Running   1 (12d ago)    24d
calico-node-qk5kt                       1/1     Running   1 (12d ago)    24d
coredns-565d847f94-kkpbp                1/1     Running   0              160m
coredns-565d847f94-tqd8z                1/1     Running   1 (12d ago)    23d
etcd-kubemaster.ittraining.loc           1/1     Running   1 (12d ago)    23d
kube-apiserver-kubemaster.ittraining.loc  1/1     Running   1 (12d ago)    23d
kube-controller-manager-kubemaster.ittraining.loc  1/1     Running   12 (5d4h ago)  23d
kube-proxy-ggmt6                         1/1     Running   1 (12d ago)    23d
kube-proxy-x5j2r                         1/1     Running   1 (12d ago)    23d
kube-proxy-x7fpc                         1/1     Running   1 (12d ago)    23d
kube-scheduler-kubemaster.ittraining.loc  1/1     Running   14 (31h ago)   23d
metrics-server-5dbb5ff5bd-vh5fz         1/1     Running   1 (12d ago)    23d
```

Recherchez des erreurs éventuelles dans les journaux de chaque pod :

```
root@kubemaster:~# kubectl logs -n kube-system kube-proxy-ggmt6 | tail
I0916 07:32:34.968850    1 shared_informer.go:255] Waiting for caches to sync for service config
I0916 07:32:34.968975    1 config.go:226] "Starting endpoint slice config controller"
I0916 07:32:34.968988    1 shared_informer.go:255] Waiting for caches to sync for endpoint slice config
I0916 07:32:34.968995    1 config.go:444] "Starting node config controller"
I0916 07:32:34.969002    1 shared_informer.go:255] Waiting for caches to sync for node config
I0916 07:32:35.069078    1 shared_informer.go:262] Caches are synced for service config
I0916 07:32:35.069147    1 shared_informer.go:262] Caches are synced for node config
I0916 07:32:35.069169    1 shared_informer.go:262] Caches are synced for endpoint slice config
I0916 07:33:06.103911    1 trace.go:205] Trace[210170851]: "iptables restore" (16-Sep-2022 07:33:03.886)
```

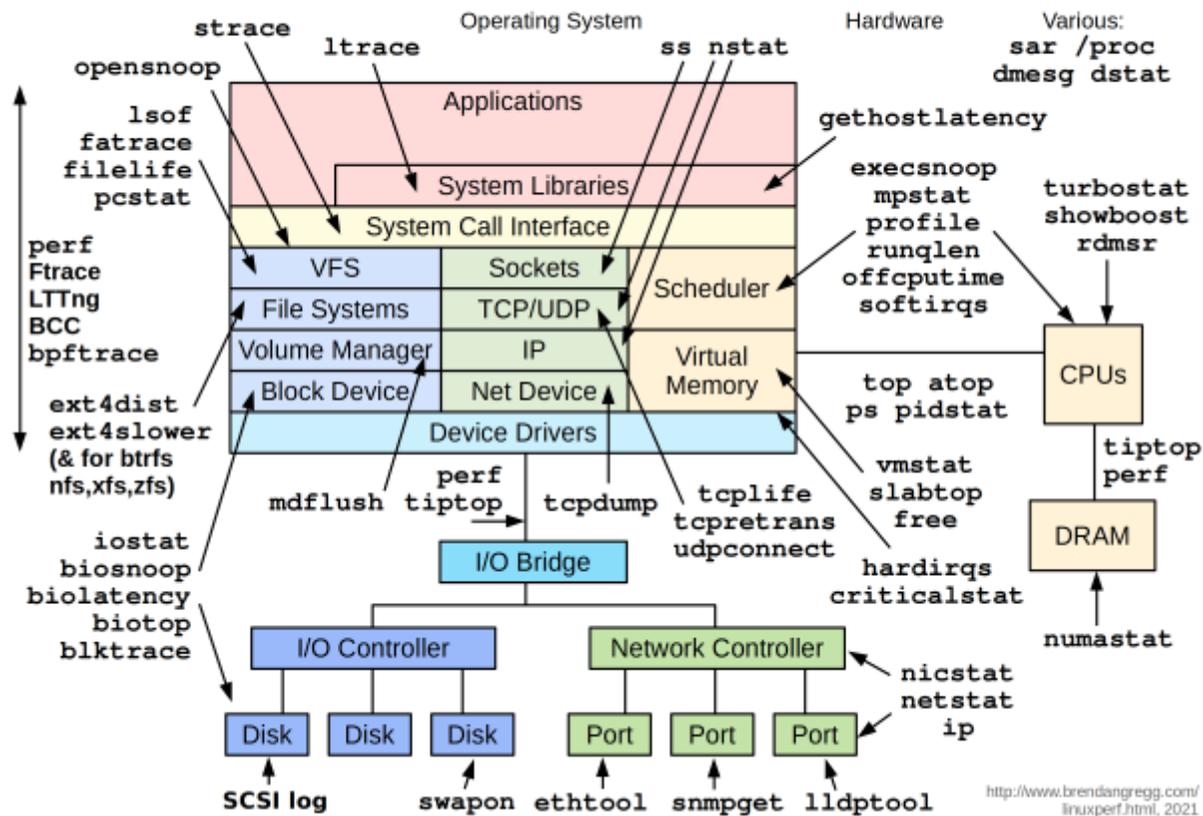
```
(total time: 2216ms):  
Trace[210170851]: [2.216953699s] [2.216953699s] END
```

```
root@kubemaster:~# kubectl logs -n kube-system coredns-565d847f94-kkpbp | tail  
[INFO] plugin/kubernetes: waiting for Kubernetes API before starting server  
[INFO] plugin/kubernetes: waiting for Kubernetes API before starting server  
.:53  
[INFO] plugin/reload: Running configuration SHA512 =  
591cf328cccc12bc490481273e738df59329c62c0b729d94e8b61db9961c2fa5f046dd37f1cf888b953814040d180f52594972691cd6ff41b  
e96639138a43908  
CoreDNS-1.9.3  
linux/amd64, go1.18.2, 45b0a11
```

5.2 - Le Conteneur netshoot

Si, à ce stade, vous n'avez pas trouvé d'erreurs apparentes, il convient de créer un pod qui contiendra un conteneur généré de l'image **nicolaka/netshoot**. Cette image contient un grand nombre d'outils de dépannage pré-installés :

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Créez le fichier **nginx-netshoot.yaml** :

```
root@kubemaster:~# vi nginx-netshoot.yaml
root@kubemaster:~# cat nginx-netshoot.yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx-netshoot
  labels:
    app: nginx-netshoot
```

```
spec:
  containers:
  - name: nginx
    image: nginx:1.19.1
  ---
apiVersion: v1
kind: Service
metadata:
  name: service-netshoot
spec:
  type: ClusterIP
  selector:
    app: nginx-netshoot
  ports:
  - protocol: TCP
    port: 80
    targetPort: 80
```

Créez le pod et le service :

```
root@kubemaster:~# kubectl create -f nginx-netshoot.yaml
pod/nginx-netshoot created
service/service-netshoot created
```

Vérifiez que le service est en cours d'exécution :

```
root@kubemaster:~# kubectl get services
NAME                TYPE          CLUSTER-IP      EXTERNAL-IP      PORT(S)          AGE
kubernetes          ClusterIP     10.96.0.1       <none>           443/TCP         24d
service-netshoot    ClusterIP     10.107.115.28   <none>           80/TCP          5m18s
```

Créez maintenant le fichier **netshoot.yaml** :

```
root@kubemaster:~# vi netshoot.yaml
```

```
root@kubemaster:~# cat netshoot.yaml
apiVersion: v1
kind: Pod
metadata:
  name: netshoot
spec:
  containers:
  - name: netshoot
    image: nicolaka/netshoot
    command: ['sh', '-c', 'while true; do sleep 5; done']
```

Créez le pod :

```
root@kubemaster:~# kubectl create -f netshoot.yaml
pod/netshoot created
```

Vérifiez que le status du pod est **READY** :

```
root@kubemaster:~# kubectl get pods
NAME                READY   STATUS    RESTARTS   AGE
netshoot            1/1    Running   0           6m7s
nginx-netshoot      1/1    Running   0           9m32s
postgresql-6f885d8957-tnlbb 1/1    Running   0           98m
sharedvolume        2/2    Running   0           8d
troubleshooting     1/1    Running   0           125m
volumepod           0/1    Completed 0           8d
```

Entrez dans le conteneur **netshoot** :

```
root@kubemaster:~# kubectl exec --stdin --tty netshoot -- /bin/bash
bash-5.1#
```

Testez le bon fonctionnement du service **service-netshoot** :

```
bash-5.1# curl service-netshoot
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
  body {
    width: 35em;
    margin: 0 auto;
    font-family: Tahoma, Verdana, Arial, sans-serif;
  }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

Dernièrement, utilisez la commande **nslookup** pour obtenir l'adresse IP du service :

```
bash-5.1# nslookup service-netshoot
Server:          10.96.0.10
Address:         10.96.0.10#53

Name:   service-netshoot.default.svc.cluster.local
```

Address: 10.107.115.28



Important : Pour plus d'information concernant les outils inclus dans le conteneur **netshoot**, consultez la page de **netshoot** sur **GitHub**.