Starting from late 1990’s, there is a trend to place increasing number of IP cores onto a single silicon chip. This chip is often referred to as System on Chip (SoC). While the amount of cores rises rapidly, the conventional mainstream on-chip communication technologies including buses and fully connected point-to-point connections turn into a bottleneck to the performance of SoC.

To alleviate this matter, a promising approach known as Network on Chip (NoC) has been proposed. It carries on networking theory and on-chip communication techniques, and considerably improves performance over the two aforementioned traditional approaches. Noxim is a popular NoC simulator selection among researchers to perform simulations in two-dimensional rectangular mesh NoCs. Nevertheless, the official version of Noxim lacks of supports to honeycomb topologies, Dynamic Voltage and Frequency Scaling (DVFS) and power gating.

With the purpose to enable simulations for honeycomb topologies, DVFS and power gating, the original Noxim is re-implemented in two projects, namely Noxim Honeycomb and Noxim DVFS. The architecture and mechanisms of the original Noxim including signal binding, packet transmission control, coordinate system, processing element and routing are studied and analysed to establish the foundation of the re-implementations. For Noxim Honeycomb, topologies and architecture of routers are presented. Details of implementation regarding mesh modelling, honeycomb coordinate system, signal binding adaptation and routing algorithms are illustrated. For Noxim DVFS, details of dynamic power management are depicted. Relevant routing algorithms are enhanced during the project. In addition, aspects about frequency scaling, power gating, routing data maintenance and a simulation execution mechanism are discussed. Based on the two projects, simulation cases are developed and performed. Furthermore, applications of those are discussed. Several potential improvements are introduced for future researches.

Keywords: network topology, Network on Chip, honeycomb mesh, DVFS, power gating, simulation, SystemC, Noxim, routing algorithm