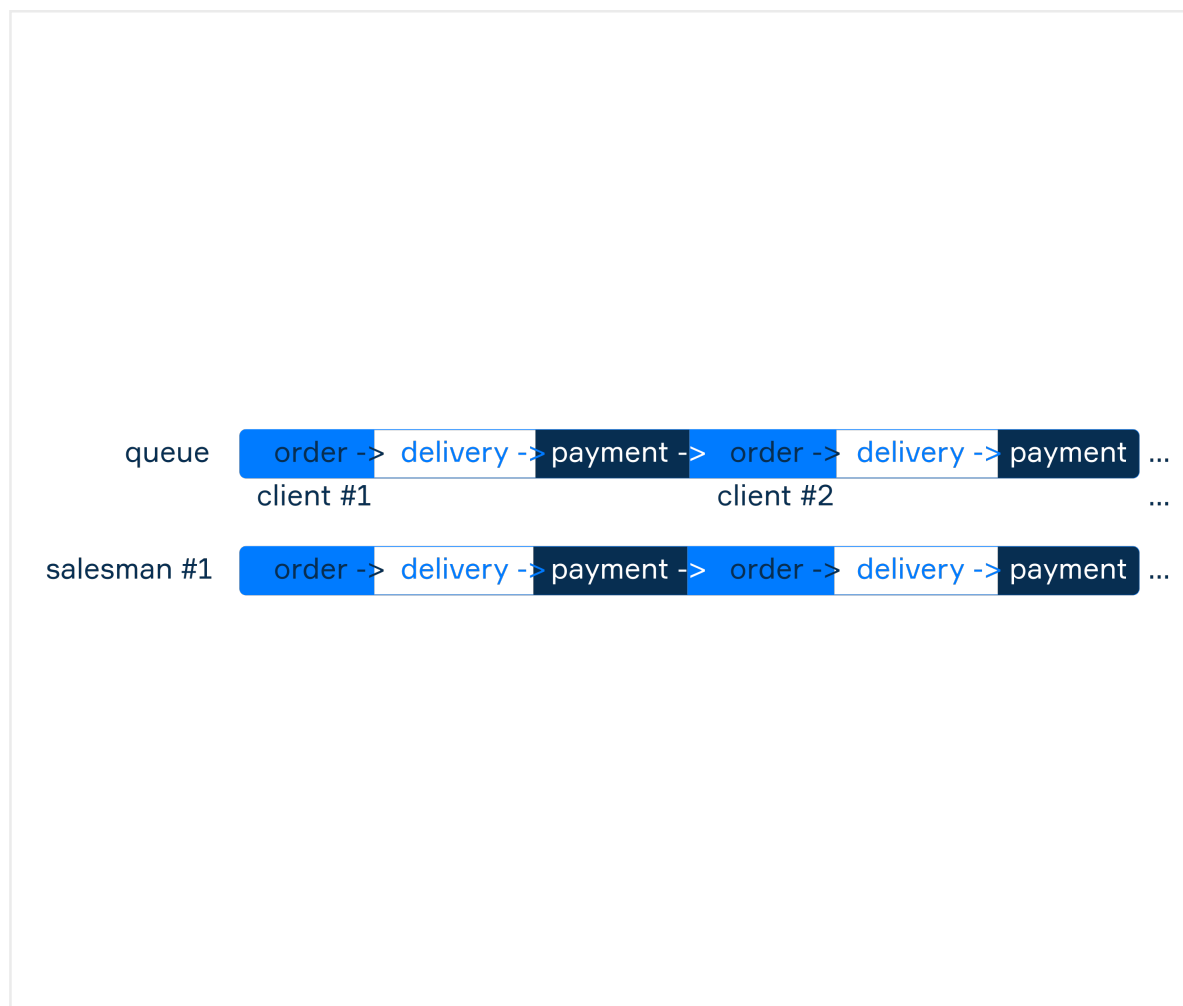


Synchronous, asynchronous, parallel

When we are considering some complex process, let's call it **workflow**, various parts of it may run differently. There are three sorts of workflow executions sequence: synchronous, asynchronous, and parallel.

Synchronous workflow

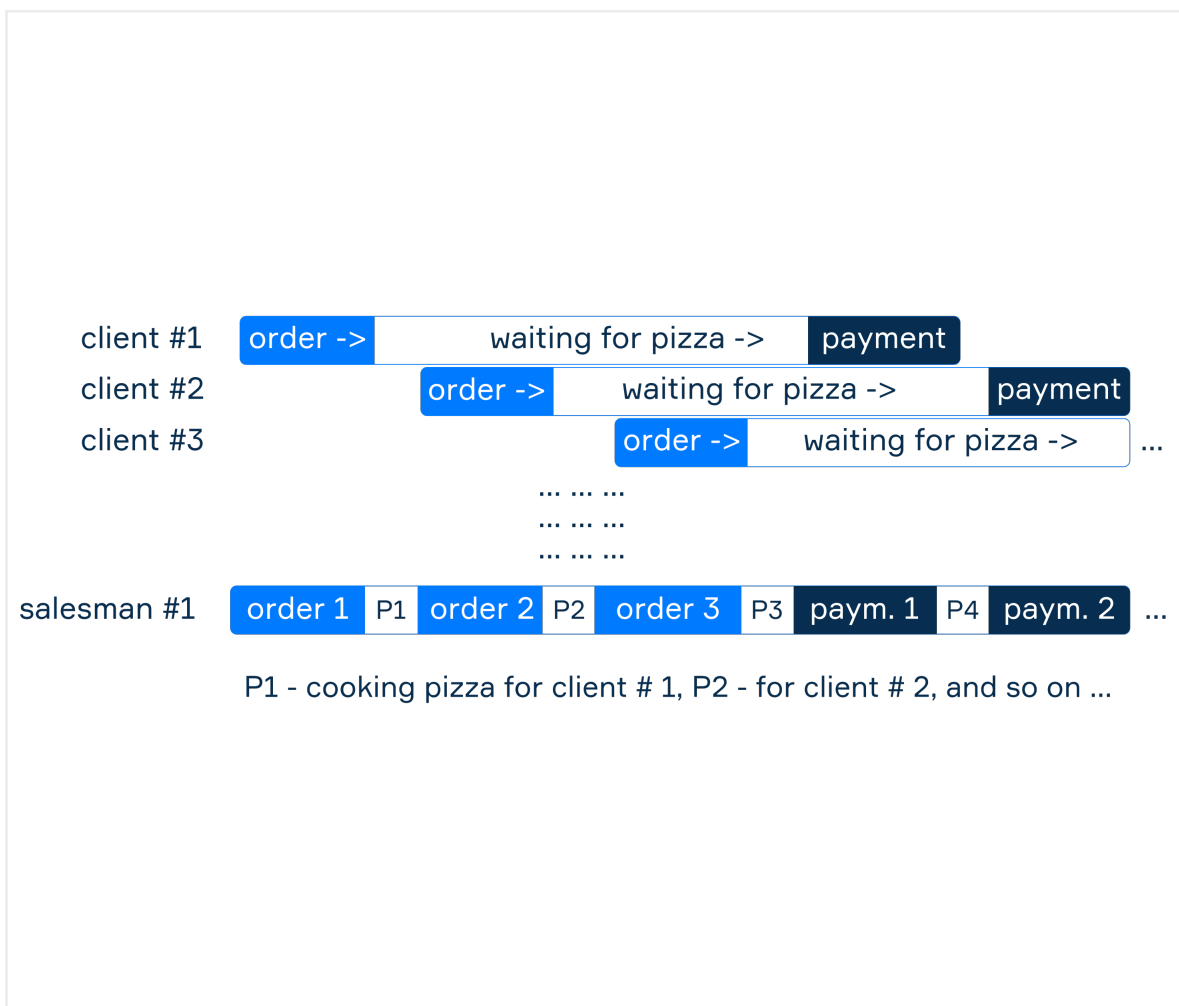
There are many models to manage customer flows. The simplest approach is one shop with one seller. The seller deals with each client from the beginning to the end of each sale *and* performs all the roles from storekeeper to cashier.



When there are many customers at the same time, this approach is very far from perfect as the seller can deal only with one client per time, while others have to wait in line. They serve each client separately one by one which means starting to serve the next client only after finishing with the current. We name this type of action a **synchronous** one.

Asynchronous workflow

Let's imagine our old shop becomes fancier, this is a pizza shop now. After the first client has ordered their pizza, they need to wait for it to be cooked. At this point, the seller leaves the first customer alone for a while, and now the second one can make their order, then the third, and so on.



Our old friend seller can serve several customers simultaneously in overlapping periods. We call such behaviour **asynchronous**.

Parallel processing

As the pizza shop sales are growing, now one worker is not enough for the whole business. So, we should hire several. If each seller has a separate compact oven for preparing exactly one pizza at a time, then we can divide the queue of buyers among the sellers.



Now each of them works independently, and this is a case of **parallel** processing. Each task in parallel processing is running in a continuous period as a whole unit process. Parallel execution is possible only if there is more than one executor.

- Synchronous: one task at a time, the next starts when the current is done.
- Asynchronous: multiple tasks at the same time in overlapping periods, executed by little parts.
- Parallel: multiple or one task split into parts being executed continuously by different executors in parallel.