

Fault Tolerance

(7 points)

This homework covers the concepts regarding the fault tolerance within distributed systems. Please investigate the theoretical background in details.

The homework must be uploaded to OLAT until Monday, **28.05.2018**, at **08:00**, and will be evaluated on 29th May! The tutorial with hints will be taken on Tuesday, 22.05.2018.

Assignment:

1. Theoretical background

- a) Compare the following systems *A* and *B* in terms of *availability*! System *A* fails three times in average per hour, and each fail lasts 30 seconds, while System *B* fails 30 times in average per hour, and each fail lasts 3 seconds. Yield a final equation for the availability, and then use the values that are given for each system! **(1 points)**
- b) How many redundant systems *A* do you need to join in a cluster in order to achieve availability of 99.9% per hour? Assume to be a fault tolerant to crush failures. Redo the same task to achieve again availability of 99.9%, but per 20 minutes! **(1 point)**

2. Practical task.

Develop a program that will simulate crush failures of a system with *N* redundant components and calculate the real availability. Divide the time into slots (each iteration is one time slot). Do not use direct equations from theoretical background, but simulate failures with probability functions!

a) Version 1:

Input:

- failure rate of a single component $A(t)$ per time slot 1s
- N
- $T = 10.000$ secs

Output:

- availability

Use the numbers of 1.a)

(2 points)

b) Version 2:

Input:

- availability
- failure rate of a single component $A(t)$ per time slot 1s
- $T = 10.000$ secs

Output:

- N

Use numbers of 1.b).

(2 points)

Demonstrate that your programs generate similar data as the theory.

(1 point)