

Organizing Collaboration in Open Source Teams

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Abstract

An improved version is published [online](#)

To organize a research team, we need to establish simple communication pathways. This includes ways to conduct text chat video conferencing, code sharing, editing, and task management. In the following sections, we will list some useful tools that can be used by the research team while keeping the learning curve to a minimum. For more information and improvements, please contact: laszewski@gmail.com

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1 Organizing Collaborative Research Teams

To organize a research team, it is of utmost importance to establish simple collaboration pathways. This includes ways to conduct video conferencing, text chat code sharing, editing, and task management.

In the following sections, we will list some useful tools that can be used by the research team while keeping the learning curve to a minimum. In general, it is good to ask the participants if they already use particular tools in a category and if all in the team use them to adopt them. However, this may limit the general availability in case the team grows into the open-source community. Hence, it is important to consider licensing issues and if possible adopt free tools for the research team.

1.1 Communication

We start by identifying tools for voice and text communications.

1.1.1 Video Conferencing

Videoconferencing has undoubtedly become a major component of research teams. It allows face meetings without the need for traveling. Thus you can spend the time saved on travel. Also, it allows researchers to continue if unexpected events take place that does not allow in-person meetings such as the recent COVID epidemic.

Sometimes videoconferencing will produce acoustic feedback: a very loud loop of sound within a call. Members of a call can prevent this phenomenon by wearing headphones; if not possible, keep speaker volume down. Acoustic feedback also occurs when more than one device, in close proximity to each other, is on the same call. Avoid this feedback by wearing headphones or earbuds.

There are many conferencing tools available that can be used. You may even use multiple dependent on the particular meeting or preferences by the subgroup. To keep things simple it is however recommended to just use one tool.

1.1.1.1 Google Meet Google Meet is an online service that facilitates meetings as video and audio conference calls. It has evolved from Google Hangouts.

What are good features?

Some good features of Google Meet include the ability to use closed captions allowing the integration of participants having trouble hearing the speaker. It is compatible across devices and typically its sound quality is very good.

What are not so good features?

1. Google Meet does not provide an easy way to have others take control of a remote desktop. However, it is possible to use Google Remote Desktop for it.
 - <https://remotedesktop.google.com/?pli=1>
2. Google Meet cannot share each other's desktops at the same time. This feature was available in Hangouts but is no longer available as far as we can tell.
3. Google Meet restricts call times to one hour. After one hour has passed, a new call must be started.

Why you may consider choosing Google meet and not Zoom?

Google offers many services that are useful for collaboration. This includes Google Drive, Docs, Slides, Gmail, Calendar, and Groups. As they can be accessed through a single account, it is obvious that Google Meet provides a valuable set of services to any research team.

1.1.1.2 Zoom Zoom is a cloud-based communications platform that provides one-on-one's, group meetings, and webinars.

What are good features?

Some of Zoom's features include live chat, screen sharing, a whiteboard, and virtual reactions for meeting participants. Additionally, it can record meetings to the cloud or personal devices, create breakout rooms, and allows participants to seamlessly move between them. A very important feature is that the meeting owner can remotely control another participant's screen. Zoom allows users to join a session through an established meeting URL. Participants do not need to be signed in or even have a Zoom account. Additionally, people joining from places with limited Internet access can call into the meeting's audio channel using dedicated telephone numbers.

What are not so good features?

Free account holders can host unlimited one-on-one meetings (meeting durations up to 24 hrs). In contrast to Google Meet (which has a one hour meeting limit), there is a duration limit of 40 mins for meetings with three or more participants. We observed that video quality can be unstable, and the overall platform performance can quickly deteriorate over limited bandwidth connections. In such cases, we recommend switching off the

camera from the participant that has issues. Furthermore, if you do a lot of calculations at the same time on your machine, it may affect the quality of the call. This applies to older machines and should allow you to give a beautiful argument to get a new computer. In some cases, you may have a second computer and can use one for sharing your session, while the other one is used for sound, or you use a cell phone for the latter.

How can someone take control of a remote desktop?

To take control of a remote desktop, the host must activate screen sharing. Once the screen sharing is activated, we need to click the **View Options** drop-down menu (usually at the top of the screen) and click on **Request remote control**. The remote user will then get a prompt to approve the remote control request.

Institutional accounts may have the remote control functionality disabled by their account administrator. For further details, refer to the [Zoom support pages](#).

1.1.2 Real-time and Offline Text Messaging

In many research projects, participants may be in different timezones or have schedules that do not provide overlapping times for video-conferencing. For this reason, it is important to support a chat-like feature that allows the researchers to catch up with activities that took place they were not available for. Tools such as e-mail have filled this demand for quite some time. Recently additional tools such as Slack have appeared that enhance the e-mail activity while also allowing real-time text messaging.

1.1.2.1 Slack Slack is a communication software that is used for groups to send and receive text messages. Additional 3rd party services can be added to Slack that can even send messages to it automatically.

What are good features?

Slack offers a GUI that focuses on a real-time message stream. It can be used on computers, phones, and tablets. It is easy to send photos, which may be useful in case the device you need to discuss is not on the Internet but you need to share the content for example of its screen.

What are not so good features?

Slack is stream-based and does not provide a good mechanism for organizing messages once they have been sent. The thread feature is far inferior to that of even a simple e-mail client. If one is involved in many Slack workspaces, it becomes difficult to manage them. Most importantly, Slack comes with only a limited number of free messages in its free version. This means you will have to pay once you exceed the limit. Thus, even the integration of useful services such as GitHub notifications is not recommended as you will exceed the limits too quickly. A posting policy needs to be established. Those that are not using Slack frequently may be out of touch quickly. Although there is an unread threads feature, it may be filled with messages if you do not use Slack daily just to keep up.

To support the separation of topics, it is advisable to create several channels such as “general” or a channel for a particular topic. However, it is also important to limit the number of channels so it does not become too confusing. Keep in mind that Slack users are not automatically added to new channels.

How does one add all Slack workspace users to a new channel?

By default, users must manually browse the list of channels and join them by clicking **Add channels** on the left side of the GUI. However, any user can add everyone to the channel by doing the following:

1. Type **/who** in **#general** and then press **Enter** to send the message; you will see a message only you can see: a list of all the members in the channel.
2. Copy this message from Slackbot. Ensure you are copying the names of the users which all begin with **@**.
3. Paste the output in the new channels and press **Enter**. This will not actually mention everybody— it will only prompt a dialog box confirming to invite everyone. Click **Invite Them**.

1.2 Creating Text

As part of your project, you will need to develop documents such as manuals or reports; hence, you must have the means to easily add text to your project. This includes the creation of text via editors but also through dictation in case this is useful and works for you.

1.2.1 Dictation

Sometimes it is convenient to directly dictate the text for a manual or tutorial into an editor. On macOS and Windows, you will find useful tools for this. A voice-to-text recorder may also help you in case you have a recorded video of yourself to generate transcripts. A disadvantage for a lot of non-native English speakers is that the accuracy may be limited and that not using them leads to unacceptable results. Some of them can be trained.

Hence before you integrate it into your toolset, we recommend trying it out. Different participants may be more successful than others. However, errors will happen and you will have to clean up the document after dictation.

Examples include:

- [Apple Dictation](#) (free for Apple devices): You can directly dictate into various applications that help you improve your text such as Grammarly and MS Word if you have installed them.
- [Windows 10 Voice Recognition](#) (free for Windows users). You can directly record into MS Word so you get a free grammar checker. **Note: We received reports from some of our participants that they could not get this to work. More investigation is needed.**
- [Google Docs](#) offers build-in voice typing. Its recognition quality is very good as well as fast. It does have difficulties recognizing some names and acronyms. **Note: that we were unable to get it to work in Chromium on Ubuntu 21.04. We have not tried other versions.**

1.2.2 Grammar Checkers

When developing content for tutorials and documentation, it is important to check their correctness with a grammar checker. We have made the best experience with Grammarly followed by MS Word. The best way to use them is to copy and paste small sections into them from your document and then check them. After you are satisfied, copy the contents back to the original one while overwriting the old text.

1.2.2.1 Grammarly What are good features?

Grammarly works well, is available for free, and the free version is good enough for most.

What are not so good features?

As with any grammar checker, not everything is corrected properly. In some text, it shows false errors, but it's still very good.

1.2.2.2 Word What are good features?

The word grammar checker is built into Word and has a high accuracy.

What are not so good features?

In practice, we observed that Grammarly performs better. Copying text back and forth can introduce errors when it comes to using quotes and other symbols. Thus you must check all symbols after you copy them into a markdown document. In case you have the choice we currently recommend you use Grammarly.

1.2.3 Editors

You will likely need multiple editors as part of your research activities. This is motivated by the fact that we do lots of development on your local machine, but also do remote development via terminal access to a remote computer that does not have a GUI. In case you only want to learn one editor to do all of this, just use emacs. We have listed below some editors and you may want to choose

- **emacs** vs vi/vim for terminal editing
- **pycharm** vs MS code for fancyful python code development

There is a third option that we will use and that is Jupyter which allows us to interactively develop Python code. Jupyter is important as it is used by many data scientists due to its ad hoc interactive mode while programming. However, PyCharm and VS Code also provide options to view and run Jupyter notebooks. However, not everything that works in Jupyter is working on these platforms.

Here is a list of popular editors for python:

- **emacs**
 - Pro: terminal, established, very good markdown support, block format with ESC-q, keyboard shortcuts also used in bash, and their shells have a python and markdown mode
 - Cons: some users have a hard time remembering the keyboard shortcuts, the editor may get stuck in some unknown mode that you activated by accident. ALL this is easy to fix by remembering CTRL-X-s (save) and CTRL-G (get out of a strange mode)
- **vi**
 - use vim instead, vi is available on all Linux machines, but has rather archaic editing controls.
- **vim**
 - Pros: like vi, but with cursor control
 - Cons: often awkward to use
- **Pycharm**
 - Pro: best Python editor
 - Cons: needs lots of resources, the steep learning curve
- **VS Code from Microsoft**
 - Pro: often used on Raspberry
 - Cons: Pycharm seems to have more features from the start

1.3 Documentation with Markdown

We have developed a special booklet that helps you to feel the many features of markdown that can be used to create scientific documentation please follow the link to this document to find out more. For open-source projects, you often need to develop documents that are portable across platforms and do not depend on editors provided by a specific vendor. They exist a great number of formats that could be used but most recently markdown has become one of the easier-to-use document formats For developing portable documentation.

- [Scientific Writing with Markdown, Gregor von Laszewski](#)

There are many editors for editing markdown locally on your computer or and services that are offered remotely. For groups one of the services that we have successfully used is Hackermd.io. On macOS one of the very useful editors at macdown. However, emacs already provides a built-in markdown editor for you if. If you are using PyCharm it also comes with a MacDown editor but you cannot enable it if it does not come with your version.

For complex documents, the management of the document with Github is superior to those of online editors. This is especially the case if the documents have to be split up into multiple documents due to their size.

1.4 ToDo Lists

It is important to communicate quickly some tasks in documents that we write as a team. To do this we use the keyword `TODO`, followed usually by an explanation what needs to be done. As a `TODO` can be hopefully resolved quickly it should be able to complete them in 1-2 hours. Any `TODO` that may take longer we also add to our GitHub project for it to be recorded and if we identify delays in its execution we can assign additional team members to help on these larger tasks.

Once a team member has identified a `TODO` item, the team member can simply put his name behind it, as well as the date and time of the anticipated completion so others know you work on it. Also, it is recommended to communicate on slack about the task you do if you run into issues or have questions.

In case a `TODO` has not yet been assigned, a team member can simply take it and complete it. In practice we have seen in some groups that the project lead needs to assign tasks to speed up the development and avoid long times of inactivity by team members.

1.5 Git and GitHub

Git is a distributed version control system to support working on project in teams while allowing different team members to contribute and to curate the contribution through reviews.

GitHub is a service offered for free with the limitation that the repositories should not be larger than 1GB and the individual files must be smaller than 200MB. Github is very popular for OpenSource projects and through its free offering allows community building around OpenSource Projects.

1.5.1 Git from the command line

Git can easily be installed on all platforms including

- macOS: You will need to install Xcode which includes not only git but user Linux programs such as Makefile
- Ubuntu: You can install it via `apt install git`
- Windows: You can install it via *Git Bash* which is distributed from <https://git-scm.com/downloads>. When installing read carefully the available options. We recommend you install a desktop shortcut.

1.6 Git from IDEs

Pycharm is one of the best editors for Python. It does provide build-in support to interact with GitHub. For beginners, we do recommend to get started with PyCharm's GitHub features.

1.7 GitHub from a GUI

Some may fancy using a Graphical user interface to interact with GitHub. However, in many cases, the terminal access is simpler. However, if you like to browse the repositories and see the commit tree, these GUI interfaces are useful. Several such interfaces are available at:

- <https://git-scm.com/downloads/guis>

1.7.1 GitHub Commands

Many tutorials introduced get up in its full details however many of the contributing participants in open source project may not need them. That is it important to identify which commands are the most useful ones to get team members started

What are the most important commands?

- `git pull`
 - retrieves the latest content from the shared remote repository
- `git add FILENAME`

- adds a filename to the local repository. Also, do never use the git command `git add .` as that adds all files and you could have files that you do not want to commit. instead **always** use `git add FILENAME`, where FILENAME is the file you like to add.
- `git commit -m "commit comment" FILENAME`
 - commits the current content of the FILE to the local repository
- `git push`
 - pushes the content from the local repository to the shared remote repository

More advanced feature of git is the use of branches. With branches we can coordinate individual contributions that I merged into the main remote repository. This is done With a branch name as well as a git pull request.

- `git checkout BRANCHNAME`
 - creates a new branch in your local repository
- `git push -u origin BRANCHNAME`
 - pushes the branch with the name BRANCHNAME to the remote repository for all to see

After your branch may be reviewed by the team it may be decided to merge it into the main branch. This has to be done carefully and multiple people should review such a merge before It is executed and pushed. You can try out a branch by checking it out with the command

```
$ git checkout BBRANCHNAME
```

After the check out you have the contents of the branch in your local repository and you can verify if it works. Usually one person or team members are dedicated to merging branches. A branch can be merged with the commands

```
$ git checkout main
$ git merge main BRANCHNAME
```

To push the branch into the remote repository simply used to the push command.

```
$ git push
```

2 Appendix