Final Project: Chatting with Friends

Overview

As discussed in the course overview, you will not be required to take a midterm or final exam. Rather, we will be assessing your understanding of the course material by asking you to apply what you have learned through a final project. At this point in the class you have learned how to work with the computer file system, modules, sockets, and APIs. You have also learned how to write simple tests for your code, classes, apply recursive function calls, and handle exceptions that occur when your program runs. Therefore, your final project should build upon and extend what you have learned so far and completed in your assignments.

The final project is worth a total of 150 points, similar to what you have earned for most course assignments. However, grading for final project will be far more rigid than what you have experienced so far. You will have roughly five weeks to complete your final project, during which time we expect you to integrate everything you have learned from the work you have completed. To help you manage the final project alongside your remaining three assignments, you will be allowed to work in groups. Working in a group is **optional** and will be limited to a **maximum of three**.

> **Note**
>
> If you choose to work in a group you must create a team name and nominate a leader. The leader will be responsible for communication and submission. We will discuss how to submit a group assignment in class as we near the end of the quarter. DO NOT wait until the last week of class to formalize your group. Take care of this step as soon as possible.

For your final project you will develop a module that enables a program to send and receive direct messages with another user on the DSP platform. You will then incorporate this module into a graphical user interface (GUI) using Tkinter. There is a significant amount of work required to make this program feature complete, so you should get started early and gradually build your program step by step. To help you get started, the requirements for your final program have been divided into several parts. You are encouraged to follow each part in order. If you are working in a group, assigning a single part to each group member is a good way to divide the work equitably as each part can be written and tested independently of the final program.

Part 1: Implement Direct Messaging Protocol

To communicate with another user on the DSP platform, your program will need to make use of new protocol messages. To support these new messages, your program should extend your `ds_protocol` module to support direct messaging with the following commands:

directmessage

Accepts a message to be sent directly to another user.

```
# Send a directmessage to another DS user
{"token":"user_token", "directmessage": {"entry": "Hello World!","recipient":"ohhimark", "timestamp":
"1603167689.3928561"}}

# Request unread message from the DS server
{"token":"user_token", "directmessage": "new"}

# Request all messages from the DS server
{"token":"user_token", "directmessage": "all"}
```

Recall from `a3` that `user_token` is retrieved by sending a successful join command. So in order to send a direct message you must first join the server.

The DS server will respond to **directmessage** requests with the following **ok** response messages:

```
# Sending of direct message was successful
{"response": {"type": "ok", "message": "Direct message sent"}}

# Response to request for **`all`** and **`new`** messages. Timestamp is time in seconds
# of when the message was originally sent.
{"response": {"type": "ok", "messages": [{"message":"Hello User 1!", "from":"markb",
"timestamp":"1603167689.3928561"},{"message":"Bzzzzz", "from":"thebeemoviescript"
"timestamp":"1603167689.3928561"}]}}
```

To process these new response messages you will need to extend the message conversion code that you wrote for **a3**. How you solve this requirement is up to you, but a good approach will likely include adding a function to your **ds_protocol** that converts JSON messages to a list or dictionary.

Writing a Test

When your code is complete, write a small test program to verify that your messages are being processed as expected. Your program should import your module (e.g., import ds_protocol, if you are extending your ds_protocol module) and call the code you have written with a few test messages. You can use the messages provided above or create a few of your own as test cases. You can name your test whatever you like, but it should be prepended with the word **test_**:

```
test_ds_message_protocol.py
```

Once your test program is complete, you are ready to move on to the next part of the assignment.

Part 2: The DS Direct Messenger Module

Now that you have a functioning protocol in place, you are ready to write your message send and retrieve code. The first thing you will do is complete the direct messenger module. Your module must adhere to the following rules:

- Must be named **ds_messenger.py**
- Must implement the following classes and methods

```
class DirectMessage:
  def __init__(self):
    self.recipient = None
    self.message = None
    self.timestamp = None


class DirectMessenger:
  def __init__(self, dsuserver=None, username=None, password=None):
    self.token = None

  def send(self, message:str, recipient:str) -> bool:
    # returns true if message successfully sent, false if send failed.
    pass

  def retrieve_new(self) -> list:
    # returns a list of DirectMessage objects containing all new messages
    pass

  def retrieve_all(self) -> list:
    # returns a list of DirectMessage objects containing all messages
    pass
```

You are free to add as many supporting methods to either of these classes that you need, but the **ds_messenger.py** module should be able to function without any other dependencies. A program that imports your module should be able to call the required functions to exchange messages with the DS server. You may reuse or import the code you have written for the **ds_client.py** module to reduce the amount of code you have to write.

Writing a Test

Once again, when your code is complete, write a small test program to verify that your `ds_messenger` module is functioning properly. You can name your test whatever you like, but it should be prepended with the word `test_`:

```
test_ds_messenger.py
```

Once your test program is complete, you are ready to move on to the next part of the assignment.

Part 3: Store Messages Locally

Some of the data your program uses should be preserved across multiple uses. To complete this feature you can either implement your own data storage code or extend the `Profile` module to support serializing new data.

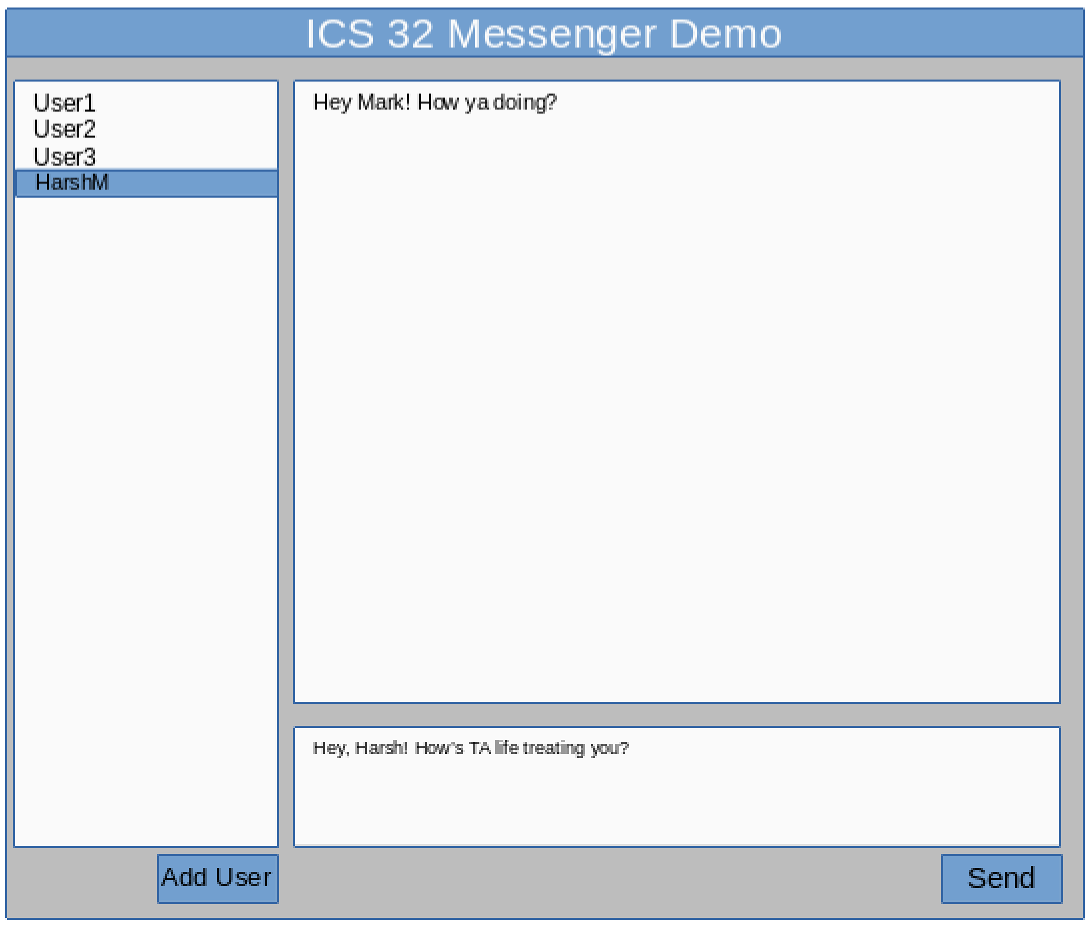
Your program should be able to store message data locally so that when the program starts it does not have to connect to the DSP server to display messages. Your program should also store recipient data locally so that your user does not have to add the same recipients each time the program is run. It's fine if you require a user to first load their dsu profile (or custom file format you build) before displaying data. The important thing here is to NOT require an internet connection to get messages.

However you handle this requirement, after using your program once, all recipients added and messages retrieved should be appear in the GUI at start on subsequent uses.

Part 4: The Graphical User Interface

The final part of the assignment will be to write a graphical user interface (GUI) for your module using Tkinter. You are free to implement the interface however you like or adapt the Tkinter GUI starter code that you were given in assignment 5.

There are many ways to create a graphical interface for a direct messaging program. You are not required to follow the example below. However, if you are not sure where to start the following wireframe should point you in the right direction.

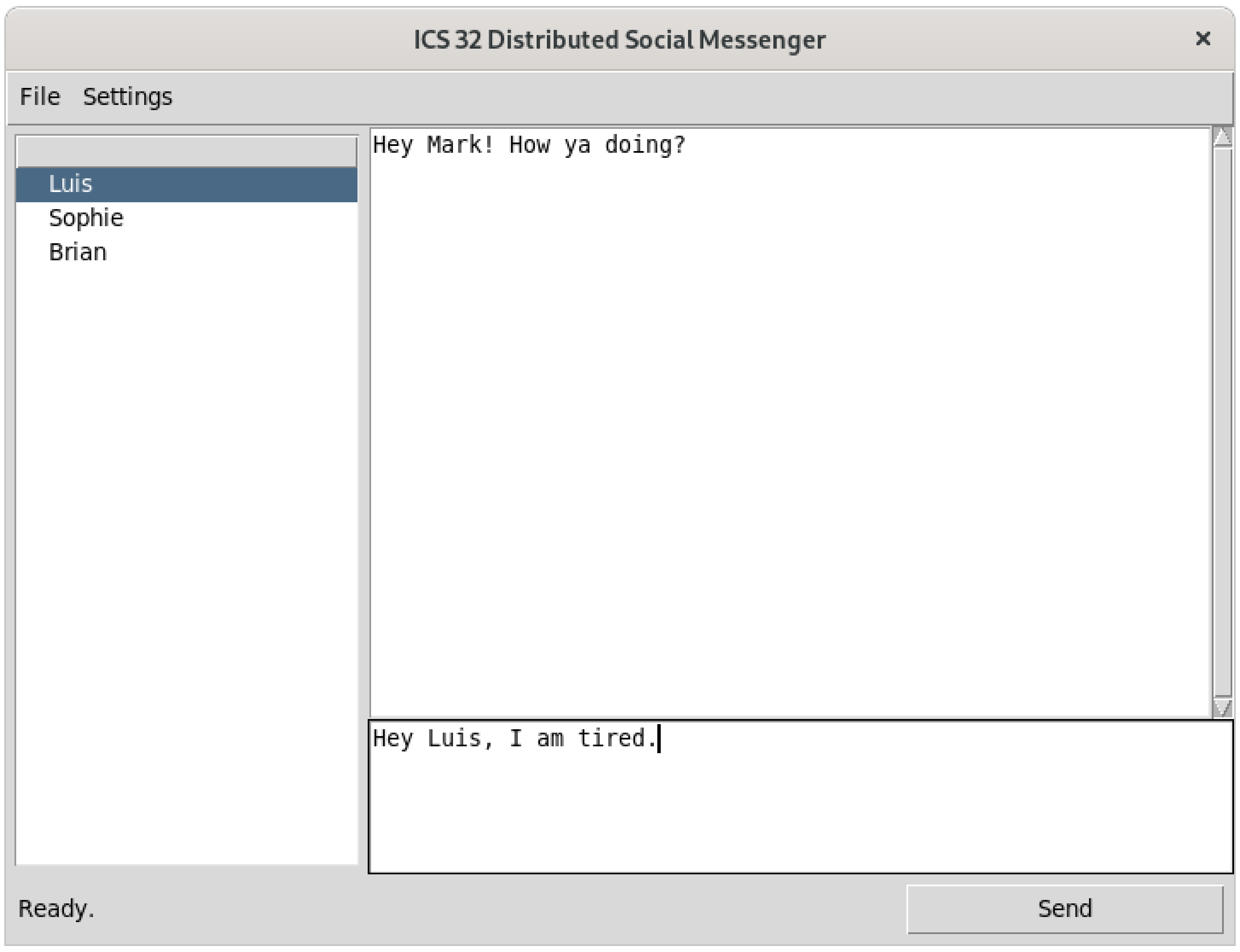


In the wireframe model presented above, there are 5 widgets that are responsible for all of the input and output in the program:

1. On the left is a treeview widget that displays all of the DS users that have sent you messages. Selecting a user will display the messages that they have sent in (2).
2. On the upper right is the display widget that contains the messages sent by the user selected in (1).
3. On the lower right is the text input widget where new messages are written.
4. The 'Add User' button is used to add new contacts to receive direct messages.
5. The 'Send' button sends the message entered in (3).

Tip

The layout used in this wireframe is nearly identical to the layout provided to you in assignment 5. You may reuse that existing code to save you some steps.



Hey Mark! How ya doing?

Hey Luis, I am tired.

Ready.

One possible version of the Social Messenger app is pictured above. In this version, the add user requirement has been moved to the settings menu. To see this version in action, watch the class recording for week 7.

In addition to the requirements described above, there are a few other tasks you must complete:

1. Your GUI must automatically retrieve new messages while the program is running.
2. Your conversations must be visually separated in some way (e.g., left/right align, color, identifier, etc).
3. Selecting a new contact in the treeview should display any recent messages with that contact in the message window.
4. Your GUI must include at least one "flourish." A flourish is some feature that goes beyond the core requirements for a functional program. Past assignment flourishes have included a dark mode toggle, chat bubbles, profile switcher, and a profile wizard. This is your chance to have some fun with the project and make your final program unique. Feel free to ask us if your idea flourish will count for this requirement.

Schedule

The following schedule is a recommendation for how to go about carrying out this assignment. We will not hold you to this schedule (save for the deadline!), but we strongly advise you to stick to it if you want to complete the assignment on time.

Week 7

Thoroughly read through the assignment and decide if you want to work with a group.

Find one or two partners, meet, and assign roles. You should also establish a meeting time at least once a week.

Week 8

Familiarize your self with the various requirments. Install PDOC and try it out. Get in the habit of writing comments in a format supported by PDOC.

Complete Part 1.

Week 9

Start working on Part 2 and Part 3. How you divide these two parts up will depend on the size and structure of your group (if you have one). Although both part 2 and 3 can be completed independently of each other, they will eventually need to interact. So if you are in a group discuss *how* they will interact, divide, and conquer.

Start planning your 'flourish' for Part 4.

Week 10

Part 2 and 3 should be completed early in the week. You will need most of the time this week to connect the work from parts 1-3 to the graphical interface.

Complete part 4 by end of week.

Week 11 (Finals week)

At this point you should have the program functioning. Plan to use the last few days of the quarter to test as much as possible.

Prepare your code, tests, README, and documentation for submission. Zip everything up, then unzip in a new location and test again. Make sure everything works. Make sure you did not forget to 'add' something to your submission.

This project will take about three full weeks to complete, so start early, work on it frequently, and test... test...test.

Starter Repository

Unlike previous assignments, you will not be provided with a starter repository that contains partial code. It is your responsibility to follow the conventions used in this course to create, name, comment, and use the modules necessary to create this program. If you do not name a required module correctly, we will not fix it for you. So pay particular attention to the names that you assign to modules. We will use grading tools to test some of your code, if our tool cannot find a required file, you will lose points.

We have provided an empty repository that includes a README file for your convenience. You are free to use this repository to manage your code if you would like, but it is not required.

Starter Repository

Final Submission

To receive full credit your final project must make **informed** use of the following criteria:

Classes

You have been provided with some skeletal classes to use in your module. However, there will undoubtedly be other areas of the program where a class improves your program design. You must use at least one new class in addition to what has already been provided for you.

Custom Exceptions

Your program should implement *at least one* custom exception class.

Use of try/except

Areas of code prone to exceptions (sockets, file i/o, etc.) should be wrapped in try/except statements. Exceptions should be handled in a way that does not negatively affect the functionality of your program.

Commenting and Documentation

Your overall final program should contain sufficient code comments for a new programmer to be able to understand what your code does. Your program should include an HTML document generated using PDOC that can be used to understand all of the code that you have written.

Function

Your program must work. Functionality of your program will be assessed in two ways. First, a user should be able to run your program and send and receive direct messages with a DS server. Second, your `ds_messenger` module must work outside of your main program. We will use a validity checker program for grading that imports your module and makes calls on the required class and methods.

> **Note**
>
> Informed use means that you have thoughtfully applied the requirements in a way that is beneficial to your program. In other words, do not simply make up pointless tests or classes to check a box for the assignment.

You will submit all files required to run your project, your two `test_` programs, PDOC files, and a README file that details any required instructions on how to build and run it. You must also include all references and sources that you used to build your project. If you included code in your project from an external source (**e.g.**, StackOverflow, text books, sample programs, and so on), you must cite these sources in the readme as well as leave comments in your code files indicating where it was found by you or your group members.

Grading

> **Note**
>
> You will not be graded on the visual quality of your GUI. Getting TKinter to render perfectly on all platforms is difficult and we do not expect you to test across multiple platforms. So do your best to ensure that all of your UI elements can be accessed, but don't worry too much about perfect rendering.

This assignment will be graded on a 150 point scale, with the 150 points being allocated completely to whether or not you submitted something that meets all of the above requirements. The following rubric will be used:

Requirements (100 points)

Does the program fulfill the requirements described in each part of the assignment?

Are there any bugs or errors?

Validity (25 points)

Does the project adhere to the principles taught in class for creating robust and bug free code.

Documentation (25 points)

Does the project provide sufficient documentation. Your code should be well commented so that we can understand what purpose it serves in your project. Your README should clearly explain how to run your project. And when run, the functionality of your project should be clear and intuitive. Your PDOC file should clearly articulate what each class, method, function does.

Your final submission should include all materials described in Parts 1-4, zipped and uploaded to the Canvas submission page by the due date. Since this is the last assignment for the course, there will be no late submissions accepted.

Previous
Week 10 Notes

By Mark S. Baldwin