Simulation of a Real-World Problem

Back-off algorithm is a collision resolution mechanism which is used in random access MAC protocols (CSMA/CD). This algorithm is generally used in Ethernet to schedule re-transmissions after collisions. If a collision takes place between 2 or more stations, they may restart transmission as soon as they can after the collision. This is a contention based access therefore each station generates a random back off time before attempting to re-transmit. We can simulate this algorithm as follows using the threads.

```
import java.util.Random;
class Backoff implements Runnable{
    private Thread t;
    private String threadName;
    Random rand;
    int max, randomNum, generated;


    Backoff(String name){
        threadName = name;
        System.out.println("Creating "+threadName);
    }

    public void run(){
    max = 1000;
    rand = new Random();
    randomNum = rand.nextInt(max);
    genarated = randomNum;

    while(randomNum != 0){
        randomNum--;
    }
    System.out.println(threadName +" randomly generated "+ generated);
    }

    public void start(){
    System.out.println("Starting "+ threadName);
    if(t== null){
       t = new Thread(this, threadName);
       t.start();
    }

    }

}
public class RandomBackOff {

    public static void main(String...args){
    Backoff pc1 = new Backoff("computer 1");
    Backoff pc2 = new Backoff("computer 2");
```

```
41      Backoff pc3 = new Backoff("computer 3");
        Backoff pc4 = new Backoff("computer 4");
43      Backoff pc5 = new Backoff("computer 5");
        System.out.println("\n");
45      pc1.start();
        pc2.start();
47      pc3.start();
        pc4.start();
49      pc5.start();

51      }
    }
53
    \*
55   --- exec-maven-plugin:3.0.0:exec (default-cli) @ mavenproject1 ---
Creating computer 1
57  Creating computer 2
Creating computer 3
59  Creating computer 4
Creating computer 5
61

63  Starting computer 1
Starting computer 2
65  Starting computer 3
Starting computer 4
67  Starting computer 5

69  computer 4 randomly generated 170
Creating computer 5 randomly generated 431
71  computer 3 randomly generated 654
Creating computer 2 randomly generated 860
73  computer 1 randomly generated 158
------------------------------------------------------------------------
75  BUILD SUCCESS
------------------------------------------------------------------------
77  Total time:  0.814 s
Finished at: 2021-08-18T10:41:32+02:00
79
    */
```

Something to think about:
Consider the simulation of the rolling of 10 (six sided) dice during a game by 10 players. If the game is a maximization game the player with the lowest value is eliminated. If there is a tie in the lowest value a re-throw is ordered. This continues until one player is left and is declared the winner.