# Working in the Cloud: Web-based Version Control System for Task-oriented Group and Individual Projects

Aim to develop this version control system with these features:

1. Fully web-based, without need of installation of any software at client side, and can be accessed at anywhere. It meets the concept of Cloud Computing.

2. Task-oriented development friendly, avoid concurrent and overlap editing, avoid confusing.

# Literature review

This section was about the literatures related to this project – a web-based version control system.

## Version Control

Version control, usually be called as revision control or source control, was a method of managing files related to development of projects through their whole life cycle [1]. Most version control software includes CVS and Subversion run as client-server model, so they support more than one users working especially programming for a same project, because the multi-clients can be connected to a central version control server to be synchronized [2] [3]. The general features provided by version control include storing each commit/version of files or directories, allowing rollback, showing changing history and assist merge/integration [1]. Based on the features, many kinds or parts of project can use version control to be effective managed, such as projects of software development and documentation writing. Each commit/change can be marked with properties of which author did this commit and what time it committed. The commits also comes with a unique version code to identify the times of changes of it. Users can also add some comments to the version when they commit it, so it is very clear to identify what the users changed in there committed version. When a version commit has been identified as worse than an older version, the changes can be easily roll backed to a previous version at any time [1].

Even though the version control policy now sounds wonderful enough, however there still an important point should be noticed, that is the “concurrent access” problem existing in almost all the version control systems. Every project developer can access an entire project, and have privilege in changing any part of the project. It is hard to assign responsibility as tasks to the developers, and the developers may forget where their positions in developing the projects are. When a developer mixed up his/her range of development, and changed some files which someone else is working for, it may leading to more serious problems, even though merge policy can do combination of most their works, because the result cannot be guaranteed as the most expected one. Some version control system such as Subversion has designed the “lock” feature to prevent this problem. However, even though a file has been locked by a developer, other developers can also get copy of it from archive of older versions, because it is hard to be restricted under the current version control policy.

To solve this problem, this MSc project was aimed to develop a version control system which has “task-oriented” feature to avoid developers forget their role in development, also prevent the happen of concurrent editing of files. Task-oriented development could support more than one people working with one project at its separated tasks, without interrupt and overlap. Assignment of tasks for the developers can be confirmed by a discussion in a group of each developer’s strong points and weak points, and finish assigning by group leader in the new system.

## Existing Version Control System

As coordination and work management were important features of the system, some design can be learnt from operating mechanism of existing version control system. In the following, the popular software-based client-server version control system CVS [2] and Subversion [3] will be analysed by their important features.

### Unique version number

Every change of directory and file will generate a new version to the directory and file itself. Copying, renaming and deleting will be considered as a change. Each historical version will be kept for in-case use [3].

### Atomic commits

For coordination considering, every submitting of change set will generate a version of change history, even only a part of the set has been changed [3]. As this project was task-based, so it could be different from the SVN versioning mechanism, which is every files will update to a latest same version code after an every submitting command. Task-based feature limited area of change set to tasks, therefore, the versioning mechanism could be designed as every time of file and directory change will increase the version number of file and directory individually, and the task version will be increased when a submit operation has been executed, no matter how many changes of file and directory have been made, even only renamed a file.

### Locking

To avoid unsynchronised editing, lock-work-submit-unlock is a very good feature provided by SVN for clash free editing [3]. In this project, the task as a minimum assignable unit, could be locked when a user start doing the task. When a lock has been set to a task, other user except the user who sets the lock cannot request to do the task, even he/she was already been assigned to the task.

The project was designed as task-based, also helps members in a group doing their common project under schedule. In contrast, none of existing version control system provides scheduling features, including the most popular software-based version control system – Subversion. To achieve the schedulable feature, in the system of this MSc project development, the tasks could be set up with relationship with other tasks. In 1910, Henry Gantt first published the concept of predecessor in his famous Gantt chart [4]. It resolved the organisation problem of group collaboration in scheduling very well. This project uses the concept from Gantt chart to scheduling tasks. In the system, a task could have a predecessor/father task, which means a task can be start only when its predecessor task already finished.

# Web

Most (maybe all) version control systems are traditional client-server model based, and need to install software at both server side and client side. For entry-level users, it may be hard for them to install and configure client side software to work with server which providing version control service; For users who often working in different kinds of environment instead of their own computer, such as working at computer lab and on mobile devices like iPad, they may have not got privilege to install client side software of version control systems, or the mobile device does not support software for version control.

To allow client side user can working at most environment with version control support, it is important to find out a way deliver the service without need of installing software. By the inspiring of more and more popular cloud computing concepts, this project was considered to develop a web-based version control system which does not need any installation of client side software. Web-based design overcomes the drawbacks of software-based design, such as hard to use at anywhere and hard to configure by entry-level user. It can be easily accessed at any computer, even a mobile phone, just need a browser and network access to the version control server.

In order to develop the system to be used at web, there are several programming languages available, such as Java/JSP[[1]](#footnote-1), ASP[[2]](#footnote-2), ASP.net[[3]](#footnote-3), CGI and PHP. In these languages, Java as a popular programming language in object-oriented software development can also provide web service by working with JSP on Servlet[[4]](#footnote-4), even though it provides the most object-oriented structure for programming, however, it is hard to set up server side environment and also hard to programming in the scale of this kind of project; ASP, an Microsoft’s outdated web application uses Visual Basic programming language, which is very popular at the era of Microsoft Windows NT 4.0 and Windows 2000, with many down sides such as lack of library support and low safety design; ASP.net is the latest Microsoft’s web application uses C# as programming language, overcomes many drawbacks existed at ASP, however it still not an open source platform like before; the last one, PHP, is the most shining web programming language with lots of great features, such as fully open source, object-oriented support, abundant built-in library functions and rich high quality open source resources. The running environment of PHP is also easy to be set up. It can run with open source web server software such as Apache and Nginx, also Microsoft’s IIS[[5]](#footnote-5) series. So this MSc project has been chosen PHP as the programming language.

## Interaction Design

As a web app with user interface, interaction design is an important part of this project.

# Bibliography

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1. JSP, JavaServer Pages, a technology uses Java language creates dynamic web content [5]. [↑](#footnote-ref-1)
2. [↑](#footnote-ref-2)
3. [↑](#footnote-ref-3)
4. [↑](#footnote-ref-4)
5. [↑](#footnote-ref-5)