Car Wash Station Simulation

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```
library(simmer)
library(simmer.plot)
```

```
## Loading required package: ggplot2
```

```
NUM_MACHINES <- 2  # Number of machines in the carwash
WASHTIME <- 5      # Minutes it takes to clean a car
T_INTER <- 7       # Create a car every ~7 minutes
SIM_TIME <- 60     # Simulation time in minutes

# setup
set.seed(42)
env <- simmer()
```

```
car <- trajectory() %>%
  log_("arrives at the carwash") %>%
  seize("wash", 1) %>%
  log_("enters the carwash") %>%
  timeout(WASHTIME) %>%
  set_attribute("dirt_removed", function() sample(50:99, 1)) %>%
  log_(function(attr)
    paste0(attr["dirt_removed"], "% of dirt was removed")) %>%
  release("wash", 1) %>%
  log_("leaves the carwash")
```

```
env %>%
  add_resource("wash", NUM_MACHINES) %>%
  # feed the trajectory with 4 initial cars
  add_generator("car_initial", car, at(rep(0, 4))) %>%
  # new cars approx. every T_INTER minutes
  add_generator("car", car, function() sample((T_INTER-2):(T_INTER+2), 1)) %>%
  # start the simulation
  run(SIM_TIME)
```

```
## 0: car_initial0: arrives at the carwash
## 0: car_initial0: enters the carwash
## 0: car_initial1: arrives at the carwash
## 0: car_initial1: enters the carwash
## 0: car_initial2: arrives at the carwash
## 0: car_initial3: arrives at the carwash
## 5: car_initial0: 96% of dirt was removed
## 5: car_initial1: 64% of dirt was removed
## 5: car_initial0: leaves the carwash
## 5: car_initial1: leaves the carwash
## 5: car_initial2: enters the carwash
## 5: car_initial3: enters the carwash
## 9: car0: arrives at the carwash
## 10: car_initial2: 82% of dirt was removed
## 10: car_initial3: 75% of dirt was removed
```

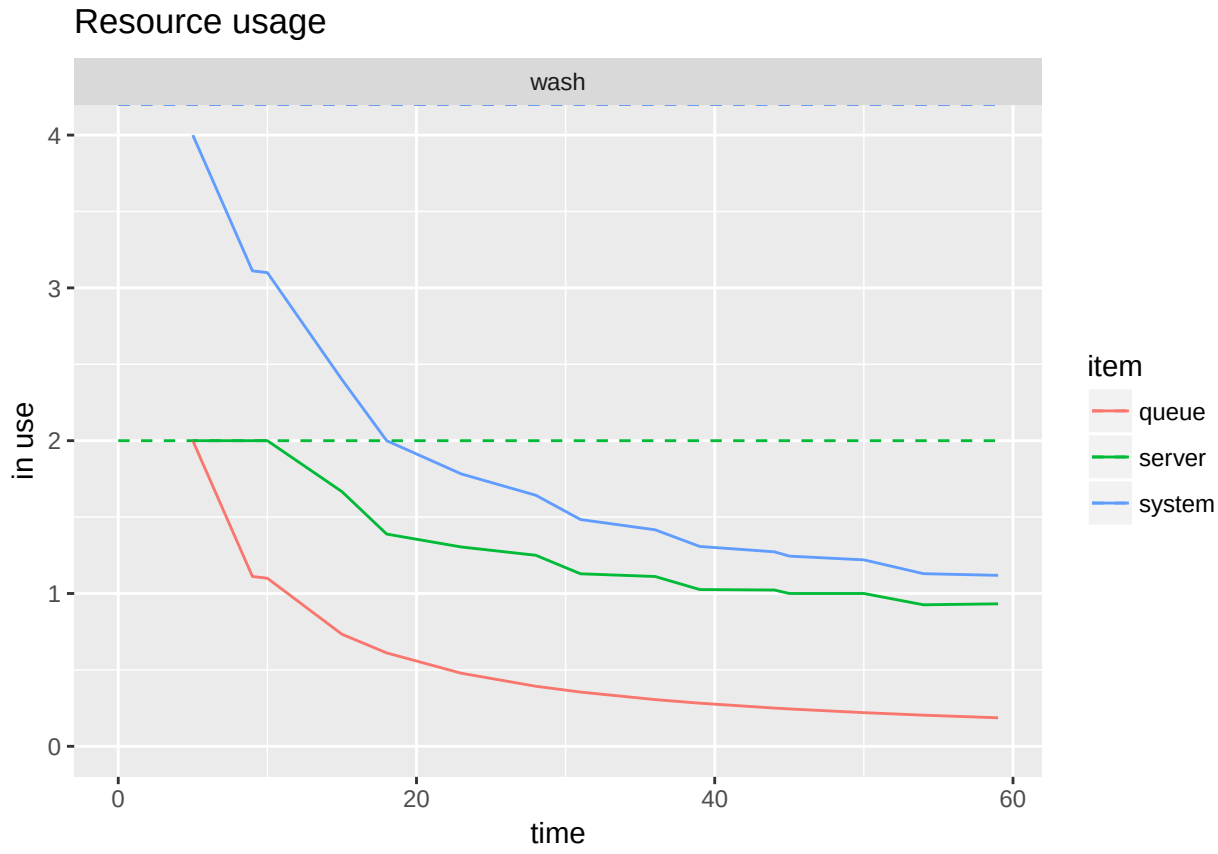
```
## 10: car_initial2: leaves the carwash
## 10: car_initial3: leaves the carwash
## 10: car0: enters the carwash
## 15: car0: 86% of dirt was removed
## 15: car0: leaves the carwash
## 18: car1: arrives at the carwash
## 18: car1: enters the carwash
## 23: car1: 85% of dirt was removed
## 23: car1: leaves the carwash
## 23: car2: arrives at the carwash
## 23: car2: enters the carwash
## 28: car2: 72% of dirt was removed
## 28: car2: leaves the carwash
## 31: car3: arrives at the carwash
## 31: car3: enters the carwash
## 36: car3: 96% of dirt was removed
## 36: car3: leaves the carwash
## 39: car4: arrives at the carwash
## 39: car4: enters the carwash
## 44: car4: 73% of dirt was removed
## 44: car4: leaves the carwash
## 45: car5: arrives at the carwash
## 45: car5: enters the carwash
## 50: car5: 98% of dirt was removed
## 50: car5: leaves the carwash
## 54: car6: arrives at the carwash
## 54: car6: enters the carwash
## 59: car6: 78% of dirt was removed
## 59: car6: leaves the carwash
## 59: car7: arrives at the carwash
## 59: car7: enters the carwash
```

```
## simmer environment: anonymous | now: 60 | next: 64
## { Resource: wash | monitored: 1 | server status: 1(2) | queue status: 0(Inf) }
## { Generator: car_initial | monitored: 1 | n_generated: 4 }
## { Generator: car | monitored: 1 | n_generated: 9 }
```

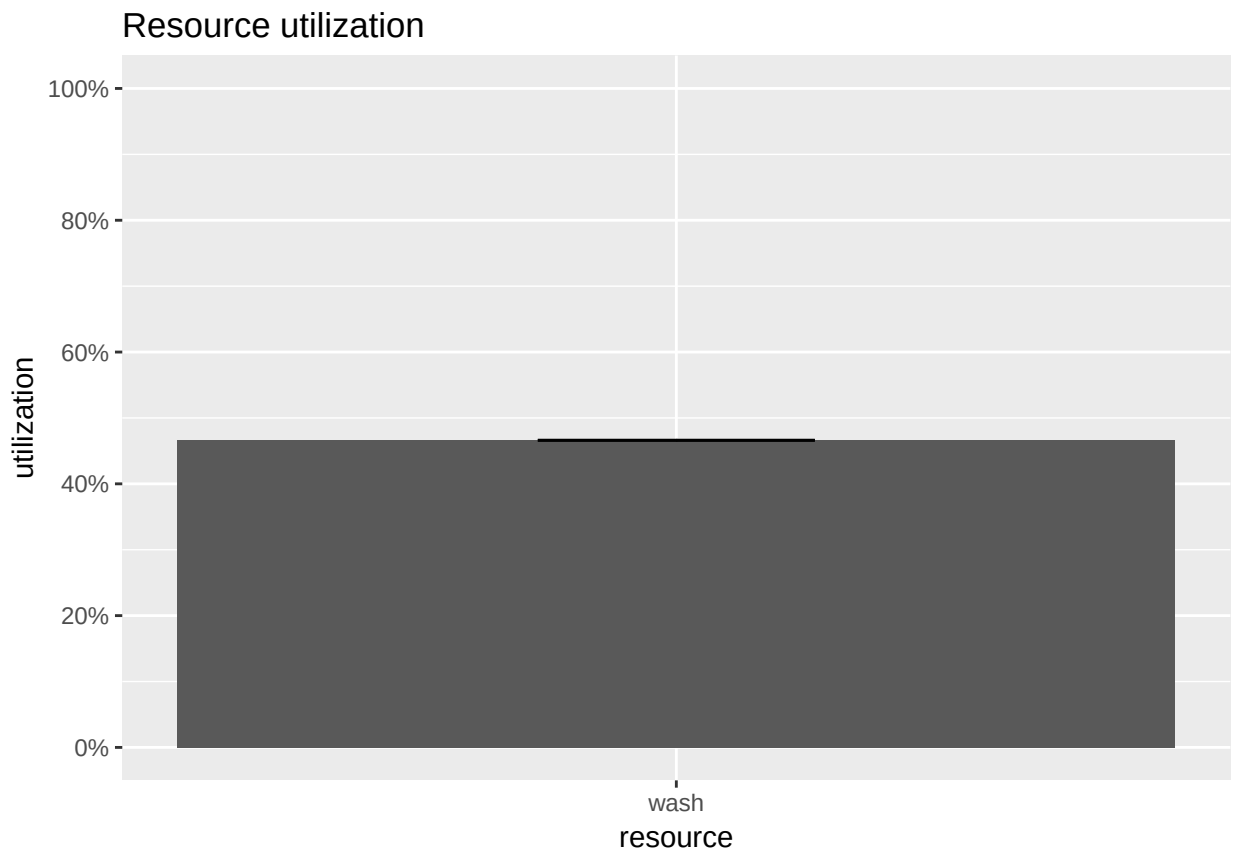
Plot Things

```
plot(env, what = "resources", metric = "usage", c("wash"))
```

```
## Warning: Removed 12 rows containing missing values (geom_path).
```

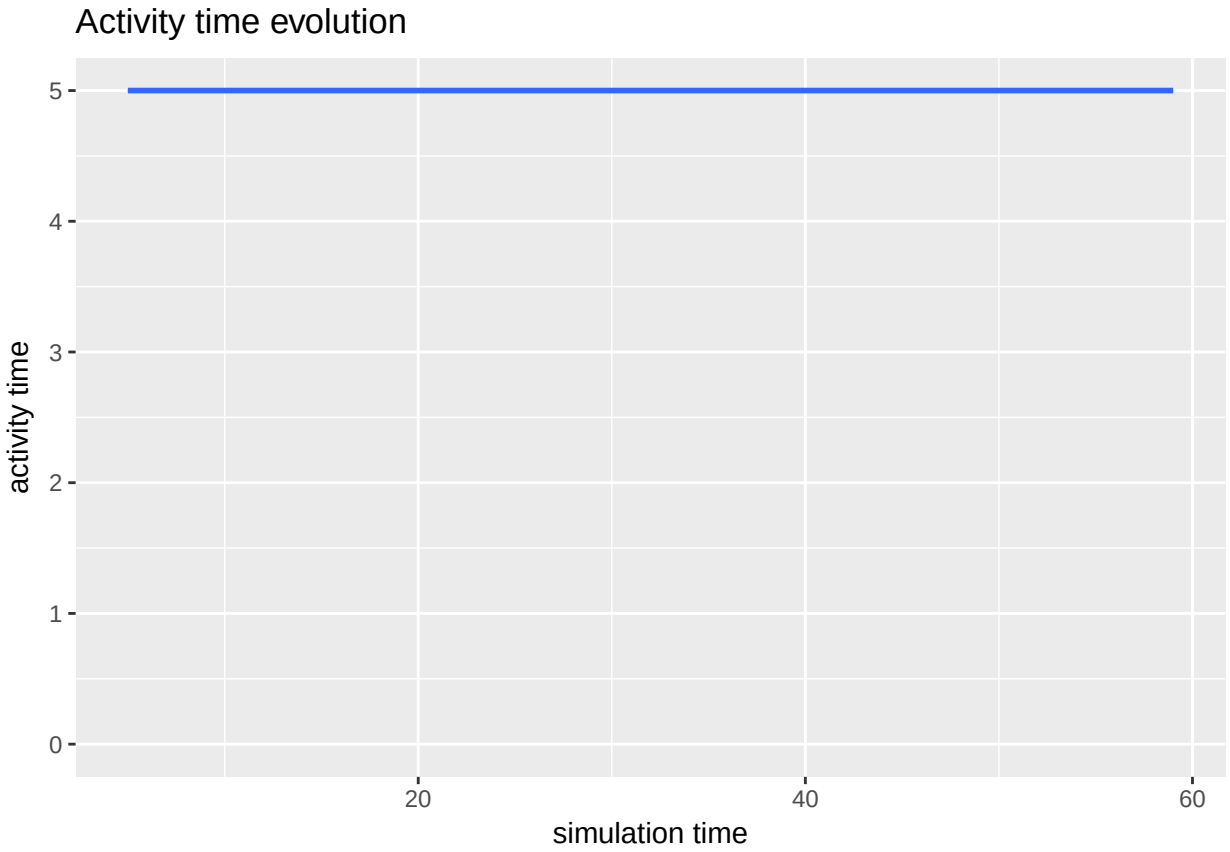



```
plot(env, what = "resources", metric = "utilization", c("wash"))
```



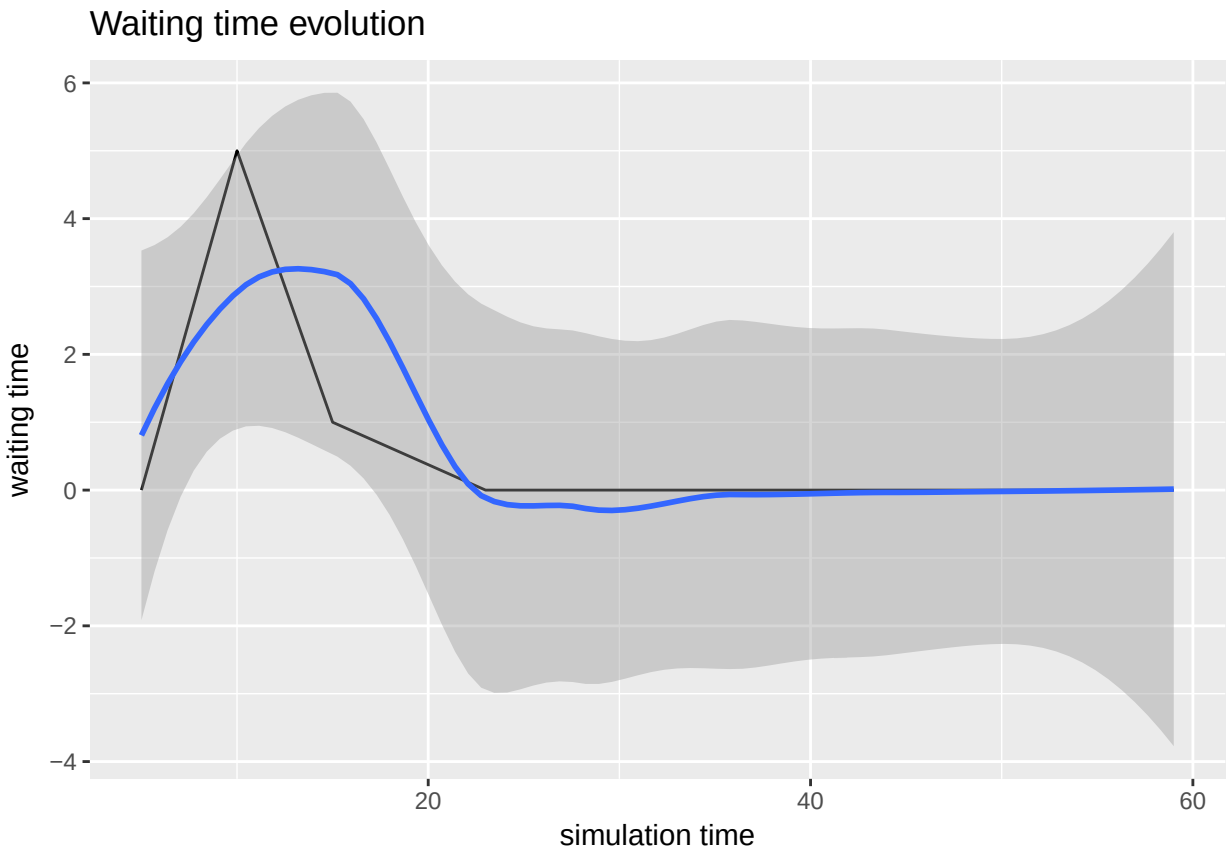

```
plot(env, what = "arrivals", metric = "activity_time")
```

```
## `geom_smooth()` using method = 'loess'
```



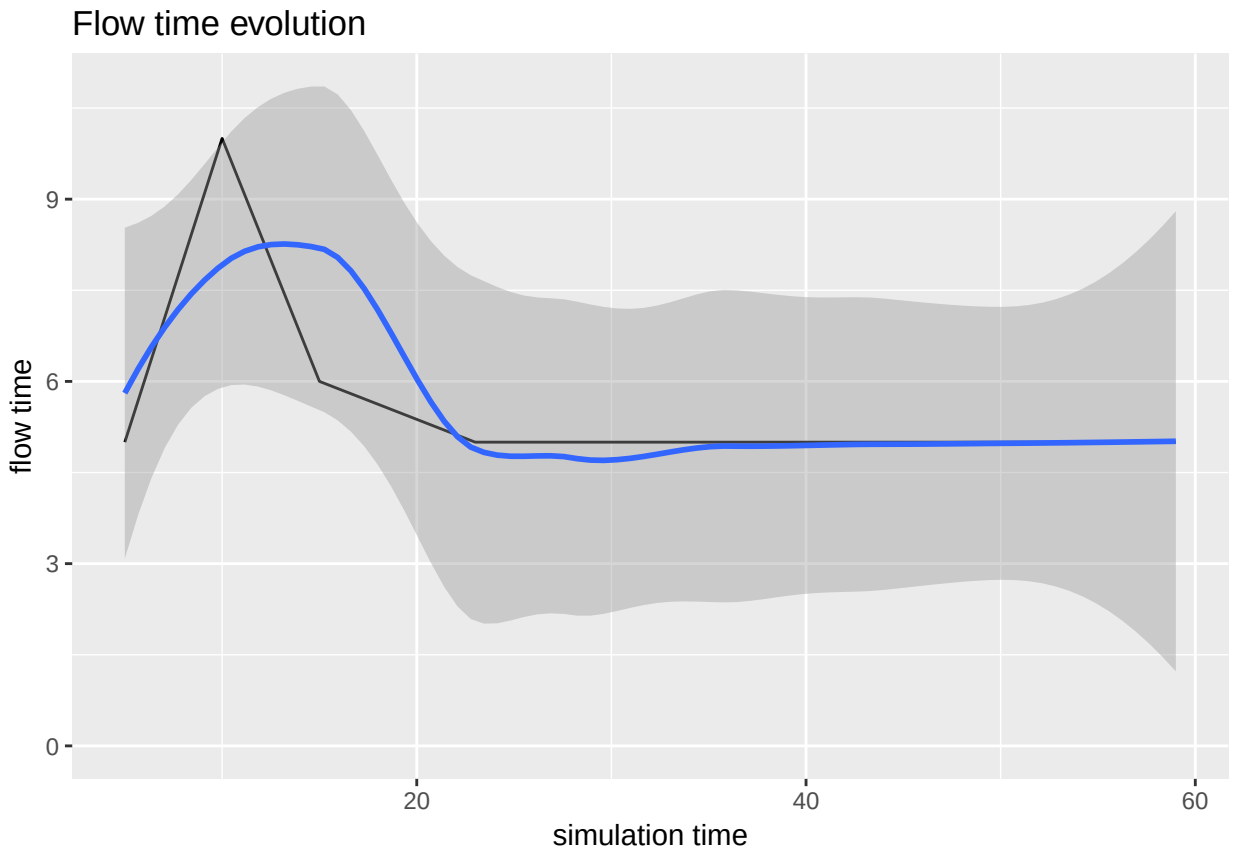

```
plot(env, what = "arrivals", metric = "waiting_time")
```

```
## `geom_smooth()` using method = 'loess'
```




```
plot(env, what = "arrivals", metric = "flow_time")
```

```
## `geom_smooth()` using method = 'loess'
```


Flow time evolution
flow time
9
6
3
0
20
40
60
simulation time