

## Basic Performance Indices and Workloads

The enclosed file `barrier.log` is a log file taken from a PLC sensor monitoring a machine in a production line. Each line of the log file has the following format:

`[yyyy:ddd:hh:mm:ss:f] [eeee]`

Where:

- [yyyy] are four digits specifying a year
- [ddd] are three digits in the range [000-365] that identify a day in the year
- [hh] is an hour in range [00-23]
- [mm] is a minute in range [00-59]
- [ss] is a second in the range [00-59]
- [f] is a tenth of second, in the range [0-9]
- [eeee] is a four digit code representing an event:
  - [\_IN\_] – a raw part entered the machine
  - [\_OUT] – a completed part exited the machine

For example :

`[2023:167:10:51:12:1] [_IN_]`

Means that one sensor detected a raw part arriving at the machine on the 167<sup>th</sup> day of 2023, at 10:51:12 and 1 tenth of second.

Using this data and assuming that jobs are served in the order of arrival, one at a time, and not interrupted, compute for both cases:

- Arrival rate and throughput
- Average inter-arrival time
- Utilization
- Average Service Time
- Average Number of Jobs
- Average Response Time
- Probability of having  $m$  parts in the machine (with  $m = 0, 1, 2$ )
- Probability of having a response time less than  $\tau$ , (with  $\tau = 1 \text{ min}, 5 \text{ min}$ )