**Project 6 – Aeronautical Communications (1)**

Consider a communication system between aircrafts (ACs) and a control tower (CT). ACs generate one packet of fixed size every seconds, where the latter is a random variable to be described later.

The connection between ACs and the CT is provided by ground base stations[[1]](#footnote-1) (BS), which are placed on the ground according to a grid deployment[[2]](#footnote-2), at a distance between neighbors.

Each AC can select only one serving BS at a time. The service time of each transmission[[3]](#footnote-3) is a function of the distance between AC and BS and is definedas , where is a constant value[[4]](#footnote-4). Each AC can transmit only one packet at a time[[5]](#footnote-5).

ACs move randomly[[6]](#footnote-6) at a constant speed and can execute periodically a handover operation (i.e. change their serving BS), every seconds. The handover operation works as follows:

* The AC selects the closest BS;
* Data transmissions for the considered AC are paused for a penalty time[[7]](#footnote-7) of seconds.

Model the system described above and study the end-to-end delay and the queue length for various values of interarrival time and handover period .

More in detail, at least the following scenarios must be evaluated:

* Constant interarrival times.
* Exponential distribution of interarrival time, with the same means as the previous case.

In all cases, it is up to the team to calibrate the scenarios so that meaningful results are obtained.

Project deliverables:

1. Documentation (according to the standards set during the lectures)
2. Simulation code
3. Presentation (up to 10 slides maximum)

1. The connection between each BS and the CT is fixed and stable, allowing to account for a well-defined latency. [↑](#footnote-ref-1)
2. Consider the grid to be deployed on a wraparound finite 2-dimensional space (“Pacman effect”). [↑](#footnote-ref-2)
3. The service time is the time for a packet to be processed by the AC and sent to the serving BS once it has been picked up from the AC’s packet queue. [↑](#footnote-ref-3)
4. The value of is the same for all the ACs. [↑](#footnote-ref-4)
5. If a packet has been generated by the AC but the latter is still busy, it is put at the end of the AC’s queue. [↑](#footnote-ref-5)
6. The AC’s position is of interest whenever it affects the behavior of packet transmission (i.e. computation of service time). There is a way with INET to cope with it. [↑](#footnote-ref-6)
7. Modeling the penalty time is up to the team: more in detail, the *meaning* of the penalty has to be outlined (whether or not it includes discovering the closest BS, recognizing whether or not the latter is the current serving BS, whether or not to force a reconnection in this latter case). [↑](#footnote-ref-7)