

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РФ

Федеральное государственное автономное  
образовательное учреждение высшего образования  
«Национальный исследовательский университет ИТМО»

**ФАКУЛЬТЕТ СИСТЕМ УПРАВЛЕНИЯ И РОБОТОТЕХНИКИ**



**УНИВЕРСИТЕТ ИТМО**

**ЛАБОРАТОРНАЯ РАБОТА №7**

по дисциплине  
‘ПРОГРАММИРОВАНИЕ’

Вариант №66348

*Выполнили:*

Студент группы R3137

Нгуен Тоан

*Преподаватель:*

Максимова Марина Михайловна

# Лабораторная работа #7

---

## 1. Текст задания.

### Требования

Внимание! У разных вариантов разный текст задания!

Доработать программу из [лабораторной работы №6](#) следующим образом:

1. Организовать хранение коллекции в реляционной СУБД (PostgreSQL). Убрать хранение коллекции в файле.
2. Для генерации поля id использовать средства базы данных (sequence).
3. Обновлять состояние коллекции в памяти только при успешном добавлении объекта в БД
4. Все команды получения данных должны работать с коллекцией в памяти, а не в БД
5. Организовать возможность регистрации и авторизации пользователей. У пользователя есть возможность указать пароль.
6. Пароли при хранении хэшировать алгоритмом **SHA-512**
7. Запретить выполнение команд не авторизованным пользователям.
8. При хранении объектов сохранять информацию о пользователе, который создал этот объект.
9. Пользователи должны иметь возможность просмотра всех объектов коллекции, но модифицировать могут только принадлежащие им.
10. Для идентификации пользователя отправлять логин и пароль с каждым запросом.

Необходимо реализовать многопоточную обработку запросов.

1. Для многопоточного чтения запросов использовать **создание нового потока** (`java.lang.Thread`)
2. Для многопоточной обработки полученного запроса использовать **создание нового потока** (`java.lang.Thread`)
3. Для многопоточной отправки ответа использовать **Cached thread pool**
4. Для синхронизации доступа к коллекции использовать **синхронизацию чтения и записи с помощью** `java.util.concurrent.locks.ReadWriteLock`

## 2. Диаграмма классов разработанной программы

- Смотрите диаграмму классов сервера [здесь](#)
- Смотрите диаграмму классов клиента [здесь](#)

## 3. Исходный код программы

### Структура папок

Рабочая область по умолчанию содержит три проекта, где:

- **server**: источник сервера
- **client**: источник клиента
- **common**: проект предоставляет необходимые объекты как для клиента, так и для сервера

## 4. Результаты программы

### 4.1 Консоль сервера

```
> Task :server:run
17:03:03,869 |-INFO in ch.qos.logback.classic.LoggerContext[default] -
Found resource [logback-test.xml] at
[file:/home/mrtoan/Documents/Java/prog-
lab7/server/build/resources/main/logback-test.xml]
17:03:03,964 |-INFO in
ch.qos.logback.classic.joran.action.ConfigurationAction - debug attribute
not set
17:03:03,972 |-INFO in ch.qos.logback.core.joran.action.AppenderAction -
About to instantiate appender of type [ch.qos.logback.core.ConsoleAppender]
17:03:03,974 |-INFO in ch.qos.logback.core.joran.action.AppenderAction -
Naming appender as [consoleAppender]
17:03:03,980 |-INFO in
ch.qos.logback.core.joran.action.NestedComplexPropertyIA - Assuming default
type [ch.qos.logback.classic.encoder.PatternLayoutEncoder] for [encoder]
property
17:03:04,034 |-INFO in ch.qos.logback.core.joran.action.AppenderAction -
About to instantiate appender of type
[ch.qos.logback.core.rolling.RollingFileAppender]
17:03:04,040 |-INFO in ch.qos.logback.core.joran.action.AppenderAction -
Naming appender as [fileAppender]
17:03:04,059 |-INFO in c.q.l.core.rolling.TimeBasedRollingPolicy@904861801
- No compression will be used
17:03:04,061 |-INFO in c.q.l.core.rolling.TimeBasedRollingPolicy@904861801
- Will use the pattern logs/application_%d{yyyy-MM-dd}%.i.log for the
active file
17:03:04,064 |-INFO in
ch.qos.logback.core.rolling.SizeAndTimeBasedFNATP@c33b74f - The date
pattern is 'yyyy-MM-dd' from file name pattern 'logs/application_%d{yyyy-
MM-dd}%.i.log'.
17:03:04,064 |-INFO in
ch.qos.logback.core.rolling.SizeAndTimeBasedFNATP@c33b74f - Roll-over at
midnight.
17:03:04,072 |-INFO in
ch.qos.logback.core.rolling.SizeAndTimeBasedFNATP@c33b74f - Setting initial
period to Mon May 23 17:02:44 MSK 2022
17:03:04,072 |-WARN in
ch.qos.logback.core.rolling.SizeAndTimeBasedFNATP@c33b74f -
SizeAndTimeBasedFNATP is deprecated. Use SizeAndTimeBasedRollingPolicy
instead
17:03:04,073 |-WARN in
ch.qos.logback.core.rolling.SizeAndTimeBasedFNATP@c33b74f - For more
information see
http://logback.qos.ch/manual/appenders.html#SizeAndTimeBasedRollingPolicy
17:03:04,075 |-INFO in
ch.qos.logback.core.joran.action.NestedComplexPropertyIA - Assuming default
type [ch.qos.logback.classic.encoder.PatternLayoutEncoder] for [encoder]
property
```

```
17:03:04,077 |-INFO in
ch.qos.logback.core.rolling.RollingFileAppender[fileAppender] - Active log
file name: logs/application.log
17:03:04,077 |-INFO in
ch.qos.logback.core.rolling.RollingFileAppender[fileAppender] - File
property is set to [logs/application.log]
17:03:04,078 |-INFO in ch.qos.logback.classic.joran.action.RootLoggerAction
- Setting level of ROOT logger to DEBUG
17:03:04,078 |-INFO in ch.qos.logback.core.joran.action.AppenderRefAction -
Attaching appender named [consoleAppender] to Logger[ROOT]
17:03:04,078 |-INFO in ch.qos.logback.core.joran.action.AppenderRefAction -
Attaching appender named [fileAppender] to Logger[ROOT]
17:03:04,078 |-INFO in
ch.qos.logback.classic.joran.action.ConfigurationAction - End of
configuration.
17:03:04,079 |-INFO in
ch.qos.logback.classic.joran.JoranConfigurator@130161f7 - Registering
current configuration as safe fallback point
```

```
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.postgresql.jdbc.TimestampUtils
(file:/home/mrtoan/.gradle/caches/modules-2/files-
2.1/org.postgresql/postgresql/42.1.4/1c7788d16b67d51f2f38ae99e474ece968bf71
5a/postgresql-42.1.4.jar) to field java.util.TimeZone.defaultTimeZone
WARNING: Please consider reporting this to the maintainers of
org.postgresql.jdbc.TimestampUtils
WARNING: Use --illegal-access=warn to enable warnings of further illegal
reflective access operations
WARNING: All illegal access operations will be denied in a future release
The database connection has been established.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.DatabaseCommunication
- The database connection has been established.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_COORDINATES_BY_COORDINATES_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_TYPE_BY_ID query completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_ADDRESS_BY_ADDRESS_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.DatabaseUserManager -
SELECT_USER_BY_ID query completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_COORDINATES_BY_COORDINATES_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_TYPE_BY_ID query completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_ADDRESS_BY_ADDRESS_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.DatabaseUserManager -
SELECT_USER_BY_ID query completed.
The collection is loaded.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.CollectionManager -
```

```
The collection is loaded.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - Server
start...
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - The server is
running.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
Port listening '4999'...
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - Port listening
'4999'...
The connection with the client has been established.
INFO | 23-05-2022 17:03:25 | [main] ServerLogger s.Server - The connection
with the client has been established.
INFO | 23-05-2022 17:03:25 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
Port listening '4999'...
INFO | 23-05-2022 17:03:25 | [main] ServerLogger s.Server - Port listening
'4999'...
The connection with the client has been established.
INFO | 23-05-2022 17:03:31 | [main] ServerLogger s.Server - The connection
with the client has been established.
INFO | 23-05-2022 17:03:31 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
Port listening '4999'...
INFO | 23-05-2022 17:03:31 | [main] ServerLogger s.Server - Port listening
'4999'...
The connection with the client has been established.
INFO | 23-05-2022 17:03:37 | [main] ServerLogger s.Server - The connection
with the client has been established.
INFO | 23-05-2022 17:03:37 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
Port listening '4999'...
INFO | 23-05-2022 17:03:37 | [main] ServerLogger s.Server - Port listening
'4999'...
INFO | 23-05-2022 17:03:48 | [Thread-3] ServerLogger
s.u.DatabaseUserManager - SELECT_USER_BY_USERNAME_AND_PASSWORD query
completed.
INFO | 23-05-2022 17:03:48 | [Thread-0] ServerLogger s.u.ConnectionHandler
- Request 'login' processed.
INFO | 23-05-2022 17:04:21 | [Thread-4] ServerLogger
s.u.DatabaseUserManager - SELECT_USER_BY_USERNAME_AND_PASSWORD query
completed.
INFO | 23-05-2022 17:04:21 | [Thread-1] ServerLogger s.u.ConnectionHandler
- Request 'login' processed.
INFO | 23-05-2022 17:04:32 | [Thread-5] ServerLogger
s.u.DatabaseUserManager - SELECT_USER_BY_USERNAME_AND_PASSWORD query
completed.
INFO | 23-05-2022 17:04:32 | [Thread-2] ServerLogger s.u.ConnectionHandler
- Request 'login' processed.
INFO | 23-05-2022 17:04:42 | [Thread-1] ServerLogger s.u.ConnectionHandler
- Request 'info' processed.
INFO | 23-05-2022 17:04:46 | [Thread-0] ServerLogger s.u.ConnectionHandler
- Request 'show' processed.
INFO | 23-05-2022 17:04:53 | [Thread-2] ServerLogger s.u.ConnectionHandler
```

```
- Request 'help' processed.  
<=====--> 87% EXECUTING [2m 29s]  
> :server:run
```

## 4.2 Консоль Клиента

### Client 1

```
> Task :client:run  
The connection to the server has been established.  
Waiting for permission to share data...  
Permission to share data received.  
Do you already have an account? (+/-):  
>  
<=Enter login:> 87% EXECUTING [19s]  
> =====--> 87% EXECUTING [20s]  
<<Enter password:--> 87% EXECUTING [24s]  
> :client:run  
<=User Thuyen authorized.XECUTING [26s]  
$ =====--> 87% EXECUTING [27s]  
<=Organization{--> 87% EXECUTING [1m 25s]  
    id=2,  
    name='Toan',  
    coordinates=Coordinates{x=12, y=21.0},  
    creationDate=2022-05-22T02:41:00.379159,  
    annualTurnover=100000,  
    organizationType=GOVERNMENT,  
    officialAddress=Address{street='Nguyen Hue', zipCode='100dddss'}}  
  
Organization{  
    id=3,  
    name='Toan',  
    coordinates=Coordinates{x=1, y=1.0},  
    creationDate=2022-05-22T02:42:19.059832,  
    annualTurnover=10,  
    organizationType=PUBLIC,  
    officialAddress=Address{street='nguyen toan', zipCode='11ccc'}}  
$  
<=====--> 87% EXECUTING [7m]  
> :client:run
```

### Client 2

```
> Task :client:run  
The connection to the server has been established.  
Waiting for permission to share data...  
Permission to share data received.  
Do you already have an account? (+/-):
```

```

>
<=Enter login:> 87% EXECUTING [46s]
> :client:run
<=Enter password:--> 87% EXECUTING [49s]
> :client:run
<<User admin1 authorized. EXECUTING [54s]
$ =====> 87% EXECUTING [55s]
<=Collection details:% EXECUTING [1m 15s]
  Type: java.util.ArrayList
  Amount of elements: 2
  Date of last initialization: 2022-05-23 17:03:04.201048
$
<=====--> 87% EXECUTING [7m 14s]
> :client:run

```

### Client 3

```

> Task :client:run
The connection to the server has been established.
Waiting for permission to share data...
Permission to share data received.
Do you already have an account? (+/-):
>
<=Enter login:> 58% EXECUTING [54s]
> :client:run
<=Enter password:---> 58% EXECUTING [57s]
> :client:run
<=User admin2 authorized. EXECUTING [1m]
$ :client:run
<<help
info
to standard output (type, initialization date, number of elements, etc.)
show
add {element}
update <ID>
element whose id is equal to the given one
remove_by_id <ID>
clear
exit
file)
execute_script <file_name>
add_if_min {element}
element whose id is equal to the given one
remove_greater {element}
elements lower than the given
history
average_of_annual_turnover
specified file
count_greater_than_official_address {element}
whose officialAddress field value is greater than the specified one
filter_greater_than_type <OrganizationType> display elements whose

```

display help on available commands  
print information about the collection  
display all items in the collection  
add a new element to the collection  
update the value of the collection  
remove item from collection by ID  
clear the collection  
terminate program (without saving to file)  
execute script from specified file  
update the value of the collection  
remove from the collection all  
display history of used commands  
read and execute the script from the  
print the number of elements  
display elements whose

```
organization type field value is equal to the given one
server_exit                               shut down the server
$
<=====-----> 58% EXECUTING [7m 26s]
> :client:run
```

### 4.3 Содержимое лог-файла

```
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.DatabaseCommunication
- The database connection has been established.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_COORDINATES_BY_COORDINATES_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_TYPE_BY_ID query completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_ADDRESS_BY_ADDRESS_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.DatabaseUserManager -
SELECT_USER_BY_ID query completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_COORDINATES_BY_COORDINATES_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_TYPE_BY_ID query completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger
s.u.DatabaseCollectionManager - SELECT_ADDRESS_BY_ADDRESS_ID query
completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.DatabaseUserManager -
SELECT_USER_BY_ID query completed.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.u.CollectionManager -
The collection is loaded.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - Server
start...
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - The server is
running.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
INFO | 23-05-2022 17:03:04 | [main] ServerLogger s.Server - Port listening
'4999'...
INFO | 23-05-2022 17:03:25 | [main] ServerLogger s.Server - The connection
with the client has been established.
INFO | 23-05-2022 17:03:25 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
INFO | 23-05-2022 17:03:25 | [main] ServerLogger s.Server - Port listening
'4999'...
INFO | 23-05-2022 17:03:31 | [main] ServerLogger s.Server - The connection
with the client has been established.
INFO | 23-05-2022 17:03:31 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
INFO | 23-05-2022 17:03:31 | [main] ServerLogger s.Server - Port listening
```



```
'4999'...
INFO | 23-05-2022 17:03:37 | [main] ServerLogger s.Server - The connection
with the client has been established.
INFO | 23-05-2022 17:03:37 | [main] ServerLogger s.Server - Permission for
a new connection has been received.
INFO | 23-05-2022 17:03:37 | [main] ServerLogger s.Server - Port listening
'4999'...
INFO | 23-05-2022 17:03:48 | [Thread-3] ServerLogger
s.u.DatabaseUserManager - SELECT_USER_BY_USERNAME_AND_PASSWORD query
completed.
INFO | 23-05-2022 17:03:48 | [Thread-0] ServerLogger s.u.ConnectionHandler
- Request 'login' processed.
INFO | 23-05-2022 17:04:21 | [Thread-4] ServerLogger
s.u.DatabaseUserManager - SELECT_USER_BY_USERNAME_AND_PASSWORD query
completed.
INFO | 23-05-2022 17:04:21 | [Thread-1] ServerLogger s.u.ConnectionHandler
- Request 'login' processed.
INFO | 23-05-2022 17:04:32 | [Thread-5] ServerLogger
s.u.DatabaseUserManager - SELECT_USER_BY_USERNAME_AND_PASSWORD query
completed.
INFO | 23-05-2022 17:04:32 | [Thread-2] ServerLogger s.u.ConnectionHandler
- Request 'login' processed.
INFO | 23-05-2022 17:04:42 | [Thread-1] ServerLogger s.u.ConnectionHandler
- Request 'info' processed.
INFO | 23-05-2022 17:04:46 | [Thread-0] ServerLogger s.u.ConnectionHandler
- Request 'show' processed.
INFO | 23-05-2022 17:04:53 | [Thread-2] ServerLogger s.u.ConnectionHandler
- Request 'help' processed.
```

## 5. Выводы по работе

Во время выполнения данной лабораторной работы мы изучили основы многопоточного программирования, научились работать с базами данных, реализовывали простейшую систему учетных записей.