Infinimesh v3 Installation:

Infinimesh platform is shipped as a small local infrastructure that is running inside of a Docker engine on local computer. We provide the scripts and pre-build images with Infinimesh components that can be deployed locally inside running engine. At the end of the installation is expected to have a fully working system which later needs to be provisioned with at least one device in order to see actual communication.

Supported operating system: Any major distribution of Linux that supports Docker, MacOSX (not running on Apple Silicon), Microsoft Windows.

Who installs the platform in scope of evaluation, ideally should worked before with:

- Version control systems – git
- Docker containers
- Certificate management
- Basic understanding of networking and domain name resolution

We have included also steps for installing any missing components on local system, in case is not already available.

Check minimal requirements (common on all supported operating systems)

- git
- docker engine
- openssl binary and library (for generation of self-signed certificates)
- mqtt client (for testing Infinimesh platform)

For **Microsoft Windows**, install following binaries:

OpenSSL binary: https://slproweb.com/products/Win32OpenSSL.html
Docker Engine (desktop): https://docs.docker.com/desktop/install/windows-install/
Git: https://github.com/git-for-windows/git/releases/tag/v2.38.1.windows.1

For Linux, depending of the distribution, install:

	Ubuntu / Debian	**RPM based (Redhat / CentOS, Fedora,etc)**
git	• Start by updating the package index: sudo apt update. • Run the following command to install Git: sudo apt install git. • Verify the installation by typing the following command which will print the Git version: git --version	sudo dnf update -y sudo dnf install git -y git --version

Installation of Docker engine on Linux:

Follow official documentation at: https://docs.docker.com/desktop/install/linux-install/
for your installed Linux distribution.

(for .rpm Based distribution)

```
#[root@localhost ~]# yum install -y yum-utils
Dependencies resolved.
(…)
Installed:
  yum-utils-4.0.21-3.el8.noarch
Complete!
[root@localhost ~]# yum-config-manager \
>      --add-repo \
>      https://download.docker.com/linux/centos/docker-ce.repo
Adding repo from: https://download.docker.com/linux/centos/docker-ce.repo
[root@localhost ~]#[root@localhost ~]# yum install docker-ce docker-ce-cli
containerd.io docker-compose-plugin
Docker CE Stable - x86_64
(…)
Installing:
 containerd.io                          x86_64          1.6.10-3.1.el8
docker-ce-stable            33 M
 docker-ce                              x86_64          3:20.10.21-3.el8
docker-ce-stable            21 M
 docker-ce-cli                          x86_64          1:20.10.21-3.el8
docker-ce-stable            30 M
 docker-compose-plugin                  x86_64          2.12.2-3.el8
docker-ce-stable            10 M
Installing dependencies:
 checkpolicy                            x86_64          2.9-1.el8
baseos                     348 k
 container-selinux                      noarch          2:2.167.0-
(…)
Installed:
  checkpolicy-2.9-1.el8.x86_64
container-selinux-2:2.167.0-1.module_el8.5.0+911+f19012f9.noarch
  containerd.io-1.6.10-3.1.el8.x86_64                                docker-
ce-3:20.10.21-3.el8.x86_64
  docker-ce-cli-1:20.10.21-3.el8.x86_64                              docker-
ce-rootless-extras-20.10.21-3.el8.x86_64
  docker-compose-plugin-2.12.2-3.el8.x86_64                          docker-
scan-plugin-0.21.0-3.el8.x86_64
  fuse-overlayfs-1.7.1-1.module_el8.5.0+890+6b136101.x86_64          fuse3-
3.2.1-12.el8.x86_64
  fuse3-libs-3.2.1-12.el8.x86_64
libcgroup-0.41-19.el8.x86_64
  libslirp-4.4.0-1.module_el8.5.0+890+6b136101.x86_64
policycoreutils-python-utils-2.9-16.el8.noarch
  python3-audit-3.0-0.17.20191104git1c2f876.el8.x86_64               python3-
libsemanage-2.9-6.el8.x86_64
  python3-policycoreutils-2.9-16.el8.noarch                          python3-
setools-4.3.0-2.el8.x86_64
  slirp4netns-1.1.8-1.module_el8.5.0+890+6b136101.x86_64

Complete
```

```
[root@localhost ~]# systemctl start docker
[root@localhost ~]#
[root@localhost ~]# docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
2db29710123e: Pull complete
Digest:
sha256:faa03e786c97f07ef34423fccceeec2398ec8a5759259f94d99078f264e9d7af
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.
```

(for .deb Based distribution)

Download of the Infinimesh platform

From command line, issue following commands:

Download Infinimesh platform:

```
[root@localhost infinimesh]#git clone
https://github.com/infinimesh/infinimesh.git
Cloning into 'infinimesh'...
remote: Enumerating objects: 35637, done.
remote: Counting objects: 100% (841/841), done.
remote: Compressing objects: 100% (314/314), done.
Receiving objects:  24% (8629/35637), 69.82 MiB | 3.46 MiB/s
```

After download has finish, access the folder and start the platform

```
[root@localhost ~]#
[root@localhost infinimesh]# ls
CODE_OF_CONDUCT.md  Dockerfiles  README.md         asciicast.gif  console
e2e     go.sum  pkg          vetur.config.js
CONTRIBUTING.md     LICENSE      api.swagger.json  cmd            docker-
compose.yaml  go.mod  hack    traefik.yml
[root@localhost infinimesh]# docker compose up -d
[+] Running 18/50
 ⠴ redis Pulling
13.6s
   ⠼ a603fa5e3b41 Waiting
6.5s
   ⠼ 77631c3ef092 Waiting
6.5s
   ⠼ ed3847cf62b8 Waiting
6.5s
   ⠼ 261a8b530567 Waiting
6.5s
   ⠼ 7d9005a8af6d Waiting
6.5s
   ⠼ 828da1afb5be Waiting
6.5s
```

```
 ⠴ db Pulling
13.6s
   ⠿ 213ec9aee27d Pull complete
(…)
[+] Running 14/14
 ⠿ Network infimesh_default        Created
0.5s
 ⠿ Volume "infinimesh_data"         Created
0.0s
 ⠿ Volume "infinimesh_user-media"   Created
0.0s
 ⠿ Container infinimesh-http-fs-1   Started
1.4s
 ⠿ Container infinimesh-rabbitmq-1  Started
1.6s
 ⠿ Container infinimesh-handsfree-1 Started
1.6s
 ⠿ Container infinimesh-redis-1     Started
1.4s
 ⠿ Container infinimesh-proxy-1     Started
1.8s
 ⠿ Container infinimesh-db-1        Started
1.5s
 ⠿ Container infinimesh-shadow-1    Started
1.9s
 ⠿ Container infinimesh-repo-1      Started
2.6s
 ⠿ Container infinimesh-mqtt-1      Started
3.7s
 ⠿ Container infinimesh-web-1       Started
3.5s
 ⠿ Container infinimesh-console-1   Started
4.2s
```

install CLI for Infinimesh platform:

Download the precompiled version of **inf** binary from following link: https://github.com/infinimesh/inf/releases for your operating system.

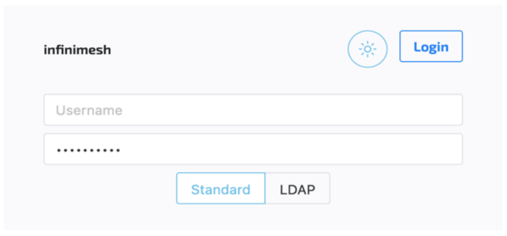
Edit hosts file (/etc/hosts) by using an editor on local operating system and add following hosts:

```
127.0.0.1 api.infinimesh.local
127.0.0.1 console.infinimesh.local
127.0.0.1 traefik.infinimesh.local
127.0.0.1 rbmq.infinimesh.local
127.0.0.1 db.infinimesh.local
127.0.0.1 media.infinimesh.local
127.0.0.1 mqtt.infinimesh.local
```

Previous step is mandatory, otherwise will not be able to access the platform.

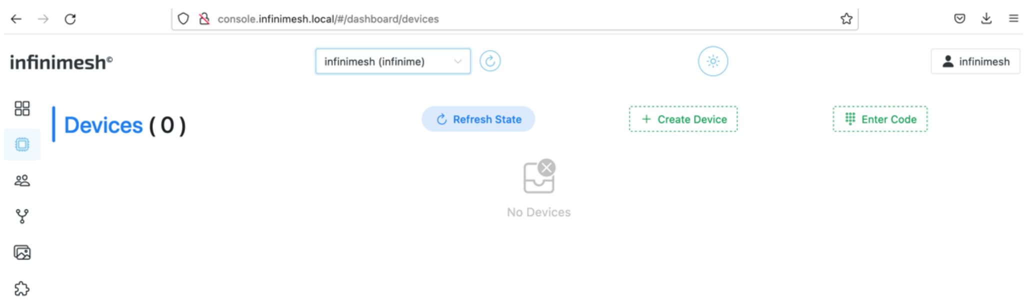
Access the console of the Infinimesh platform, by pointing your browser at the address: https://console.infinimesh.local

Use the default credentials:
Username: “infinimesh”
Password: “infinimesh”



On picture above, you can see the login page of the Infinimesh platform. Browser used on this example is Mozilla Firefox, but can be any other standard browser.

After a successful login, for the first time on a clean install, first page will look as the page bellow. In the picture bellow, can be seen than no device has been added.



Working with devices:

Infinimesh V3 supports authentication of devices using certificates pairs (public and private keys) or token based.

Please note: every device needs to have a way to authenticate.

For the first time we can use an existing certificate pair that we already have (or has been provided by us as example), but in case we want to create new ones, procedure bellow can be followed:

Authentication using certificates:

Bellow commands for certificate creation will work on Linux distributions and MacOSX. For Microsoft Windows in necessary to install openssl binary.

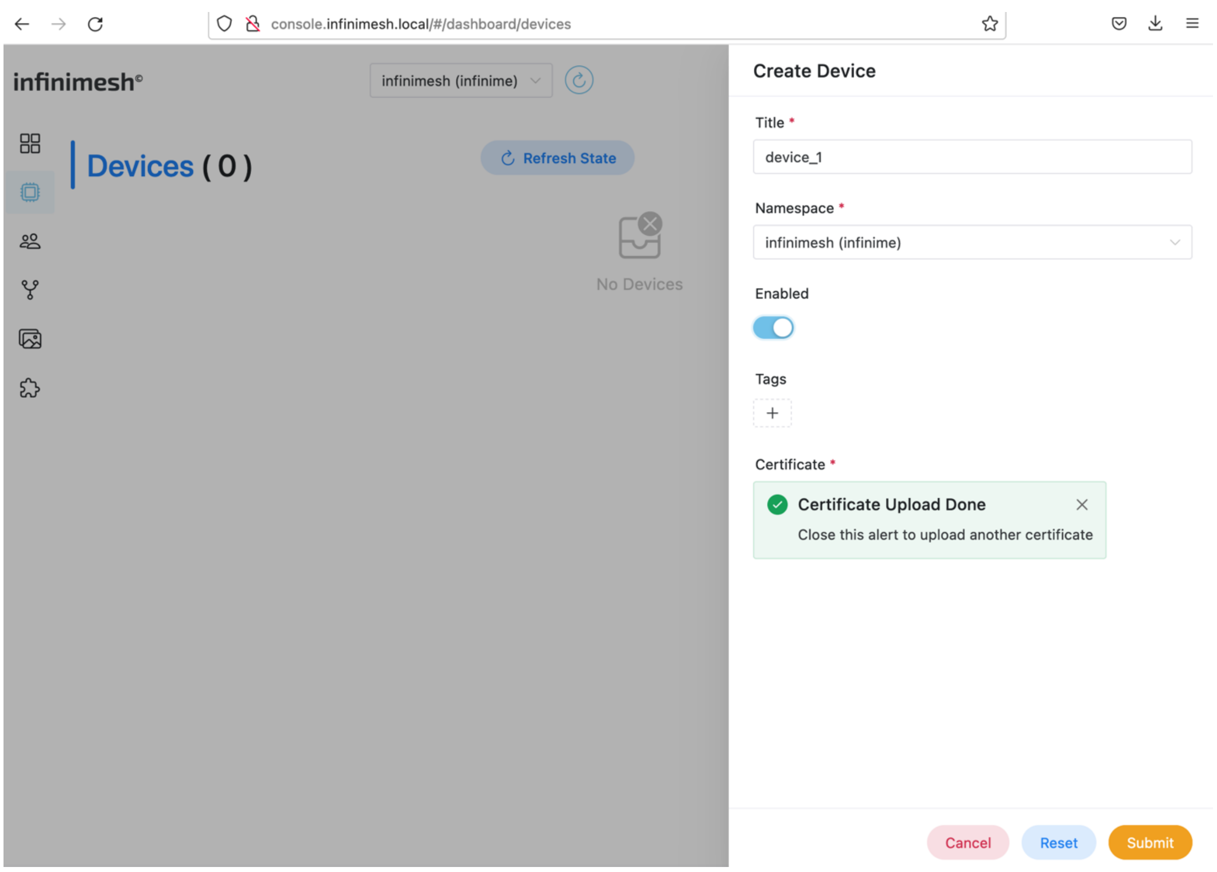
Generate a private key for the device:

```
#openssl genrsa -out sample_1.key 4096
```

Generate the client certificate (and self-sign it):

```
#openssl req -new -x509 -sha256 -key sample_1.key -out sample_1.crt -days
365
```

Private key (sample_1.key) is on client side and the corresponding public key (sample_1.key) is uploaded into Infinimesh platform in order to validate that the connecting client is authenticated. Device creation can be done using UI console or the cli that talks with platform through API calls.


console.infinimesh.local/#/dashboard/devices

Create Device

Title *: device_1

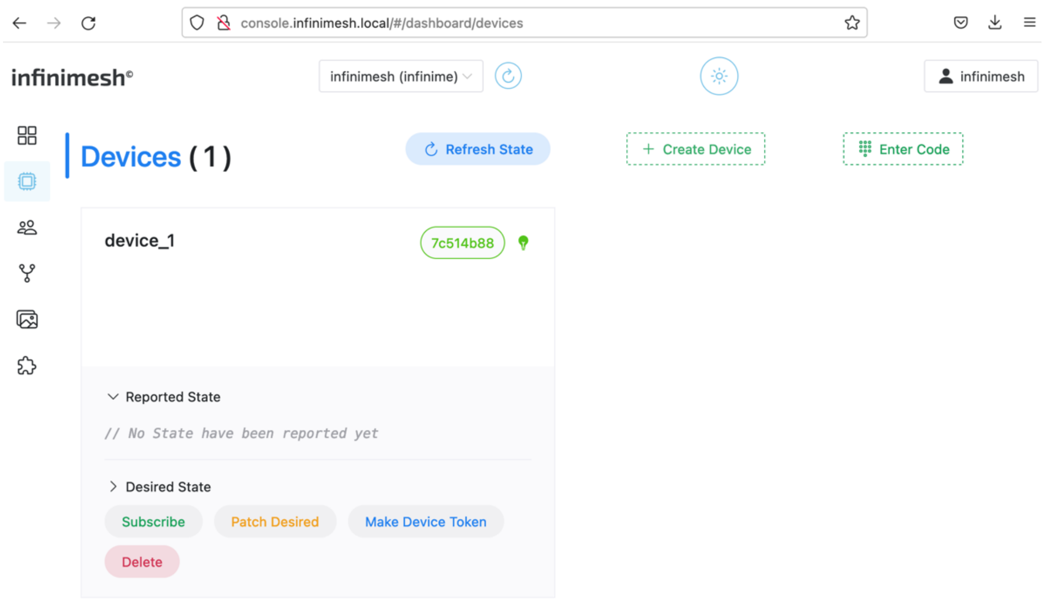
Namespace *: infinimesh (infinime)

Enabled: on

Tags

Certificate *

Certificate Upload Done
Close this alert to upload another certificate


console.infinimesh.local/#/dashboard/devices

Devices (1)

device_1 7c514b88

Reported State
```
// No State have been reported yet
```
Desired State

Send states from a device to infinimesh

To simulate a device, we use the mosquitto_pub client. You can use any MQTT client, e.g. eclipse paho as well as Microsoft Edge on RaspberryPI, Yocto MQTT layers or Ubuntu Core based snaps. We use sometimes MQTTBox (http://workswithweb.com/html/mqttbox/installing_apps.html).

```
mosquitto_pub --cafile /etc/ssl/certs/ca-certificates.crt --cert
sample_1.crt --key sample_1.key -m '{"abc" : 1337}' -t "devices/<YOUR
DEVICE ID>/state/reported/delta" -h mqtt.api.infinimesh.io  --tls-version
tlsv1.2 -d -p 8883
```

Please note:

- you will most likely need to adjust the --cafile flag to the path to the CA certificates on your system. This is OS specific.
- -t "devices/`<YOUR DEVICE ID>`/state/reported/delta" is a placeholder and needs to be replaced with actual ID of the device.

Bellow is an actual example, with DeviceID 0x1. On your installation might be different.

```
Client mosqpub|3396-thinkpad sending CONNECT
Client mosqpub|3396-thinkpad received CONNACK (0)
Client mosqpub|3396-thinkpad sending PUBLISH (d0, q0, r0, m1,
'devices/0x1/state/reported/delta', ... (14 bytes))
Client mosqpub|3396-thinkpad sending DISCONNECT
```

The data has been sent successfully to the platform. To send more than one value per API call you can use JSON arrays in any complexity (https://www.w3schools.com/js/js_json_arrays.asp).

Read device data from the platform

We managed to send data from a device to the platform. Now let's read back the device data from infinimesh! You can do this via gRPC or HTTP API. The simplest way is with the CLI (which uses gRPC).

```
inf state get 0x8a
```

Replace `0x8a` with the ID of your device. The output will look like this:

```
Reported State:
  Version:    2
  Timestamp:  2019-03-30 20:53:41.844158131 +0100 CET
  Data:
    {
      "abc": 1337
    }
Desired State: <none>
Configuration: <none>
```

In this case, the device sent a datapoint `abc` with the value `1337` at `20:53:41`.

Send states from the platform to the device

Sending states (`desired states`) to a device is very simple. You only need to know the deviceID. Use the API, or just the CLI.

```
inf state set 0x9c 1337
```

This sends the state `1337` to the device. Note that repeatedly sending the same state does not trigger a new message every time. Only changes are sent to the device.

Once the state has been sent, you can inspect it on the server by running:

```
inf state get 0x9c
```

The state is visible in the `desired` section.