# Computational Method Winter Semester 2014/2015

All students who want to make the lecture „Rechnergestützte Netzanalyse“ as computational method need to do the following task. The model should be sent to bing.bai@uni-due.de together with the completed scan form (or directly submit the printed form in SK 222) before **April. 30th 2015**.

The name of zip-file should be:

[Your Name, Your Student ID Number].

## Form:

You need to complete all information such as your name, study number, Email address and so on. Please don’t fill in the note in the form.

**Attention:**

**a. If your exam is failed, the hands-on project of computational method is invalid.**

**b. If you want to change your score in the following semester (summer semester for supplementary examination), please also finish the following hands-on project. There is just one hands-on project every year for its corresponding exam.**

A factory processes three different types of products. After the transportation and packaging, these products will be sent to warehouse for storage. Seven types of MUs are needed: box 1, box 2, box 3, product 1, product 2, product 3 and truck (product 1 must be taken into box 1; product 2 must be taken into box 2; product 3 must be taken into box 3).

For products transportation: three different types of products will be entering the production lines every 2 minutes with a cyclic sequence from three entrances (sequence of all incoming products should be 1, 2 and 3 respectively with 2 pieces on table). The three different types of products will be transported through a worker to their corresponding exits. After that all of the products will be packed in a Frame:

**Frame: Packing**

As the picture showed, there is one turn table can follow the packing strategy for the three types of products:

| Product | Product 1 | Product 2 | Product 3 |
|---|---|---|---|
| **Angel** | 90 | 180 | 270 |

Later there is a truck waiting in a loading station for sending all these three products to assembly stations (please just set 1 truck in the 20$^{st}$ minute waiting at the loading station). The distance between the loading station and unloading station is 10 km (after the delivery the truck must return back to the loading station for following tasks). (Unloading station is in position 7000m)

At the same time, three different types of boxes arrive in the assembly stations with a negative exponential distribution every 10 minutes in cyclic sequence (the sequence of the incoming boxes should be 1, 2 and 3 respectively with 1 piece in table). The assembly stations can automatically place the products in the box. Only one product can be placed in a box. The capacity of the assembly machine is one box at a time. The processing time of the assembly station is 1 minute per box. But this assembly machine is always broken. In case of a breakdown, a separate worker is assigned for repairing the assembly machine. The break of the assembly machines are:

| | Availability | MTTR |
|---|---|---|
| **Assembly Station 1** | 70% | 30 Sec. |
| **Assembly Station 2** | 80% | 20 Sec. |
| **Assembly Station 3** | 90% | 10 Sec. |

Finally, the products will be sent through a turntable from their corresponding assembly stations to their corresponding warehouses (according to their corresponding sensors).

<u>You can define the name and color for different items (please don't forget to change the name in the code which you have defined.)</u>

**Please:**

1. Build a model of this factory and run the simulation for 24 hours.
2. Use the Sankey diagram to show the material flow of the products and boxes.
3. Please set all processing time of place buffer as 0.
4. The setting of the truck is x:3 and y:3
5. Dimension of warehouse is: x:100 and y:100.
6. The Speed of the truck should be 100 m/s.
7. Distance of sensors are: Position 50 m for each warehouse.
8. Please answer the following answers.

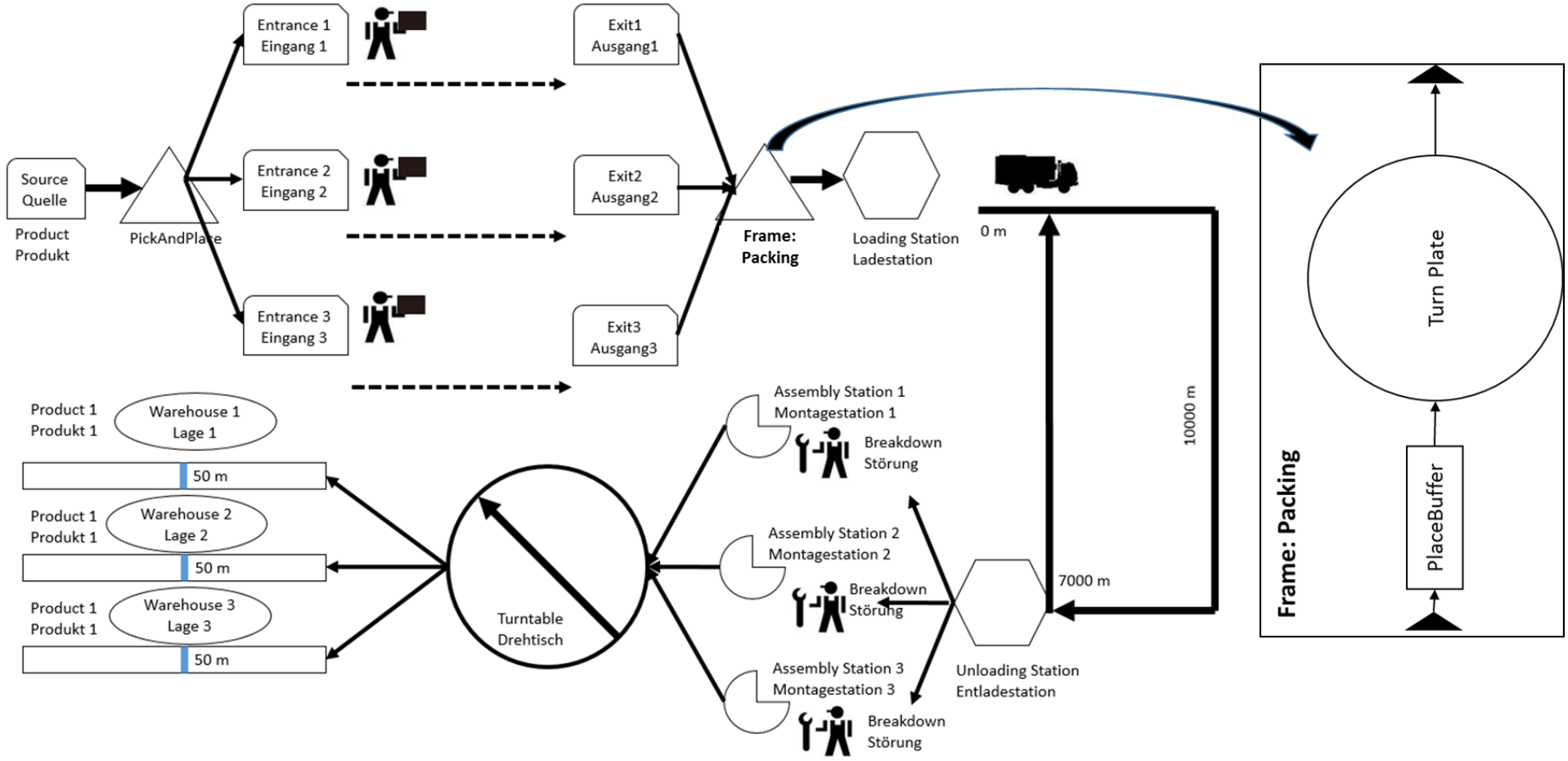
1. Please theck the turn palet with help of sankey diagramm. Which product has the higher throughput?

2. What are the failed time of the three assembly machines? Which one has the highest “waiting time”?

3. Please open the three warehouses finding the “relative empty”. Which warehouse has the highest “relative empty”?

4. If there are 3 workers for taking the three products . How many products will be stored in warehouses? How many products will be increased?

5. If there are three workers for repairing of the three assembly machines. How many products will be stored in warehouses? How many products will be increased?


Source
Quelle
Product
Produkt
PickAndPlace
Entrance 1
Eingang 1
Entrance 2
Eingang 2
Entrance 3
Eingang 3
Exit1
Ausgang1
Exit2
Ausgang2
Exit3
Ausgang3
Frame:
Packing
Loading Station
Ladestation
0 m
10000 m
7000 m
Unloading Station
Entladestation
Assembly Station 1
Montagestation 1
Breakdown
Störung
Assembly Station 2
Montagestation 2
Breakdown
Störung
Assembly Station 3
Montagestation 3
Breakdown
Störung
Turntable
Drehtisch
Product 1
Produkt 1
Warehouse 1
Lage 1
50 m
Product 1
Produkt 1
Warehouse 2
Lage 2
50 m
Product 1
Produkt 1
Warehouse 3
Lage 3
50 m
Frame: Packing
PlaceBuffer
Turn Plate