CVS – concurrent versions system

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Overview – what is CVS?

CVS is a Version Control System (VCS)

CVS == Concurrent Versioning System

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Overview – what is version control

Version control, and change management

- Keep track of changes (revisions)
- Share changes with others (public repository)
- Maintain multiple versions of a same set of data (branches)

What kind of data?

- Source code
- Documentation
- Configuration files
- Binary data as well (less efficient)

CVS terminology

repository

- Central, master copy containing all files being versioned. Directory structured

working copy

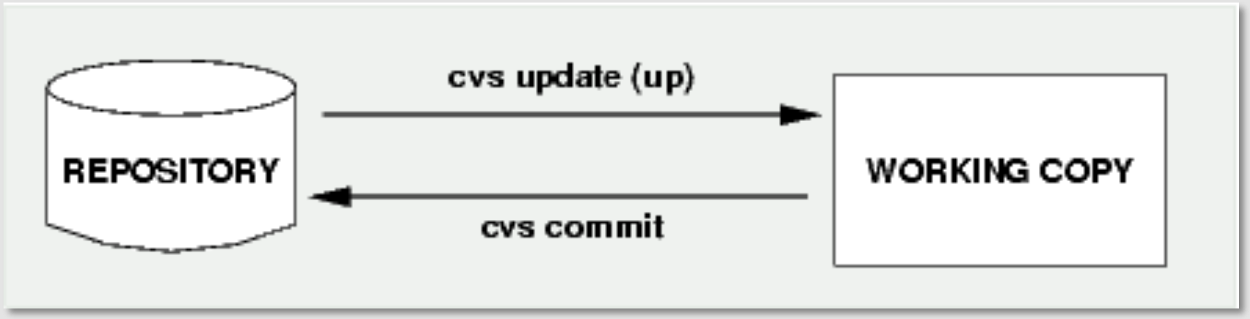
- Local copy of a project, checked out from a repository. Contains special directories (CVS) with information about which files are under CVS control, where they files come from and where they should be committed.

module

- A set of directories, files or other modules under a common “shortcut” name

CVS principles

- CVS uses a centralized "master copy": the *repository*
- All work is done in a *working copy*
- Changes are *committed* back to the the *repository*
- Special directory, *CVS*



CVS – the repository

- CVS is a centralized VCS (1 repository)
- The repository contains files in the RCS format, all ending in ' ,v '

- Each RCS file contains a complete history, with change log, of the file being versioned
- Well adapted to text files
- The repository is NEVER edited by hand
- A number of tools exist to analyze or browse the repository
  - cvsweb/webcvs

CVS – the repository

- Clients can access the repository locally or over the network.
- The repository is indicated (UNIX) using the CVSROOT environment variable:
- CVSROOT=

```
- /cvs/myprojects                             # local disk
- :pserver:myserver.com:/cvs/myprojects       # via pserver
- :ext:user@myserver.com:/cvs/myprojects      # via SSH
```

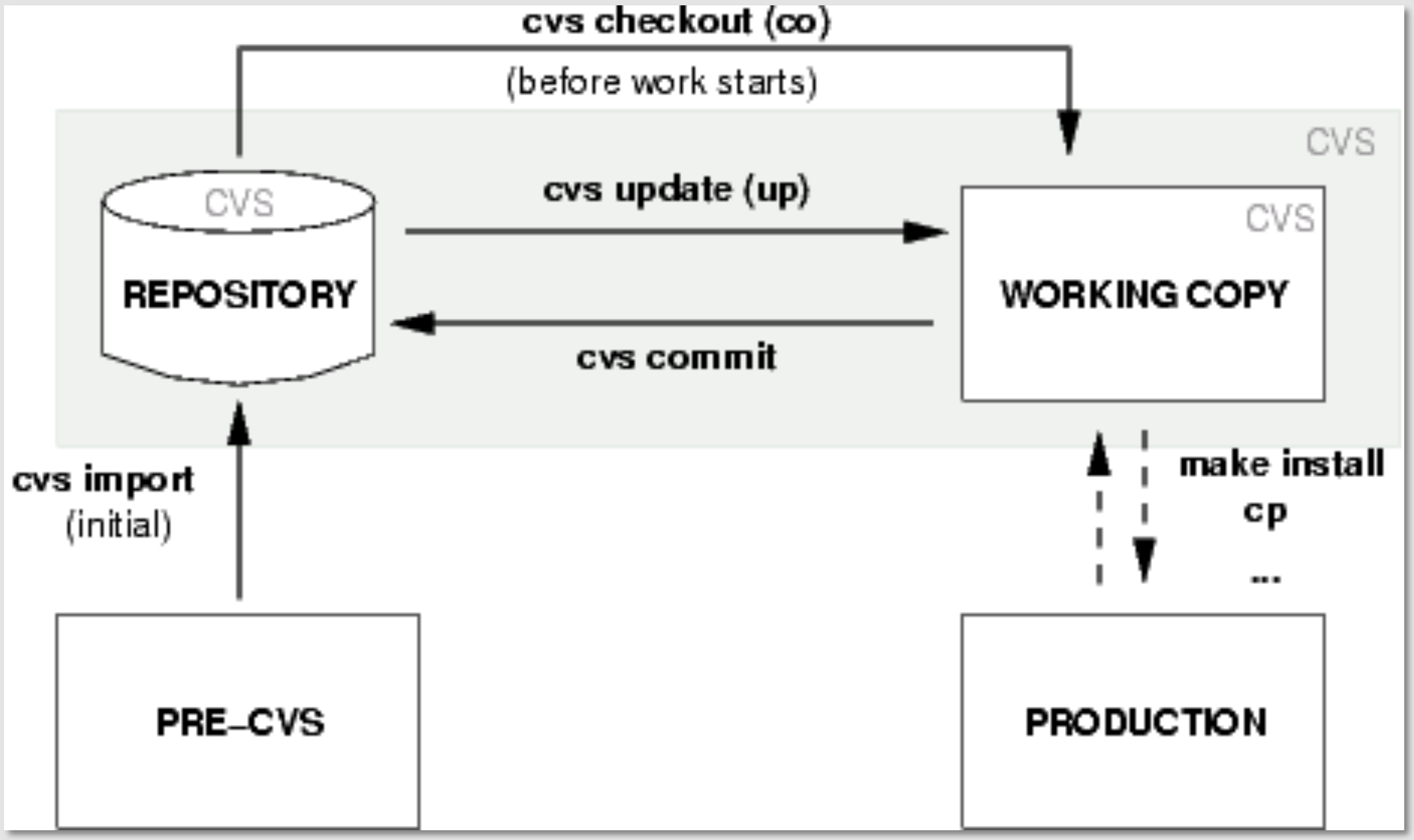
- Allows for distributed work over LAN/WAN

CVS – example workflow

- Initial checkout
  - cvs co *projectname* initial checkout
  - vi *filename* ... work ...
  - cvs commit *[filename]* record changes

- Later:
  - cvs up update working copy from repository
  - vi *filename* ... work ...
  - cvs commit *[filename]* record changes

CVS – example workflow – cont'd



CVS clients

- Exist for most operating systems
  - cvs command line (UNIX, Win32)
  - TortoiseCVS – embeds in Explorer (Win32)
  - WinCVS (Win32)
  - ...
- Access the repository over the network or locally
- Can access CVS via software such as Trac

CVS commands – action commands

import

- import a new project into an existing repository

checkout (co)

- check out a working copy of a project/file/module from the repository

update (up)

- update a working copy from the CVS version

commit

- commit changes back to the repository (incl. new files)

CVS commands – action commands cont'd

add

- add a new file in the working copy, ready to commit

delete (del)

- remove a file from the working copy, ready to commit

CVS command – status commands

status

- see the status and version of a given file or by default all files

diff

- show the difference between a given revision (by default: the last one) of the named file and the file in the working repository

log

- show revision history for one or more files

A working example

```
% CVSROOT=:ext:server.name:/data/cvs
% export CVSROOT
% cvs co someproject
Password: *******
cvs server: Updating someproject
U dir/file1
U dir/file2
...
% ls -l dir/
-rwxr-xr-x 2 netmanage staff  512 Dec 20 15:44  CVS/
-rw-r--r-- 1 netmanage staff 1244 Nov 17 14:21  file1
-rw-r--r-- 1 netmanage staff  341 Dec  3 21:04  file2
...
% vi file1
...
% cvs commit file1
```

A working example – cont'd

```
...................... editor .........................
/ Bugfix -- Modified file1 to fix bug                   /
\                                                       \
/ CVS:----------------------------------------------    /
\ CVS: Enter Log.  Lines beginning with `CVS:' are      \
/ CVS: removed automatically                            /
\ CVS:                                                  \
/ CVS: Modified Files:                                  /
\ CVS:    file1                                         \
/ CVS:----------------------------------------------    /
\.......................................................\

/tmp/cvsUABnYm: 8 lines, 290 characters
Checking in file1;
/data/cvs/dir/file1,v  <--  file1
new revision: 1.2; previous revision: 1.1
done
%
```

What's in the CVS/ directory ?

Entries

- existing files, and newly added files

Root

- where the repository is located

Repository

- name of module or path in the repository

The CVS Id directive

In an existing file, adding a single line with:

```
$Id$
```

... will automatically insert the file version in the file at the next commit.

Setting up a new repository

- Anyone can create a repository, anywhere
- Done using the `cvs init` command
- Example:
  - `mkdir /home/tldadmin/cvs`
  - `export CVSROOT=/home/tldadmin/cvs`
  - `cvs [-d /home/tldadmin/cvs] init`
  - `ls -l /home/tldadmin/cvs`

```
drwxrwxr-x 3 cvs staff 1024 Dec 20 15:45 CVSROOT/
```

Accessing the new repository

Locally

- `cvs -d /home/netmanage/cvs` ...
  - Not necessary to specify -d if CVSROOT is defined

Remotely

- `cvs -d :ext:servername:/home/tldadmin/cvs ...`
- SSH must be available!

Ready for import!

Importing a new project...

```
% CVSROOT=/home/tldadmin/cvs; export CVSROOT
% cd someplace/myproject/
% cvs import my/new/project before_cvs start

 ........................ editor ..........................
/ Import pre-CVS version of my new project                /
\                                                         \
/ CVS:-------------------------------------------------- /
\ CVS: Enter Log.  Lines beginning with `CVS:' are       \
/ CVS: removed automatically                              /
\.........................................................\
N my/new/project/file1
N my/new/project/file2
...
No conflicts created by this import

%
```

Importing a new project...cont'd

- The location for this project in the repository is now my/new/project, under the /data/cvs repository i.e.:
  - /home/tldadmin/cvs/my/new/project
- Let's test that we can check out the project:

```
% cvs co new/project
U my/new/project/file1
U my/new/project/file2
% cd my/new/project
% ls -l
...
```

Modules

- my/new/project is maybe too long as a project name
- solution: modules, which are shorter names for directories or groups of directories and other modules.
- For example:

```
project         my/new/project
```

- With such a module defined, it will be possible to checkout, commit, etc... using the simple name “project”

```
cvs -d :ext:/data/cvs co project
```

- We'll see how to define modules later.

The CVSROOT/ directory

A default module is always created when one inits a repository: CVSROOT

```
% cvs co CVSROOT
U CVSROOT/checkoutlist
U CVSROOT/commitinfo
U CVSROOT/config
U CVSROOT/cvswrappers
U CVSROOT/editinfo
U CVSROOT/loginfo
U CVSROOT/modules
U CVSROOT/notify
U CVSROOT/rcsinfo
U CVSROOT/taginfo
U CVSROOT/verifymsg
```

The CVSROOT/ directory – cont'd

Files described in cvs(5)

- man 5 cvs

Most relevant:

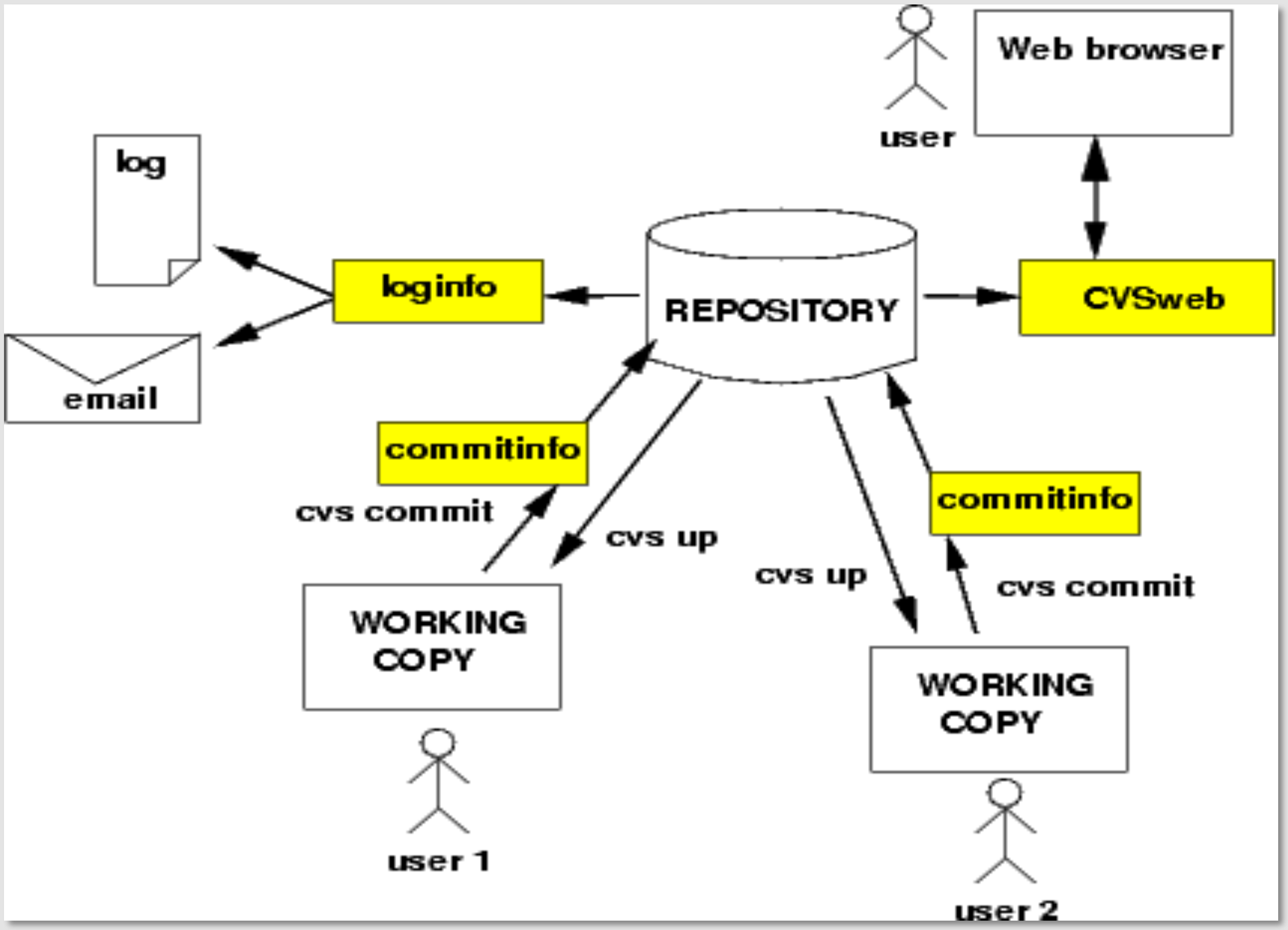
- modules	define modules
- commitinfo	pre-commit scripts
- cvswrappers	handle special files
- loginfo	post-commit scripts

Pre- and post- jobs

- Using commitinfo and loginfo, it is possible to have automatic jobs run before and after each commit, for instance:

- pre-commit stage (commitinfo)
  - verify that a user is allowed to modify a given file
  - check syntax for a file
  - ...
- post-commit stage (loginfo)
  - send update as a mail
  - append it to a log
  - ...

The big picture: mail, cvsweb, lists



Putting it all together...

CVS shortcomings

- Symlinks and ownership of files are not recorded
- No renaming of files (copy + delete)
- No changesets
  - each file has 1 version, need post-processing work to figure out “all files for this commit”
- No disconnected operation
  - add, remove, commit, ... all need access to the server
- Branching/merging is quite complicated

Subversion (SVN)

Subversion (SVN) is now the more popular choice for revision control than CVS

- http://subversion.apache.org/
- "Enterprise-class centralized version control for the masses”

Subversion is essentially a superset of CVS. Current feature descriptions are here:

- http://subversion.apache.org/features.html

This materials for this class were developed using Subversion… 4 people, 4 continents, 1 repository…

Automated scenarios

- Idea: automate configuration management tasks so that configuration files are automatically versioned using CVS...
- ... even when the sysadmin forgets :)
- Implementation – cron job
  - look at all files in a given directory
  - if they exist in the repository already -> commit
  - if they don't, add, then commit

Automated scenarios – cont'd

- Already exists for network equipment: RANCID
  - http://www.shrubbery.net/rancid/
- Simple concept to implement for all relevant files in /etc
- Subscribe all admins to the alias mailing list, so everyone receives a notification when a change takes place – whether planned or not!

References

- CVS Project Main Page
  http://www.nongnu.org/cvs/
- CVSweb Main Page
  http://www.freebsd.org/projects/cvsweb.html
- Free Book (350 Pages) on CVS
  http://cvsbook.red-bean.com/
- Free Windows Client for CVS
  http://www.tortoisecvs.org/