UAVSim User Manual

A STEP BY STEP MANUAL FOR USING UAVSIM

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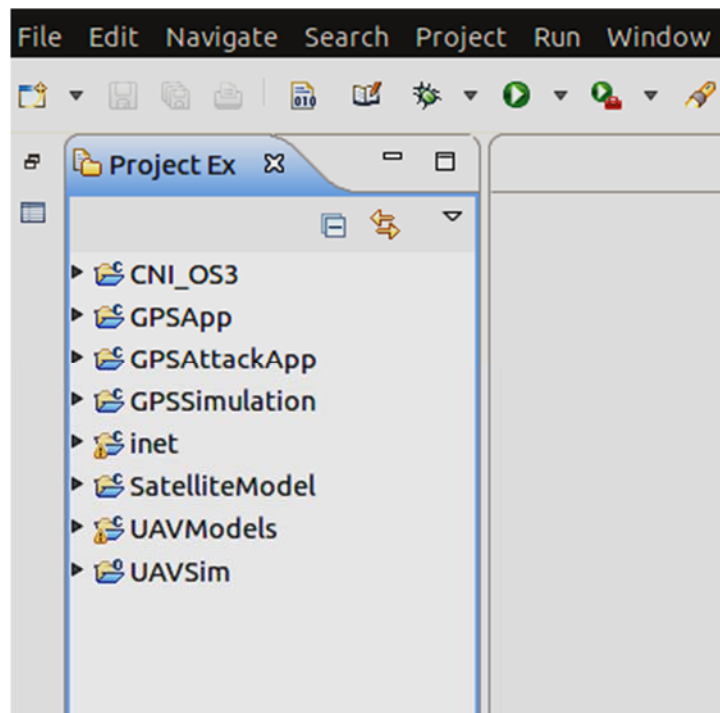
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1. Start OMNET++ IDE

Once the installation is complete, start the Omnet++ IDE using omnetpp in the terminal. As shown in figure 1, there are eight modules in the UAVSim.

Figure 1

2. Run GPSSimulation:

To run the GPSSimulation, open the GPSSimulation right click on omnetpp.ini file, then Run As -> Omnet++ Simulation. It can also be started by selecting omnetpp.ini and then clicking on RUN icon as shown in figure 2 or the Run tab. Press ctrl+F11 to run the application from the keyboard.
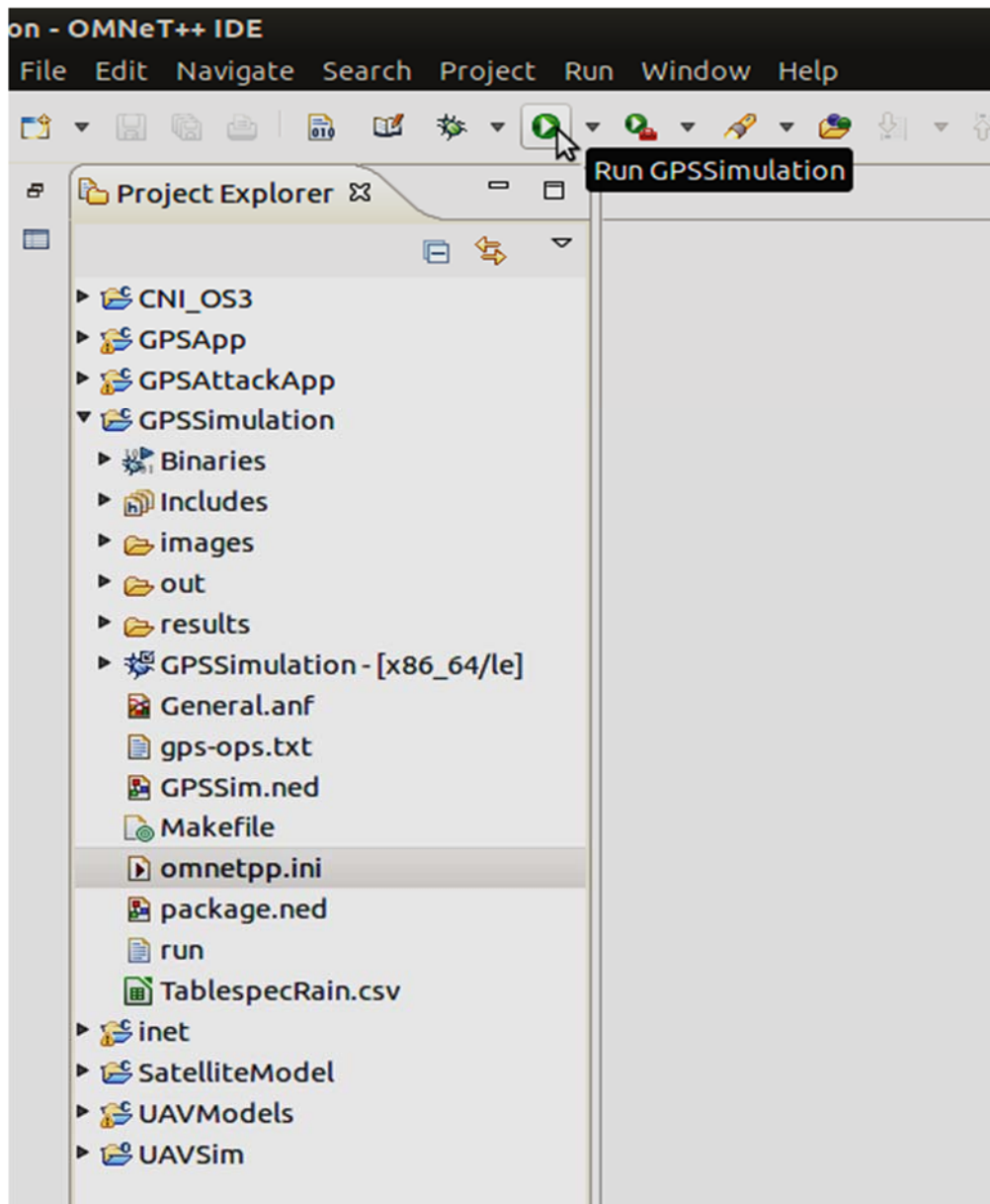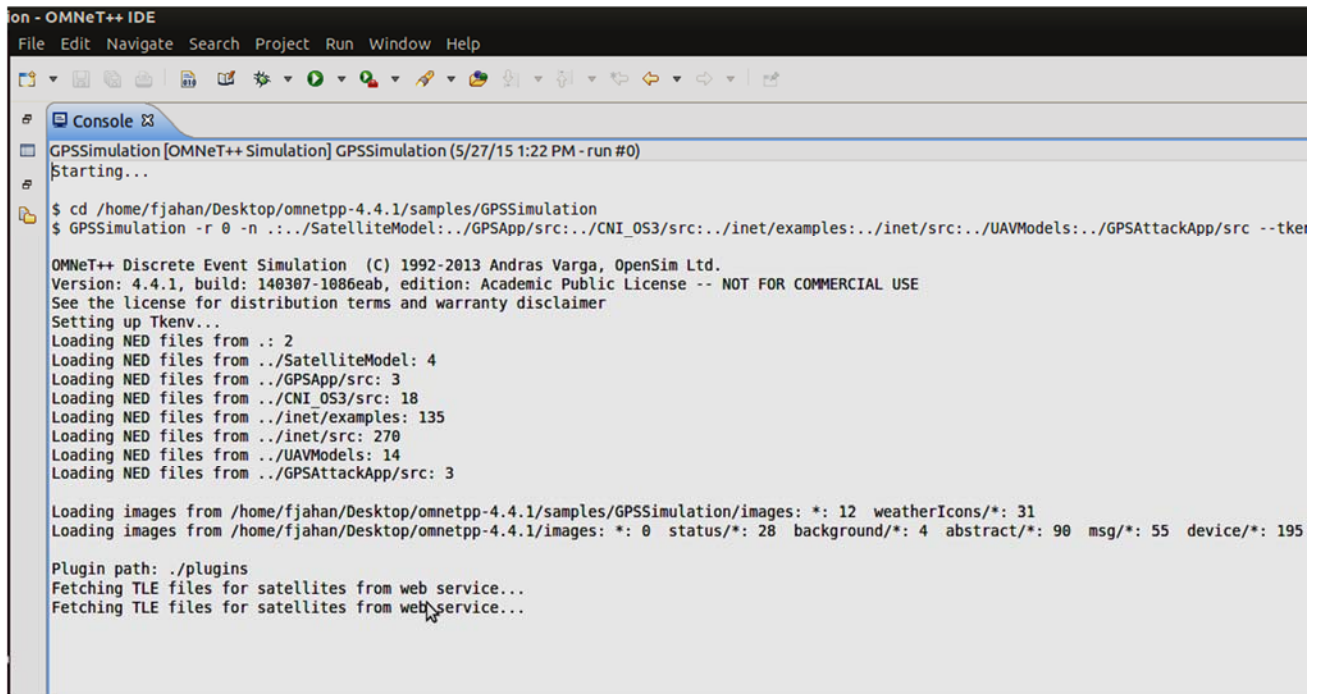

Figure 2

The console window shows the configuration and build progress of the application.

Figure 3

Once the application has started, it will open two windows:
- Omnet++/Tkenv, and
- Graphical Interface
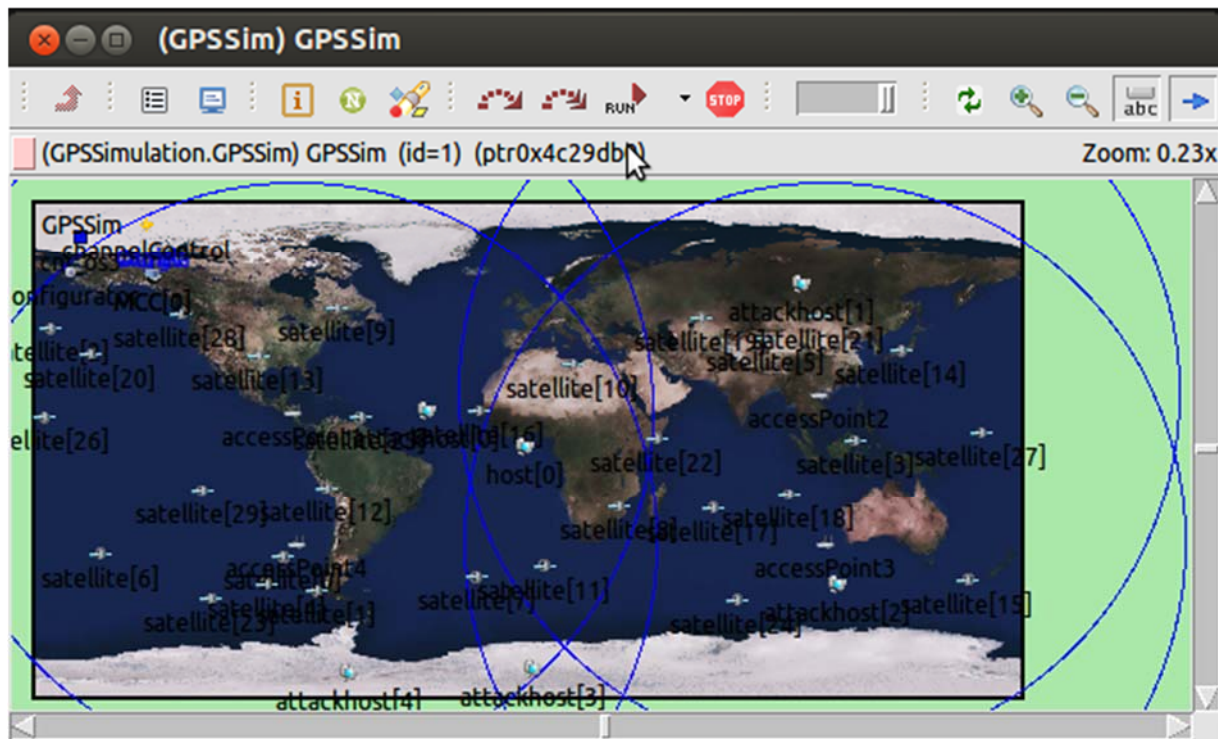
Figure 4
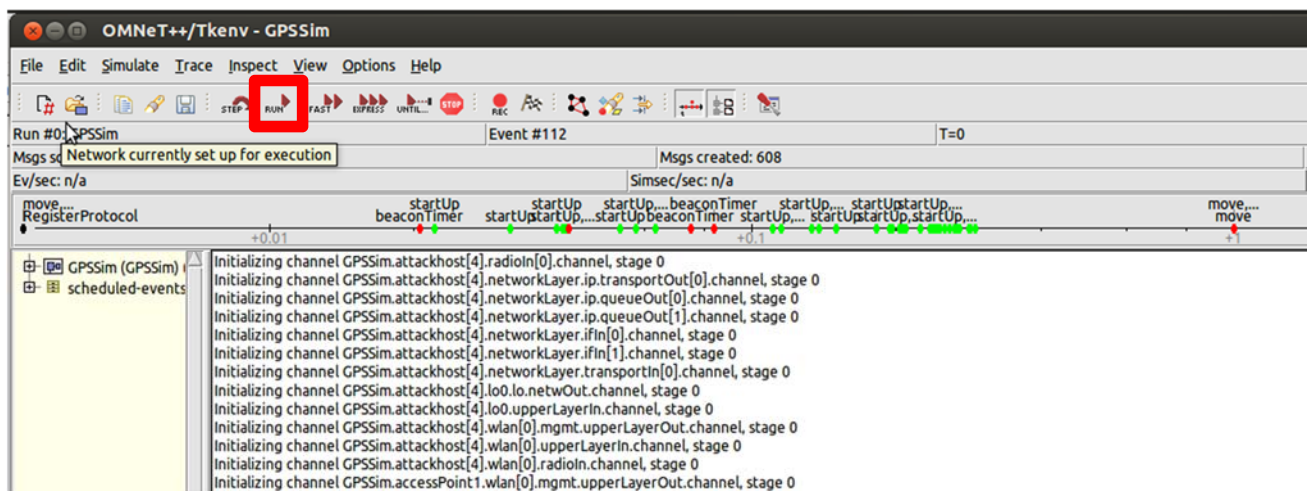
Figure 5

The Tkenv window shows the initialization of the network layers and displays the event being executed. To start the the simulation, there are three run modes, represented by three icons on the toolbar: *Run* (Normal), *Fast*, *Express*. *Fast* executes the model typically one or two order of magnitude faster than *Run* (measured in event/sec, displayed on the status bar), and *Express* executes one to three order of magnitude faster than *Fast*. In turn, they offer progressively less and less animation and debug output [1]. The output of the execution can be seen on the console window.

3. Changing Parameters

The parameters of the host, attack host or satellites can be changed from the omnetpp.ini file in the source file or Form. Simulation time can be varied by changing the value of `sim-time-limit`. Number of hosts, attackhost and satellites can be set using `numOfHost, numOfAttackHost, numOfSats` parameters respectively. Host and attackhost mobility can be set to any of the mobility defined in INET module. The default mobility used is linear mobility.

OMNETPP. INI

```
# Lines beginning with `#' are comments
[General]
seed-set = 2241210
tkenv-image-path = images/
num-rngs = 3
sim-time-limit = 600s # Variable
network = GPSSim
record-eventlog=false
cmdenv-express-mode= true
# Load images for icons

**.mobility.rng-0 = 1
**.wlan[*].mac.rng-0 = 2

GPSSim.satellite[*].mobilityType = "SatSGP4Mobility"    # default("SatSGP4Mobility")
#**.playgroundSizeX = 2160   # Fixed values for used map! DO NOT CHANGE except when using a
different map!
#**.playgroundSizeY = 1080

**.constraintAreaMinX = 0m
**.constraintAreaMaxX = 2160m

**.constraintAreaMinY = 0m
**.constraintAreaMaxY = 1080m

**.constraintAreaMinZ = 0m
**.constraintAreaMaxZ = 0m

*.channelControl.pMax = 100000W

*.satellite[*].wlan[*].radio.transmitterPower = 500W
**.host[*].wlan[*].radio.transmitterPower = 10W
**.attackhost[*].wlan[*].radio.transmitterPower = 30W
#${transmitterPower=1000, 5000, 10000, 50000, 100000}W

**.numOfMCCs = 2
**.numOfSats = 30
**.numOfHost = 1
```

```
**.numOfAttackHost = 5              #${host=20, 30, 40}

# Host mobility declaration
**.host*.mobilityType = "LinearMobility"
#For circular Mobility
#**.host*.mobility.cx = 561m
#**.host*.mobility.cy = 432m
#**.host*.mobility.r = 1m
**.host*.mobility.initFromDisplayString = false
#**.host[*].mobility.updateInterval = 0.1s
**.host*.mobility.speed = truncnormal(0.0037mps, 0.005mps)
#**.host*.mobility.angle = 30deg                     #Mobility angle of the host.
**.wlan[*].bitrate = 2Mbps
**.wlan[*].mgmt.frameCapacity = 10
**.wlan[*].mac.maxQueueSize = 14
**.wlan[*].mac.rtsThresholdBytes = 3000B
**.wlan[*].mac.retryLimit = 7
**.wlan[*].mac.cwMinData = 7
#**.wlan[*].mac.cwMinBroadcast = 31

# Attack mobility declaration
**.attackhost*.mobilityType = "LinearMobility"
#For circular Mobility
#**.attackhost*.mobility.cx = 565m
#**.attackhost*.mobility.cy = 435m
#**.attackhost*.mobility.r = 2m
**.attackhost*.mobility.initFromDisplayString = false
#**.host[*].mobility.updateInterval = 0.1s
**.attackhost*.mobility.speed =truncnormal(0.0075mps, 0.005mps)
#**.attackhost[*].mobility.

# udp app configuration
**.numUdpApps = 0
**.satellite[*].numGpsApps = 1
**.host[*].numGpsApps = 1
**.host[*].numGpsAttackApps = 0
**.attackhost[*].numGpsAttackApps=1
**.attackhost[*].numGpsApps=0
#**.udpApp[*].typename = "UDPBasicBurst"
**.gpsApp[*].localPort = 100
**.gpsApp[*].destPort = 100
**.gpsApp[*].messageLength = 1250B
**.gpsAttackApp[*].localPort = 100
**.gpsAttackApp[*].destPort = 100
**.gpsAttackApp[*].messageLength = 1250B
**.satellite[*].gpsApp[*].sendInterval = 0.5s
**.host[*].gpsApp[*].sendInterval = 0.5s
**.attackhost[*].gpsAttackApp[*].sendInterval = 0.5s
**.gpsApp[*].chooseDestAddrMode= "perBurst"
**.gpsAttackApp[*].chooseDestAddrMode= "perBurst"
#**.host[*].gpsApp[*].destAddrRNG = 2
**.satellite[*].gpsApp[0].destAddresses = moduleListByPath("**.host[*]")
```

```
#moduleListByNedType("inet.nodes.inet.StandardHost")
**.attackhost[*].gpsAttackApp[0].destAddresses = moduleListByPath("**.host[*]")
#moduleListByNedType("inet.nodes.inet.StandardHost")
**.host[*].gpsApp[0].destAddresses = ""
**.host[*].gpsApp[0].burstDuration = 10s
**.host[*].gpsApp[0].sleepDuration = 30s
**.satellite[*].gpsApp[0].burstDuration = 10s
**.satellite[*].gpsApp[0].sleepDuration = 0s
**.attackhost[*].gpsAttackApp[0].burstDuration = 10s
**.attackhost[*].gpsAttackApp[0].sleepDuration = 0s
#**.satellite[1].gpsApp[0].burstDuration = 10s
#**.satellite[1].gpsApp[0].sleepDuration = 0s
#**.satellite[2].gpsApp[0].burstDuration = 0.2s
#**.satellite[2].gpsApp[0].sleepDuration = 0.2s
#**.satellite[3].gpsApp[0].burstDuration = 0.2s
#**.satellite[3].gpsApp[0].sleepDuration = 0s
#**.satellite[4].gpsApp[0].burstDuration = 0s
#**.satellite[4].gpsApp[0].sleepDuration = 0s
#**.gpsApp[0].startTime = 2s
#**.gpsApp[0].stopTime = 20s
#**.gpsApp[0].delayLimit = 3s
#**.gpsApp[*].localPort = 100


# Network parameters
**.updateInterval = 1s # Interval to update the satellite's positions on the map
#**.numOfSats = 31        # Number of satellites used in simulation. ATTENTION! Must be smaller
or equal to number of satellites in choosen TLEfile
#**.numOfMCCs = 44        # Number of Mission Control Centers (MAX: 44)


# Parameters for UserConfig
**.userConfig.frequency = 1e9Hz         # Variable
**.userConfig.min_snr = 0dBHz           # Variable


# Parameters for WebServiceControl
**.webServiceControl.apiKeyWeather = "45fw8m3nb6mq7p28da4vvu8p" # Insert you own API Key. You can
register at http://www.worldweatheronline.com/free-weather-feed.aspx
**.webServiceControl.usernameAltitude = "ayjavaid"                      # Insert your
own username from http://www.geonames.org/login
**.webServiceControl.altitudeCacheThreshold = 100                        # (default = 100)
Maximum number of saved altitude values. Be careful when changing!
**.webServiceControl.tleCacheThreshold = 10                              # (default =
10) Maximum number of saved TLE data strings. Be careful when changing!
**.webServiceControl.weatherCacheThreshold = 10                          # (default = 10)
Maximum number of saved weather data strings. Be careful when changing!


# Parameters for WeatherControl
**.weatherControl.defaultPrecipPerHour = -1 # (default = -1 means using live weather data) Precip
per hour (unit mm/(m²*h))


# Parameters for Norad
*.satellite[*].NoradModule.TLEfile = "gps-ops.txt" # Provide the filename of the TLEs. Used by
Webservice if GUI not used, must fit the names from http://celestrak.com/NORAD/elements/xxx.txt
```

```
# Parameters for Calculation
**.calculation.rainTableFile = "TablespecRain.csv" # Provide the name of the Table for the Rain
parameters. DO NOT CHANGE!

# Parameters for Satellite
*.satellite[*].transmitPower = 10dBW # (default = 7dBW) Transmit power of satellites (Can be
choosen individually for each satellite, see MCCs for example)

#*.satellite[0].satelliteName = "GPS BIIA-10 (PRN 32)" # default = "", satelliteName is only used
if a specific satellite from a TLE file should be used instead of the first numOfSats.


# Mission Control Centers all over the world
# Algier
GPSSim.MCC[0].mobility.latitude = 36.46
GPSSim.MCC[0].mobility.longitude = 3.03
GPSSim.MCC[0].cityName = "Algier"
```

4. GPSApp Simulation

To run the GPSApp without launching an attack, set the `numOfAttackHost` equals to 0. This will disable the attackhost and only hosts will be visible in the graphical interface which will use the GPSApp for navigation.

5. Contact

For any questions/issues, please contact the developers:

- Farha Jahan: farha.jahan@utoledo.edu
- Ahmad Javaid: ahmad.javaid@utoledo.edu

6. Reference:

1) How to make Fast mode faster?, Omnet++ wiki,
https://omnetpp.org/pmwiki/index.php?n=Main.HowToMakeFastModeFaster, Online, Last accessed:
05/26/2015