

Exercise No. 4
Peer-To-Peer Networks
Winter 2016

Exercise 1 *Chernoff 1*

Having a peer A with interval size $1/n'$ in a P2P-network with n' peers. x Files are randomly distributed to all peers. We now take a look at the Bernoulli-Experiment 'Does A receive a file?'

- What is the probability for A to receive exactly 3 files?
- If $x = c' \cdot n' \cdot \log(n')$. What is then $p, n, S_n, E[S_n]$ from the Chernoff Bound?
- If you set $c = 0.5$ in the lower and upper Chernoff Bound what probability do you get for:
 - $x = c' \cdot n' \cdot \log(n')$
 - $x = c' \cdot n'^2$
 - $x = c' \cdot n'$
- Can you choose c' for the 3 experiments in such a way that you get a low or extremely low probability ?

Exercise 2 *Chernoff 2*

Having m data blocks, we pass them through an encoding function, resulting in $2m$ data blocks. Afterwards, they are distributed randomly among n' peers ($n' \gg m$) with a probability of failure p .

- What is the expected number of failed blocks?
- The data can be recovered if we have at least m data blocks. What is the probability that we can recover the data after it has been distributed?