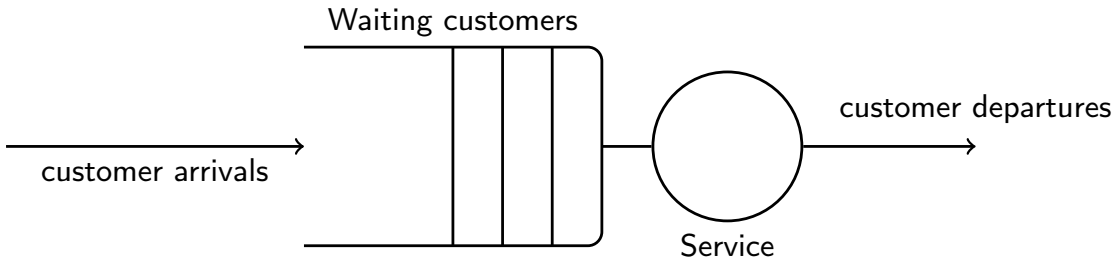
What is a queue?

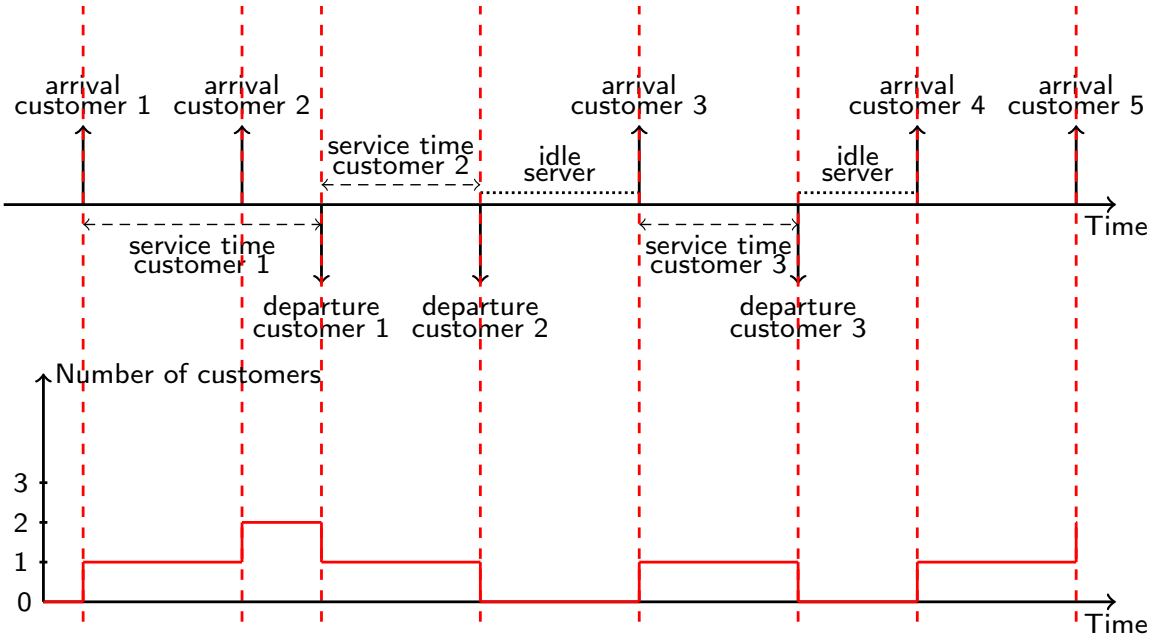
A simple example of a queue

A first simple example



Again let's consider our simple example with one server and an infinite buffer.

A first simple example



Arrivals are represented by up arrows and departures by down arrows. Let's study the evolution of the number of customers in the queue, assuming that at start time the system is empty. When the first customer arrives the number of customers switches to one. When the second customer arrives the first one is still there and the number of customers then switches to two: at this time the server is busy with the first customer, and the second customer takes up the first position in the buffer.
Then the first customer leaves the system so the number of customers goes back to one, and the second customer starts to be served. When the second customer has been served, the system is empty and the server is idle since no new customers have arrived in the meantime. We could go on like that with any further customers.

Mathematical modeling

- The **evolution over time of the number of customers** in the system (waiting or being served) is modeled by a **random process**.
- The **stationary state** of this random process is studied in order to estimate **average performance** (blocking probability, mean delay, mean utilization rate, etc...).

This leads us to think about the mathematical modeling of the system. In what follows what we model is the number of customers in the system. To be more precise the evolution over time of the number of customers in the system is modeled as a random process. A study of the stationary state of this random process is conducted. This makes it possible to evaluate mean performance parameters such as blocking probability, mean delay, or mean resource utilization rate.