ASSIGNMENT NO.: 2

PROBLEM- 2

Part-1)

1. I considered the Ocean tracking database, that I created in Assignment 1. The database name is “database_otn”.

Part-2)

Wrote a Java program to perform two concurrent transactions.

1. I made 2 transaction classes “concurrentTransaction1” and “concurrentTransaction2” to perform transaction containing 5 statements such as UPDATE, SELECT, DELETE etc.

2. After making 2 different classes, I prepared all the SQL queries for both transactions as 2 separate blocks by using “if-else” statements.

   CASE1:

   - All the transactions will perform the query in the operation() block. It will perform the actual set of operations after acquiring the locks. It means the prepared SQL statements for each transaction that acquired locks will be executed in this method.
   - If the current transaction identified is T1, then T1 will acquire the lock and perform all the SQL queries.
   - The 5 queries I chose is:

```
String concurrentTransaction_id = "T1";
String T1_statement1 = "SELECT *FROM animals_scientific_name";
String T1_statement2 = "SELECT *FROM animals_scientific_name WHERE aphiaid =?;";
String T1_statement3 = "UPDATE animals_scientific_name SET scientificname =? WHERE aphiaid =?;";
String T1_statement4 = "SELECT * FROM animals_scientific_name WHERE aphiaid =?;";
String T1_statement5 = "DELETE FROM animals_scientific_name WHERE aphiaid =? ;";
```

   - Therefore the “if-block” will do Transaction T1. While doing the transaction, T2 will wait for T1 to release the lock.
   - After the T1 executed all the queries, it will release the lock. And T2 will acquire the lock.
   - For T1 to acquire lock I used acquireLock() method and to release the lock I used releaseLock() method.

   CASE2:

- Now, if the current transaction is T2, then T2 will acquire the lock and perform all the queries in the “else” block. Now T2 will acquire the lock and T1 will wait.
- T2 will perform the below 5 queries:

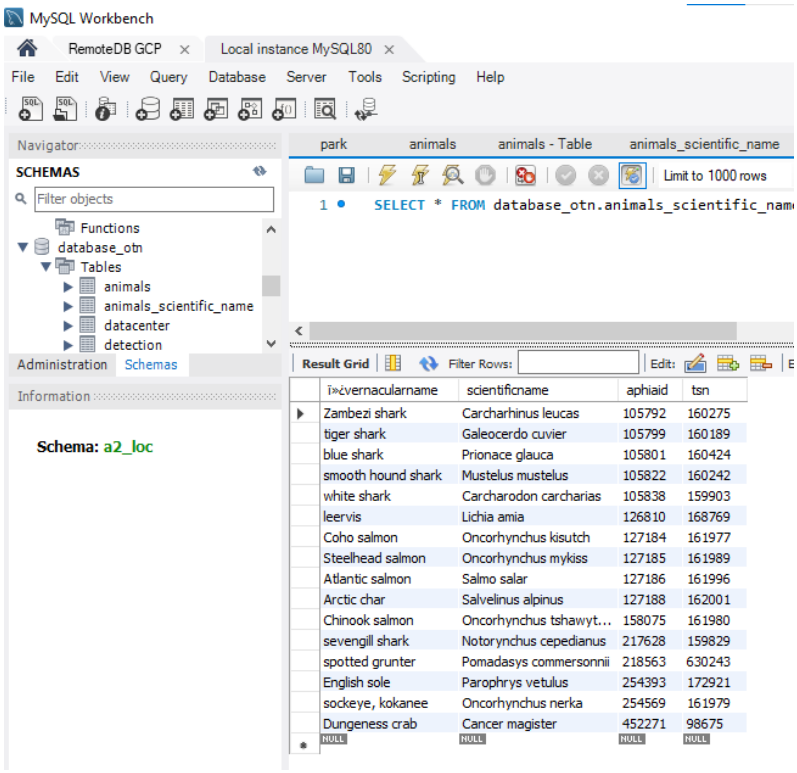
```
String concurrentTransaction_id = "T2";
String T2_statement1 = "SELECT *FROM animals_scientific_name";
String T2_statement2 = "SELECT *FROM animals_scientific_name WHERE aphiaid =?;";
String T2_statement3 = "UPDATE animals_scientific_name SET scientificname =? WHERE aphiaid =?;";
String T2_statement4 = "SELECT *FROM animals_scientific_name WHERE aphiaid =?;";
String T2_statement5 = "DELETE FROM animals_scientific_name WHERE aphiaid =?;";
```

- After T2 performs all queries, it will release the lock and T1 will acquire it.

Output:

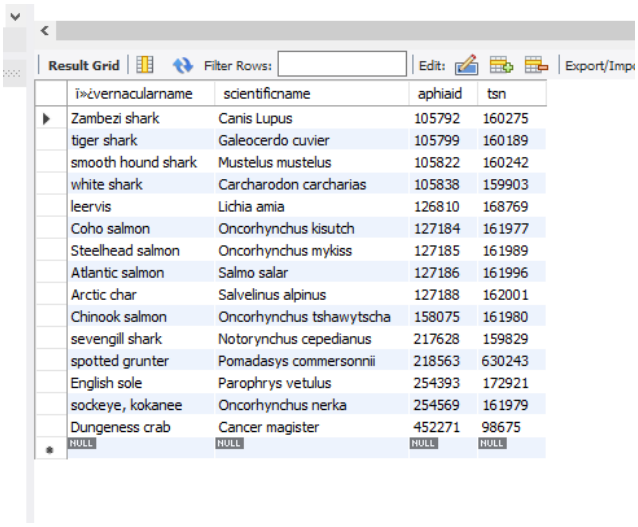
TEST CASE-1: T1 acquired the lock first.

Before running the code (Before any update):



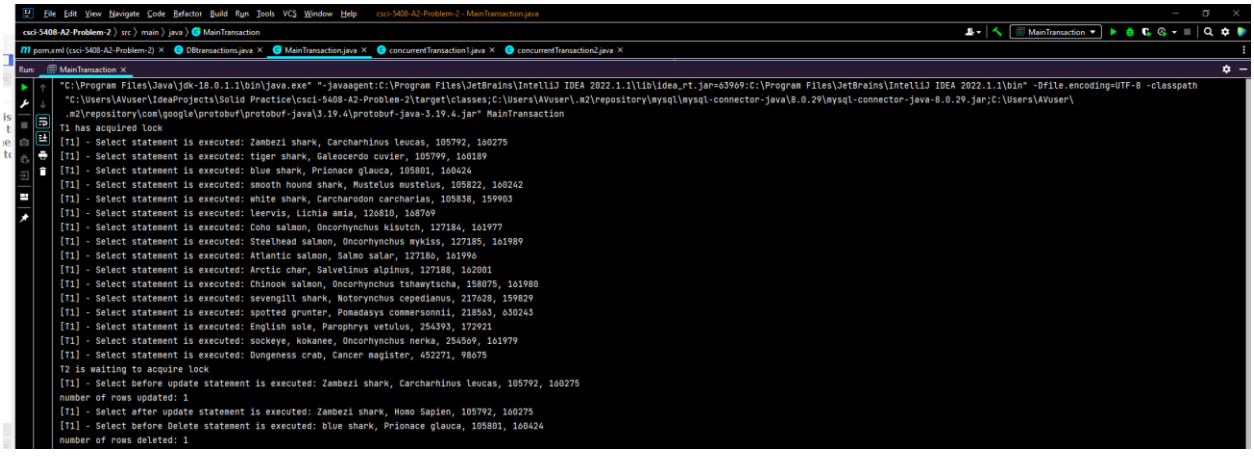
After running the code (After Update):

- T1 updated the scientific name = “Carcharhinus leucas” to “Homo Sapien”. But after that when T2 acquired lock, T2 updated the scientific name = “Homo Sapien” to “Canis Lupus”. But after that when T1 in id= 105792
- Also, the row where id = 105801 got deleted because of the delete operation.



Result Grid | Filter Rows: | Edit: | Export/Imp

ï»¿vernacularname	scientificname	aphiaid	tsn
Zambezi shark	Canis Lupus	105792	160275
tiger shark	Galeocerdo cuvier	105799	160189
smooth hound shark	Mustelus mustelus	105822	160242
white shark	Carcharodon carcharias	105838	159903
leervis	Lichia amia	126810	168769
Coho salmon	Oncorhynchus kisutch	127184	161977
Steelhead salmon	Oncorhynchus mykiss	127185	161989
Atlantic salmon	Salmo salar	127186	161996
Arctic char	Salvelinus alpinus	127188	162001
Chinook salmon	Oncorhynchus tshawytscha	158075	161980
sevengill shark	Notorynchus cepedianus	217628	159829
spotted grunter	Pomadasys commersonnii	218563	630243
English sole	Parophrys vetulus	254393	172921
sockeye, kokanee	Oncorhynchus nerka	254569	161979
Dungeness crab	Cancer magister	452271	98675
NULL	NULL	NULL	NULL



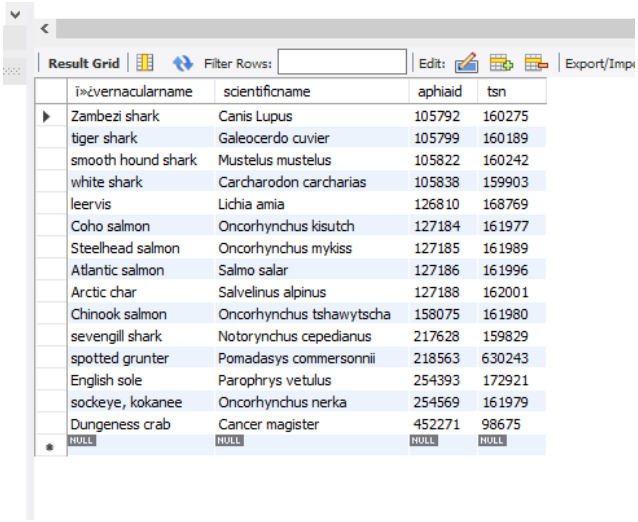
```
"C:\Program Files\Java\jdk-18.0.1.1\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.1.1\lib\idea_rt.jar=63969:C:\Program Files\JetBrains\IntelliJ IDEA 2022.1.1\bin" -Dfile.encoding=UTF-8 -classpath
 "C:\Users\AVuser\IdeaProjects\Solid Practice\csci-5408-A2-Problem-2\target\classes;C:\Users\AVuser\.m2\repository\mysql\mysql-connector-java\8.0.29\mysql-connector-java-8.0.29.jar;C:\Users\AVuser\
 .m2\repository\com\google\protobuf\protobuf-java\3.19.4\protobuf-java-3.19.4.jar" MainTransaction
T1 has acquired lock
[T1] - Select statement is executed: Zambezi shark, Carcharhinus leucas, 105792, 160275
[T1] - Select statement is executed: tiger shark, Galeocerdo cuvier, 105799, 160189
[T1] - Select statement is executed: blue shark, Prionace glauca, 105801, 160424
[T1] - Select statement is executed: smooth hound shark, Mustelus mustelus, 105822, 160242
[T1] - Select statement is executed: white shark, Carcharodon carcharias, 105838, 159903
[T1] - Select statement is executed: leervis, Lichia amia, 126810, 168769
[T1] - Select statement is executed: Coho salmon, Oncorhynchus kisutch, 127184, 161977
[T1] - Select statement is executed: Steelhead salmon, Oncorhynchus mykiss, 127185, 161989
[T1] - Select statement is executed: Atlantic salmon, Salmo salar, 127186, 161996
[T1] - Select statement is executed: Arctic char, Salvelinus alpinus, 127188, 162001
[T1] - Select statement is executed: Chinook salmon, Oncorhynchus tshawytscha, 158075, 161980
[T1] - Select statement is executed: sevengill shark, Notorynchus cepedianus, 217628, 159829
[T1] - Select statement is executed: spotted grunter, Pomadasys commersonnii, 218563, 630243
[T1] - Select statement is executed: English sole, Parophrys vetulus, 254393, 172921
[T1] - Select statement is executed: sockeye, kokanee, Oncorhynchus nerka, 254569, 161979
[T1] - Select statement is executed: Dungeness crab, Cancer magister, 452271, 98675
T2 is waiting to acquire lock
[T1] - Select before update statement is executed: Zambezi shark, Carcharhinus leucas, 105792, 160275
number of rows updated: 1
[T1] - Select after update statement is executed: Zambezi shark, Homo Sapien, 105792, 160275
[T1] - Select before Delete statement is executed: blue shark, Prionace glauca, 105801, 160424
number of rows deleted: 1
```

```
[T1] - Select after update statement is executed: Zambezi shark, Homo Sapien, 105792, 160275
[T1] - Select before Delete statement is executed: blue shark, Prionace glauca, 105801, 160424
number of rows deleted: 1
Locks released by:T1
T2 has acquired lock
[T2] - Select statement is executed: Zambezi shark, Homo Sapien, 105792, 160275
[T2] - Select statement is executed: tiger shark, Galeocerdo cuvier, 105799, 160189
[T2] - Select statement is executed: smooth hound shark, Mustelus mustelus, 105822, 160242
[T2] - Select statement is executed: white shark, Carcharodon carcharias, 105838, 159903
[T2] - Select statement is executed: leervis, Lichia amia, 126810, 168769
[T2] - Select statement is executed: Coho salmon, Oncorhynchus kisutch, 127184, 161977
[T2] - Select statement is executed: Steelhead salmon, Oncorhynchus mykiss, 127185, 161989
[T2] - Select statement is executed: Atlantic salmon, Salmo salar, 127186, 161996
[T2] - Select statement is executed: Arctic char, Salvelinus alpinus, 127188, 162001
[T2] - Select statement is executed: Chinook salmon, Oncorhynchus tshawytscha, 158075, 161980
[T2] - Select statement is executed: sevengill shark, Notorynchus cepedianus, 217628, 159829
[T2] - Select statement is executed: spotted grunter, Pomadasys commersonnii, 218563, 630243
[T2] - Select statement is executed: English sole, Parophrys vetulus, 254393, 172921
[T2] - Select statement is executed: sockeye, kokanee, Oncorhynchus nerka, 254569, 161979
[T2] - Select statement is executed: Dungeness crab, Cancer magister, 452271, 98675
[T2] - Select before Update statement is executed: Zambezi shark, Homo Sapien, 105792, 160275
number of rows updated: 1
[T2] - Select after update statement is executed: Zambezi shark, Canis Lupus, 105792, 160275
number of rows deleted: 0
Locks released by:T2

Process finished with exit code 0
```

TEST CASE 2: T2 acquired the lock first.

Before running the code (Before any update):



Result Grid | Filter Rows: | Edit: | Export/Imp

ï»¿vernacularname	scientificname	aphiaid	tsn
Zambezi shark	Canis Lupus	105792	160275
tiger shark	Galeocerdo cuvier	105799	160189
smooth hound shark	Mustelus mustelus	105822	160242
white shark	Carcharodon carcharias	105838	159903
leervis	Lichia amia	126810	168769
Coho salmon	Oncorhynchus kisutch	127184	161977
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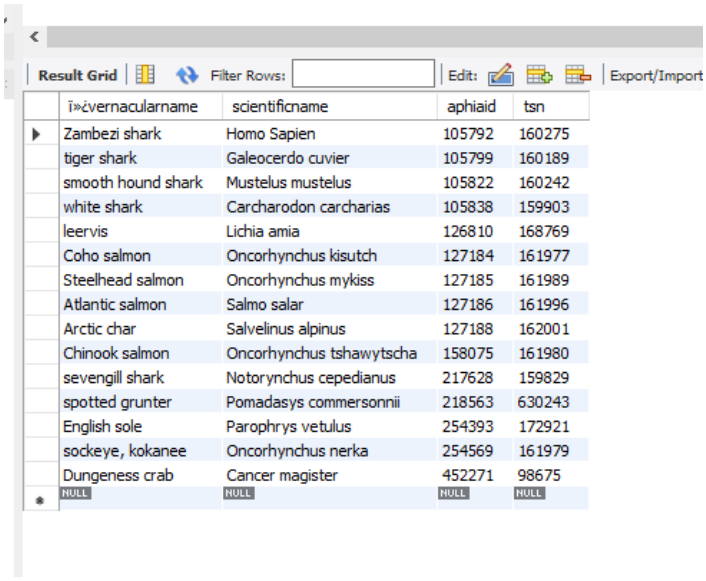
Arctic char	Salvelinus alpinus	127188	162001
Chinook salmon	Oncorhynchus tshawytscha	158075	161980
sevengill shark	Notorynchus cepedianus	217628	159829
spotted grunter	Pomadasys commersonnii	218563	630243
English sole	Parophrys vetulus	254393	172921
sockeye, kokanee	Oncorhynchus nerka	254569	161979
Dungeness crab	Cancer magister	452271	98675
NULL	NULL	NULL	NULL

After running the code (After the update):

- T2 updated the scientific name = “Canis Lupus to “Canis Lupus”(Because am passing the same value). But after that when T1 acquired lock, T1 updated the scientific name = “Canis Lupus” to “Homo Sapien”. But after that when T1 in id= 105792
- Also, the row where id = 105801 got deleted because of the delete operation.



Result Grid | Filter Rows: | Edit: | Export/Import

ï»¿vernacularname	scientificname	aphiaid	tsn
Zambezi shark	Homo Sapien	105792	160275
tiger shark	Galeocerdo cuvier	105799	160189
smooth hound shark	Mustelus mustelus	105822	160242
white shark	Carcharodon carcharias	105838	159903
leervis	Lichia amia	126810	168769
Coho salmon	Oncorhynchus kisutch	127184	161977
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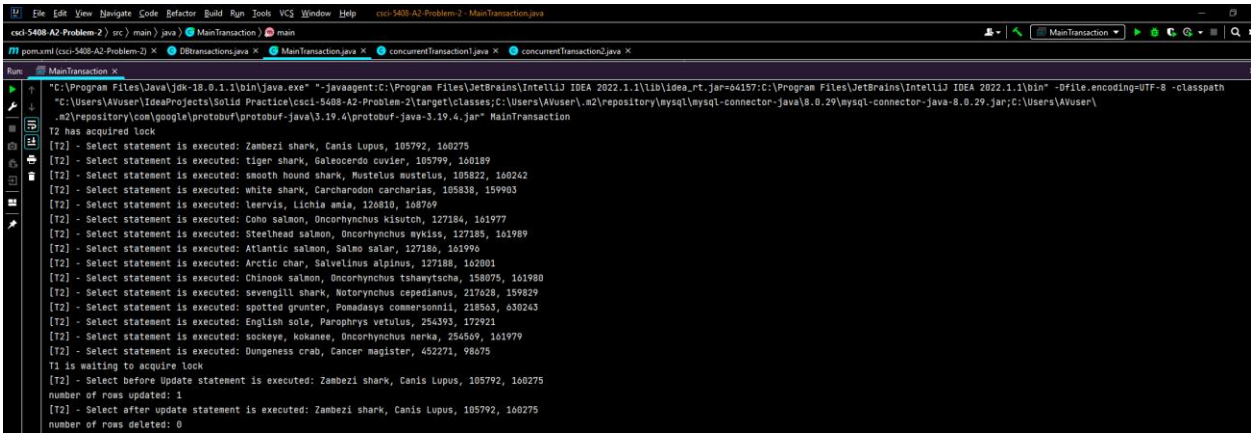
English sole	Parophrys vetulus	254393	172921
sockeye, kokanee	Oncorhynchus nerka	254569	161979
Dungeness crab	Cancer magister	452271	98675
NULL	NULL	NULL	NULL

In the TEST CASE 2- You’ll notice the number of rows deleted = 0 by T2 and T1 . Because in the TEST CASE 1 which was first run, the row was already deleted by T1.



```
"C:\Program Files\Java\jdk-18.0.1.1\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2022.1.1\lib\idea_rt.jar=64157:C:\Program Files\JetBrains\IntelliJ IDEA 2022.1.1\bin" -Dfile.encoding=UTF-8 -classpath
"C:\Users\AVuser\IdeaProjects\Solid Practice\csci-5408-A2-Problem-2\target\classes;C:\Users\AVuser\.m2\repository\mysql\mysql-connector-java\8.0.29\mysql-connector-java-8.0.29.jar;C:\Users\AVuser\
.m2\repository\com\google\protobuf\protobuf-java\3.19.4\protobuf-java-3.19.4.jar" MainTransaction
T2 has acquired lock
[T2] - Select statement is executed: Zambezi shark, Canis Lupus, 105792, 160275
[T2] - Select statement is executed: tiger shark, Galeocerdo cuvier, 105799, 160189
[T2] - Select statement is executed: smooth hound shark, Mustelus mustelus, 105822, 160242
[T2] - Select statement is executed: white shark, Carcharodon carcharias, 105838, 159903
[T2] - Select statement is executed: leervis, Lichia amia, 126810, 168769
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[T2] - Select statement is executed: Chinook salmon, Oncorhynchus tshawytscha, 158075, 161980
[T2] - Select statement is executed: sevengill shark, Notorynchus cepedianus, 217628, 159829
[T2] - Select statement is executed: spotted grunter, Pomadasys commersonnii, 218563, 630243
[T2] - Select statement is executed: English sole, Parophrys vetulus, 254393, 172921
[T2] - Select statement is executed: sockeye, kokanee, Oncorhynchus nerka, 254569, 161979
[T2] - Select statement is executed: Dungeness crab, Cancer magister, 452271, 98675
T1 is waiting to acquire lock
[T2] - Select before Update statement is executed: Zambezi shark, Canis Lupus, 105792, 160275
number of rows updated: 1
[T2] - Select after update statement is executed: Zambezi shark, Canis Lupus, 105792, 160275
number of rows deleted: 0
```

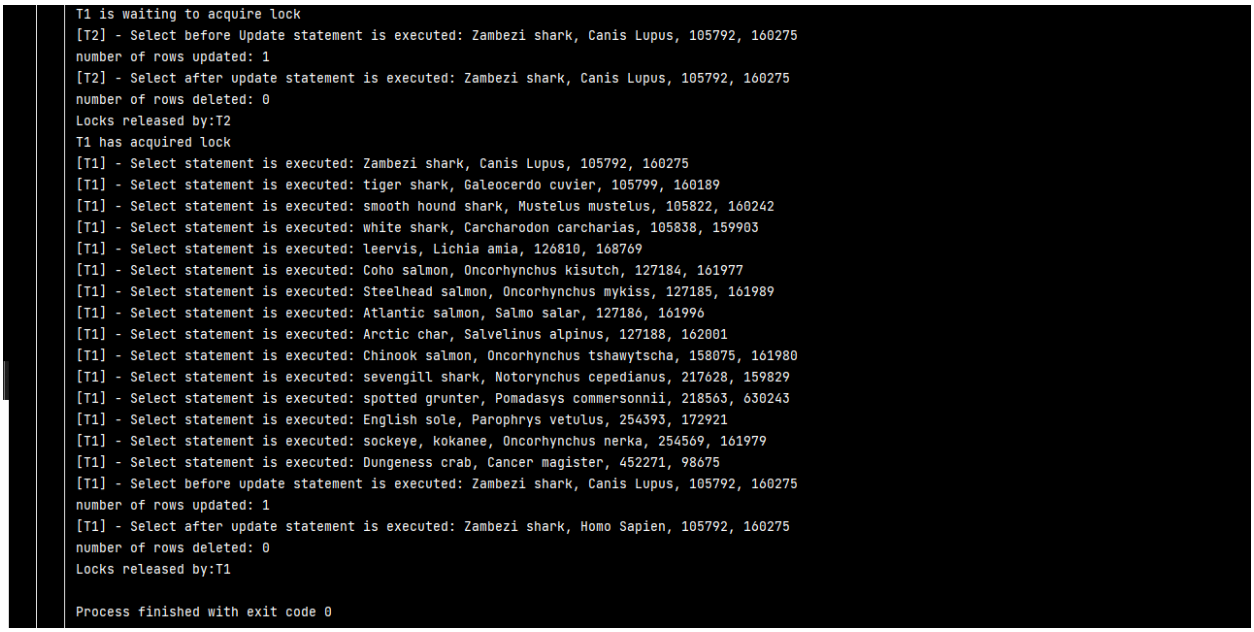

References:

1. https://dal.brightspace.com/d2l/le/content/221749/viewContent/3040910/View
2. https://www.tutorialspoint.com/explain-about-concurrent-transactions-in-dbms#:~:text=Concurrent%20transaction%20or%20execution%20includes,or%20simultaneously%20in%20the%20system.
3. https://docs.oracle.com/javase/7/docs/api/java/lang/Runnable.html

GitLab Link:

https://git.cs.dal.ca/umatiya/csci5408_s22_faiza_umatiya_b00899642.git