SUPINFO Academic Dept.

SUPINFO

International University

INSTITUTE OF INFORMATION TECHNOLOGY

Group Projects
B.Sc. - Qwirk

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1. Project Overview

Qwirk is a startup dedicated in personal and professional communication applications. Their new product is a complete instant messaging system, as Skype or Slack is.

Your team has been selected to write this application that will work on Windows, MacOS and Linux systems.

2. Functional Expression

2.1. Software Development

Quirk aims to develop instant messaging and compete with Skype or Slack and thus, must have several functionalities listed below:

- Create an account (log in with email and password, plus several properties)

- Change status (Online, Busy, Away, Offline, and add custom statuses)

- Add, remove, block and rename a contact

- Create a group (private) with several contacts

- Create a channel (public) with a way to join this channel without confirm

- Leave groups and channels

- Handle moderator operations or group and channels

- Share files

- Call one or several people

2.1.1. Landing screen

On landing screen, you must provide several options:

- Create an account: User must specify email, password, profile picture and username. Username and profile picture will be displayed on every instant message. Several other properties must be available for filling but optional: Birth date and Bio.

- Log in: By filling email and password fields, the user should be able to connect

- Reset password: Use one of many well-known secured ways to reset a password

2.1.2. Home screen

On home screen, user should see recent groups, channels, and contacts. Click on one of these items should display the conversation history and allow to talk. You must provide other controls: Create a group, create a channel, add a contact, options and disconnect.

A group, as a channel should be defined with a name and a list of people. As a group or channel creator, the user should be defined as moderator. As a moderator of a group/channel, the user should be able to edit and delete other's messages, kick users (for a specified time), ban users (forever), and remove a user's ban. For kick and ban actions, the moderator may add a reason. The moderator can also give

and take back moderator rights on user in the group/channel. Every people in the group/channel can add other people and leave.

Users should be allowed to add a contact. When adding a contact, the added user should receive a notification and can accept or decline. When accepted, both should see their statuses and start messaging. When declined, the invitation should stay pending.

Options allows you to edit and test connectivity/hardware, such as port used for application (two choices), configure microphone and speakers, change both profile picture and username, change password, change downloaded files' location, and every other option you find useful for this application.

Disconnect should bring the user back to the landing screen.

2.1.3. Messaging

As messaging is the core feature or Qwirk, you must provide a lot of functionalities. When displaying the messaging part of our application (when clicking on a group, a channel, or a contact), you must be able to:

- Type messages (carriage returns allowed) and send them

- Write text in bold by enclosing it between stars, italic by slashes, underline by underscores, and strike by tildes.

- Any URL should create a link that can be followed by clicking on it.

- Code and configuration can also be pasted and defined as such, setting a special font (Courier) and keeping white spaces and indent no matter what.

- Filed should be draggable in the messaging area and accessible from everyone in the conversation. Pictures should be previewed. Files can't be bigger than 50Mo.

- Receiving a message should trigger OS notification system

- Emojis should be handled

- Click on an username should start a private conversation

- On a private conversation, a link to the user's profile should be available, showing the username, email, profile picture, birth date and bio

- Any other option you find useful can be add in this area

A user should be able to start an audio or video call, and people in the conversation can accept or decline the call. While calling, you still should be able to use any other option listed above, plus activate and deactivate your microphone.

3. Supporting Architecture

The company is launching the business so you'll have to design and implement the entire IT infrastructure, including system deployment and network configurations.

3.1. High Availability

As every IT company knows, when providing a service running on the internet, availability is a critical part of business.

In that goal, your infrastructure will be deployed on two different data centers. One is localized in New York, NY and the other one in Dallas, TX.

To be as efficient as possible, both data centers must work with load balancing in an Active/Active mode.

Moreover, in each data center, the frontend server(s) will have a backup, ready to ensure continuity in case of crash. In other word, each data center will be a cluster of Active/Passive servers.

3.2. Storage and Backup

3.2.1. Storage

As customers expect to have an history of their conversations kept at all time and because they must be ensured that the files they share will be effectively transmitted, storage will be a central point of the solution. Data must be replicated in between different nodes at every time and always accessible.

Whatever solution you choose for the your data storage, disks have always a probability of failure. For that reason, your solution must take in consideration hot-swappable disks.

3.2.2. Backup

You know that high availability and redundancy can't prevent some kind of damages your infrastructure can take. In case of ultimate emergency, you'll have to implement a backup plan in a third data center located in Toronto Canada.

This backup must take place every day at 2AM and must include a dump of the entire database(s) and every file shared by your customers.

The physical part of the saving is made on tapes (as far as you know) but is delegated to a canadian contractor who just asks you to copy every data that must be saved on a frontal server in his data center.

3.3. Network

In each data center, you're responsible of your own network so you can implement IPv6 or IPv4 as the default communication protocol.

Your free to choose each number of links you want between the different data centers but, knowing deploying or renting optical fiber has a cost, you'll have to be as efficient as possible.

3.4. Security

People are going to share all their life with your new product. You have to be perfectly sure that no leak will ever ruin your image.

To offer the best security for your customers' data, you will implement 2 features.

3.4.1. Ban on connection failure

First of all, you will ban for 5 minutes, based on their IP address, people who fail to connect 10 times on your platform.

After those 5 minutes, you will allow them to connect again and if they fail 10 other times, they will be banned for week.

Finally, after that week, if the IP address fails 10 other times, he will banned for 2 months.

Then the process starts again.

3.4.2. Encryption

The second and most critical part is that all the communications made between the 3 data centers must be fully encrypted.

4. Deliverables

Regarding the development part, the deliverables are the following:

- The source code

- Any information or dependencies to make the program up and running

- Any document that you find relevant

Regarding the architecture part, the deliverables are the following:

- Physical network topology

- Logical network topology

- Services' configuration files for each server

- Step-by-step implementation guide

- Any document that you find relevant

For the whole project, you'll also prepare a PowerPoint project defense presentation, when you'll introduce to potential customers for your product.

5. Graded items

The project is graded, based on 1000/940 points, like the following.

5.1. Development (420/390 points)

- Users can create their account (10 points)

- Users can log in (10 points)

- Users can log out (5 points)

- Users can reset their password securely (20 points)

- Users can change status (5 points)

- Users can add and remove a contact (10 points)

- Users can accept or decline contact invitation (5 points)

- Users can rename a contact (3 points)

- Users can block a contact (3 points)

- Users can create a group (6 points)

- Users can create a channel (6 points)

- Users can publicly join a channel (5 points)

- Users can leave groups and channels (6 points)

- Users can moderate a group or a channel (15 points)

- A moderator can give moderator rights to another user in group or channel (6 points)

- Share files and store them (20 points)

- Audio call one or several people (60 points)

- Video call one or several people (60 points)

- Users can activate/deactivate their microphone (5 points)

- Users can instant message with other people (10 points)

- Users can transform their text: bold, italic, underline, strike (8 points)

- URLs are automatically considered as links (8 points)

- Code and configuration are automatically transformed (8 points)

- Files are draggable in the messaging area (20 points)

- Pictures have a preview in the messaging area (10 points)

- Emojis are handled (10 points)

- See user's profile (6 points)

- Users can change their details on the options page (10 points)

- Users can configure network port (20 points)

- Users can configure microphone and speakers (20 points)

- Bonus features (30 points)

5.2. Infrastructure (420/390 points)

- The suggested architecture is corresponding to the client needs (80 points)

- The designed architecture is following the best practice (30 points)

- The architecture provides Active/Active high-availability between both data centers (30 points)

- The architecture provides Active/Passive high-availability inside each data center (30 points)

- The architecture is providing storage resiliency (70 points)

- The whole infrastructure is backed up and stored on a third data center (70 points)

- The network is correctly sized (10 points)

- The banishment is fully implemented (35 points)

- The connection in between each data center is fully encrypted (35 points)

- Bonus features (30 points)

5.3. Documentation (160 points)

- Development – Installation and user's guide (20 points)

- Development – Design Patterns (15 points)

- Development – Database structure and optimization (15 points)

- Development – Ergonomics and ease of use (15 points)

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- Architecture – Installation and admin guide (20 points)

- Architecture – System (15 points)

- Architecture – Storage and backup (15 points)

- Architecture – Network (15 points)