Version Control

(Správa verzí)

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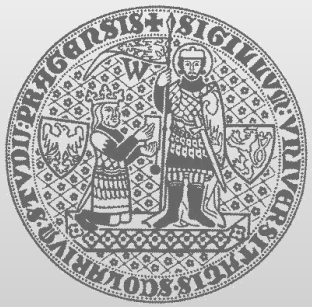

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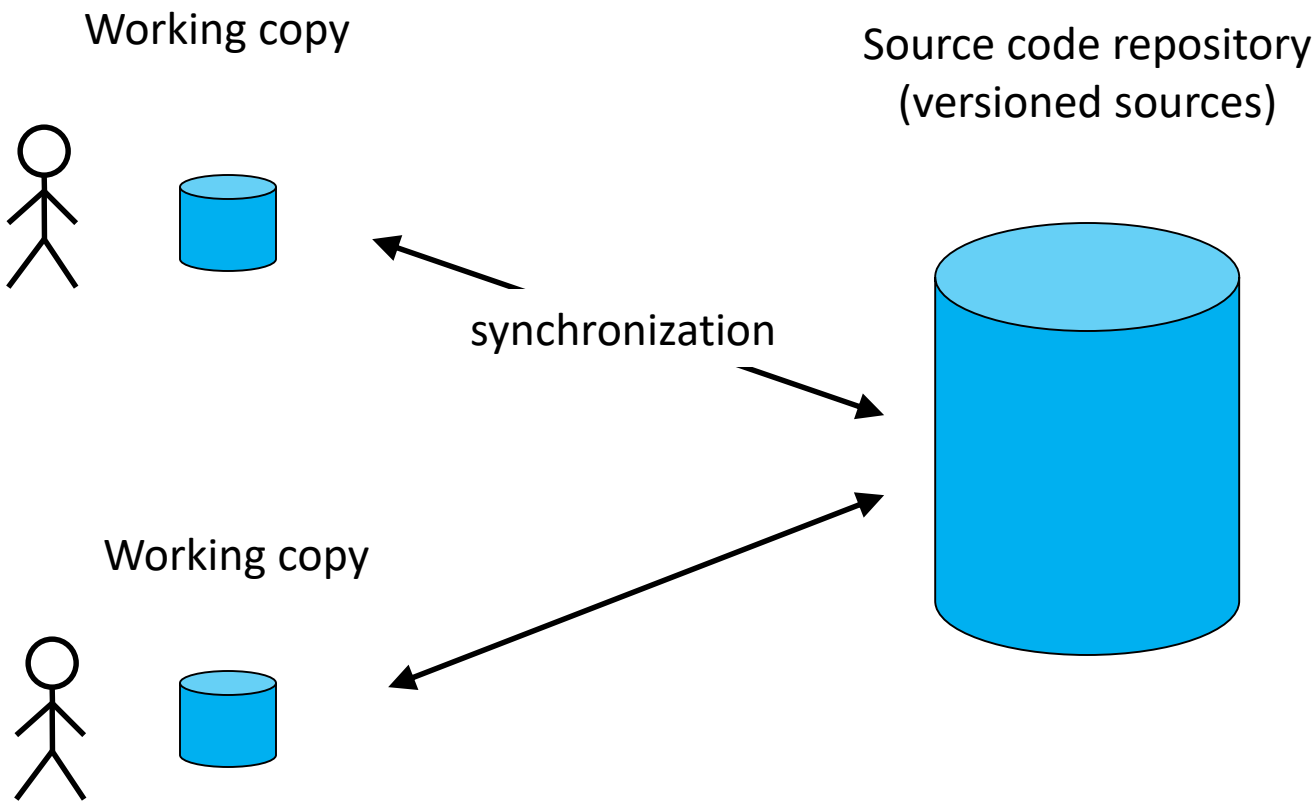
faculty of mathematics and physics

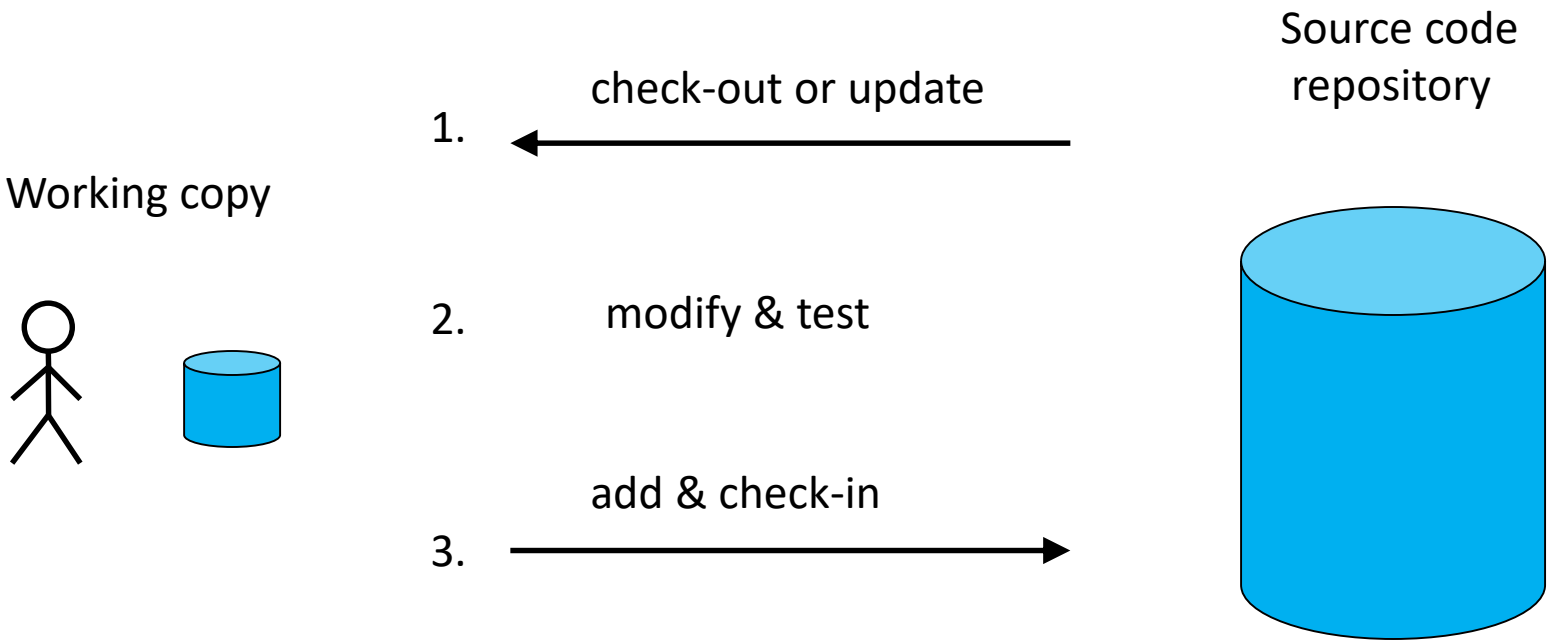
What is it good for ?

- Keeping history of system evolution
  - Tracking progress
- Allowing concurrent work on the system
  - Teams of developers
  - Possible conflicts
- Easy reverting to a previous version
  - Safer experimentation

Typical architecture



Basic usage scenario



Centralized versioning systems

- CVS: Concurrent Versioning System
  - The “classic” system
- SVN: Subversion
  - Currently used by many open-source projects
    - http://apache.org/index.html#projects-list

Subversion

Important features

- Whole source tree versioned
  - Integer numbers (1,2,3,...)
- Mixed versions in the working copy
- Atomic commits
- Versioning for files and directories
  - Operations: move, rename, delete
- Support for binary files
- Disconnected operations
- Metadata in ".svn" directories

Locations

- Repository
  - Local directory (file://<absolute path>)
  - Remote server (svn+ssh://<network url>)
- Working copy
  - Local directory on your computer
- Always create separated local directories !!

Basic commands

- Help: `svn help <command>`
- Create new repository: `svnadmin create`
- Create new working copy: `svn checkout`
- Update working copy: `svn update`
- List modified and new files: `svn status -v`
- Show differences between repository and working copy (two versions): `svn diff -r<version>`
- Add new files into repository: `svn add`
- Commit changes: `svn commit -m "..."`
- Display information about file: `svn info`

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Task 1

- Create repository in a local directory
  - For example, in $HOME/svnrepo
- In the working copy,
  - Create directory (e.g., “main”) where you will put everything
  - Create some files in that directory (e.g., your old program)
- Add the directory and files into the repository and commit
- Create another file and commit into the repository

- Do not forget to write commit messages !!

- Commands
  - `svn checkout, update, status [-v], diff, add, commit [-m], info`
  - `svnadmin create`

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Few more useful commands

- Undo changes in working copy: `svn revert`
- See full history of a given file: `svn log`

- Importing whole unversioned tree into repository: `svn import <dir> <repo>`
- Exporting content of the repository without metadata: `svn export`

Task 2

- Make some changes in versioned files
- Cancel them with `svn revert`
- Use `svn log` to see full history of some file
- Use `svn diff -r<v1>:<v2>` to see differences between two specific versions

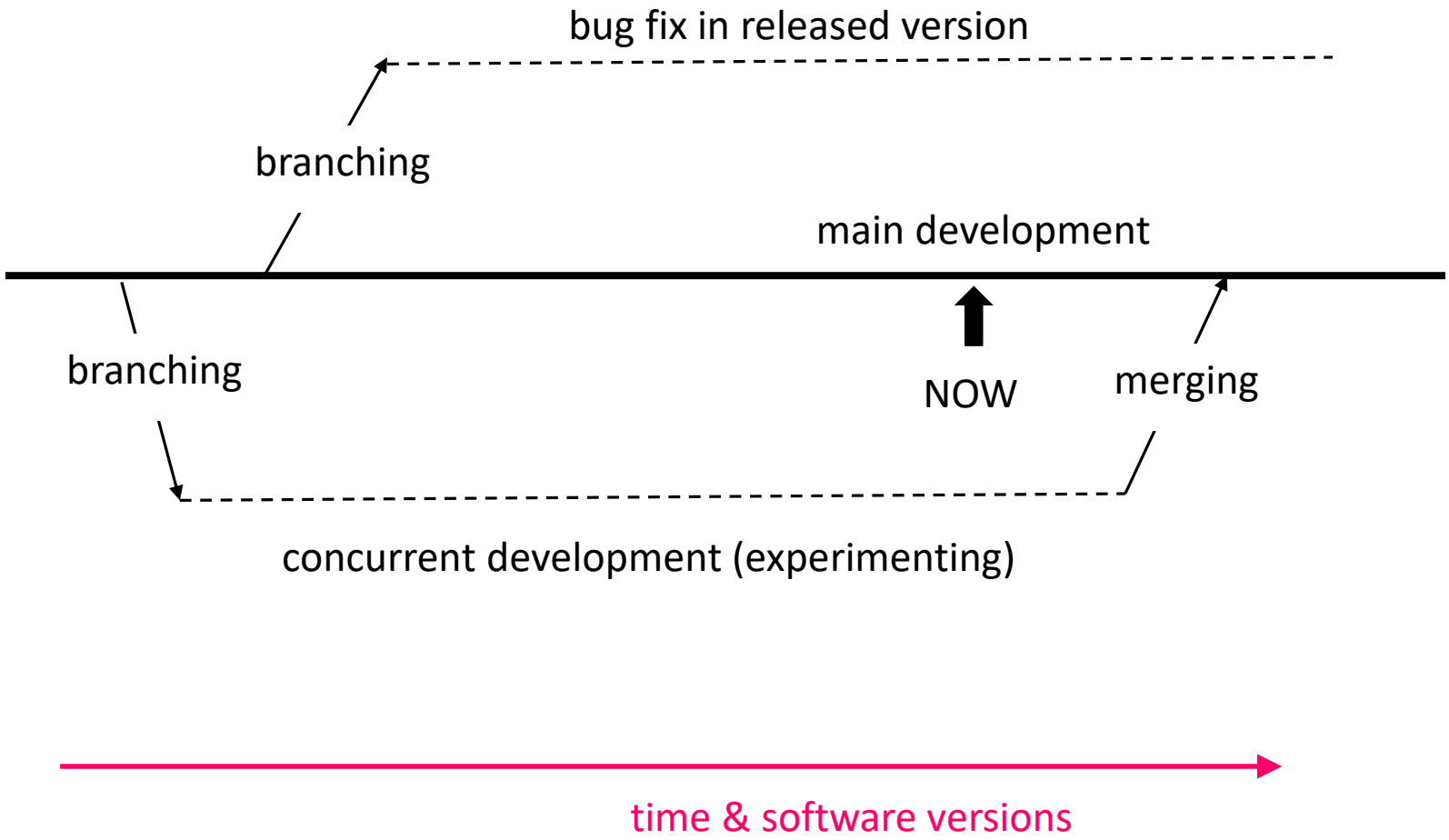
Managing files and directories

- Commands
  - `svn add <path>`
  - `svn delete <path>`
  - `svn copy <path1> <path2>`
  - `svn move <path1> <path2>`
  - `svn mkdir <path>`
- Path
  - In your local working copy
  - Repository (auto-commit)

Task 3

- Try some changes in your local working copy
  - add new directory, rename file, ...
- Commit everything
- Delete the new directory in the repository
- Update your working copy

Branches and merging



Branching and merging – commands

- Create new branch
  - `svn copy <main line repo path> <branch repo path>`
- Print differences
  - `svn diff <main line repo path> <branch repo path>`
- Make your branch up-to-date (sync merge)
  - `svn merge <main line repo path>`
  - `svn merge ^/<main line repo dir>`
- Merge branch into the main line (trunk)
  - `svn merge --reintegrate ^/<branch repo dir>`
- Preview
  - `svn merge <repo path> --dry-run`

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Task 4

- Create new branch in your repository
- Checkout the branch into a new working copy
- Make some changes in the working copy for the branch, and commit immediately
- Make some changes to different files in the working copy for the main line, and commit immediately
- Print differences between the main line and branch
- Merge branch safely into the main line

- Commands
  - `svn copy, svn merge <repo path>`
  - `svn merge --reintegrate`

Undoing committed modifications

- Merge negative version range into local working copy
  - `svn merge <repo path> -r <v1>:<v2>`
  - Note: v1 > v2
- Commit everything

Cherrypicking

- Merge specific change into your branch
  - `svn merge -c <version> <repo path>`
- Commit your branch

Conflicts

- Options
  - Postpone resolving
  - Choose version
  - External merge tool
  - and many others
- Conflict markers
  - <<<<<<< and >>>>>>> in source file
- Three variants of the source file created

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Task 5

- Checkout new working copy of the main line
- Make conflicting changes to the same file in both working copies of the main line
- Commit changes in the new working copy
- Try updating the original working copy
  - It still contains uncommitted local changes
- Explore different options to resolve conflicts

Tree conflicts

- Subversion 1.6+
- Typical cause
  - Renamed files and directories
  - Deleted files
- Solution
  - Make proper changes in the working copy
  - Use patches created with `svn diff`
  - Resolve and commit
    - `svn resolve --accept=working <path>`

Task 6

- Rename some file in one working copy (WC1) of the main line, and commit
- Change this file in the other working copy (WC2)
- Update the working copy WC2
  - Tree conflict should occur now
- Solve the tree conflict properly
  - Propagate changes to the file with a new name
  - Remove the old file in the working copy WC2
  - Command: `svn resolve`

Tags

- Snapshot with a human-friendly name
- Logical copy of the whole source tree
  - `svn copy <repo path 1> <repo path 2>`
- Listing all tags (directory entries)
  - `svn list <repo path>`

Standard repository layout

/trunk
/branches
/tags

/project1/trunk
/project1/branches/feature1
/project1/tags
/project2/trunk
/project2/branches
/project2/tags/R_1_0
/project2/tags/R_1_2_1

Revision keywords

- HEAD
  - Latest version in the repository
- BASE
  - Revision number in the working copy (before modifications)
- COMMITTED
  - The latest revision in which the item changed and was committed (not larger than BASE)
- PREV
  - Equal to COMMITTED-1

Best practices: synchronizing developers

- Software developed in large teams
  - People may not be always able to coordinate efficiently
- Solution: Copy-Modify-Merge
  - Concurrent modification of source files
  - Resolving conflicts when they happen
- Alternative: Lock-Modify-Unlock
  - The old classic approach (“before internet”)
  - Does not scale well (exclusive access)
  - Not very robust (people forget to unlock)

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Best practices: branches and merging

- Use branches for experimental features
- Create special branch for each feature
- Separate release and development branches
  - Propagating bugfixes from development to stable

- Merge often and synchronize with trunk
  - Lower chance of ugly conflicts occurring
  - Smaller conflicts are easier to resolve
  - Commit often → others will have to merge

Properties

- Standard name-value pairs
- Many internal system properties
  - svn:ignore, svn:eol-style, ...
- Setting property value
  - `svn propset <name> <value> <path>`
  - `svn propset <name> -F <file> <path>`
- Other commands
  - `svn proplist`
  - `svn propget`
  - `svn propedit`

Locks

- Still needed to work with binary files
  - Merge not supported for concurrent modifications
- Locking
  - `svn lock`
- Unlocking
  - `svn commit`
  - `svn unlock`
- Inspecting
  - `svn info`

Repository access

- Local filesystem
  - UNIX permissions
- Remote
  - SSH, HTTP

GUI clients for SVN

- Tortoise SVN (Windows)
  - http://www.tortoisesvn.net
- Eclipse IDE
- Other
  - kdesvn (Linux)
  - svnx (Mac OS)

Links

- http://subversion.apache.org
- SVN Book
  - http://svnbook.red-bean.com

Homework

- Assignment
  - http://d3s.mff.cuni.cz/~parizek/teaching/sdt/
- Deadline
  - 15.10.2018 / 16.10.2018