4 LTE Network Simulator

4.1 Simulation Environment

The LTE simulation model developed in this work is implemented using the OPNET software environment [mod11]. OPNET is a commercial simulation tool that provides several network and application performance management solutions. The simulation modeling tool of OPNET Modeler© is used to design and implement the LTE simulation model. It is a hierarchical modeling environment that is based on a C/C++ programming tool, and has an advanced Graphical User Interface used for analysis and debugging. Some of its key features include [mod11]: a model library involving many protocols and vendor nodes implementations, object oriented programming, a 32-bit and 64-bit fully parallel simulation kernel. As stated earlier, it consists of several hierarchical editors as shown in Figure 4.1 mainly: project editor, node editor, process editor and open model source code.

![OPNET modeler© hierarchical editors](image)

Figure 4.1: OPNET modeler© hierarchical editors
4.2 Simulation Framework

The main objective behind the development of the LTE simulation model is to analyze, evaluate and study several aspects of the LTE network such as: end user performance, LTE radio performance (Uu interface) and the LTE transport performance (S1/X2 interface). To be able to achieve the above targets the simulation model is designed to model both the E-UTRAN and EPC. The modeling is done with particular focus on the important features and functionalities of the nodes and protocols. These are modeled with great depth in order to be able to conduct the intended study. Mobile communication systems are very complex and include a huge amount of functionalities; this is also the case with LTE. To simplify the modeling of such a system, a reference architecture is required that represents the desired compromise between the complexity and the intended simulation performance targets. The reference LTE network architecture used for this thesis is shown in Figure 4.2 [Wee11]. It consists of a number of eNodeBs each controlling three cells. The number of eNodeBs, intermediate routers and users shown in the figure are merely an example and can be changed depending on the required scenario.

By comparing the reference architecture to the general LTE network architecture shown on Figure 3.1, it can be seen that most of the entities have been modeled