Meet.me

Dashboard Module Specifications

CONTENT

OBJECTIVE

- Provide a session manager who will manage all the relevant details about a session both on the server as well as client-side.
- Provide a summarizer that will summarise the meeting held with appropriate filtering.
- Provide a telemetry analyzer that will analyze the data transferred for the discussions held on the server and present it in a neat and efficient manner.
- Provide a persistence interface that will handle storing of files and images that are generated by the telemetry analyzer and summarizer.
- The dashboard keeps track of users in the session and all the relevant information such as usernames, streams, session passwords, etc.
- Maintain the session details such as users in the session, session password, user and IP mappings, etc.

TEAM CONFIGURATION

Team Lead:

- **Handled By:** Siddharth Shah
- **Role:**
    - To design the abstract design for the dashboard module.
    - Handle the deadlines for the dashboard module and accordingly design time schedules for other team members as well.
    - Integrate the module with other modules and handle internal team conflicts or design choices.
    - Regression testing and E2E testing for the module.

Session Manager:

- **Handled By:** Rajeev Goyal
- **Role:**
    - Runs as controller on the server as well as on the client-side
    - Initialize all managers in other modules with appropriate dependencies
    - Act as an interface between all the submodules in the Dashboard module.
    - Maintain the details of all the users in the session
    - Set the users list for the Networking module to broadcast

Summary Logic:

- **Handled By:** Sairoop Bodepudi
- **Role:**
    - Design an algorithm to summarise the contents discussed during the discussion
    - Efficient model the summarizer to run efficiently whenever client asks for summary.

Telemetry:

- **Handled By:** Harsh Parihar
- **Role:**
    - Run analysis on the data of all discussions done on the server
    - Run analysis on the data of a particular discussion
    - Analysis telemetrics include users/discussion, number of total discussions, chats/user for ongoing session, the time any user spends in the meeting.

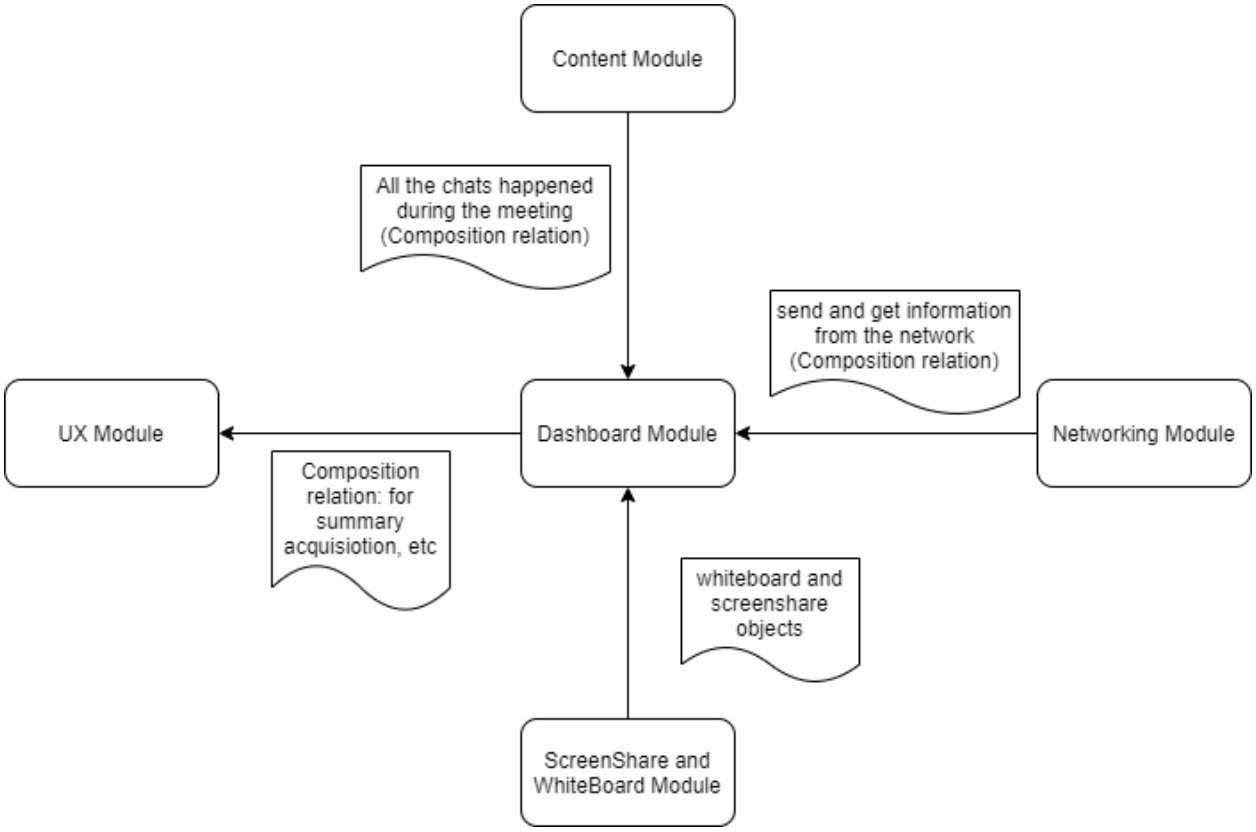
Persistence:

- **Handled By:** Parmanand Kumar
- **Role:**
    - Store the summary and telemetry analysis at the end of the meeting efficiently and effectively.
    - Create graphs for the telemetry analytics and store them as in PNG format.

DEPENDENCY DIAGRAM

- The dashboard will depend on all the modules present in the project.

- Following is the dependency diagram which states the dependency relationships and the information passed during in the relation



- As the dashboard module runs as a controller module, it has to initialize almost all the modules in the software

MODULE DIAGRAM

The dashboard modules have different flow tracks based on different events, all the events and the data for the event are depicted in the following diagrams.

Server Boots Up:

When the server is started the session object is initialized on the server-side by the session manager and the session manager also regulates the flow of IP address and port to connect to the server.

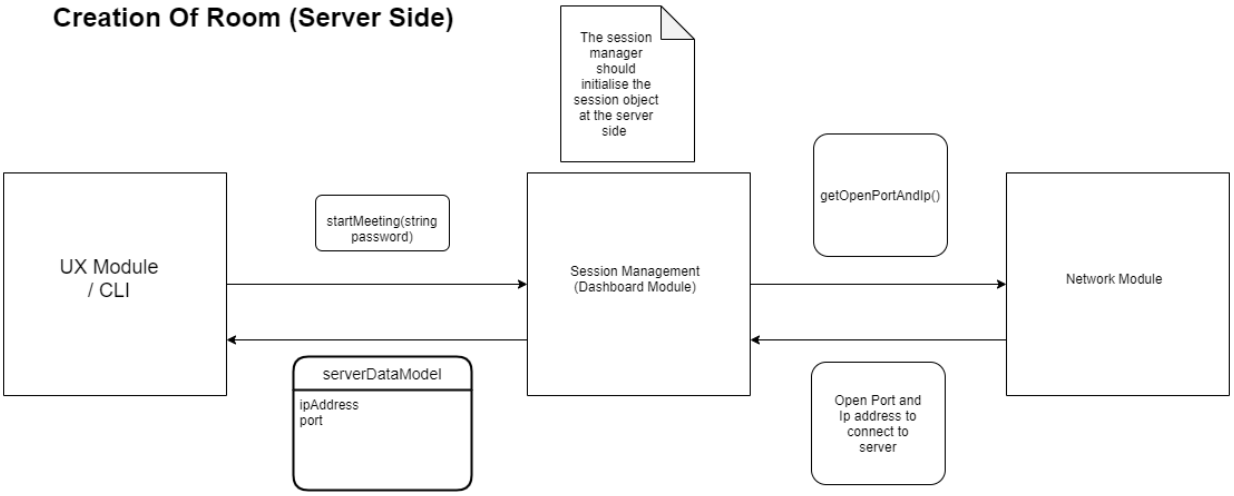


Figure 1. The data flow diagram whenever server boots up

Client Joins the Meeting:

When a client joins the meeting, the dashboard on the client-side receives the clientJoinModel from the UX which is transmitted to the Network Module on the client in order to send it to the server. The server-side dashboard module creates a user object based on the client details that are received and then adds this object to the session object maintained on the server-side. The telemetry submodule in the dashboard module must run its analytics on the changed data. This new user object is broadcasted to all the users who were present before the arrival of the new user and the server session object is sent to the new user. The received data at the client-side will be notified to the UX module from the dashboard module at the client-side.

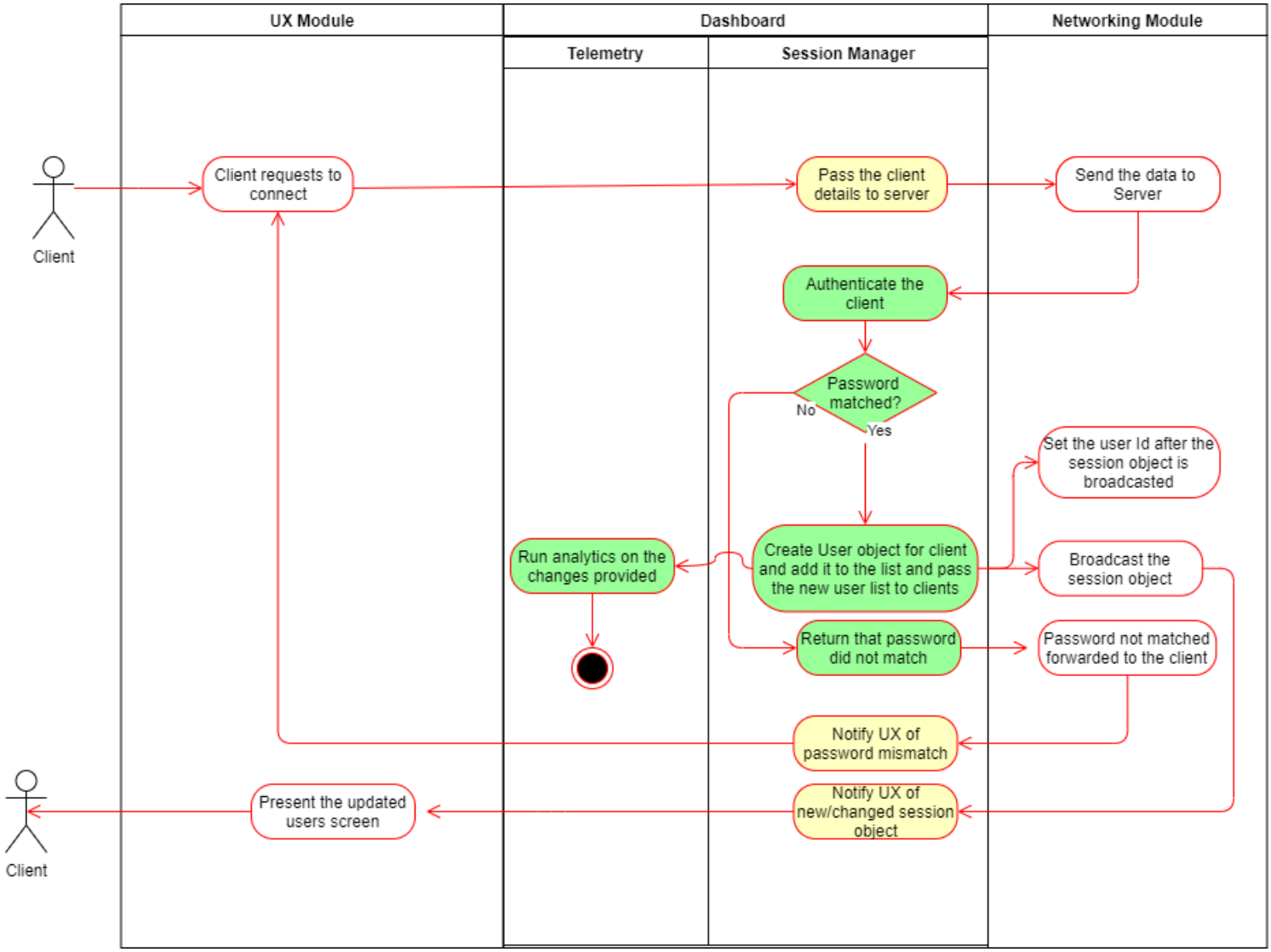


Figure 2: Activity diagram for client join event

Client Departure:

Whenever the client leaves the meeting, the UX will run the clientLeft() function from the session manager's interface for UX. This event will be passed on to the server via networking and then on the server side the dashboard module will remove the user from the session object maintained at the server-side and the same will be notified to the telemetry submodule via publisher-subscriber relationship. Then this new session object will be broadcasted to remaining clients and thus notified to the UX on other clients for the appropriate changes.

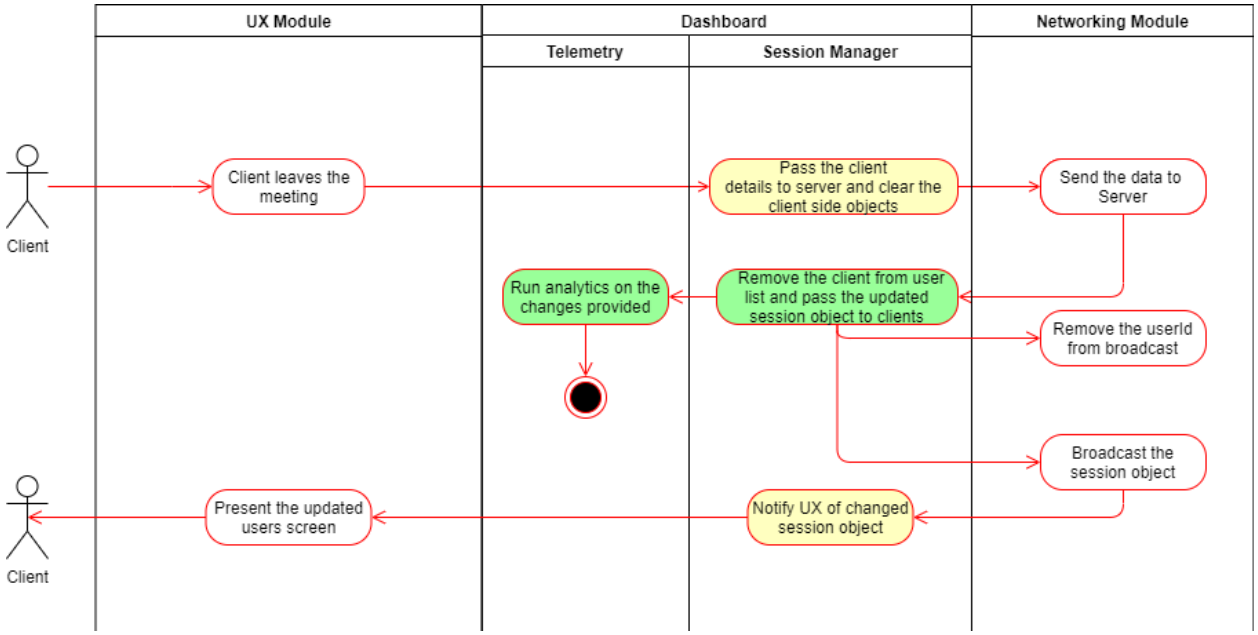


Figure 3: The activity diagram for the event when some client departs

End Meeting:

When the meeting ends, the session manager should clear up the session object at the client-side. The session manager at the server-side should gather all the chats from the Chat module and provide them to the summary logic submodule and the telemetry for a summary of the meeting and analyzing the data transferred during the meeting. This summary and analysis should be given to persistence in order to store as text and png files on the host/server.

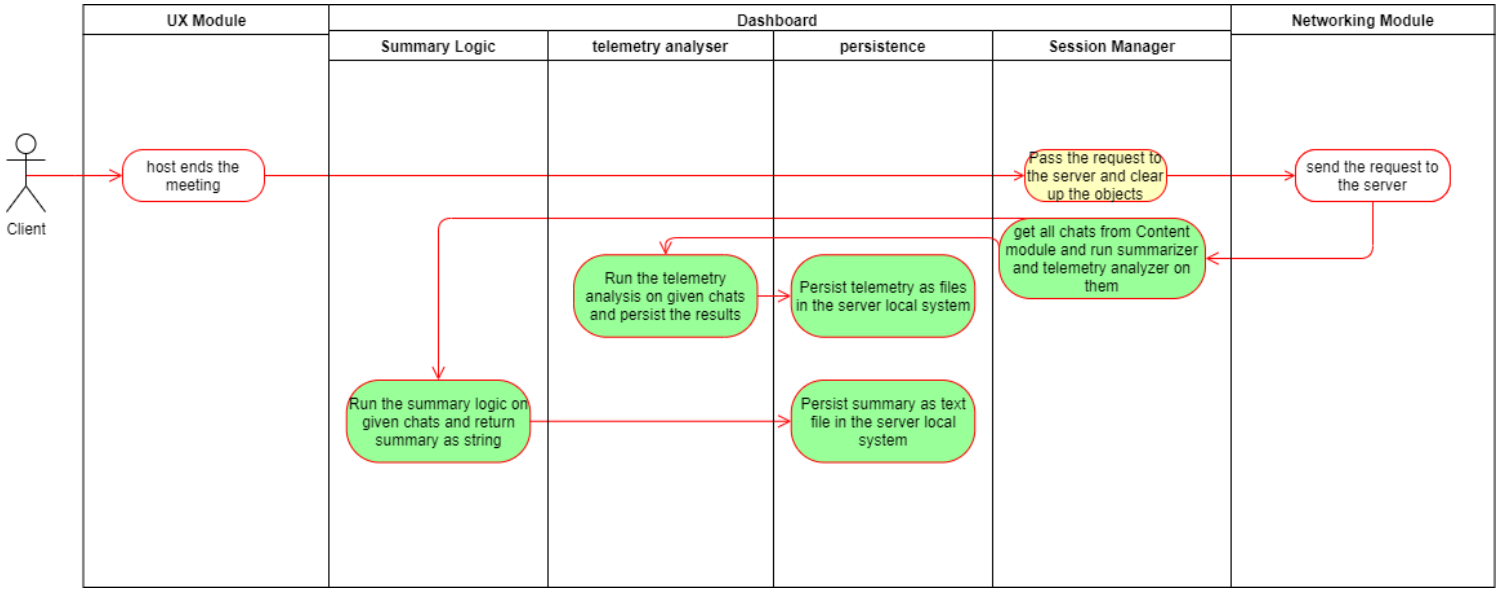


Figure 4: a) Activity Diagram for End Meeting Event.

Summary Retrieval During The Session:

When some client requests the summary for the ongoing discussion, the dashboard will send the request from the client-side to the server-side, where it will run the summary logic on all the chats in discussion and return the generated summary to the client who requested it.

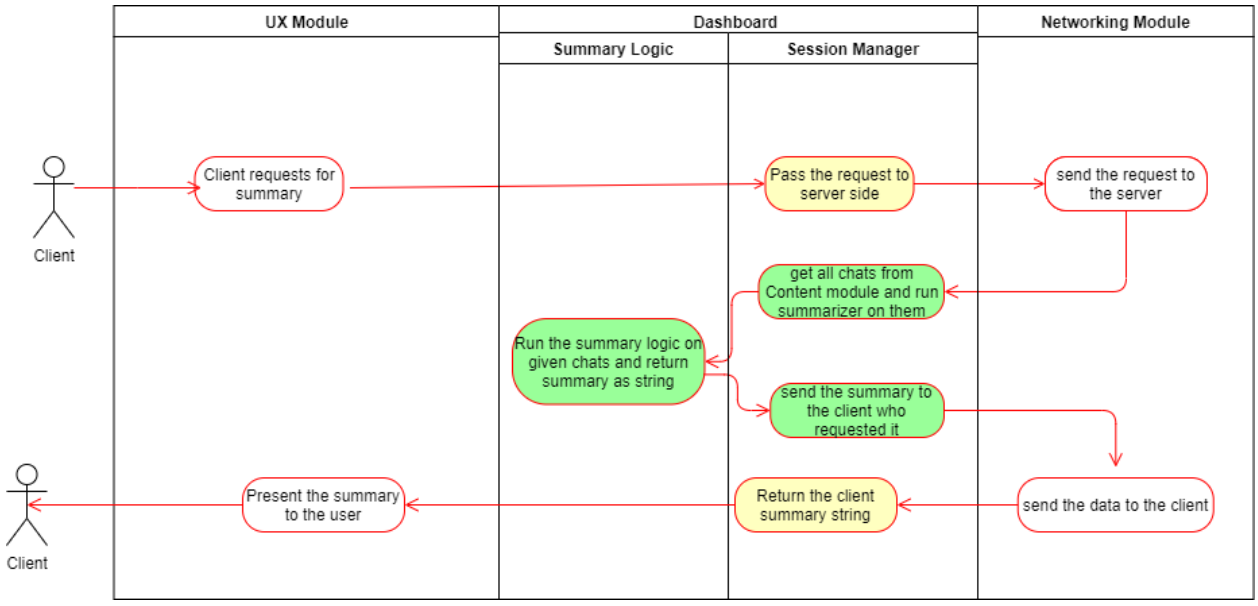


Figure 5: a) Data flow and b) Activity Flow diagrams when some client requests for summary

SESSION MANAGEMENT SUBMODULE

Overview

The UX layer sits at the top of the other module and users interact via this layer only. Below the UX layer is the Dashboard Module layer that handles UX's interaction with other modules. The Session Manager is an important submodule of the dashboard. It will create sessions at the beginning of the meet and manage these entities during an ongoing meeting. A server session consists of all the users currently in the meeting. The session manager is also responsible for asking the telemetry service to create/update statistics and the summariser to fetch the summary of the meeting.

Objectives

The Session manager should be able to complete the given tasks when the following events occurs:

- Host creates the meeting: The SM should give the UX the ports and IP address required to join the meeting.
- User joins the meeting: The password must be checked and the session should be updated accordingly. The content and Screen-share & whiteboard module should be provided with the new user. The Telemetry and UX module should be notified of this change.
- User leaves the meeting: The session must change accordingly. The Telemetry and UX module should be notified of this change.
- User asks for getting the summary: The SM should get the summary from the summariser by providing it with the chats of the meet. This summary then should be returned to the UX.
- Host ends the meeting for everyone: The summary and analytics are created and stored in the host's local machine.

Design Analysis

The UX depends on the Session Management module which in turn depends on the Networking Module.The SM(Session Manager) uses the Content module to get the chats and send users to it. Similarly, the Screen-share and Whiteboard module is also used by the SM to send/set users. To achieve this design in the implementation, the following can be done:

- The Session Manager(SM) will maintain a session object on the server side which will contain the list of all the users present in the meeting.

- The SM will provide the UX with a factory using which the UX can create Session manager objects (both client and the server side) that will live till the end of the meeting.

- The session management module will consist of an interface which will be used by the UX module with the help of functions defined.

- To notify the UX about any changes, the session management module will also consist of listeners for different kinds of subscriptions.

- The Networking module will provide a factory to the SM so that it can create a networking object. The networking module will provide an interface to the Session Management module that will be used by the latter.

- The Session management module will subscribe to the listener(s) provided by the Networking module.

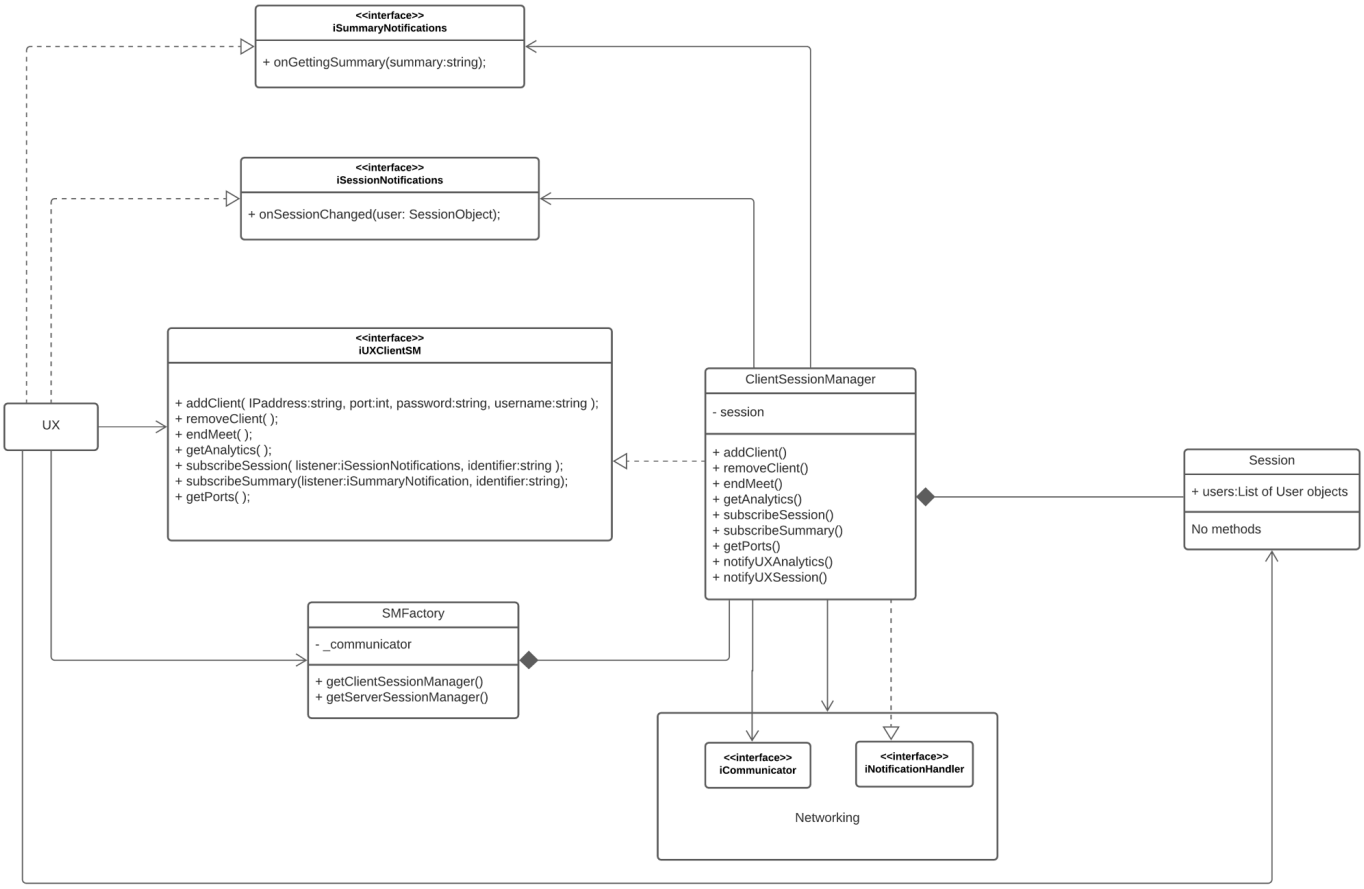
- The Content module will also create an interface which will be used by the SM to set users or get the chat. Same goes for the Screen-share & whiteboard module.

- The Summarizer submodule and the Telemetry submodule will also provide interfaces to the SM to fetch or save the summary and analytics respectively. These objects will be created using the respective factories of these submodules. The SM will also provide the Telemetry with a listener so that any changes in the analytics are notified.

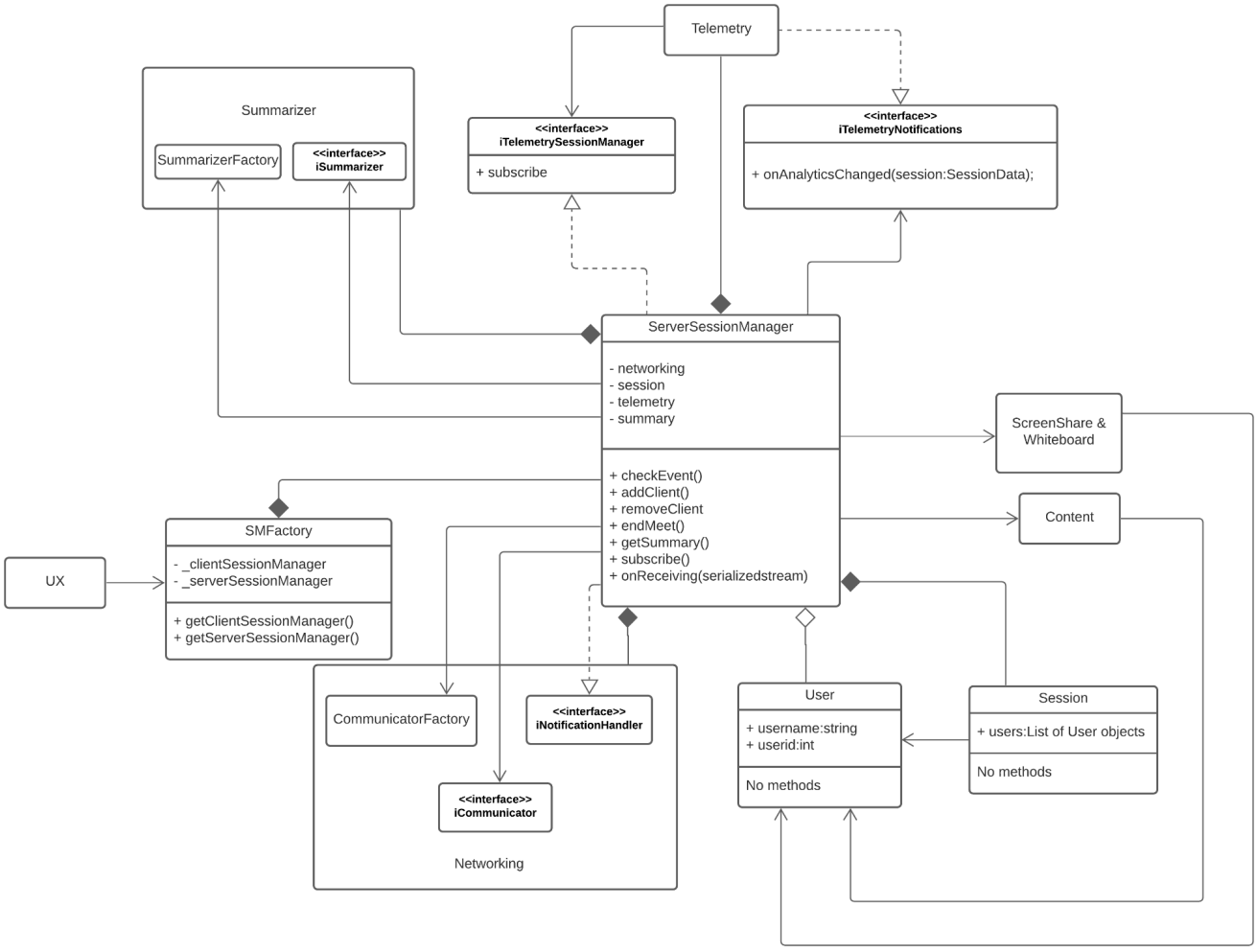
Class Diagram

For simplicity, the functions arguments are not specified in the Client Session Manager as they were already defined in the interface.

- Client Side class diagram of the Session Manager:



- Client Side class diagram of the Session Manager:



Interfaces

Client Side

```
// Notifies clients that the session has been changed
public interface iSessionNotifications
{
    // Handles the change of the session
    void onSessionChanged(SessionData users);
}

// Notifies clients that the Summary has been received
public interface iSummarynNotifications
{
    //Handles the reception of the summary
    void OnGettingSummary(string summary);
}

public interface iUXClientSM
{
    // This method will be used by the client to join
    // the meeting
    void addClient(string IPaddress,
                   int port,
                   string password,
                   string username);

    // This method is used when a client leaves
    // the meeting
    void removeClient();

    // used to end the meeting (by host)
    void endMeet();

    // Changes in the Session object can be subscribed from here
    void subscribeSession(iSessionNotifications listener,
                          string identifier);

    // This method will fetch the Summary to UX by notifying it
    void subscribeSummary(iSummarynNotifications listener,
                          string identifier);

    // It will return the ports and ipadress at the
    // beginning of the meeting so that other can join
    string getPorts();
}
```

Server Side

```
// Notifies the telemetry module about session changes
public interface iTelemetryNotifications
{
    // Handles the change of the session
    void onAnalyticsChanged(SessionData session);
}

// interface between the Telemetry and SM
public interface iTelemetrySessionManager
{
    // Subscribes to notifications from Session Management
    void subscribe(iTelemetryNotifications listener, string identifier);
}
```

Further Plans

To provide analytics on the go, using the telemetry submodule, to the UX, a class called Analytics can be made that will be returned to UX upon request. The UX can use this class to display the analytics.

SUMMARY LOGIC SUBMODULE

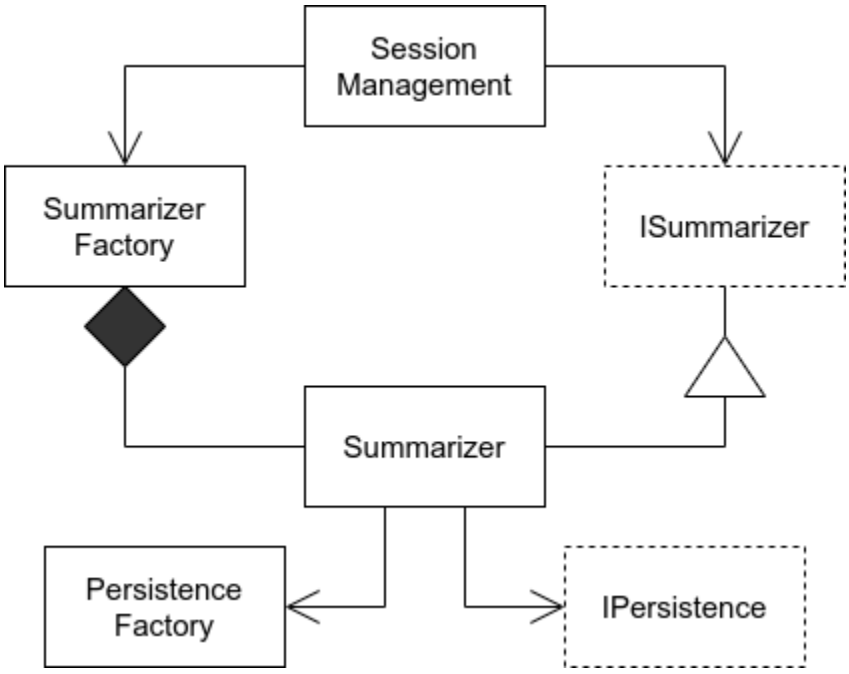
Overview

In our application, we wish to support summarizing the different properties that would be present such as the chat, images, etc to provide the user with a summary and gist of the discussion that has happened which can help in the revision of selected discussions. This module would be used by the Session management to generate summaries of different discussions.

Objective

- A single interface that can be used by the session management module:
    - This module should be simple and scalable with easy-to-use methods for session management.
    - There should be only one instance of the summarizer that carries out the predefined logic keeping track of the state and the prior while summarizing.
- The module should be running asynchronous in the server to generate a better summary:
    - The module should have methods and instances that run in the background server and not on the fly so that it would not bottleneck the performance of the application.
- The module should be able to generate summary statistics that can be influenced by the user preferences:
    - The summary generated should depend on the chat discussion in the room which would be provided after the end of the discussion and the logic can summarize it using the predefined logic.

Class Diagram



Interface

```
// Interface for Summary Logic Module
public interface ISummarizer {
    // Function to get the summary of the chat
    // and discussion to present in the Dashboard
    string GetSummary(Chat[] chats);

    // Function to save the summary of the entire
    // meeting after the completion via Persistence
    int SaveSummary(Chat[] chats);
}
```

Design Analysis

Creation of Summarizer

- The creation of the summarizer is done by using the Summarizer factory which creates an instance of the summarizer which would thus persist throughout the session.
- The reason for this design choice is that a summarizer if data-driven will learn to perform better and can also summarize the content to provide the relevant information more effectively.
- This summarizer would be created at the Session management since the session manager would be responsible for obtaining the chat messages and other information and redirecting it to various modules.
- The interface of the summarizer is essential along with the summarizer factory since we would want the other modules to access only the different methods that would be required for summarizing and at the same time the so-called summarizer would be obtained by calling the GetSummarizer method of the summarizer factory.
- The abovementioned design choice would provide an abstraction of the internal summarizer class which would not be exposed to other modules as only its interface functions are needed and the other methods would not be required for the functionality.

Summarizer

- The Summarizer class would run the summary logic algorithm which can be data-driven or predetermined based on the requirements after the end of the discussion.
- This particular design would not bottleneck the performance of the entire application waiting for the algorithm to complete execution and it can be done at a later point in time. This also facilitates better summarization of the discussion since the algorithm would be exposed to the entire discussion/ chat while giving the summary a wider picture.
- The first method that would be available to the session manager would be the GetSummary which would be a method that would take a chat string input and

provide a concise representation of the chat that would be displayed on the dashboard.

- The Summary logic algorithm would be running Machine learning based models under the hood which would be trained on open source chat summary datasets that are available for academic use.
- Machine learning models over the past few years have proven to be extremely helpful in assisting many tasks and automating with human level performance giving almost life-like answers to many query and summarization based tasks with advancements in sequence models like Transformers and attention.
- The generated summary would be used by the session manager to store in the database and retrieved for showing on the dashboard.

Stretch Code

Multiple directions of work in the future include:

- Incorporation of more information for the summary logic algorithm in addition to the chats for example screen share, whiteboard data, etc.
- Having more sophisticated data-driven Machine Learning algorithms that can be used to summarize the collected data while keeping in mind the computational barriers and making the most efficient use of the same.
- Addition of more features including recommendation systems based on the collected data to improve user experience.

References

Gliwa, B., Mochol, I., Biesek, M., & Wawer, A. (2019). SAMSum Corpus: A Human-annotated Dialogue Dataset for Abstractive Summarization. *Proceedings of the 2nd Workshop on New Frontiers in Summarization*. https://doi.org/10.18653/v1/d19-5409

TELEMETRY SUBMODULE

Overview

The function of the telemetry module is to provide statistics related to chats at different timestamps, the number of users active at any timestamp, in an easy to observe format, like histogram or pie chart. This sort of gives the overall activeness of a particular session.

Objective

To fetch the information from the session management, and use it to create the statistics in .png file format.

● A class that would be directly associated with the Persistence module and the session management module:

1. This module should be simple and scalable with easy-to-use methods for Persistence.

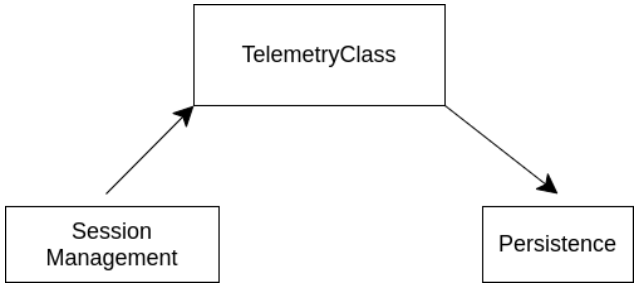
● The module should be running asynchronous in the server to generate a better analysis:

1. The module should have methods and instances that run in the background server and not on the fly so that it would not bottleneck the performance of the Application.

● The module should be able to generate statistics which can be influenced by the user preferences:

1. The analysis done should depend on the users in the room and how active they were in the discussion, which would be provided after the end of the discussion.
2. A priority queue would be used on the messages sent by users, and the activeness is determined through the same.

Class Diagram



Code:

```
Class Telemetry{
        void onSessionChange(session:SessionObject);
        void time_user(session:SessionObject);
        void user_message(session:SessionObject);
        void send_to_persistence(map<int,vector<pair<int,int>>>);
}
```

- onSessionChange(session:SessionObject): It is the subscription which I would be getting from SessionManagement module if any changes occur.
- time_user(session:SessionObject): Plots histogram for number of users at every time stamp.
- user_message(session:SessionObject) : Plots histogram for user and number of messages sent by each.
- Send_to_persistence: As the name suggest, this function sends the data to the persistence module for storage.

PERSISTENCE SUBMODULE

FUTURE SCOPE

- Add screen share images and whiteboard objects to the summary of the meeting.
- Add more telemetry analytics such as latency in the network, etc in the final meeting analysis