

Marry Christmas!
Frohe Weihnachten!
С Рождеством!

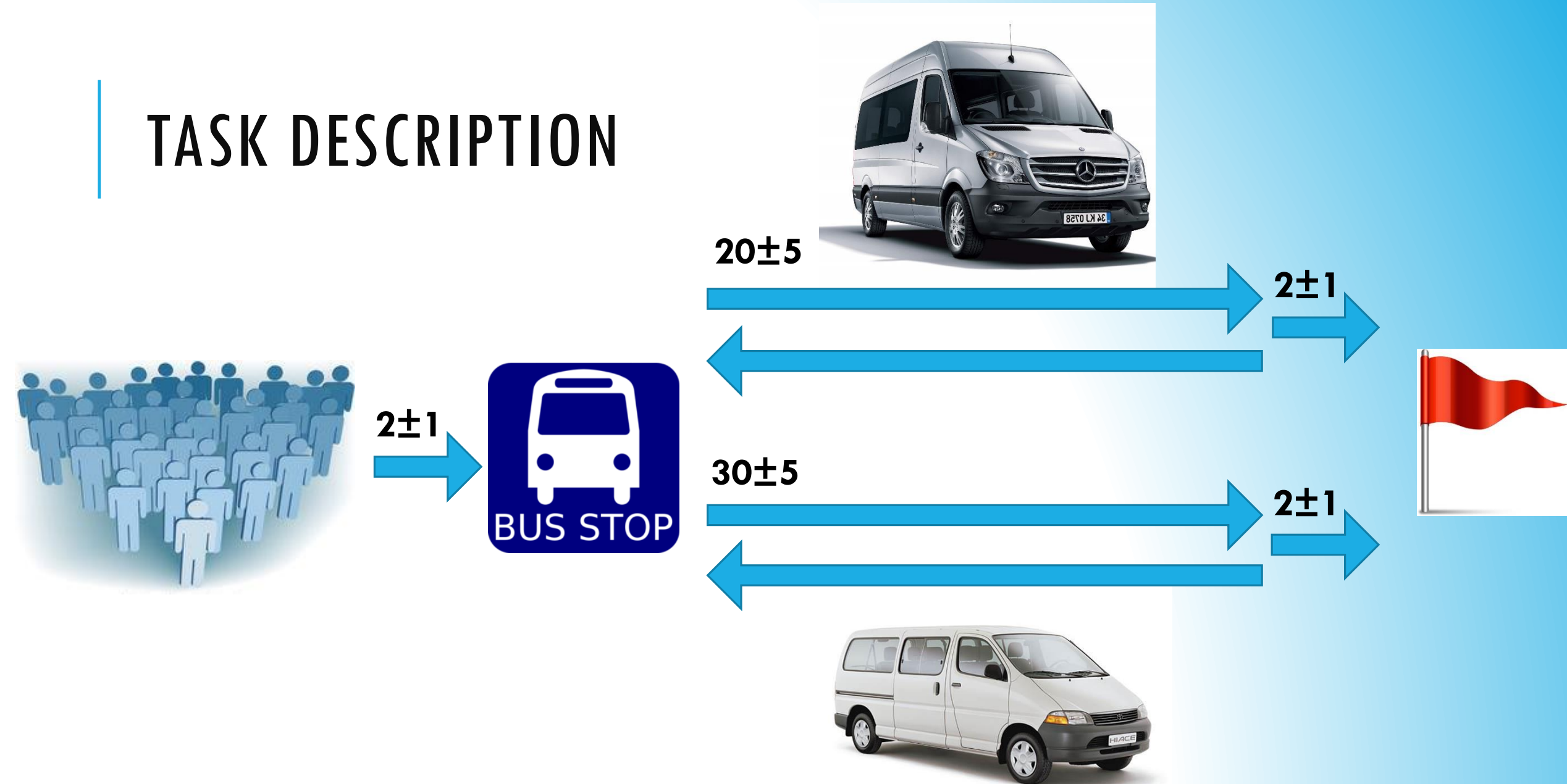
BUS SIMULATION

by Martin Weber

TASK DESCRIPTION

- 1 x **bus stop** with a **capacity of 30** people
- 2 x **busses** (bus A & bus B) with **n number of seats**
- **passengers arrive** at bus stop in a rhythm of **2 ± 1 min**
- passengers **prefer** to enter **bus A**
- **bus A** takes **20 ± 5 min** for the ride
- **bus B** takes **30 ± 5 min** for the ride
- time for **leaving** the bus is **2 ± 1 min**
- **ticket is 2** (Rubel) per passenger
- **busses drive 10 h per day**

TASK DESCRIPTION



every time is in minute

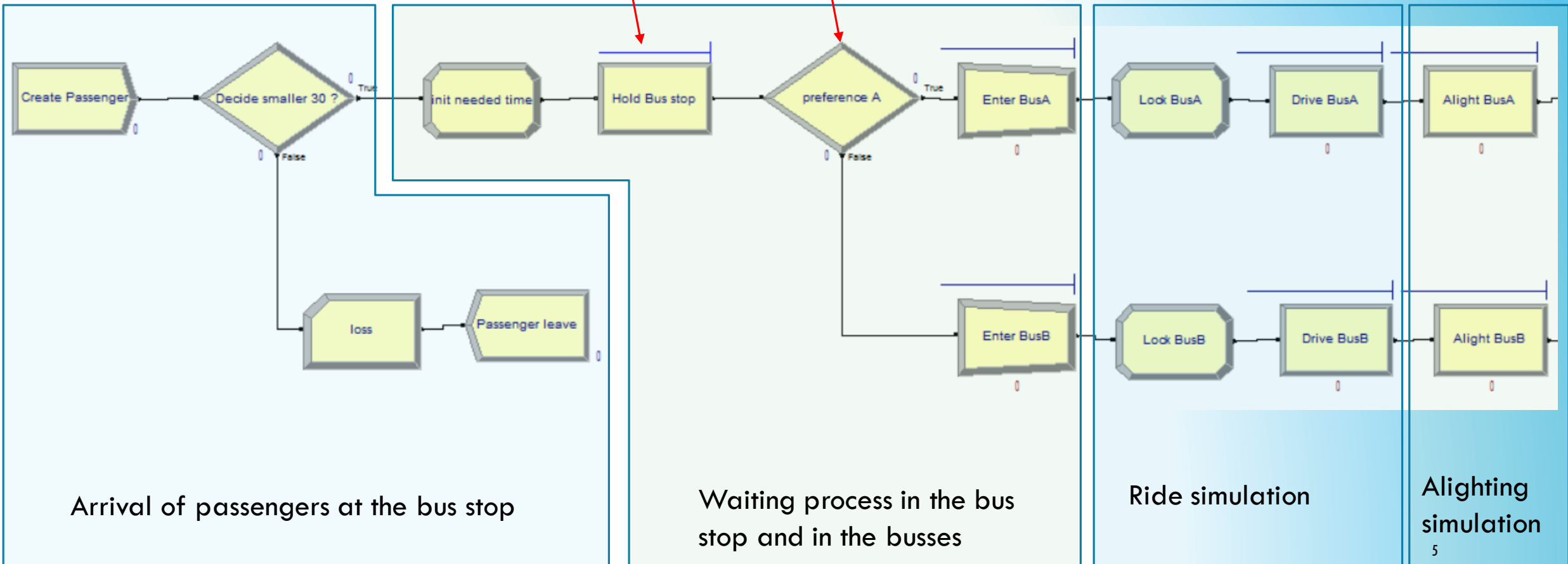
SIMULATION TASK

- Find the **average waiting time** of the passengers according to the number of seats.
- Get the **minimum waiting time** according to the number of seats.
- Get the **gain per day** according to the number of seats.
- n goes from 10 to 25.

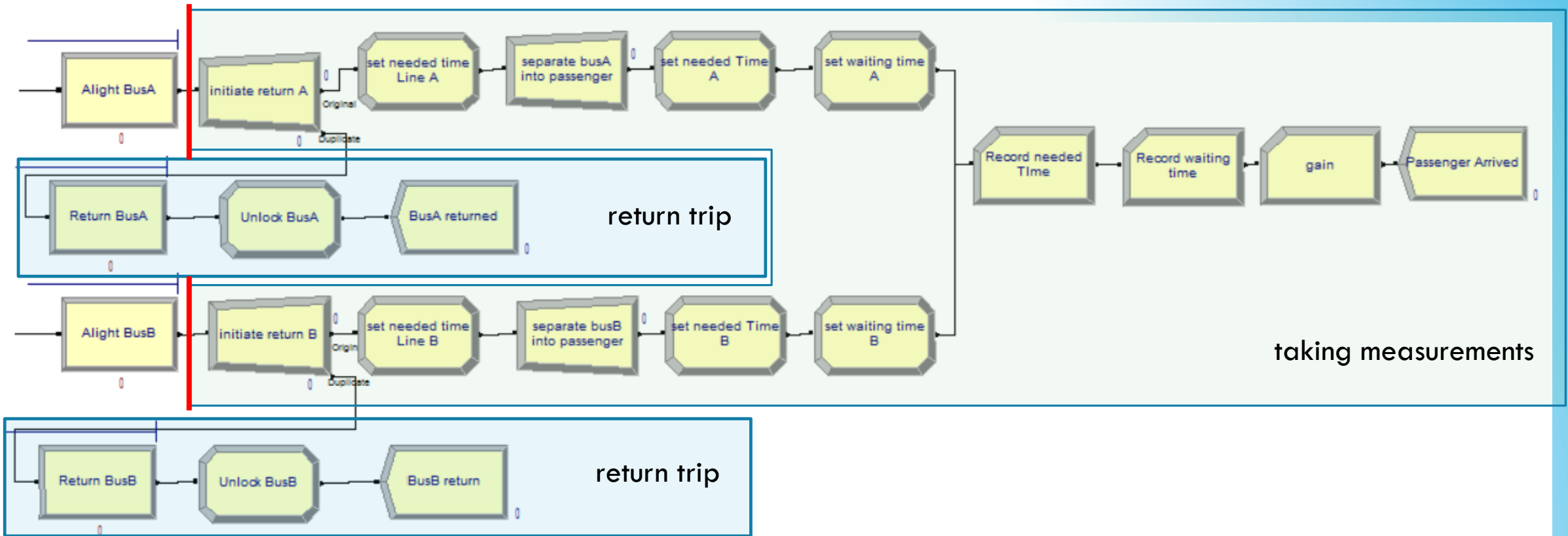
ARENA SIMULATION PART 1/2

Passing condition:
 $\text{BusALock} == 0 \mid \mid \text{BusBLock} == 0$

IF condition:
 $\text{BusALock} == 0$



ARENA SIMULATION PART 2/2



SIMULATION PARAMETERS

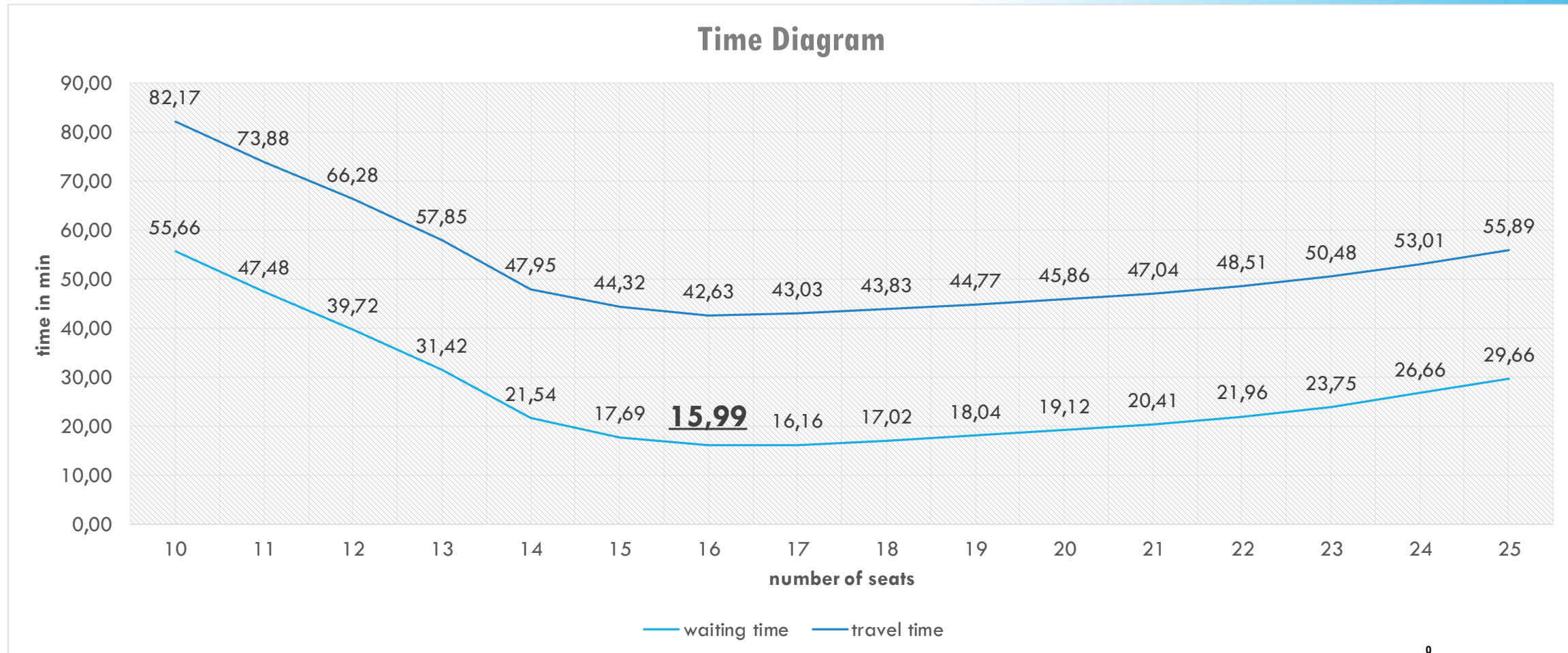
Number of Replications: 100

Replication Length: 10 hours

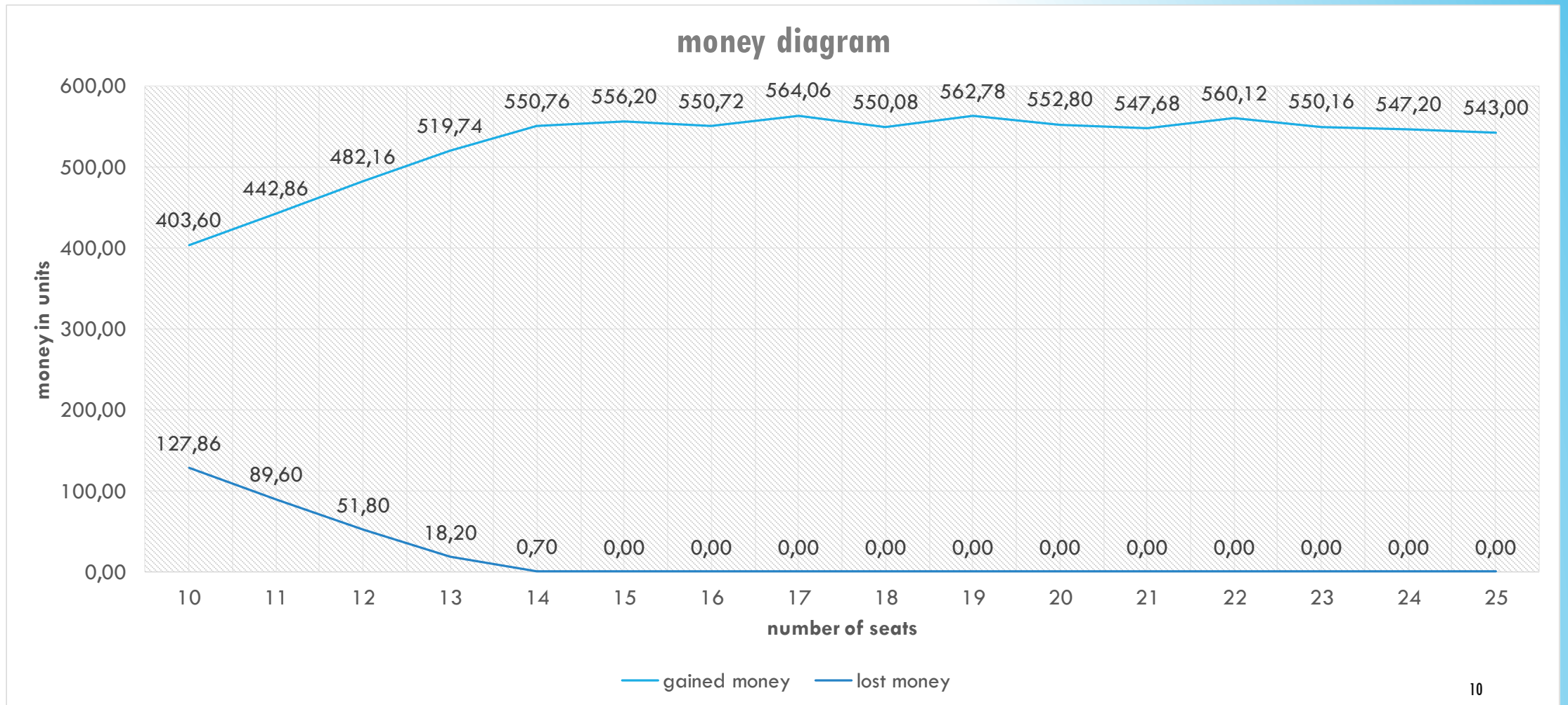
Variable n: 10 ... 25 (number of seats)

Number of seats	Waiting time in Queue	Travel time	Gained money	Lost money
10	55.6573	82.1657	403.60	127.86
11	47.4844	73.8795	442.86	89.36
12	39.7159	66.2807	482.16	51.80
13	31.4188	57.8485	519.74	18.20
14	21.5418	47.9501	550.76	0.70
15	17.6895	44.3209	556.20	0.00
16	15.9864	42.6264	550.72	0.00
17	16.1624	43.0317	564.06	0.00
18	17.0232	43.8292	550.08	0.00
19	18.0436	44.7733	562.78	0.00
20	19.1165	45.8627	552.80	0.00
21	20.4079	47.0427	547.68	0.00
22	21.9602	48.5070	560.12	0.00
23	23.7515	50.4792	550.16	0.00
24	26.6550	53.0059	547.20	0.00
25	29.6634	55.8853	543.00	0.00

RESULTS

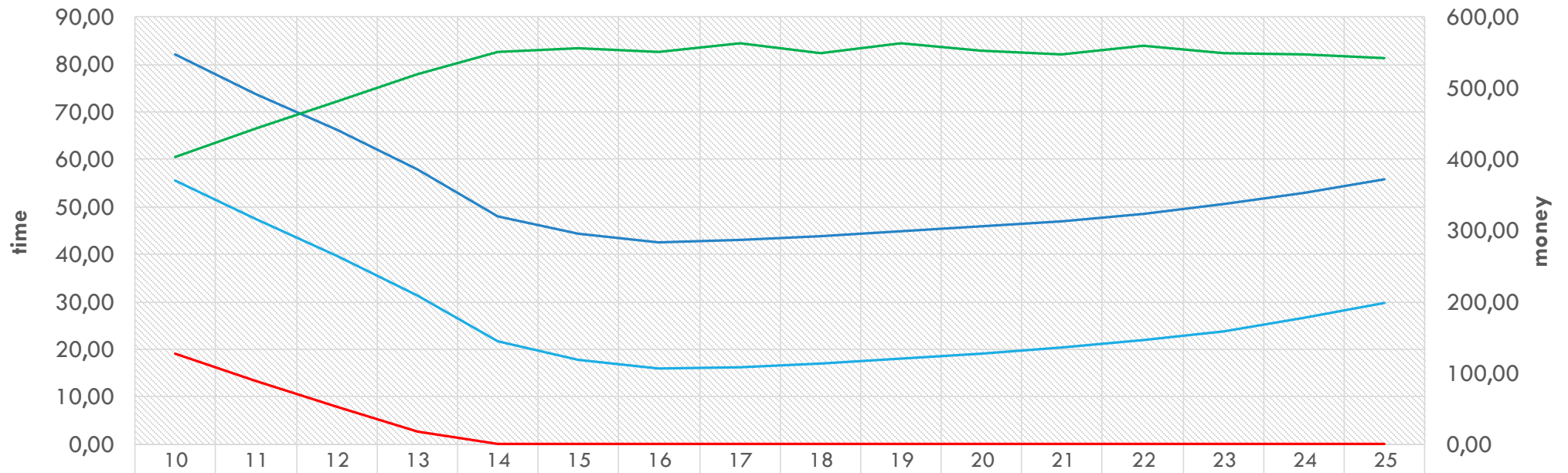


RESULTS



RESULTS

Time and Money Diagram



— waiting time — travel time — gained money — lost money

ERROR ANALYSIS

- Whenever simulations stops in one Replication, passengers who are currently in a bus won't be counted.
- affects every replication
- does not change the rough behavior

SUMMARY & CONCLUSION

- **Best result** is reached at a bus with **16 seats** according to the waiting time (about **16min**).
- Also a bus with **15 seats** reaches quite good results (about **17.5min**)
- Maybe a bus with **14 seats** also OK (about **21.5min**)
- behavior of cash flow is in every case almost the same (about 550 without loss)