基于kubernetes构建智能化监控告警系统

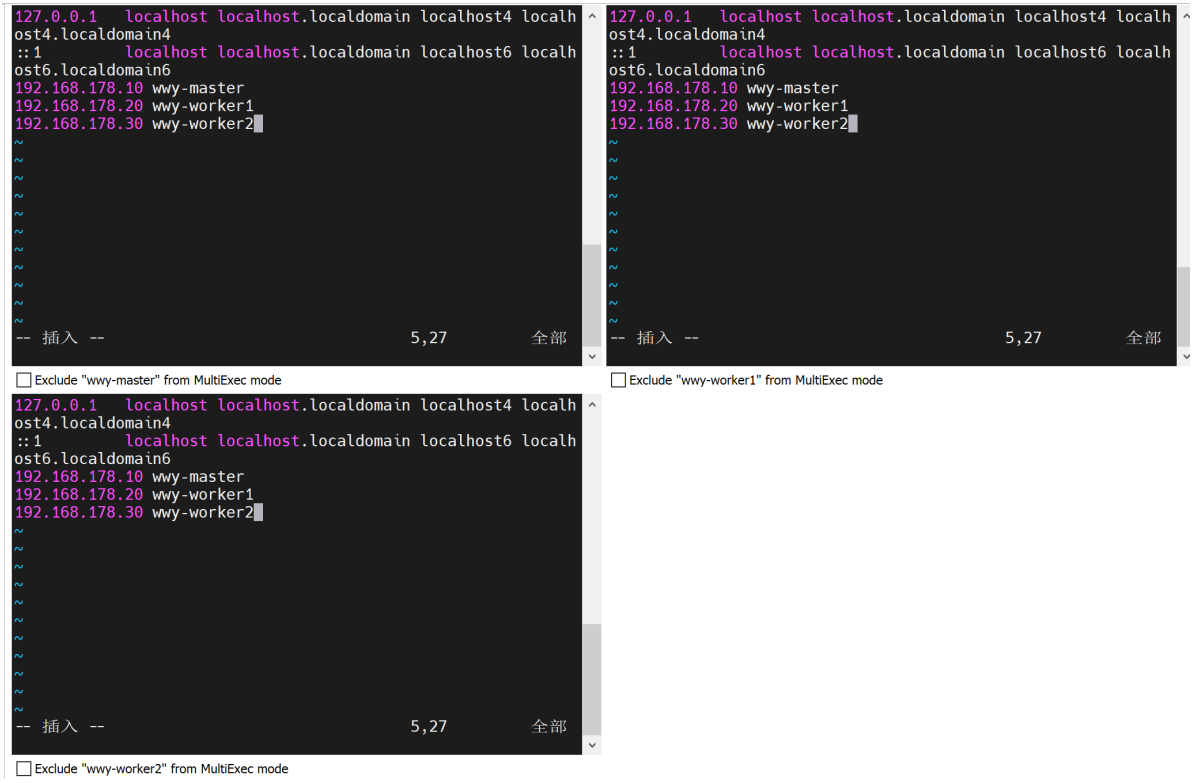
k8s集群规划

hostname	ip
wwy-master	192.168.178.10
wwy-worker1	192.168.178.20
wwy-worker2	192.168.178.30

基于sealos搭建k8s集群

准备基本环境

```
# 所有的主机都要配置主机名和域名映射
# 设置主机名
hostnamectl set-hostname wwy-master
vim /etc/hosts
```



安装sealos

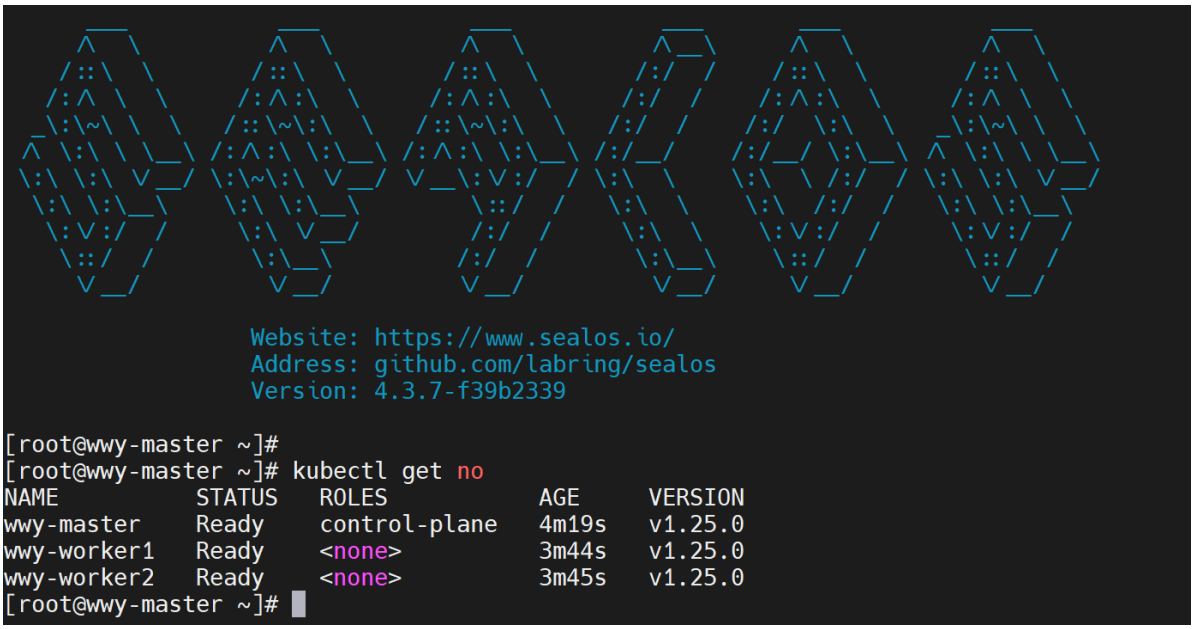
官方文档：https://sealos.io/zh-Hans/docs/self-hosting/lifecycle-management/quick-start/deploy-kubernetes

下载地址：https://github.com/labring/sealos/releases

安装kubernetes集群

k8s version: 1.25.0

官方文档：https://sealos.io/zh-Hans/docs/self-hosting/lifecycle-management/quick-start/deploy-kubernetes

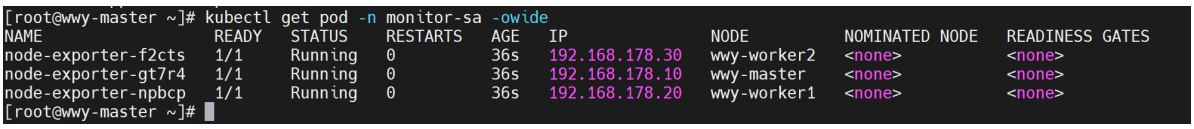


node_exporter安装和配置

在所有节点安装node-exporter

```
[root@wwy-master ~]# kubectl create ns monitor-sa
namespace/monitor-sa created

#在所有节点导入node-exporter.tar.gz
[root@wwy-master ~]# ctr -n k8s.io images import node-exporter.tar.gz
```

```
[root@wwy-master ~]# kubectl apply -f node-export.yaml
daemonset.apps/node-exporter created

#查看是否部署成功
[root@wwy-master ~]# kubectl get pod -n monitor-sa -owide
```



```
#查看节点总内存使用情况
[root@wwy-master ~]# curl http://192.168.178.20:9100/metrics |grep
node_memory_MemTotal_bytes
```

```
[root@wwy-master ~]# curl http://192.168.178.20:9100/metrics |grep node_memory_MemTotal_bytes
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
  0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--     0# HELP node_memory_MemTotal_bytes Memory information field MemTotal_bytes.
# TYPE node_memory_MemTotal_bytes gauge
node_memory_MemTotal_bytes 2.095648768e+09
100 90284  100 90284    0     0  3189k      0 --:--:-- --:--:-- --:--:-- 3265k
[root@wwy-master ~]#
```

prometheus（2）之对kubernetes的监控 - 大辉哥 - 博客园 (cnblogs.com)

prometheus server安装和配置

创建serviceaccount账号，对其做RBAC授权

```
[root@wwy-master ~]# kubectl create serviceaccount monitor -n monitor-sa
serviceaccount/monitor created

[root@wwy-master ~]# kubectl create clusterrolebinding monitor-
clusterrolebinding -n monitor-sa --clusterrole=cluster-admin --
serviceaccount=monitor-sa:monitor
clusterrolebinding.rbac.authorization.k8s.io/monitor-clusterrolebinding created

[root@wwy-master ~]# kubectl create clusterrolebinding monitor-
clusterrolebinding-1 -n monitor-sa --clusterrole=cluster-admin --
user=system:serviceaccount:monitor:monitor-sa
clusterrolebinding.rbac.authorization.k8s.io/monitor-clusterrolebinding-1
created
```

创建prometheus数据存储目录

```
在两个worker节点上创建数据存储目录
[root@wwy-worker1 ~]# mkdir /data
[root@wwy-worker1 ~]# chmod 777 /data/
[root@wwy-worker2 ~]# mkdir /data
[root@wwy-worker2 ~]# chmod 777 /data/
```

创建一个configmap用来存放prometheus配置信息

```
[root@wwy-master ~]# kubectl apply -f prometheus-cfg.yaml
configmap/prometheus-config created
[root@wwy-master ~]# kubectl get cm -n monitor-sa
NAME                 DATA   AGE
kube-root-ca.crt     1      23h
prometheus-config    1      45s
```

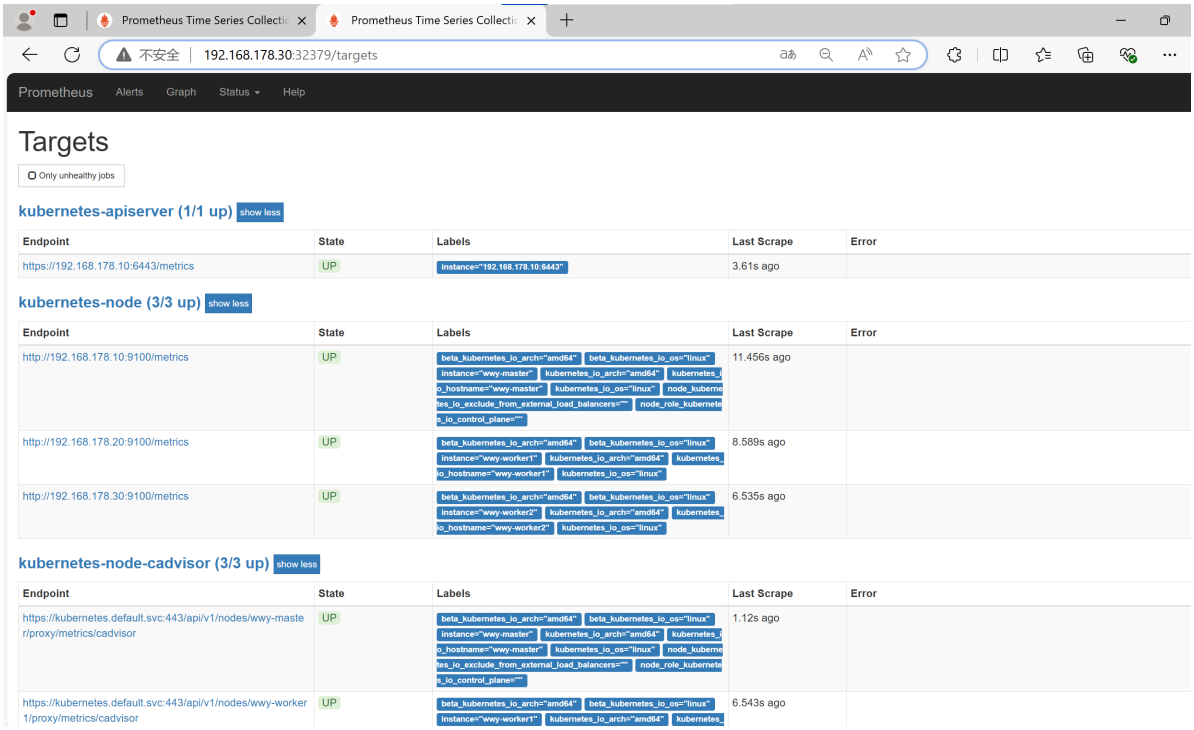
通过deployment部署prometheus

```
导入prometheus
[root@wwy-worker1 ~]# ctr -n=k8s.io images import prometheus-2-2-1.tar.gz
WARN[0000] DEPRECATION: The `configs` property of
`[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd
v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking docker.io/prom/prometheus:v2.2.1
(sha256:9dd99da46165fcc573db2c8e4b65f9dc33914ed6a8cf6385cb8a73a0a0682926)...done

[root@wwy-worker2 ~]# ctr -n=k8s.io images import prometheus-2-2-1.tar.gz
WARN[0000] DEPRECATION: The `configs` property of
`[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd
v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking docker.io/prom/prometheus:v2.2.1
(sha256:9dd99da46165fcc573db2c8e4b65f9dc33914ed6a8cf6385cb8a73a0a0682926)...done

部署prometheus
[root@wwy-master ~]# kubectl apply -f prometheus-deploy.yaml
deployment.apps/prometheus-server created
查看promethues的pod的状态
[root@wwy-master ~]# kubectl get pods -n monitor-sa
NAME                                READY   STATUS    RESTARTS   AGE
node-exporter-f2cts                 1/1     Running   0          23h
node-exporter-gt7r4                 1/1     Running   0          23h
node-exporter-npbcp                 1/1     Running   0          23h
prometheus-server-59964b7488-4dtw6  1/1     Running   0          10s
prometheus-server-59964b7488-qxn8c  1/1     Running   0          10s
```

给prometheus pod创建一个service

```
[root@wwy-master ~]# kubectl apply -f prometheus-svc.yaml
service/prometheus created

可以看到service在宿主机上映射的端口是32379
[root@wwy-master ~]# kubectl get svc -n monitor-sa
NAME         TYPE       CLUSTER-IP    EXTERNAL-IP   PORT(S)          AGE
prometheus   NodePort   10.96.0.139   <none>        9090:32379/TCP   9s
```

访问prometheus服务，点击页面的Status->Targets，如下图，说明我们配置的服务发现可以正常采集数据



prometheus热加载

Grafana的安装和配置

导入并安装Grafana

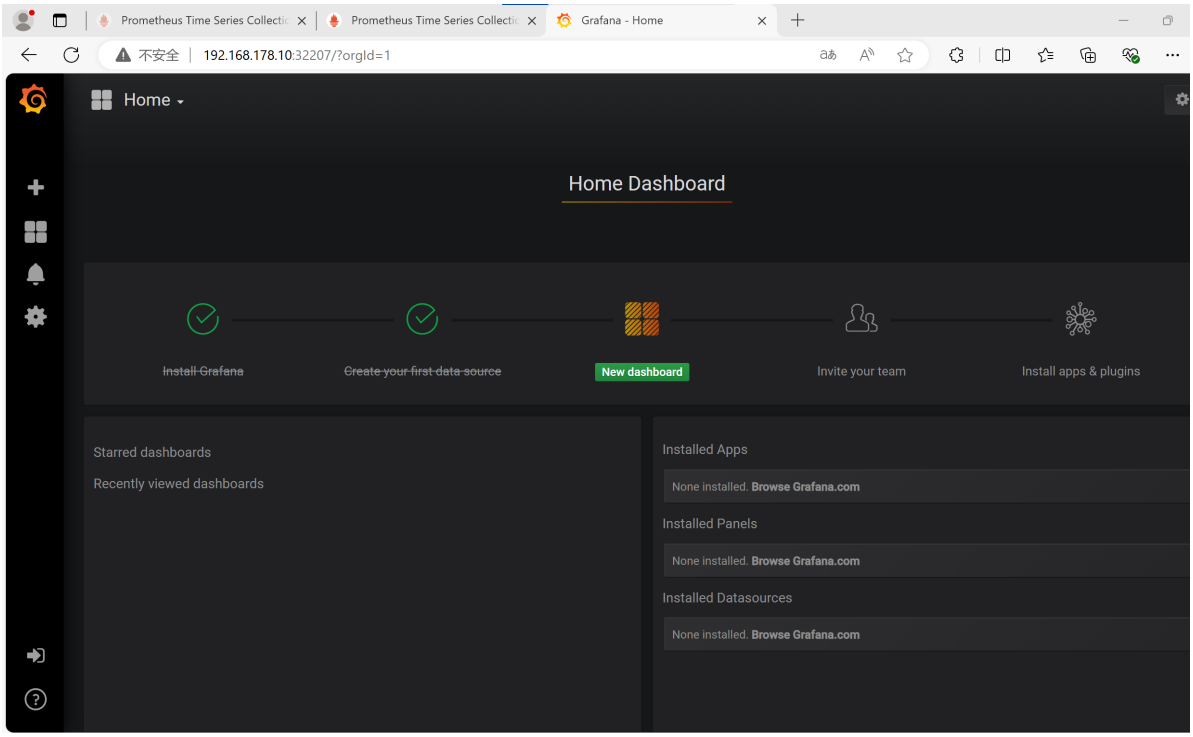
```
[root@wwy-worker1 ~]# ctr -n=k8s.io images import heapster-grafana-amd64_v5_0_4.tar.gz
WARN[0000] DEPRECATION: The `configs` property of `[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking k8s.gcr.io/heapster-grafana-amd64:v5.0.4 (sha256:1703015b12590c4c0a34d82e8c69c4e87a6f2303107034c720624e7cd74380da)...done

[root@wwy-worker2 ~]# ctr -n=k8s.io images import heapster-grafana-amd64_v5_0_4.tar.gz
WARN[0000] DEPRECATION: The `configs` property of `[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking k8s.gcr.io/heapster-grafana-amd64:v5.0.4 (sha256:1703015b12590c4c0a34d82e8c69c4e87a6f2303107034c720624e7cd74380da)...done


[root@wwy-master ~]# kubectl apply -f grafana.yaml
deployment.apps/monitoring-grafana created
service/monitoring-grafana created

检查Grafana的pod的运行状态
[root@wwy-master ~]# kubectl get pod -n kube-system -l task=monitoring
NAME                                  READY   STATUS    RESTARTS   AGE
monitoring-grafana-d47cdf886-fc58h    1/1     Running   0          16s
```

```
monitoring-grafana-d47cdf886-mstz7   1/1     Running   0          16s
```

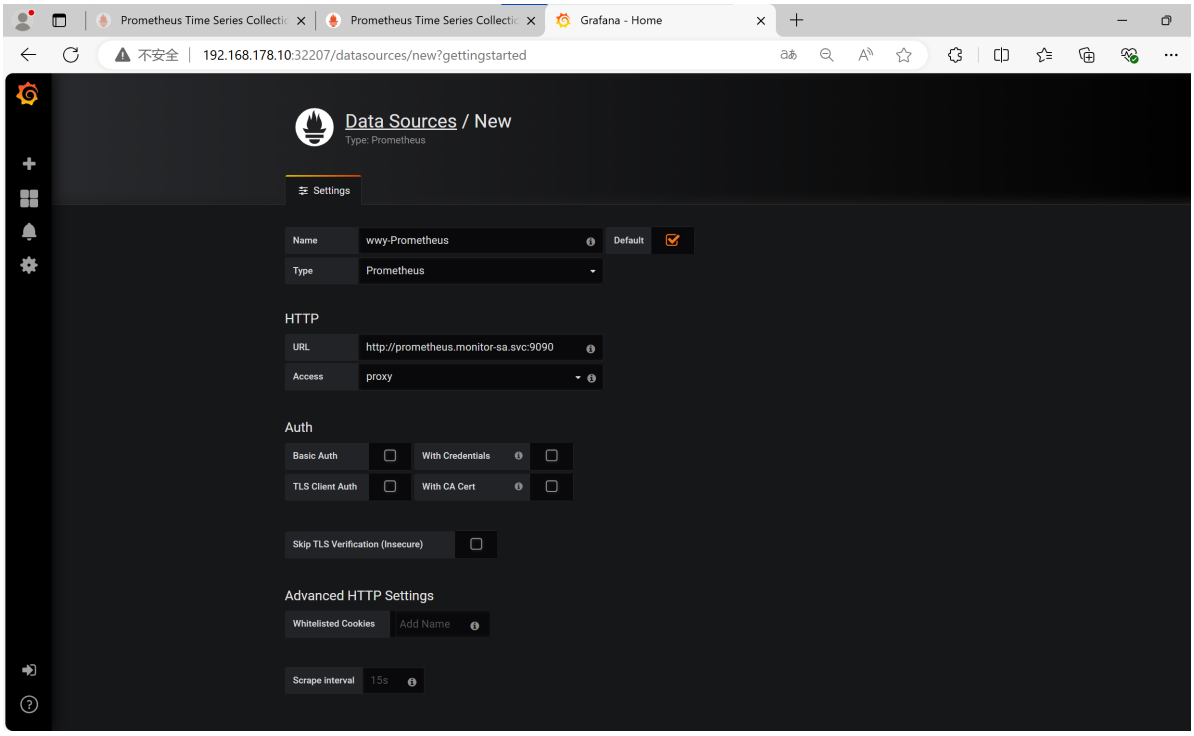
Grafana接入prometheus数据源

```
可以看到grafana的访问端口为32207
[root@wwy-master ~]# kubectl get svc -n kube-system
NAME                  TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)
      AGE
kube-dns              ClusterIP   10.96.0.10     <none>
 53/UDP,53/TCP,9153/TCP   23h
monitoring-grafana    NodePort    10.96.3.125    <none>        80:32207/TCP
       3m24s
```

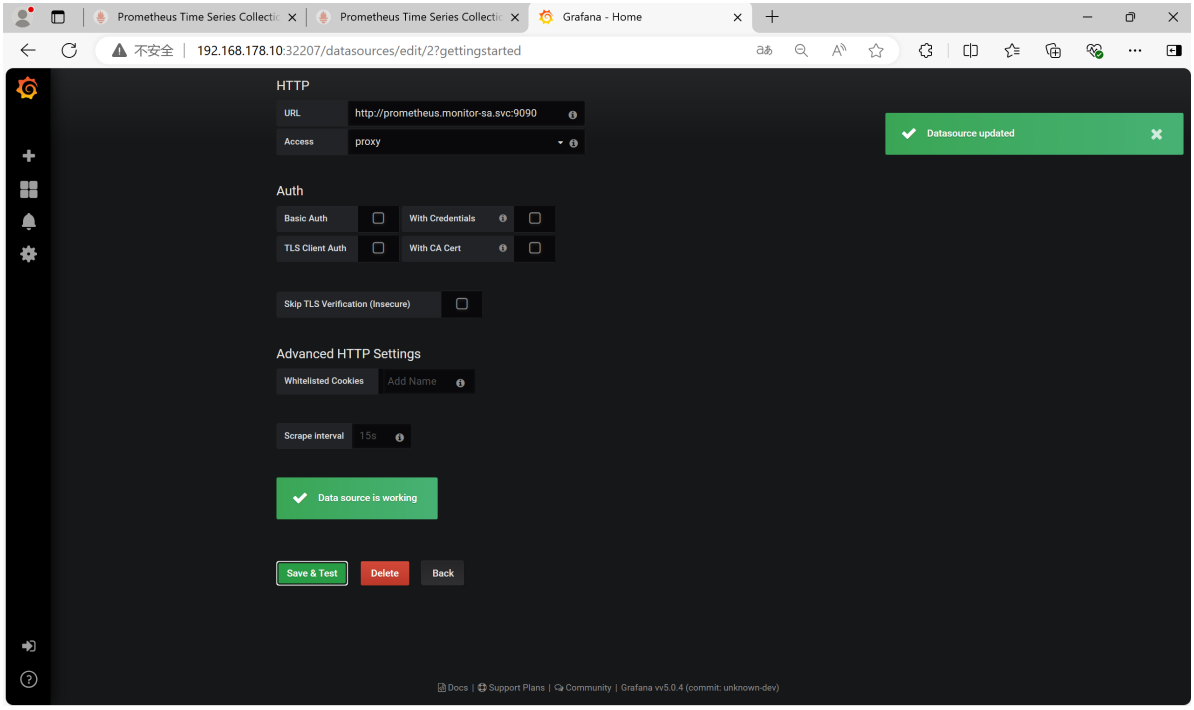
访问grafana服务界面



填写prometheus数据源配置信息

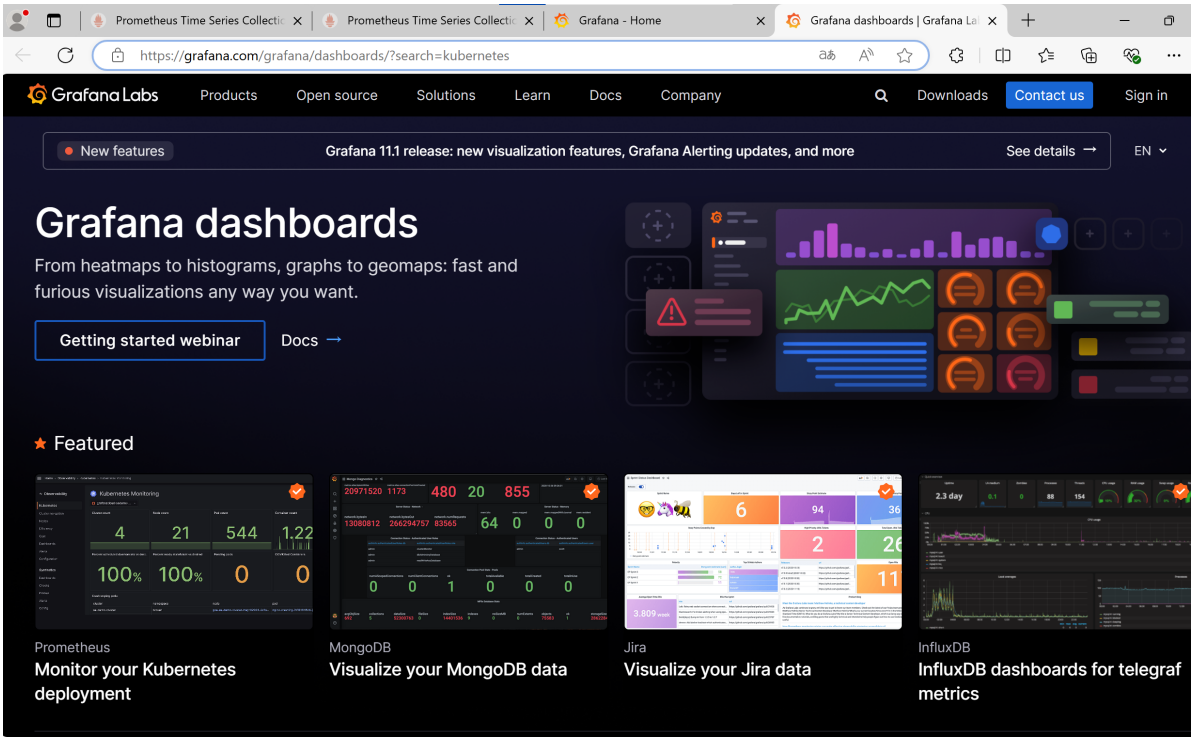


测试prometheus数据源连通性



在以下网站选择Grafana dashboard模板并导入

[Grafana dashboards | Grafana Labs]



安装kube-state-metrics组件

创建sa，并对sa授权

```
[root@wwy-master ~]# kubectl apply -f kube-state-metrics-rbac.yaml
serviceaccount/kube-state-metrics created
clusterrole.rbac.authorization.k8s.io/kube-state-metrics created
clusterrolebinding.rbac.authorization.k8s.io/kube-state-metrics created
```

导入并安装kube-state-metrics组件

```
[root@wwy-worker1 ~]# ctr -n=k8s.io images import kube-state-
metrics_1_9_0.tar.gz
WARN[0000] DEPRECATION: The `configs` property of
`[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd
v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking quay.io/coreos/kube-state-metrics:v1.9.0
(sha256:bf40aa1452dcefe34680c595995af1f4a72b7a480b3597fe863a3a5c4e8dde42)...done

[root@wwy-worker2 ~]# ctr -n=k8s.io images import kube-state-
metrics_1_9_0.tar.gz
WARN[0000] DEPRECATION: The `configs` property of
`[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd
v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking quay.io/coreos/kube-state-metrics:v1.9.0
(sha256:bf40aa1452dcefe34680c595995af1f4a72b7a480b3597fe863a3a5c4e8dde42)...done
```

创建kube-state-metrics的deploy

```
[root@wwy-master ~]# kubectl apply -f kube-state-metrics-deploy.yaml
deployment.apps/kube-state-metrics created

[root@wwy-master ~]# kubectl get pod -n kube-system -l app=kube-state-metrics
NAME                                  READY   STATUS              RESTARTS   AGE
kube-state-metrics-7594ddfc96-pclf6   0/1     ContainerCreating   0
5m33s
kube-state-metrics-7594ddfc96-tg7zc   0/1     ContainerCreating   0
5m33s
Events:
  Type     Reason                  Age                 From
Message
  ----     ------                  ----                ----               ------
-
  Normal   Scheduled               10m                 default-scheduler
Successfully assigned kube-system/kube-state-metrics-7594ddfc96-pclf6 to wwy-
worker2
  Warning  FailedCreatePodSandBox  10m                 kubelet            Failed
to create pod sandbox: rpc error: code = Unknown desc = failed to setup network
for sandbox "c5371edf5a1f1fb569b2d733138ae0bf7a53231f7dfcc9007ce802c073e18bef":
plugin type="calico" failed (add): error getting ClusterInformation: connection
is unauthorized: Unauthorized
  Normal   SandboxChanged          14s (x46 over 10m)  kubelet            Pod
sandbox changed, it will be killed and re-created.

[root@wwy-master ~]# kubectl get pod -n kube-system -l app=kube-state-metrics
NAME                                  READY   STATUS    RESTARTS      AGE
kube-state-metrics-7594ddfc96-89bqw   1/1     Running   1 (18h ago)   20h
kube-state-metrics-7594ddfc96-t4whx   1/1     Running   0             20h
```

```
[root@wwy-master ~]# kubectl get pod -n kube-system -l app=kube-state-metrics
NAME                                  READY   STATUS    RESTARTS      AGE
kube-state-metrics-7594ddfc96-89bqw   1/1     Running   1 (18h ago)   20h
kube-state-metrics-7594ddfc96-t4whx   1/1     Running   0             20h
[root@wwy-master ~]#
```

部署kube-state-metrics-svc

```
[root@wwy-master ~]# kubectl apply -f kube-state-metrics-svc.yaml
service/kube-state-metrics created
[root@wwy-master ~]# kubectl get svc -n kube-system
NAME                  TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)
      AGE
kube-dns              ClusterIP   10.96.0.10     <none>
 53/UDP,53/TCP,9153/TCP   2d19h
kube-state-metrics    ClusterIP   10.96.0.244    <none>        8080/TCP
      16s
monitoring-grafana    NodePort    10.96.3.125    <none>        80:32207/TCP
      43h
```

部署Alertmanager报警报警系统

注册一个新的QQ邮箱并开启IMAP/SMTP服务和POP3/SMTP服务

创建alertmanager-configmap文件

[root@wwy-master ~]# kubectl apply -f alertmanager-cm.yaml
configmap/alertmanager created

创建prometheus和告警规则配置文件

把alertmanager.tar.gz镜像包上传的k8s的各个工作节点，手动解压：

```
[root@wwy-worker1 ~]# ctr -n=k8s.io images import alertmanager.tar.gz
WARN[0000] DEPRECATION: The `configs` property of
`[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd
v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking docker.io/prom/alertmanager:v0.14.0
(sha256:fa5192990c11d1e69489b4c624af2dfb905b0ce73ef82b8aae930c71e5d28bc4)...done

[root@wwy-worker2 ~]# ctr -n=k8s.io images import alertmanager.tar.gz
WARN[0000] DEPRECATION: The `configs` property of
`[plugins."io.containerd.grpc.v1.cri".registry]` is deprecated since containerd
v1.5 and will be removed in containerd v2.0. Use `config_path` instead.
unpacking docker.io/prom/alertmanager:v0.14.0
(sha256:fa5192990c11d1e69489b4c624af2dfb905b0ce73ef82b8aae930c71e5d28bc4)...done
```

创建一个etcd-certs

```
[root@wwy-master etcd]# kubectl -n monitor-sa create secret generic etcd-certs --
from-file=/etc/kubernetes/pki/etcd/server.key --from-
file=/etc/kubernetes/pki/etcd/server.crt --from-
file=/etc/kubernetes/pki/etcd/ca.crt
secret/etcd-certs created
```

部署prometheus-alertmanager-cfg.yaml和prometheus-alertmanager-

deploy.yaml

```
[root@wwy-master ~]# kubectl apply -f prometheus-alertmanager-cfg.yaml
configmap/prometheus-config configured

[root@wwy-master ~]# kubectl apply -f prometheus-alertmanager-deploy.yaml
deployment.apps/prometheus-server configured

[root@wwy-master ~]# kubectl get pod -n monitor-sa -owide
NAME                                READY   STATUS        RESTARTS      AGE
IP               NODE          NOMINATED NODE   READINESS GATES
node-exporter-f2cts                 1/1     Running       1 (20h ago)   2d20h
192.168.178.30   wwy-worker2   <none>           <none>
node-exporter-gt7r4                 1/1     Running       1 (20h ago)   2d20h
192.168.178.10   wwy-master    <none>           <none>
node-exporter-npbcp                 1/1     Running       1 (20h ago)   2d20h
192.168.178.20   wwy-worker1   <none>           <none>
prometheus-server-59964b7488-4dtw6  0/1     Terminating   1             45h
100.87.224.14    wwy-worker1   <none>           <none>
prometheus-server-59964b7488-qxn8c  1/1     Terminating   1 (20h ago)   45h
100.82.124.8     wwy-worker2   <none>           <none>
prometheus-server-cf567d975-fxlzx   2/2     Running       0             35s
100.87.224.17    wwy-worker1   <none>           <none>
prometheus-server-cf567d975-ldk2w   2/2     Running       0             35s
100.82.124.13    wwy-worker2   <none>           <none>
```

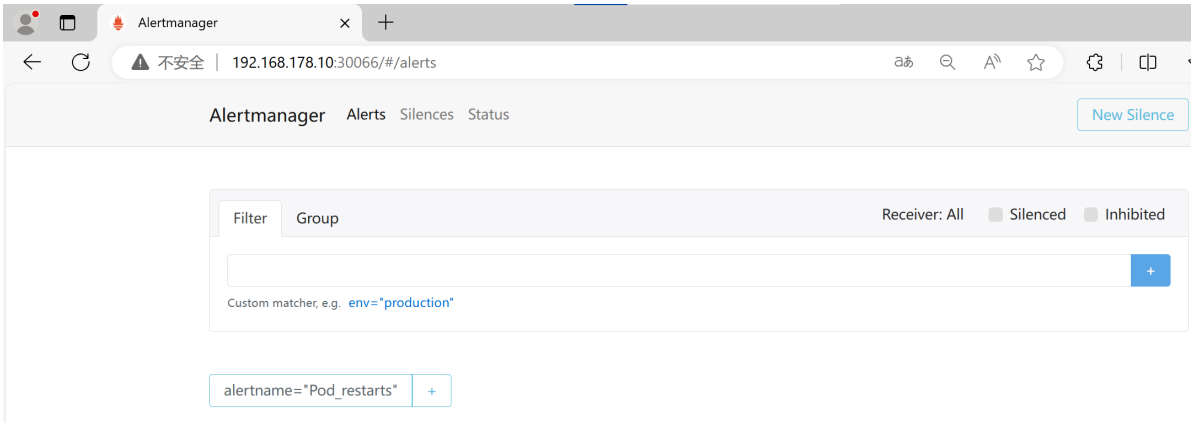
```
[root@wwy-master ~]# kubectl apply -f alertmanager-cm.yaml
configmap/alertmanager created
[root@wwy-master ~]# vim  alertmanager-cm.yaml
[root@wwy-master ~]# kubectl delete -f prometheus-alertmanager-deploy.yaml
deployment.apps "prometheus-server" deleted
[root@wwy-master ~]# kubectl apply -f prometheus-alertmanager-deploy.yaml
deployment.apps/prometheus-server created
[root@wwy-master ~]# kubectl get pod -n monitor-sa -owide
NAME                                READY   STATUS        RESTARTS      AGE     IP              NODE          NOMINATED NODE   READINESS GATES
node-exporter-f2cts                 1/1     Running       1 (20h ago)   2d20h   192.168.178.30  wwy-worker2   <none>           <none>
node-exporter-gt7r4                 1/1     Running       1 (20h ago)   2d20h   192.168.178.10  wwy-master    <none>           <none>
node-exporter-npbcp                 1/1     Running       1 (20h ago)   2d20h   192.168.178.20  wwy-worker1   <none>           <none>
prometheus-server-59964b7488-4dtw6  0/1     Terminating   1             45h     100.87.224.14   wwy-worker1   <none>           <none>
prometheus-server-59964b7488-qxn8c  1/1     Terminating   1 (20h ago)   45h     100.82.124.8    wwy-worker2   <none>           <none>
prometheus-server-cf567d975-fxlzx   2/2     Running       0             35s     100.87.224.17   wwy-worker1   <none>           <none>
prometheus-server-cf567d975-ldk2w   2/2     Running       0             35s     100.82.124.13   wwy-worker2   <none>           <none>
[root@wwy-master ~]#
```

在k8s的控制节点创建alertmanager-svc.yaml文件

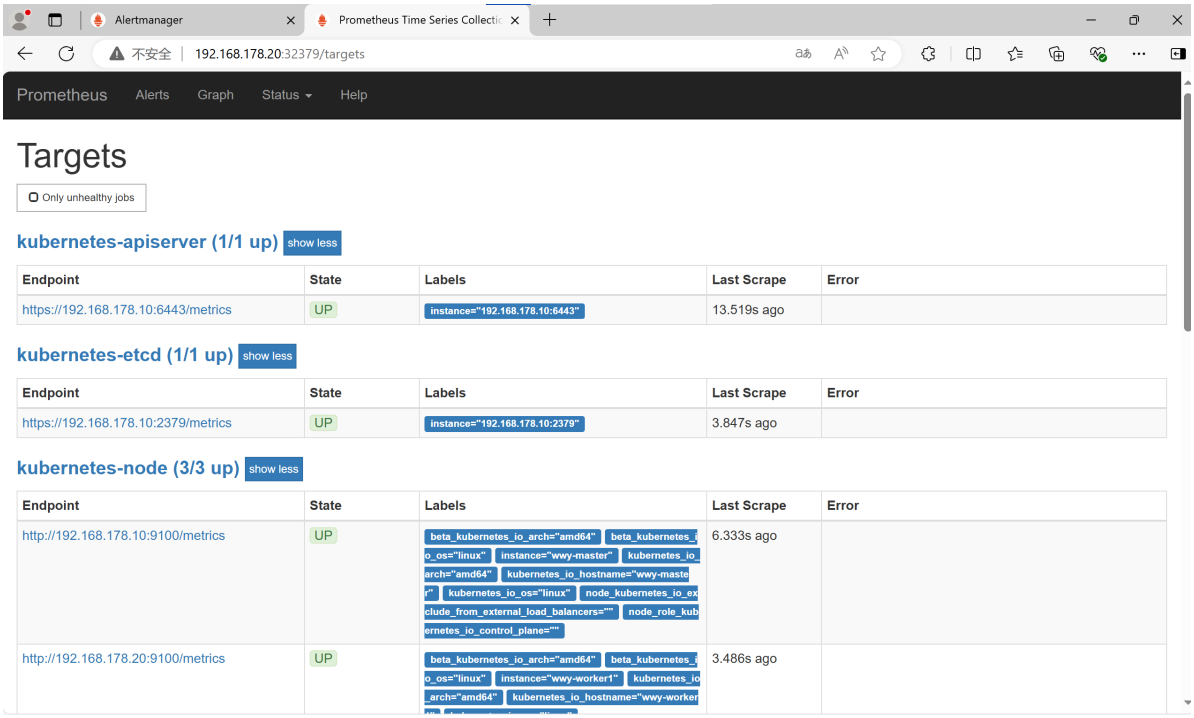
```
[root@wwy-master ~]# kubectl apply -f alertmanager-svc.yaml
service/alertmanager created

[root@wwy-master ~]# kubectl get svc -n monitor-sa
NAME           TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE
alertmanager   NodePort    10.96.1.200    <none>        9093:30066/TCP   31s
prometheus     NodePort    10.96.0.139    <none>        9090:32379/TCP   45h
```

查看service在物理机映射的端口,可以看到alertmanager的service在物理机映射的端口是30066,访问http://192.168.178.10:30066/#/alerts

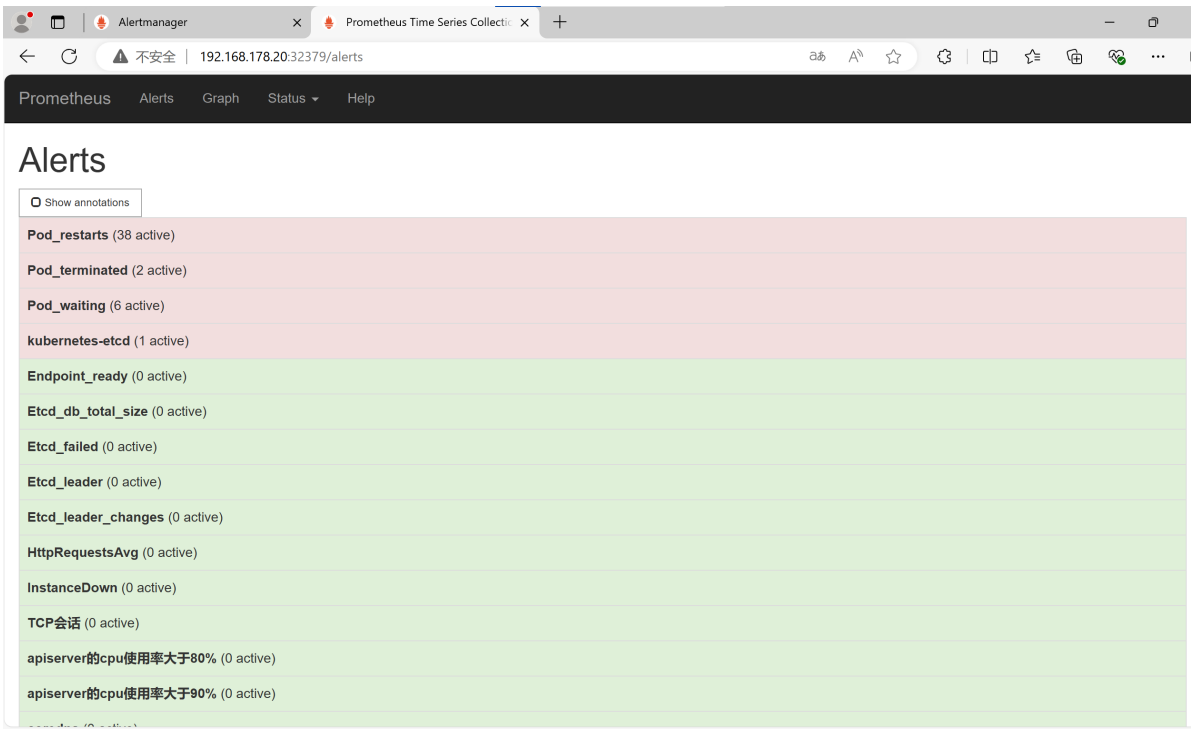
```
[root@wwy-master ~]# kubectl get svc -n monitor-sa
NAME           TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE
alertmanager   NodePort    10.96.1.200    <none>        9093:30066/TCP   31s
prometheus     NodePort    10.96.0.139    <none>        9090:32379/TCP   45h
[root@wwy-master ~]#
```



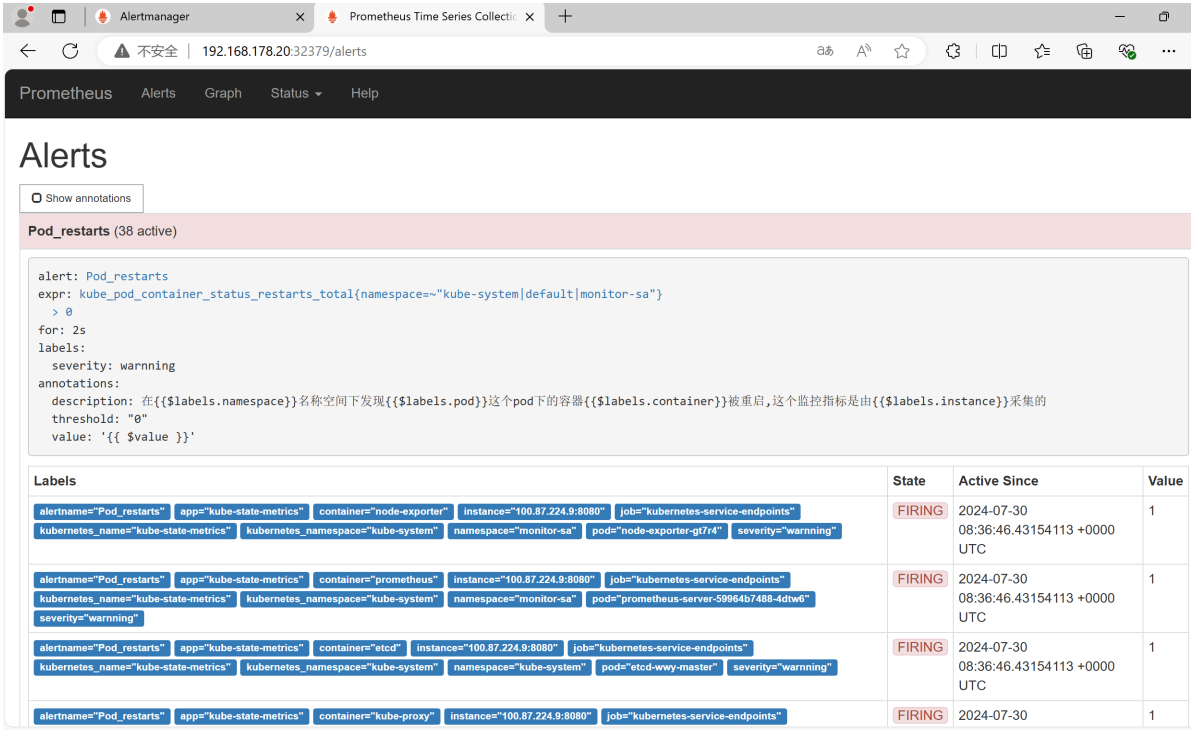
访问prometheus



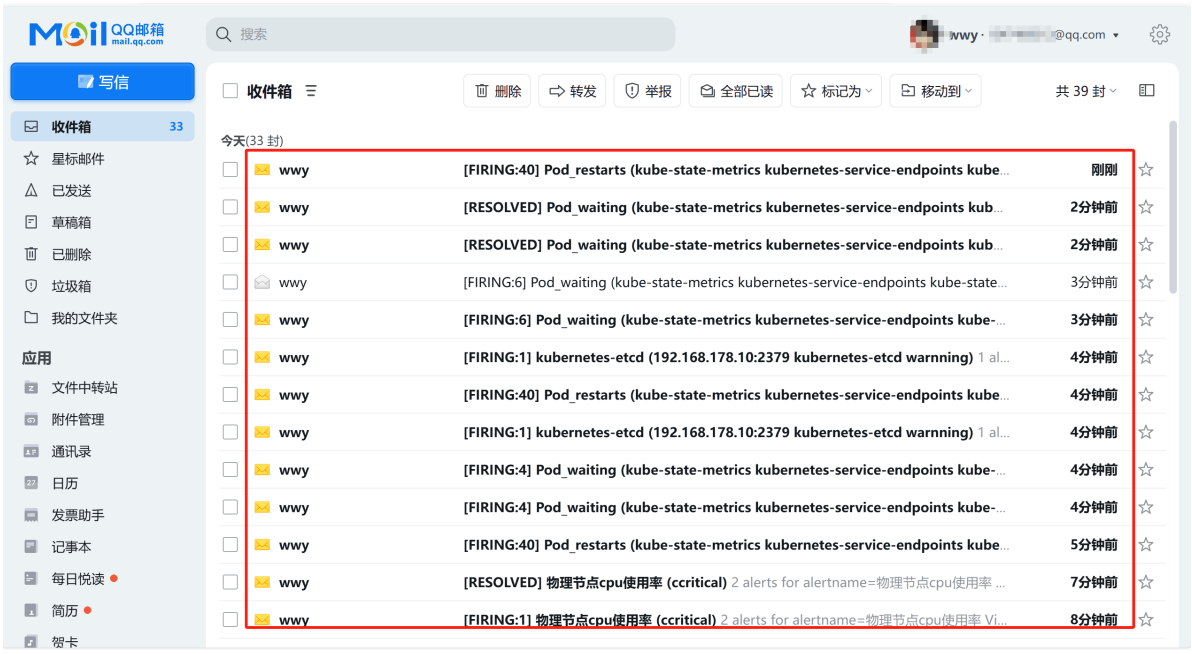
点击alerts

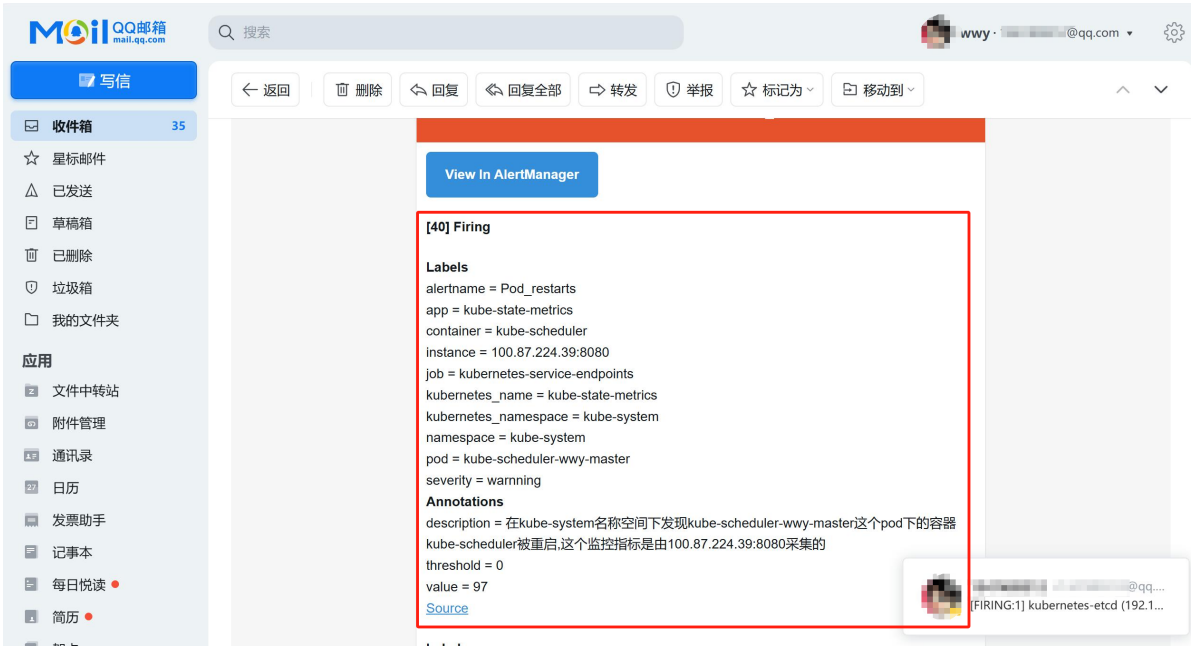


点击pod_restarts



如果配置正确，就可以在邮箱看到发送到邮箱的报警信息





更新配置文件

为了每次修改配置文件可以热加载prometheus，也就是不停止prometheus，
就可以使配置生效，想要使配置生效可用如下热加载命令：

```
[root@wwy-master ~]# kubectl get pod -n monitor-sa -owide
NAME                                  READY   STATUS    RESTARTS       AGE     IP
            NODE          NOMINATED NODE   READINESS GATES
node-exporter-f2cts                   1/1     Running   2 (11m ago)    2d21h
192.168.178.30   wwy-worker2   <none>           <none>
node-exporter-gt7r4                   1/1     Running   1 (21h ago)    2d21h
192.168.178.10   wwy-master    <none>           <none>
node-exporter-npbcp                   1/1     Running   2 (22m ago)    2d21h
192.168.178.20   wwy-worker1   <none>           <none>
prometheus-server-cf567d975-kxlkp     2/2     Running   0              24m
100.87.224.22    wwy-worker1   <none>           <none>
prometheus-server-cf567d975-nck7w     2/2     Running   0              25m
100.87.224.20    wwy-worker1   <none>           <none>
[root@wwy-master ~]# curl -X POST http://100.87.224.22:9090/-/reload


暴力更新配置文件
kubectl delete -f alertmanager-cm.yaml
kubectl apply -f alertmanager-cm.yaml
kubectl delete -f prometheus-alertmanager-cfg.yaml
kubectl apply -f prometheus-alertmanager-cfg.yaml
kubectl delete -f prometheus-alertmanager-deploy.yaml
kubectl apply -f prometheus-alertmanager-deploy.yaml
```

遇到的问题

```
error: Internal error occurred: error executing command in container: failed to exec in container: failed to start exec "f6ac37a3cc41aa95d646d4ea547efa275a50c4eefc1a3ba8d41b3778597f4a65": OCI runtime exec failed: exec failed: unable to start container process: exec: "/bin/bash": stat /bin/bash: no such file or directory: unknown
```

这个问题发生在尝试在 Docker 容器中执行命令时。错误的核心是 exec: "/bin/bash": stat /bin/bash: no such file or directory，这意味着 Docker 容器内没有找到 /bin/bash 这个文件或目录，改成/bin/sh即可进入容器

刚开始promethues和alertmanager运行正常，但邮箱却收不到告警信息，后来把邮箱服务器换成QQ邮箱后即可正常收到报警信息