CS 350: Homework #8
Due 3PM, Thursday, April 5

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Question 2

Please find the source code for this problem in the folder directory named 'Q2'. In this folder you will find four files: 'Controller.java', 'Passenger.java', 'Shuttle.java', and 'Q2-Sample-Output.txt'. The code has been commented for clarity of what each method is doing.

Controller.java

This file defines the Java class for the controller of the shuttle system in which there is a single shuttle. The main method spawns and runs 50 passengers concurrently. In this code, you will also find a number of initialized arrays and semaphores. `pickUpRequests` and `dropOffRequests` are used to keep track of the number of pick-up or drop-off requests at a given terminal. `enterLock` and `exitLock` semaphores are used to keep track of whether or not passengers may enter or exit the shuttle. There is also a variable `shuttleCap` to keep track of the shuttle's capacity and a corresponding mutex `scMutex` to access this variable.

Passenger.java

This file defines the Java class for a passenger looking to ride the shuttle. Each passenger has a unique ID and randomly assigned starting/destination terminals. A passenger's main protocol consists of waiting for the shuttle, boarding the shuttle, riding the shuttle, and leaving the shuttle upon reaching their destination.

Shuttle.java

This file defines the Java class for a shuttle traveling through the terminals. Because there is only one shuttle in this system, it does not need a unique ID. The main protocol for a shuttle consists of cycling through the 6 terminals. It only stops at one if a passenger riding it has requested that terminal as a destination or if there is room on the shuttle and passengers want to board it from that terminal.

Q2-Sample-Output.txt

The following is a sample output of the program in which 50 passengers are in the airport. Please note that when you run this program, the protocols are repeated endlessly, so you will need to perform a keyboard interrupt to see what the console is printing. I've also attached a text file called 'Q2-Sample-Output.txt' so you can view a larger portion of the output.

```
Passenger 0 is waiting for the shuttle at terminal 5
Passenger 1 is waiting for the shuttle at terminal 1
Passenger 2 is waiting for the shuttle at terminal 5
Passenger 26 is waiting for the shuttle at terminal 2
```

```
Passenger 3 is waiting for the shuttle at terminal 0
Passenger 38 is waiting for the shuttle at terminal 1
The Shuttle arrived at Terminal 0
Passenger 4 is waiting for the shuttle at terminal 3
Passenger 5 is waiting for the shuttle at terminal 1
Passenger 6 is waiting for the shuttle at terminal 4
Passenger 7 is waiting for the shuttle at terminal 3
Passenger 8 is waiting for the shuttle at terminal 2
Passenger 9 is waiting for the shuttle at terminal 1
Passenger 10 is waiting for the shuttle at terminal 3
Passenger 11 is waiting for the shuttle at terminal 0
Passenger 12 is waiting for the shuttle at terminal 5
Passenger 13 is waiting for the shuttle at terminal 5
Passenger 14 is waiting for the shuttle at terminal 0
Passenger 15 is waiting for the shuttle at terminal 3
Passenger 16 is waiting for the shuttle at terminal 3
Passenger 17 is waiting for the shuttle at terminal 2
Passenger 18 is waiting for the shuttle at terminal 3
Passenger 19 is waiting for the shuttle at terminal 2
Passenger 20 is waiting for the shuttle at terminal 0
Passenger 21 is waiting for the shuttle at terminal 0
Passenger 22 is waiting for the shuttle at terminal 0
Passenger 23 is waiting for the shuttle at terminal 5
Passenger 24 is waiting for the shuttle at terminal 1
Passenger 25 is waiting for the shuttle at terminal 5
Passenger 27 is waiting for the shuttle at terminal 2
Passenger 28 is waiting for the shuttle at terminal 5
Passenger 29 is waiting for the shuttle at terminal 2
Passenger 30 is waiting for the shuttle at terminal 4
Passenger 31 is waiting for the shuttle at terminal 2
Passenger 32 is waiting for the shuttle at terminal 3
Passenger 33 is waiting for the shuttle at terminal 5
Passenger 34 is waiting for the shuttle at terminal 0
Passenger 35 is waiting for the shuttle at terminal 2
Passenger 36 is waiting for the shuttle at terminal 3
Passenger 37 is waiting for the shuttle at terminal 2
Passenger 39 is waiting for the shuttle at terminal 0
Passenger 40 is waiting for the shuttle at terminal 3
Passenger 41 is waiting for the shuttle at terminal 1
Passenger 42 is waiting for the shuttle at terminal 4
Passenger 43 is waiting for the shuttle at terminal 4
Passenger 44 is waiting for the shuttle at terminal 1
Passenger 45 is waiting for the shuttle at terminal 3
Passenger 46 is waiting for the shuttle at terminal 4
Passenger 47 is waiting for the shuttle at terminal 3
Passenger 48 is waiting for the shuttle at terminal 1
Passenger 49 is waiting for the shuttle at terminal 1
Passenger 3 is entering the shuttle at terminal 0
Passenger 39 is entering the shuttle at terminal 0
Passenger 34 is entering the shuttle at terminal 0
Passenger 22 is entering the shuttle at terminal 0
Passenger 21 is entering the shuttle at terminal 0
Passenger 20 is entering the shuttle at terminal 0
Passenger 14 is entering the shuttle at terminal 0
Passenger 11 is entering the shuttle at terminal 0
The Shuttle arrived at Terminal 1
Passenger 3 is on the shuttle en route to terminal 5
Passenger 39 is on the shuttle en route to terminal 1
```

```
Passenger 34 is on the shuttle en route to terminal 1
Passenger 22 is on the shuttle en route to terminal 3
Passenger 21 is on the shuttle en route to terminal 5
Passenger 20 is on the shuttle en route to terminal 4
Passenger 14 is on the shuttle en route to terminal 5
Passenger 11 is on the shuttle en route to terminal 2
Passenger 1 is entering the shuttle at terminal 1
Passenger 49 is entering the shuttle at terminal 1
Passenger 48 is entering the shuttle at terminal 1
Passenger 44 is entering the shuttle at terminal 1
Passenger 41 is entering the shuttle at terminal 1
Passenger 24 is entering the shuttle at terminal 1
Passenger 9 is entering the shuttle at terminal 1
Passenger 5 is entering the shuttle at terminal 1
Passenger 38 is entering the shuttle at terminal 1
The Shuttle arrived at Terminal 2
. . .
```

Question 3

Please find the source code for this problem in the folder directory named 'Q3'. In this folder you will find four files: 'Controller.java', 'Passenger.java', 'Shuttle.java', and 'Q3-Sample-Output.txt'. The code has been commented for clarity of what each method is doing.

Controller.java

This file defines the Java class for the controller of the shuttle system in which there are two shuttles. The main method spawns and runs 50 passengers concurrently. In this code, you will also find the same arrays and semaphores initialized in Problem 2. However, an additional mutex called `shuttle` has been implemented to make sure that only one shuttle can access a terminal at a time.

Passenger.java

This file defines the Java class for a passenger looking to ride the shuttle. Each passenger has a unique ID and randomly assigned starting/destination terminals. A passenger's main protocol consists of waiting for the shuttle, boarding the shuttle, riding the shuttle, and leaving the shuttle upon reaching their destination.

Shuttle.java

This file defines the Java class for a shuttle traveling through the terminals, which is almost identical to the shuttle class from Problem 2. The main difference is that a mutex from the controller is waited and signaled for to ensure that a shuttle will not stop at a terminal if the other shuttle is already there.

Q3-Sample-Output.txt

The following is a sample output of the program in which 50 passengers are in the airport. Please note that when you run this program, the protocols are repeated endlessly, so you will need to perform a

keyboard interrupt to see what the console is printing. I've also attached a text file called 'Q3-Sample-Output.txt' so you can view a larger portion of the output.

```
Passenger 0 is waiting for a shuttle at terminal 4
Passenger 18 is waiting for a shuttle at terminal 4
Passenger 1 is waiting for a shuttle at terminal 0
Passenger 2 is waiting for a shuttle at terminal 5
Passenger 31 is waiting for a shuttle at terminal 1
Passenger 3 is waiting for a shuttle at terminal 5
Shuttle 1 arrived at Terminal 0
Passenger 4 is waiting for a shuttle at terminal 1
Shuttle 1 is leaving Terminal 0
Passenger 5 is waiting for a shuttle at terminal 4
Passenger 6 is waiting for a shuttle at terminal 5
Passenger 7 is waiting for a shuttle at terminal 3
Passenger 8 is waiting for a shuttle at terminal 0
Passenger 9 is waiting for a shuttle at terminal 0
Passenger 10 is waiting for a shuttle at terminal 0
Passenger 11 is waiting for a shuttle at terminal 1
Passenger 12 is waiting for a shuttle at terminal 4
Passenger 13 is waiting for a shuttle at terminal 1
Passenger 14 is waiting for a shuttle at terminal 4
Passenger 15 is waiting for a shuttle at terminal 3
Passenger 16 is waiting for a shuttle at terminal 4
Passenger 17 is waiting for a shuttle at terminal 3
Passenger 19 is waiting for a shuttle at terminal 2
Passenger 20 is waiting for a shuttle at terminal 2
Passenger 21 is waiting for a shuttle at terminal 5
Passenger 22 is waiting for a shuttle at terminal 1
Passenger 23 is waiting for a shuttle at terminal 4
Passenger 24 is waiting for a shuttle at terminal 1
Passenger 25 is waiting for a shuttle at terminal 5
Passenger 26 is waiting for a shuttle at terminal 4
Passenger 27 is waiting for a shuttle at terminal 1
Passenger 28 is waiting for a shuttle at terminal 3
Passenger 29 is waiting for a shuttle at terminal 0
Passenger 30 is waiting for a shuttle at terminal 5
Passenger 32 is waiting for a shuttle at terminal 2
Passenger 33 is waiting for a shuttle at terminal 5
Passenger 34 is waiting for a shuttle at terminal 5
Passenger 35 is waiting for a shuttle at terminal 4
Passenger 36 is waiting for a shuttle at terminal 0
Passenger 37 is waiting for a shuttle at terminal 3
Passenger 38 is waiting for a shuttle at terminal 5
Passenger 39 is waiting for a shuttle at terminal 2
Passenger 40 is waiting for a shuttle at terminal 4
Passenger 41 is waiting for a shuttle at terminal 4
Passenger 42 is waiting for a shuttle at terminal 4
Passenger 43 is waiting for a shuttle at terminal 0
Passenger 44 is waiting for a shuttle at terminal 2
Passenger 45 is waiting for a shuttle at terminal 4
Passenger 46 is waiting for a shuttle at terminal 1
Passenger 47 is waiting for a shuttle at terminal 3
Passenger 48 is waiting for a shuttle at terminal 0
Passenger 49 is waiting for a shuttle at terminal 3
Passenger 1 is entering a shuttle at terminal 0
Passenger 48 is entering a shuttle at terminal 0
Passenger 43 is entering a shuttle at terminal 0
```

```
Passenger 36 is entering a shuttle at terminal 0
Passenger 29 is entering a shuttle at terminal 0
Shuttle 0 arrived at Terminal 0
Passenger 10 is entering a shuttle at terminal 0
Passenger 9 is entering a shuttle at terminal 0
Passenger 8 is entering a shuttle at terminal 0
Passenger 1 is on a shuttle en route to terminal 1
Passenger 48 is on a shuttle en route to terminal 5
Passenger 43 is on a shuttle en route to terminal 3
Passenger 36 is on a shuttle en route to terminal 5
Passenger 29 is on a shuttle en route to terminal 2
Passenger 10 is on a shuttle en route to terminal 4
Passenger 1 is exiting a shuttle at terminal 1
Shuttle 0 is leaving Terminal 1
Passenger 9 is on a shuttle en route to terminal 4
Passenger 8 is on a shuttle en route to terminal 4
Passenger 1 is waiting for a shuttle at terminal 0
Passenger 31 is entering a shuttle at terminal 1
Passenger 46 is entering a shuttle at terminal 1
Passenger 27 is entering a shuttle at terminal 1
Passenger 24 is entering a shuttle at terminal 1
Passenger 22 is entering a shuttle at terminal 1
Passenger 13 is entering a shuttle at terminal 1
Shuttle 1 arrived at Terminal 1
Passenger 11 is entering a shuttle at terminal 1
Passenger 4 is entering a shuttle at terminal 1
Passenger 31 is on a shuttle en route to terminal 5
Passenger 46 is on a shuttle en route to terminal 3
Passenger 27 is on a shuttle en route to terminal 3
Passenger 24 is on a shuttle en route to terminal 2
Passenger 22 is on a shuttle en route to terminal 3
Passenger 13 is on a shuttle en route to terminal 4
Passenger 11 is on a shuttle en route to terminal 0
Passenger 29 is exiting a shuttle at terminal 2
Passenger 4 is on a shuttle en route to terminal 3
Shuttle 1 is leaving Terminal 2
Passenger 24 is exiting a shuttle at terminal 2
Passenger 29 is waiting for a shuttle at terminal 0
Passenger 24 is waiting for a shuttle at terminal 1
Passenger 19 is entering a shuttle at terminal 2
Passenger 44 is entering a shuttle at terminal 2
Passenger 39 is entering a shuttle at terminal 2
Passenger 32 is entering a shuttle at terminal 2
Shuttle 0 arrived at Terminal 2
Passenger 20 is entering a shuttle at terminal 2
Passenger 19 is on a shuttle en route to terminal 1
Passenger 44 is on a shuttle en route to terminal 0
Passenger 39 is on a shuttle en route to terminal 0
Passenger 32 is on a shuttle en route to terminal 0
Passenger 20 is on a shuttle en route to terminal 3
Passenger 46 is exiting a shuttle at terminal 3
Passenger 43 is exiting a shuttle at terminal 3
Passenger 46 is waiting for a shuttle at terminal 1
Passenger 20 is exiting a shuttle at terminal 3
Passenger 4 is exiting a shuttle at terminal 3
Passenger 22 is exiting a shuttle at terminal 3
Shuttle 0 is leaving Terminal 3
. . .
```