

Parallel Computing

Higher Institute for Applied Sciences and Technology

Teacher: Mohammad Bashar Dasouki
Student: Daaa Hanna
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Lab 1 Vault Hacking Race

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Q1: What are the probabilities that each of the hackers or the police win?

Assuming that the password is uniformly random between 0 and 9999

Which we can say it is true because of the computer pseudo randomness

Lets assume the password is p and the A Hacker (ascending) got it right so in that case the time he spend finding this password is

$$T1 = (p+1) * 0.005$$

Lets assume Hacker B (Descending) got it right then the time spend finding the password is

$$T2 = (10000 - p) * 0.005$$

For T1 to actually win T1 have to be < 11 (time it take the police to win)

$(p+1) * 0.05 < 11$ solving for p we get that $p < 2199$

Doing the same thing for T2 and solving for p we get $p > 7800$

We can conclude that the rest of the numbers are the cases where the police wins

By dividing over the overall space we get the probabilities

Hacker A wins 22% \Rightarrow overall 44% for hackers to win

Hacker B wins 22% \Rightarrow overall 44% for hackers to win

Police wins 56%

Q2: Why did we use `Thread.sleep(5)` in `isCorrectPassword()`?

To simulate real life calculation

If we didn't sleep after all the iteration that the hacker searching is instantaneous and they will win 100% of the time.

Q3: What happens if the password is 5000? Who wins?

According to the first question calculations police will always win in that case

Q4: How can the hackers improve their chances of winning?

Since the space of searching is 100% independent we can add more threads each thread searching in a different ascending/descending subspace

Q5:What are the security / safety risks of calling System.exit() from different threads?

It doesn't account for what the other threads are doing

For example one thread could be writing to that database and another thread calls system.exit which will leave the database in a corrupt state.

Q6:Why did we use Thread.MAX_PRIORITY for the hackers? Does it guarantee they will win?

No it does not, this just increases the probability of the hackers winning by giving it higher priority in the eyes of the scheduler. So it becomes around 48 or 49 % for hackers to win!!