Computer Labs: Version Control with Subversion

2º MIEIC

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The Problem

```
$edit video_gr.c, make, run, edit, make, run, ...
```

OK! Now that it enters in graphics mode, let's make a backup

```
$copy video_gr.c video_gr.v1.c
$edit video_gr.c, make, run, edit, make, run, ...
```

OK! Now that it maps graphic memory, let's make another backup

```
$copy video_gr.c video_gr.v2.c
$edit video_gr.c, make, run, edit, make, run, ...
```

OK! Now that it draws a pixel, let's make another backup

```
$copy video_gr.c video_gr.v3.c
$edit video_gr.c, make, run, edit, make, run, ...
```

Oops! Does not leave graphics mode, let's retrieve the backup

```
$copy video_gr.v7.c video_grc.
```

Hmm! This is not the version I want. Should it be v3? ... Oops, deleted the last version !@£#%/#*&$@

The Solution? Subversion! (SVN)

- Subversion is a version control system that is able to:
  - Keep several versions of an entire (development) directory tree
  - Restore any of the versions it keeps in a consistent way
- Furthermore, it:
  - supports **concurrent access** to the different files or directories in the tree **by several users**;
  - keeps a log of the changes performed to each file/directory that **can be used to document/keep track of the main changes** between versions
  - allows to create new **branches**, i.e. to keep track of the evolution of multiple directory trees that have a common ancestor (i.e. a tree of directory trees)

SVN Key Concepts

Repository This is the central store (and the server program) that keeps the **different versions** of the data

- It usually keeps data for different “projects”
- We’ll refer to the data of a “project” kept in the repository as ... the repository

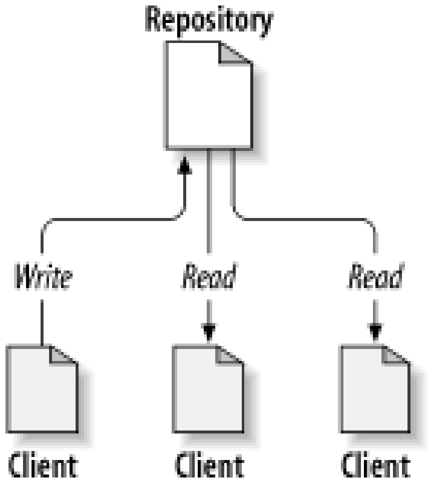
Working Copy This is a copy of **one version** of the data of a “project”. The working copy is kept in a client computer, may be the computer that keeps the repository

- The working copy is a standard directory tree
- Other programs, like editors and compilers, do not need to be “version-control-aware”

There may be several working copies of a given repository (project), thus supporting the collaboration of multiple programmers in a project

Revision A new revision (version) is created by **committing** to the repository the changes done in a working copy

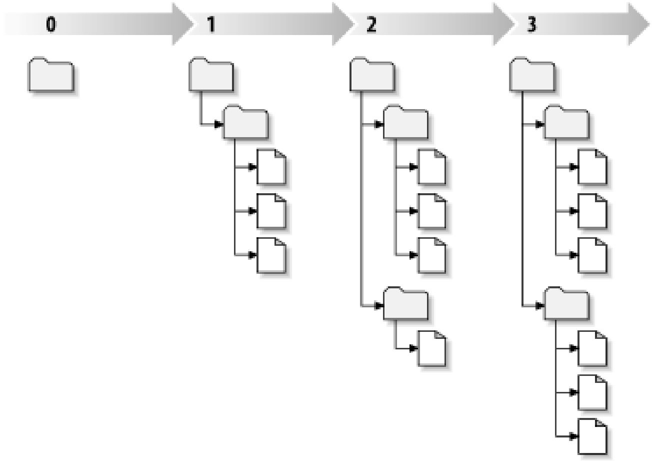
SVN: The Repository and Working Copies



Source: Ben-Collins-Sussman et al. Version Control with Subversion

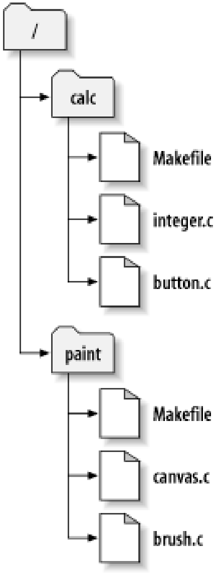
SVN: Revisions

Revision A new revision (version) is created by **committing** to the repository the changes done in a working copy



Source: Ben-Collins-Sussman et al. Version Control with Subversion

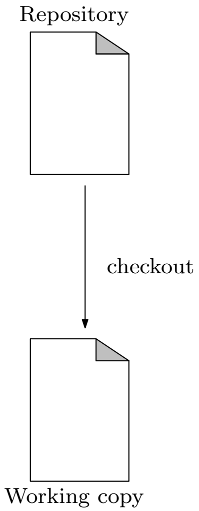
SVN: Multiple Projects



Source: Ben-Collins-Sussman et al. Version Control with Subversion

SVN: Basic Usage

- Generate a working copy using **checkout**



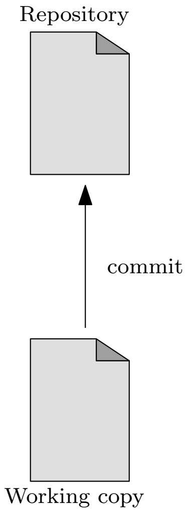
SVN: Basic Usage

- Change the working copy with your favorite editor

Repository
Working copy

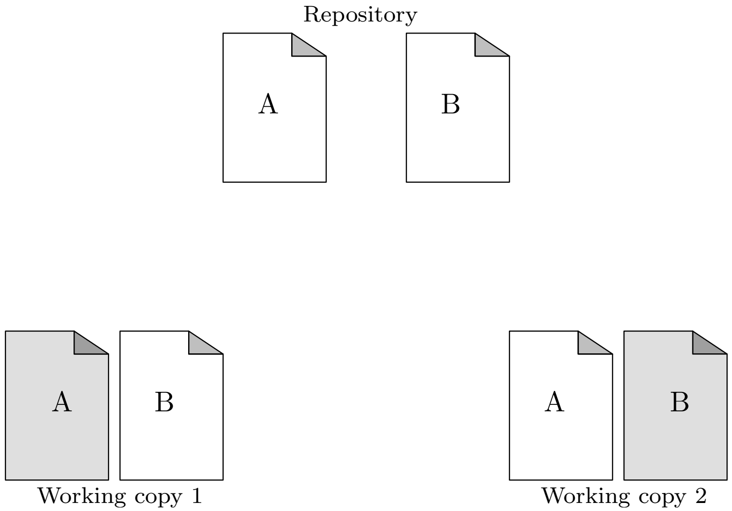
SVN: Basic Usage

- Publish your changes on the repository with **commit**



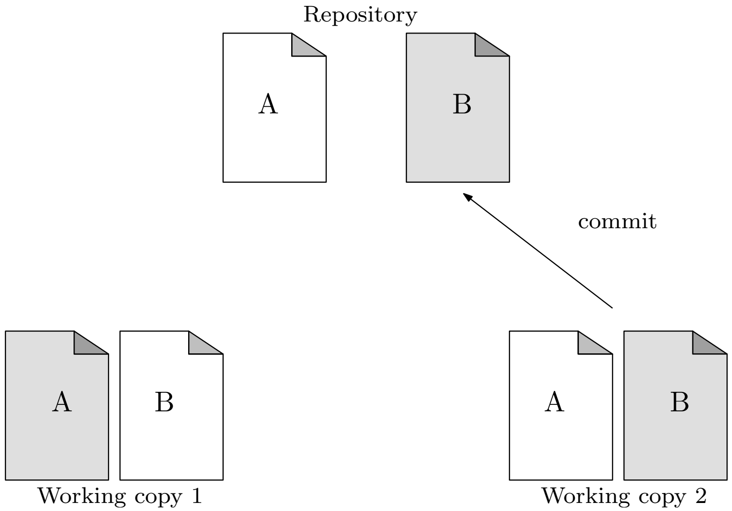
SVN: Multiple Users

- Often several users work concurrently on their own working copies, normally on different files



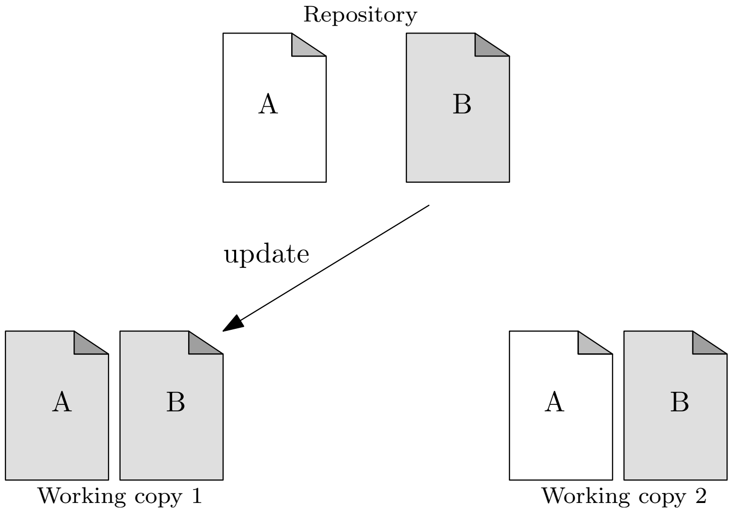
SVN: Multiple Users

- When a user commits its changes, the working copies of the remaining users become outdated

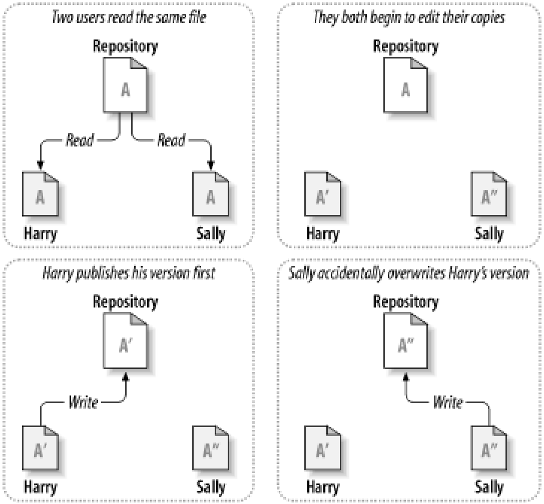


SVN: Multiple Users

- To bring its working copy in sync with the latest version of the repository a user must **update** it



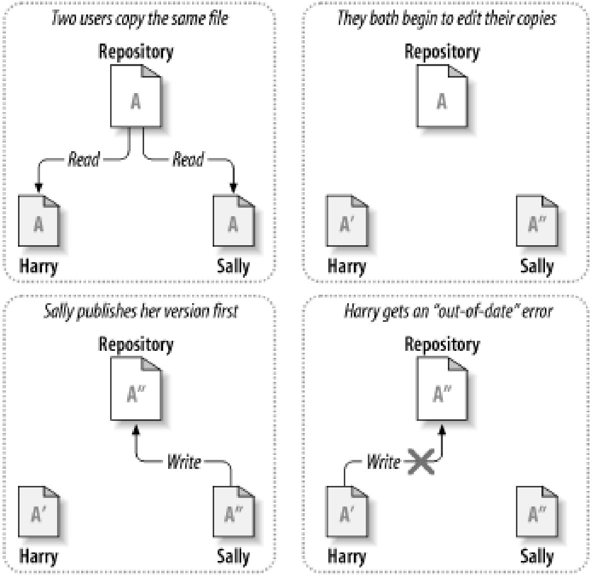
SVN: Conflicts with Multiple Users


Two users read the same file
Repository
A
Read
Read
A
A
Harry
Sally
They both begin to edit their copies
Repository
A
A′
A″
Harry
Sally
Harry publishes his version first
Repository
A′
Write
A′
A″
Harry
Sally
Sally accidentally overwrites Harry's version
Repository
A″
Write
A′
A″
Harry
Sally

Source: Ben-Collins-Sussman et al. Version Control with Subversion

To address this problem SVN uses a versioning approach known as **Copy-Modify-Merge**

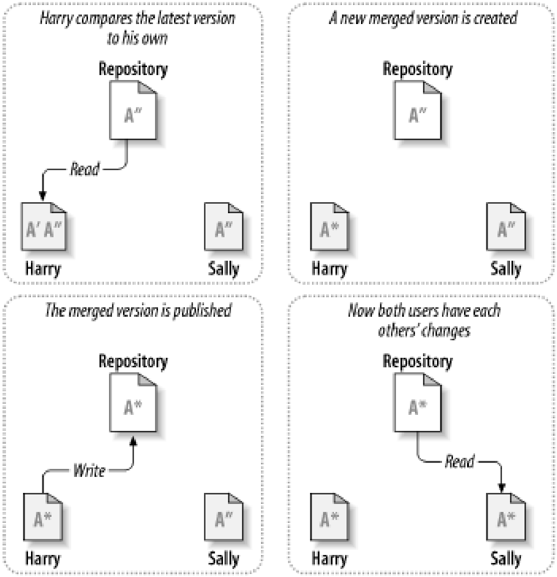
SVN: Automatic Conflict Detection



Two users copy the same file
Repository
A
Read
Read
A
A
Harry
Sally
They both begin to edit their copies
Repository
A
A′
A″
Harry
Sally
Sally publishes her version first
Repository
A″
Write
A′
A″
Harry
Sally
Harry gets an "out-of-date" error
Repository
A″
Write
A′
A″
Harry
Sally

Source: Ben-Collins-Sussman et al. Version Control with Subversion

SVN: Manual Conflict Resolution



Harry compares the latest version to his own
Repository
A″
Read
A′ A″
Harry
A″
Sally
A new merged version is created
Repository
A″
A*
Harry
A″
Sally
The merged version is published
Repository
A*
Write
A*
Harry
A″
Sally
Now both users have each others' changes
Repository
A*
Read
A*
Harry
A*
Sally

Source: Ben-Collins-Sussman et al. Version Control with Subversion

SVN: (Some) Useful Commands

checkout create a working copy

mkdir create a directory

- Even if you do not have a working copy

add add a file/directory to the working copy

delete remove a file/directory to the working copy

- **Be careful**, it may also remove the files in the working copy

move rename a file in the repository

status list changes made to the working copy

diff show differences between the working copy and the repository, or between revisions in the repository

update update the working copy

commit update the repository

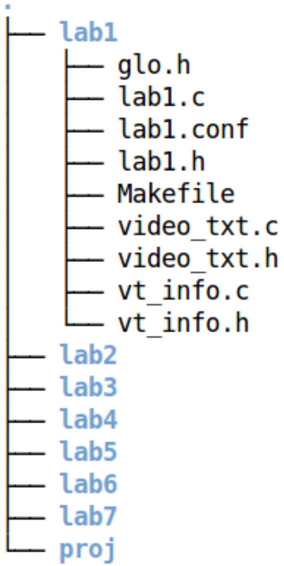
log list messages with date and author information attached to revisions and which paths changed in each revision

SVN and LCOM Labs

- You must use SVN to submit your work:
  - By the end of your lab class
- There is a 15 minutes tolerance, after that you get a 0
  - To take most advantage of the classes you should work before the class rather than after.
- You'll use the SVN repository available via the Redmine project manager provided by CICA.

Redmine's SVN Repository Structure

- There is one SVN repository per Redmine project
- To facilitate your life, and ours, you must keep it structured as shown in the picture on the right
  - You can create the structure incrementally
- You may create subdirectories under the "top level" directories
  - This is unlikely to help in the labs
  - But may be useful in the project



```
.
├── lab1
│   ├── glo.h
│   ├── lab1.c
│   ├── lab1.conf
│   ├── lab1.h
│   ├── Makefile
│   ├── video_txt.c
│   ├── video_txt.h
│   ├── vt_info.c
│   └── vt_info.h
├── lab2
├── lab3
├── lab4
├── lab5
├── lab6
├── lab7
└── proj
```

Creation of This Structure (One Way)

Assumption Redmine's SVN repository has already been configured in Lab 0

Steps

1. Create the directory for Lab 1:
   ```
   svn mkdir lab1 https://svn.fe.up.pt/repos/lcom1415-t0g00 -m "..."
   ```
2. Create a working copy with an empty directory:
   ```
   svn checkout https://svn.fe.up.pt/repos/lcom1415-t0g00/lab1
   ```
3. Copy files provided for Lab 1 to directory `lab1/`
4. Add the files to the repository from inside `lab1/`:
   `svn add lab1.[ch]` etc.
5. Commit your changes:
   ```
   svn commit -m "Added files provided for Lab 1"
   ```

- Later you can get a working copy for Lab 1, with added files:
  ```
  svn checkout https://svn.fe.up.pt/repos/lcom1415-t0g00/lab1
  ```
- If you are using your own computer and already have a working copy, **use `update` instead**.

SVN: Advantages

- It provides automatic backup
- It makes it easy to restore a previous version
- It is supported by most IDEs including Eclipse
  - But you can also use a command line client, even in Minix
- Users can work on any computer
- Members of a team can work simultaneously and independently on the same project
- It logs **who** did/committed **what** and **when**
  - By using appropriate messages or comments, it is also possible to know **why**
- It is possible to try a new approach, and continue development on the older one

Thanks to:

I.e. shamelessly translated material by:

- João Cardoso (jcard@fe.up.pt)

Further Reading

- Serch the web for the right tutorial for you on
  - SVN
  - SVN plugins for Eclipse
- *Ben Collins-Sussman et. al* Version Control with Subversion [DRAFT] For Subversion 1.?