UNIVERSITÀ DI PISA

Artificial Intelligence and Data Engineering

Distributed Systems and Middleware Technologies

UniSup

Project Documentation

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1 — Introduction

UniSup is an instantaneous chat application that allows users to exchange short text messages among them.

1.1 Description

UniSup name is composed by *Uni* that stands for University, which is the main application scope; and *Sup* which is a popular slang abbreviation that stands for *"What's up?"*. Every time a **user** logs in correctly (an authentication check is performed), he/she will be able to see his/her chat history. After a click on a specific chat, he/she can visualize the list of the last messages exchanged with that particular contact. Filling the text field and clicking on the **SEND** button will send a message to the selected contact. At any time, he/she can start a new conversation with a new contact: it only requires a click on the corresponding button, typing destination username and the text Payload and click on the **SEND** button.

When a user logs into the system, he/she will receive every message sent to him/her while he/she was offline. On the contrary, while he/she is online, he/she receives messages on **REAL TIME** and the interface is automatically updated reporting the new message. Of course, messages within a chat are always displayed in chronological send order, and they are forwarded according to a **FIFO** policy.

At the application start, the user will visualize an authentication form: he/she can login with an existing account or register a new one, of course no duplicated usernames are allowed.

From the application Scene, by clicking on the **LOGOUT** button, the user logs out the system and goes back to the authentication form. The user can now login again, even with a different account.

2 — Analysis Stage

2.1 Main Use Cases

- An *unregistered user* can
  - Sign up using a non-duplicate username and a custom password
- A *registered (not logged) user* (can
  - Login using his/her own credentials
- A *logged user* (can
  - Visualize his/her list of **contacts**
  - Send a new **message** to the selected **contact**
  - Send a new **message** to a new **contact**
  - If a **message** is received, visualize it thanks to the real-time interface update
  - Logout
- The *system* should
  - Correctly forward each **message** to the correct receiver
  - Store **messages** whose destination is an offline user: those messages will be forwarded when the receiver is online again
  - Store all the **message** histories and send them to the specific **user** each time he/she logs in

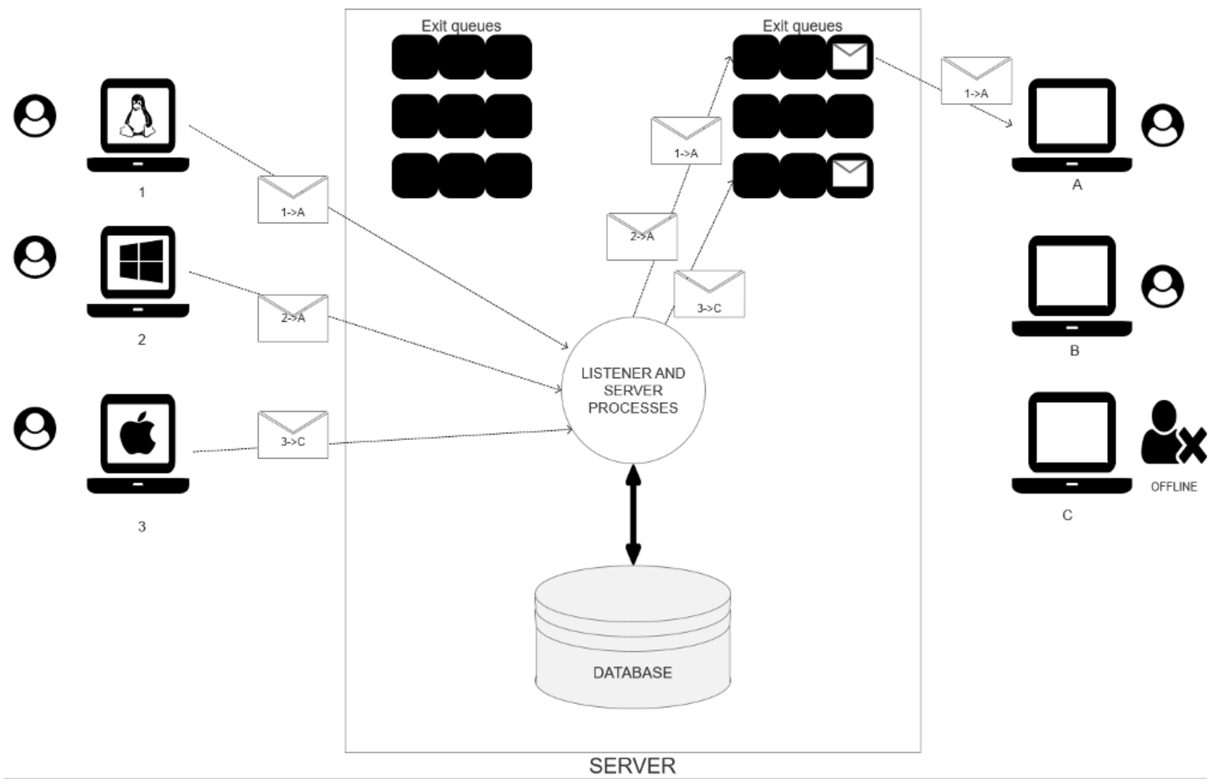
2.2 Size and Scope of the Application

As cited in the Introduction (chapter 1), the application has been designed for working within limited entities/environments, for example among close friends attending the same University. This is mainly because the selected approaches and technologies (for more details see next chapters) are not very scalable and they are suitable for a limited number of nodes. Anyway, the following properties are guaranteed:

- No message can ever be lost, regardless the fact that the receiving user is online
- The application is totally OS-independent
- The GUI provides a user-friendly experience and makes application easy to use d
- Within small clusters, the application ensures good performance

3 — Project Stage

3.1 System Architecture



As shown in the previous picture, the application is based on a client-server architecture, in which each client, in order to send a **message** to a **user**, contacts the main server which is in charge of determining receiver's physical address and forward the **message** if it is online. In the image some typical scenarios are represented to help better understand how *Unisup* works. In particular:

1. The message 1 → A is sent from the client 1 destined to the client A: it arrives at the main server that pushes it into the corresponding queue. The client A is online and there is no message to consume on the queue, so it is immediately forwarded.
2. The message 2 → A is sent from the client 2 destined to the client A: as the previous one, it is pushed into A's queue but this time the channel is busy. The message will be forwarded as soon as the channel comes idle again.
3. The message 3 → C is sent from client 3 destined to C: again, it is pushed on the correct queue. C is offline, so the message is not forwarded; it will be delivered as soon as C turns online again.

The OS picture inside clients means that the system works on every OS. Eventually, the database icon has been added since it is required for mapping clients' addresses and store chat histories.

3.2 Clients

3.2.1 Role of the Client

3.2.2 Technologies

3.3 The Server

3.3.1 Role of the Server

3.3.2 Persistent Data Storing

3.3.3 Queueing

3.4 Synchronization Management

3.4.1 Client-Side

3.4.2 Server-Side

3.5 Sequence UML Diagrams