Scheduling model at MAC level for LTE, downlink (DL) transmission

Dragos Chileban[1] and Razvan Andar[1]

[1]Politehnica University of Timisoara, CTI Eng 4th year

December 10, 2024

Abstract

We developed an Omnet++ application[1] for simulating a scheduling model at MAC level for LTE, downlink (DL) transmission[2]. As features we implemented the PF (proportional fair) channel dependent scheduling algorithm, as every user will have his own radio quality for each channel, the values being uniformly distributed between 0 and 1. Using 10 channels and 3 users with different priorities, low, medium and high we simulated and graphically represented the mean delay time for each of those users as a function of the network load (10 - 100%).

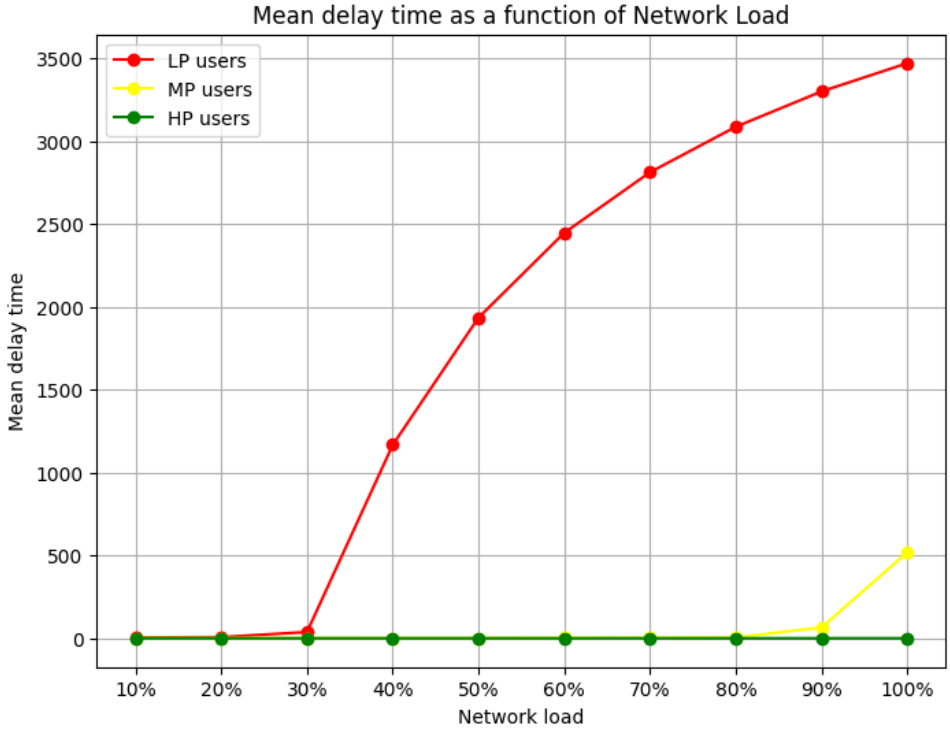

Figure 1: Mean delay time as a function of network load.

As previously mentioned, there are 3 user priorities having weights 1, 4 and 9. The formula of the priority is the product between the user weight, the radio on the respective channel and the time passed since it was last served. Each channel computes its ranking of users and chooses the best one. Using 10 channels we simulated the algorithm for network load between 10% and 100% and plotted the results in Fig 1. As values of the delay are very high for the low priority users we plotted the results separately for each user in Fig 2. Considering the 2 figures we can clearly observe that for low priority users the delay time increases logarithmically when the network load reaches 30%. For the medium priority ones, the

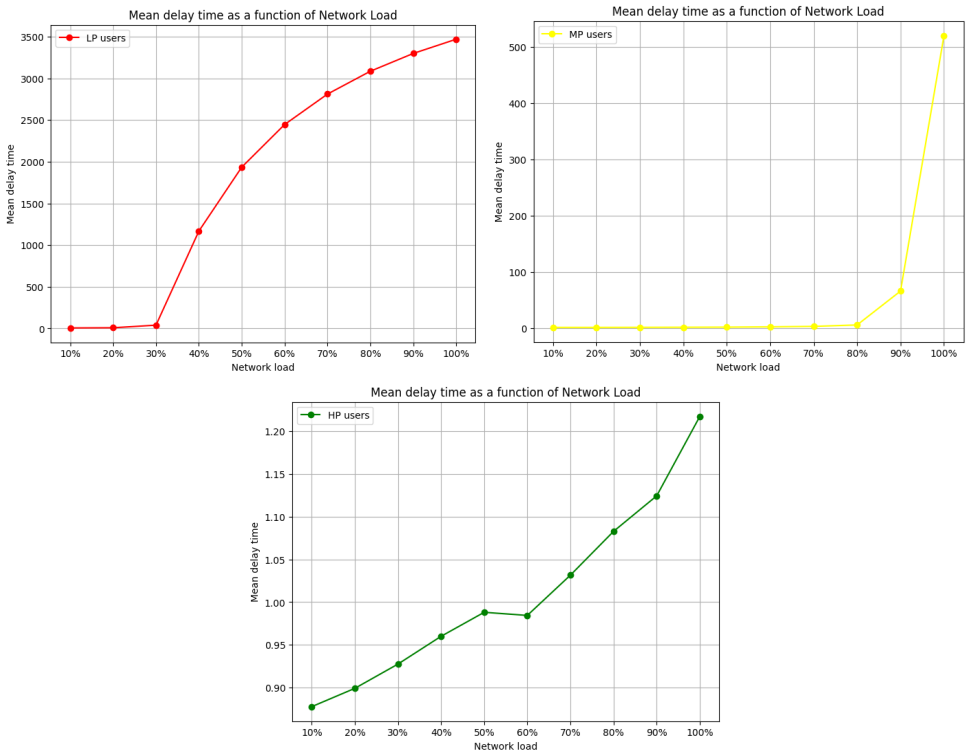

Figure 2: Each user priority mean delay time as a function of the network load.

delay time is not affected until 90% network load while the high priority users delay times are low and constant.

In the separate plots we could see that low priority representation keeps its shape. In the medium priority plot we can observe the exponential growth in the last 3 steps while the ascending of the delay time of high priority users is somehow linear.

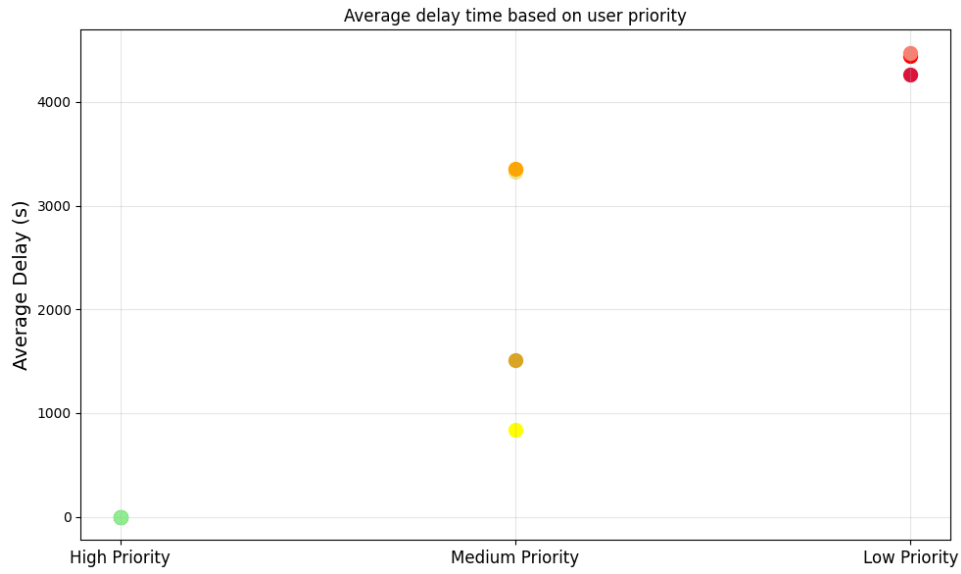

Figure 3: Average delay time for each user priority (2 HP, 5 MP, 3 LP), 30 channels and 50% network load.

One last experiment we did was increasing the number of users to 10 (2 HP, 5 MP, 3 LP) and the number of channels to 30 in order to see how the average delay time of each users category is evolving in a more complex network (Fig 3).

References

[1] https://github.com/Andarw/Cad_Project_Omnet

[2] https://staff.cs.upt.ro/~todinca/cad/LTE_DL_scheduling.html