Slicing in 5G networks

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A slice simulator with MDP resolution

Last Call

- Taking account of lost jobs in the reward:
  $alpha * (C_j * j + E[L] * C_l) + (1 - alpha) * C_s * n$
  E[L] - expected number of lost jobs

- First results of a toy scenario

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What's new?

- Bugfix
- Support for bigger histograms
- Support for bigger queue
- Support for servers > 1
- Conservative agent (always use the maximum of available servers)
- New plots: jobs in the system, active servers, policy table, histograms
- New cost formulation: **$alpha * C_j * j + beta\ E[L] * C_l + gamma * C\_s * n$**

  where E[L] - expected number of lost jobs

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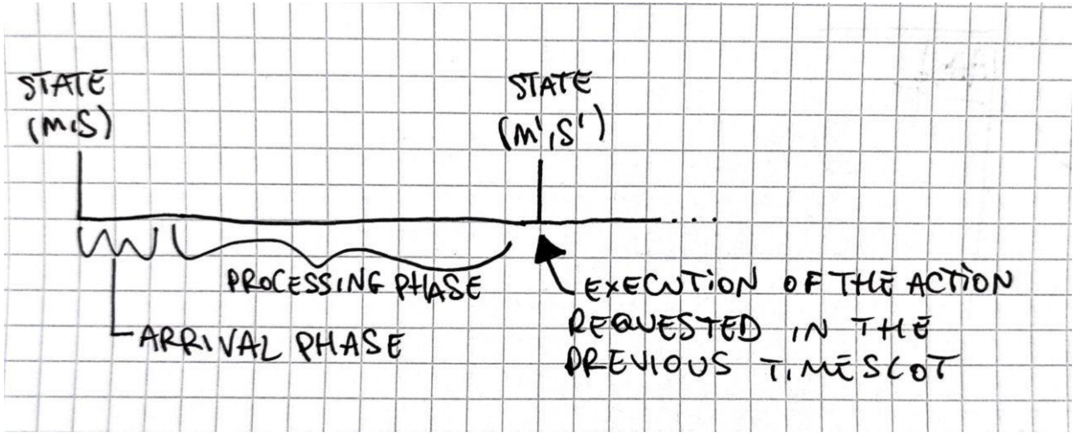
Formulation - Assumption

- At the moment in which the timeslot starts, the execution of the action performed in the previous timeslot takes place
- Arrival Phase: incoming jobs are enqueued and here happens losses due the full queue
- Processing Phase: jobs in queue are processed



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Formulation - Transition Probability

$$Q(m, s \to m', s') = \sum_{a=[m'-m]^+}^{\text{qsize}-m} P(\text{arr} = a) \cdot P(\text{proc} = m + a - m' | a + m) \tag{2}$$

$$+ \sum_{a=\text{qsize}-m+1}^{\infty} P(\text{arr} = a) P(\text{proc} = \text{qsize} - m' | \text{qsize}) \tag{3}$$

Where $P(\text{proc} = x|y)$ is the probability of processing x jobs given that y jobs are found in the queue the instant when the processor starts to pick jobs from the queue. Observe that

$$P(\text{proc} = x|y) = \begin{cases} H_{\text{departures}}(x) & \text{if } x < y \\ \sum_{x=y}^{\infty} H_{\text{departures}}(x) & if x \geq y \end{cases}$$

Notice that is the number of current servers s is equal to 0, then the departure histogram will be just [1., 0., ..., 0.]

(2) non full queue
(3) full queue but we have missing probabilities due the histograms

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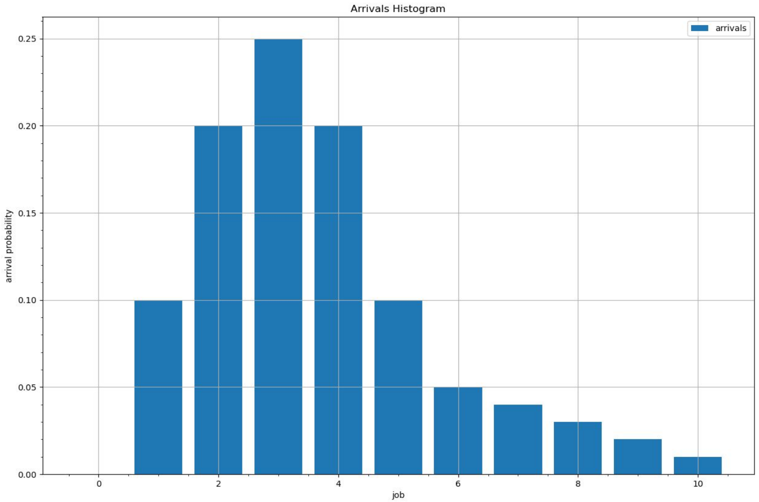
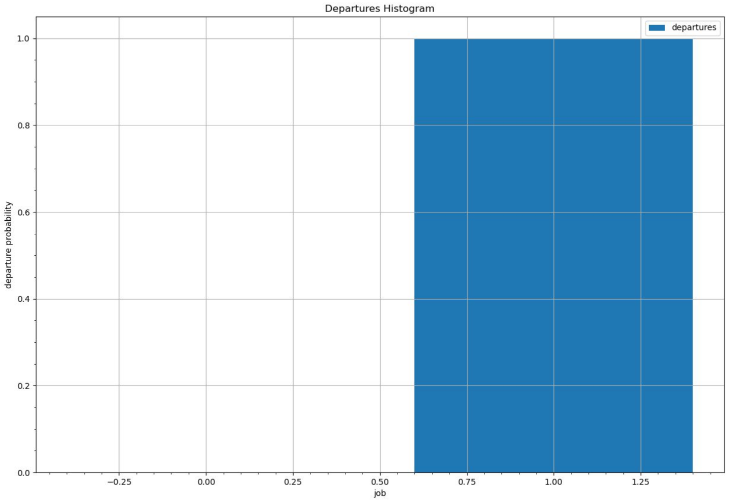
A scenario





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A scenario

See attached zip file