MIDDLE EAST TECHNICAL UNIVERSITY

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ENGINEERING FACULTY

DEPARTMENT OF COMPUTER ENGINEERING

Vitriol

Software Design Document

GROUP MALLORN

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Table of Contents

Vitriol

Table of Figures

Table of Tables

1.0 Overview

This design report includes a complete description of the Vitriol project. This document includes features, functionalities, specifications and explanations about the project which is a design project for the Computer Engineering Design course of the Department of Computer Engineering, Middle East Technical University.

1.1 Scope

The document holds the structural overview of all modules, interfaces, data and module designs in order to support design and development process. In the implementation of the process, this document will be a direction for developers.

1.2. Purpose

This document is prepared to describe and visualize the basic architecture of Vitriol Project. The main aim of this document is to identify the software system which is designed to meet the requirements of the Software Requirements Specification document.

1.3. Intended Audience

The expected audience for this document is the development team of the software. The team can use this document for reviewing and implementing purposes.

2.0 Definitions

	Definition
Meta learning	Utilizing past learning experience for new learning tasks.
Apache Spark	Apache Spark, a fast and general engine for large-scale data processing.

	Acronyms & Abbreviations
MYSQL	Open source relational database management system
SRS	System Requirements Specification
UML	Unified Modeling Language
SDD	Software Design Description
Stakeholder	Any person with an interest in the project who is not a developer
Database	A collection of related data

3.0 Conceptual Model for Software Design Descriptions

3.1 Software Design in Context

The system has client server architecture. The user can use the capabilities of the system by means of a web browser and internet connection. Beyond the client/server architecture, the services system provided, and the component it has shall be designed as much as in the concept of RESTful services. It requires login, and uses browser cookies on the client side to confirm the session information. On the server side sessions are stored in an in-memory-caching tool. Moreover a lot of information about the user is kept and used in the system, so there is a need for a database(actually two, for separation of concerns).

The business intelligence part is all about big data and machine learning. The machine learning model shall include spark modules and hadoop libraries.

3.2. Software Design Descriptions within the Live Cycle

3.2.1. Influences on SDD preparation

This document is prepared by considering the opinions of the stakeholders and the SRS document is an important reference to this document.

3.2.2. Influences on Software Life Cycle Products

The project consists of two parts which can be named as web module and machine learning module. Also the web module can be divided into backend and frontend whereas ml module can be separated as meta learning module and model creation module. And all four submodules can be divided into smaller parts. The scrum methodology is used for the software process model . In each sprint developer team focused on a different sub module, designed, developed and integrated. After each sprint design team discussed the backlogs and possible improvements.

3.2.3. Design Verification and Design Role in Validation

Software design description is the primary reference for the verification and validation of whether the software product designed fulfills the specified requirements in Vitriol SRS Document. The requirements for each specific intended use of the product are modeled in the design view parts of the document. The verification and validation of the design view models are carried out based on this document.

4.0 Design Description Information Content

4.1. Introduction

This SDD is written to provide architectural design identification of Vitriol Project. This document defines stakeholders, design concerns and viewpoints which specifies different system properties.

4.2. SDD identification

Design specifications stated in this document will be used in architectural design, system implementation and development phases. All rights of Vitriol System belong to Mallorn project group. Mallorn project group is responsible for issuing and authorship. In this design report UML is mainly used for demonstration the design viewpoints.

4.3. Design Stakeholders and their concerns

Mallorn team members and end users are main stakeholders of the project. Other stakeholders are instructors of Computer Engineering

Design course: Prof. Dr. Atilla Özgit and Ass. Prof. Emre Akbaş. Project supervisor is Assoc. Prof. Pınar Karagöz and Course Assistant id Itır Önal Ertuğrul. Targeted end users are companies that have huge amount of data and willing to run certain processes on their data. Moreover government organizations, individuals, and non-governmental organizations working with big data are also in the scope of targeted end users of Vitriol. The academic stakeholders of the projects demands visualization of the data. This is important for them to understand the distribution of the data to judge the systems decisions. The end users are demanding ease of use mostly. Hence the web page shall designed accordingly. The last but not the least concern is security. The data of end users shall be kept in database services which are unreachable from the outside world. The only way to reach to data is the application itself.

5.0. Design Viewpoints

Context Viewpoint: Roles of users and stakeholders are explained in this viewpoint. This viewpoint helps for verification and validation tests when specifying the context of product. Information will flow between its entities and system.
Composition Viewpoint: This viewpoint describes interactions between high level modules of system. Logical Viewpoint: Logical viewpoint describes logical class structures of Wearable Device, Intermediate Device, Web Service and Phone Application layers individually.
Interaction Viewpoint: Interaction methods and structural design of interaction between layers are explained in Interaction Viewpoint.

5.1 Context Viewpoint

The context viewpoint of a system defines the relationships, interactions and dependencies between the system and the environment which it interacts. It draws a boundary between a design subject and its environment. Use case diagrams and use case descriptions are presented for displaying the relationships and interactions between the system and actors of system.

This viewpoint aims to show technical relationships which the system being designed has with the various elements. Briefly, it provides information flow between design subject and its environment.

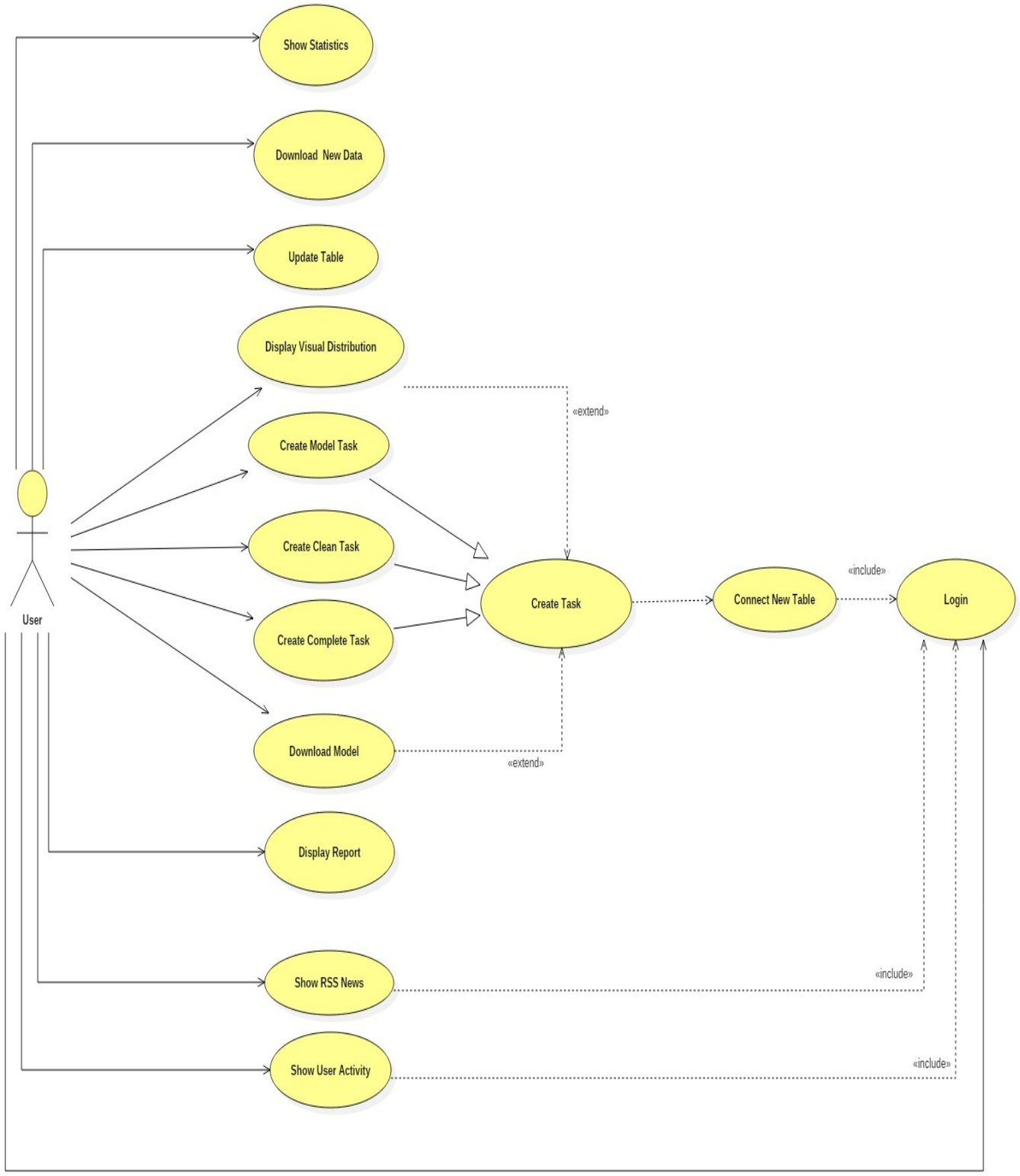


Figure 1: General Use Case Diagram

No	Functionality	Short Description
1	Login	Logging into system with membership and password
2	Show Statistics	Statistics of the raw data of the user’s
3	Display New Data	Displaying the data of the user’s
4	Update Table	Updating the table accordimg to user’s needs
5	Display Visual Distribution	After machine learning algorithms applied visulation of data will be shown..
6	Create Model Task	Creating new models with a table id and label column
7	Create Clean Task	Creating a clean task with a table id
8	Create Complete Task	Creating a complete task with a table id
9	Download Model	Downloading a created model
10	Display Report	Displaying the Vitriol logs after a given task
11	Show RSS News	Related news will be shown user profile page.
12	Show User Activity	Usage history of the user
13	Create Task	Entering the task creation page
14	Connect New Table	Connecting to the new remote table and copying it

Table 1: Overview of the Use-Case

5.1.1. Design Concerns

The purpose of the context viewpoint is to be crystal clear in the field of services, operations and design scopes concerning the project. This part is obviously a key to development since it mostly investigates the relationship between actors and the services that is offered by the application, thus making it applicable to most design efforts.

5.1.2 Use Cases

5.1.2.1 Login Use Case for User

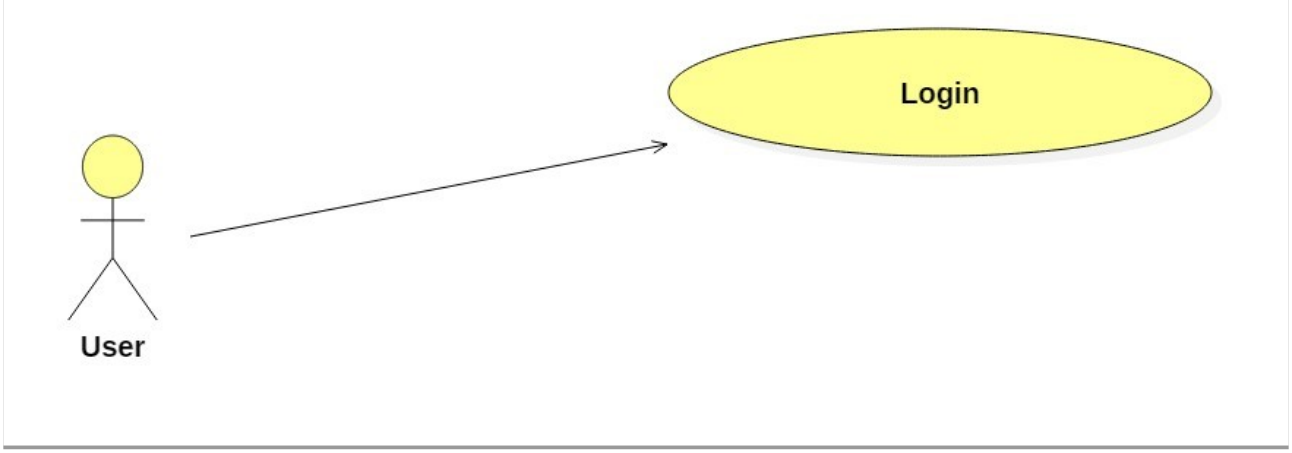


Figure 1: Login Use Case

Use Case ID	UC1
Use Case Name	Login
Description	This use case describe event in which a user login to system with his/her username and password.
Actors	User
Precondition	-
Trigger	The user tries to login to the system using the web service providing login credentials.
Basic Flow	1- The user enters his/her username 2- The user enters his/her 8 digit password 3- Web service checks the database for password confirmation via server

	4- Web service displays a correct password message
Exception Flow	If the entered password does not match with the password in the database an error message is displayed by web service.
Post Conditions	-

Table 1: Description of Login Use Case

5.1.2.2 Show Statistics Use Case for User

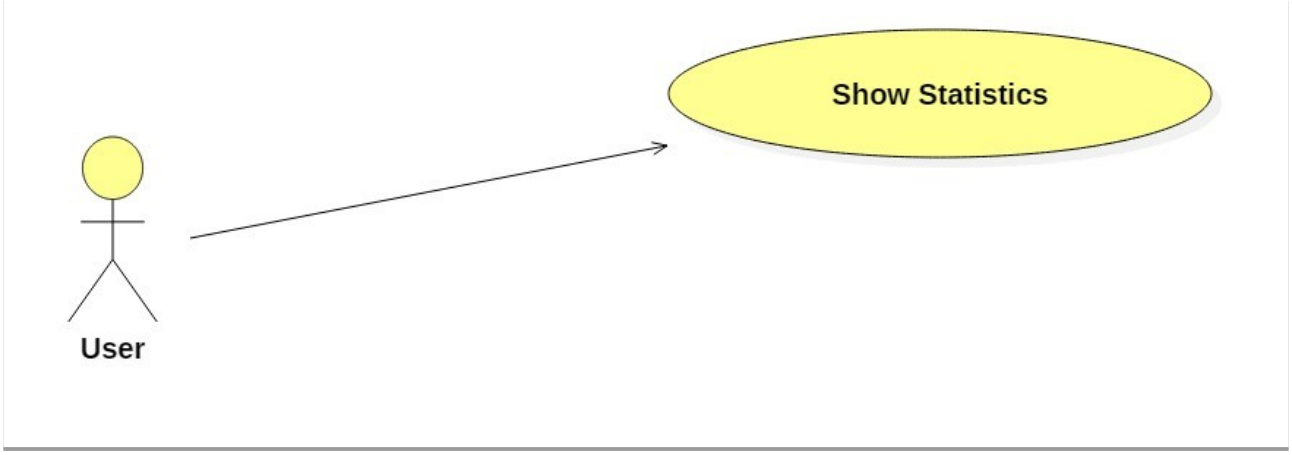


Figure 1: Show Statistics Use Case

Use Case ID	UC2
Use Case Name	Show Statistics
Description	This use case describe event in which a user see the statistics of raw data that uploaded the system.Statistics will be about mean,median,mod,number of rows etc..
Actors	User
Precondition	Connect the new table
Trigger	The user tries to see his data statistics
Basic Flow	1- The user enters the display database page. 2- The user choses a table from his database.

	3- The user presses the show statistics button.
Exception Flow	If the database does not have any table to show stattistics, then the request will be rejected.
Post Conditions	-

Table 1: Description of Show Statistics Use Case

5.1.2.3 Display New Data Use Case for User

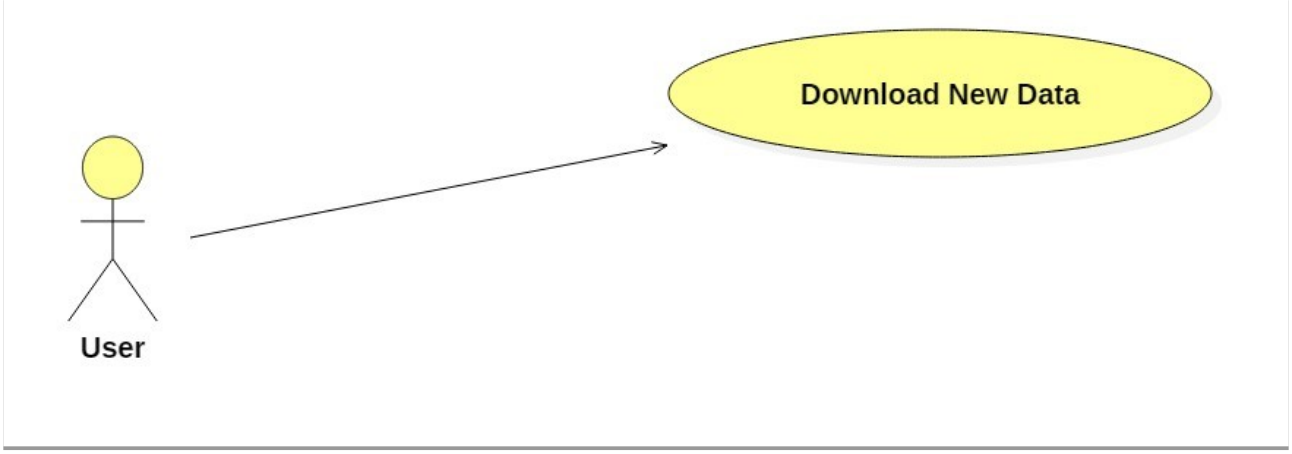


Figure 1: Display New Data Use Case

Use Case ID	UC3
Use Case Name	Download New Data
Description	This use case describe event in which a user can download the data in an excel file or csv file
Actors	User
Precondition	The user should login to the system and should provide his database credentials.

Trigger	The user tries to download the data that his given table
Basic Flow	1- The user enters the database page. 2- The user choses a table from his database. 3- The user presses the download button.
Exception Flow	If the database does not have any table to download, then the request will be rejected.
Post Conditions	-

Table 1: Description of Display New Data Use Case

5.1.2.4 Update Table Use Case for User

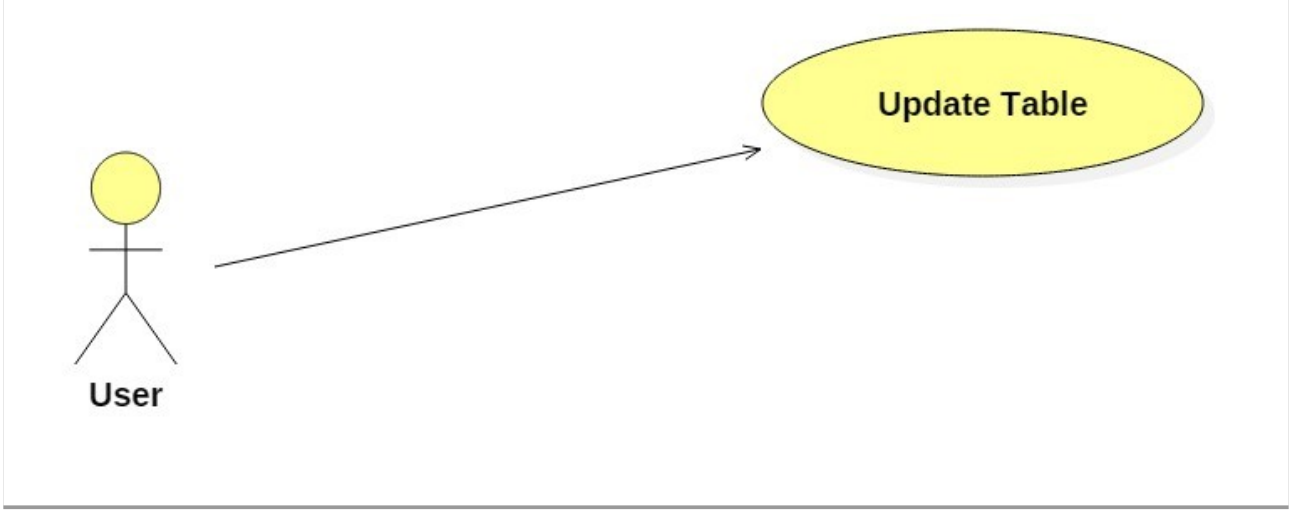


Figure 1: Update Table Use Case

Use Case ID	UC4
Use Case Name	Update Table
Description	This use case describe event in which a user can update his/her databases tablesin web service.
Actors	User

Precondition	The user should login to the system and should provide his database credentials.
Trigger	The user tries to update the tables that his/her given databases
Basic Flow	1- The user enters the update table page. 2- The user choses a table from his database. 3- The user presses the update button.
Exception Flow	If the database does not have any table to download, then the request will be rejected
Post Conditions	-

Table 1: Description of Update Table Use Case

5.1.2.5 Display Visual Distribution Use Case for User

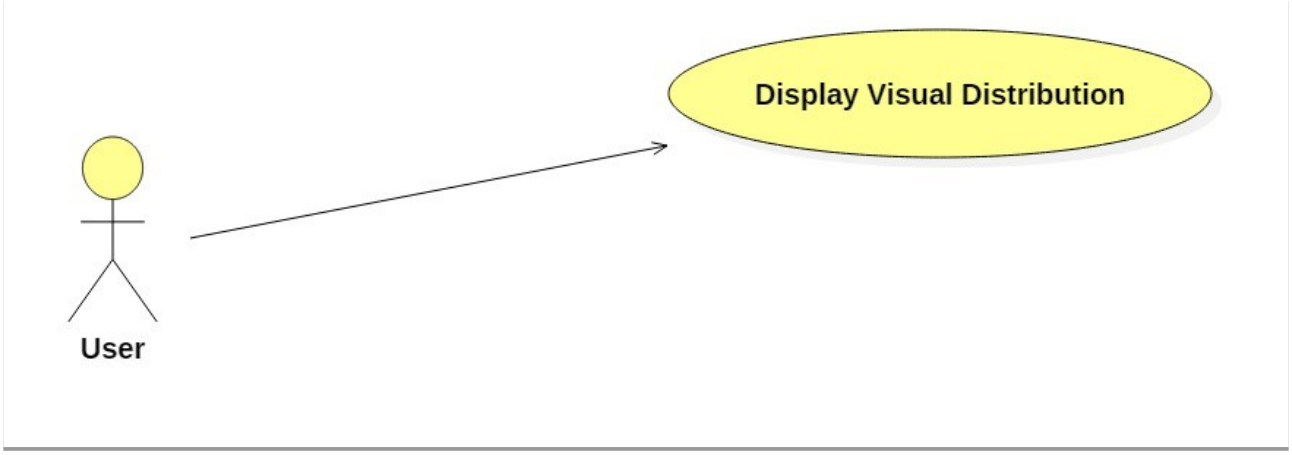


Figure 1: Display Visual Distribution Use Case

Use Case ID	UC5
Use Case Name	Display Visual Distribution
Description	This use case describe event in which a user wants to visualize his data distribution.
Actors	User
Precondition	The user should login to the system and should provide his database credentials.
Trigger	The user tries to visualize his data.
Basic Flow	1- The user enters the visualize page. 2- The user choses a table from his database.

	3- The user presses the visualize button.
Exception Flow	If the database does not have any table to visualize, then the request will be rejected.
Post Conditions	-

Table 1: Description of Display Visual Distribution Use Case

5.1.2.6 Create Model Task Use Case for User

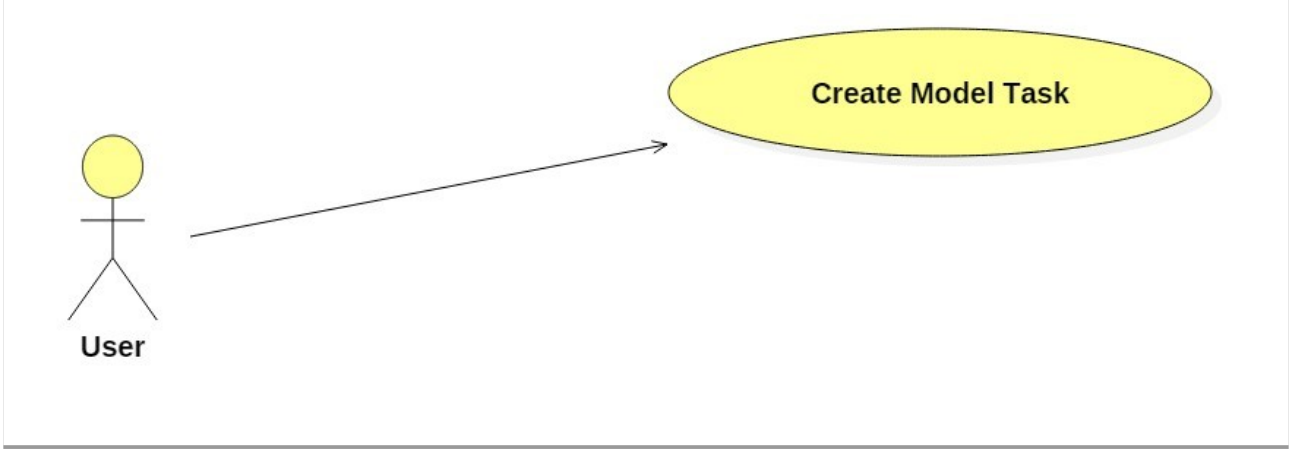


Figure 1: Create Model Task Use Case

Use Case ID	UC6
Use Case Name	Create Model Task
Description	This use case describe event in which a user wants to create a model task.
Actors	User
Precondition	The user should login to the system and should chose a table from his database and a label column. Then he should press the “create task” button.
Trigger	The user tries to create a model for his given table and label column..
Basic Flow	1- The user presses the “create model task” button.
Exception Flow	If given label column in sparse or special

	category according to data understanding results, then system shows an error message.
Post Conditions	-

Table 1: Description of Create Model Task Use Case

5.1.2.7 Create Clean Task Use Case for User

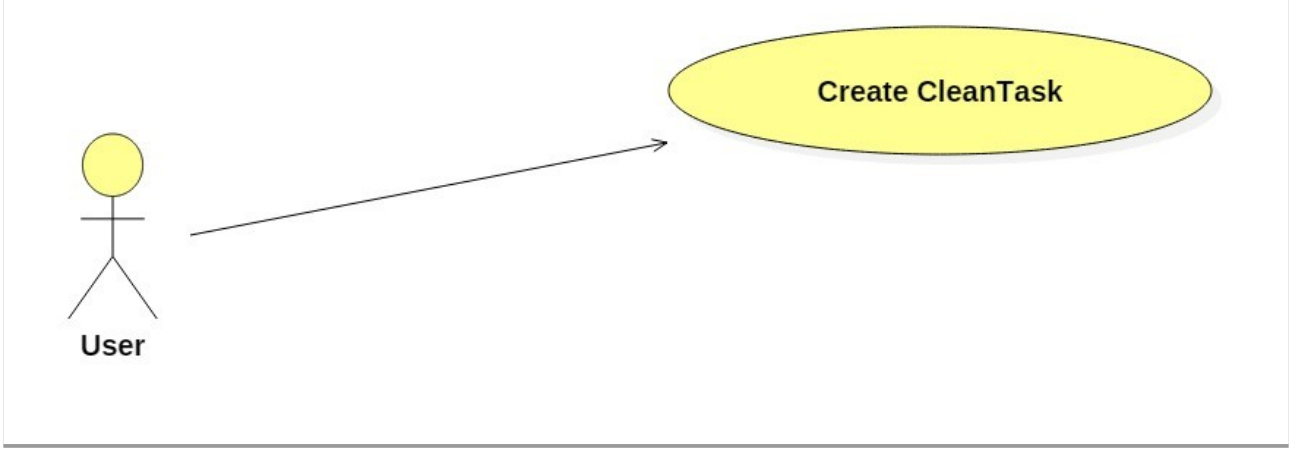


Figure 1: Create Clean Task Use Case

Use Case ID	UC7
Use Case Name	Create Clean Task
Description	This use case describe event in which a user wants to create a clean task.
Actors	User
Precondition	The user should login to the system & should chose a table then press the “create task” button .
Trigger	The user tries to create a clean task.
Basic Flow	1- The user enters the “create task” page. 2- The user presses the “clean task” button.
Exception Flow	-

Post Conditions	-

Table 1: Description of Create Clean Task Use Case

5.1.2.8 Create Complete Task Use Case for User

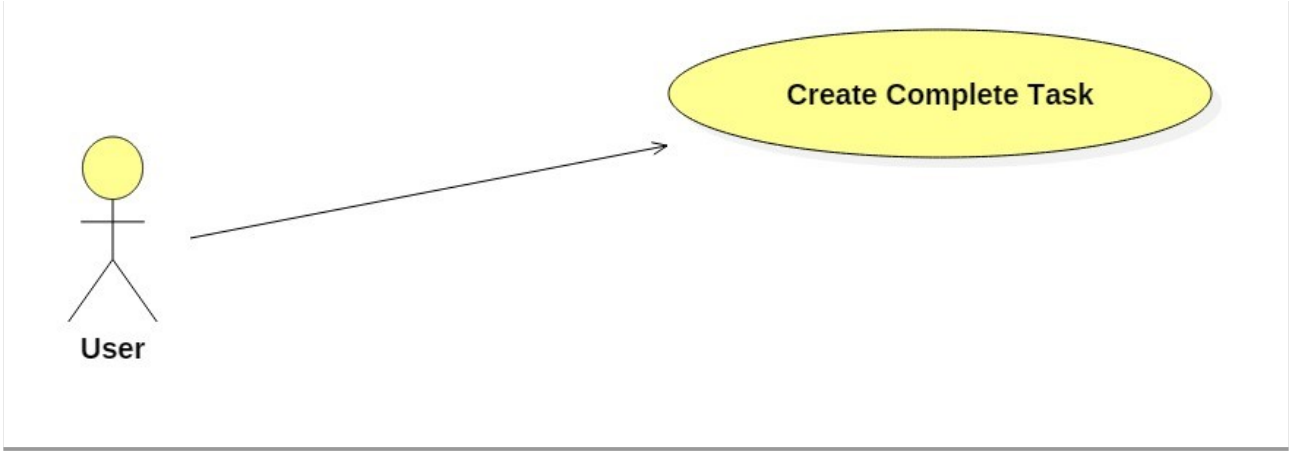


Figure 1: Create Complete Task Use Case

Use Case ID	UC8
Use Case Name	Create Complete Task
Description	This use case describe event in which a user wants to create a complete task.
Actors	User
Precondition	The user should login to the system & should chose a table then press the “create task” button .
Trigger	The user tries to create a complete task.
Basic Flow	1- The user enters the “create task” page. 2- The user presses the “complete task” button.
Exception Flow	-
Post Conditions	-

Table 1: Description of Create Complete Task Use Case

5.1.2.9 Download Model Use Case for User

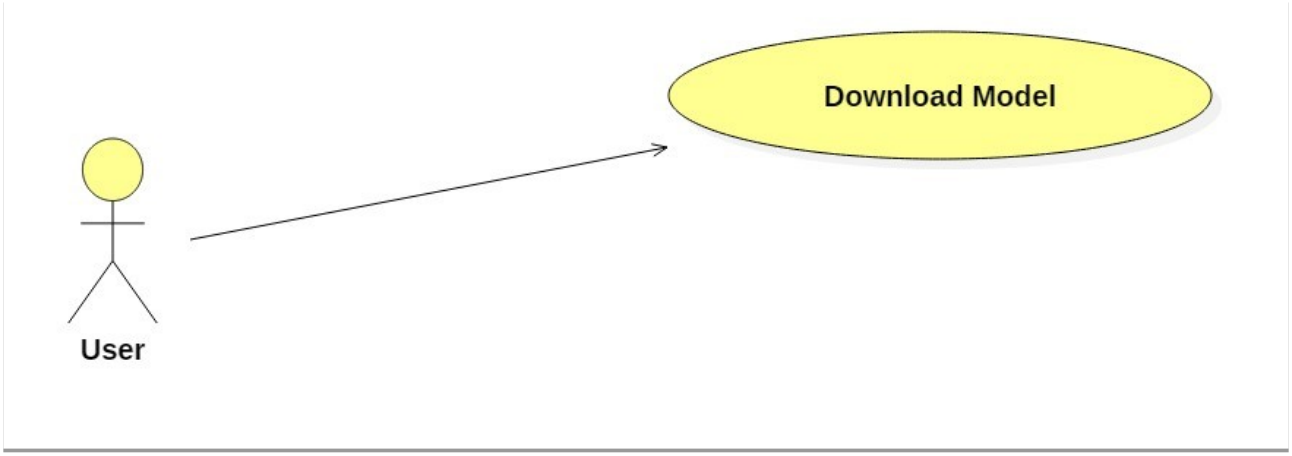


Figure 1: Download Model Use Case

Use Case ID	UC9
Use Case Name	Download Model
Description	This use case describe event in which a user wants to download one of his created models
Actors	User
Precondition	User should login to system.
Trigger	The user tries to download a model.
Basic Flow	1- The user enters the “my models” page. 2- The user selects one of the created models. 3- The user presses the download button. 4- Web service displays a success message after the model download process finished.
Exception Flow	If user has not an existing model download process fails.
Post Conditions	-

Table 1: Description of Download Model Use Case

5.1.2.10 Display Report Use Case for User

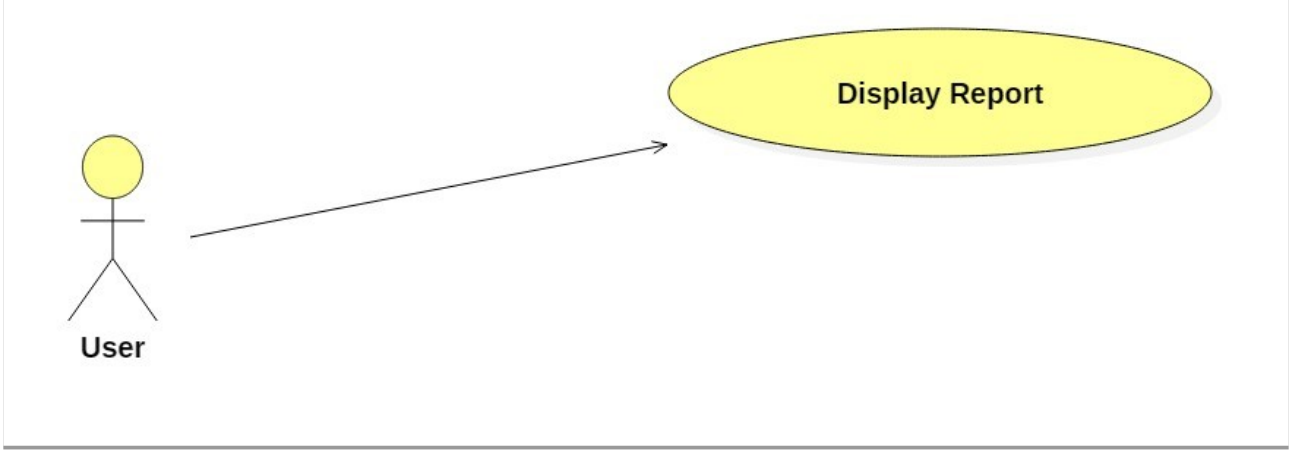


Figure 1: Display Report Use Case

Use Case ID	UC10
Use Case Name	Display Report
Description	This use case describe event in which a user wants to look his reports.
Actors	User
Precondition	The user should login to the system.
Trigger	The user wants to look at his reports.
Basic Flow	1- User enters “my reports” page. 2- User double clicks the report that he wants to look.
Exception Flow	If user hasn't created a task before, then the system shows a pop up message stating that there is no report to show.
Post Conditions	-

Table 1: Description of Display Report Use Case

5.1.2.11 Show RSS News Use Case for User

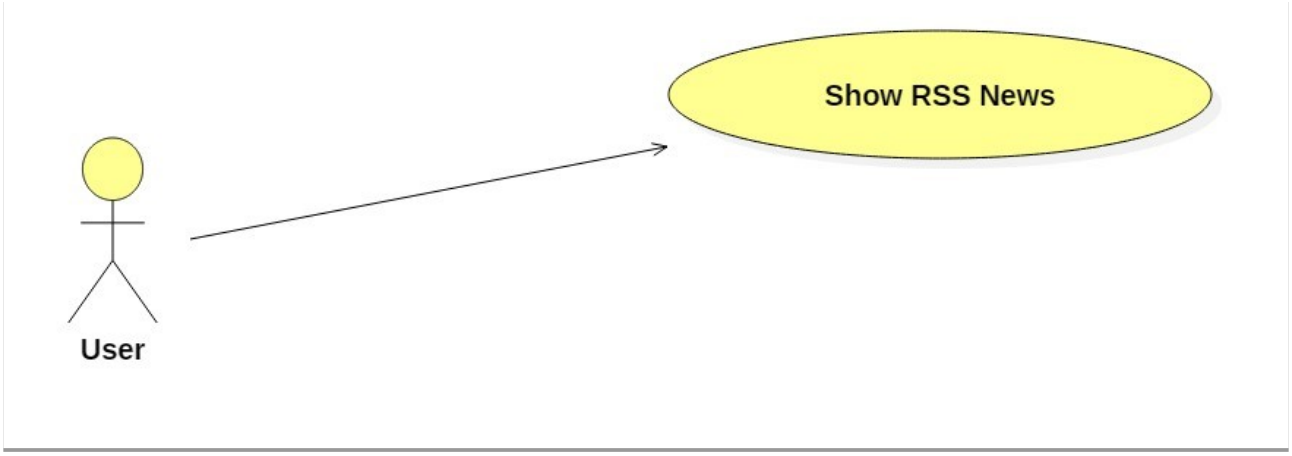


Figure 1: RSS News Use Case

Use Case ID	UC11
Use Case Name	RSS News
Description	This use case describe event in which a user can see the updated news related to machine learning and big data in his/her profile page
Actors	User
Precondition	-User should login to the system
Trigger	-
Basic Flow	1- User login to the system. 2- Rss news will be open in the profile page automatically
Exception Flow	-
Post Conditions	-

Table 1: Description of RSS News Use Case

5.1.2.12 Show User Activity Use Case for User

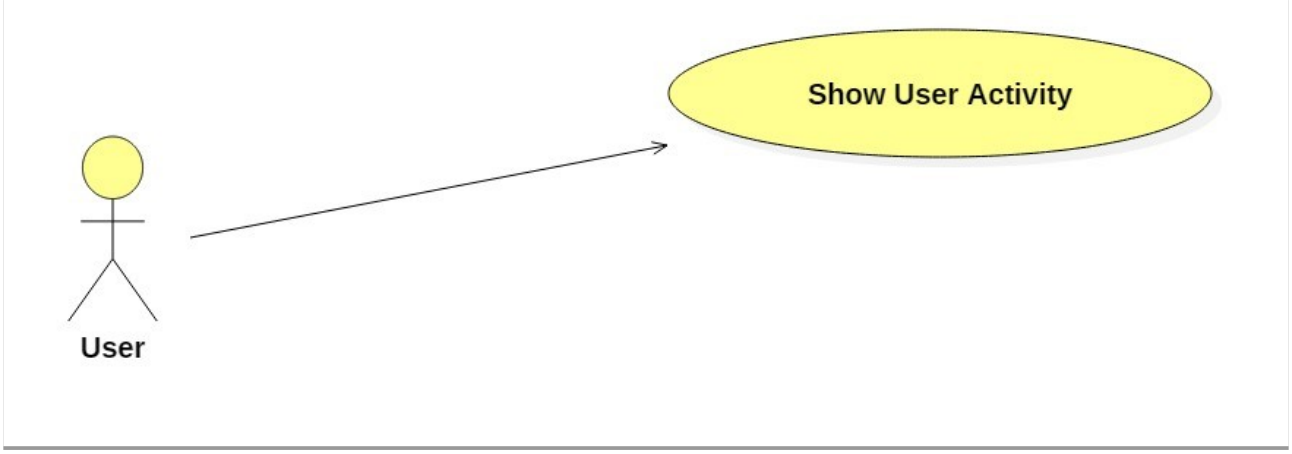


Figure 1: Show User Activity Use Case

Use Case ID	UC12
Use Case Name	Show User Activity
Description	This use case describes the event in which a user can see his/her usage history of the Vitriol in a profile page.
Actors	User
Precondition	User should login to the system
Trigger	-
Basic Flow	1- User login to the system. 2-Usage history will be open in the profile page automatically
Exception Flow	-
Post Conditions	-

Table 1: Description of Show User Activity Use Case

5.1.2.13 Create Task Use Case for User

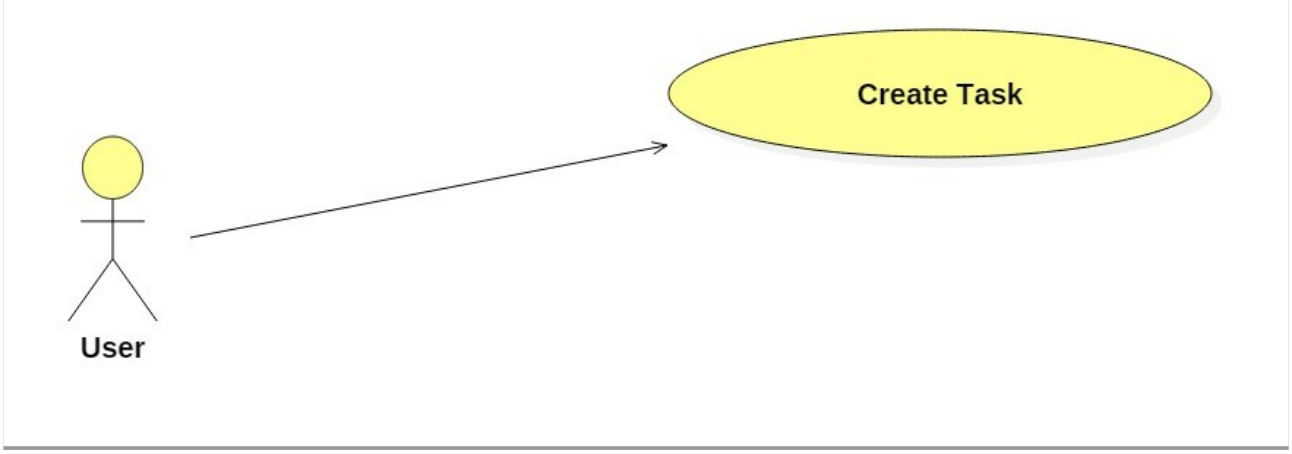


Figure 1: Create Task User Case

Use Case ID	UC13
Use Case Name	Create Task
Description	This use case describe event in which a user wants to create a model.
Actors	User
Precondition	The user should login to the system and should chose a table from his database.
Trigger	The user tries to create a model.
Basic Flow	1- The user presses the “create task” button.
Exception Flow	-
Post Conditions	-

Table 1: Description of Create Task Use Case

5.1.2.14 Connect New Table Use Case for User

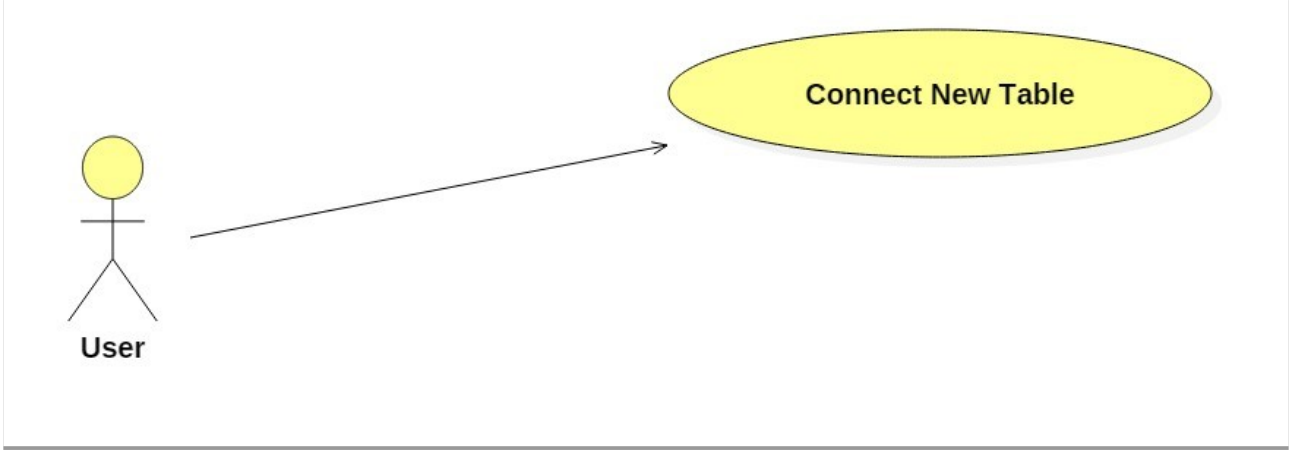


Figure 1: Connect New Table Use Case

Use Case ID	UC14
Use Case Name	Connect New Table
Description	This use case describe event in which a user wants to connect his/her databases to the Vitriol servers.
Actors	User
Precondition	The user should login to the system and should fill the his/her databases details.
Trigger	The user tries to connect new table.
Basic Flow	1- User login to the system. 2-User fill the databases ip address,name,type,port number and user name. 3-Then user shoul choosede his data type such as health,education,law etc. 4-Connection and copy process will be done after all.
Exception Flow	If the given address or names are wrong connect new table process will fail and system will be ask the user these informations again.
Post Conditions	-

Table 1: Description of Connect New Table Use Case

5.2 Composition *Viewpoint*

The composition viewpoint concerns about the architecture of the whole system and provides a top level view of the entire system. It contains UML Component Diagram for the logical representation and UML Deployment Diagram for the physical representation of the system.

5.2.1. Design Concerns

The aim of this viewpoint is providing information to stakeholders and programmers for planning and controlling the system. This kind of subsystem level illustration can be used for assembling components, cost estimation and schedules in terms of development effort. System components as modules, packages, files and their interconnections are illustrated in Component diagram. For the hardware components, also deployment diagram is provided below.

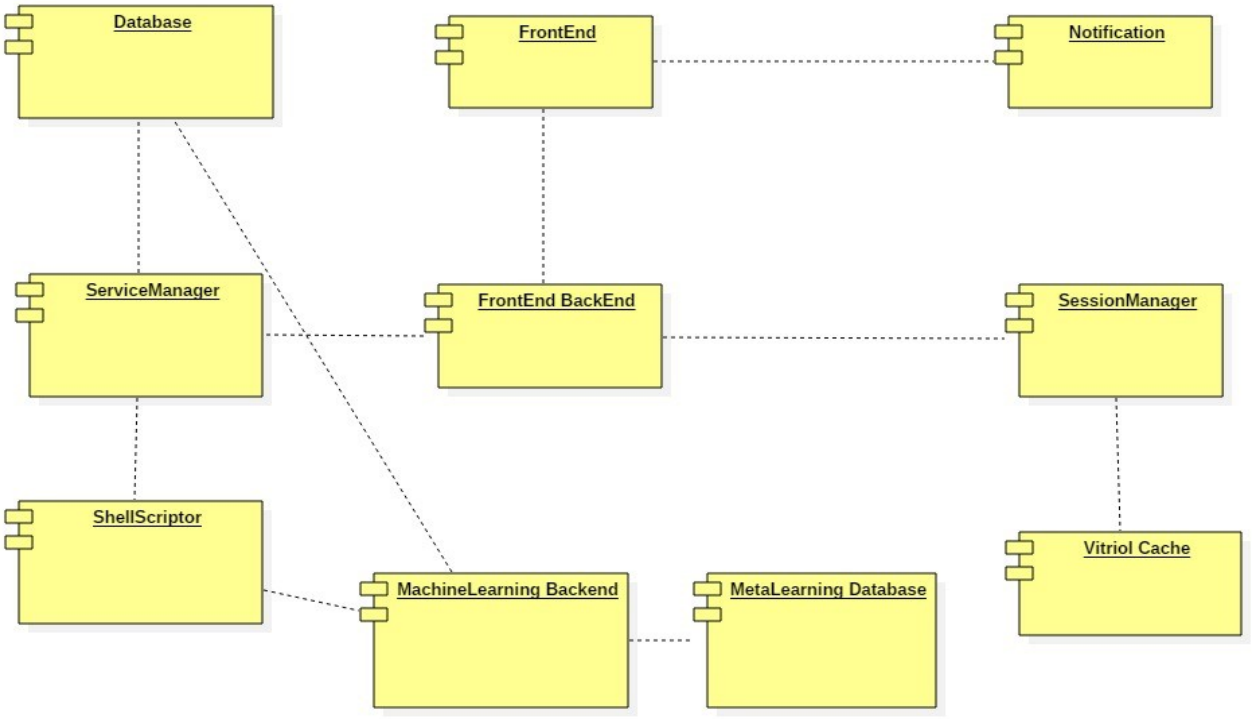


Figure 1: Component Diagram of Vitriol

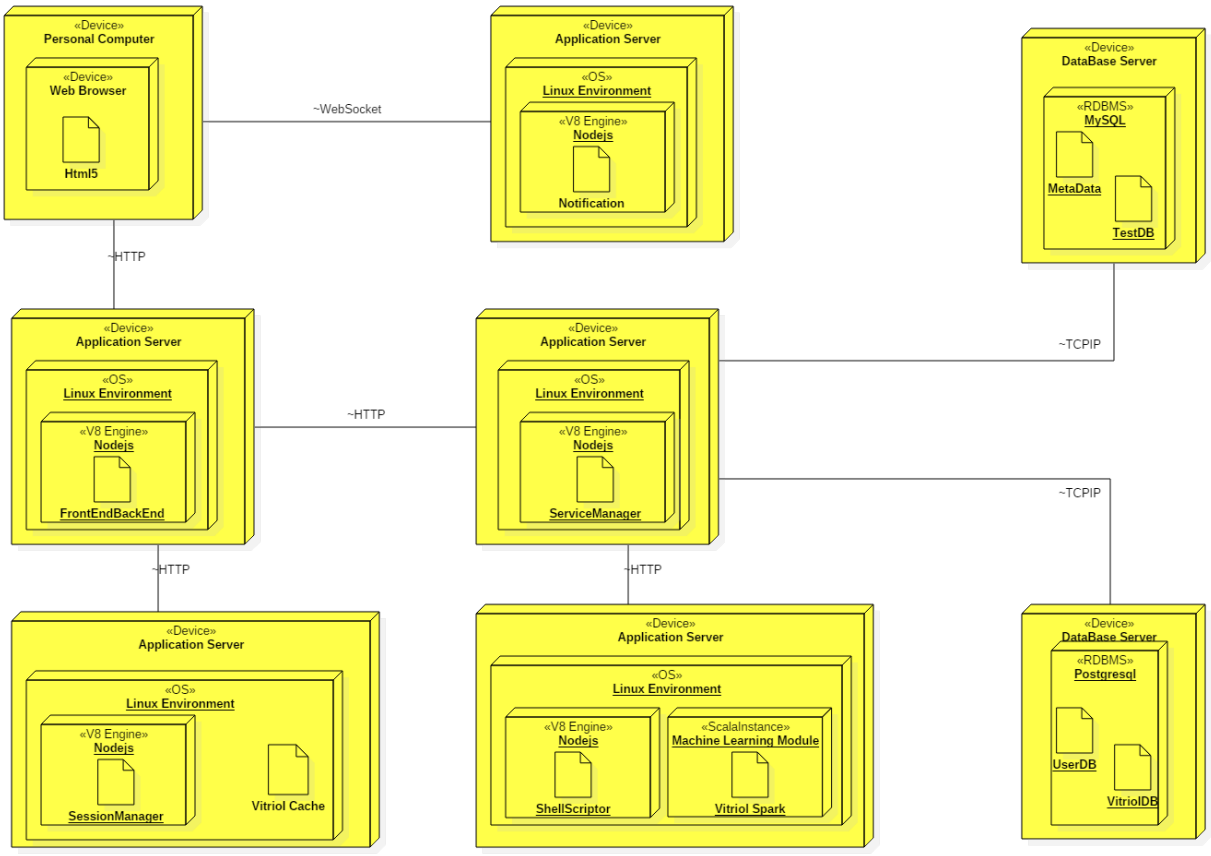


Figure 1: Deployment Diagram of Vitriol

5.3 Interaction *Viewpoint*

This viewpoint aims to show the interaction information between the system entities and actors. In order to visualize the interaction viewpoint sequence diagrams are used in this section.

5.3.1 Design Concerns

The system shall be designed with respect to separation of concerns and divide and conquer principles. Interaction viewpoint provides information to the stakeholders about the fact that, which part of the system is the responsibility of which module.

5.3.2 Sequence Diagrams

5.3.2.1 Sequence Diagram for Login Use Case

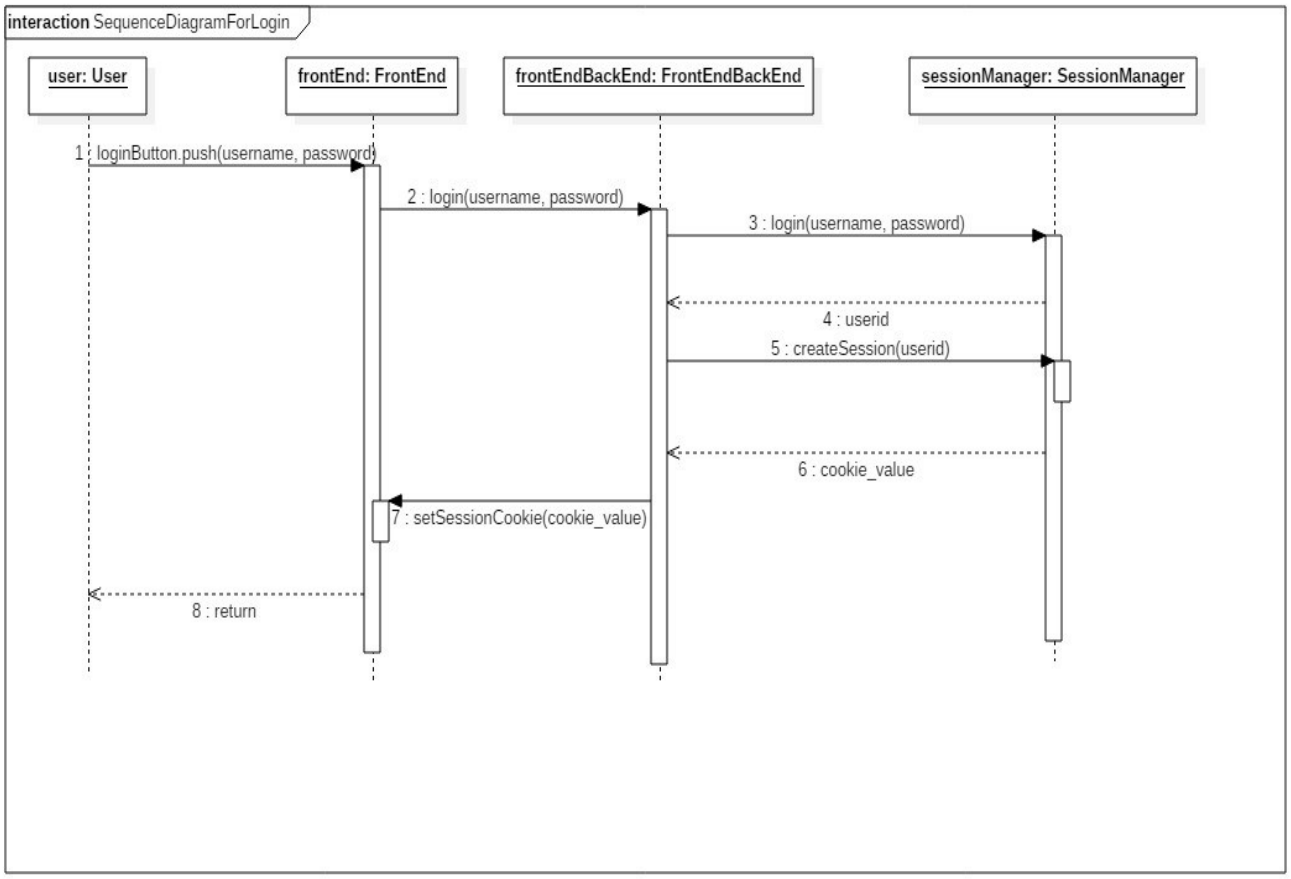


Figure 2: Sequence Diagram for Login Use Case

5.3.2.2 Sequence Diagram for Show Statistics Use Case

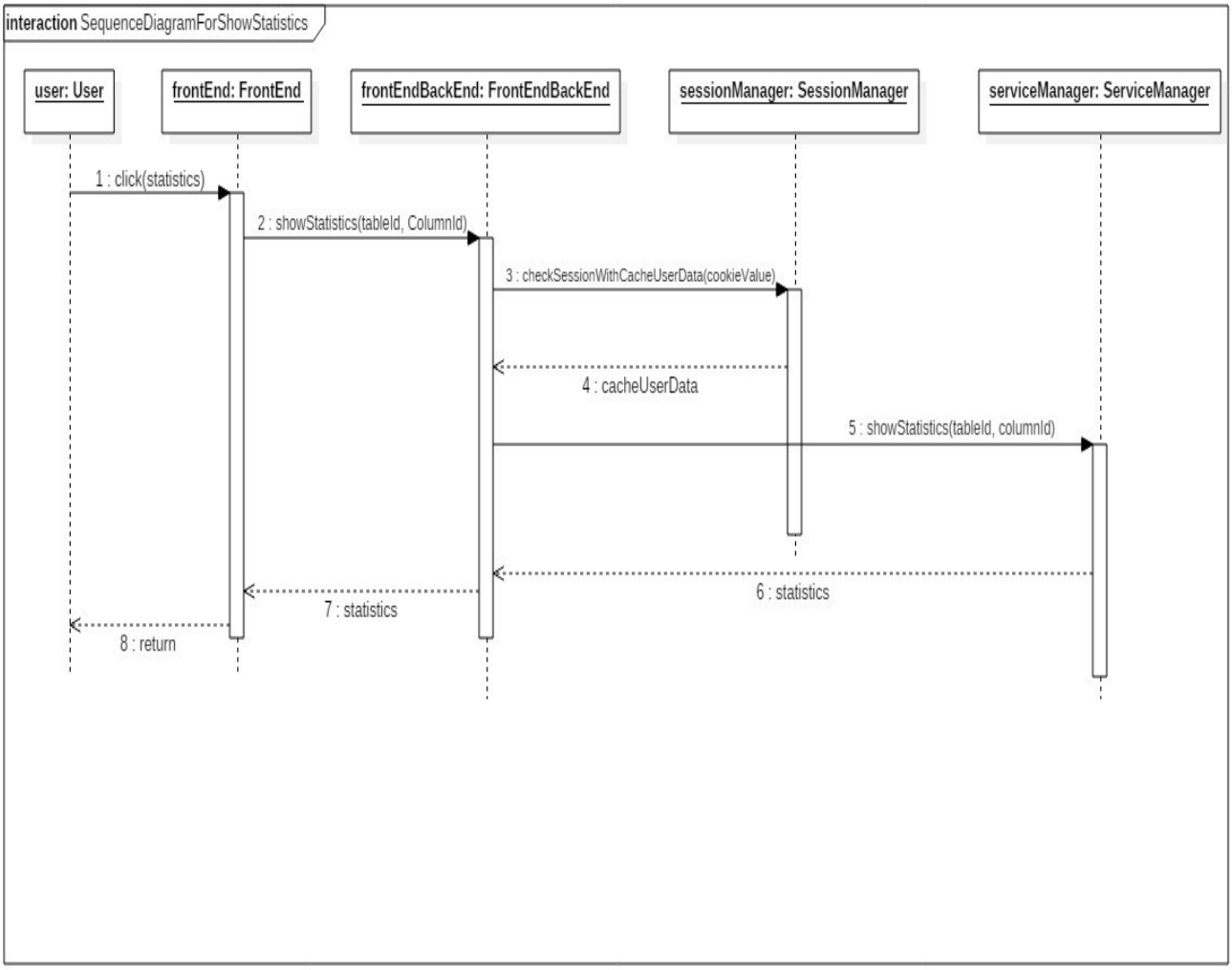


Figure 3: Sequence Diagram for Show Statistics Use Case

5.3.2.3 Sequence Diagram for Download New Data Use Case

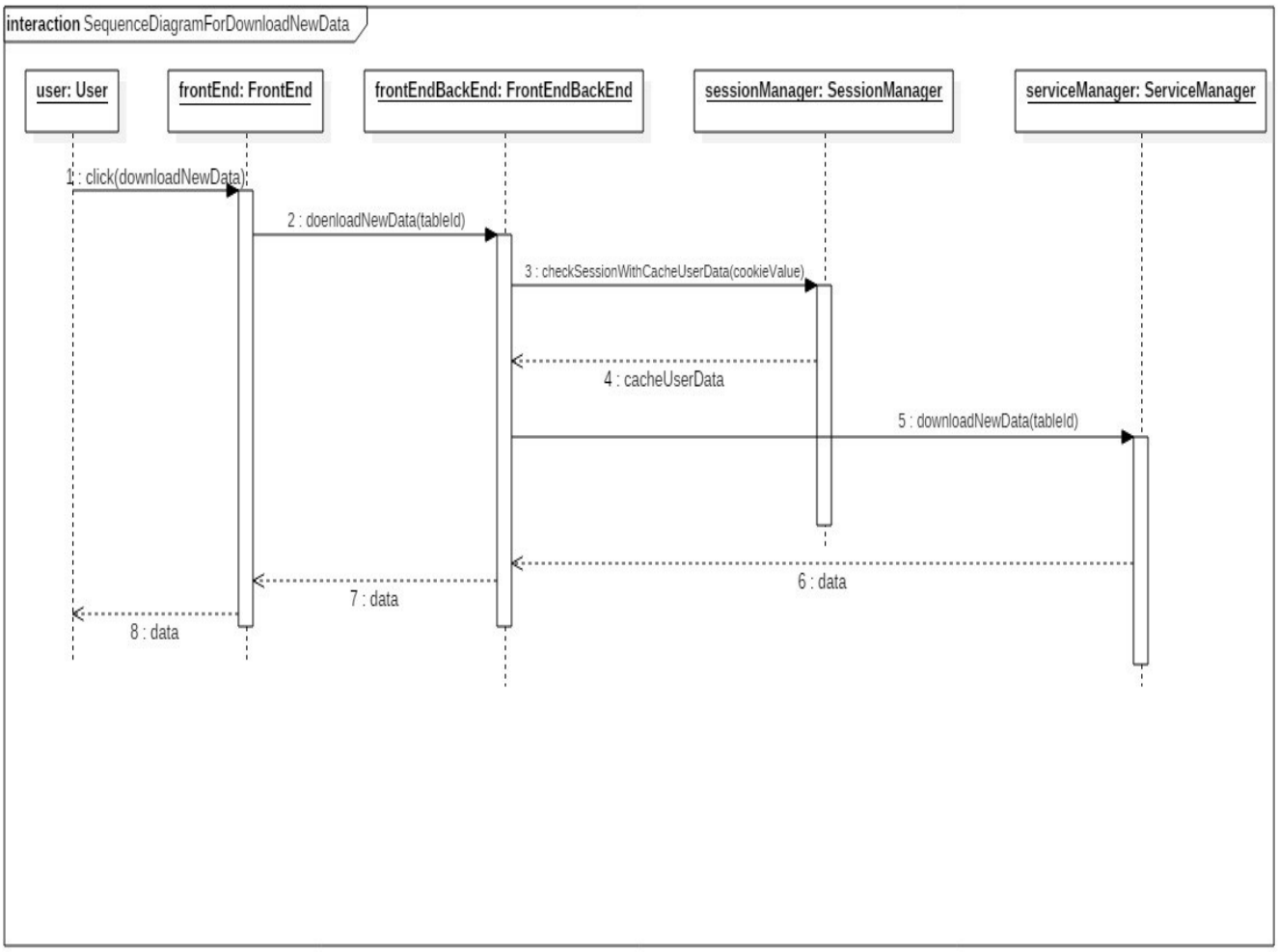


Figure 4: Sequence Diagram for Download New Data Use Case

5.3.2.4 Sequence Diagram for Update Table Use Case

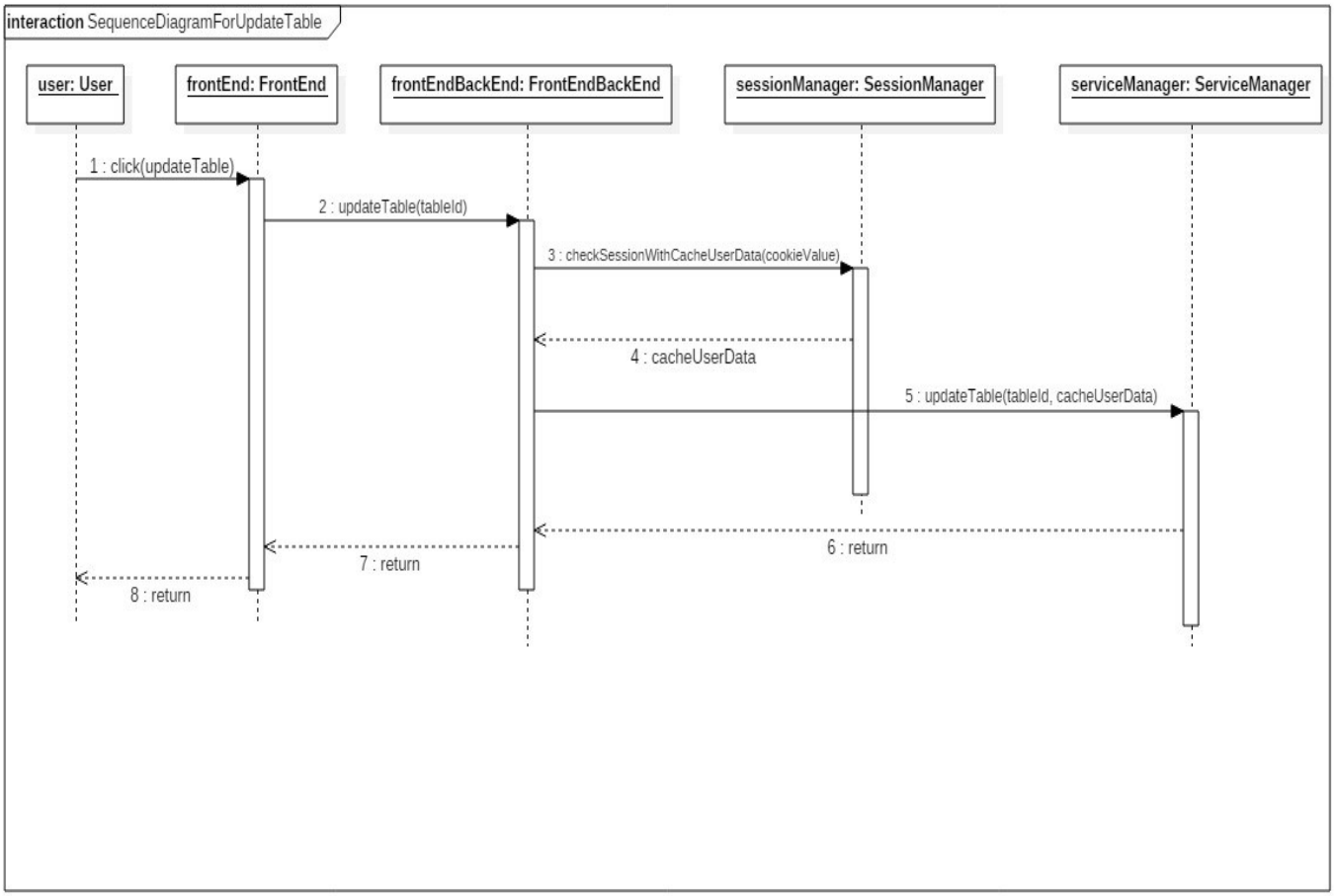


Figure 5: Sequence Diagram for Update Table Use Case

5.3.2.5 Sequence Diagram for Display Visual Distribution Use Case

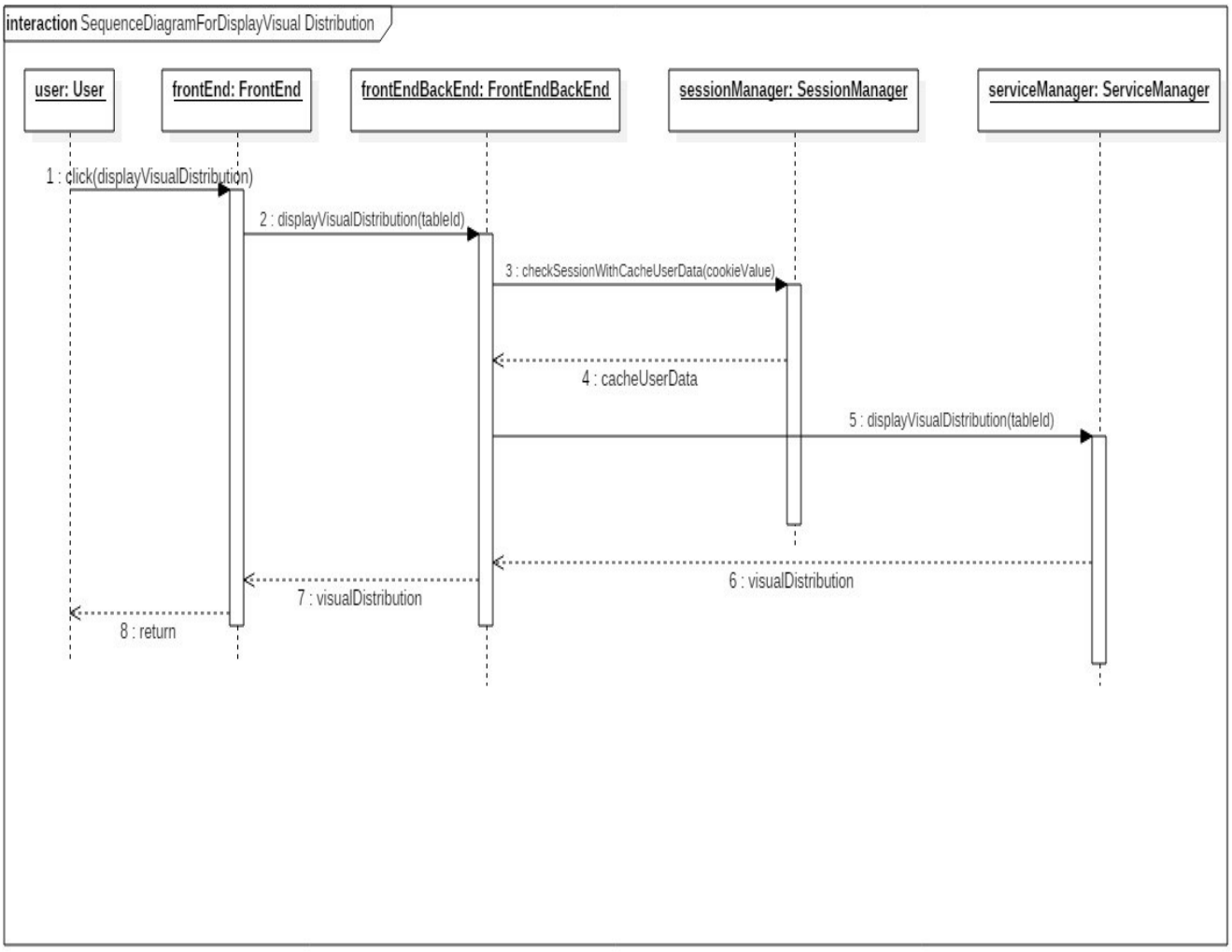


Figure 6: Sequence Diagram for Display Visual Distribution Use Case

5.3.2.6 Sequence Diagram for Create Model Task Use Case

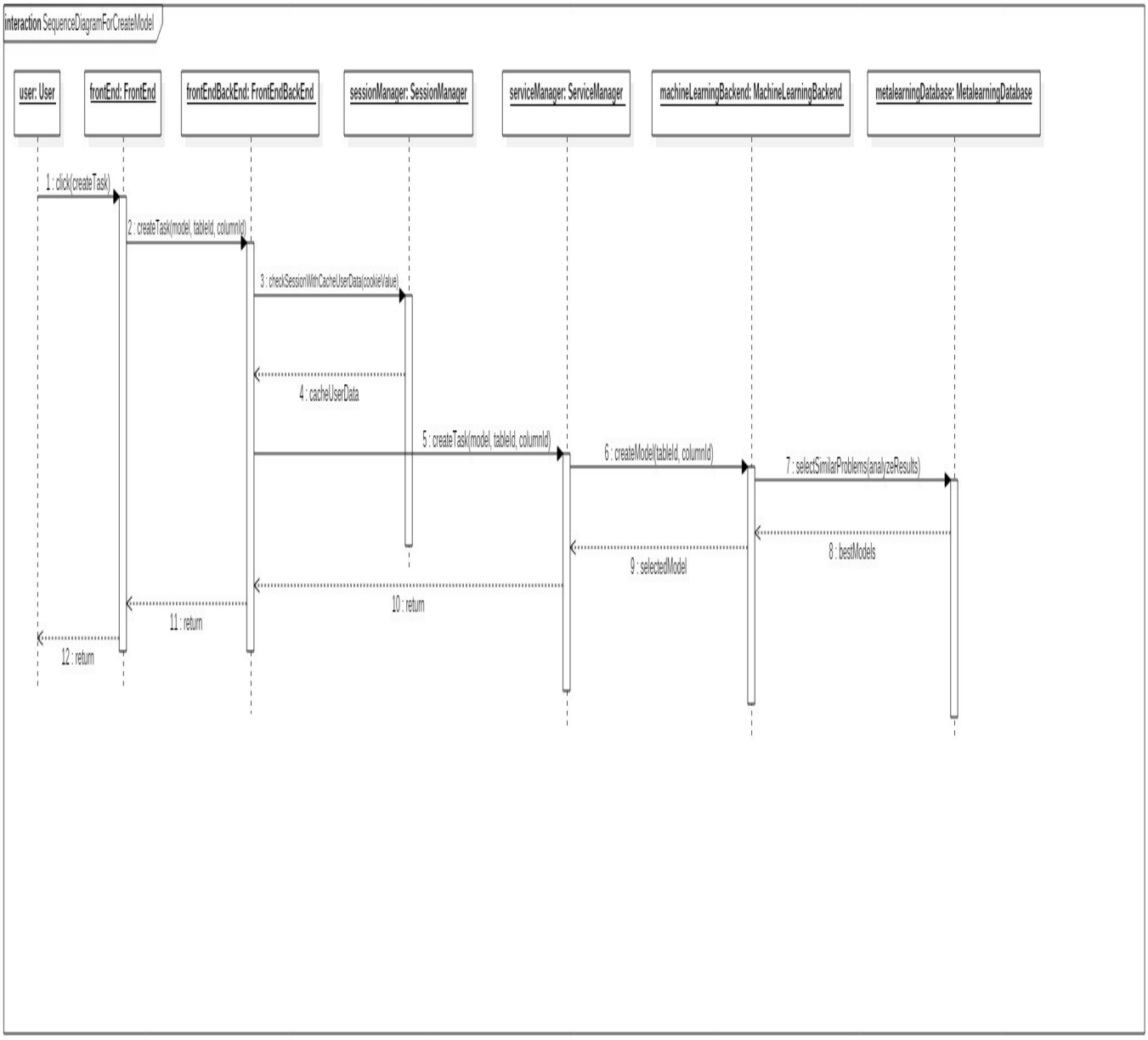


Figure 7: Sequence Diagram for Create Model Task Use Case

5.3.2.7 Sequence Diagram for Create Clean Task Use Case

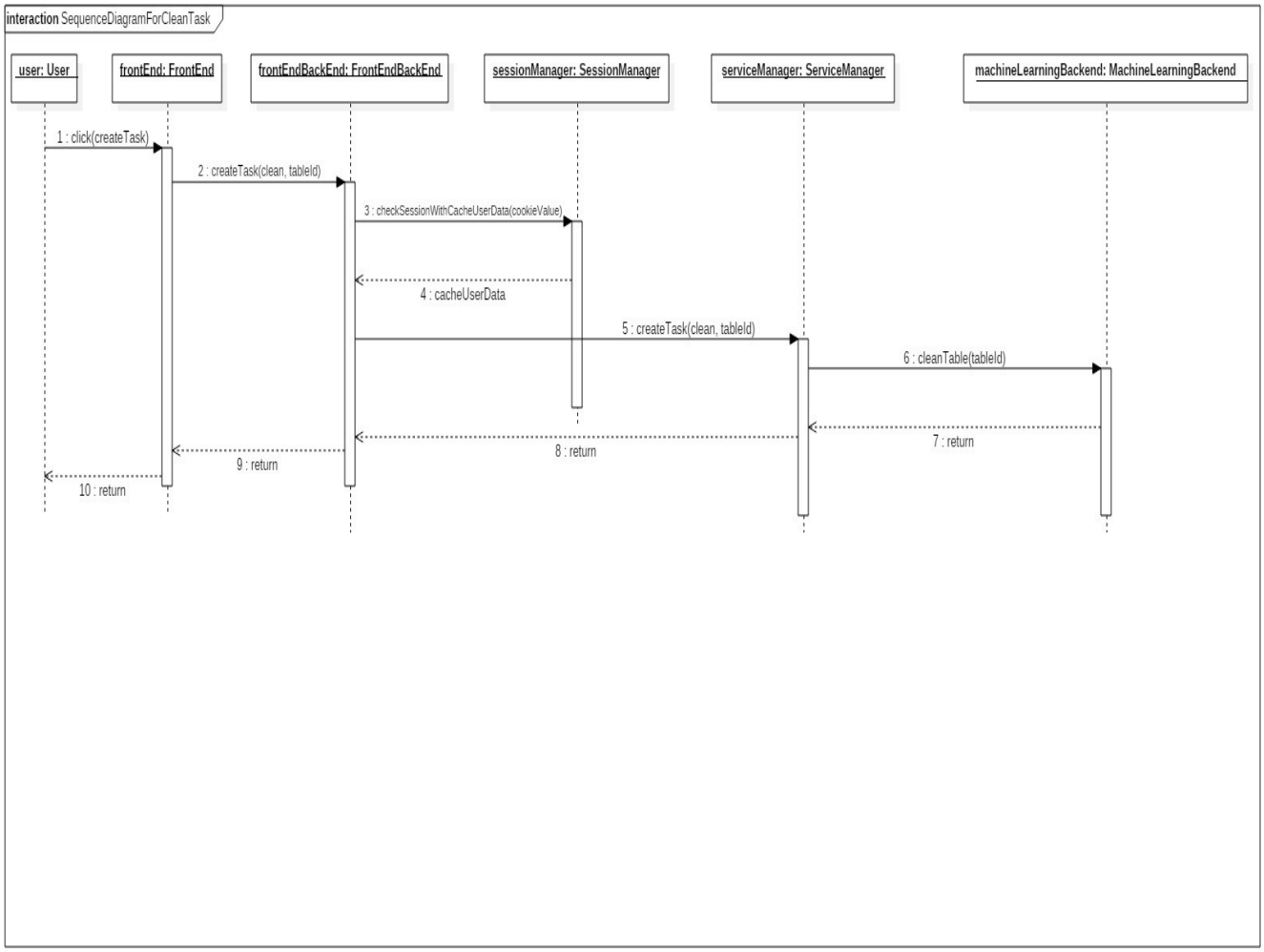
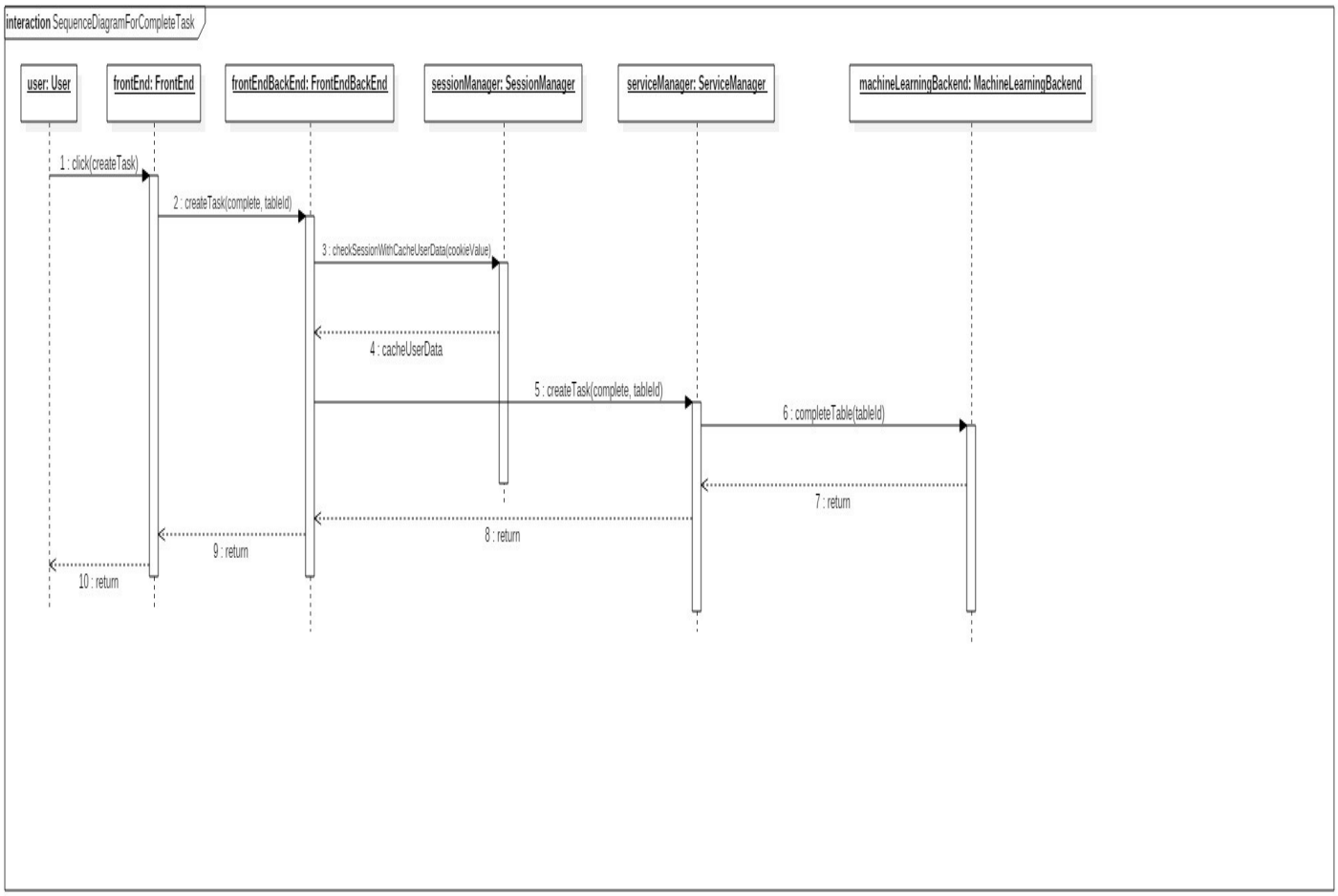


Figure 8: Sequence Diagram for Create Clean Task Use Case

5.3.2.8 Sequence Diagram for Complete Task Use Case



5.3.2.9 Sequence Diagram for Download Model Use Case

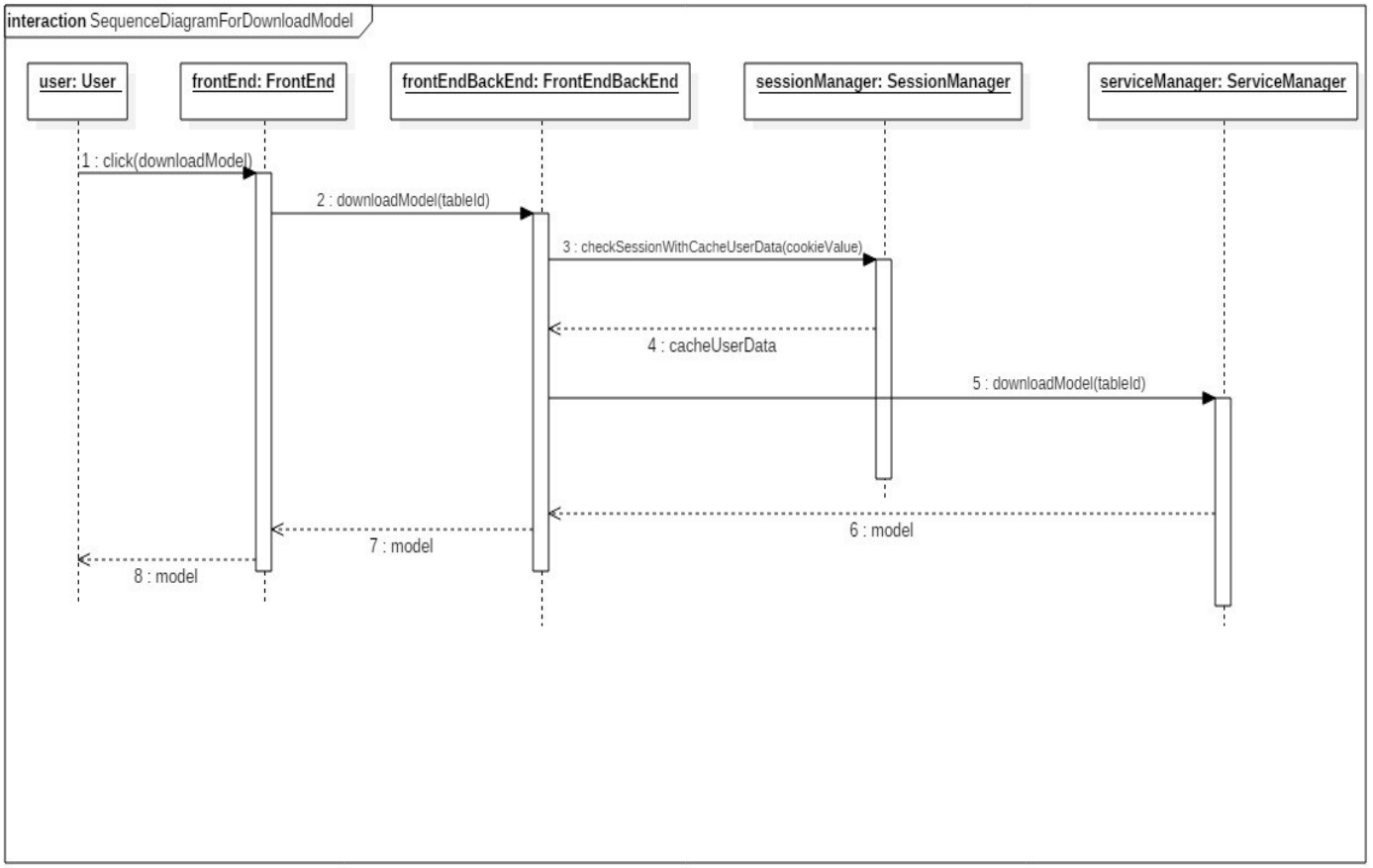


Figure 9: Sequence Diagram for Download Model Use Case

5.3.2.10 Sequence Diagram for Display Report Use Case

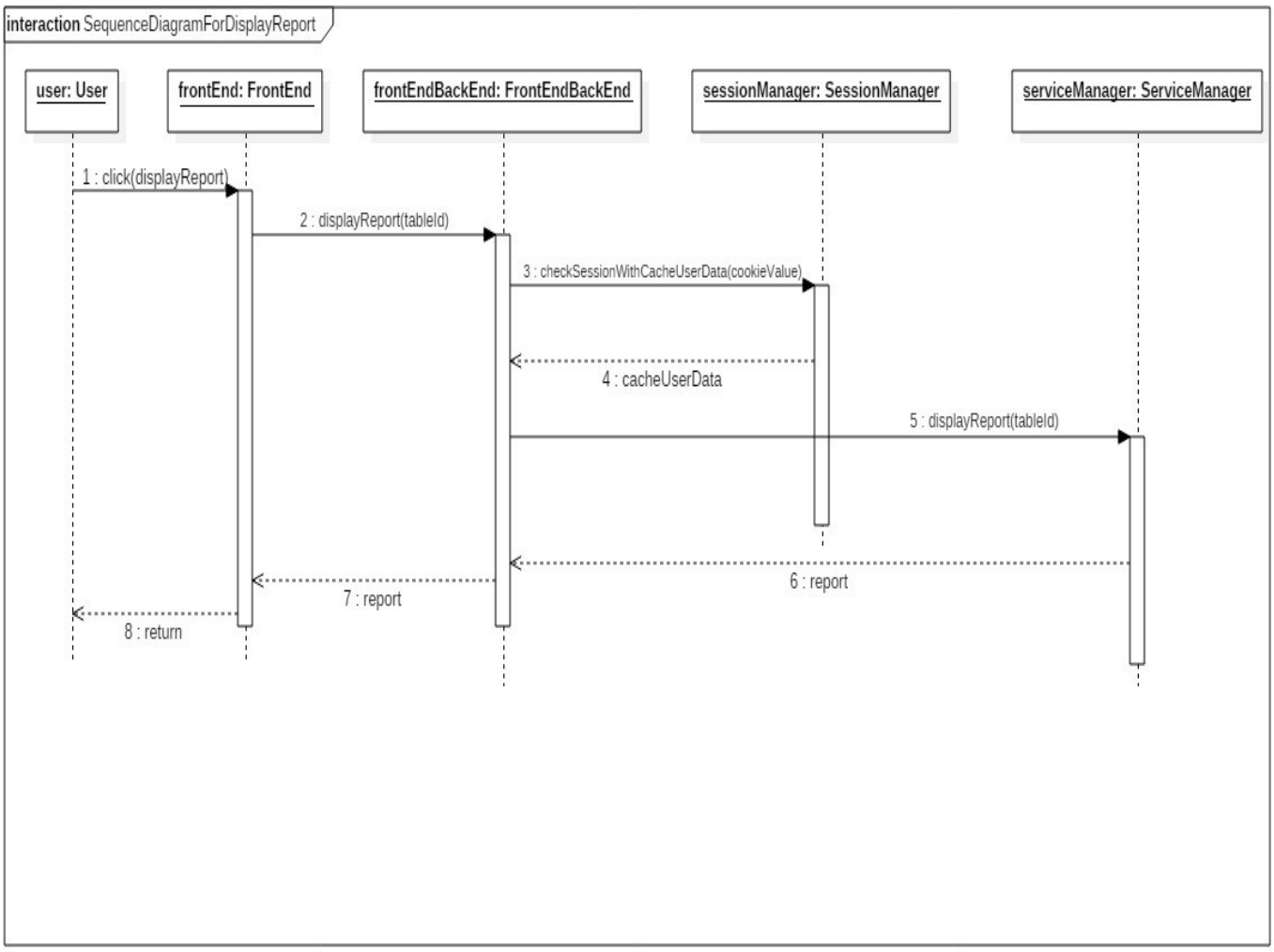


Figure 10: Sequence Diagram for Display Report Use Case

5.3.2.11 Sequence Diagram for RSS News Use Case

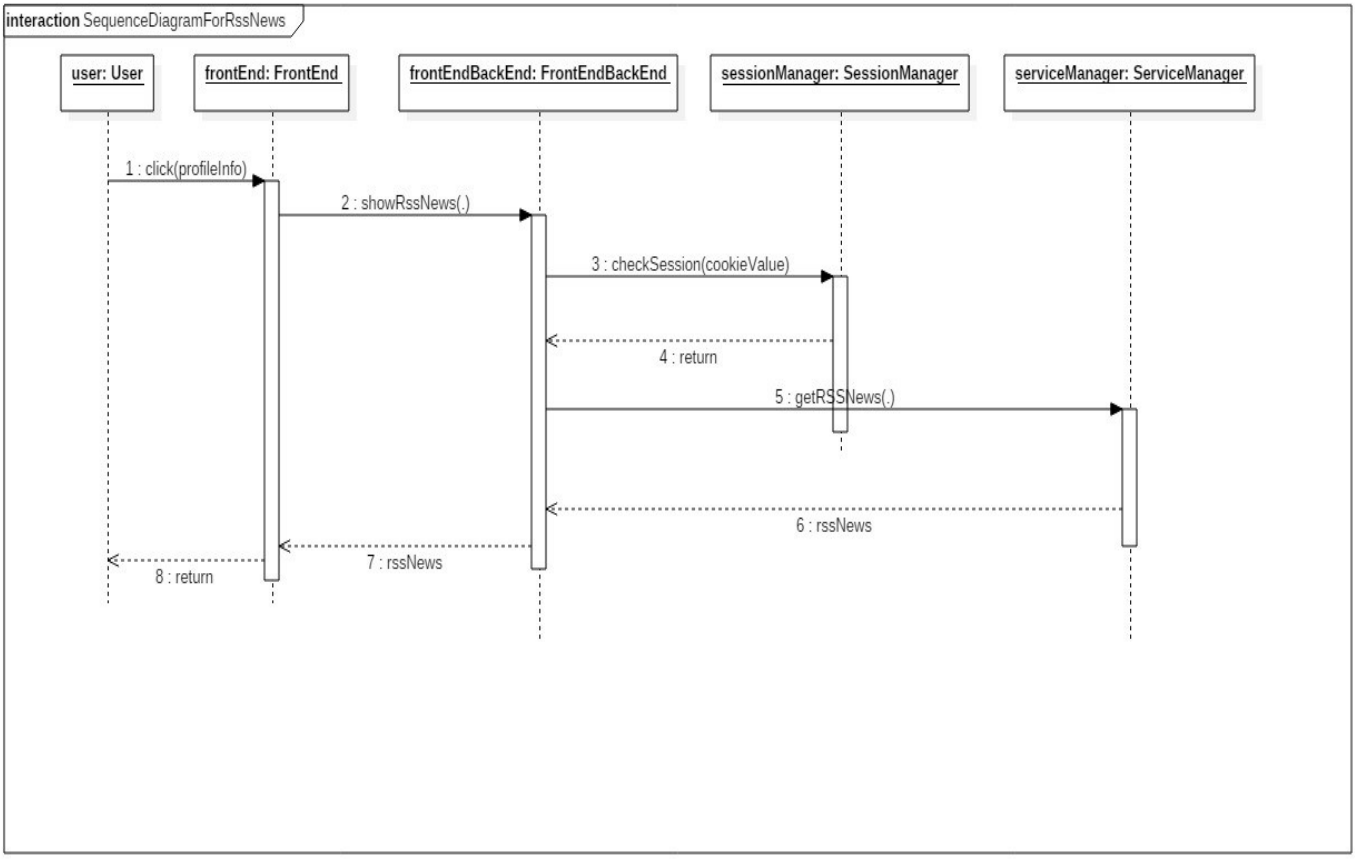


Figure 11: Sequence Diagram for RSS News Use Case

5.3.2.12 Sequence Diagram for Show User Activity Use Case

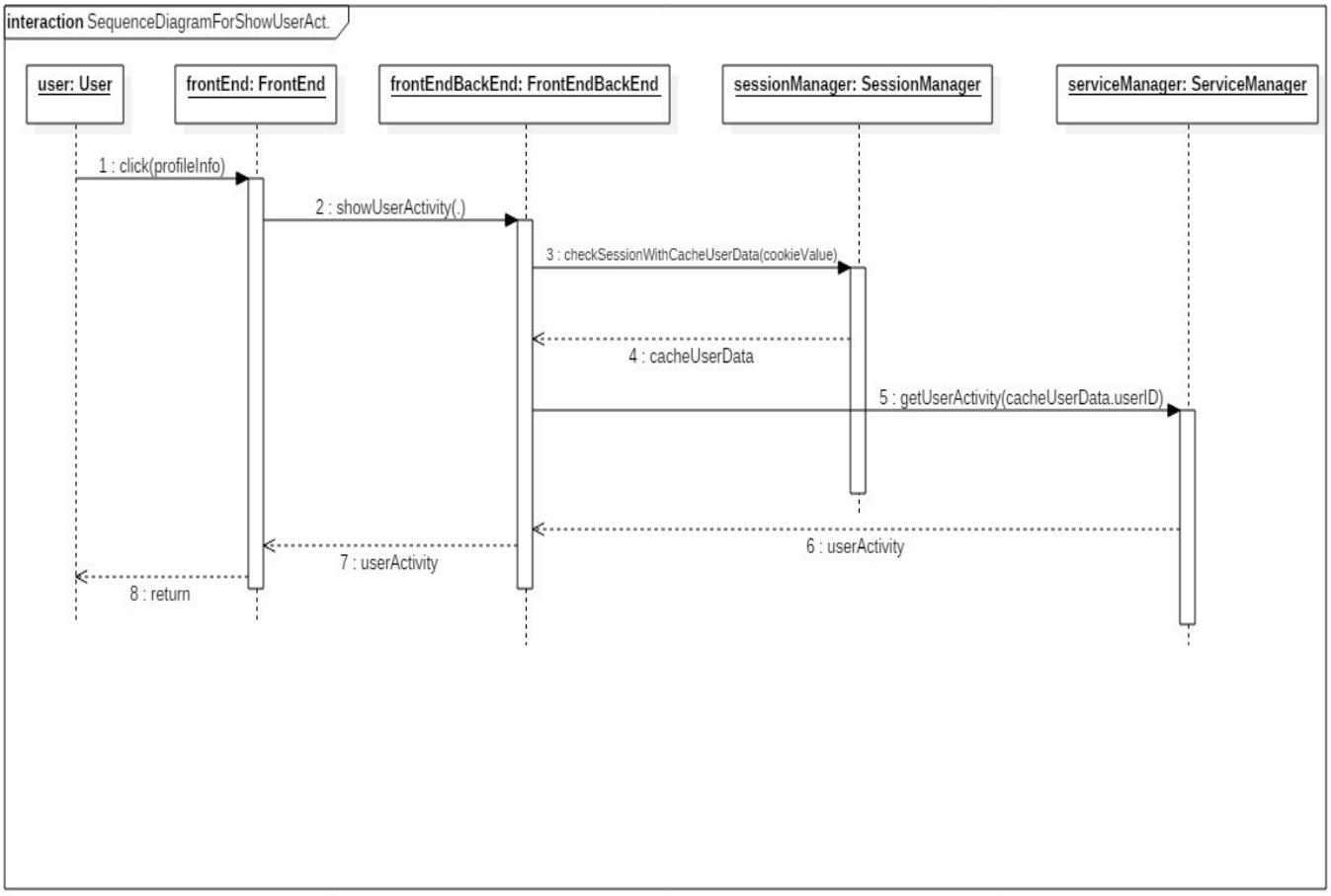


Figure 12: Sequence Diagram for Show User Activity Use Case