

Mission Support System: UI and server Improvements

About Me

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Background:

I am currently a 2nd-year B.Tech. student of University Institute of Engineering & Technology, Panjab University, Chandigarh, India. I am pursuing a B.Tech. in Information Technology. I expect to graduate in 2024.

I very much like to solve mathematical problems. I have been programming for the last 2 years. My favourite Programming language is Python due to its simplicity of syntax and less complex coding. I have also interned with the design innovation centre lab, at Panjab University in the machine learning domain.

I am doing competitive programming on Codechef, Codeforces and Hackerrank. I am also a member of the IEEE society and the college programming club.

Issues Resolved

<i>S No.</i>	<i>Contribution</i>	<i>Issue</i>	<i>PR</i>
1	Update Copyright Year 2020 to 2021.	#755	#757
2	Hint added with an error message for side view.	# 706	# 783
3	Fixed Typos.	—	# 804
4	Disable mscolab login without credentials.	# 852	# 871
5	Set mscolab collaborator role to access version history.	# 920	#925
6	Migrate existing thermodynamic functions to metpy functions.	# 1004	# 1009
7	Fixed #999.	# 999	# 1010
8	URL replaced in “docker_based_installation.rst”.	# 1073	# 1078
9	Display operation description below connected URL.	# 1281 # 1286	# 1284
10	Review communication state over socket io.	# 1328	# 1329
11	Further properties for operations.	# 1280	# 1321

Issues Reported

<i>S No.</i>	<i>Issues</i>	<i>Link</i>
1	Text overlapping in “Top View” window.	# 1037
2	Error in file upload in mscolab chat.	# 1290

Project Description:

A Brief description of MSS:

Mission Support System (MSS) is a tool that helps scientists in the field of atmospheric science to plan flight routes, in which parameters of the atmosphere, like temperature and aerosol particle characteristics, are measured. A research aircraft typically carries a comprehensive scientific payload, composed of data acquisition instruments used by different companies and research institutions. These instruments help scientists measure the relevant parameters for understanding the chemical processes in the atmosphere.

I propose to work on the following features and improvements to Mission Support Collaboration

- 1. Multiple Flight Paths on a View:** There are campaigns with more than one aircraft and sometimes researchers want to do experiments in different altitudes with the same pattern. Therefore we need an option to add another flight path on a view.
- 2. Filter existing Flight paths:** If an operation remains unused for a long time, it should be moved to an inactive state, so only current flight paths will be shown on UI. And there should be an option for creators to reactivate inactive flight paths and also to inactivate them. This keeps the list of projects for all users in a clean state.
- 3. Invitation System:** There can be hundreds of users who need to be added to a project. Currently, the only way to add users to the operation is through a “manage users” dashboard, which is time-consuming for the creator. To solve this, an invitation system should be developed. (similar to Whatsapp group invite feature).

4. Show development of flight path versions, in asynchronous work mode.

1. Multiple Flight Paths on a View

I propose to work on the following features:

1. Display Multiple Flight Paths
 - Load local flight tracks on view simultaneously.
 - Display or remove an individual flight path from the map.
 - Providing a mouse wheel to zoom in/out.
2. For FlightPath on TopView,
 - Several flight paths on the map can be painted simultaneously with data.
 - Only the active one can be changed if multiple flight paths are opened on view.
 - Support for overlaying in top view.
3. For Table, on TableView
 - Multiple waypoint tables will be opened in different tabs.
 - After activating a tab here, the control widget will also activate the flight path in the top view and side view for changes.
4. Grouping of flight paths:
 - Multiple flight paths can be grouped, so all grouped waypoints can be changed at once only.
 - Grouped flight paths will be stored in a grouping table in the database.
5. For each Flightpath:
 - Set a Temporary title for maps.
 - Users can toggle the active state so that it is possible to alter the data.
 - Implement UI option in WMS dockwidget to add new flight paths on views.

2. Filter Existing Flight Paths

- Projects move to an inactivated layer when they remain unused for 30 days.
- Admin of the project can activate it again.
- Only when the project is activated, it is visible to other users.

3. Invitation System

- Project creator can invite users to join the project.
- Invite links with different permission levels can be created.
- Inactivation of links can be possible.
- Invites can be sent through email.

4. Show development of flight path versions, in asynchronous work mode.

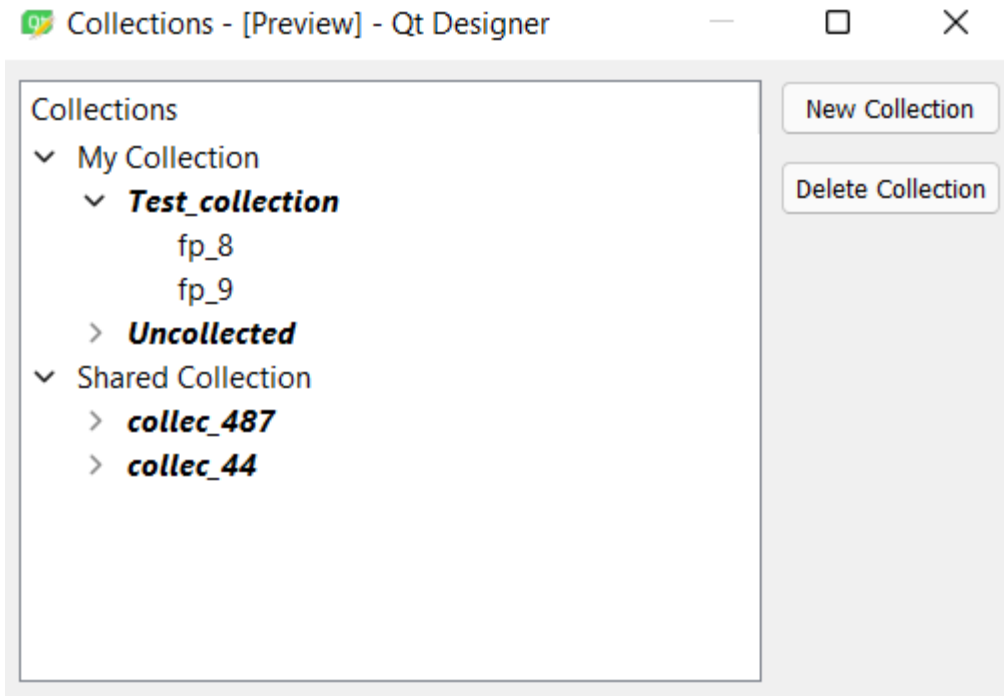
Currently, a version history is not available in asynchronous work mode. Its offline intermediate is missing.

User Interface:

Here I have shown the user interface changes and the new windows I would be working on for the proposed ideas.

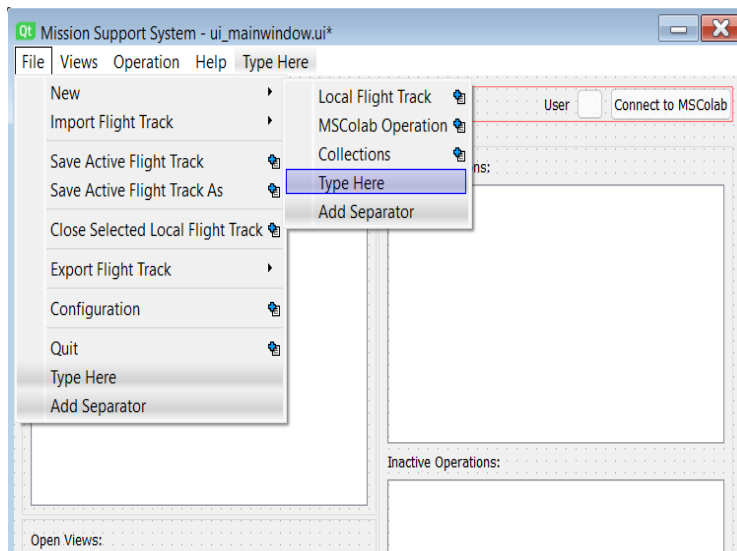
- a) Collection Window: To create collections of mscolab operations.
- **“New Collection”** button will create a collection of operations selected from the ‘Uncollected’ section.
 - **“Delete Collection”** button will delete the collection and operations will be moved to the “Uncollected” section.
 - **My Collection:** It contains all collections and uncollected flight paths of a user.
 - **Shared Collection:** It has collections that are shared with other users.

While sharing the collections with other users, we will use the same set of users and their permissions as in the manage users function, so that collections are only visible to users with the correct permission level.



Proposed Collections Window(Subject to change)

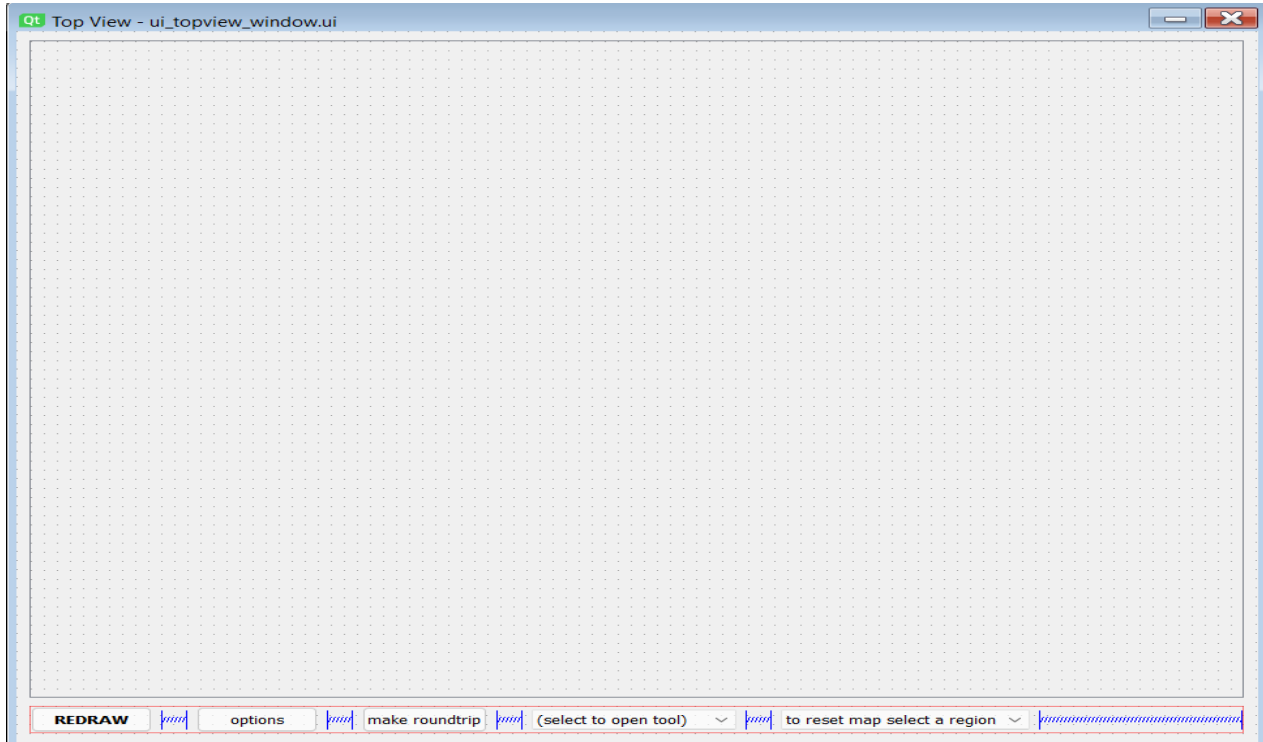
- File->New->Collections



b) **TopView Window:** To show the top view of multiple flight paths on a view.

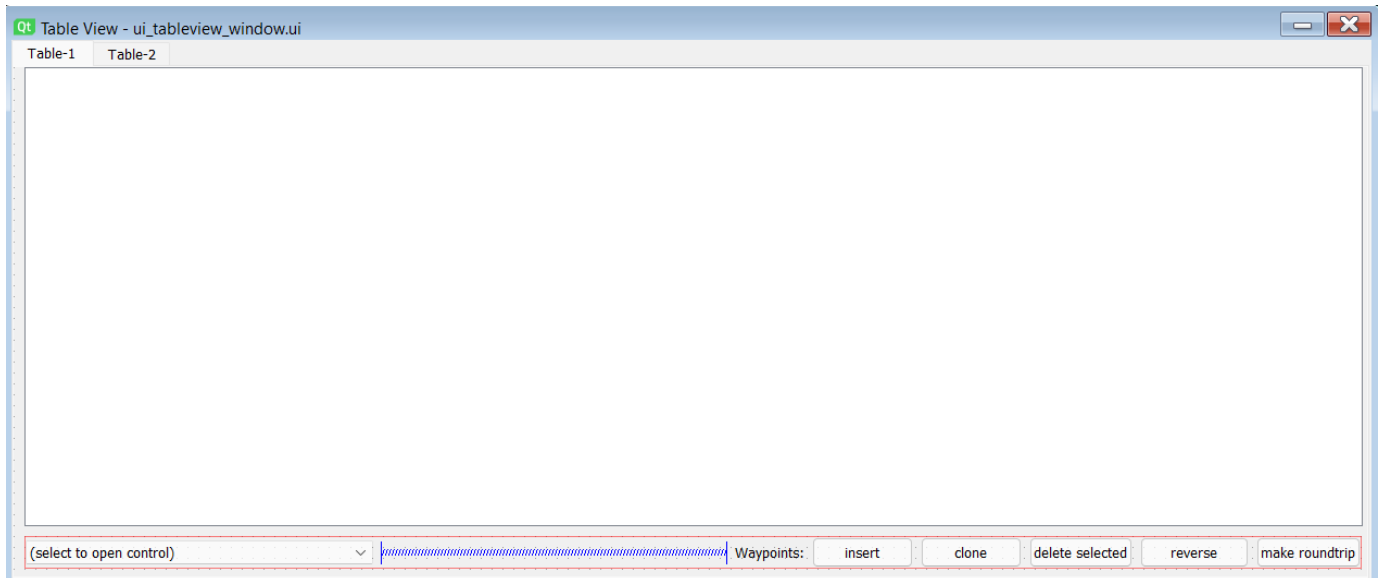
Using a scroll area and inserting multiple flight paths in that area one below the other, then one can easily compare two flight paths. and Activation of flight paths

can be possible from a “**control_dockwidget**”. Changes can only be done on active flight paths.



Proposed Top View Window (Subject to Change)

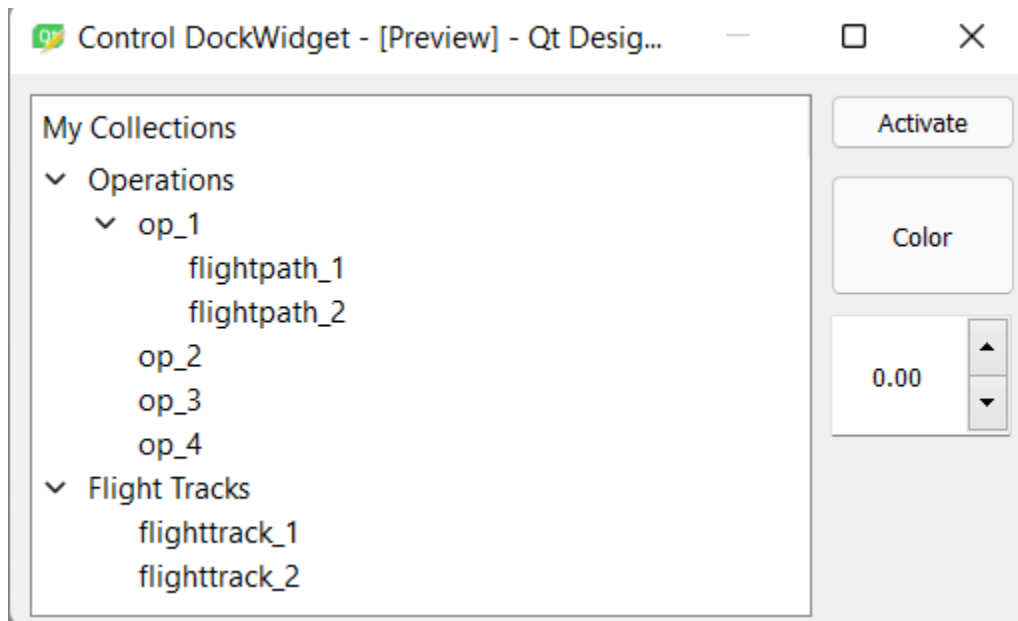
c) **TableView Window:** Multiple waypoint tables will be opened when a user opens multiple flight paths in topview window.



Proposed Table View Window (Subject to Change)

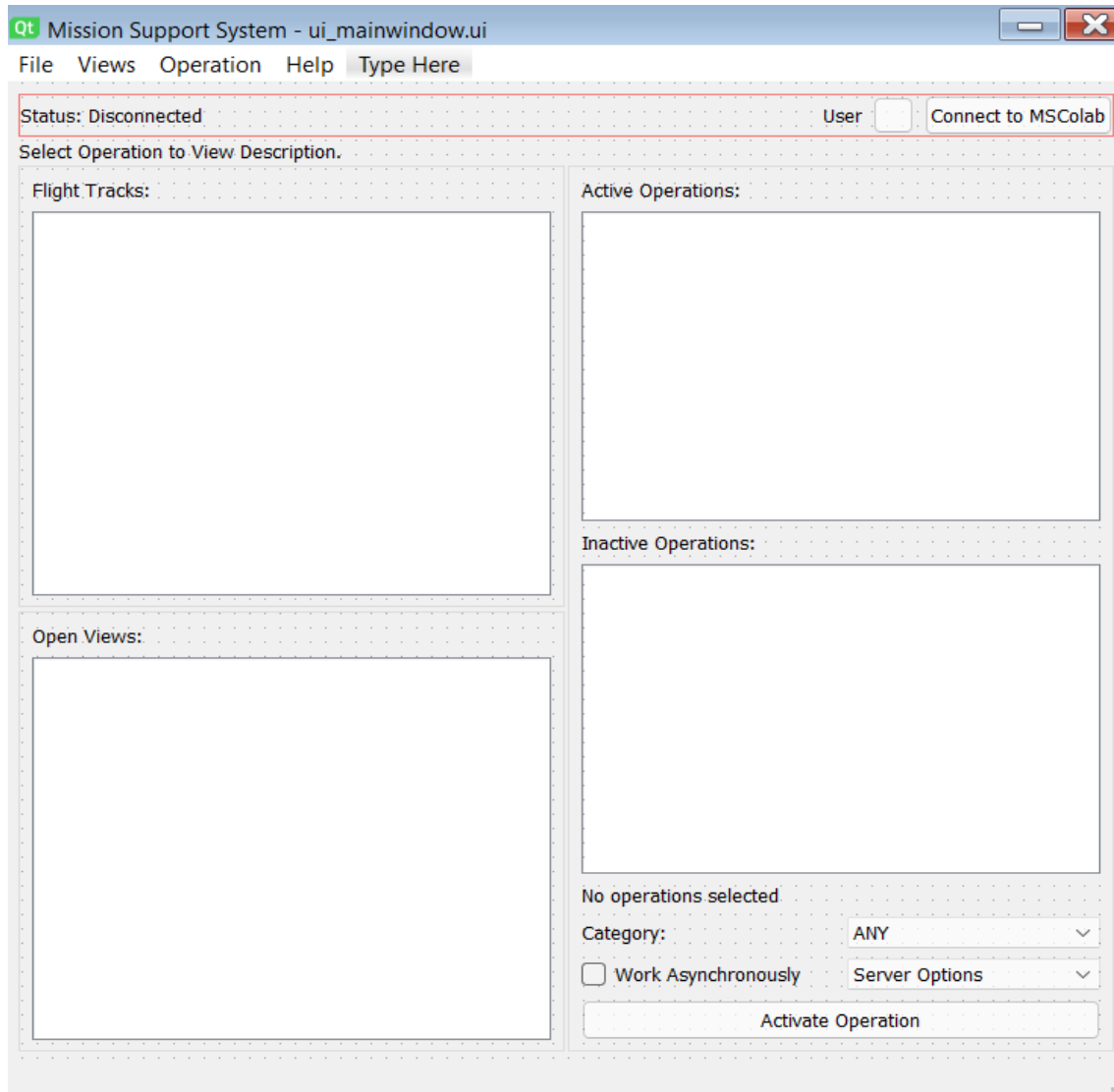
d) **Control dockwidget:** web map service control widget

1. Operations and flight tracks can be activated for change from MSS main window.
2. In this dockwidget all opened flight paths are listed under their parent operation.
3. Flight Paths can be activated for changes.
4. Color and line width of the drawing of flight paths can be changed.



Proposed Control DockWidget (Subject to Change)

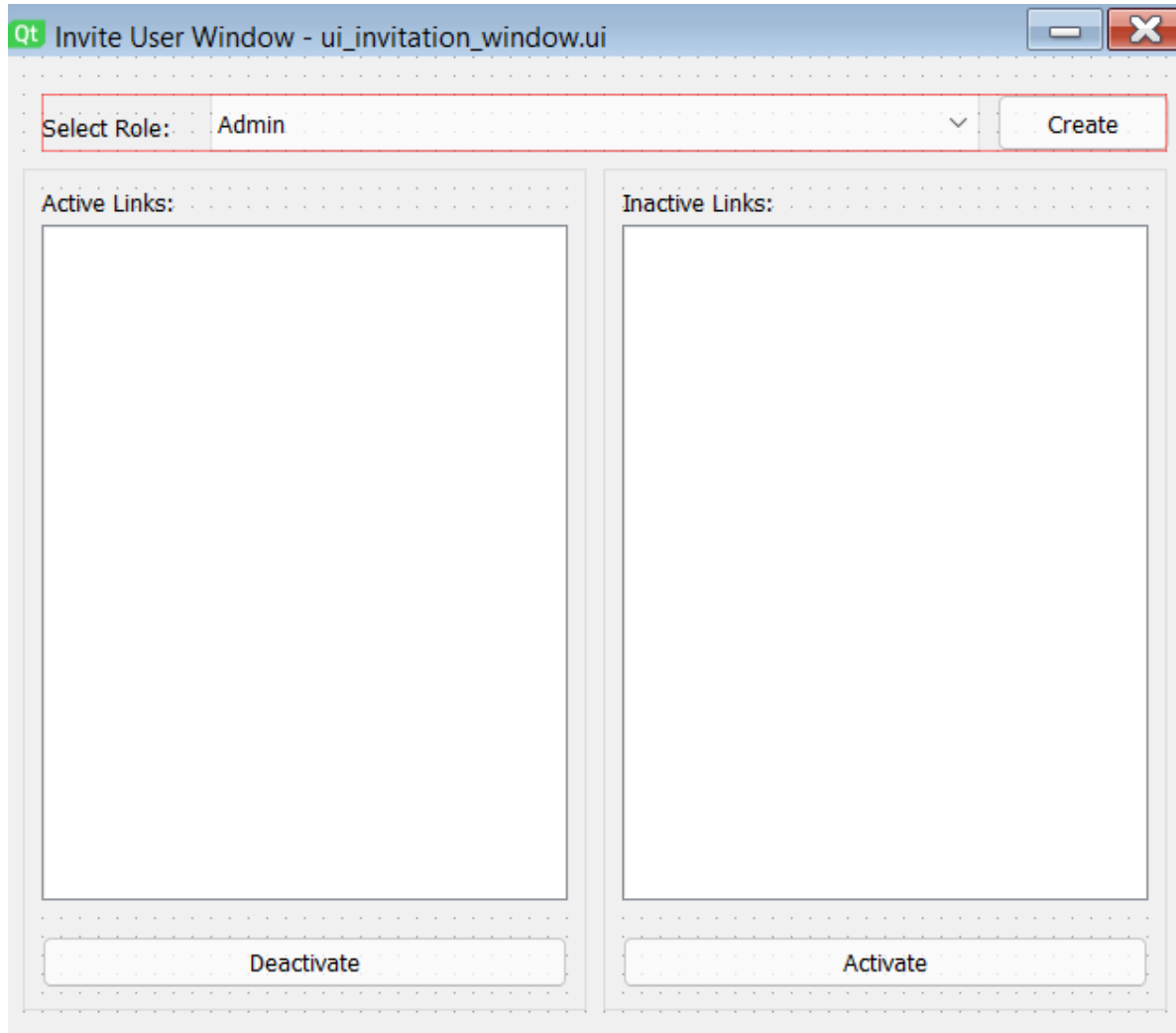
e) **MSS Main Window:** To add the feature of project filtration



Proposed MSS Main Window(Subject to change)

f) **Invite User Window:** To invite users to a project.

- Invite links can only be created by the creator of projects using the below UI.



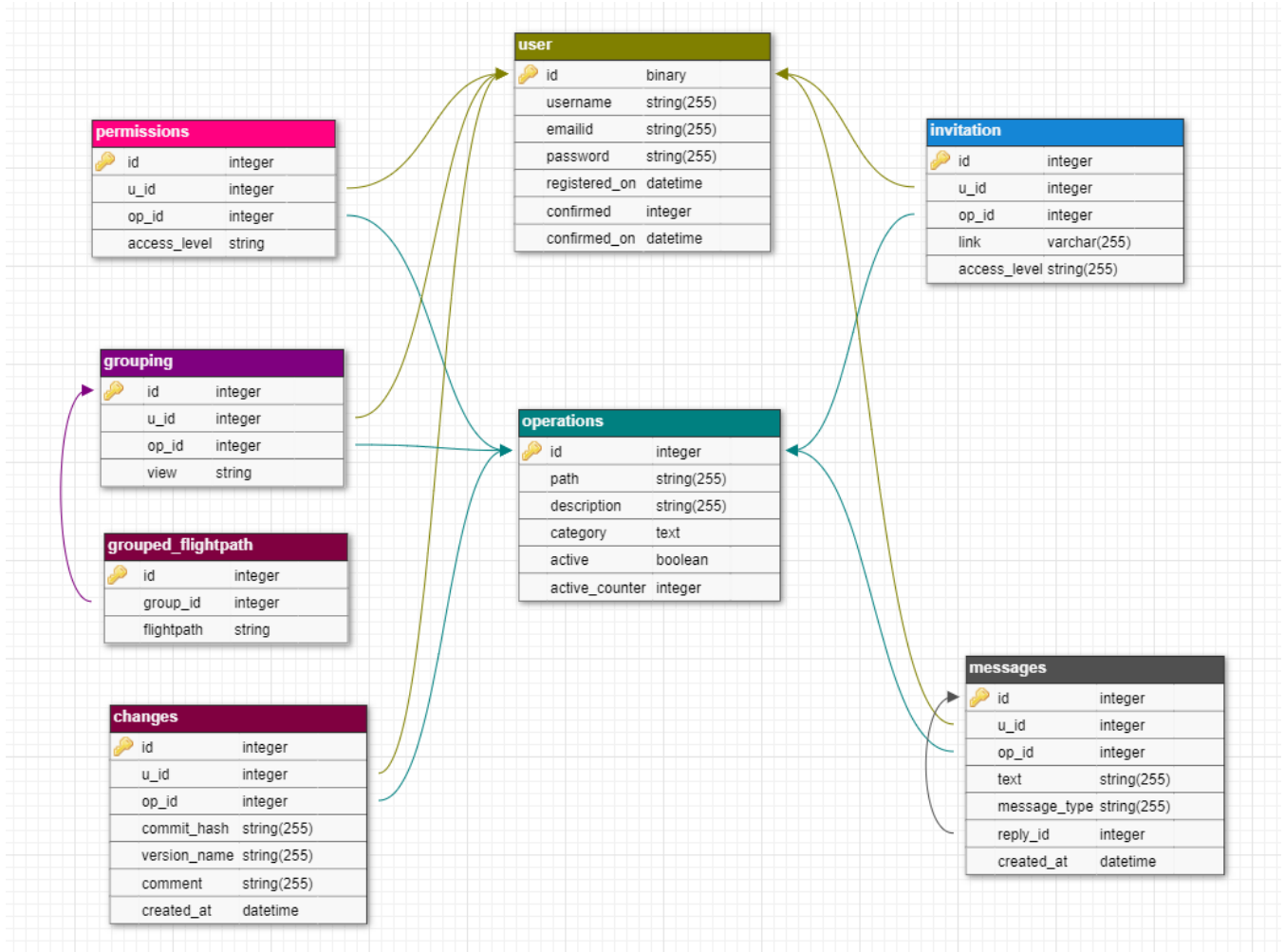
Proposed User Invite Window(Subject to change)

Database Schema:

For managing the invite system, a new table - **“invitation”**, would be added to the database. In the operations table new attributes - **“active”** and **“active_counter”** would be added to hold the records of active operations and time counter respectively.

For grouping of flight paths, new tables are added - **“grouping”** and **“grouped_flightpath”**. In the grouping table, group_id and view name(top view/side view) are recorded.

In the grouped_flightpath table, names of flight paths in a particular group are saved.



- **Users**

- Id: id of the user. Primary key
- username: Unique username of each user.
- email id: email of each user.
- Password: Hashed password of each user.

- **Operations**

- Id: id of project. Primary key.
- path: name of the project.
- description: Show description of operation.
- category: Show category of operation.
- active: state whether the project is active or not
- active_counter: records the number of days from its last use.

- **Invitation**

- Id: id of invitation. Primary Key
- u_id: id of a user. Foreign key
- op_id: id of an operation. Foreign key
- link: invite link.
- access_level: access_level of invite link.
- **Permissions**
 - Id: id of permission. Primary key
 - u_id: id of a user. Foreign Key
 - op_id: id of an operation. Foreign key
 - access_level: access level of the user (creator, admin, collaborator, viewer)
- **Changes**
 - Id: id of invitation. Primary Key
 - u_id: id of a user. Foreign key
 - op_id: id of an operation. Foreign key
 - commit_hash: The git commit hash for the change.
 - version_name: version name of the commit.
 - comment: The commit comment message.
 - created_at: Timestamp of when the change was made.
- **Messages**
 - Id: id of permission. Primary key
 - u_id: id of a user. Foreign Key
 - op_id: id of an operation. Foreign key
 - text: The text content of the message.
 - message_type: Type of message(user message, service message)
 - reply_id: id of message this message is replying to. *Null* if not replying to any message.
 - created_at: Timestamp of when the message was made.
- **Grouping**
 - Id: id of grouping. Primary key
 - u_id: id of a user. Foreign key
 - op_id: id of an operation. Foreign key
 - view: Type of view (top view).
- **Grouped Flightpath**
 - Id: id of grouped flightpath

- group_id: group id of the flight path. Foreign key
- flight path: name of the flight path.

API:

The following are the new *APIs* that would need to be developed on which I would be working for my ideas proposed in GSOC.

- **Invite User:** New endpoint /get_invite_link, /activate_invite_link and /deactivate_invite_link needs to be developed.
 - The /get_invite_link will generate invite links for different access levels.
 - The /activate_invite_link endpoint activates the deactivated invite link.
 - The /deactivate_invite_link endpoint deactivates the activated invite link.
- **Update Profile:** New endpoint /update_profile will be developed. It will add the first name, and nickname to the user profile.

Stretch Goals:

I would like to work on some other issues:

1. Refactor servers.
2. Save images from top view/side view to mscolab chat.
3. Improve automated tutorials for the MSUI user interface, remove duplicate code and also create more tutorials.
4. **Chat Service Additions:** For improving the communications between the users. I would be working on adding the following features to the chat service provided in mscolab:
 1. **System Message:** Users will be informed about changes in flight paths in operation.
 2. **Timestamps:** Users can see the timestamp of a message.
 3. **User Mention:** Clicking on the user would create a user mention(@mention). This is similar to the WhatsApp mention feature.

Timeline

Time Span	Work
20th May - 12th June	Community Bonding Period
20th May - 22nd May (2 days)	<ul style="list-style-type: none">→ Decide schedule and mode of communication for weekly meetings.→ Setup a GSoC blog.
23rd May - 4th June (2 Weeks)	<ul style="list-style-type: none">→ Discuss with mentors any changes or improvements to be made in the proposed architecture and draft the final design document.→ Solve some existing issues in MSS.→ Improve the test coverage of mscolab.
5th June - 12th June(1 week)	<p>Deep dive into the codebase:</p> <ul style="list-style-type: none">→ Get familiarized with the existing codebase.→ Make a rough note of all the functions and code that would require modifications after implementing the proposed ideas to catch errors early.

13th June	Official Coding starts
13th June - 26th June (2 Weeks)	<ul style="list-style-type: none"> → Display multiple flight paths. → Development of top view for multiple flight path support.
27th June - 10th July (2 Weeks)	<ul style="list-style-type: none"> → Development of table view for multiple waypoint support. → Add new unit tests and improve existing ones.
11th July - 24th July (2 Weeks)	<ul style="list-style-type: none"> → Improve the Mscolab chat window. (Stretch Goal - 1) → Work on any backlogs, fix new bugs and improve unit tests. → Test functionality of newly implemented code.
25th July - 29th July	Phase - I Evaluation
25th July - 7th August(2 Weeks)	<ul style="list-style-type: none"> → Show development of flightpath, in asynchronous work mode. → Improve the Mscolab chat window. (Stretch Goal - 2) → Review work done and complete incomplete tasks. → Solve bugs if found.

8th August- 21st August (2 Weeks)	<ul style="list-style-type: none"> → Development of filters for existing flight paths. → (Stretch Goal - 3) → Develop an invitation system for Mscolab. → Find and solve more bugs, if found.
22nd August - 4th September (2 Weeks)	<ul style="list-style-type: none"> → Improve the Mscolab chat window → (Stretch Goal - 4) → Update the documentation and ensure no part is left undone.
5th September - 12th September	Final work submission
5th September - 12th September	<ul style="list-style-type: none"> → Ask mentors for more detailed review and work on fixes covering code/documentation. → Prepare the final summary of the project for submission.
12th September - 19th September	Mentors submit final evaluation
20th September	Result Announced

Future Work

If there is still some work left in the project, I will first complete it and also continue my contributions to the Mission Support System and help new

contributors. I will also work on updating documentation for MSS tools and introduce practical usage of it.

Other Commitments

- If I am selected for GSoC, it will be my full-time commitment. I would be working for 29-30 hours a week on average.
- I will be having my final exams in the second half of June which will last for 2 weeks. In my schedule, I have arranged buffer time so I will remain on track.

Why am I best suited for this Project?

I am suitable for this project because I have good knowledge of Python and Git, and also very much like to contribute to open-source projects. I am a very fast learner and have much interest in programming. I have enough time to devote to this project and also have the experience to solve the issues in this project.

Are you applying for other Projects?

No, I am applying only for this project.