Dpto. Ingeniería de Comunicaciones. University of Málaga

WiMo-SIM Getting started guide

Wireless Mobile Simulator (WiMo-SIM)

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1. Introduction

WiMo-SIM is a standard compliant link-level simulation environment for the 3GPP Long Term Evolution Advanced (LTE-A) technology. The simulator has been developed by the Communications Engineering Research Group at the University of Malaga (Spain).

The purpose of this guide is to show how to carry out a simulation and to evaluate the output results of the WiMo-SIM.

2. Installing the WiMo-SIM

Unzip the *WM-SIM.rar* file within a folder. Be aware that the location of all unzipped files, including the *config* folder, is kept in the same folder.

3. Running a simulation

It is necessary to have a computer with Windows and Matlab Compiler Runtime installed in your computer.
The process that allows us to obtain results with WiMo-SIM requires first to generate a network realization using *networkPlacement* application. The complete process appears below.

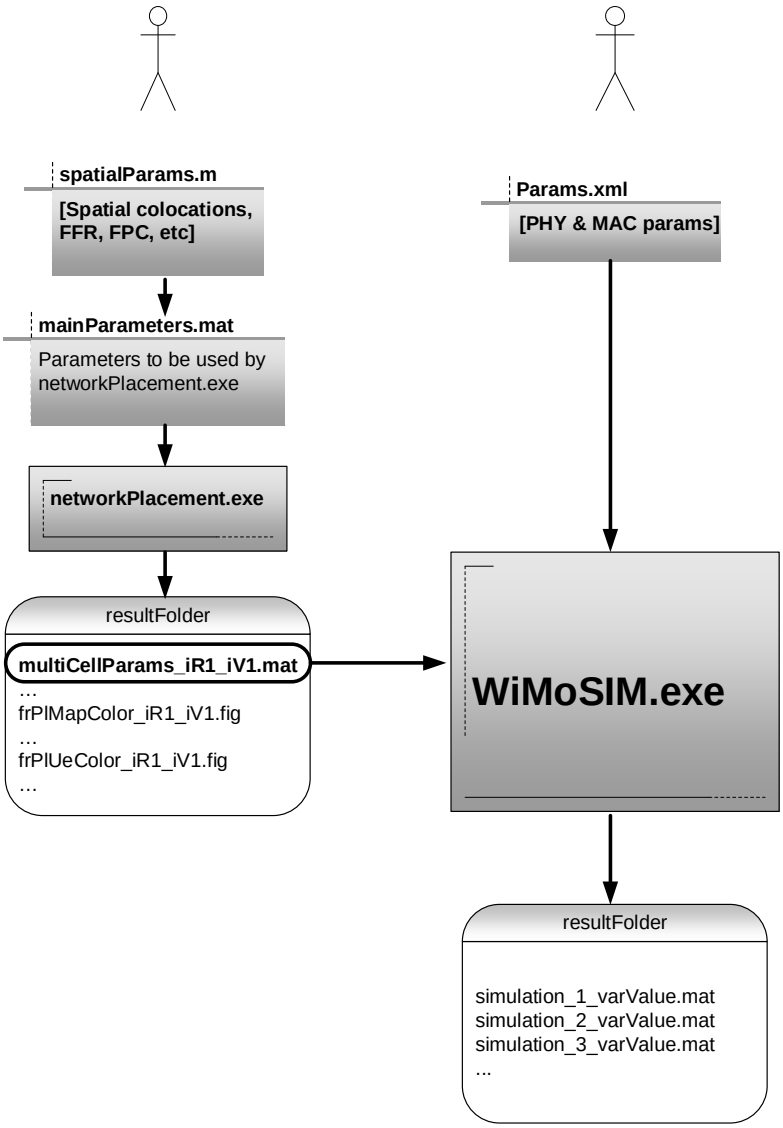

Figure 1. Scheme for running a simulation

1. Open the Matlab file *mainParams.m*. Chose the desired network parameters and run the script. Those parameters are explained in [1]. This script will generate a *.mat* file named *mainParameters.mat*.
2. Run *networkPlacement* application. This application uses the *mainParameters.mat* file generated in the previous step. A folder with some descriptive figures and a *.mat* files is generated for each network realization. *You must copy each .mat file for each network realization you plan to simulate and paste them in the 'config' folder*. These *.mat* files are used by WiMo-SIM.
3. Configure the simulation parameters. To see these parameters, drag the *Params.xml* file to the *WM-Settings* application. Then, a window like in Fig. 2 will appear.

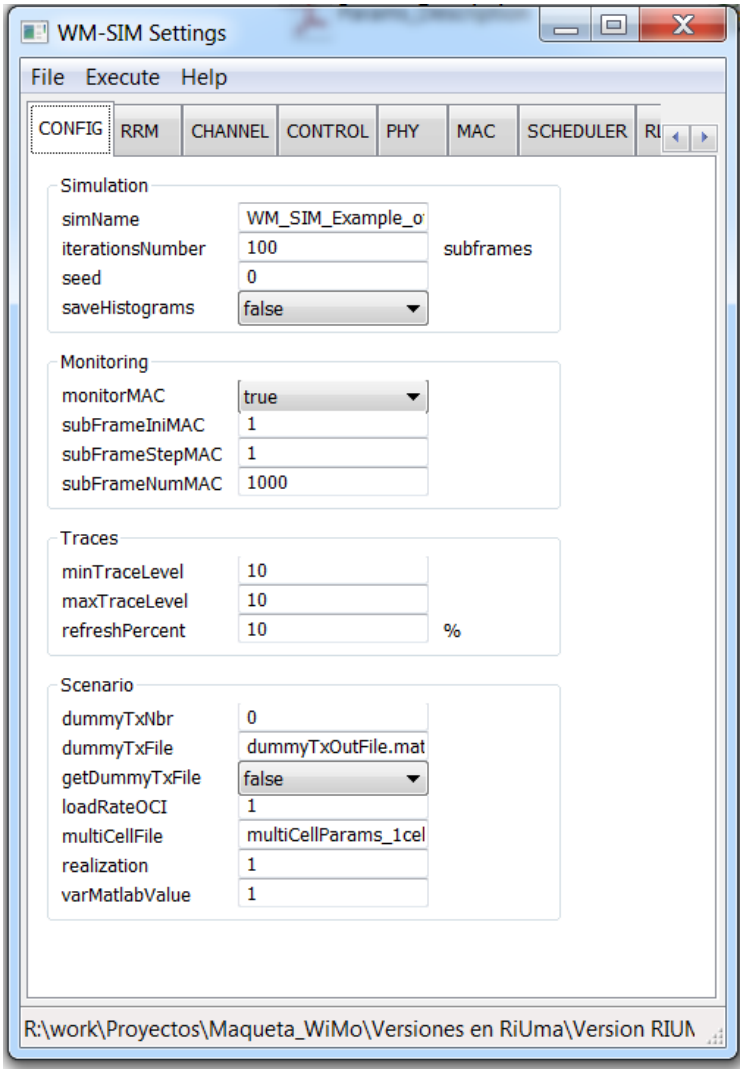

Figure 2. View of simulation *WM-Settings* window

As it is shown, parameters are organized in tabs and boxes. All these parameters can be modified by the user. To keep any change is necessary to save them by clicking **File → Save**. A complete description of these parameters is in [2].
It should be noted that the *multiCellFile* parameter of the box *Scenario* in the tab *CONFIG*, must contain de name of the *.mat* file with the network configuration generated in the previous step. For more details, see [2].

4. To run the simulator using the given parameter configuration, close the *WM-Settings* application and double click in the *WM-SIM* application.

Once the simulator will start running, the following window will appear:

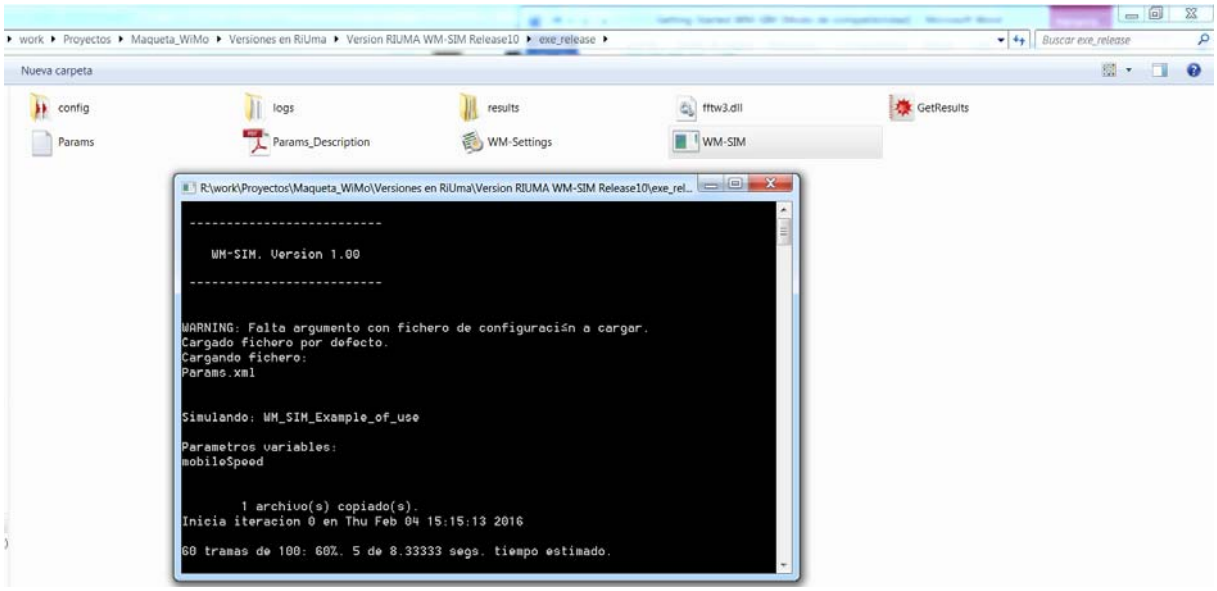

Figure 3. Execution of the WM-SIM

Note that two new folders have been created when running the simulator:

- *results*: For each simulation run, it contains a new folder. The name of this folder will be the value of the field *simName* of the box *Simulation* in the tab *CONFIG*, plus the name of the variable parameters defined in the tab *VAR_PARAM* (if no variable parameters have been defined, this part of the name will be omitted), plus the date of the simulation with format *yymmdd_hhmm*. Inside this folder there are several kind of files:
    - Matlab files which contain the simulation results. The name of this file will be *simulation*, plus the value and the name of the variable parameters defined in the tab *VAR_PARAM*. Hence, there will be as *Matlab* files as the multiplication of the number of variations associated to each variable parameter defined. Again, if no variable parameters have been defined, this part of the name will be omitted and the name of the file will be *simulation.mat*. A complete description of the meaning of the variables contained into this Matlab file can be found in [3].

    - a copy of the xml file used to run the simulation. A complete description of the meaning of parameters which appears in this file can be found in [2].

    - Matlab files with some information of the allocation made by the scheduler. The name of this file will be *monitorMAC_CeldaX_simulation* (where *X* is the identifier of the cell to which the file is associated), plus the value and the name of the variable parameters defined in the tab *VAR_PARAM*. Hence, there will be as *Matlab* files as the multiplication of the number of variations associated to each variable parameter defined and the number of cells simulated. Again, if no variable parameters have been defined, this part of the name will be omitted and the name of the file will be *monitorMAC_CeldaX_simulation.mat* (where *X* is the identifier of the cell to which the file is associated). A complete description of the meaning of the variables contained into this Matlab file can be found in [4].
      It should be mentioned that this kind of Matlab file will be only created if the value *true* has been selected for the parameter *monitorMAC* in the box *Monitoring* in the tab *CONFIG*.

- *log*: it contains text files which show the traces of the simulations, including if an error has occurs during the simulation. The size of this text file (the number of lines it will contains) depends on the level of trace selected using the parameters *minTraceLevel* and *maxTraceLevel* in the box *Traces* in the tab *CONFIG* (see [2]).
  Two kinds of log files can be found:
  - One associated to the global simulation: The name of this file will be the value of the field *simName* of the box *Simulation* in the tab *CONFIG*, plus the date of the simulation in the format *_yyyymmdd_ hh***h***mm***m***ss***s**. This file will contain the information which identified the overall simulation: the version of the WiMo-SIM used, the name of the parameters file used to run the simulation and the name of the simulation (which will be determined by the value of the field *simName* of the box *Simulation* in the tab *CONFIG*).
  - Associated to the variation of variable parameters: The name of this file will be the value of the field *simName* of the box *Simulation* in the tab *CONFIG*, plus the value and the name of the variable parameters defined in the tab *VAR_PARAM*, plus the date of the simulation in the format *_yyyymmdd_hh***h***mm***m***ss***s**. Hence, there will be as many log files of this kind as the multiplication of the number of variations associated to each variable parameter defined. This file will contain information related to the concrete iteration the file is associated i.e.: the seed employed in the iteration, the number of the actual iteration (to respect to the total number of iterations) and the time taken to finish the iteration.
    If an error occurs, the associate trace will appear in this kind of files. In the current version the messages which appear in the log files are written in Spanish. In the following versions the messages will written in English.

When the simulation is finished, open the *results* folder and check that a new folder has been created inside. After opening this new folder, you will find 5 files:

- Two results files called *simulation_4_mobileSpeed.mat* and *simulation_34_mobileSpeed.mat*. Each of these files contains the results of each simulation point (one point corresponds to a mobile speed of value 4 km/h and the other to a mobile speed of value 34 km/h).
- Two monitor files called *monitorMAC_Celda0_simulation_4_mobileSpeed.mat* and *monitorMAC_simulation_34_mobileSpeed.mat*. These files contain information about the allocation made by the scheduler.
- A copy of the *Params.xml* file that was used to run this simulation.

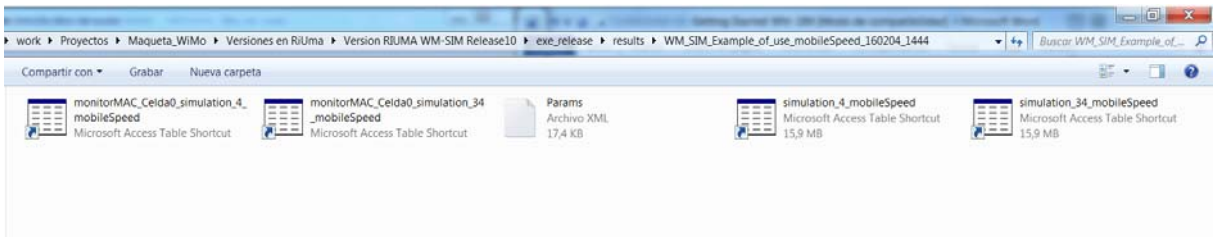

Figure 4. New files created

Load any of the results files, and check the results obtained by running this simulation.

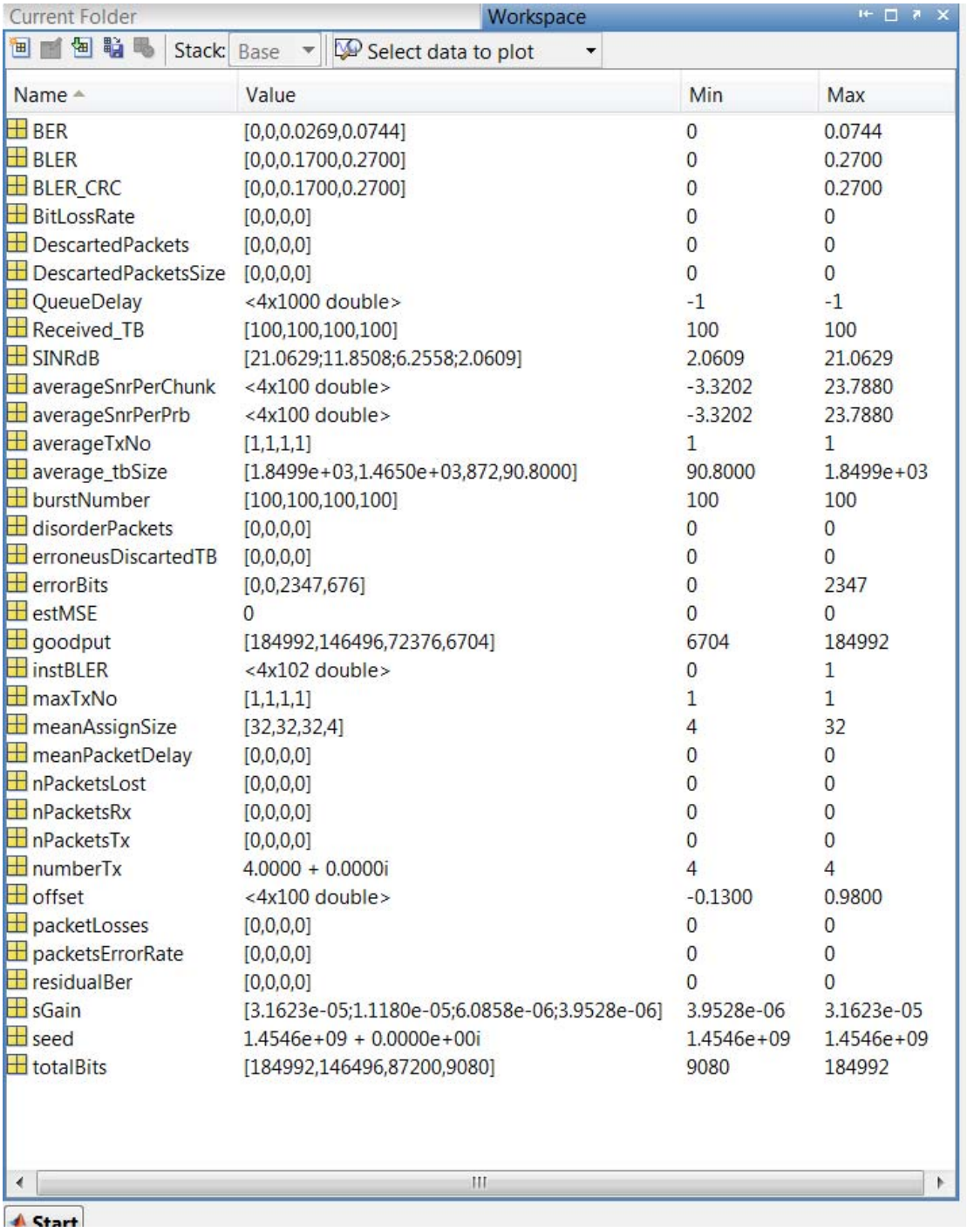

Figure 5. Content of the *simulation_4_mobile.mat* file

Now go back to the main folder and open the *Params.xml* file. Modify the following parameters:

- CONFIG → Simulation → simName = *failExample*
- MAC → HARQ → maxHarqReTxNo = 4
- Save the changes by cliking ***File → Save***

Next run the simulator. You will notice than the simulator will start and suddenly it will shut down. It is due to a wrong configuration of the parameters. In this case, we are allowing a maximum number of 4 HARQ retransmissions, but we have not activated the HARQ mode

(MAC → HARQ → harqActivate = false). Thus, this configuration of the parameters has no sense.
If you open the *log* folder and check the *failExample_4_mobile_xxxxxxxx_xxhxxmxxs.txt* file, you will see that an error message is written in Spanish (see Fig. 6).

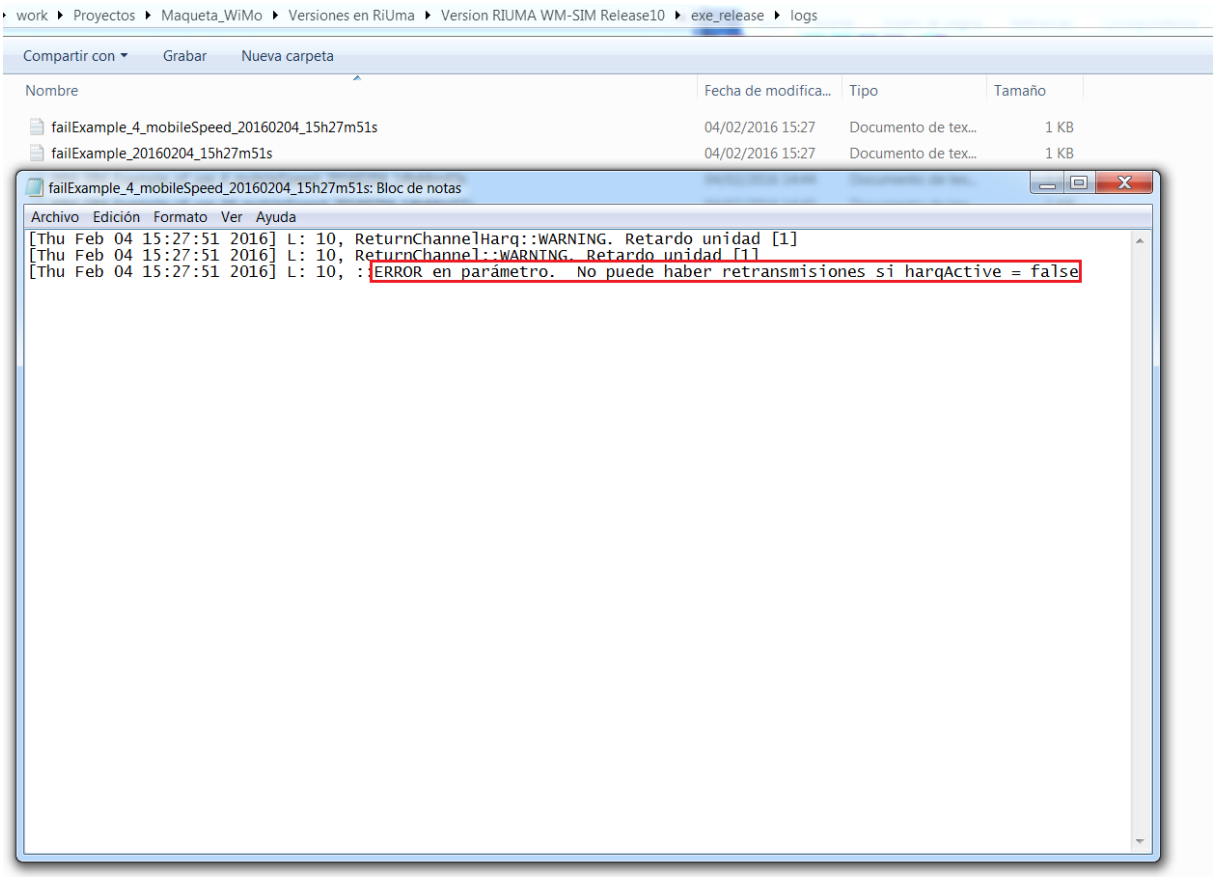

Figure 6. Content of the log file associated to the wrong simulation

If you need some help with any result obtained after a simulation run (results obtained in the result file, error messages in log files, etc.), you can send the *Params.xml* file to the following email: *ltesim@ic.uma.es*. Also, any doubt or suggestion about the WiMo-SIM will be highly appreciated.

4. Acronyms

FFR	Fractional Frequency Reuse
FPC	Fractional Power Control
HARQ	Hybrid Automatic Repeat Request
LTE-A	Long Term Evolution - Advanced
MAC	Medium Access Control
WiMo-SIM	Wireless Mobile SIMulator

5. References

[1] Network Placement_Description_v2.1.pdf
[2] Params_Description_v2.1.pdf
[3] Results_Description_v2.1.pdf
[4] MonitorMAC_Description_v2.1.pdf