

LOG-a-TEC Portal Tutorial

LOG-a-TEC is a wireless outdoor testbed

- Meant for experimentation with
 - Spectrum sensing
 - Dynamic spectrum access
 - Cognitive radio
- Experimentation can be
 - Remote through the web portal
 - On site with additional equipment such as USRPs, TV band transmitters, etc.

- A total of 52 VESNA sensor nodes in two clusters

Industrial zone City center



LOG-a-TEC Configuration


- 32 nodes with ISM 2.4 GHz transceivers
- 14 nodes with ISM 868 MHz transceivers
- 4 nodes with UHF receivers
- 2 coordinators

How to start working with LOG-a-TEC

- Contact us to get an account (or to make some other convenient arrangement)
- Using the account, log in the portal and request a slot for running your experiments
- Run your experiments in the granted slot
- Try first pre-defined simulations and experiments to get used to the environment
- Before running real experiments, use the GRASS-RaPlaT tool to check what results to expect!

Step 1

- The web portal looks as depicted below
- Choose one of the two clusters to run your experiments

LOG-a-TEC  SensorLab
Johannes Kepler Institute

GENERAL SIMULATIONS EXPERIMENTS REPROGRAM

Cognitive Radio Networking

Choose the cluster: Industrial Zone
JSI
Industrial Zone
City Centre
KabelNet

GRASS-RaPlat Sim
Select the Simulation

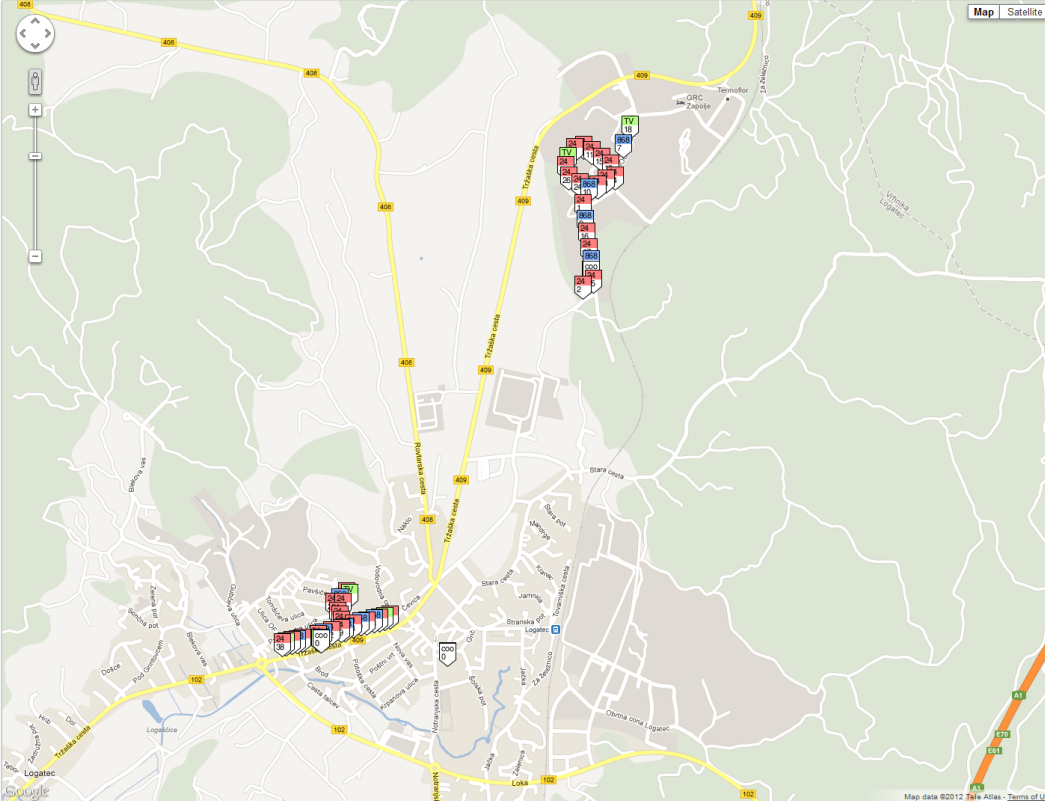
Opacity: 50

Download request-response log file in text or in hexadecimal format:
[Text request-response log file](#) [Hex request-response log file](#)

Direct communication with the nodes:
nodes720/sensing/deviceConfigList

Enter Resource Enter Content

dev #0, TDA18219, 2 configs:
cfg #0: DVB-T 1.7 MHz:
base: 470000000 Hz, spacing: 1000 Hz, bw: 1700000 Hz, channels:
392000, time: 50 ms
cfg #1: DVB-T 8.0 MHz:
base: 470000000 Hz, spacing: 1000 Hz, bw: 8000000 Hz, channels:
392000, time: 50 ms



Step 2

- For each node in the cluster there are some pre-configured settings available
- You can directly communicate with the nodes to see what's available using GET and POST requests (see the General tab in the portal and the figure on the right)

The screenshot displays the 'LOG-a-TEC' interface with the 'SensorLab' logo (Josef Stefan Institute) in the top right. The 'GENERAL' tab is selected, showing settings for 'Cognitive Radio Networking'. A dropdown menu for 'Choose the cluster:' is set to 'Industrial Zone'. Below it, the 'GRASS-RaPlat Simulation' dropdown is set to '< Select the Simulation >'. An 'Opacity' slider is positioned at 50. There are two links for downloading log files: 'Text request-response log file' and 'Hex request-response log file'. A section for 'Direct communication with the nodes:' includes a text input field containing 'nodes?20/sensing/deviceConfigList' and a 'GET' button. Below this, there are fields for 'Enter Resource' and 'Enter Content', along with a 'POST' button. At the bottom, configuration details for two channels are listed: 'dev #0, TDA18219, 2 configs:', 'cfg #0: DVB-T 1.7 MHz:' (base: 470000000 Hz, spacing: 1000 Hz, bw: 1700000 Hz, channels: 392000, time: 50 ms), and 'cfg #1: DVB-T 8.0 MHz:' (base: 470000000 Hz, spacing: 1000 Hz, bw: 8000000 Hz, channels: 392000, time: 50 ms).

Step 3

- Predefined GRASS-RaPlaT simulations are available for
 - UHF,
 - ISM 2.4 GHz,
 - ISM 868 MHz
- The results for these simulations are pre-computed rather than generated on the fly

LOG-a-TEC



GENERAL

SIMULATIONS

EXPERIMENTS

REPROGRAM

Cognitive Radio Networking

Choose the cluster: Industrial Zone

GRASS-RaPlaT Simulation:

- < Select the Simulation >
- < Select the Simulation >
- TV Band (BW = 200 kHz, f_o = 780 – 800 MHz)
MUX Transmitter @ ~562MHz
Nodes 7, 8, 10 (Transmission Power 0 dBm)
Nodes 7, 8, 10 (Transmission Power +12 dBm)
- ISM 2.4 GHz (BW = 200 kHz, f_o = 2.4 GHz)
Nodes 2, 17, 24, 26 (Transmission Power 0 dBm)
Nodes 2, 17, 24, 26 (Transmission Power +1 dBm)
- ISM 868 MHz (BW = 200 kHz, f_o = 868 MHz)
Nodes 7, 8, 10 (Transmission Power 0 dBm)
Nodes 7, 8, 10 (Transmission Power +12 dBm)

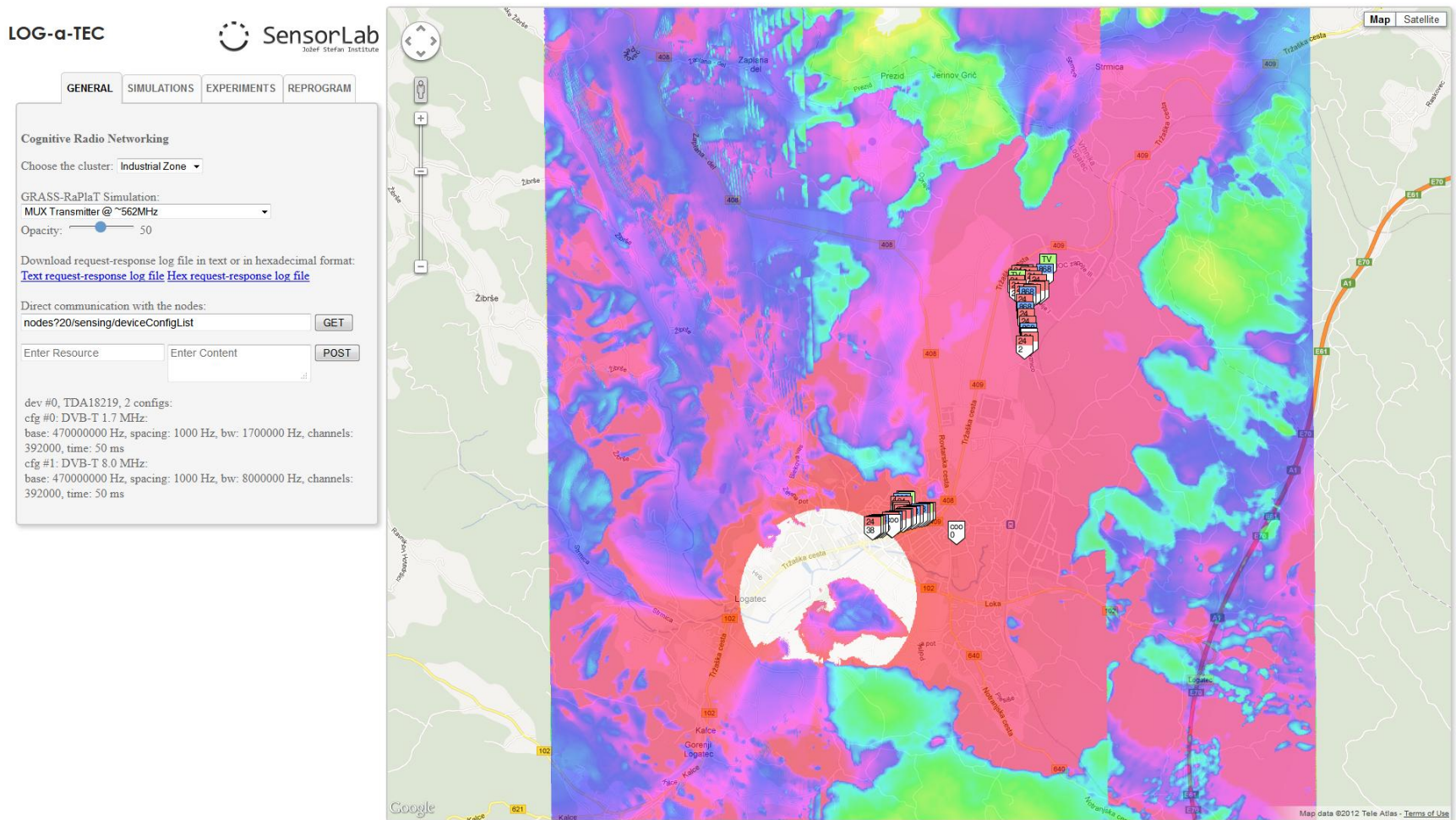
decimal format:
[log file](#)

GET

POST

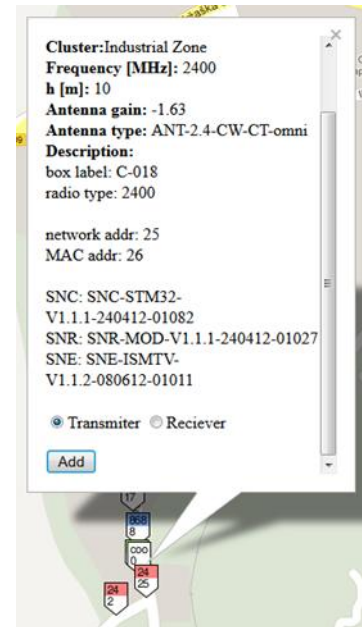
Example simulation result

- For a multiplex transmitter on ~562 MHz



Step 4

- On the fly GRASS-RaPlaT simulations can also be requested
 - Select one by one the nodes you wish to add to the simulation
 - A pop-up will appear where you will be able to see all the configurations of the node (see top right figure)
 - Select whether you want the node to act a transmitter or receiver
 - Add the node to the simulation list (see a list of two nodes in the bottom right figure)
 - Select the type of simulation you wish: coverage or received power



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GENERAL SIMULATIONS EXPERIMENTS REPROGRAM

☒ Coverage ☐ Rx_power

Transmitter:

[Delete selected row](#)

lat	lng	h [m]	Frequency [MHz]	Power [dBm]	Antenna gain
45.930763	14.23707	10	2400	10	-1.63
45.931019	14.237695	10	2400	10	-1.63

1 to 2 Previous Next

Options:

Radius[km]: 1

Threshold[dBm]: -114

Transmission range (interference area):
☐ Yes ☒ No

On the fly GRASS-RaPlaT simulation setup for *coverage* computation

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GENERAL SIMULATIONS EXPERIMENTS REPROGRAM

☒ Coverage ☐ Rx_power

Transmitter:

[Delete selected row](#)

lat	lng	h [m]	Frequency [MHz]	Power [dBm]	Antenna gain
45.930763	14.23707	10	2400	10	-1.63
45.931019	14.237695	10	2400	10	-1.63

1 to 2 Previous Next

Options:

Radius[km]: 1

Threshold[dBm]: -114

Transmission range (interference area):

☐ Yes ☒ No

Start

Map Satellite Terrain

Cluster: Industrial Zone
Frequency [MHz]: 2400
h [m]: 10
Antenna gain: -1.63
Antenna type: ANT-2.4-CW-CT-omni
Description:
box label: C-018
radio type: 2400
network addr: 25
MAC addr: 26
SNC: SNC-STM32-V1.1.1-240412-01082
SNR: SNR-MOD-V1.1.1-240412-01027
SNE: SNE-ISMV-V1.1.2-080612-01011
☒ Transmitter ☐ Reciever
Add

Google

Map data ©2012 Tele Atlas - Terms of Use

On the fly GRASS-RaPlaT simulation setup for *received power* computation

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GENERAL SIMULATIONS EXPERIMENTS REPROGRAM

☐ Coverage ☒ Rx_power

Transmitter:

[Delete selected row](#)

lat	lng	h [m]	Frequency [MHz]	Power [dBm]	Antenna gain
45.930763	14.23707	10	2400	10	-1.63
45.931019	14.237695	10	2400	10	-1.63

1 to 2 Previous Next

Receiver:

lat	lng
45.932266	14.237428

1 to 1 Previous Next

Radius[km]: 1

Start

Cluster: Industrial Zone
Frequency [MHz]: 2400
h [m]: 10
Antenna gain: -1.63
Antenna type: ANT-2.4-CW-CT-omni
Description:
box label: C-007
radio type: 2400

network addr: 17
MAC addr: 18

SNC: SNC-STM32-V1.1.1-240412-01127
SNR: SNR-MOD-V1.1.1-240412-01012
SNE: SNE-ISMTV-V1.1.2-080612-01007

☐ Transmitter ☒ Receiver

Add

Step 5

- Visualize the simulation results
- For each node, select what you wish to see (coverage, legend) and how you wish to see it (opacity)

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GENERAL SIMULATIONS EXPERIMENTS REPROGRAM

☒ Coverage ☐ Rx_power

Transmitter:
[Delete selected row](#)

lat	lng	h [m]	Frequency [MHz]	Power [dBm]	Antenna gain
45.933407	14.237202	10	868	10	-1.63
45.934643	14.237417	10	868	10	-1.63

1 to 2 ◀ Previous Next ▶

Options:

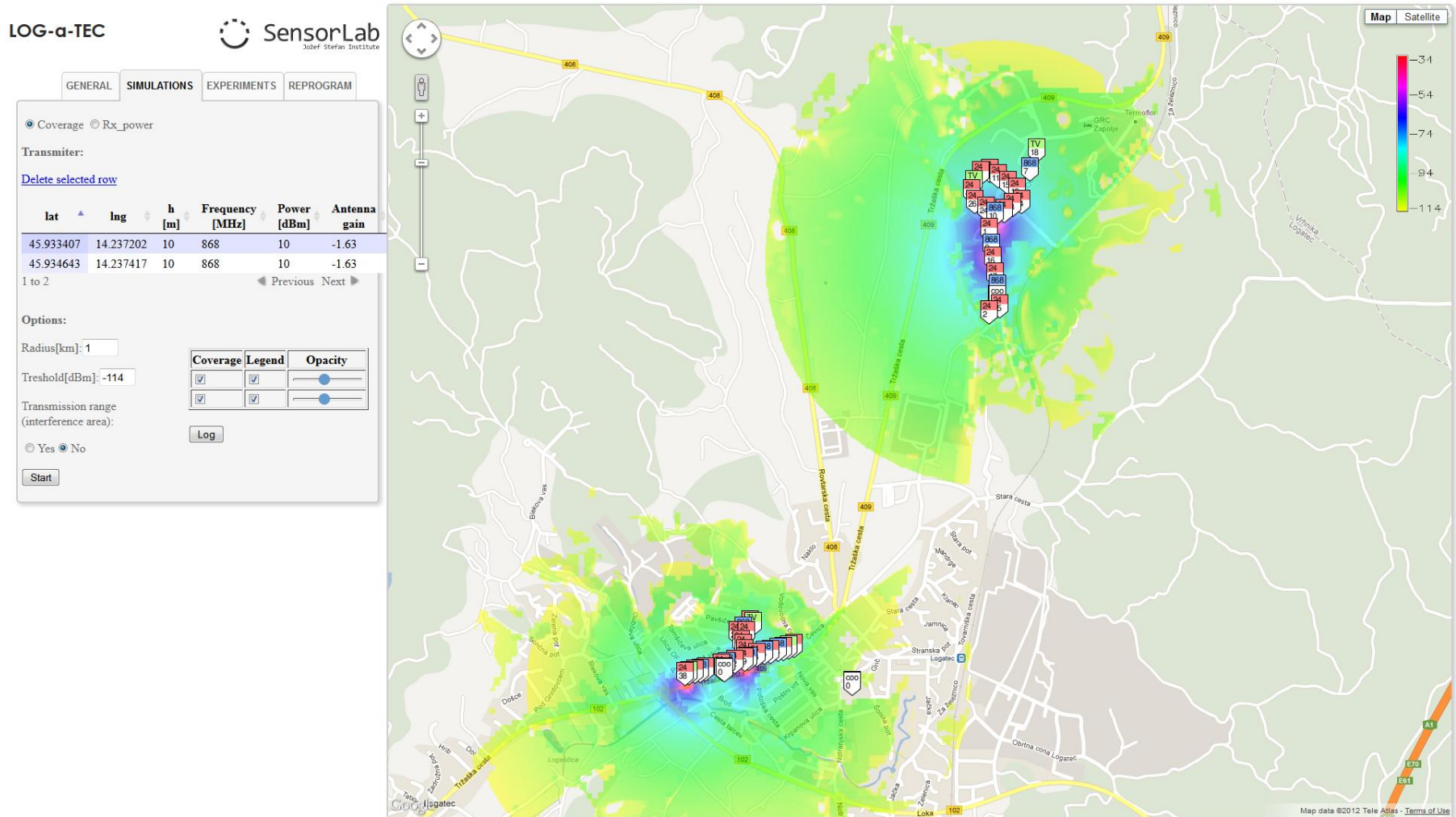
Radius[km]:

Threshold[dBm]:

Transmission range (interference area):
☐ Yes ☒ No

Coverage	Legend	Opacity
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="range" value="100"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="range" value="100"/>

Example GRASS-RaPlaT visualization of the *coverage* result



Step 6

- Select and run one of the pre-defined cognitive radio experiments
- Currently three pre-defined cognitive radio experiments are available:
 - Context awareness in the TVWS
 - Coexistence in the 2.4 GHz ISM band
 - Coexistence in the UHF band/TVWS

LOG-a-TEC

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GENERAL

SIMULATIONS

EXPERIMENTS

REPROGRAM

- Put GET and POST requests in a text file and upload it to the server
- Multiple requests should be separated by an empty line
- The POST request should contain a single semicolon between the resource name and content
- Characters that are NOT allowed in GET and POST requests: ; empty line

Example:

hello
description
hello;hello PUT request content

The meaning of nodes colors on Google maps:

Green - UHF
Blue - ISM 868
Red - ISM 2400
Yellow - unused locations

Cognitive Radio Experiments:

< Select the Experiment >
< Select the Experiment >
Context awareness in the TVWS
Coexistence in the 2.4 GHz ISM band
Coexistence in the UHF band/TVWS

Start

Log

Example experiment

- A context awareness in TV white spaces is selected
- Three UHF nodes are selected to scan the ~562 MHz band
 - Node 19 (industrial zone) with SuperScanstick antenna
 - Node 20 (industrial zone) with SuperGainer antenna
 - Node 47 (kabelnet) with SuperScanstick antenna
- The results of the experiments can be downloaded at visualization time

Example run of the context awareness experiment in TV white spaces

- While the experiment is being run, you will be kept updated with the progress via the console

The screenshot displays the LOG-a-TEC interface, which includes a map of Ljubljana and a console window showing log output. The interface has a top bar with the LOG-a-TEC logo and SensorLab branding. Below this is a navigation bar with tabs for GENERAL, SIMULATIONS, EXPERIMENTS, and REPROGRAM. The EXPERIMENTS tab is active, showing a dropdown menu for 'Context awareness in the TVWS' and buttons for 'Start' and 'Log'. On the left side of the EXPERIMENTS tab, there are three buttons labeled 'Output results 1', 'Output results 2', and 'Output results 3'. The main area of the interface is a map of Ljubljana, showing various streets and landmarks. A console window titled 'root/log' is overlaid on the map, displaying the following log output:

```
version=1325376177
status=COMPLETE
crc=534656012

Unprintable packet
Unprintable packet
Unprintable packet
size=1248
version=1325376175
status=COMPLETE
crc=1320857761

experiment is finished. retrieving data.
size=1248
version=1325376175
status=COMPLETE
crc=1320857761

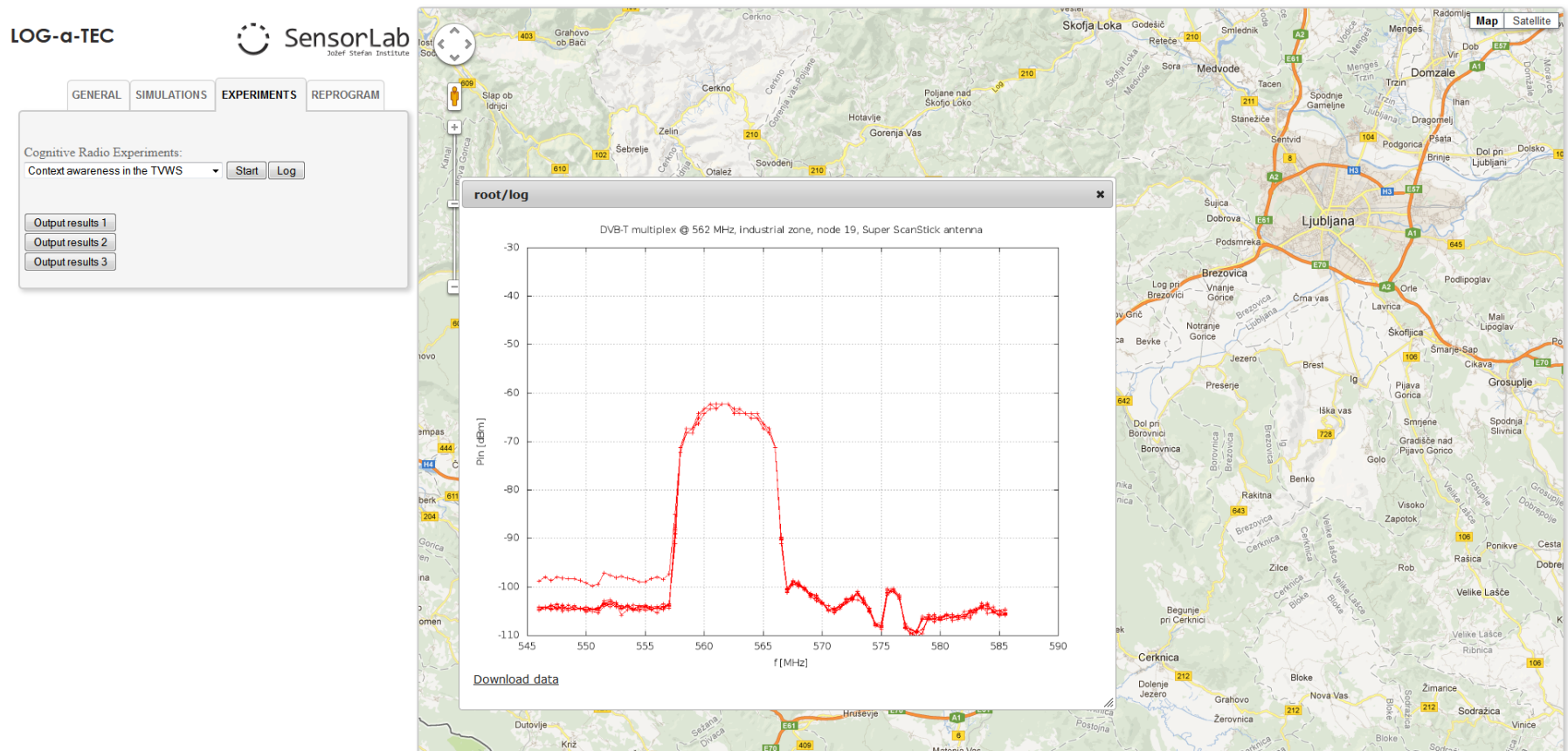
Unprintable packet
Unprintable packet
Unprintable packet
size=1216
version=1325980587
status=COMPLETE
crc=658413308

experiment is finished. retrieving data.
size=1216
version=1325980587
status=COMPLETE
crc=658413308

Unprintable packet
Unprintable packet
Unprintable packet
```

Visualization of the results for Node 19

- The results of the experiment are displayed in a graphical form



Visualization of the results for Node 20

LOG-a-TEC

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GENERAL SIMULATIONS EXPERIMENTS REPROGRAM

Cognitive Radio Experiments:

Context awareness in the TVWS

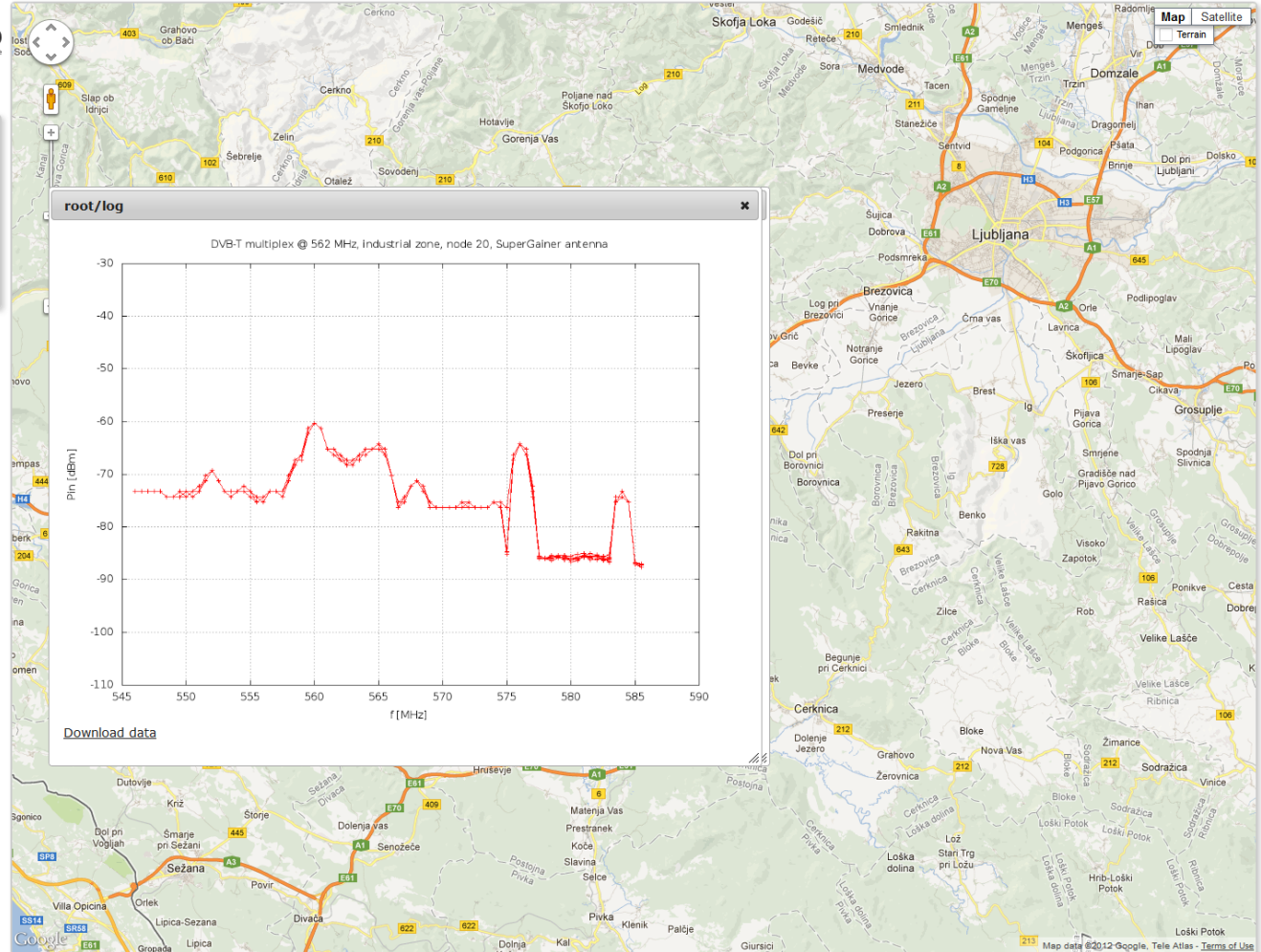
Start

Log

Output results 1

Output results 2

Output results 3



Visualization of the results for Node 47

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GENERAL SIMULATIONS EXPERIMENTS REPROGRAM

Cognitive Radio Experiments:

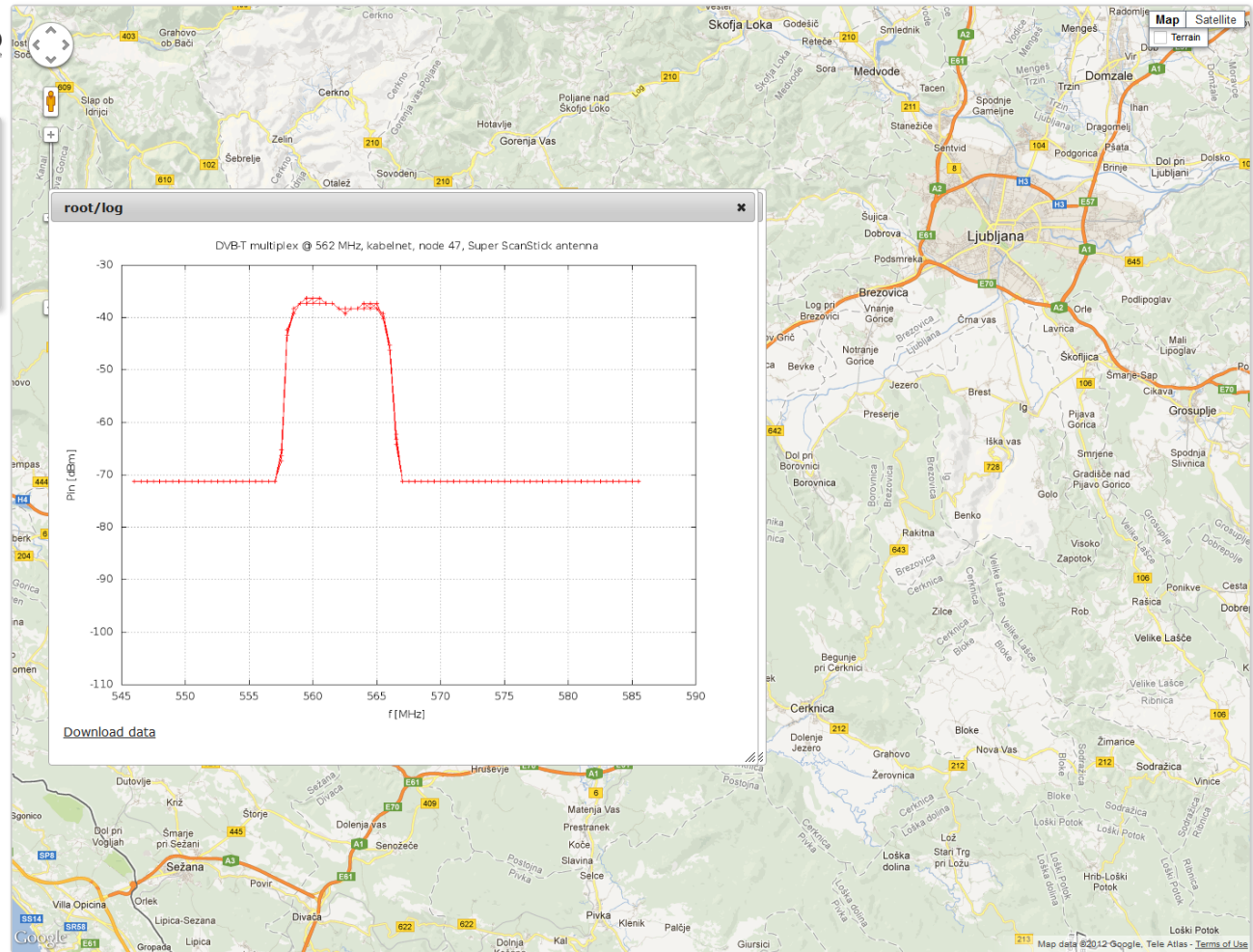
Context awareness in the TVWS

Start Log

Output results 1

Output results 2

Output results 3



Step 7

- Compose and run your own experiment using the GET and POST commands to talk to the desired nodes

LOG-a-TEC

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GENERAL

SIMULATIONS

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- Put GET and POST requests in a text file and upload it to the server
- Multiple requests should be separated by an empty line
- The POST request should contain a single semicolon between the resource name and content
- Characters that are NOT allowed in GET and POST requests: ; empty line

Example:

hello

description

hello;hello PUT request content

The meaning of nodes colors on Google maps:

Green - UHF

Blue - ISM 868

Red - ISM 2400

Yellow - unused locations

Cognitive Radio Experiments:

- < Select the Experiment >
- < Select the Experiment >
 - Context awareness in the TVWS
 - Coexistence in the 2.4 GHz ISM band
 - Coexistence in the UHF band/TVWS

Start

Log

Step 8

- LOG-a-TEC also supports remote reprogramming of the nodes
- This functionality is currently used only by internal experimenters and developers of the testbed. It will be available to outside experimenters at a later time

