

# FM SETUP INSTRUCTIONS

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## FM Installation

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### FM installation prerequisites

1. Install docker(<https://docs.docker.com/engine/install/>)
2. Install docker-compose(<https://www.digitalocean.com/community/tutorials/how-to-install-and-use-docker-compose-on-ubuntu-20-04>)
3. Works only on x86 arch

### Setup FM with push\_fm script

1. Clone fleet manager repository and setup git config for submodule

```
git clone https://github.com/AtiMotors/fleet_manager
cd fleet_manager
git pull
git submodule init

# open and edit .git/config file, add branch=dev to submodule mule
entry
[submodule "mule"]
url = https://<token>@github.com/AtiMotors/mule.git
active = true
branch = dev
```

git submodule update

2. Checkout to release/branch, update mule submodule.

```
git checkout <branch>
git submodule update --remote
git submodule update
```

### 3. Setup cert files - You will need python installed in your machine to carry out this step

*3.1 Update all\_server\_ips, http\_scheme in static/fleet\_config/fleet\_config.toml, add wireguard ip of the server as well if wg access is present*

```
for example:
all_server_ips=["192.168.6.11", "10.9.0.168", "127.0.0.1"]
http_scheme="https"
```

*3.2 Install toml, cryptography in your machine(not server)- these packages are required to generate cert files*

```
pip install toml cryptography
```

*3.3 Upon successful installation of the above mentioned packages, run setup\_certs.py to generate FM cert file*

```
cd utils && python3 setup_certs.py
../static/fleet_config/fleet_config.toml ../static
```

*3.4 Copy the cert file(static/certs/fm\_rev\_proxy\_cert.pem) to all the sherpas(/opt/ati/config/fm\_rev\_proxy\_cert.pem)*

### 4. Update static directory with map\_files

*4.1. Create map folders for each of the fleets*

```
mkdir static/fleet_1/map/
copy all the map files of fleet_1 to static/fleet_1/map/

mkdir static/fleet_2/map/
copy all the map files of fleet_2 to static/fleet_2/map/
```

### 5. If server has internet, allows you to download open-source packages (Recommended to use step 6 instead of this step)

a. If you want to setup fm on a remote location, run push\_fm script to create all the docker images on the server

```
./scripts/push_fm.sh -Wi username@ip
```

b. If you want to setup fm on your machine, run push\_fm script to create all the docker images on your machine

```
./scripts/push_fm.sh -W
```

6. If server doesn't have internet access, copy built docker images to the server from Ati server(data@192.168.10.21:/atidata/datasets/FM\_v<fm\_version>\_docker\_images), run the following commands

a. Load base images on server/localhost

```
ssh username@ip
cd FM_v<fm_version>_docker_images
bash load_docker_images.sh
exit
```

b. If you want to setup fm on a remote location, run push\_fm script from your machine to create all the docker images on the server

```
./scripts/push_fm.sh -Wbi username@ip
```

c. If you want to setup fm on your machine, run push\_fm script from your machine to create all the docker images on your machine

```
./scripts/push_fm.sh -Wb
```

7. [Setup plugins](#) if any.
8. [Setup sherpas](#).
9. [Setup optimal dispatch config](#)
10. [Push mule docker image to local docker registry](#)
11. To start using fleet\_manager, follow [Start or Restart FM](#)

## Setup FM by copying built docker images

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1. Copy built docker images to the FM server from Ati server(data@192.168.10.21:/atidata/datasets/FM\_v<fm\_version>\_docker\_images)
2. Load docker images

```
cd FM_v<fm_version>_docker_images
bash load_docker_images.sh
```

3. Backup the current static directory if already present. Copy "static" directory from fleet\_manager repository/FM\_v<fm\_version>\_docker\_images folder to the FM server, update it with the info from backup.
4. Copy docker-compose.yml from <fm\_repository>/misc/ or FM\_v<fm\_version>\_docker\_images folder to the static folder.
5. Create cert files if not already present by following [Setup FM with push\\_fm script](#) steps 1-3.
6. Copy the cert files generated (fm\_rev\_proxy\_cert.pem, fm\_rev\_proxy\_key.pem) to the static/certs/ directory in the FM server
7. Follow steps 7-10 in [Setup FM with push\\_fm script](#)
8. To start using fleet\_manager, follow [Start or Restart FM](#)

## Start or Restart FM

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1. Modify timezone if required by setting environment variables TZ, PGTZ in services fleet\_manager, db enlisted in static/docker-compose.yml.
2. Start FM

```
cd static
docker-compose -p fm down
docker-compose -p fm up
```

3. Use FM through UI, if running FM on localhost use ip as 127.0.0.1

```
https://<ip>/login
username: <username>
password: <password>
```

4. Addition/Deletion of fleets, sherpas should be done through Configure page on the dashboard. Adding it to fleet\_config.toml will have no effect. Fleets names have to be same as map\_names. Copy the map files to the static directory on FM server by following [Setup FM with push\\_fm script](#) step 4 before trying to add it through dashboard.

5. Please restart FM using `restart_fleet_manager` button on the maintenance page, after adding sherpas/fleets.
6. Induct all the sherpas that you want to use
  - a. Press enable for trips button from sherpa card
  - b. Only those sherpas that has been enabled for trips will get assigned with a trip
7. Follow [Fleet maintenance](#) if needs be

## Run FM Simulator

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- a. Follow [Setup FM with push\\_fm script](#) , steps 1-2
- b. Set simulate in `static/fleet_config/fleet_config.toml`

```
[fleet.simulator]
simulate=true

[fleet]
http_scheme="http"
```

- c. To get trip bookings done automatically add routes(list of station names), trip booking frequency(seconds) to `fleet_config`.

```
[fleet.simulator.routes]
route1 = ["Station A", "Station B"], [10]]
route2 = ["Station A", "Station C"], [60]]
```

- d. Make sure all the stations mentioned in `gmaj` file(`<fleet_name>/map/grid_map_attributes.json`) has only the below mentioned tags. Tags like `conveyor`, `auto_hitch`, `auto_unhitch` will not work in simulator mode.

```
"station_tags": [
  "parking",
  "dispatch_not_reqd"
]
```

- e. If you want to start sherpas at particular station add this patch to config

```
[fleet.simulator.initialize_sherpas_at]
sample_sherpa="Station A"
```

- f. If you want to simulate transit visas set visa handling in `fleet.simulator` config

```
[fleet.simulator]
visa_handling=true
```

g. Follow remaining steps in [Setup FM with push\\_fm script](#), steps 3-7. [Setup Sherpa](#) not required for simulation

## Setup sherpas

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a. Copy fm cert file(fm\_rev\_proxy\_cert.pem) generated in [Setup FM with push\\_fm script](#) step 3 to sherpa's /opt/ati/config directory

b. Add this patch to /opt/ati/config/config.toml in the mule

```
[fleet]
api_key = " "
chassis_number = " "
data_url = "https://<fm_ip_address>:443/api/static"
http_url = "https://<fm_ip_address>:443"
ws_url = "wss://<fm_ip_address>:443/ws/api/v1/sherpa/"
fm_cert_file="/app/config/fm_rev_proxy_cert.pem"
```

c. Setup/update ati\_mule\_maintenance service

```
git clone https://github.com/AtiMotors/system

copy latest mmts_utils.sh, ati_mule_maintenance.sh from ati_core folder to
/etc/systemd directory in sherpa
copy ati_mule_maintenance.service from ati_core folder to
/etc/systemd/system directory in sherpa

#stop the ati_mule_maintenance service and delete maintenance fifo file
ssh into mule
sudo systemctl stop ati_mule_maintenance
sudo systemctl disable ati_mule_maintenance
sudo rm /opt/ati/run/maintenance_req_fifo

#start maintenance service
ssh into mule
cd /etc/systemd
sudo chmod ugo+rx mmts_utils.sh
sudo chmod ugo+rx ati_mule_maintenance.sh
sudo chmod ugo+rx /opt/ati/uniflash
sudo systemctl enable ati_mule_maintenance
sudo systemctl start ati_mule_maintenance

#enable 443 port
sudo ufw allow 443
```

#### d. Setup mule nginx container (if not already present)

1. Check if mule nginx container is running: (below command should show container running)

```
ssh into mule
docker ps | grep mule_nginx
```

2. Build container (if nginx container is not present):

- Make a new folder, shell\_scripts

```
cd /opt/ati
mkdir shell_scripts
```

- Copy load\_mule\_nginx.sh file from server(data@192.168.10.21:/atidata/datasets/FM\_v<fm\_version>\_docker\_images/load\_mule\_nginx.sh) to mule (/opt/ati/shell\_scripts). (DO NOT copy this script to /opt/ati folder on mule)
- Run load\_mule\_nginx.sh

```
cd /opt/ati/shell_scripts
bash load_mule_nginx.sh
```

- Restart mule docker

```
docker restart mule
```

## Setup Plugin

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### a. [Setup IES](#)

## Setup IES

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### a. Add IES plugin to static/fleet\_config/plugin\_config.toml

```
all_plugins=["ies"]
```

b. Modify static/plugin\_ies/locationID\_station\_mapping.json file. Map IES station names to corresponding ati station names as the template indicates.

```
{
  "Warehouse_Pick": "ECFA start",
  "HP02_FA02": "ECFA-2",
  "HP03_FA01": "ECFA-1",
}
```

## Setup optimal dispatch config

Optimal dispatch logic tries to allocate the pending trips with the best sherpa available. Choice of best sherpa is made with the paramter  $Z$

$$Z = (\eta)^a / (\text{priority})^b$$

$$\text{priority} = p_1 / p_2$$

where,  
 eta - expected time of arrival computed for the sherpa to reach the first station of the trip booked,  
 priority - measure of how long a trip has been pending,  
 p1 - Time since booking of currrent trip,  
 p2 - Minimum of time since booking across all the pending trips,  
 a - eta power factor ,  $0 < a < 1$ ,  
 b - priority power factor ,  $0 < b < 1$ ,

1. **Maximise number of trips done:** To get maximum number of trips done in a given time frame eta\_power\_factor can be set to 1, priority\_power\_factor can be set to 0. This will make the optimal disaptch logic to lean towards trips that can be started faster. The trip booking order will not be followed.

```
[optimal_dispatch]
method="hungarian"
prioritise_waiting_stations=true
eta_power_factor=1.0
priority_power_factor=0.0
```

2. **Fair scheduling:** To configure optimal dispatch logic to take trips in the order they were booked eta\_power\_factor can be set to 0, priority\_power\_factor can be set to 1.

```
[optimal_dispatch]
method="hungarian"
prioritise_waiting_stations=true
```



```
eta_power_factor=0.0  
priority_power_factor=1.0
```

3. **Custom configuration:** There is no ideal combination of eta\_power\_factor, priority\_power\_factor. They should be chosen according to the frequency of trip bookings, route length between the stations to maximise the throughput.
4. For good takt time, eta power factor should be higher, for fair scheduling priority power factor should be set higher.
5. Sherpas can also be restricted from running on certain routes/station by setting up exclude\_stations config. The below config will stop "sample\_sherpa"(sherpa\_name) from getting assigned with the trips with route having any of ["Station A", "Station B"]

```
[optimal_dispatch.exclude_stations]  
sample_sherpa=["Station A", "Station B"]
```

## Push mule docker image to local docker registry

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1. Copy mule docker image tar file to fm\_server and load the image

```
docker load -i <mule_image tar file>
```

2. Tag mule image with registry ip, tag on fm server

```
docker tag mule:<mule_tag> <fm_ip>:443/mule:fm
```

3. Setup certs for docker push on fm server

```
sudo mkdir /etc/docker/certs.d/<fm_ip>:443  
sudo cp <fm_static_dir>/certs/fm_rev_proxy_cert.pem  
/etc/docker/certs.d/<fm_ip>:443/domain.crt
```

4. Push mule docker image to FM local registry

```
docker push <fm_ip>:443/mule:fm
```

## Fleet maintenance

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## Update map files

1. Copy all the new map files to `<fm_static_directory>/<fleet_name>/map/` folder
2. Select the fleet which needs the map update from the webpage header in the dashboard and press `update_map` button on the webpage header (present along with `start/stop fleet`, `emergency_stop fleet` etc.)
3. Restart of FM is not required - for map updates

## Swap sherpas between fleets

1. Delete the current sherpa entry and then again add it to a different fleet. Sherpa's can't be swapped directly. FM restart would be required post addition of sherpa to the new fleet.

## Generate api keys for sherpas/conveyor/summon\_button/any hardware

1. Run `utils/api_key_gen.py` in `utils` directory in `fleet_manager` - You will need `fleet_manager` repository access, python installed in your machine to run this. Python dependencies required: `secrets`, `click`

```
cd <path_to_fleet_manager_repository>/utils
python3 api_key_gen.py --hw_id <unique_hwid>
```

## Add/Remove frontendusers

1. Run `utils/gen_hashed_password.py` in `utils` directory in `fleet_manager` - You will need `fleet_manager` repository access, python installed in your machine to run this. Python dependencies required: `hashlib`, `click`

```
cd <path_to_fleet_manager_repository>/utils
python3 utils/gen_hashed_password.py --password <password>
```

2. The generated hashed password can be added to `<fm_static_directory>/fleet_config/frontend_users.toml`

```
[frontenduser.<new_user>]
hashed_password=<hashed password>
```

3. Remove unwanted entries from `<fm_static_directory>/fleet_config/frontend_users.toml` if any.