Efficient simulation of complex queueing systems with the R package queuecomputer

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Simulation efficace des files d'attente complexe avec le paquet R "queuecomputer"

La file d'attente à une boulangerie

Simple example (input)

```
library(queuecomputer)
library(dplyr)

n_customers <- 40
arrivals <- rexp(n_customers, 3.1) %>% cumsum()
service <- rexp(n_customers, 1)

n_servers <- 3
departures <- queue_step(arrivals, service, n_servers)

#n_servers <- as.server.stepfun(10, c(2,4))
```

Simple example (output)

```
head(arrivals, 3)
```

```
## [1] 0.2436070 0.6247821 0.6717843
```

```
head(service, 3)
```

```
## [1] 1.079881 1.028247 1.292262
```

```
head(departures$departures, 3)
```

```
## [1] 1.323488 1.653029 1.964046
```

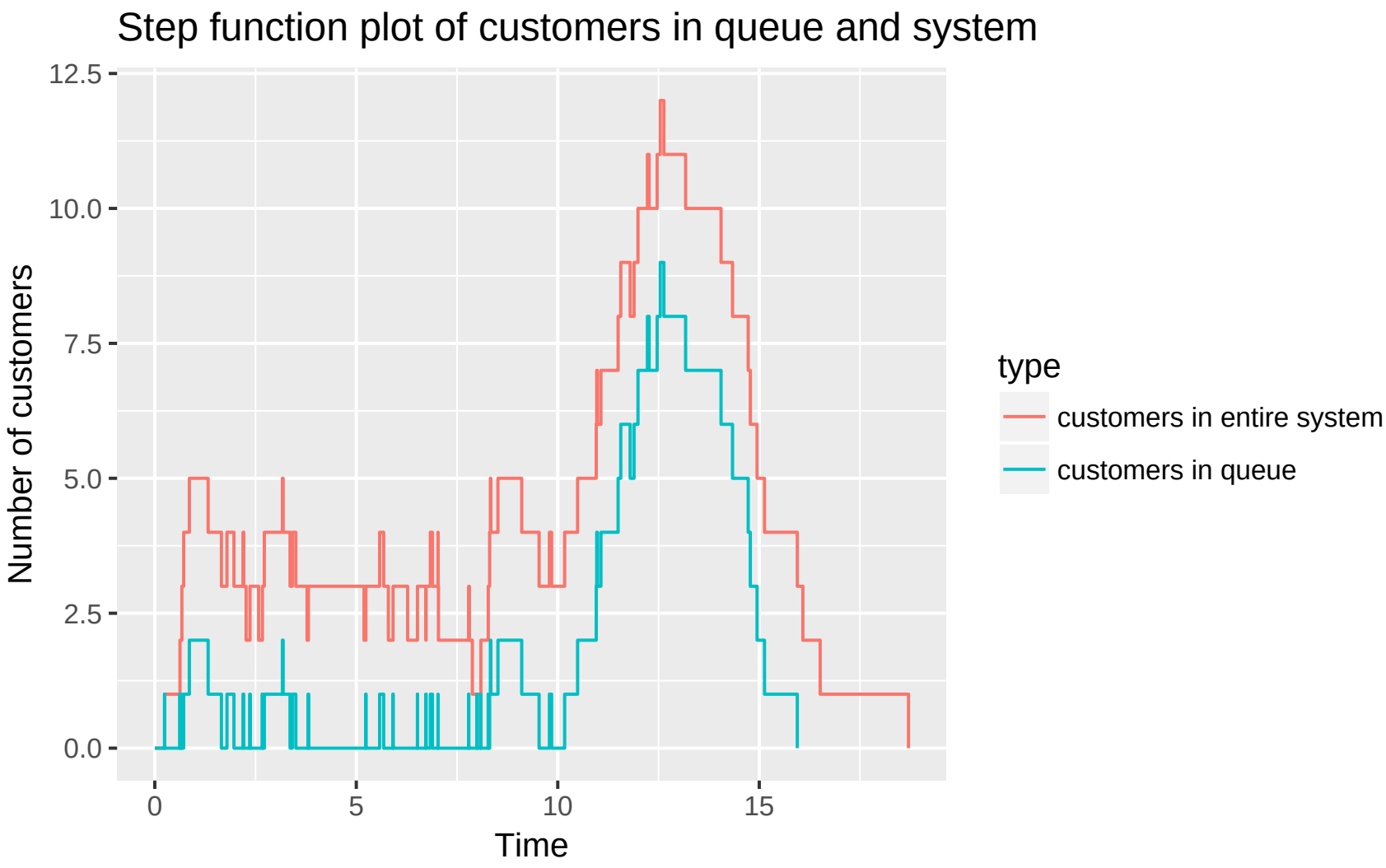
Summary

```
summary(departures)
```

```
## Total customers:
##  40
## Missed customers:
##  0
## Mean waiting time:
##  0.783
## Mean response time:
##  1.98
## Utilization factor:
##  0.85
## Mean queue length:
##  1.96
## Mean number of customers in system:
##  4.22
```

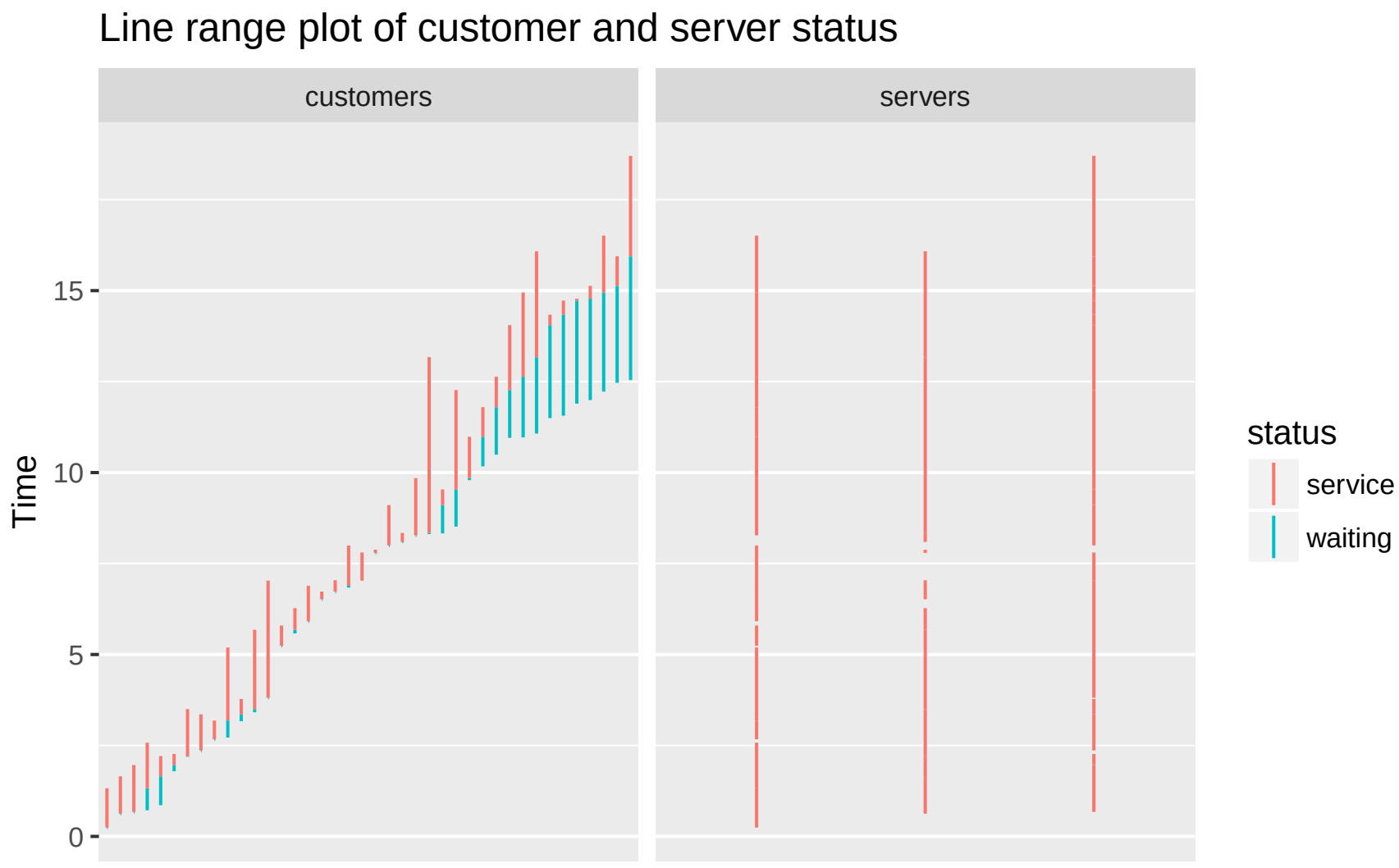
Plot of number of customers in queue

```
plot(departures, which = 4)
```



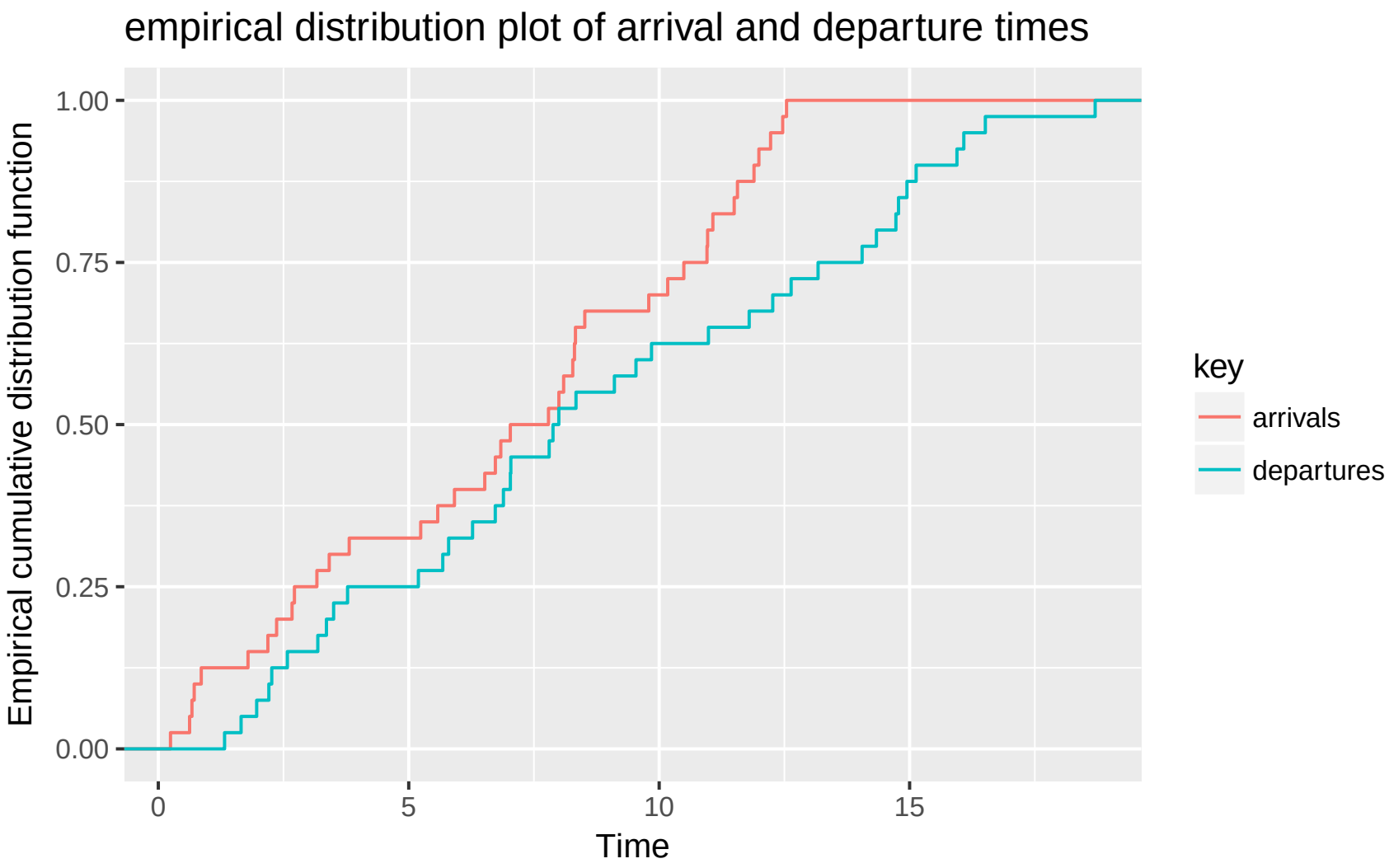
Plot of customer status

```
plot(departures, which = 5)
```

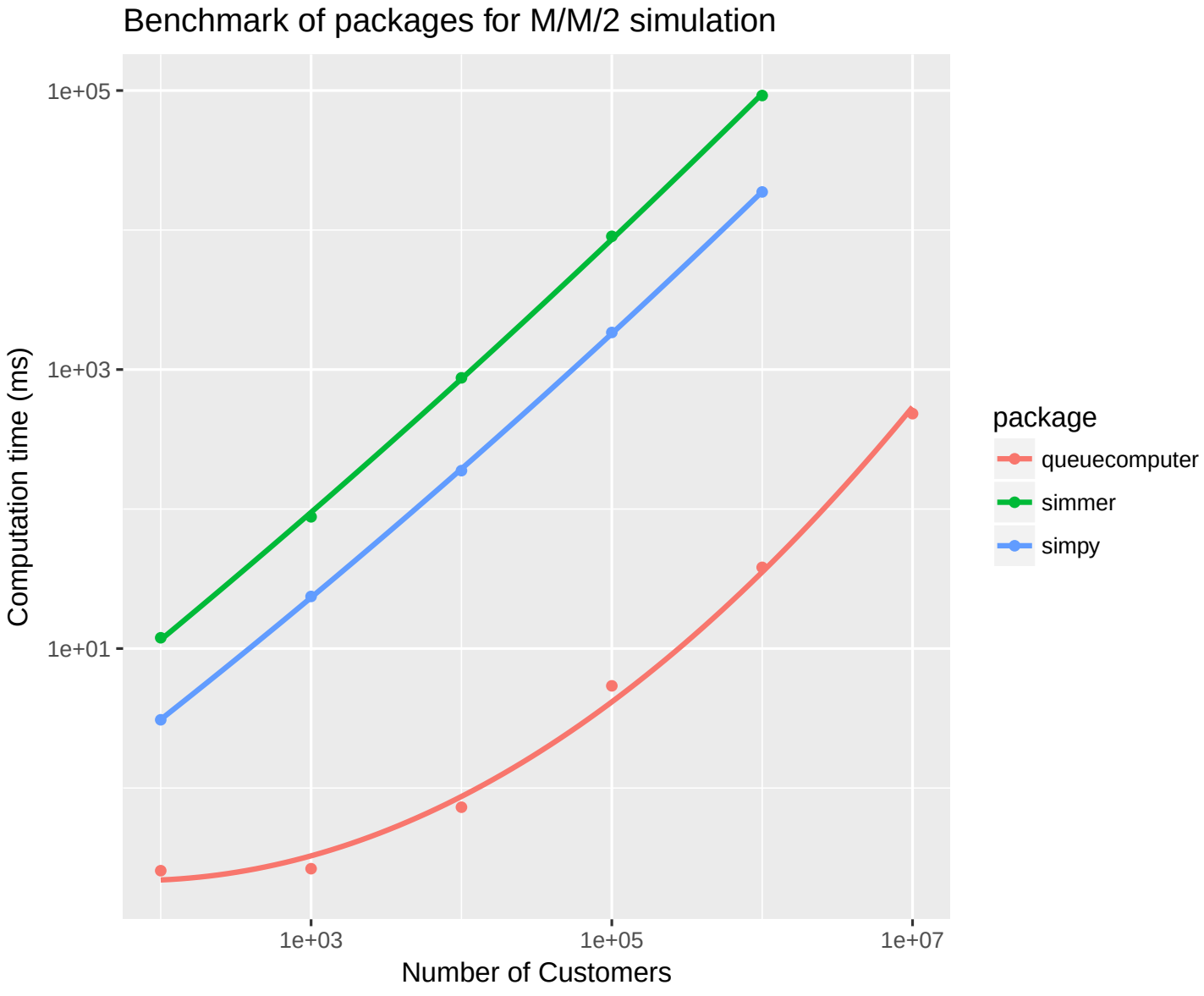


Empirical distribution of arrival and departure times

```
plot(departures, which = 6)
```



Temps de calcul / Computation time



Airport terminal

```
R> Passenger_df

## # A tibble: 25,012 × 7
##                    ID FlightNo arrival  route_imm arrive_imm service_imm
##                 <chr>   <fctr>   <dbl>     <fctr>      <dbl>       <dbl>
## 1     Cordell, Megan   ABI481  564.85     manual   566.8549  0.29075606
## 2    Matheson, Dylan   ABI481  564.85     manual   566.8532  0.15927226
## 3      Avitia, Renee   ABI481  564.85     manual   567.2014  0.22450319
## 4       Woods, Tyrel   ABI481  564.85 smart gate   566.8377  0.18222445
## 5   Pope, Christiana   ABI481  564.85 smart gate   566.0994  0.09031344
## 6   Espinoza, Mariah   ABI481  564.85 smart gate   566.8928  0.43900281
## 7  Pacheco, Charleen   ABI481  564.85     manual   567.5558  0.12917143
## 8    Harmon, Brendan   ABI481  564.85 smart gate   566.3114  0.30565961
## 9   William, Gerardo   ABI481  564.85 smart gate   567.2563  0.31975687
## 10       Hood, Colen   ABI481  564.85 smart gate   567.2181  0.33944458
## # ... with 25,002 more rows, and 1 more variables: bag_time <dbl>
```

Airport terminal

```
server_df
```

```
## # A tibble: 2 × 2
##    route_imm    servers
##        <chr>     <list>
## 1 smart gate  <dbl [1]>
## 2     manual <S3: list>
```

```
Passenger_df %>%
  left_join(server_df) %>%
  group_by(route_imm) %>%
  mutate(
    departures = queue(
      arrive_imm, service_imm, servers[[1]])
    )
```

Merci!

```
finish_presentation()
```

```
## [1] "Merci!"
```