npia-server

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Description

This project aims not only to demonstrate a proper use case for npia-api but also to
offer a production-ready implementation of npia-api compliant system (and as usual for me, it doesn't reach the level at this point ⋯).

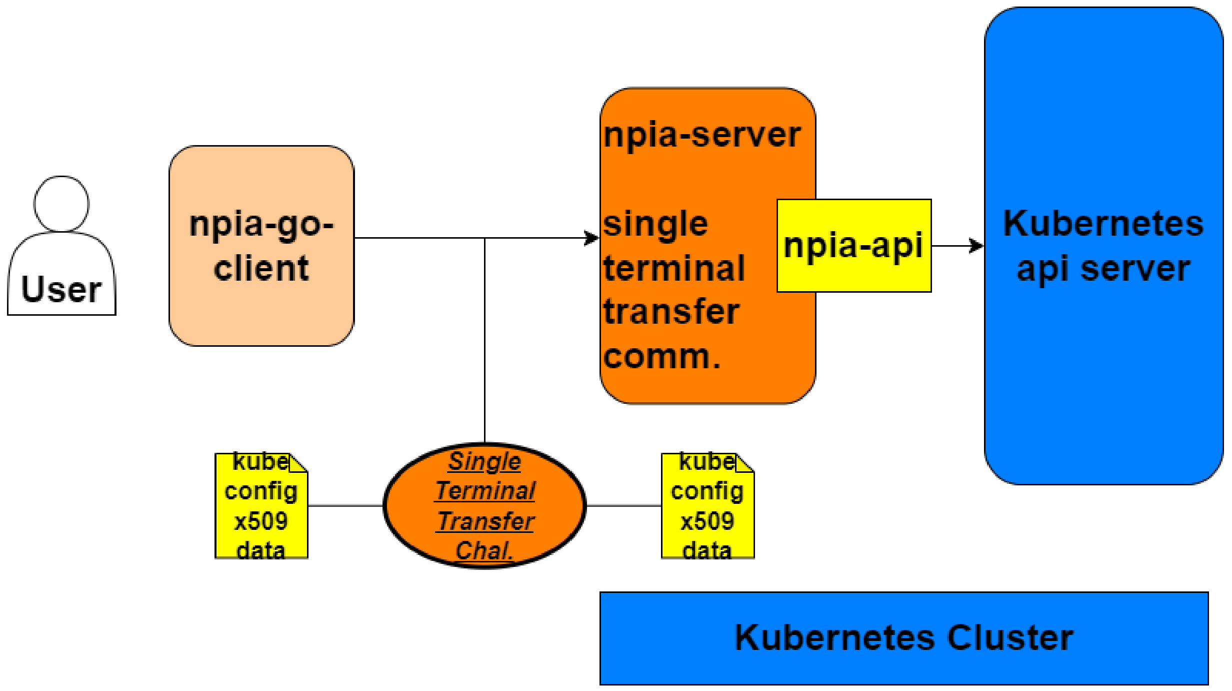
This repository holds two examplary (and hopefully someday production-grade) systems that implement somewhat distinct
interfaces to interact with npia-api. Each system is as follows.

1. Http server that implements KCXD-STTC Protocol (you think it's a bogus word? Well... it was until now! See Security section to
know what on earth that means) to handle secure http query from a compliant client, ex) npia-go-client
2. Web socket hub that implements KCXD-MTSC Protocol (again, Security) to handle secure web socket query from a compliant client
ex) the code in src/sock directory implements this, ex2) also, orchestrator/ofront will implement this protocol in future release, but for now,
it relies on oauth2 based https connection for security. This means, oauth2 user must (**please!**) configure properly the external
reverse proxy (nginx, per se) to handle https:// and wss://.

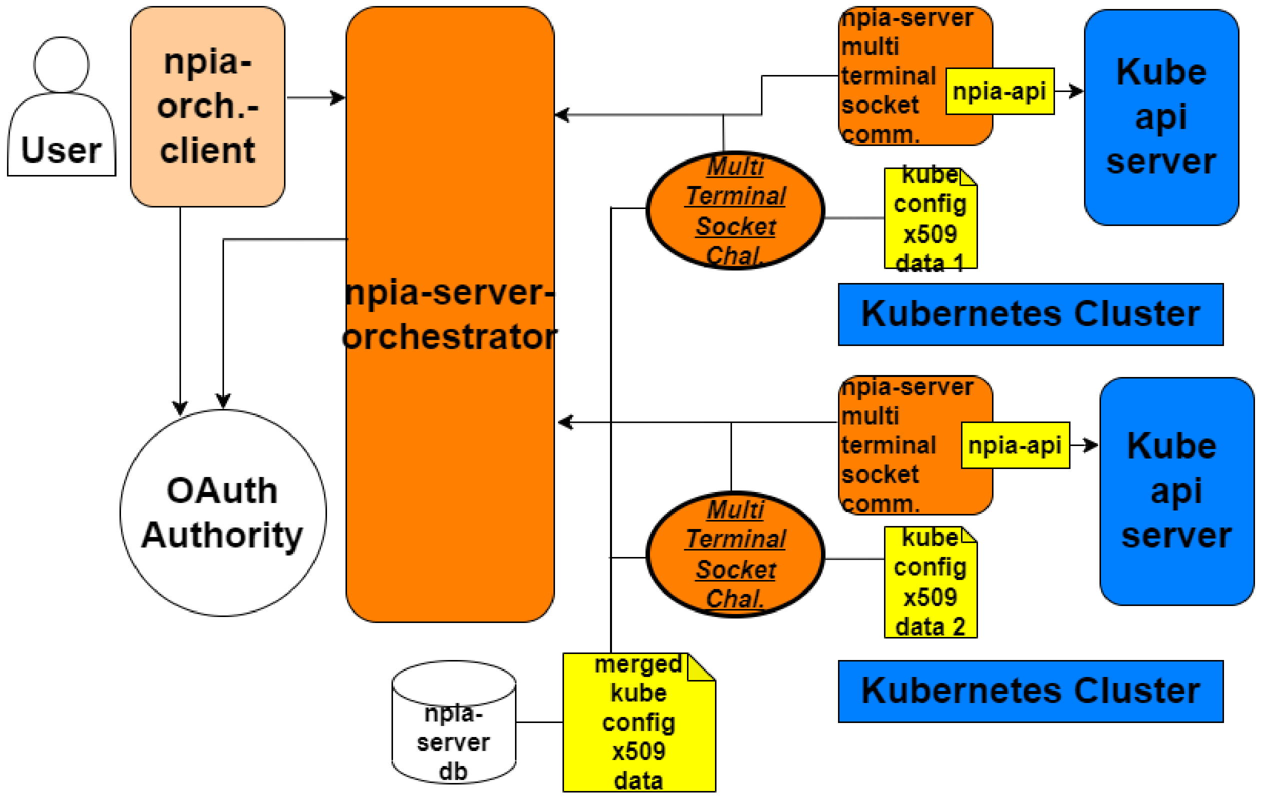
Project Overview

The blueprint for the repository is as follows.

npia-server KCXD-STTC



npia-server KCXD-MTSC



npia-server

The tree structure for the repository is as follows

```
··· debug_bin
··· debug_build_run
··· debug_cleanup
··· docs
··· go.mod
··· go.sum
··· LICENSE
··· orchestrator
·   ··· debug_amalgamate_bin
·   ··· debug_amalgamate_config
·   ··· docker-compose.yaml
·   ··· odb
·   ··· odebug_build_run
·   ··· odebug_cleanup
·   ··· ofront
·   ·   ··· config.json
·   ·   ··· ocontroller
·   ·   ··· omodels
·   ·   ··· omodules
·   ·   ··· orouter
·   ·   ··· oview
·   ··· osock
··· src
·   ··· controller
·   ··· modules
·   ··· router
·   ··· sock
··· test
·   ··· kindcluster
··· var
```

Let me guide you through the each entrypoint briefly.

- debug_bin
  Stores a kubeconfig file that holds information about two clusters for testing npia-server.
- debug_build_run
  Is a Bash script for compiling and setting up the executable and base environment\ for testing npia-server.
- debug_cleanup
  Is a Bash script for cleaning up the artifacts and environment used for testing npia-server.
- docs
  Is what it says it is.
- go.mod, go.sum
  Define the directly and indirectly required modules for functioning apis.
- LICENSE
  Is what it says it is.
- orchestrator
  Stores a docker-compose manifest file for building and running components that make up orchestrator system while also has Bash scripts for testing it

Caveats: if you already have a running cluster and corresponding kubeconfig file, DO NOT run the script "odebug_build_run" without backing up your original kubeconfig, because the script will obliterate that one

- orchestrator/debug_amalgamate_bin
  Stores "amalgamation tools" used when testing the orchestrator system, which means that the tools handle automatically baseline components needed for having a functioning orchestrator system, including merging two test kubeconfig files into one and then generating encryption key and putting encrypted merged file into the db
- orchestrator/debug_amalgamate_config
  Stores the two test kubeconfig files used for testing the orchestrator system
- orchestrator/odb
  Stores image and container information for running orchestrator database.
- orchestrator/ofront
  Holds the front part (meaning user-facing on the browser) of the orchestrator system, including configuration file needed for Google oauth.
- orchestrator/ofront/ocontroller
  Stores controller logic for handling user request regarding access and oauth authentication.
- orchestrator/ofront/omodels
  Stores database querying logic for handling user request regarding access and oauth authentication and also storing orchestrator socket request key.
- orchestrator/ofront/omodules
  Stores orchestrator gadgets that include primarily oauth modules and configuration.
- orchestrator/ofront/orouter
  Stores access paths information for users to access the orchestrator.
- orchestrator/ofront/oview
  Stores html and template assets to render on the user's browser.
- orchestrator/osock
  Stores socket connection endpoints and handling logic for both oauth-ed front user and challenge-passed server socket client and the hub channels for both sides to talk to each other.
- src
  Stores entry and initiation logic for both npia-server STTC host and npia-server MTSC client.
- src/controller
  Stores various data structures and logic for interacting with npia-server that inlcude npia-api wrapper, challenge protocol handler, network communication data structures, and npia-multi-mode handler so and so. The data structure and logic defined and implemented in here are used across,
  but not limited to, this project. Those are exported to other projects such as npia-go-client.
- src/modules
  Stores various data structures and logic primarily related to asymmetric/symmetric encryption/decryption algorithms and certificate authentication methods that are all building blocks of KCXD Challenge Protocol.
- src/router
  Stores endpoints where clients programs can access the server, get authenticated through challenges and make query to npia-api
- src/sock
  Stores functions that make up a socket client for connecting to the orchestrator hub, handling challenge protocol, and sending to/receiving from it using crypto algorithms.
- test
  Stores testing materials
- test/kindcluster
  Stores scripts and config files for setting up working kind Kubernetes cluster for testing purpose
- var

Has various this and that artifacts when developing the server

Details

This section dives into the details of each entry point.

However, it doesn·t go so deeper that you don·t have to look at the source code to understand how everything works in conjunction.

For even more details, refer to specific comments associated with a code block, or better, you could just run it yourself.

debug_bin

- config
  Is a kubeconfig file that holds the information of two kind clusters that don't exist
  on earth anymore.

orchestrator

- docker-compose.yaml
  Is a docker-compose manifest file that defines the build directory for each orchestrator
  component and the way they run.
- odebug_build_run
  Is a Bash script that consists of command lines to set up a test environment of orchestrator.
  It merges two configs in the orchestrator/debug_amalgamate_bin into one, generates an
  encryption key, encrypts the merged config file and puts the file into the orchestrator db.
- odebug_cleanup
  Removes all the environments created using orchestrator/odebug_build_run

orchestrator debug_amalgamate_bin

- amalgamate
  Is a Bash script that is used by orchestrator/odebug_build_run and handles the job of
  actually merging two kubeconfig files.
- amalgamate.go
  Is a program that generates AES GCM key and consumes merged kubeconfig file to output
  both the symmetric key and finally the encrypted kubeconfig file.

orchestrator debug_amalgamate_config

- config1
  the first kind Kubernetes cluster config for testing out npia-server.
- config2
  the second kind Kubernetes cluster config for testing out npia-server.

orchestrator odb

- Dockerfile
  Defines how the MySQL database should be built as a container image, picking up the
  encrypted kubeconfig file along the way
- init.sql

Defines how the MySQL database should be initiated inside a created container, inserting pre-defined information along with the encrypted kubeconfig file into corresponding columns.

orchestrator ofront

- Dockerfile
  Defines how a golang server environment should be built and initiated inside a container image.
- config.json
  Holds information for later use when user is trying to authenticate through Google OAuth channel.
  It consists of two fields, GOOGLE_OAUTH_CLIENT_ID which is client id retrieved when registering the oauth process on cloud.google.com and GOOGLE_OAUTH_CLIENT_SECRET which is
  also retrievable at the time you register the process on the platform along the client id.
- ofront.go
  Is a main entry for creating and running the Go Gin server that serves the front user.

orchestrator ofront ocontroller

- ocontroller.go
  Has functions for serving index html file and /orchestrator template page, redirecting to and managing access to /orchstrate if session is present and authenticated, and Google oauth initiation along with callback

orchestrator ofront omodels

- omodels.go
  Has functions to handle database query and check access authenticity, register front-user session id with socket request key if the user has successfully passed oauth process.

orchestrator ofront omodules

- config.go
  For now, has a function to read the orchestrator/ofront/config.json and a data structure to store the data
- ooauth2.go
  Has functions to set session cookie and get user data from Google after the front user got redirected to authenticate with the Google server.
  Also it has data structures to hold the oauth2 configuration and Google oauth result to check if the oauth process has been successful.

orchestrator ofront orouter

- orouter.go
  Has paths for front user to access which are main landing page, and another page where orchestrator call is made, and two others for conducting oauth2 authentication.

orchestrator ofront oview

- index.html

Is what it says it is.

- orchestrator.tmpl
  Is where, after the authentication, the front user makes call to the orchestrator hub to retrieve api processing result from the npia-server sock agent.

orchestrator osock

- Dockerfile
  Defines how the orchestrator socket image should be built and run inside a container.
- osock_front.go
  Has a function to handle the initial authentication challenge from the front user web socket connection and maintain the connection if the authentication is successful.
  Upon successful authentication, it keeps a runtime mapped record for a websocket connection identifier along with a corresponding user id.
- osock_modules.go
  Has functions for orchestrator/osock system to interact with orchestrator/odb and checking session before returning corresponding user email against a submitted request key, decrypting the user's amalgamated kubeconfig file stored inside the database.
- osock_server.go
  Has a function to handle the initial authentication challenge from the server sock agent web socket connection and maintain the connection if the authentication is successful.
  Upon successful authentication, it keeps a runtime mapped record for a websocket connection identifier along with a sysmmetric key used for secure communication and also, the front user socket search key for finding the web socket to send the api result to.
- osock.go
  Defines database connection information and socket endpoint address for both the front user and the server sock agent to connect to, and the dynamically mapped records that will hold the bidirectional reference for both the front user and server sock agent socket connection.
  Also, it has a function to initiate the base environment for orchestrator/osock to properly run

src

- main.go
  Is a main entry for npia-server to be up and running either as a single terminal transfer communication mode or a multi terminal socket communication mode.
  Along with that, it checks and sets up the base environment for npia-server to properly run.

src controller

- api.go
  Is the core interface to relay the user-sent query to the npia-api when the server is in single terminal transfer communication mode.
  It receives the query content delivered inside the request body, decrypts it, formats it to send to npia-api, retrieves the result, and finally encrypts the byte format result then sends it back.
- auth.go
  Has a function to handle the entire single terminal transfer challenge process.
- check.go

Checks status.

- definition.go
  Has all fundamental data blocks for communicating with npia-server components and within components. It defines how the api request/response data sent to/from npia-server should look like, and how the challenge protocol data should be formatted, and finally when using multi terminal socket communication mode, how the data sent to/from the orchestrator should look like.
- multimode.go
  Implements npia-multi-mode handler on the server side as api callable structure

src modules

- auth.go
  Holds all functions that uphold the single terminal transfer challenge and
  the multi terminal socket challenge. Not only that, it also contains function for generating the challenges and verifying
  them for both single terminal transfer communication mode and multi terminal socket communication mode.
- definition.go
  Has the baseline data structures for the sttc and mtsc protocol.
- utils.go
  Holds all building blocks that make up the challenge functions which include
  public key and private key encoding, extraction of those from the kubeconfig
  and asymmetric, symmetric encryption, secure random byte generation,
  certicate verification, etc.

src router

- router.go
  Defines main entries to which npia-go-client or whatever that is compliant with the apistandard and KCXD Challenge Protocol can access and send data

src sock

- module.go
  Defines and implements Go routine read channels for sequential challenge-then-listen, and write channel for interacting with orchestrator challenge signals and front-user query sent through it.
- sock.go
  Has an entry logic for running the multi terminal socket commuincation mode and the storage to keep the symmetric key to encrypt/decrypt the message after the successful authentication

test kindcluster

- kindcluster.sh
  Is a Bash script for up and running kind Kubernetes clusters for testing purpose.
- kindcluster1.yaml
  Is a yaml config file for the first test-purpose kind Kubernetes cluster
- kindcluster2.yaml
  Is a yaml config file for the second test-purpose kind Kubernetes cluster

Security Model

Warning

1. DO NOT USE PLAIN HTTP CHANNEL WHEN ACCESSING FRONT, YET!

2. DO USE YOUR OWN OAUTH CREDENTIAL!

Model Description

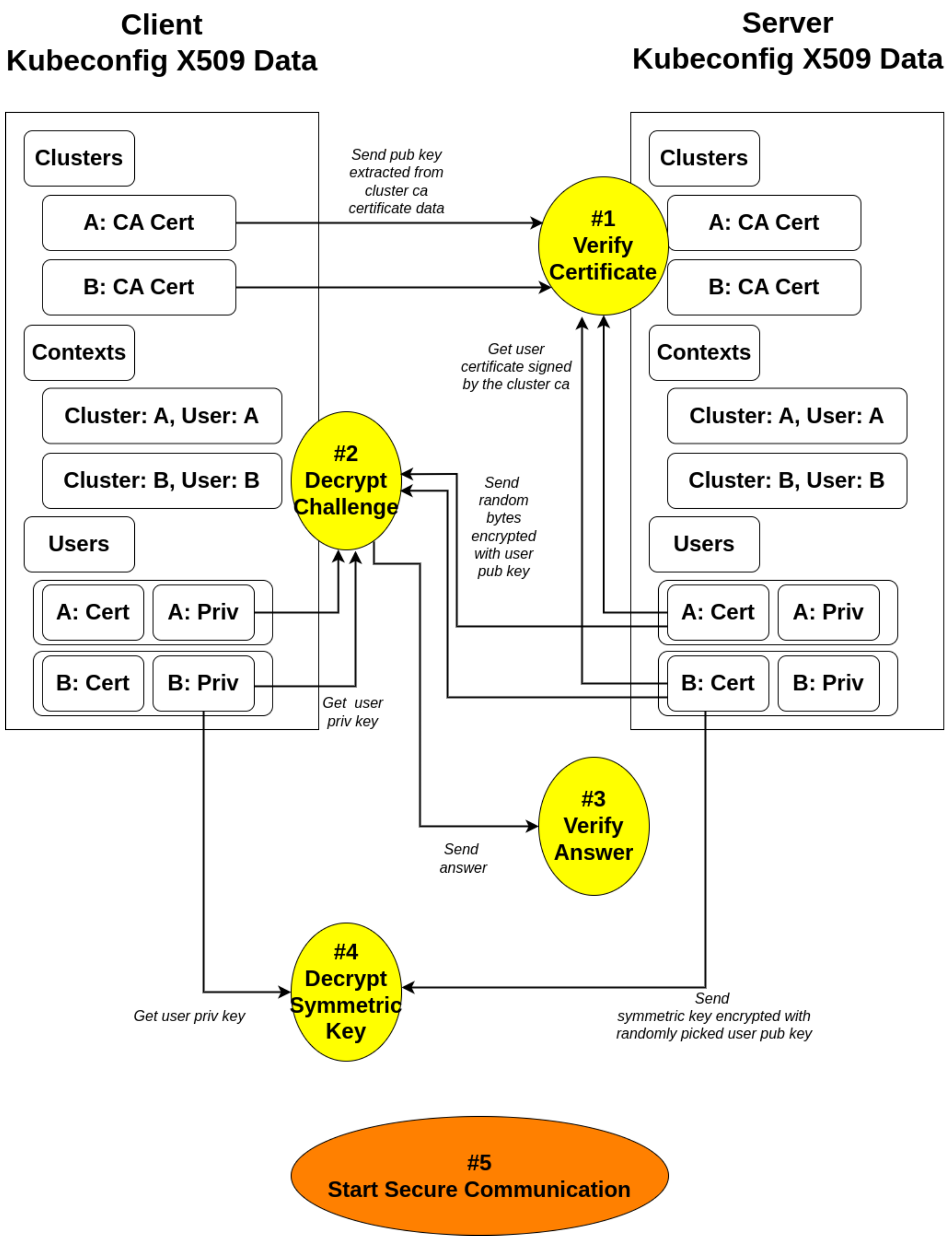
This page is about the problematic bogus words appearing excessively frequently throughout the whole documents,

1. KCXD (Kubeconfig X509 Data)
   Under the hood, when executing kubectl command, a thing called Bidirectional X509 between kubectl client and kube apiserver happens to authenticate mutual integrity. Kubeconfig is used for that protocol and npia-server decided to build a protocol upon the data which is assumed to be sharable (or not! haha) if client and server are set up by the same entity.
2. STTC (Single Terminal Transfer Challenge, or Communication)
   Using KCXD, it is a protocol between http client and server which targets single-terminal oriented requests and responses.
3. MTSC (Multi Terminal Socket Challenge, or Communication)
   Using KCXD, it is a protocol between front and orchestrator and sock client which targets multi-terminal oriented web socket requests and responses.

Model Overview

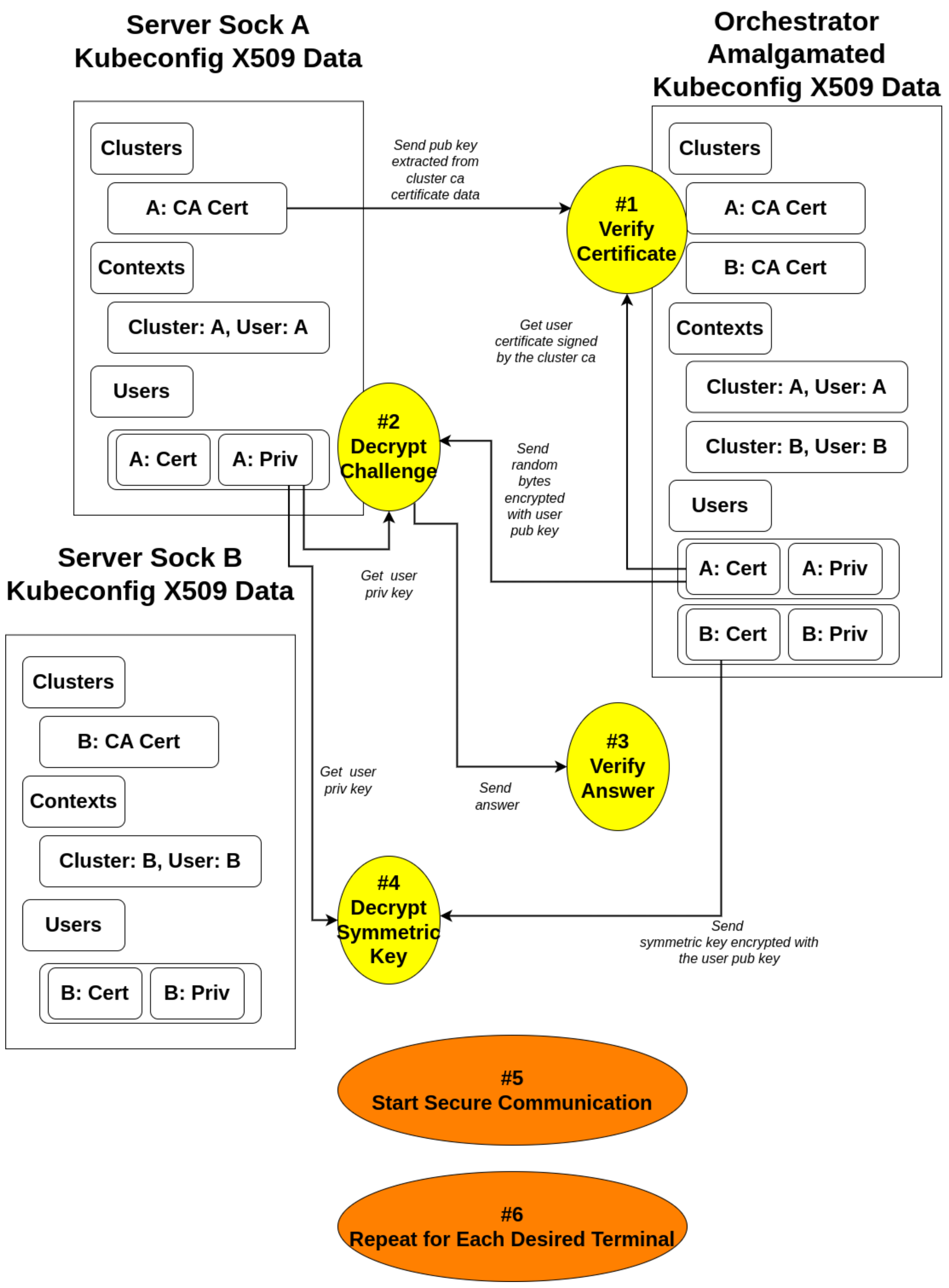
The blueprint for KCXD Challenge Protocol is as follows

1. STTC (Single Terminal Transfer Challenge)


Client
Kubeconfig X509 Data
Server
Kubeconfig X509 Data
Clusters
A: CA Cert
B: CA Cert
Contexts
Cluster: A, User: A
Cluster: B, User: B
Users
A: Cert
A: Priv
B: Cert
B: Priv
Send pub key extracted from cluster ca certificate data
#1 Verify Certificate
Get user certificate signed by the cluster ca
#2 Decrypt Challenge
Send random bytes encrypted with user pub key
Get user priv key
#3 Verify Answer
Send answer
#4 Decrypt Symmetric Key
Get user priv key
Send symmetric key encrypted with randomly picked user pub key
#5 Start Secure Communication

kcxd-sttc

2. MTSC (Multi Terminal Socket Challenge)


Server Sock A Kubeconfig X509 Data
Clusters
A: CA Cert
Contexts
Cluster: A, User: A
Users
A: Cert
A: Priv
Orchestrator Amalgamated Kubeconfig X509 Data
Clusters
A: CA Cert
B: CA Cert
Contexts
Cluster: A, User: A
Cluster: B, User: B
Users
A: Cert
A: Priv
B: Cert
B: Priv
Server Sock B Kubeconfig X509 Data
Clusters
B: CA Cert
Contexts
Cluster: B, User: B
Users
B: Cert
B: Priv
Send pub key extracted from cluster ca certificate data
#1 Verify Certificate
Get user certificate signed by the cluster ca
#2 Decrypt Challenge
Send random bytes encrypted with user pub key
Get user priv key
#3 Verify Answer
Send answer
Get user priv key
#4 Decrypt Symmetric Key
Send symmetric key encrypted with the user pub key
#5 Start Secure Communication
#6 Repeat for Each Desired Terminal

Model Details

STTC (Single Terminal Transfer Challenge)

0 In order for this protocol to be successfully resolved, client and server
must share the exactly same kubeconfig files.

1 According to its contexts fields, client extracts all available
certificate-authority-data's public keys, which are kubernetes root ca's
public keys, and sends them all with each corresponding context cluster name.
Now, upon receiving that information, server verifies if the public keys are
the ones that it has by using those keys to verify the context user's certificates,
which are supposed to be signed using kubernetes root ca's private keys if authentic.

2 Now, if the verification is successful for each and every user's certificate,
it's time for server to assign a challenge id and random bytes of 16 - 32 length for
each and every context user, store it, encrypts the random bytes using each context
user's public key, which can be extracted from the kubeconfig context user's certificate
data, and sends the data back to client.
Upon receiving this, client must remember the challenge id and for each and every entry
of context user, decrypt the challenge with corresponding private keys which are accessible
from the kubernetes context user's private key data.

3 If each and every challenge is decrypted, client sends the answer attached to the
challenge id it received.

4 If each and every challenge is correctly decrypted, server then assumes that the
counterpart has the same kubeconfig file and generates a session key for the client,
pairs it with the session's unique symmetric key for AES-GCM algorithm, encrypts
the key with randomly picked context user's public key, and finally sends it back
to the client with the context user name as a field key.

5 Finally, upon receiving it, client decrypts the data with the corresponding private
key of the user, stores the symmetric key, and starts encrypting the communication data.

MTSC (Multi Terminal Socket Challenge)

0 In order for this protocol to be successfully resolved, server sock must have
only one, exact, and whole subset of the orchestrator side's kubeconfig file.

*Going forward, server sock will be referred to as "client" and orchestrator
will be referred to as "server"*

1 According to its contexts field, client extracts the certificate-authority-data's
public key, which is kubernetes root ca's public key, and sends it with a corresponding
context cluster name.
Now, upon receiving that information, server verifies if the public key is
the one that it has by using the key to verify the context user's certificate,
which is supposed to be signed using kubernetes root ca's private key if authentic.

2 Now, if the verification is successful for ethe user's certificate,
it's time for server to assign a challenge id and random bytes of 16 - 32 length for
the context user, store it, encrypts the random bytes using each context
user's public key, which can be extracted from the kubeconfig context user's certificate
data, and sends the data back to client.
Upon receiving this, client must remember the challenge id and for the context user,

decrypt the challenge with corresponding private key which is accessible
from the kubernetes context user's private key data.

3. If the challenge is decrypted, client sends the answer attached to the
challenge id it received.
4. If the challenge is correctly decrypted, server then assumes that the
counterpart has the one, exact, and whole subset of kubeconfig file that it has and
generates a session key for the client,
pairs it with the session's unique symmetric key for AES-GCM algorithm, encrypts
the key with the context user's public key, and finally sends it back
to the client with the context user name as a field key.
5. Finally, upon receiving it, client decrypts the data with the corresponding private
key of the user, stores the symmetric key, and starts encrypting the communication data.
6. From server's point of view, if there are more than one client terminal, it iterates
the process for each terminal that wants to connect to the server.

Scenario

Scenario Description

This page is about basic examplary scenarios for each mainline use cases & implementations of

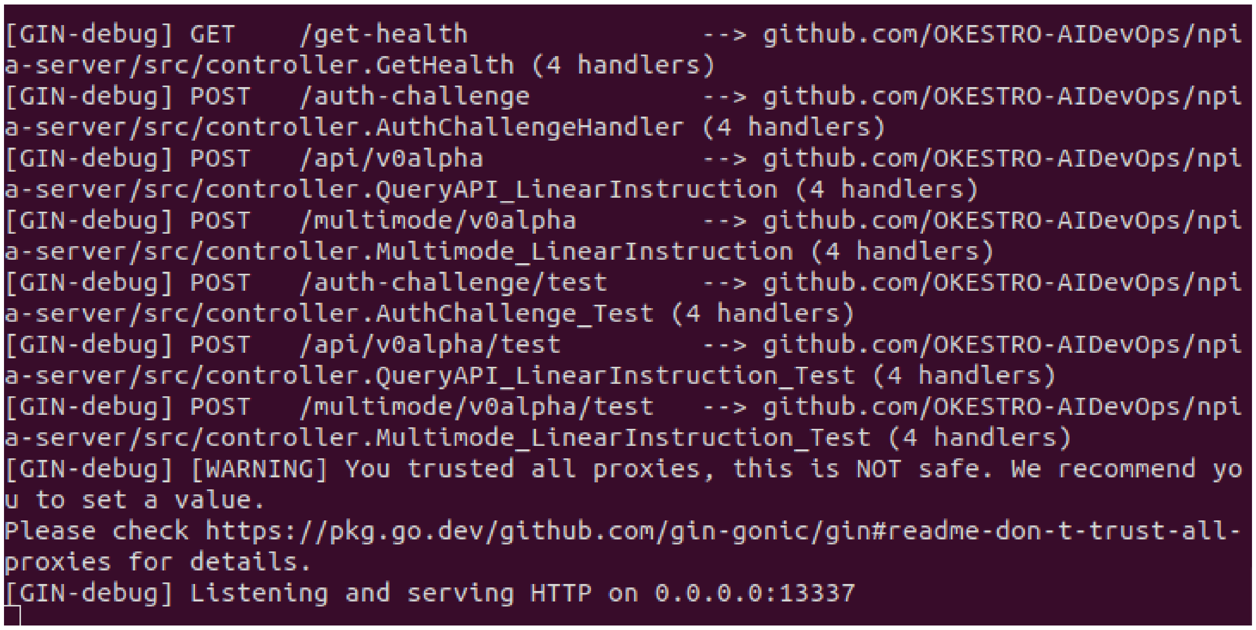
1. KCXD-STTC (Kubeconfig X509 Data based Single Terminal Transfer Communication)
2. KCXD-MTSC (Kubeconfig X509 Data based Multi Terminal Socket Communication)

1.

Single Terminal Transfer Communication Mode

1-1. Initiate npia-server STTC mode

In the below screenshot, you can see the gogin server is running
in debug mode, showing all available endpoints.
Here, our points of interest are those suffixed with /test paths since,
yes, this is a test.

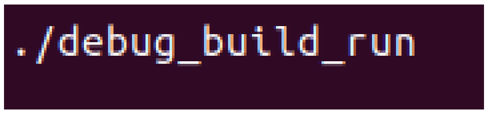


```
[GIN-debug] GET    /get-health               --> github.com/OKESTRO-AIDevOps/npi
a-server/src/controller.GetHealth (4 handlers)
[GIN-debug] POST   /auth-challenge           --> github.com/OKESTRO-AIDevOps/npi
a-server/src/controller.AuthChallengeHandler (4 handlers)
[GIN-debug] POST   /api/v0alpha              --> github.com/OKESTRO-AIDevOps/npi
a-server/src/controller.QueryAPI_LinearInstruction (4 handlers)
[GIN-debug] POST   /multimode/v0alpha        --> github.com/OKESTRO-AIDevOps/npi
a-server/src/controller.Multimode_LinearInstruction (4 handlers)
[GIN-debug] POST   /auth-challenge/test      --> github.com/OKESTRO-AIDevOps/npi
a-server/src/controller.AuthChallenge_Test (4 handlers)
[GIN-debug] POST   /api/v0alpha/test         --> github.com/OKESTRO-AIDevOps/npi
a-server/src/controller.QueryAPI_LinearInstruction_Test (4 handlers)
[GIN-debug] POST   /multimode/v0alpha/test   --> github.com/OKESTRO-AIDevOps/npi
a-server/src/controller.Multimode_LinearInstruction_Test (4 handlers)
[GIN-debug] [WARNING] You trusted all proxies, this is NOT safe. We recommend yo
u to set a value.
Please check https://pkg.go.dev/github.com/gin-gonic/gin#readme-don-t-trust-all-
proxies for details.
[GIN-debug] Listening and serving HTTP on 0.0.0.0:13337
```

1

1-2. Run npia-go-client debug script for STTC mode test client

In the below screenshot, what you see is the npia-go-client's piece of script
where you can check out a simple test interaction with the npia-server in
STTC mode which involves single terminal transfer challenge and api querying.

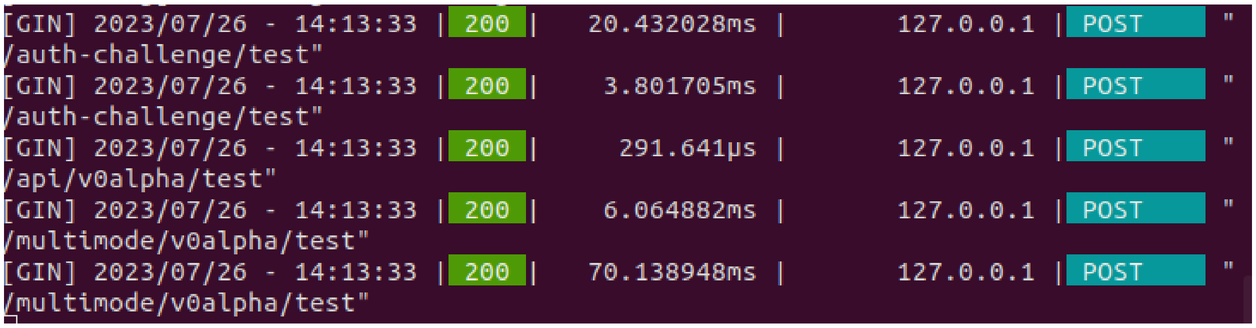


```
./debug_build_run
```

2

1-3. Check if the STTC Challenge Protocol and subsequent api queries have been successful

In the below screenshot, you can see that the first two requests have been made to
resolve challenge protocol authentication and the following api query, followed by
two more queries to initiate multi mode and then switch to another target cluster.
We can be sure the challenge was succefult since the latter three requests never return
200 status in the case of unsuccessful authenticaton.

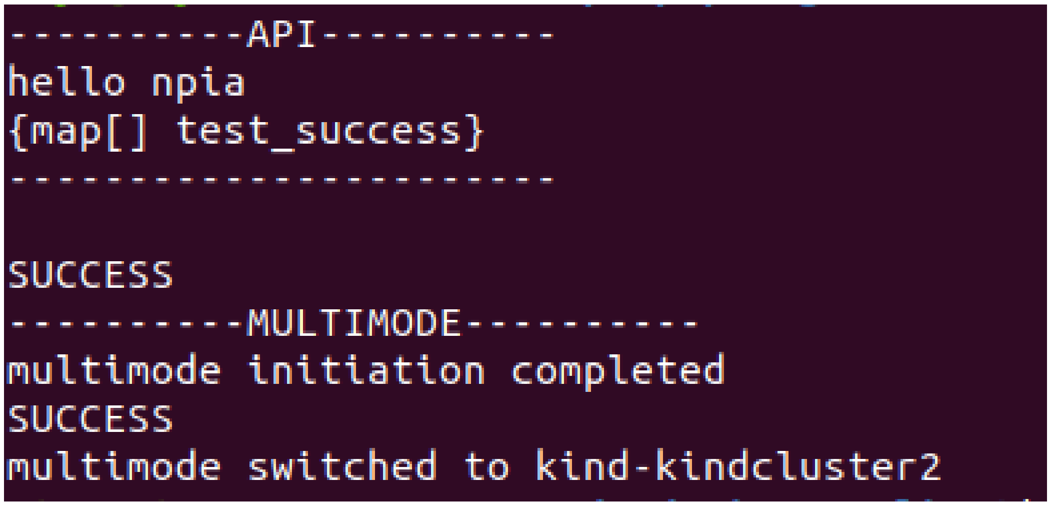


```
[GIN] 2023/07/26 - 14:13:33 | 200 |   20.432028ms |       127.0.0.1 | POST     "
/auth-challenge/test"
[GIN] 2023/07/26 - 14:13:33 | 200 |    3.801705ms |       127.0.0.1 | POST     "
/auth-challenge/test"
[GIN] 2023/07/26 - 14:13:33 | 200 |     291.641µs |       127.0.0.1 | POST     "
/api/v0alpha/test"
[GIN] 2023/07/26 - 14:13:33 | 200 |    6.064882ms |       127.0.0.1 | POST     "
/multimode/v0alpha/test"
[GIN] 2023/07/26 - 14:13:33 | 200 |   70.138948ms |       127.0.0.1 | POST     "
/multimode/v0alpha/test"
```

3

1-4. Check if the STTC client has received what it wanted

Voila, it has!



```
----------API----------
hello npia
{map[] test_success}
-----------------------

SUCCESS
----------MULTIMODE----------
multimode initiation completed
SUCCESS
multimode switched to kind-kindcluster2
```

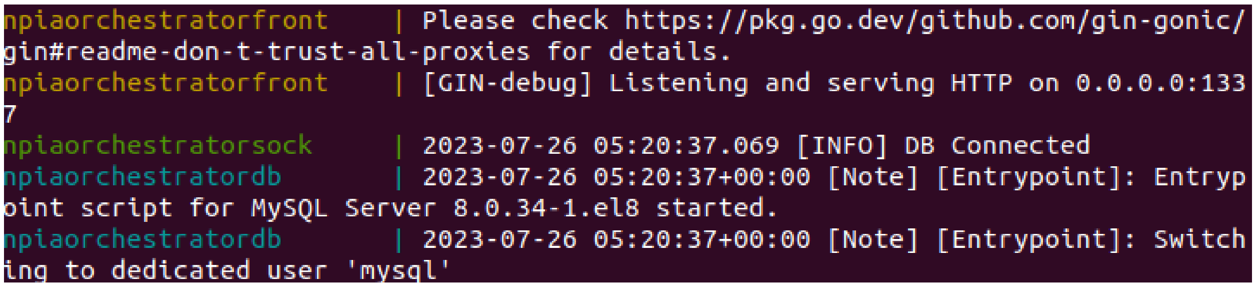
4

2.

Multi Terminal Socket Communication Mode

2-1. Initiate npia-server MTSC mode

In the below screenshot, you can see the orchestrator components are up and running as containers.

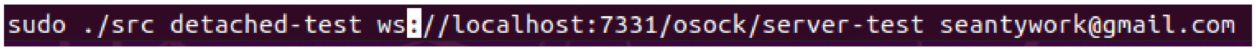


```
npiaorchestratorfront    | Please check https://pkg.go.dev/github.com/gin-gonic/
gin#readme-don-t-trust-all-proxies for details.
npiaorchestratorfront    | [GIN-debug] Listening and serving HTTP on 0.0.0.0:133
7
npiaorchestratorsock     | 2023-07-26 05:20:37.069 [INFO] DB Connected
npiaorchestratordb       | 2023-07-26 05:20:37+00:00 [Note] [Entrypoint]: Entryp
oint script for MySQL Server 8.0.34-1.el8 started.
npiaorchestratordb       | 2023-07-26 05:20:37+00:00 [Note] [Entrypoint]: Switch
ing to dedicated user 'mysql'
```

5

2-2. Initiate npia-server MTSC socket client

With a manually compiled src executable, using the below command will make
a debugging connection to the orchestrator

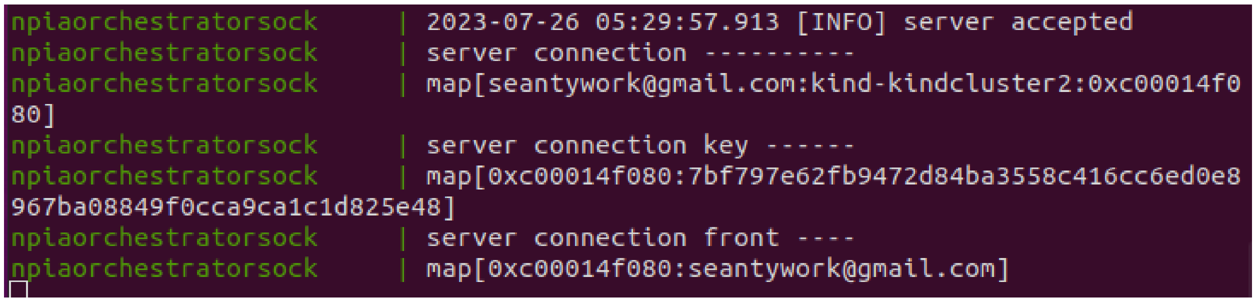


```
sudo ./src detached-test ws://localhost:7331/osock/server-test seantywork@gmail.com
```

6

2-3. Check if MTSC Challenge Protocol has been successful and connection is maintained

If the challenge protocol has been successful and connection is
accepted, you will see something like the below screenshot.

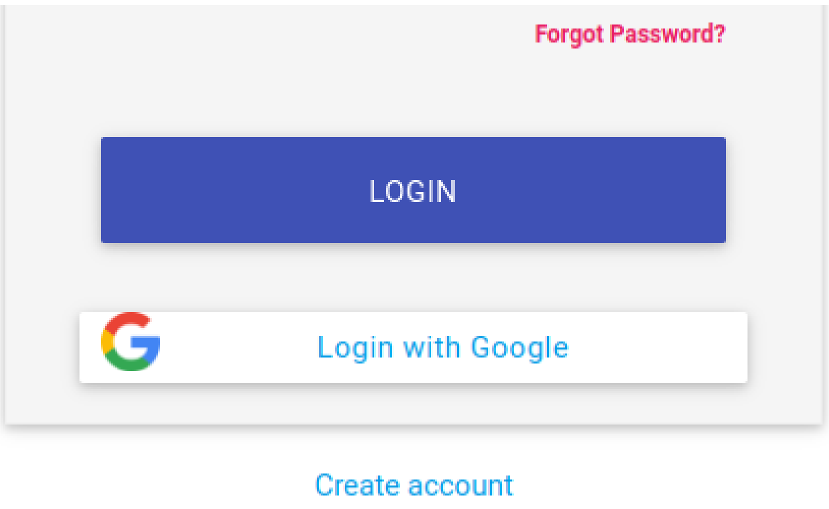


```
npiaorchestratorsock     | 2023-07-26 05:29:57.913 [INFO] server accepted
npiaorchestratorsock     | server connection ----------
npiaorchestratorsock     | map[seantywork@gmail.com:kind-kindcluster2:0xc00014f0
80]
npiaorchestratorsock     | server connection key ------
npiaorchestratorsock     | map[0xc00014f080:7bf797e62fb9472d84ba3558c416cc6ed0e8
967ba08849f0cca9ca1c1d825e48]
npiaorchestratorsock     | server connection front ----
npiaorchestratorsock     | map[0xc00014f080:seantywork@gmail.com]
```

7

2-4. As a front-user, conduct oauth2.

As the below screenshot, you will see the page popping up if you first access the default
path.



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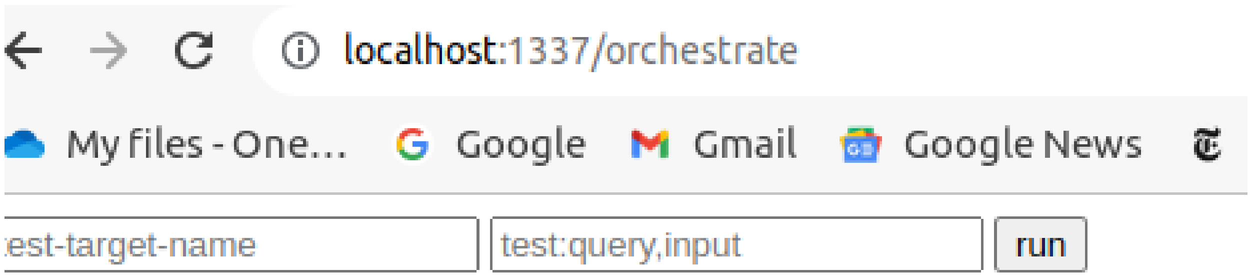
2-5. If OAuth is successful, you are ready to orchestrate multiple terminals

Just like the below screenshot, you will have an interface to query multiple terminals manifested and connected to the orchestrator.



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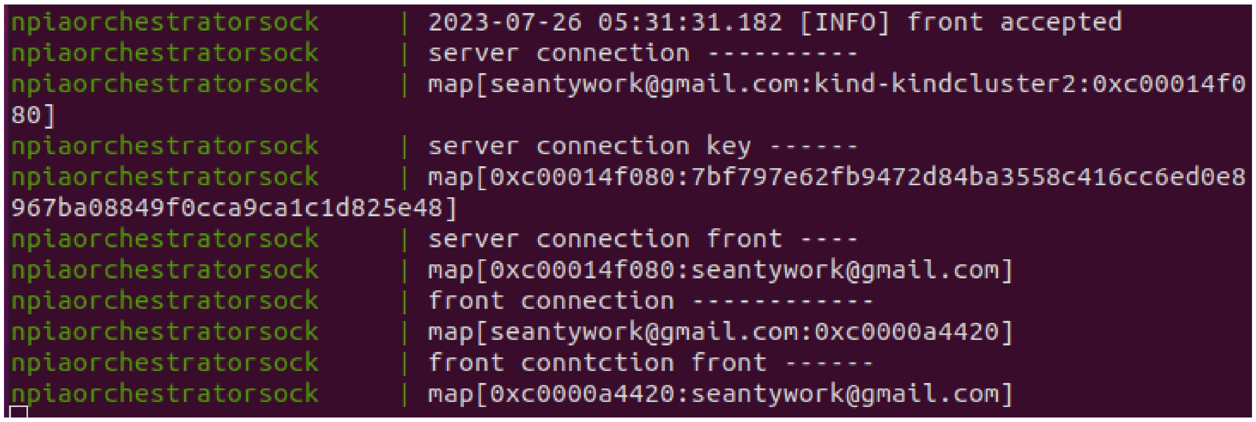
2-6. Meanwhile, check if front connection was successful.

If the oauth has been successful and connection to the orchestrator is accepted, you will see something like the below screenshot.



```
npiaorchestratorsock      | 2023-07-26 05:31:31.182 [INFO] front accepted
npiaorchestratorsock      | server connection ----------
npiaorchestratorsock      | map[seantywork@gmail.com:kind-kindcluster2:0xc00014f0
80]
npiaorchestratorsock      | server connection key ------
npiaorchestratorsock      | map[0xc00014f080:7bf797e62fb9472d84ba3558c416cc6ed0e8
967ba08849f0cca9ca1c1d825e48]
npiaorchestratorsock      | server connection front ----
npiaorchestratorsock      | map[0xc00014f080:seantywork@gmail.com]
npiaorchestratorsock      | front connection ------------
npiaorchestratorsock      | map[seantywork@gmail.com:0xc0000a4420]
npiaorchestratorsock      | front conntction front ------
npiaorchestratorsock      | map[0xc0000a4420:seantywork@gmail.com]
```

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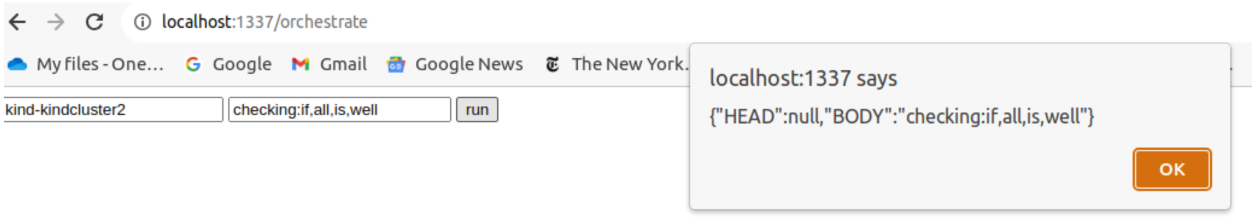
2-7. Now, let's see what happens if we actually make a query

As you can see, feeding proper arguments into the input fields and hitting run, the requested message will travel through the orchestrator, making it to the other side, getting processed, and travel back through the orchestartor to reach the client browser.



localhost:1337/orchestrate

kind-kindcluster2 | checking:if,all,is,well | run

localhost:1337 says

{"HEAD":null,"BODY":"checking:if,all,is,well"}

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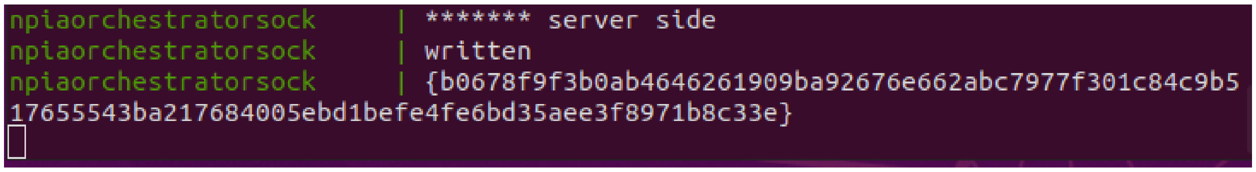
2-8. Check if the message touched the orchestrator

You can see it reached the front handler and got sent to the sock client.



```
npiaorchestratorsock      | ******* server side
npiaorchestratorsock      | written
npiaorchestratorsock      | {b0678f9f3b0ab4646261909ba92676e662abc7977f301c84c9b5
17655543ba217684005ebd1befe4fe6bd35aee3f8971b8c33e}
```

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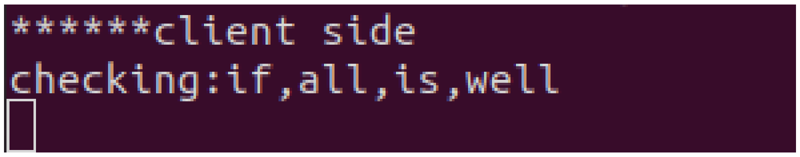
2-9. Check if the message reached the npia-server MTSC mode client

Yep, all good.



```
******client side
checking:if,all,is,well
```