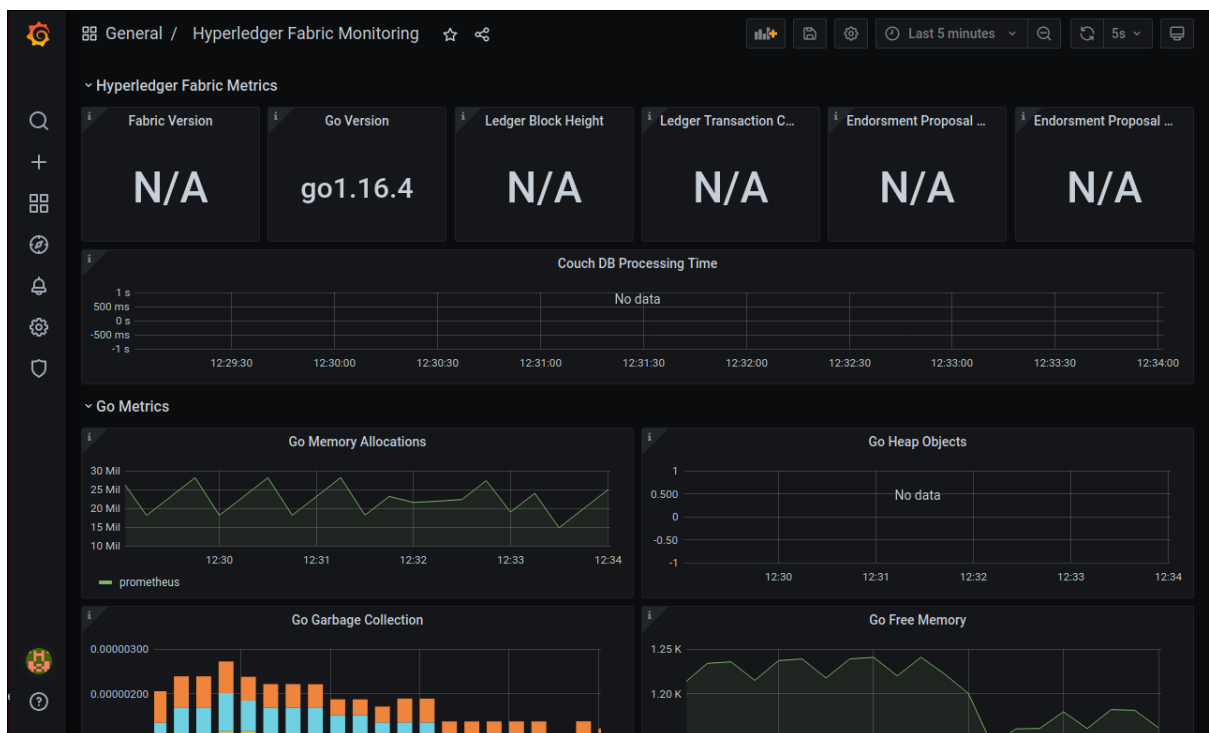


연구 보고서

| | | | |
|---|-----|------|-------------|
| 작성자 | 김한호 | 작성일자 | 2021.05.30. |
| 1. 연구 계획 | | | |
| - e2-enter-basic 작성 후 caliper-benchmark 적용 | | | |
| 2. 논문 연구 진행 | | | |
| <pre> h2kim@h2kim-VBox:~/fabric-samples-advance-topics/test-network/moniter and logging/monitoring\$ docker- compose up Creating prometheus ... Creating prometheus ... done Creating grafana ... Creating grafana ... done Attaching to prometheus, grafana prometheus level=info ts=2021-05-25T07:21:48.795Z caller=main.go:388 msg="No time or size retent ion was set so using the default time retention" duration=15d prometheus level=info ts=2021-05-25T07:21:48.796Z caller=main.go:426 msg="Starting Prometheus" v ersion="(version=2.27.1, branch=HEAD, revision=db7f0bcec27bd8aeebad6b08ac849516efa9ae02)" prometheus level=info ts=2021-05-25T07:21:48.799Z caller=main.go:431 build_context="(go=go1.16.4 , user=root@fd804fbd4f25, date=20210518-14:17:54)" prometheus level=info ts=2021-05-25T07:21:48.799Z caller=main.go:432 host_details="(Linux 5.4.0- 72-generic #80~18.04.1-Ubuntu SMP Mon Apr 12 23:26:25 UTC 2021 x86_64 prometheus (none))" prometheus level=info ts=2021-05-25T07:21:48.800Z caller=main.go:433 fd_limits="(soft=1048576, h ard=1048576)" prometheus level=info ts=2021-05-25T07:21:48.800Z caller=main.go:434 vm_limits="(soft=unlimited, hard=unlimited)" prometheus level=info ts=2021-05-25T07:21:48.803Z caller=web.go:540 component=web msg="Start lis tening for connections" address=0.0.0.0:9090 prometheus level=info ts=2021-05-25T07:21:48.818Z caller=main.go:803 msg="Starting TSDB ..." prometheus level=info ts=2021-05-25T07:21:48.822Z caller=head.go:741 component=tsdb msg="Replayi ng on-disk memory mappable chunks if any" prometheus level=info ts=2021-05-25T07:21:48.826Z caller=head.go:755 component=tsdb msg="On-disk memory mappable chunks replay completed" duration=6.43µs prometheus level=info ts=2021-05-25T07:21:48.826Z caller=head.go:761 component=tsdb msg="Replayi ng WAL, this may take a while" prometheus level=info ts=2021-05-25T07:21:48.827Z caller=tls_config.go:191 component=web msg="TL S is disabled." http2=false prometheus level=info ts=2021-05-25T07:21:48.827Z caller=head.go:813 component=tsdb msg="WAL seg ment loaded" segment=0 maxSegment=0 prometheus level=info ts=2021-05-25T07:21:48.827Z caller=head.go:818 component=tsdb msg="WAL rep lay completed" checkpoint_replay_duration=42.458µs wal_replay_duration=1.134218ms total_replay_durati on=1.218399ms prometheus level=info ts=2021-05-25T07:21:48.828Z caller=main.go:828 fs_type=EXT4_SUPER_MAGIC prometheus level=info ts=2021-05-25T07:21:48.831Z caller=main.go:831 msg="TSDB started" prometheus level=info ts=2021-05-25T07:21:48.831Z caller=main.go:957 msg="Loading configuration file" filename=/etc/prometheus/prometheus.yml prometheus level=info ts=2021-05-25T07:21:48.834Z caller=main.go:988 msg="Completed loading of c onfiguration file" filename=/etc/prometheus/prometheus.yml totalDuration=2.789407ms remote_storage=3. 366µs web_handler=486ns query_engine=1.318µs scrape=2.061686ms scrape_sd=86.254µs notify=17.476µs not ify_sd=8.818µs rules=1.211µs prometheus level=info ts=2021-05-25T07:21:48.834Z caller=main.go:775 msg="Server is ready to rec eive web requests." grafana t=2021-05-25T07:21:49+0000 lvl=info msg="Starting Grafana" logger=server version=7.5. 7 commit=91de51771c branch=HEAD compiled=2021-05-17T19:16:45+0000 </pre> | | | |
| <p>피어 도커 컨테이너의 성능을 측정하기 위해 prometheus와 grafana를 이용하여 측정하기로 함. 프로메테우스는 컨테이너화된 앱을 모니터링하는 도구임. Grafana는 시계열 메트릭 데이터를 시각화하여 제공하는 오픈소스 툴킷임.</p> | | | |



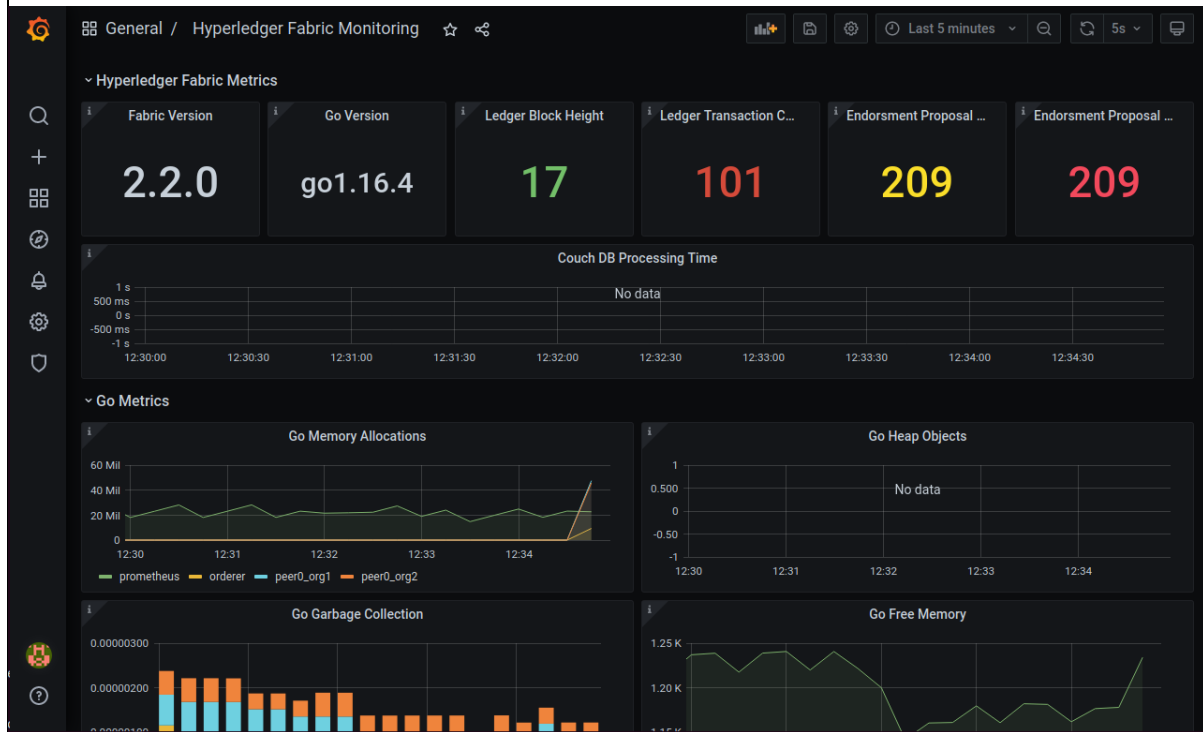
위의 docker-compose up을 이용해서 작동을 시키는 go 환경설정을 제외하고 아무것도 작동하지 않는 것을 확인할 수 있음.

```
h2kim@h2kim-VBox:~/caliper-benchmarks$ docker network connect net_test 2afb9175bb89
Error response from daemon: endpoint with name orderer.example.com already exists in network net_test
h2kim@h2kim-VBox:~/caliper-benchmarks$ docker network connect net_test 69a96790ba7d
h2kim@h2kim-VBox:~/caliper-benchmarks$
```

\$ docker connect net_test <prometheus_container>를 사용하여 네트워크에 prometheus 컨테이너를 연결하면 모니터링 시작함.

| Prometheus Alerts Graph Status Help Classic UI | | | | | |
|--|-------|---|-------------|-----------------|-------|
| All Unhealthy Collapse All | | | | | |
| orderer (1/1 up) show less | | | | | |
| Endpoint | State | Labels | Last Scrape | Scrape Duration | Error |
| http://orderer.example.com:9443/metrics | UP | instance="orderer.example.com:9443" job="orderer" | 2.132s ago | 2.949ms | |
| peer0_org1 (1/1 up) show less | | | | | |
| Endpoint | State | Labels | Last Scrape | Scrape Duration | Error |
| http://peer0.org1.example.com:9444/metrics | UP | instance="peer0.org1.example.com:9444" job="peer0_org1" | 8.771s ago | 3.055ms | |
| peer0_org2 (1/1 up) show less | | | | | |
| Endpoint | State | Labels | Last Scrape | Scrape Duration | Error |
| http://peer0.org2.example.com:9445/metrics | UP | instance="peer0.org2.example.com:9445" job="peer0_org2" | 13.449s ago | 5.725ms | |
| prometheus (1/1 up) show less | | | | | |
| Endpoint | State | Labels | Last Scrape | Scrape Duration | Error |
| http://localhost:9090/metrics | UP | instance="localhost:9090" job="prometheus" | 4.973s ago | 10.599ms | |

파이어폭스에서 <http://localhost:9090>로 접속하면 prometheus 대시보드로 접속함. Status 메뉴의 Target으로 들어가면 현재 모니터링하고 있는 컨테이너를 확인할 수 있음. 현재 모니터링하고 있으면 Up 접근할 수 없으면 Down으로 표시됨.



파이어폭스로 <http://localhost:3000>에서 다시 리로드를 하면 사용하는 컴퓨터 자원을 표시함.

```
h2kim@h2kim-VBox:~/fabric-samples-advance-topics/test-network/monitor and logging/monitoring$ docker-
compose up
Starting prometheus ...
cadvisor is up-to-date
Starting prometheus ... done
Creating grafana ...
Creating grafana ... done
Attaching to cadvisor, prometheus, grafana
prometheus | level=info ts=2021-05-26T08:33:05.102Z caller=main.go:388 msg="No time or size retent
ion was set so using the default time retention" duration=15d
prometheus | level=info ts=2021-05-26T08:33:05.102Z caller=main.go:426 msg="Starting Prometheus" v
ersion="(version=2.27.1, branch=HEAD, revision=db7f0bcec27bd8aeebad6b08ac849516efa9ae02)"
prometheus | level=info ts=2021-05-26T08:33:05.102Z caller=main.go:431 build_context="(go=go1.16.4
, user=root@fd804fbd4f25, date=20210518-14:17:54)"
prometheus | level=info ts=2021-05-26T08:33:05.102Z caller=main.go:432 host_details="(Linux 5.4.0-
72-generic #80~18.04.1-Ubuntu SMP Mon Apr 12 23:26:25 UTC 2021 x86_64 d3a2d6baa7bd (none))"
prometheus | level=info ts=2021-05-26T08:33:05.102Z caller=main.go:433 fd_limits="(soft=1048576, h
ard=1048576)"
prometheus | level=info ts=2021-05-26T08:33:05.102Z caller=main.go:434 vm_limits="(soft=unlimited,
hard=unlimited)"
prometheus | level=info ts=2021-05-26T08:33:05.104Z caller=web.go:540 component=web msg="Start lis
tening for connections" address=0.0.0.0:9090
prometheus | level=info ts=2021-05-26T08:33:05.106Z caller=main.go:803 msg="Starting TSDB ..."
prometheus | level=info ts=2021-05-26T08:33:05.114Z caller=head.go:741 component=tsdb msg="Replayi
ng on-disk memory mappable chunks if any"
prometheus | level=info ts=2021-05-26T08:33:05.114Z caller=head.go:755 component=tsdb msg="On-disk
memory mappable chunks replay completed" duration=2.212µs
prometheus | level=info ts=2021-05-26T08:33:05.114Z caller=head.go:761 component=tsdb msg="Replayi
ng WAL, this may take a while"
prometheus | level=info ts=2021-05-26T08:33:05.133Z caller=tsdb.go:191 component=web msg="TL
S is disabled." http2=false
prometheus | level=info ts=2021-05-26T08:33:05.135Z caller=head.go:813 component=tsdb msg="WAL seg
ment loaded" segment=0 maxSegment=0
```

피어에 체인코드를 올려서 성능체크를 할 수 있는지 확인하려 함. 실행했던 순서대로 진행함.

```
h2kim@h2kim-VBox:~/fabric-samples-advance-topics/test-network$ ./network.sh deployCC -ccn marbles -cc
l go -ccp ../../fabric-samples/chaincode/marbles02/go/
deploying chaincode on channel 'mychannel'
executing with the following
- CHANNEL_NAME: mychannel
- CC_NAME: marbles
- 리튬배터리 PATH: ../../fabric-samples/chaincode/marbles02/go/
- CC_SRC_LANGUAGE: go
- CC_VERSION: 1.0
- CC_SEQUENCE: 1
- CC_END_POLICY: NA
- CC_COLL_CONFIG: NA
- CC_INIT_FCN: NA
- DELAY: 3
- MAX_RETRY: 5
- VERBOSE: false
```

하이퍼레저 패브릭 네트워크에 marbles 체인코드 예제를 올려 진행함.

```
h2kim@h2kim-VBox:~/caliper-benchmarks$ npx caliper launch manager --caliper-workspace ./ --caliper-ne
tworkconfig networks/networkConfig.yaml --caliper-benchconfig benchmarks/samples/fabric/marbles/confi
g-prometheus.yaml --caliper-flow-only-test --caliper-fabric-gateway-enabled
2021.05.26-17:41:04.406 info [caliper] [cli-launch-manager] Set workspace path: /home/h2kim/calip
er-benchmarks
2021.05.26-17:41:04.406 info [caliper] [cli-launch-manager] Set benchmark configuration path: /ho
me/h2kim/caliper-benchmarks/benchmarks/samples/fabric/marbles/config-prometheus.yaml
2021.05.26-17:41:04.407 info [caliper] [cli-launch-manager] Set network configuration path: /home
/h2kim/caliper-benchmarks/networks/networkConfig.yaml
2021.05.26-17:41:04.407 info [caliper] [cli-launch-manager] Set SUT type: fabric
2021.05.26-17:41:04.595 info [caliper] [caliper-engine] Starting benchmark flow
2021.05.26-17:41:06.334 info [caliper] [fabric-connector] Initializing gateway connector compat
ible with installed SDK: 2.2.3
2021.05.26-17:41:06.416 error [caliper] [cli-launch-manager] Unexpected error during benchmark exe
cution: Error: path property does not point to a file that exists for clientSignedCert for name user1
.org1.example.com in organization Org1MSP
```

성능측정을 위해 기존에 사용했던 npx caliper 명령어를 입력하면 경로가 변경되 었기 때문에 파일을 찾을 수 없다는 에러를 발생함.

```
13 organizations:
14   - mspid: Org1MSP
15     identities:
16       certificates:
17         - name: 'user1.org1.example.com'
18           clientPrivateKey:
19             path: '../fabric-samples-advance-topics/test-network/organizations/peerOrganizations/or
g1.example.com/users/User1@org1.example.com/msp/keystore/priv_sk'
20           clientSignedCert:
21             path: '../fabric-samples-advance-topics/test-network/organizations/peerOrganizations/or
g1.example.com/users/User1@org1.example.com/msp/signcerts/cert.pem'
22       connectionProfile:
23         path: '../fabric-samples-advance-topics/test-network/organizations/peerOrganizations/org1.e
xample.com/connection-org1.yaml'
24       discover: true
25   - mspid: Org2MSP
26     identities:
27       certificates:
28         Visual Studio Code: 'user1.org2.example.com'
29           clientPrivateKey:
30             path: '../fabric-samples-advance-topics/test-network/organizations/peerOrganizations/or
g2.example.com/users/User1@org2.example.com/msp/keystore/priv_sk'
31           clientSignedCert:
32             path: '../fabric-samples-advance-topics/test-network/organizations/peerOrganizations/or
g2.example.com/users/User1@org2.example.com/msp/signcerts/cert.pem'
33       connectionProfile:
34         path: '../fabric-samples-advance-topics/test-network/organizations/peerOrganizations/org2.e
xample.com/connection-org2.yaml'
35       discover: true
```

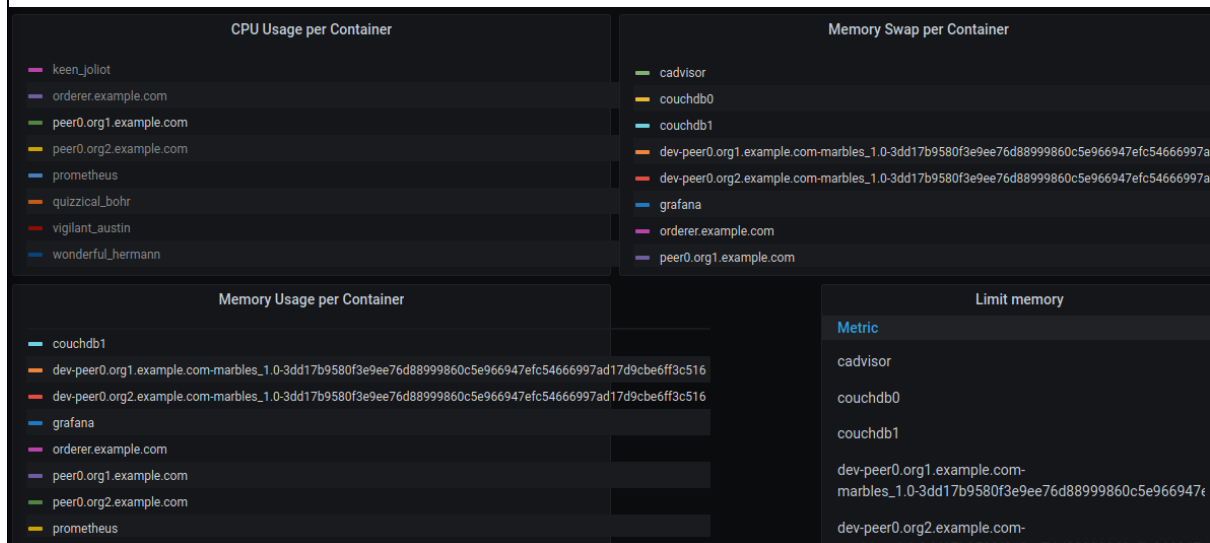
네트워크를 다시 실행했기 때문에 바뀐 인증서 경로로 변경함.


```

h2kim@h2kim-VBox:~/caliper-benchmarks$ npx caliper launch manager --caliper-workspace ./ --caliper-networkconfig networks/networkConfig.yaml --caliper-benchmarkconfig benchmarks/samples/fabric/marbles/config-prometheus.yaml --caliper-flow-only-test --caliper-fabric-gateway-enabled
2021.05.26-17:47:24.007 info [caliper] [cli-launch-manager] Set workspace path: /home/h2kim/caliper-benchmarks
2021.05.26-17:47:24.008 info [caliper] [cli-launch-manager] Set benchmark configuration path: /home/h2kim/caliper-benchmarks/benchmarks/samples/fabric/marbles/config-prometheus.yaml
2021.05.26-17:47:24.008 info [caliper] [cli-launch-manager] Set network configuration path: /home/h2kim/caliper-benchmarks/networks/networkConfig.yaml
2021.05.26-17:47:24.009 info [caliper] [cli-launch-manager] Set SUT type: fabric
2021.05.26-17:47:24.047 info [caliper] [caliper-engine] Starting benchmark flow
2021.05.26-17:47:24.909 info [caliper] [fabric-connector] Initializing gateway connector compatible with installed SDK: 2.2.3
2021.05.26-17:47:24.981 info [caliper] [IdentityManager] Adding user1.org1.example.com (admin=false) as user1.org1.example.com for organization Org1MSP
2021.05.26-17:47:24.995 info [caliper] [IdentityManager] Adding user1.org2.example.com (admin=false) as _Org2MSP_user1.org2.example.com for organization Org2MSP
2021.05.26-17:47:24.996 info [caliper] [caliper-engine] Skipping start commands due to benchmark flow conditioning
2021.05.26-17:47:25.000 info [caliper] [caliper-engine] Skipping initialization phase due to benchmark flow conditioning
2021.05.26-17:47:25.000 info [caliper] [caliper-engine] Skipping install smart contract phase due to benchmark flow conditioning
2021.05.26-17:47:25.008 info [caliper] [monitor.js] No resource monitors specified
2021.05.26-17:47:25.014 info [caliper] [default-observer] Observer interval set to 5000 seconds
2021.05.26-17:47:25.017 info [caliper] [round-orchestrator] Preparing worker connections
2021.05.26-17:47:25.022 info [caliper] [worker-orchestrator] Launching worker 1 of 5
2021.05.26-17:47:25.045 info [caliper] [worker-orchestrator] Launching worker 2 of 5
2021.05.26-17:47:25.055 info [caliper] [worker-orchestrator] Launching worker 3 of 5
2021.05.26-17:47:25.078 info [caliper] [worker-orchestrator] Launching worker 4 of 5
2021.05.26-17:47:25.090 info [caliper] [worker-orchestrator] Launching worker 5 of 5
2021.05.26-17:47:25.112 info [caliper] [worker-orchestrator] Messenger not configured, entering configure phase...
2021.05.26-17:47:25.134 info [caliper] [worker-orchestrator] No existing workers detected, entering worker launch phase...
2021.05.26-17:47:25.151 info [caliper] [worker-orchestrator] Waiting for 5 workers to be connected
...
2021.05.26-17:47:27.532 info [caliper] [cli-launch-worker] Set workspace path: /home/h2kim/caliper-benchmarks
2021.05.26-17:47:27.604 info [caliper] [cli-launch-worker] Set benchmark configuration path: /home/h2kim/caliper-benchmarks/benchmarks/samples/fabric/marbles/config-prometheus.yaml
2021.05.26-17:47:27.623 info [caliper] [cli-launch-worker] Set network configuration path: /home/h2kim/caliper-benchmarks/networks/networkConfig.yaml
2021.05.26-17:47:27.623 info [caliper] [cli-launch-worker] Set SUT type: fabric
2021.05.26-17:47:27.629 info [caliper] [cli-launch-worker] Set workspace path: /home/h2kim/caliper-benchmarks
2021.05.26-17:47:27.654 info [caliper] [cli-launch-worker] Set benchmark configuration path: /home/h2kim/caliper-benchmarks

```

경로를 변경 이후 성능측정 명령어를 사용하면 에러 없이 실행되는 것을 확인할 수 있음.



체인코드가 올라간 컨테이너가 생성된 것을 볼 수 있음. 다른 컨테이너도 확인

할 수 있음.

/

root

Docker Containers

Subcontainers

/docker

/system.slice

/user.slice

Isolation

CPU

Shares 1024 shares

Allowed Cores 0

Memory

Reservation unlimited

Limit 3.84 GB

Swap Limit 1.62 GB

파이어 폭스에 <http://localhost:8080> 접속하면 cadvisor 대시보드로 접속하면 도커 컨테이너의 컴퓨터 성능을 사용하고 있는 상태를 확인할 수 있음.

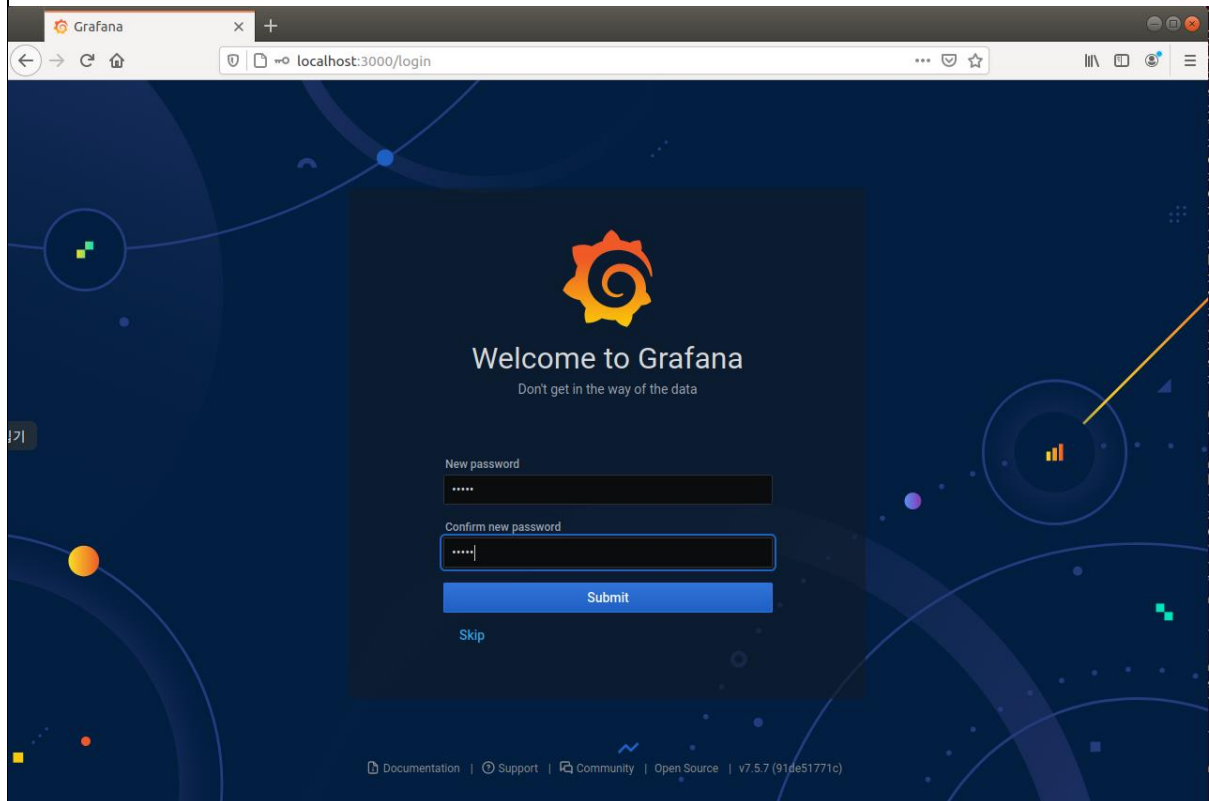
```
h2kim@h2kim-VBox:~/fabric-samples/test-network$ ./network.sh down
Stopping network
ERROR: yaml.scanner.ScannerError: while scanning for the next token
found character '\t' that cannot start any token
  in "./docker/docker-compose-test-net.yaml", line 23, column 1
Removing orphan container "ca_org1"
Removing orphan container "ca_org2"
Removing orphan container "ca_orderer"
Removing network net_test
Removing volume net_peer0.org3.example.com
WARNING: Volume net_peer0.org3.example.com not found.
No containers available for deletion
No images available for deletion
```

앞에 진행했던 연구는 다른 개발자가 깃허브에서 올려 놓은 페이지를 참조해서 작동하는 과정을 따라했음. caliper-benchmark에서 제공하는 /caliper-benchmarks/networks/prometheus-grafana 안에 있는 샘플을 통해 연구 진행을 하여 제공하는 다른 예제와의 적용이 쉽도록 진행하는 것이 나을 것이라 판단함.

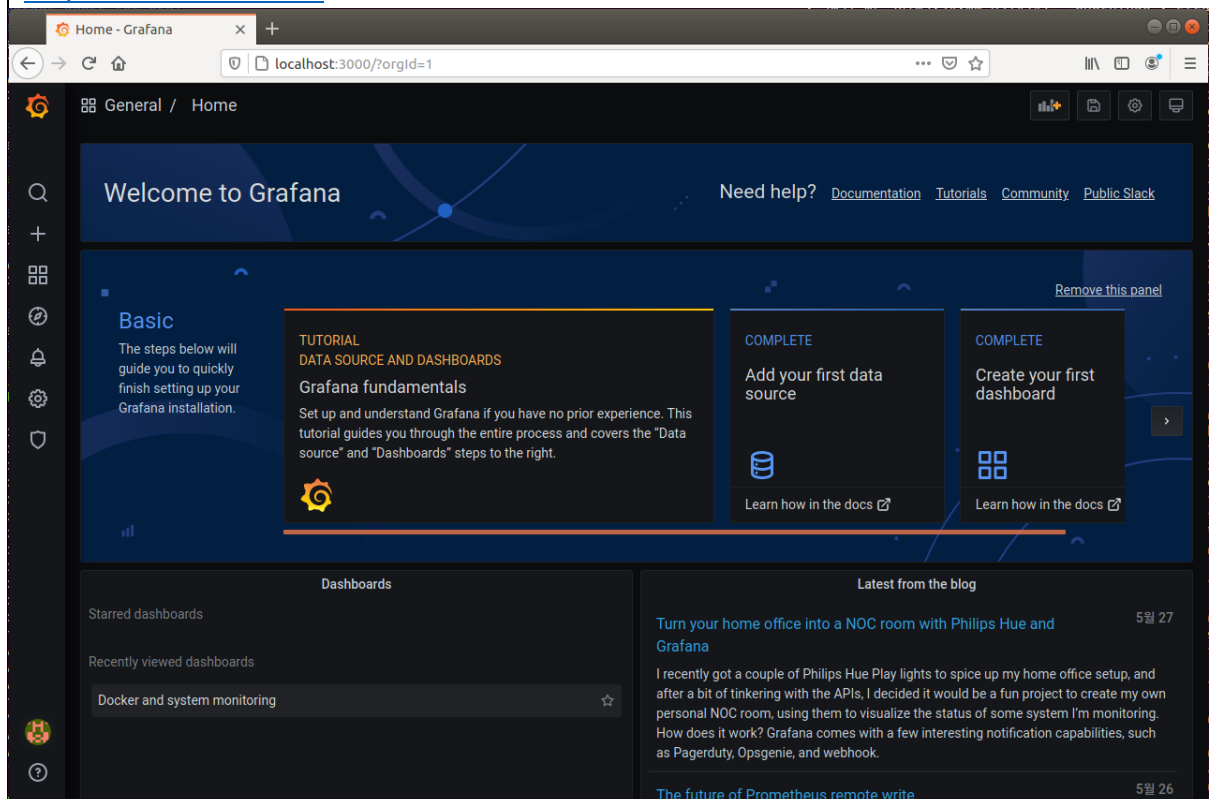
```
h2kim@h2kim-VBox:~/caliper-benchmarks/networks/prometheus-grafana$ cp docker-compose-fabric.yaml docker-compose.yaml
h2kim@h2kim-VBox:~/caliper-benchmarks/networks/prometheus-grafana$ docker-compose up
Creating network "prometheusgrafana_default" with the default driver
Creating volume "prometheusgrafana_prometheus_data" with default driver
Creating volume "prometheusgrafana_grafana_storage" with default driver
Creating prometheus ...
Creating cadvisor ...
Creating prometheus ...
Creating prometheus ... done
Creating grafana ...
Creating grafana ... done
Attaching to cadvisor, prometheus, grafana
```

prometheus-grafana 디렉토리에서 docker-compose up을 사용하여 컨테이너를

실행함.

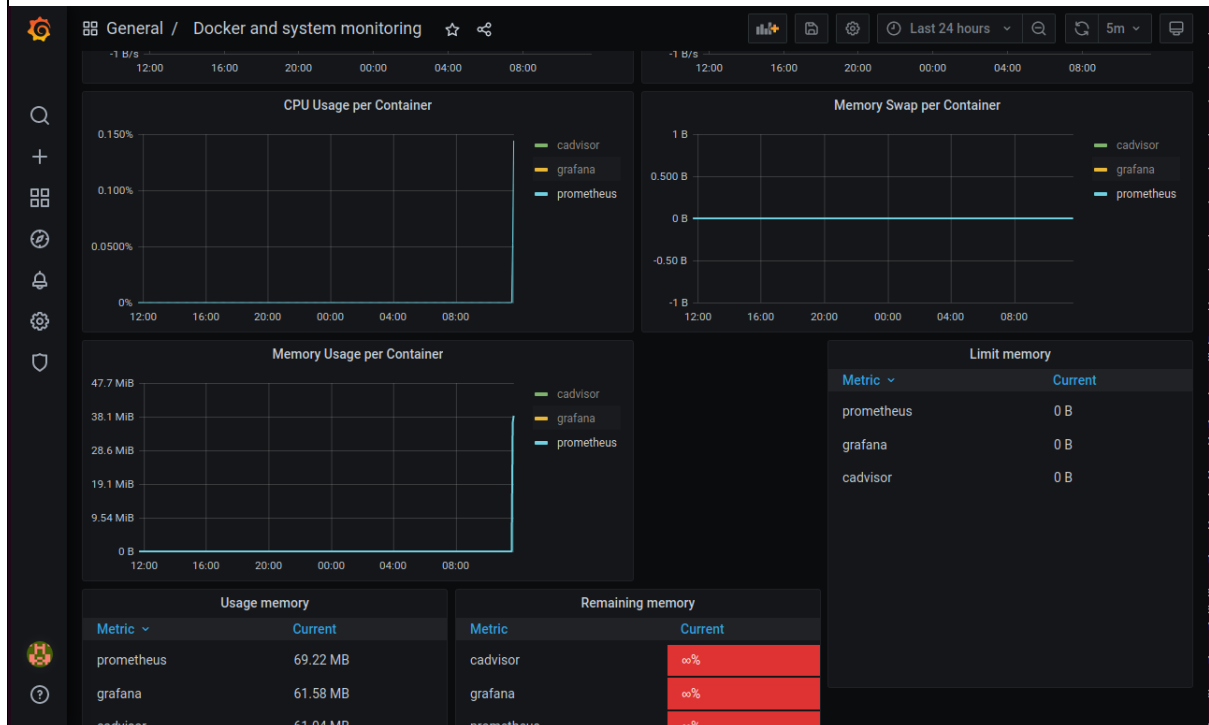


<http://localhost:3000> 웹페이지로 접속하여 Grafana 대시보드를 확인함.



Welcome 페이지에서 여러 메뉴로 들어가 성능측정을 할 datasource를 가지고 올 수 있음. 벤치마크를 볼 수 있는 대시보드를 만들어서 데이터를 통해 화면을

볼 수 있음.

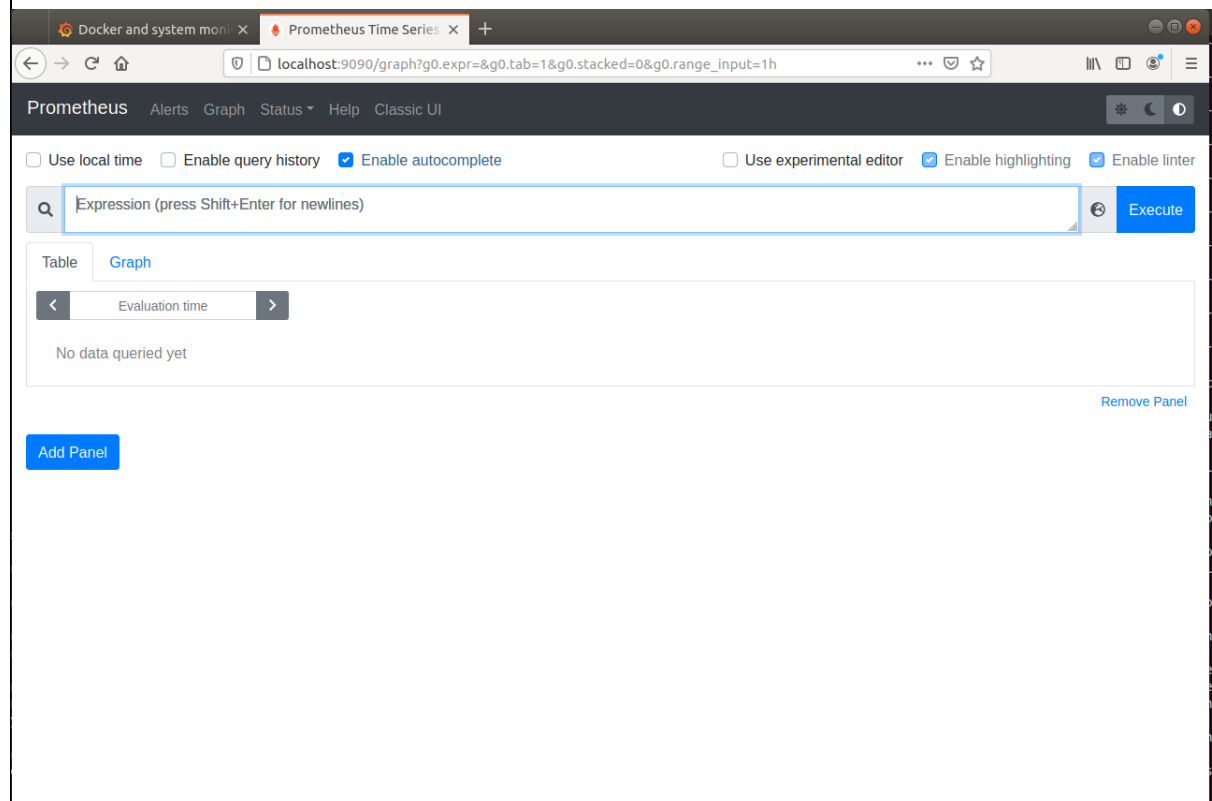


예제에서 주어지고 있는 Docker and system monitoring으로 들어가면 지금 작동하고 있는 prometheus Grafana cadvisor가 작동하고 있고 컴퓨터 자원을 사용하고 있는 것을 확인할 수 있음.

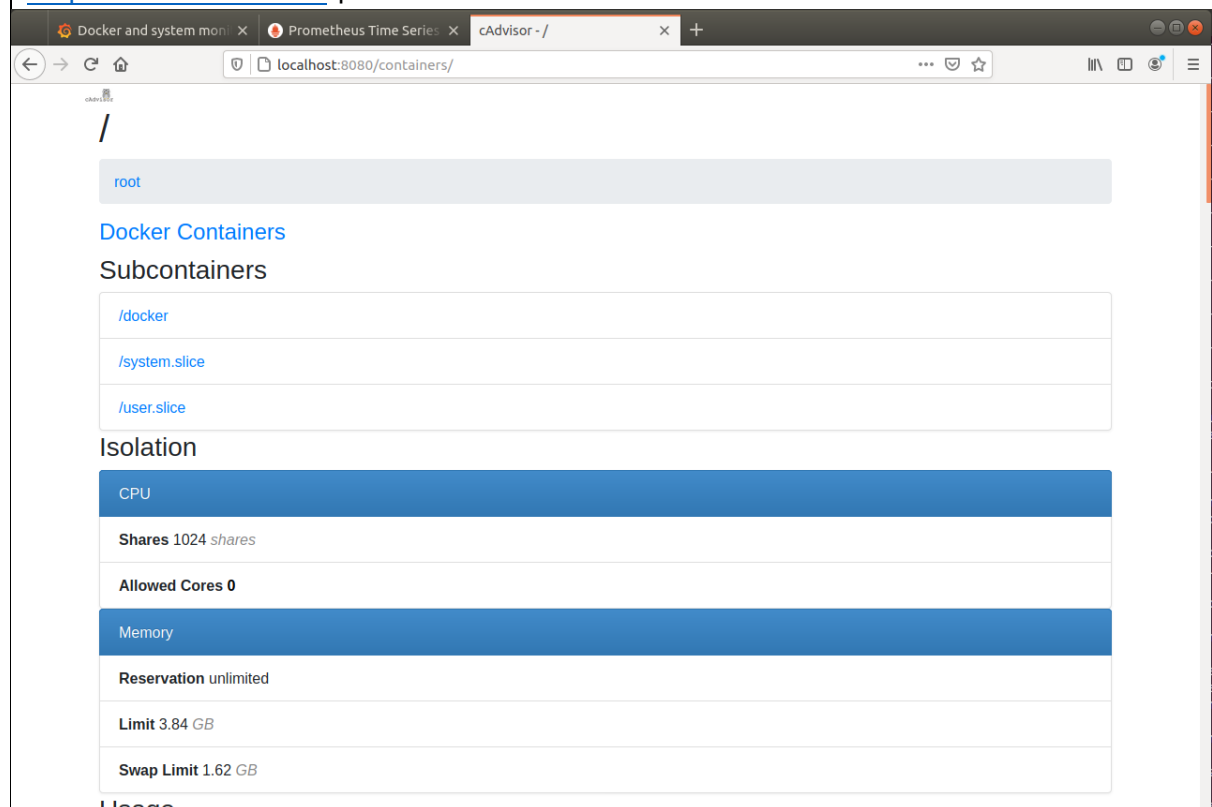
```
h2kim@h2kim-VBox:~/caliper-benchmarks/networks/prometheus-grafana/grafana/provisioning/dashboards$ cat docker-and-system.json
{
  "requires": [
    {
      "type": "grafana",
      "id": "grafana",
      "name": "Grafana",
      "version": "6.2.5"
    },
    {
      "type": "panel",
      "id": "graph",
      "name": "Graph",
      "version": ""
    },
    {
      "type": "datasource",
      "id": "prometheus",
      "name": "Prometheus",
      "version": "1.0.0"
    },
    {
      "type": "panel",
      "id": "singlestat",
      "name": "Singlestat",
      "version": ""
    },
    {
      "type": "panel",
      "id": "table",
      "name": "Table",
      "version": ""
    }
  ],
}
```

/caliper-benchmarks/networks/prometheus-

grafana/grafana/provisioning/dashboards/docker-and-system.json을 보면 대시보드를 볼 수 있음.



<http://localhost:9090> prometheus 대시보드도 작동하는 것을 확인할 수 있음.



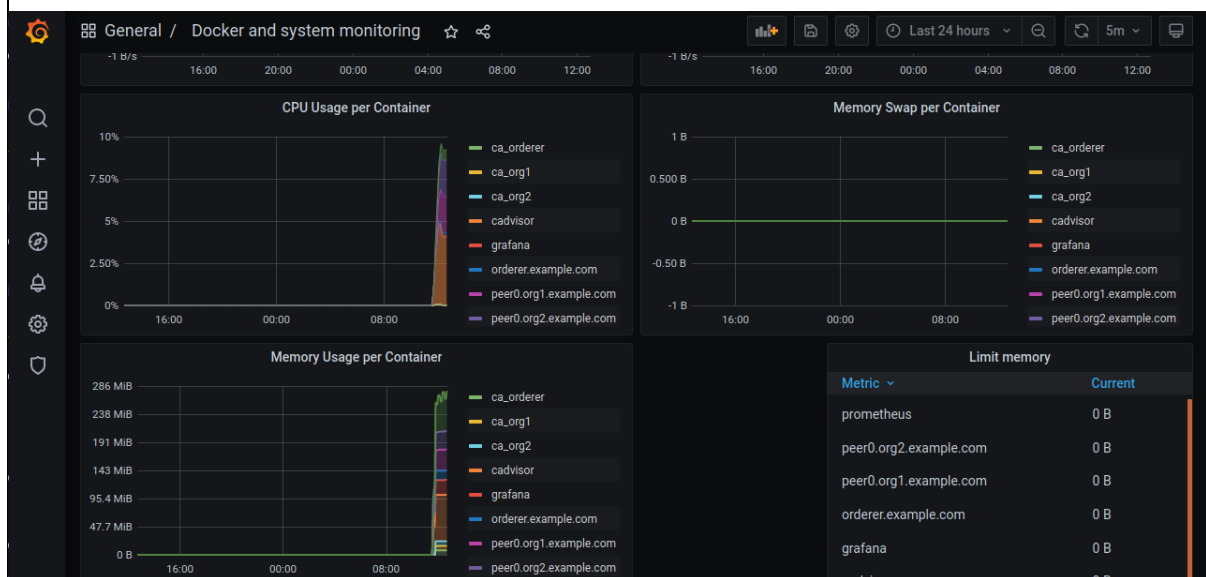
cadvisor 대시보드 페이지도 작동을 확인할 수 있음.

```
h2kim@h2kim-VBox:~/fabric-samples/test-network$ ./network.sh up createChannel -ca -c mychannel -i 2.2
-s couch
Creating channel 'mychannel'.
If network is not up, starting nodes with CLI timeout of '5' tries and CLI delay of '3' seconds and u
sing database 'couch with crypto from 'Certificate Authorities'
Bringing up network
LOCAL_VERSION=2.2.0
DOCKER_IMAGE_VERSION=2.2.0
CA_LOCAL_VERSION=1.4.8
CA_DOCKER_IMAGE_VERSION=1.4.8
Generate certificates using Fabric CA's
Creating network "net_test" with the default driver
Creating ca_org2 ...
Creating ca_orderer ...
Creating ca_org1 ...
Creating ca_org2 ...
Creating ca_orderer ...
Creating ca_org1 ...
```

테스트 네트워크를 생성하고 성능측정이 제대로 되는지 확인하기로 함.

```
h2kim@h2kim-VBox:~/fabric-samples/test-network$ docker ps
CONTAINER ID        IMAGE                                     COMMAND                  CREATED            ST
ATUS                PORTS
6123f6b2d27c       hyperledger/fabric-orderer:2.2         "orderer"               About a minute ago Up
About a minute     0.0.0.0:7050->7050/tcp
82d0b6311ef7       hyperledger/fabric-peer:2.2            "peer node start"       About a minute ago Up
About a minute     7051/tcp, 0.0.0.0:9051->9051/tcp
ca369fb38543       hyperledger/fabric-peer:2.2            "peer node start"       About a minute ago Up
About a minute     0.0.0.0:7051->7051/tcp
18f47e264adb       hyperledger/fabric-ca:latest           "sh -c 'fabric-ca-se..." About a minute ago Up
About a minute     7054/tcp, 0.0.0.0:9054->9054/tcp
15bd6dbf36bf       hyperledger/fabric-ca:latest           "sh -c 'fabric-ca-se..." About a minute ago Up
About a minute     7054/tcp, 0.0.0.0:8054->8054/tcp
2026cdb059c8       hyperledger/fabric-ca:latest           "sh -c 'fabric-ca-se..." About a minute ago Up
About a minute     0.0.0.0:7054->7054/tcp
9d617b8e514b       grafana/grafana                         "/run.sh"               13 minutes ago    Up
13 minutes         0.0.0.0:3000->3000/tcp
d00201e2c9d1       google/cadvisor:v0.27.4                "/usr/bin/cadvisor -..." 13 minutes ago    Up
13 minutes         0.0.0.0:8080->8080/tcp
00519072b30b       prom/prometheus                         "/bin/prometheus --c..." 13 minutes ago    Up
13 minutes         0.0.0.0:9090->9090/tcp
h2kim@h2kim-VBox:~/fabric-samples/test-network$ docker network connect net_test 6123f6b2d27c
Error response from daemon: endpoint with name orderer.example.com already exists in network net_test
h2kim@h2kim-VBox:~/fabric-samples/test-network$ docker network connect net_test 00519072b30b
h2kim@h2kim-VBox:~/fabric-samples/test-network$
```

도커 네트워크 연결을 명령어를 사용해 net_test에 prometheus 컨테이너를 연결함.



프로메테우스 컨테이너에서 도커 컨테이너의 벤치마크하는 것을 확인할 수 있음.

```
h2kim@h2kim-VBox:~/fabric-samples/test-network$ ./network.sh deployCC -ccn marbles -ccl go -ccp ../chaincode/marbles02/go/
deploying chaincode on channel 'mychannel'
executing with the following
- CHANNEL_NAME: mychannel
- CC_NAME: marbles
- CC_SRC_PATH: ../chaincode/marbles02/go/
- CC_SRC_LANGUAGE: go
- CC_VERSION: 1.0
- CC_SEQUENCE: 1
- CC_END_POLICY: NA
- CC_COLL_CONFIG: NA
- CC_INIT_FCN: NA
- DELAY: 3
- MAX_RETRY: 5
- VERBOSE: false
Vendoring Go dependencies at ../chaincode/marbles02/go/
~/fabric-samples/chaincode/marbles02/go ~/fabric-samples/test-network
~/fabric-samples/test-network
Finished vendoring Go dependencies
Using organization 1
+ peer lifecycle chaincode package marbles.tar.gz --path ../chaincode/marbles02/go/ --lang golang --label marbles_1.0
+ res=0
Chaincode is packaged on peer0.org1
Installing chaincode on peer0.org1...
Using organization 1
+ peer lifecycle chaincode install marbles.tar.gz
```

테스트 네트워크에 marbles 체인코드를 올리는 명령어를 사용함.

```
h2kim@h2kim-VBox:~/caliper-benchmarks$ npx caliper launch manager --caliper-workspace ./ --caliper-networkconfig networks/networkConfig.yaml --caliper-benchmarkconfig benchmarks/samples/fabric/marbles/config-prometheus.yaml --caliper-flow-only-test --caliper-fabric-gateway-enabled
2021.05.28-13:13:13.631 info [caliper] [cli-launch-manager] Set workspace path: /home/h2kim/caliper-benchmarks
2021.05.28-13:13:13.632 info [caliper] [cli-launch-manager] Set benchmark configuration path: /home/h2kim/caliper-benchmarks/benchmarks/samples/fabric/marbles/config-prometheus.yaml
2021.05.28-13:13:13.632 info [caliper] [cli-launch-manager] Set network configuration path: /home/h2kim/caliper-benchmarks/networks/networkConfig.yaml
2021.05.28-13:13:13.632 info [caliper] [cli-launch-manager] Set SUT type: fabric
2021.05.28-13:13:13.780 info [caliper] [caliper-engine] Starting benchmark flow
2021.05.28-13:13:15.561 info [caliper] [fabric-connector] Initializing gateway connector compatible with installed SDK: 2.2.3
2021.05.28-13:13:15.614 error [caliper] [cli-launch-manager] Unexpected error during benchmark execution: Error: path property does not point to a file that exists for clientSignedCert for name user1.org1.example.com in organization Org1MSP
Usage:
  caliper launch manager --caliper-bind-sut fabric:1.4 [other options]

Options:
  --help, -h          Show usage information [여부]
  --version           Show version information [여부]
  --caliper-bind-sut   The name and version of the platform to bind to [문자열]
  --caliper-bind-cwd   The working directory for performing the SDK install [문자열]
  --caliper-bind-args  Additional arguments to pass to "npm install". Use the "=" notation when setting this parameter [문자열]
  --caliper-bind-file  Yaml file to override default (supported) package versions when binding an SDK [문자열]

Error: path property does not point to a file that exists for clientSignedCert for name user1.org1.example.com in organization Org1MSP
    at IdentityManager._extractPEMFromPath (/home/h2kim/caliper-benchmarks/node_modules/@hyperledger/caliper-fabric/lib/identity-management/IdentityManager.js:324:23)
h2kim@h2kim-VBox:~/caliper-benchmarks$
```

테스트 네트워크를 내렸다가 다시 올렸기 때문에 clientSignCert 파일경로가 변경되었기 때문에 에러를 발생함.

```

13 organizations:
14   - mspid: Org1MSP
15     identities:
16       certificates:
17         - name: 'user1.org1.example.com'
18         clientPrivateKey:
19           path: '../fabric-samples/test-network/organizations/peerOrganizations/org1.example.com/
users/User1@org1.example.com/msp/keystore/af807c69546825b0a9982be432697946aa0ab24e1b41051f0ddec88
bbfcec39b_sk'
20       clientSignedCert:
21         path: '../fabric-samples/test-network/organizations/peerOrganizations/org1.example.com/
users/User1@org1.example.com/msp/signcerts/cert.pem'
22       connectionProfile:
23         path: '../fabric-samples/test-network/organizations/peerOrganizations/org1.example.com/conn
ection-org1.yaml'
24         discover: true
25   - mspid: Org2MSP
26     identities:
27       certificates:
28         - name: 'user1.org2.example.com'
29         clientPrivateKey:
30           path: '../fabric-samples/test-network/organizations/peerOrganizations/org2.example.com/
users/User1@org2.example.com/msp/keystore/6b9435deb8fec1a45b6ff362adf67b1cb81925db826bbcb69139f3f
9ddfff953_sk'
31       clientSignedCert:
32         path: '../fabric-samples/test-network/organizations/peerOrganizations/org2.example.com/
users/User1@org2.example.com/msp/signcerts/cert.pem'
33       connectionProfile:
34         path: '../fabric-samples/test-network/organizations/peerOrganizations/org2.example.com/conn
ection-org2.yaml'
35         discover: true

```

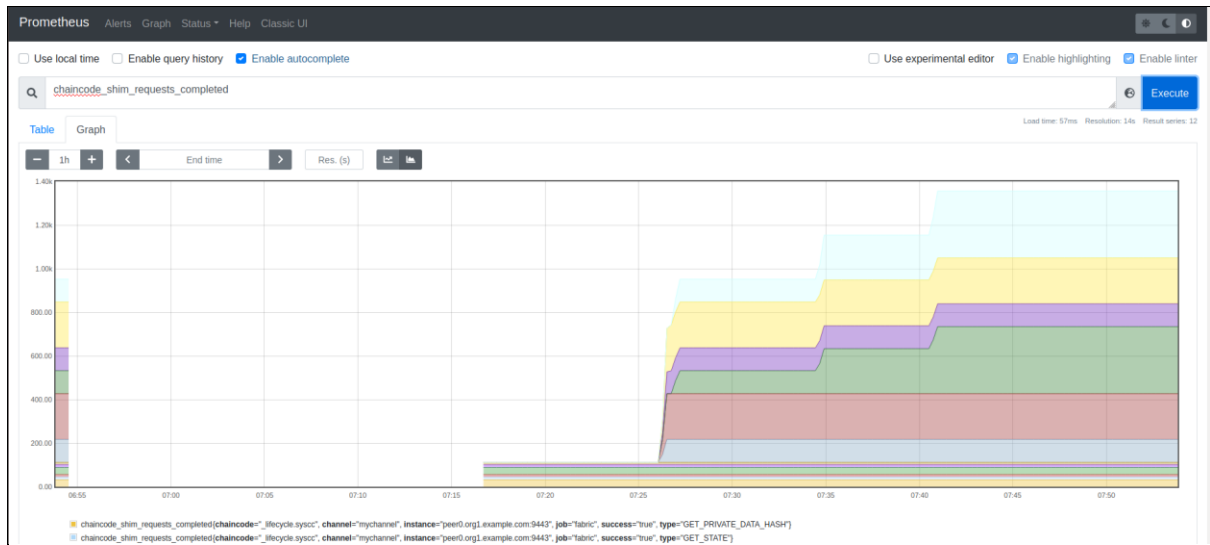
변경된 경로를 확인하고 변경하기 위해 바뀐 정보를 수정함.

```

h2kim@h2kim-VBox:~/caliper-benchmarks$ npx caliper launch manager --caliper-workspace ./ --caliper-ne
tworkconfig networks/networkConfig.yaml --caliper-benchconfig benchmarks/samples/fabric/marbles/confi
g-prometheus.yaml --caliper-flow-only-test --caliper-fabric-gateway-enabled
2021.05.28-13:18:24.433 info [caliper] [cli-launch-manager] Set workspace path: /home/h2kim/calip
er-benchmarks
2021.05.28-13:18:24.434 info [caliper] [cli-launch-manager] Set benchmark configuration path: /ho
me/h2kim/caliper-benchmarks/benchmarks/samples/fabric/marbles/config-prometheus.yaml
2021.05.28-13:18:24.434 info [caliper] [cli-launch-manager] Set network configuration path: /home
/h2kim/caliper-benchmarks/networks/networkConfig.yaml
2021.05.28-13:18:24.434 info [caliper] [cli-launch-manager] Set SUT type: fabric
2021.05.28-13:18:24.468 info [caliper] [caliper-engine] Starting benchmark flow
2021.05.28-13:18:25.456 info [caliper] [fabric-connector] Initializing gateway connector compat
ible with installed SDK: 2.2.3
2021.05.28-13:18:25.551 info [caliper] [IdentityManager] Adding user1.org1.example.com (admin=
false) as user1.org1.example.com for organization Org1MSP
2021.05.28-13:18:25.557 info [caliper] [IdentityManager] Adding user1.org2.example.com (admin=
false) as _Org2MSP_user1.org2.example.com for organization Org2MSP
2021.05.28-13:18:25.558 info [caliper] [caliper-engine] Skipping start commands due to benchm
ark flow conditioning
2021.05.28-13:18:25.559 info [caliper] [caliper-engine] Skipping initialization phase due to
benchmark flow conditioning
2021.05.28-13:18:25.559 info [caliper] [caliper-engine] Skipping install smart contract phase
due to benchmark flow conditioning
2021.05.28-13:18:25.567 info [caliper] [monitor.js] No resource monitors specified
2021.05.28-13:18:25.571 info [caliper] [default-observer] Observer interval set to 5000 seconds
2021.05.28-13:18:25.573 info [caliper] [round-orchestrator] Preparing worker connections
2021.05.28-13:18:25.573 info [caliper] [worker-orchestrator] Launching worker 1 of 5
2021.05.28-13:18:25.579 info [caliper] [worker-orchestrator] Launching worker 2 of 5
2021.05.28-13:18:25.592 info [caliper] [worker-orchestrator] Launching worker 3 of 5
2021.05.28-13:18:25.614 info [caliper] [worker-orchestrator] Launching worker 4 of 5
2021.05.28-13:18:25.619 info [caliper] [worker-orchestrator] Launching worker 5 of 5
2021.05.28-13:18:25.640 info [caliper] [worker-orchestrator] Messenger not configured, entering co
nfigure phase...
2021.05.28-13:18:25.642 info [caliper] [worker-orchestrator] No existing workers detected, enterin
g worker launch phase...
2021.05.28-13:18:25.647 info [caliper] [worker-orchestrator] Waiting for 5 workers to be connected
...

```

npx caliper 명령어를 사용하여 작동하는 것을 확인할 수 있음. Worker를 5개로 변경하여 작동하는 것을 확인할 수 있음.



prometheus 페이지에서 피어 컨테이너 별로 작동하는 함수에서 작동하는 성능 측정을 확인할 수 있음.

3. 차주 계획

- 다양한 실험값 변경을 통해 성능측정을 결과값 도출

4. 참고 자료

- [1] <https://github.com/adityajoshi12/fabric-samples-advance-topics>
- [2] <https://medium.com/finda-tech/grafana%EB%9E%80-f3c7c1551c38>
- [3] <https://medium.com/coinmonks/hyperledger-fabric-v2-x-monitoring-using-prometheus-974e433073f5>