IT 497 Group Assignment #1 Abhishek Varghese

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Kushal Tare

Mayank Shrivansh

Nikita Upadhyay

**Introduction**

Technology advances continue to provide students with tools that greatly aid their ability to study and complete their coursework. A primary example of this is the plethora of free document/assignment management and collaboration tools, such as Google Drive, Dropbox, Ubuntu One, GitHub, and Evernote that allow students to more effectively and efficiently manage and share documents. This paper will examine how well suited each of these products is in an academic environment, particularly in aiding students with individual and team assignments in both programming and non-programming classes, and will provide a specific recommendation regarding the best tool to use in IT 497.

**Google Drive**

Google Drive is a web-based tool from Google which is based on the concept of cloud computing. It allows users to create, modify, and share documents or files online and access the corresponding from anywhere using various types of devices.

Google Drive provides many useful capabilities for students. It can aid them with individual assignments/projects by providing the capability to create and view many file types, such as documents, presentations, PDFs, images. It also gives the user the ability to open and modify these files without needing the associated software (e.g. MS Word for a .doc file) installed on the device. However, the viewing and editing interfaces on Google Drive can make working with highly formatted MS Word or Excel files very difficult.

With its chat and real time collaboration features, Google Drive is also beneficial for the students with group assignments/projects. These features allow group members to discuss and modify files simultaneously online with changes occurring on each user’s screen in real-time, creating a highly collaborative work environment. Google Drive also automatically saves files being edited continuously, so if one or more users experience connectivity or computing issues on their machine, the data is securely stored and recoverable from their servers.

While it is not primarily intended for programming purposes, Google Drive does provide some capability for students in programming courses, primarily in the area of code file sharing and team collaboration. Google Drive enables students to share their code with team members on group projects, and also gives professors an easier feedback mechanism than e-mail or Reggienet. It also provides an application called Apps Script that allows students to enhance document files and spreadsheets. However, Google Drive does not provide many of the more programming specific code management capabilities that some of the other tools do, such as code repository management and file version control, like GitHub.

Google Drive is probably best suited to help students with non-programming courses because it is geared towards collaborating on more popular file formats like documentation and presentations. It also allows for fairly simple collaboration in group projects, since most students, whether they have a technical background or not, are familiar with Google technology.

**Dropbox**

Dropbox is collaboration tool that is mainly based on concept of virtualization – it creates a dedicated Dropbox folder on the user’s device that is synchronized continuously with the storage space on a server. Dropbox uses a client/server relationship that allows the client to makes changes, which are then synchronized with the server. It is a free service that initially provides its users 2 GB of free memory with the option to purchase extra space if required. Dropbox support files ranging from text, images, videos, documents, and more.

Students can use Dropbox on individual assignments as free remote storage and file access portal, but its primary utility for students is in the area of collaboration on group assignments/projects. It is hardware-independent and allows various group members to access files from any location using an Internet connection. It also gives students in groups the ability to maintain configuration control of shared documents with a feature that automatically synchronizes changes to each group member’s account. Dropbox also provides a file recovery capability through its recycling bin that can recover accidently deleted files.

Dropbox is also useful to students for programming courses since it supports different code file formats, such as HTML, CSS, C, C++, and Java. The executable file (.class) of a java program can be directly downloaded and executed on any machine. This further relieves the need for a complier or an interpreter. It can also be very useful for non-programming classes in that it provides an intuitive file sharing and collaboration platform that works well for sharing documents, presentations, and spreadsheets.

**Ubuntu One**

Ubuntu One is a diversification of the Ubuntu Linux operating system, which is operated by Canonical Ltd. It is a cloud service that enables its users to store and share files, photos, and media. It has a built-in media player and its own music store powered by Amarok, through which users can buy and play music on the go, which tends to be very popular with students.

Ubuntu One provides a student working on an individual project with the ability to store articles, documents, and other related media on personal cloud storage, freeing them from carrying it around on physical media of any sort. The individual only needs an Internet connection to access his/her work. Furthermore, students can share files with friends /group members by simply providing them with a link.

Ubuntu One can be excellent collaboration tool for group work. Its folder sharing feature is beneficial for group assignments where members constantly need to exchange information or collaborate with one another on documents or any other types of files. A folder containing all the useful information can be accessed by all the teammates by assigning each with specific sharing rights. This allows the group work from distributed locations by remotely accessing their shared information from anywhere with an Internet connection.

Although there are no special features oriented towards programmers, Ubuntu One does provide basic file/code sharing and documentation functionalities that can be helpful to a student in a programming class. Additionally, Ubuntu One client and server software is written in Python, which makes it easy for developers to use in their products.

For non-programming courses, Ubuntu One can be helpful for instructors to share notes, course documents and information with their students. That gives students a useful tool to submit their assignments to the instructors. Like the other tools mentioned so far, Ubuntu One has file-sharing capabilities that can be used by students to collaborate on non-programming files, such as documents, presentations, and spreadsheets.

**GitHub**

GitHub is a Distributed Version Control System (DVCS) built by the developers of the Linux kernel with the primary purpose of helping software developers manage the code file repositories for any number of development projects with a single tool. Through the use of both a web portal and a locally-installed application, GitHub allows multiple users to access, edit, and manage files in common repositories and ensure that versions are tracked, maintained, converged into a single master project.

While GitHub is primarily used for team-based development projects, it does have features that can be useful to students on individual assignments. It provides a free remote storage option for student files, as well as an organized view of changes to a document or collection of documents over time. GitHub’s version control/tracking capabilities enable a student to revert back to a previously “committed” version if a newer version is lost, corrupted, or unwanted. GitHub also provides a student with a structure to organize various files for one or multiple projects and provides the platform to track changes to each at the file or project level.

GitHub provides a student working on a group project all of the same capabilities mentioned above for individual assignments, but allows other group project team members access to the file repositories. It provides an organized way for multiple students to access the same documents from different computers and maintain version control. GitHub uses “branching” and “forking” to enable multiple students to work on the same project files at the same time while still maintaining version control on the files. However, GitHub’s programmer-oriented repository management features are not overly intuitive, especially for those new to using GitHub or not from a programming background.

GitHub was built by the creators of the Linux kernel with programming projects in mind, so it best suited for programming projects, including assignments in programming courses. It provides a platform for multiple programmers to work on the same project at the same time while maintaining version control and documenting changes to code files over time. All of the previously mentioned file sharing and version controls benefits apply, but they are really oriented towards code files (txt, java, etc.) instead of any other academic files because many of the editors and tracking tools are best used with those types of files.

Despite being primarily geared toward programming projects, GitHub’s version control and storage capabilities can also be useful for student assignments in non-programming courses. For a group project in a research class, like IT 497, a team could set up a shared repository to work on the same project report file, like a MS Word document, or a group of files that contribute to the same report. GitHub provides the platform and interface to allow all members to access all relevant documents, and shows all members what has been changed, by whom, and when it was changed. However, since the built-in editor is geared toward editing code files in simple text formats, it does not lend itself well to a Word document with its more advanced Word processing features and formatting. Additionally, GitHub’s branching and merging process is more difficult to manage for prose in a paper versus code in a programming file.

**Evernote**

Evernote is an application focused on the idea of “note taking.” It provides a way to organize and store documents which could have notes, pictures, and audio notes attached in a single location where it can be retrieved, edited, and shared. Evernote has a locally-installed application and a web-based application that is synchronized with each other via the Internet to provide its full set of document sharing capabilities.

Students can individually use Evernote to take notes in the classroom and include lecture audio recorded files as attachments. The web clipper features allows students to take important portions of articles from Internet and include them with their class notes. Evernote works on various devices, such as tablets and smartphones, which allows easy access to assignment and project data anytime from any place. While it is geared towards capturing class notes, Evernote also stores various types of files that students may need to complete their assignments, such as documents, presentations, and spreadsheets.

Evernote can also enable students to collaborate on projects or assignments. Team members can share their work and set individual privilege features that limit/grant various levels of access to any given team member. Evernote also provides a document backup service that saves files to a cloud-based storage system that is auto-synchronized with all the devices linked to that account.

Evernote can be used for programming courses as a safe repository for backing up source code on which a person or a group is working. It also offers organizing features that allow users to keep related documents in a single shared directory, which provides easy accessibility to work whenever required. Evernote, however, does not provide any specific programming-related features.

With its data capture, organization, and sharing features, Evernote is well-suited for non-programming courses, like IT 497. It provides the platform and tools to store and organize various types of data from various sources in a useful manner. E-mail related to subject work can be forwarded directly to an Evernote account, and Evernote’s browser extension aids enable students to save important web pages for future reference.

**Conclusion**

Various document/assignment management tools, such as Google Drive, Dropbox, Ubuntu One, GitHub, and Evernote, are giving students the capabilities to more effectively manage and complete their projects and assignments. The best option for use in IT 497, a non-programming research-driven course, seems to be Google Drive because it is the most intuitive to use for sharing, editing and maintaining version control of MS Word documents for group assignments, which is a primary concern for IT 497.