

我愛 Git

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TOSSUG - 5/20, 2008



Agenda

- 版本控制的典範移轉 (paradigm shift)
- 分散式版本控制系統
- Git 核心概念與實務



About

- 热血工读生
- 参与 GNU Classpath 在内的世界级自由軟體專案
- 热爱 patch 軟體與衣服



版本控制系统 的典範移轉

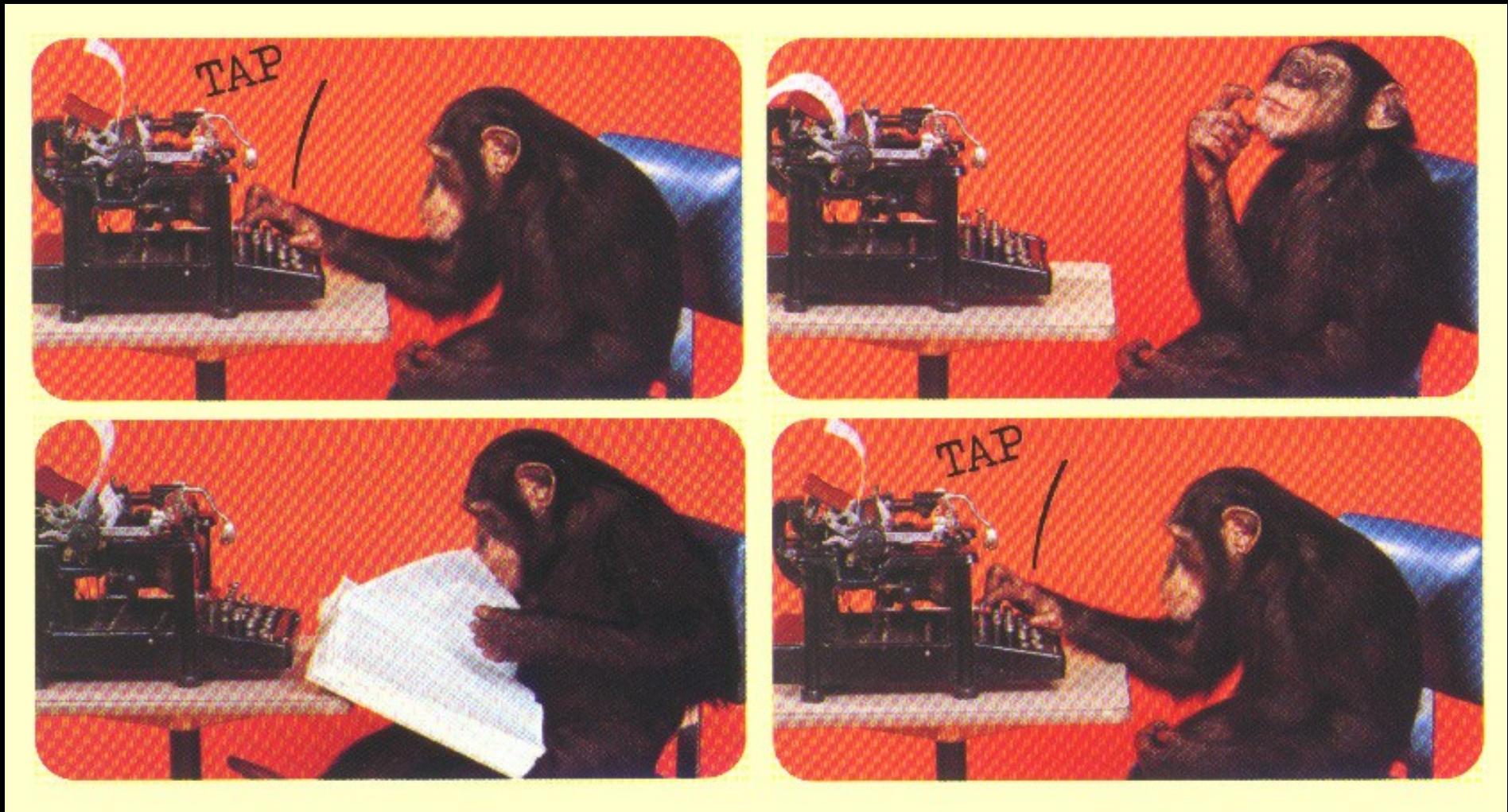


Changing...

- 時代在變
- 科技在變
- 電腦資訊快速改變
- 軟硬體的尺度劇增
- ...



但程式設計的模式基本上一致



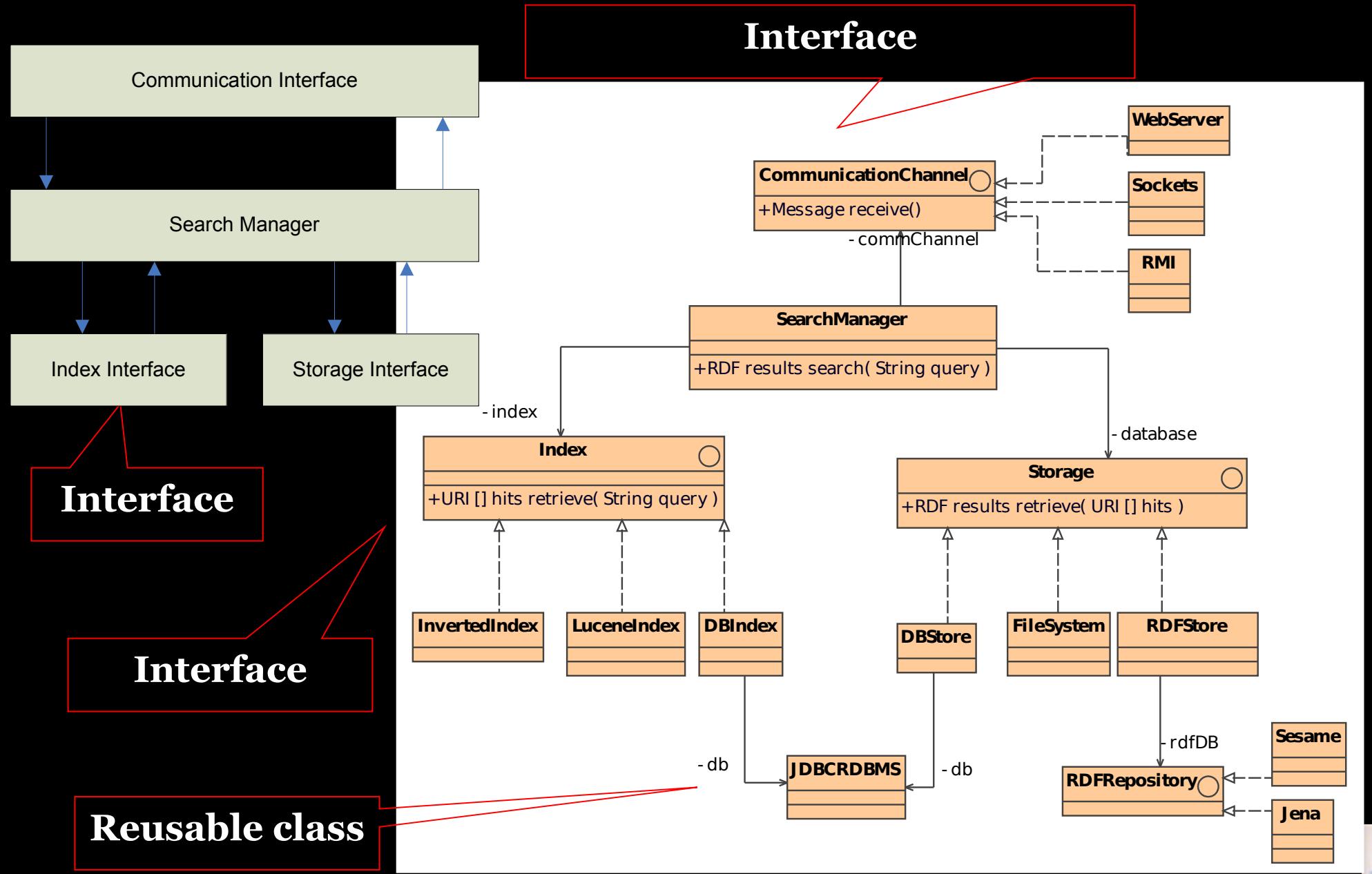
來源：<http://www.chaos.org.uk/~eddy/when/2006/monkey.html>



專案管理是大問題 ...

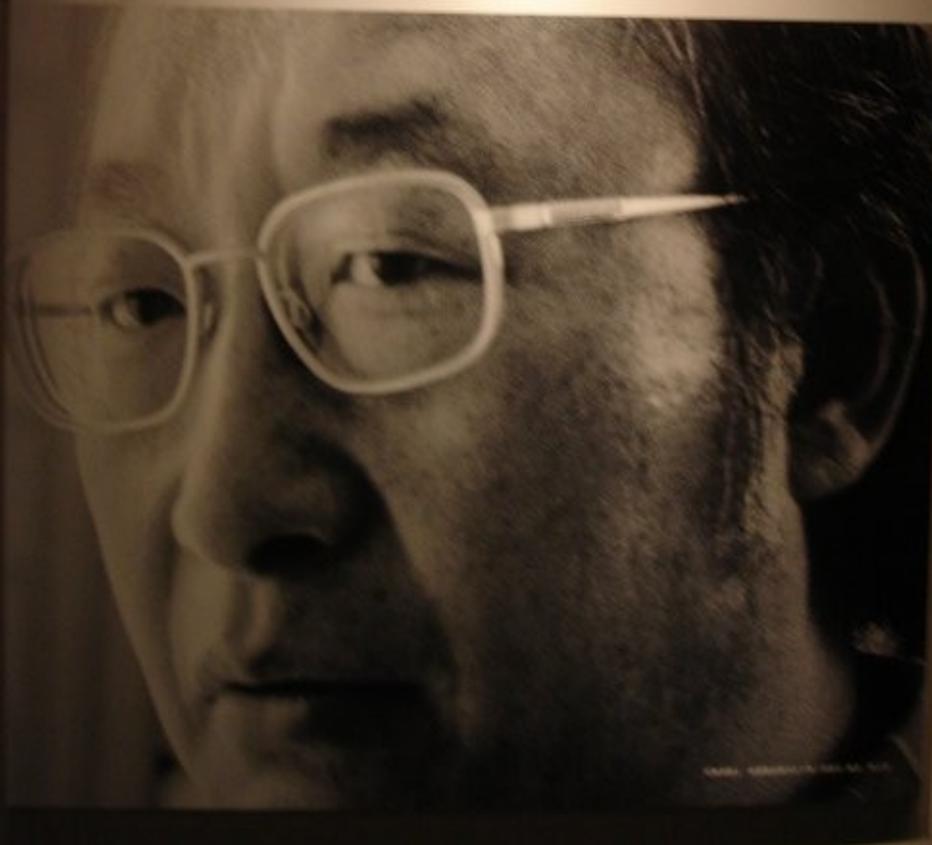


專案需要適度分析與設計



永懷歷史！

昨天的垃圾是
未來的考古遺物！



- 語出何傳坤博士
- 過程遠比結果重要
- 地理學家：「湖泊是天使的眼淚」
- 如何抱持「考古」的精神去「挖掘」？



Source Control Saves Lives



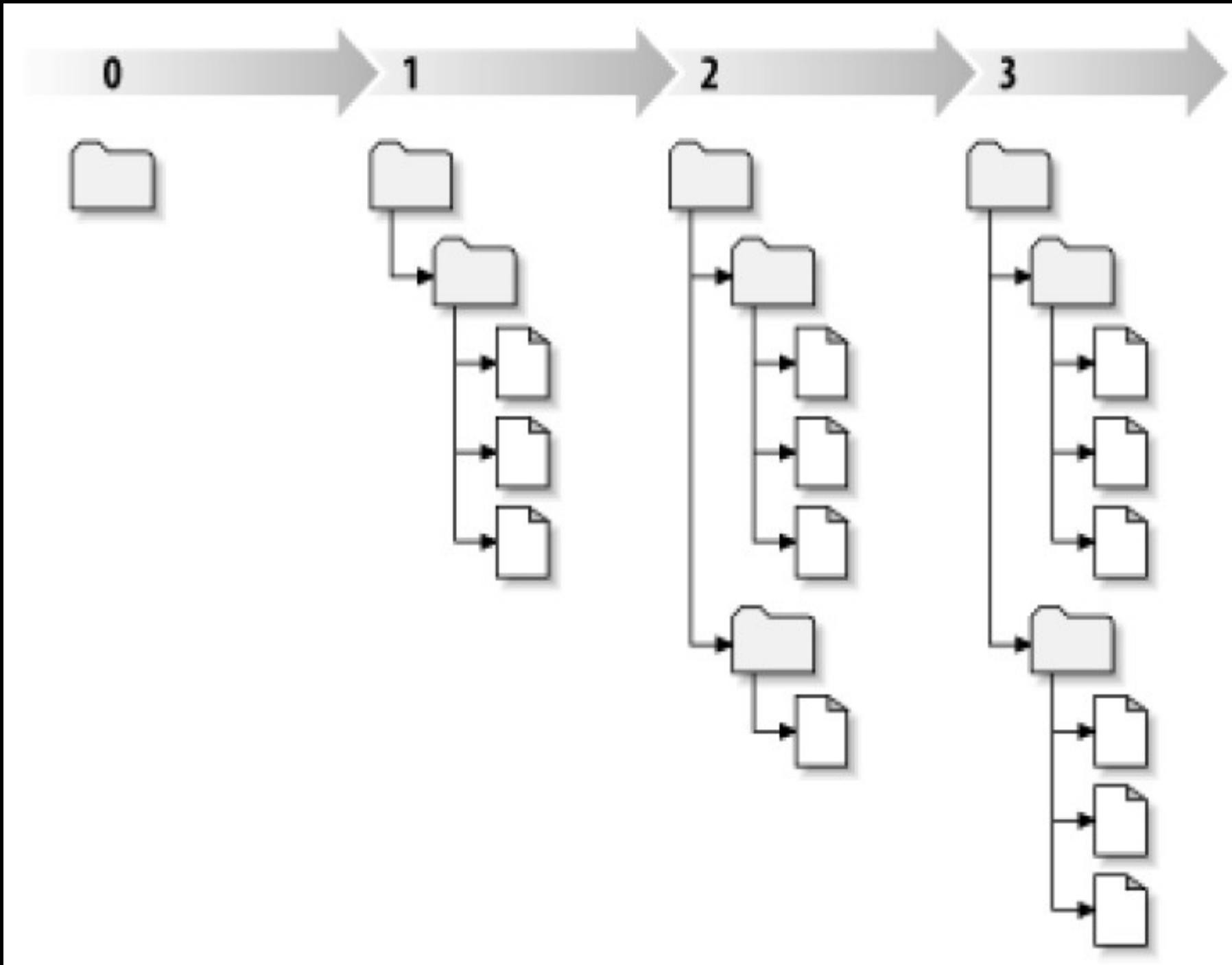


Figure 2.7. The Repository



Version Control / 版本控制

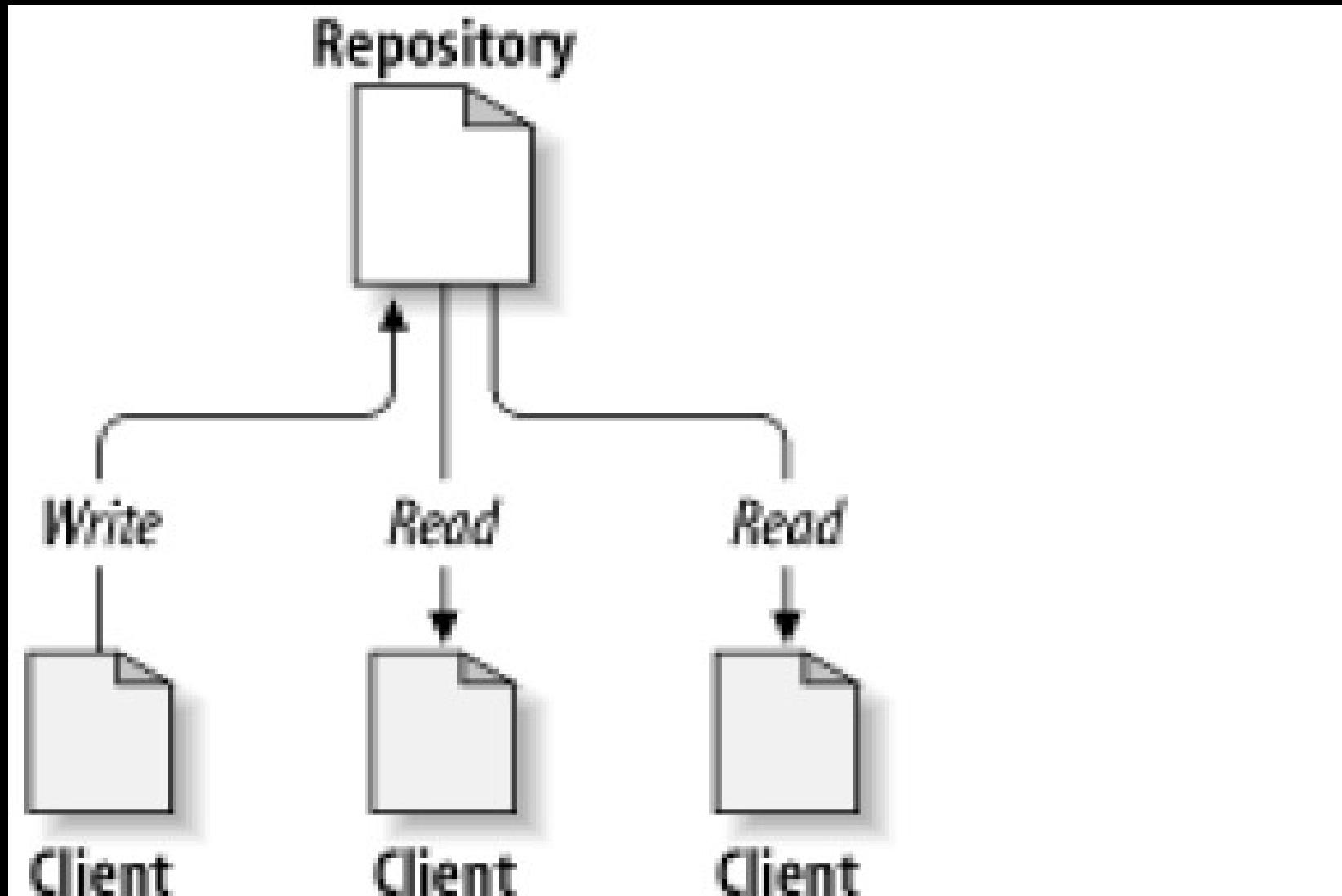


Figure 2.1. A Typical Client/Server System



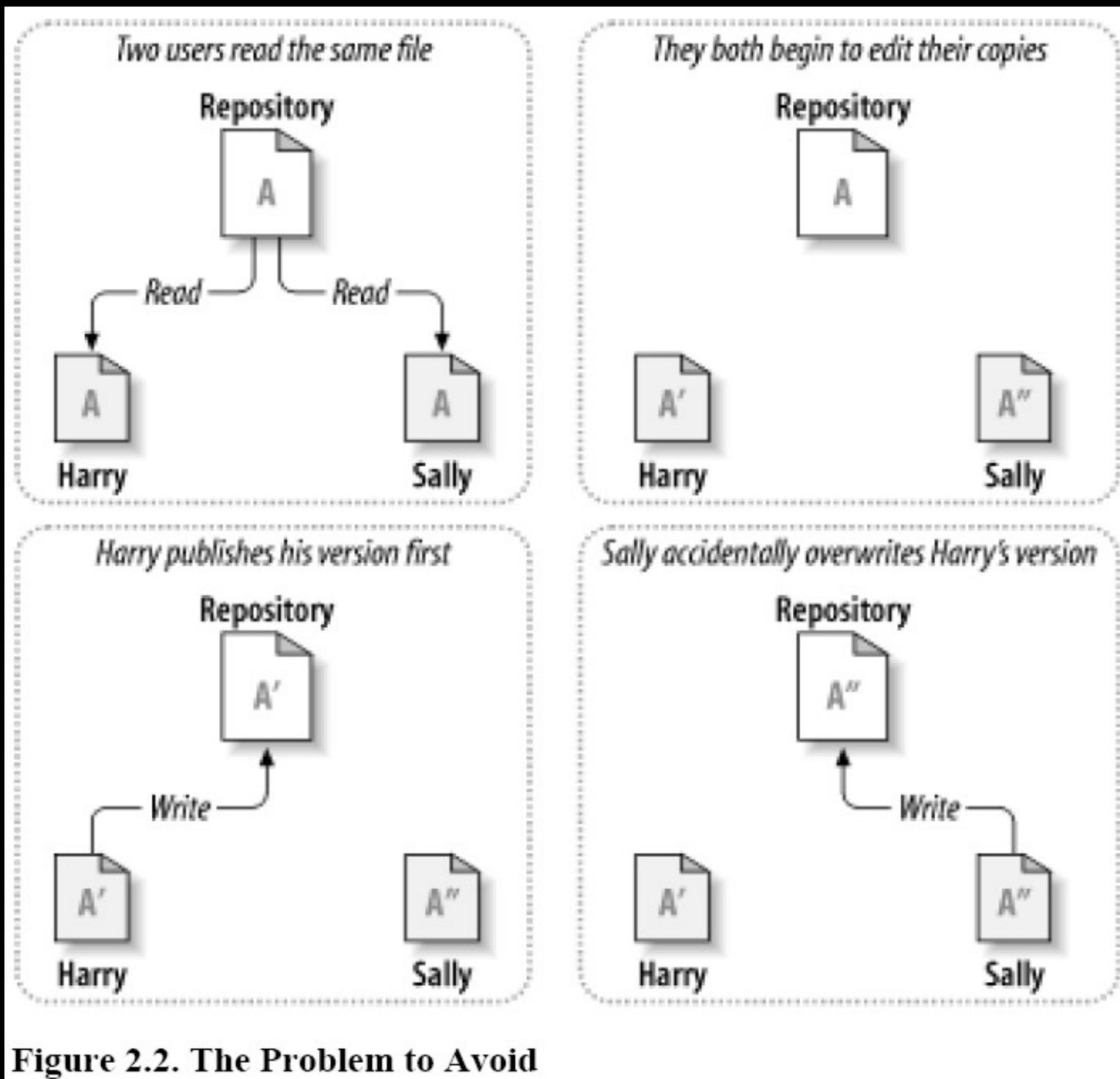


Figure 2.2. The Problem to Avoid



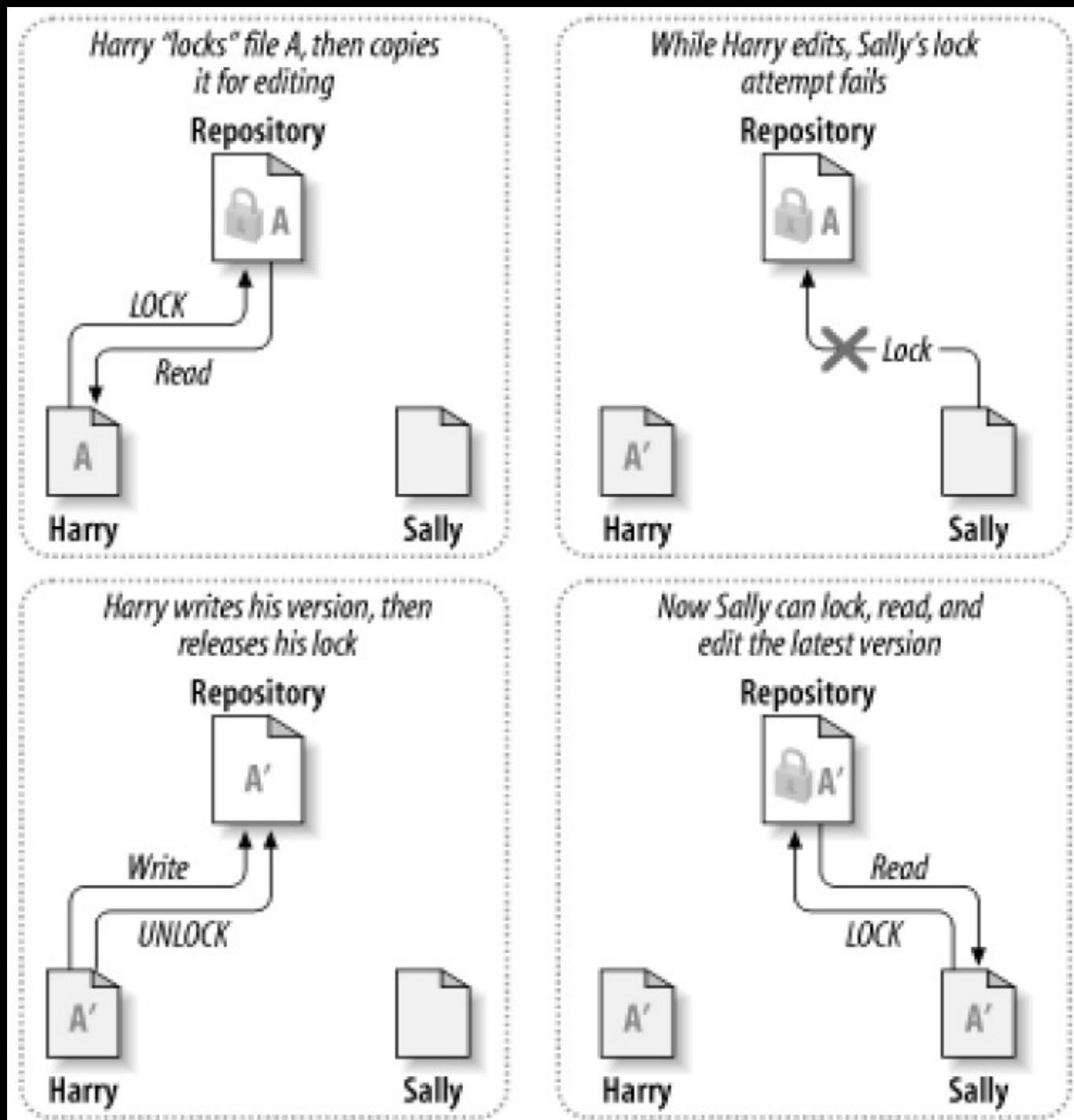


Figure 2.3. The Lock-Modify-Unlock Solution



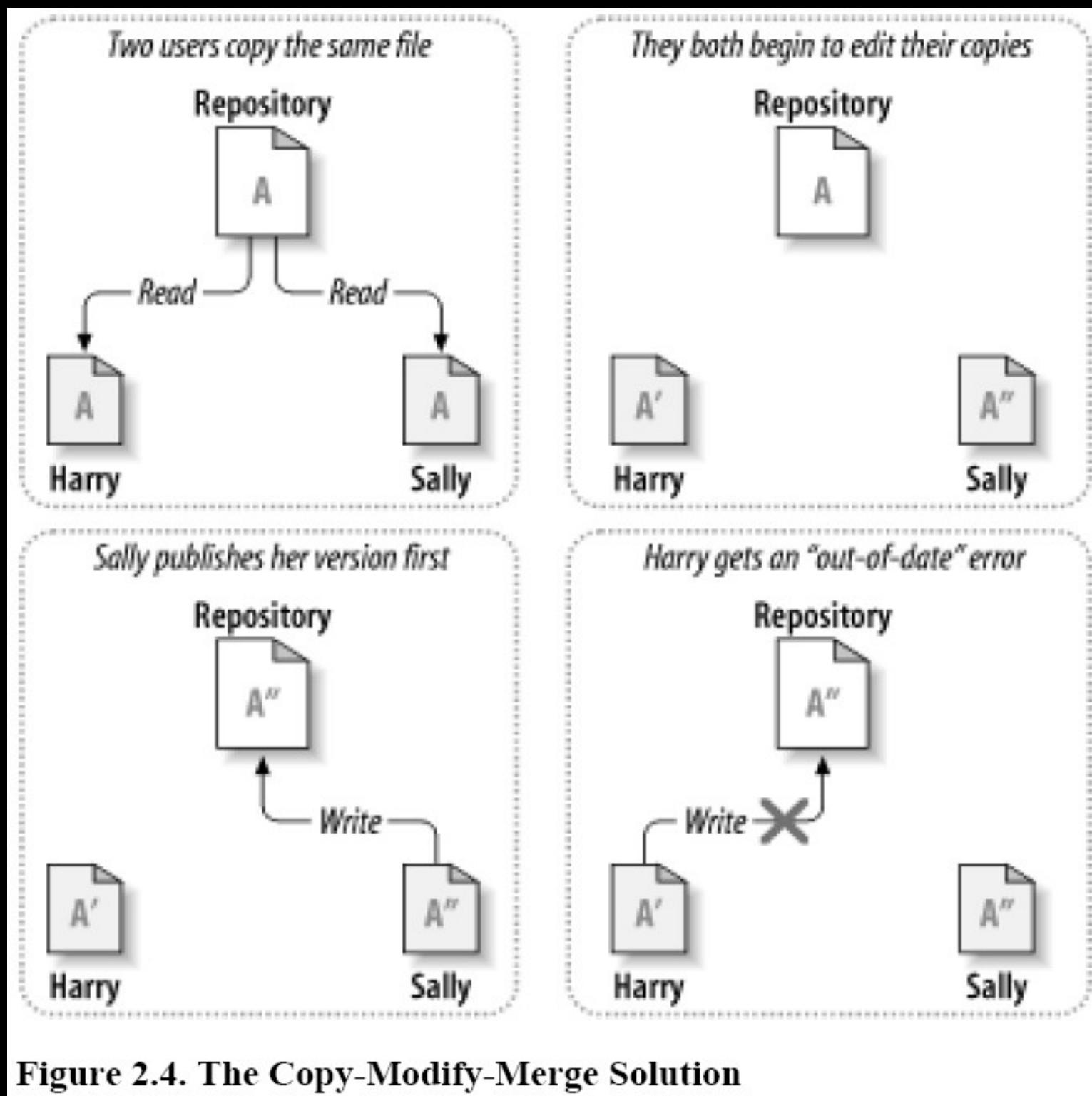
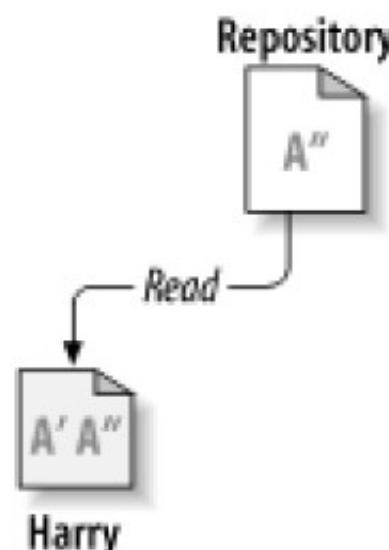


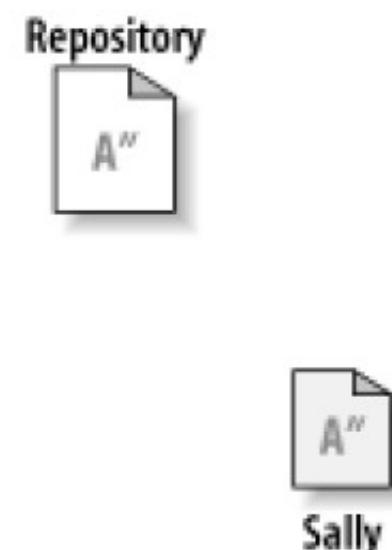
Figure 2.4. The Copy-Modify-Merge Solution



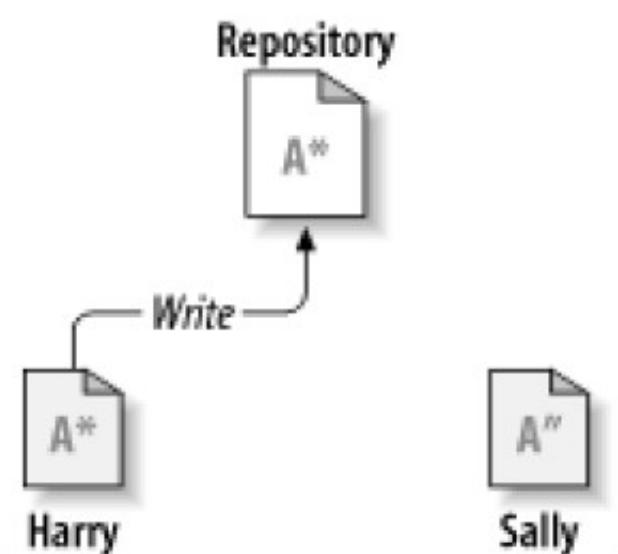
Harry compares the latest version to his own



A new merged version is created



The merged version is published



Now both users have each others' changes

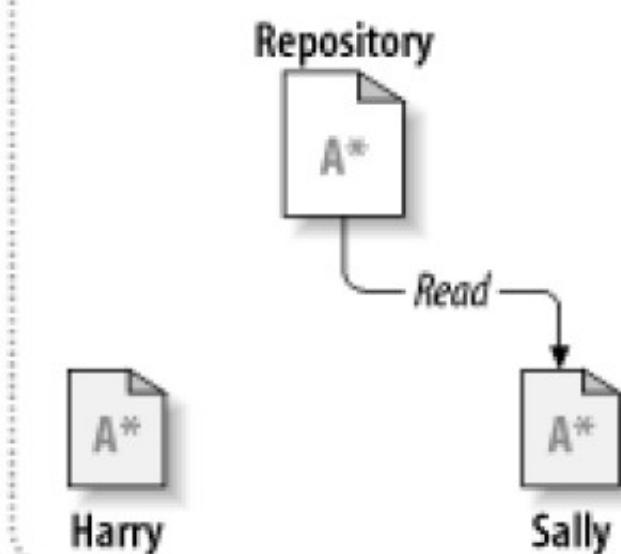


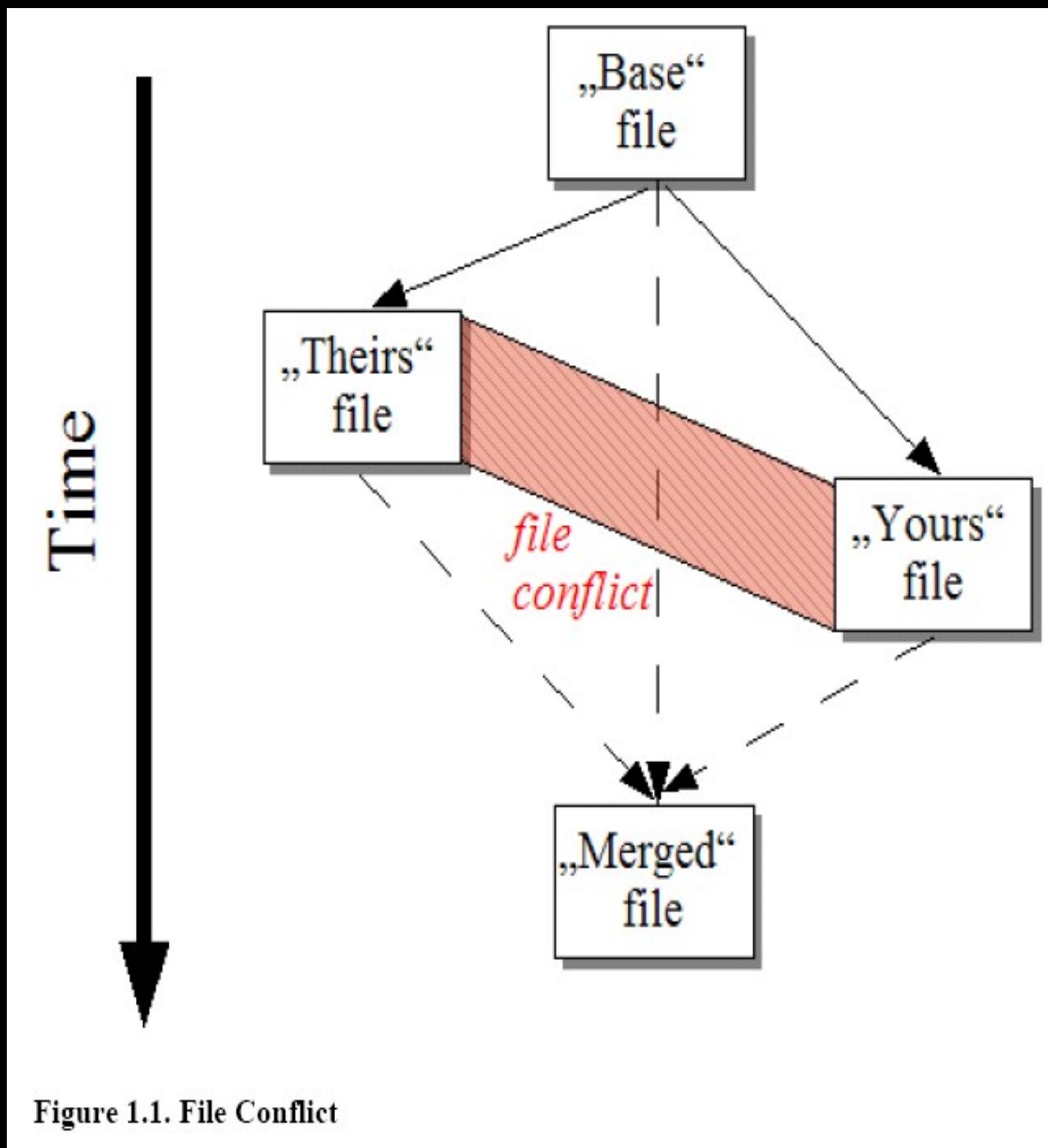
Figure 2.5. ...Copy-Modify-Merge Continued



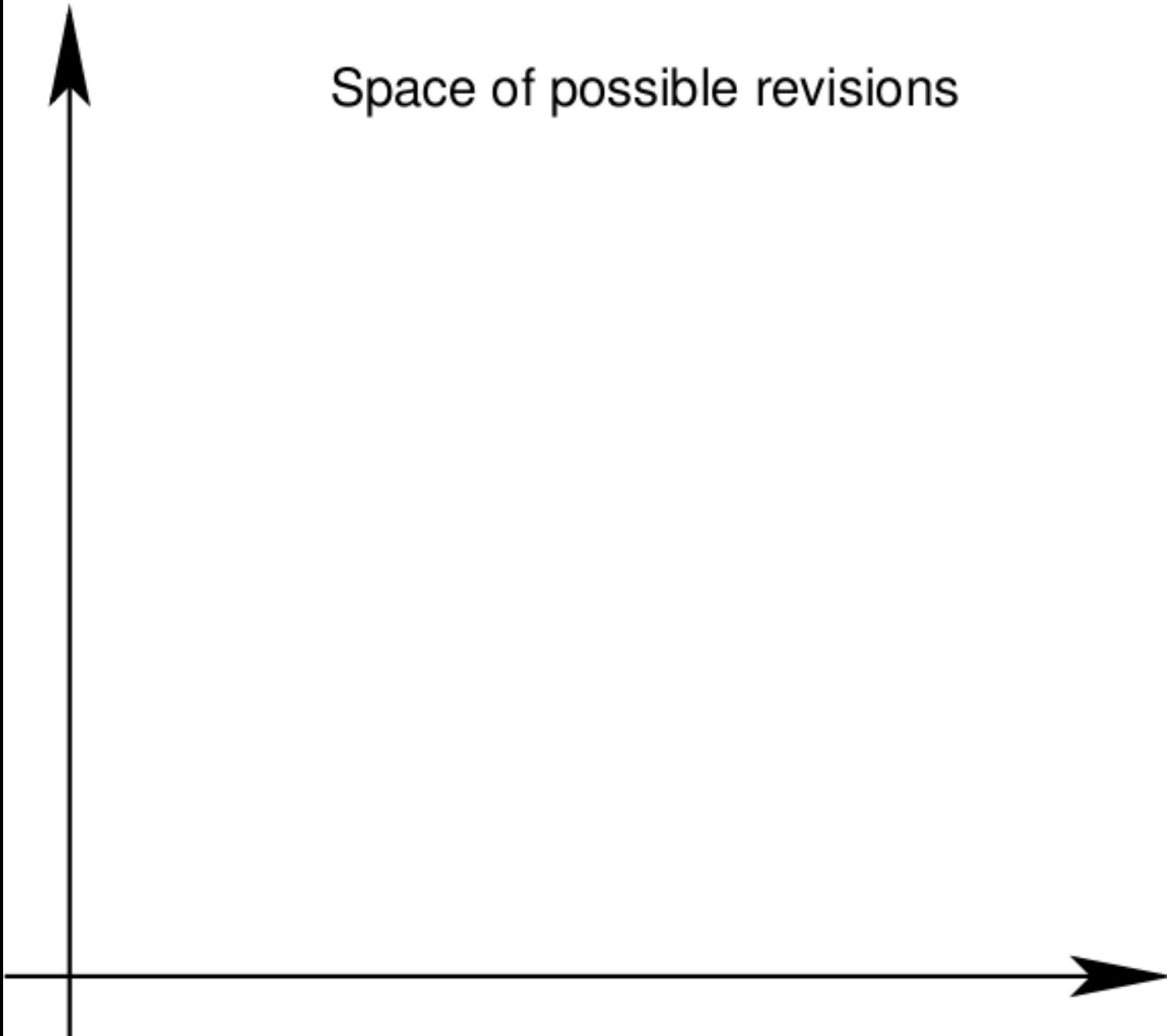
我們的發現 ...

- 版本控制必須確保每次提交更改的完整性與一致性
 - lock-modify-unlock
 - copy-modify-merge
- 整合來自不同時間點的修改 (merge) 是相當重要的設計
- 時序 (timeline) 與集中式版本控制息息相關

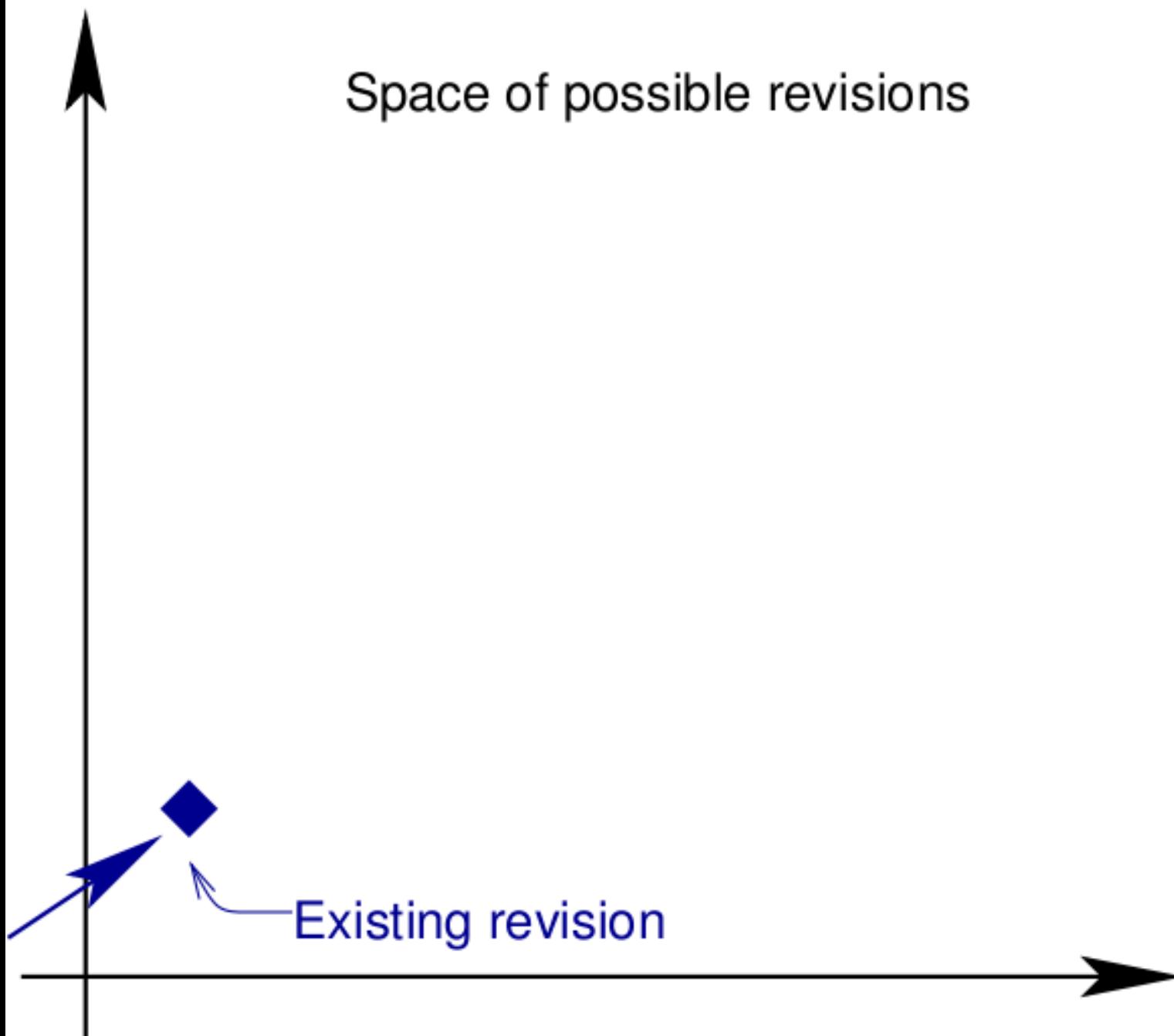




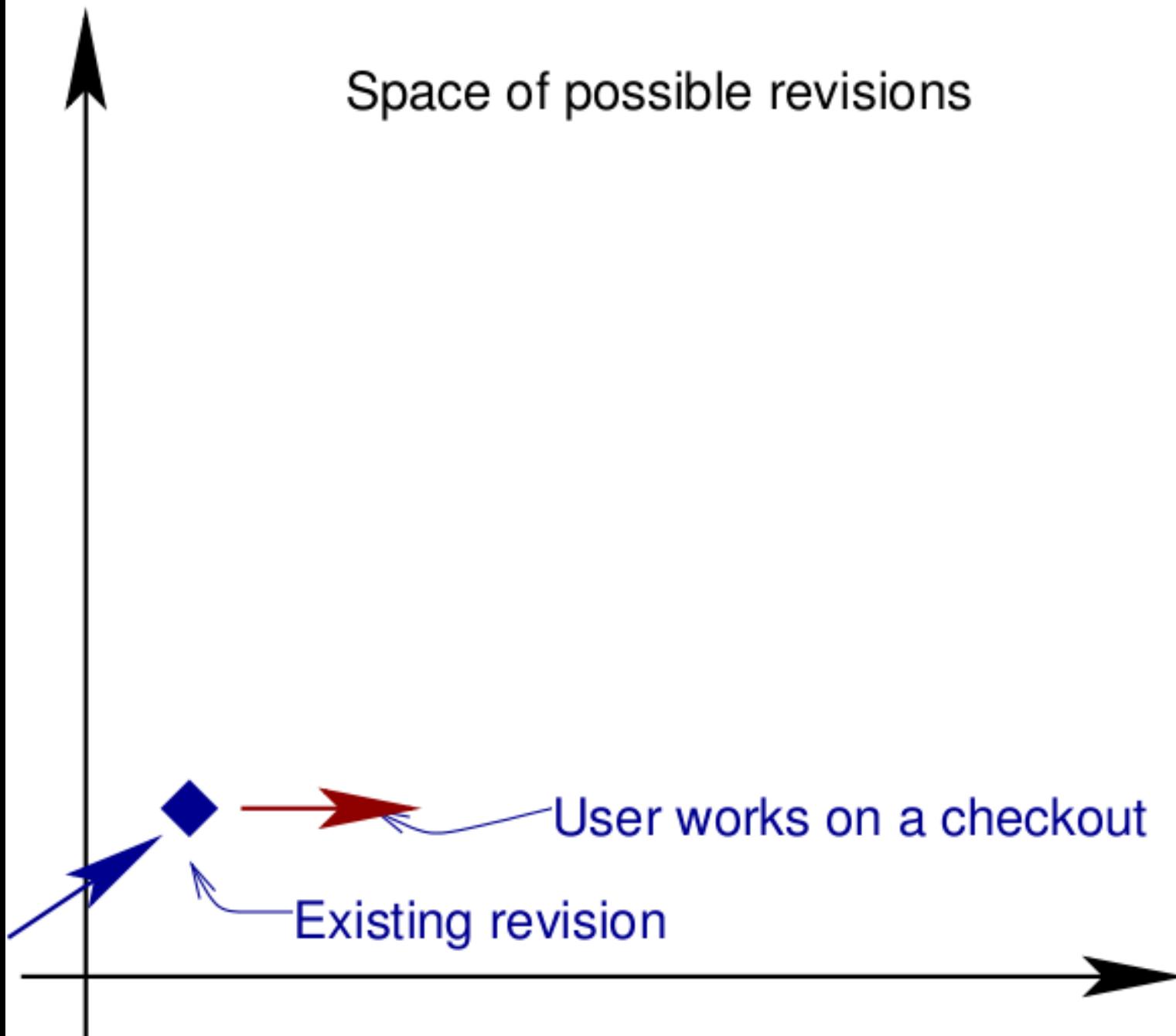
Commit/Update Approach



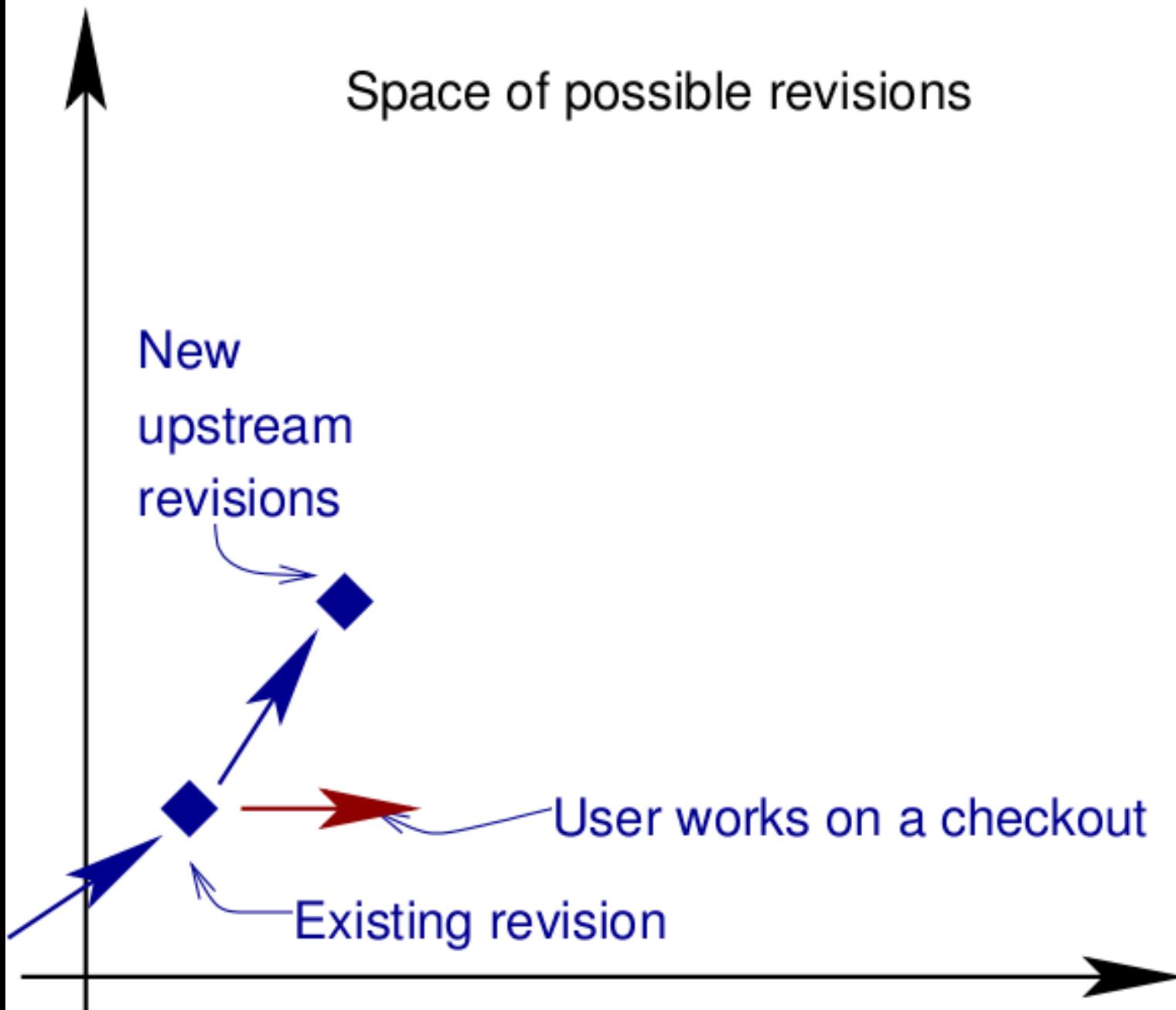
Commit/Update Approach



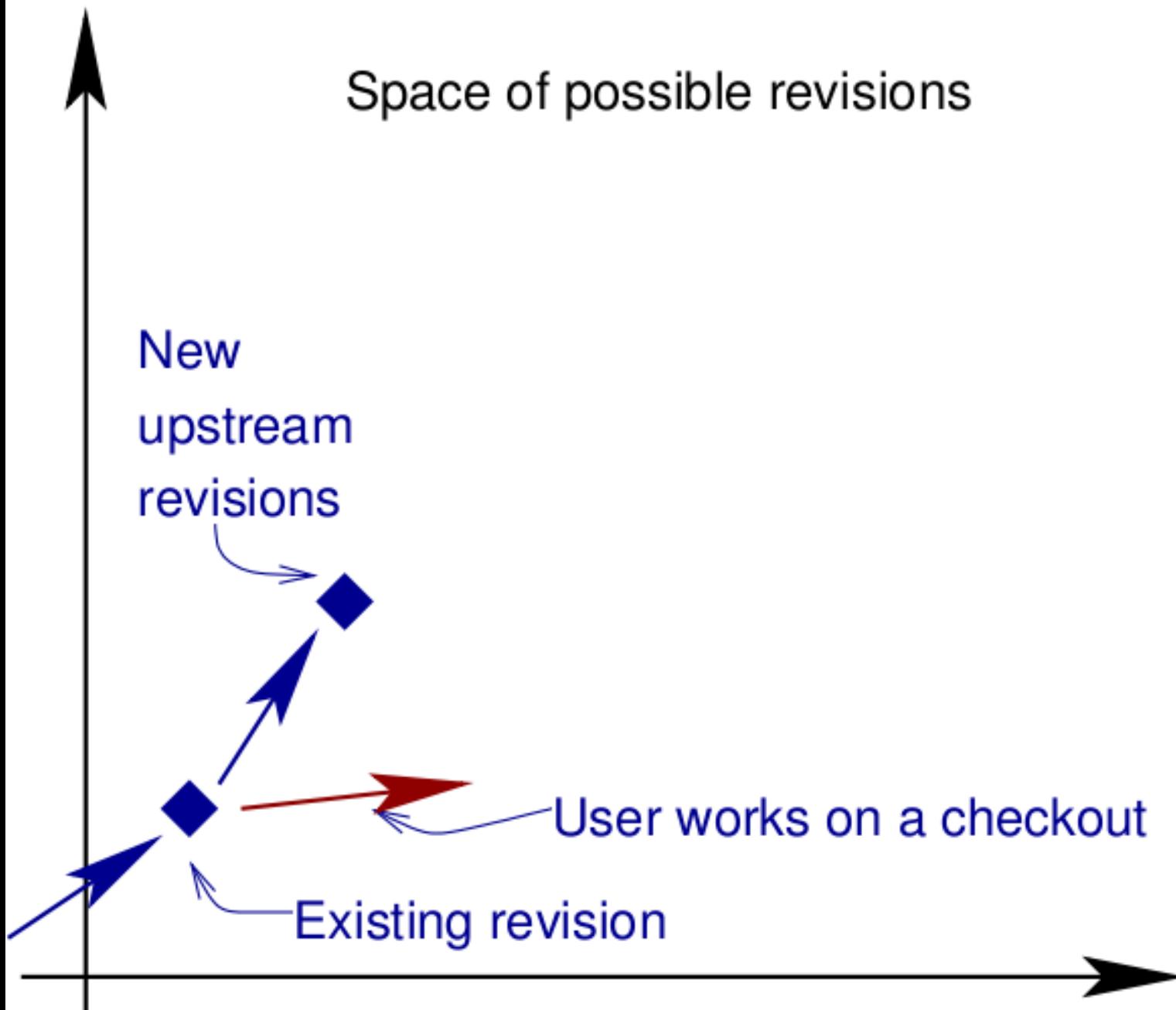
Commit/Update Approach



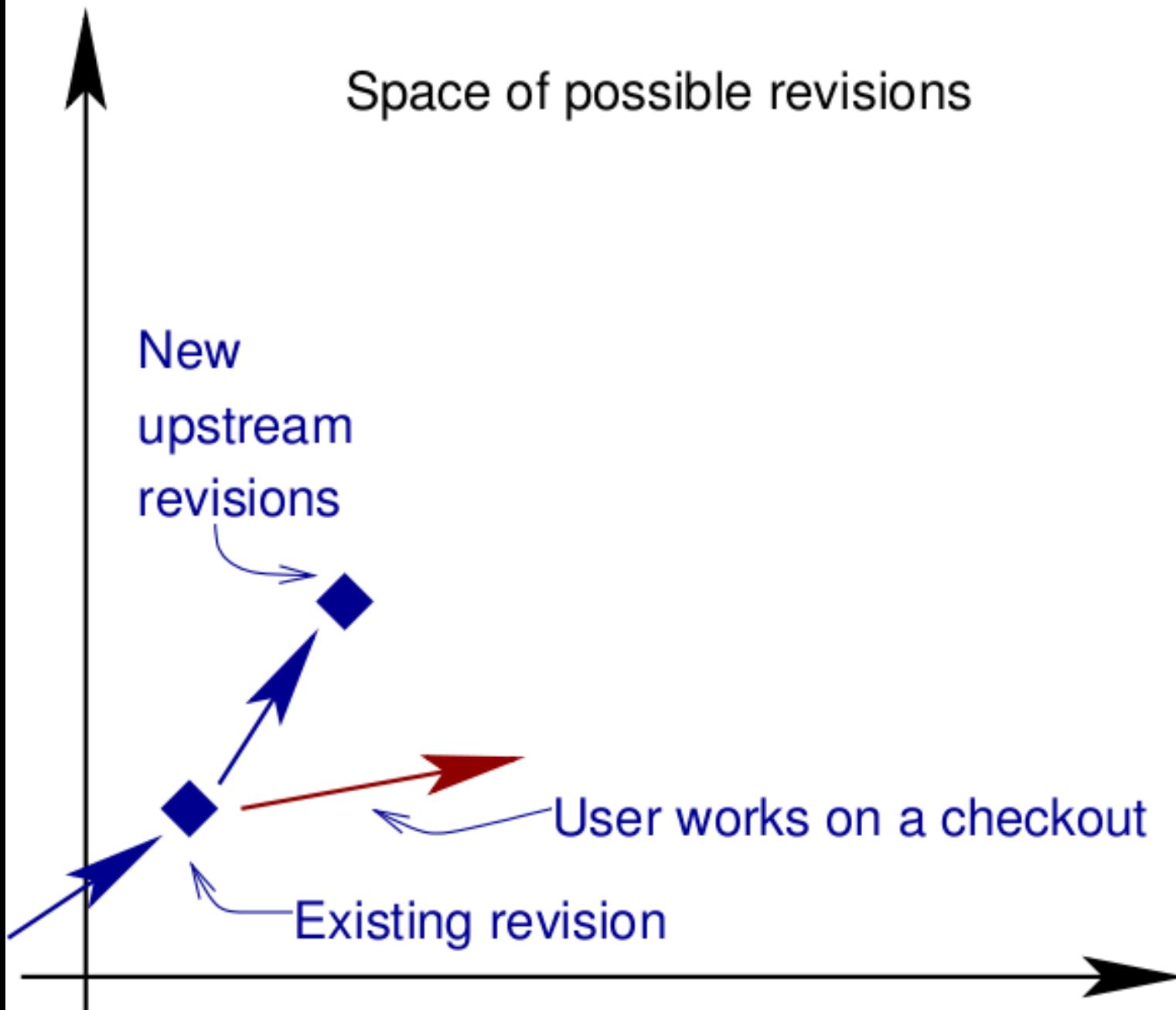
Commit/Update Approach



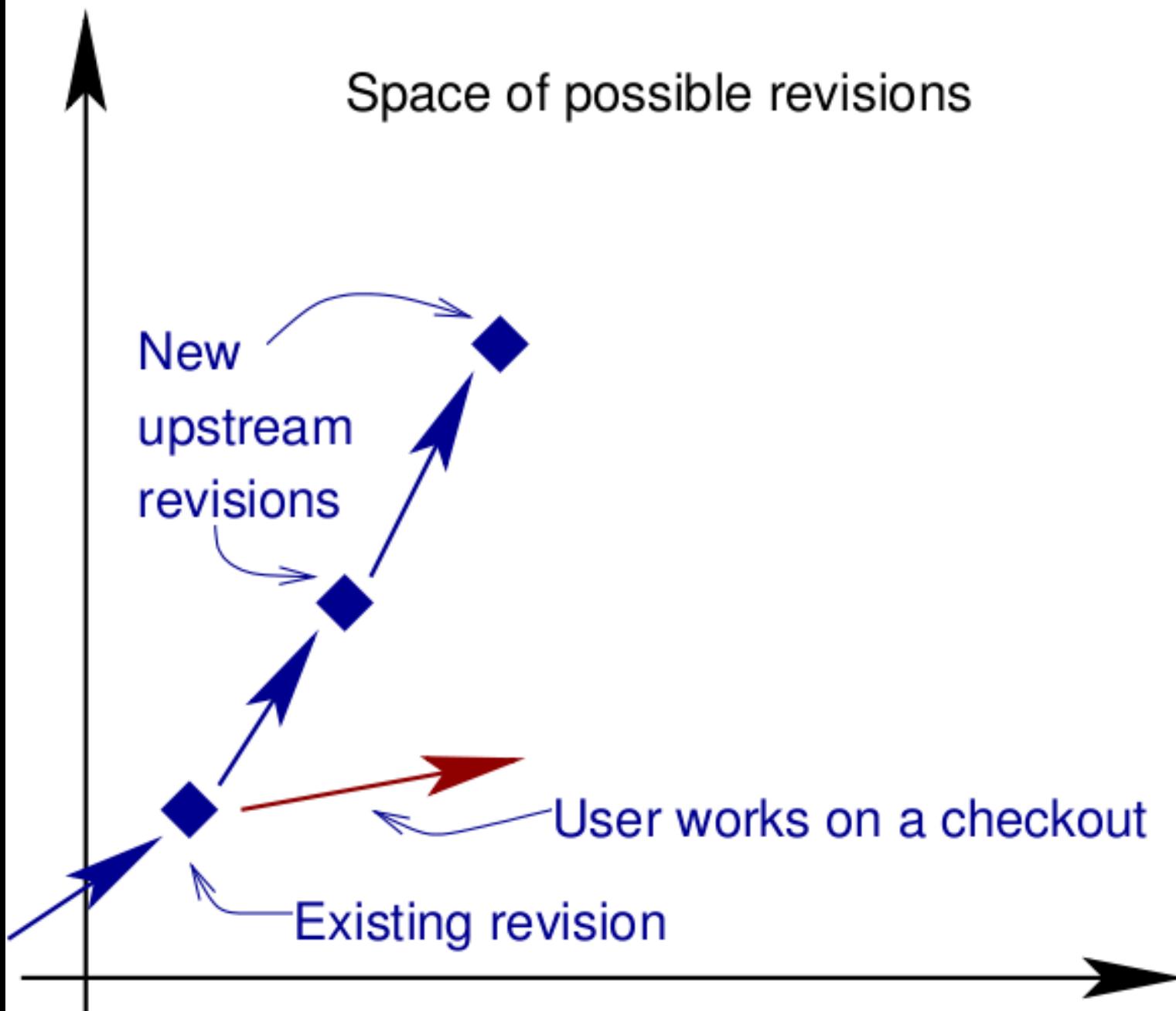
Commit/Update Approach



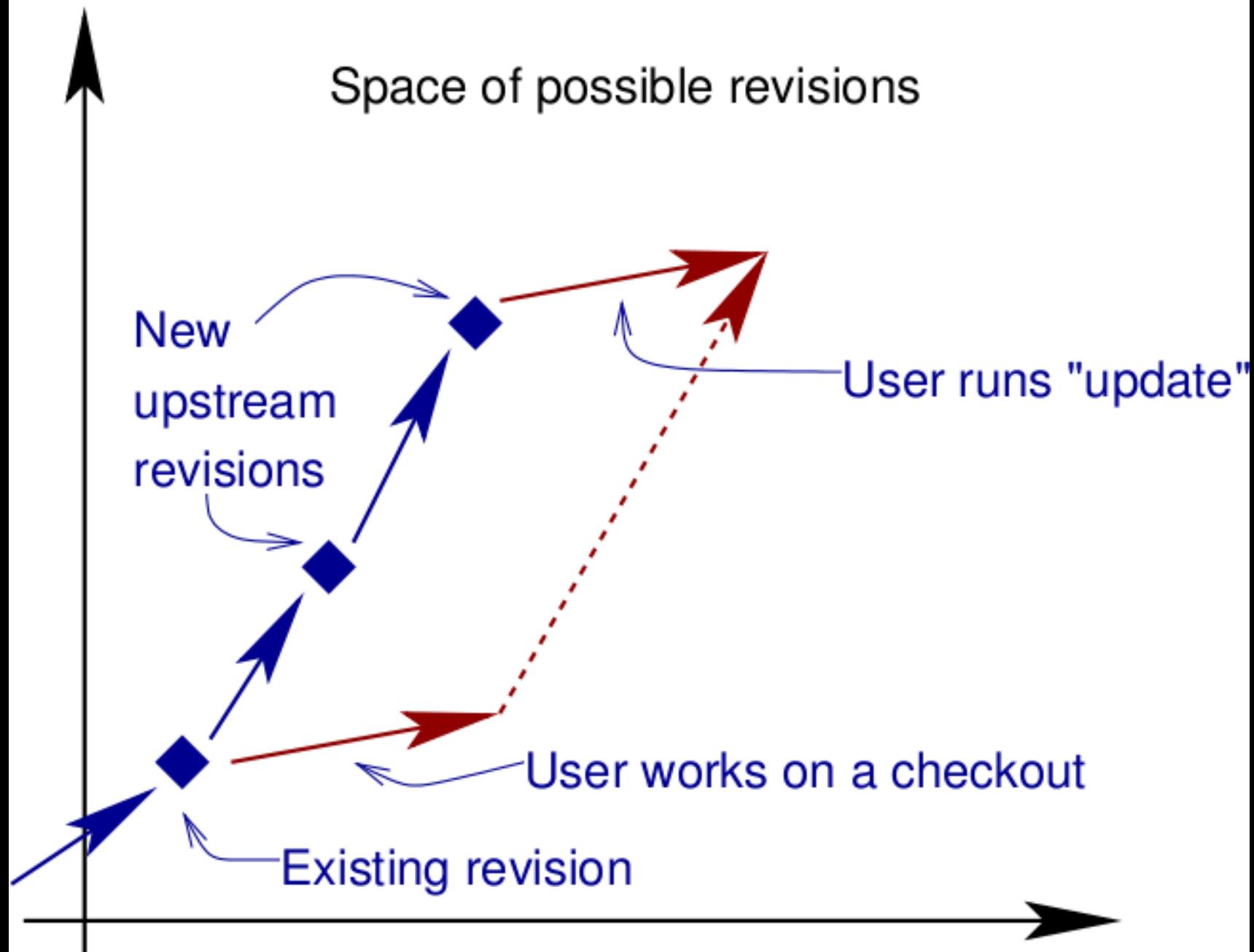
Commit/Update Approach



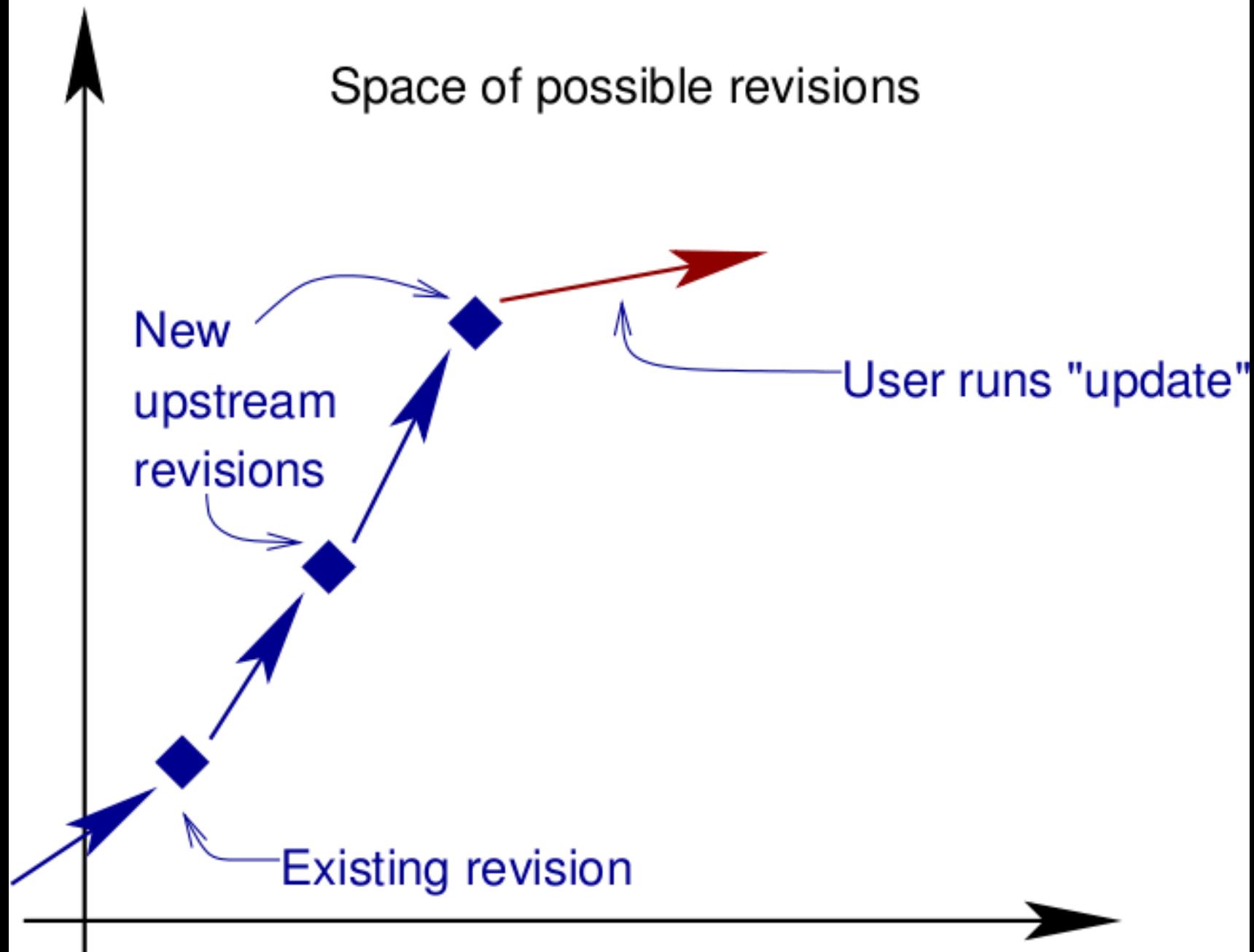
Commit/Update Approach



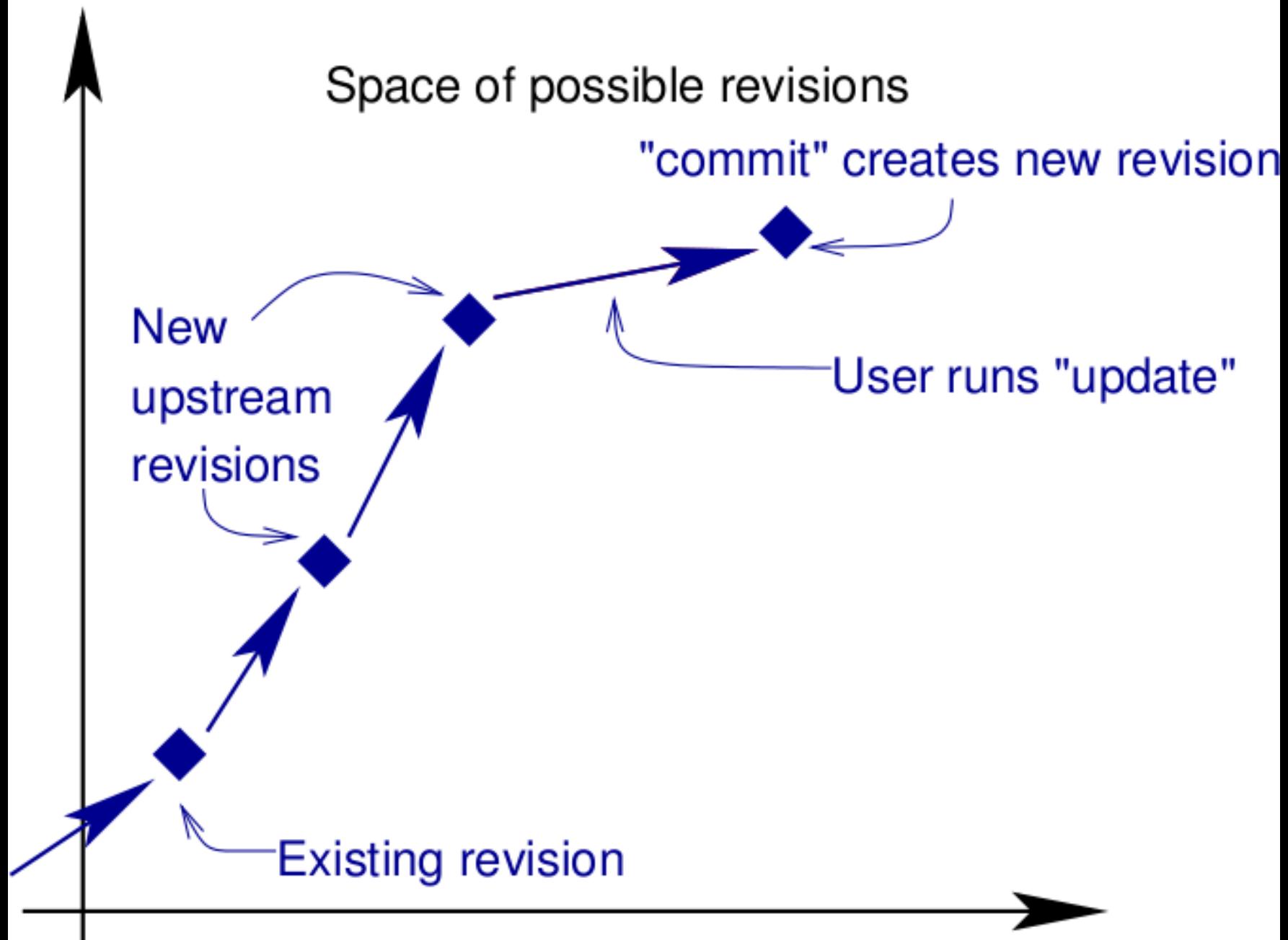
Commit/Update Approach



Commit/Update Approach



Commit/Update Approach



出發點

- 協同合作是軟體專案開發的要素
 - 所以我們有 SCM: CVS, Subversion, Mercurial, GNU Arch, SVK, Darcs, Git, Bzr..
- **SCM (Source Control Management)** 如何協助開發者?
 - Conflict / Merge



術語

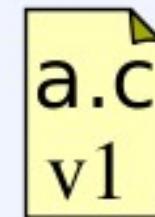
- Repository
- Pull / Push / Checkout
- Branch
- Merge
- Conflict
- Commit
- Revert



術語

- Repository

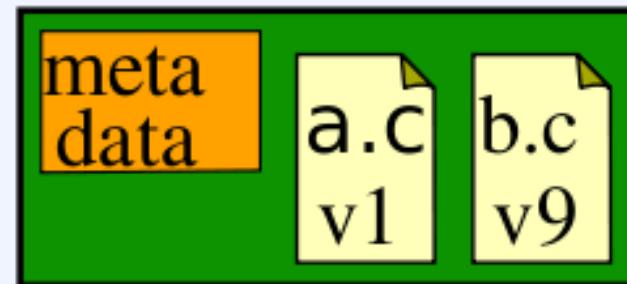
- objects / blobs / diffs / deltas / patches



術語

- Repository

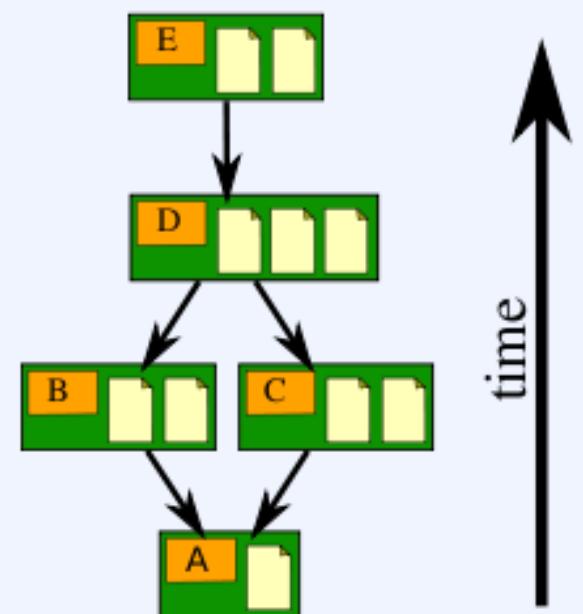
- objects / blobs / diffs / deltas / patches
- commits / changesets / revisions



術語

- Repository

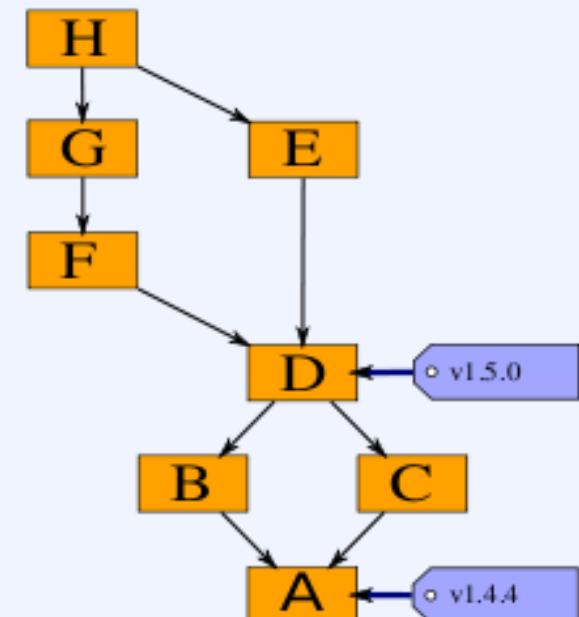
- objects / blobs / diffs / deltas / patches
- commits / changesets / revisions
- ancestry / history



術語

- Repository

- objects / blobs / diffs / deltas / patches
- commits / changesets / revisions
- ancestry / history
- tags / labels



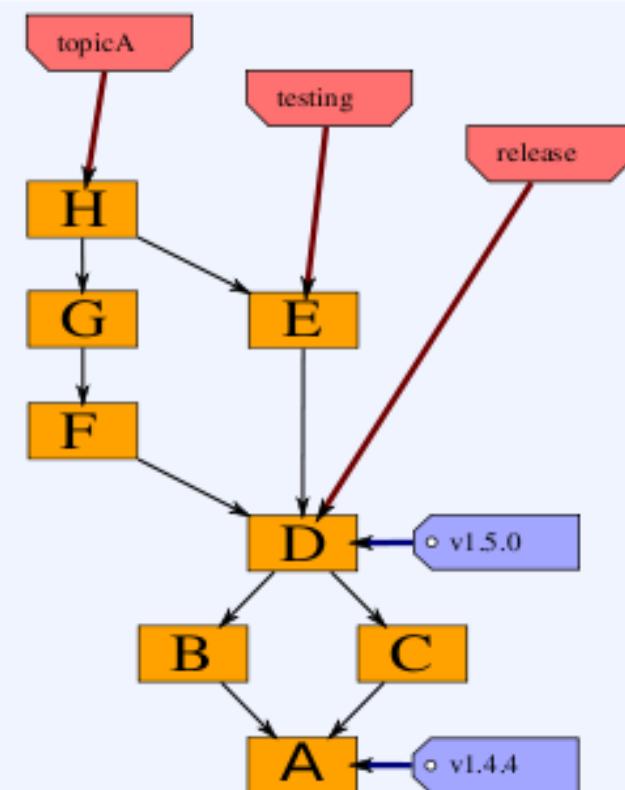
術語

- Repository

- objects / blobs / diffs / deltas / patches
- commits / changesets / revisions
- ancestry / history
- tags / labels
- branches / heads

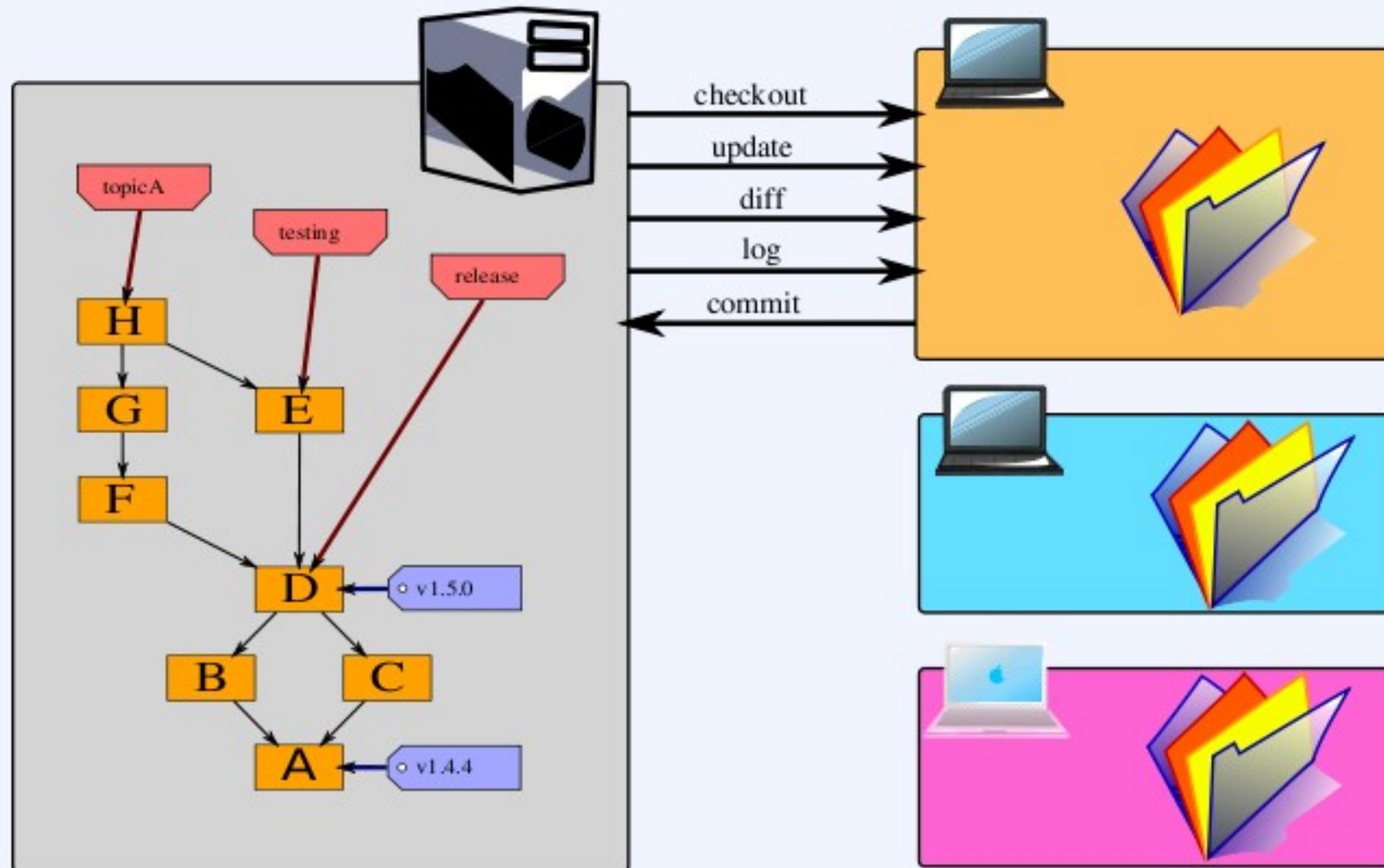
- Working directory

- files
- list of files to add/delete



術語

- Checkout, Branch, Merge, Conflict, Commit, Revert



分散式版本控 制系統



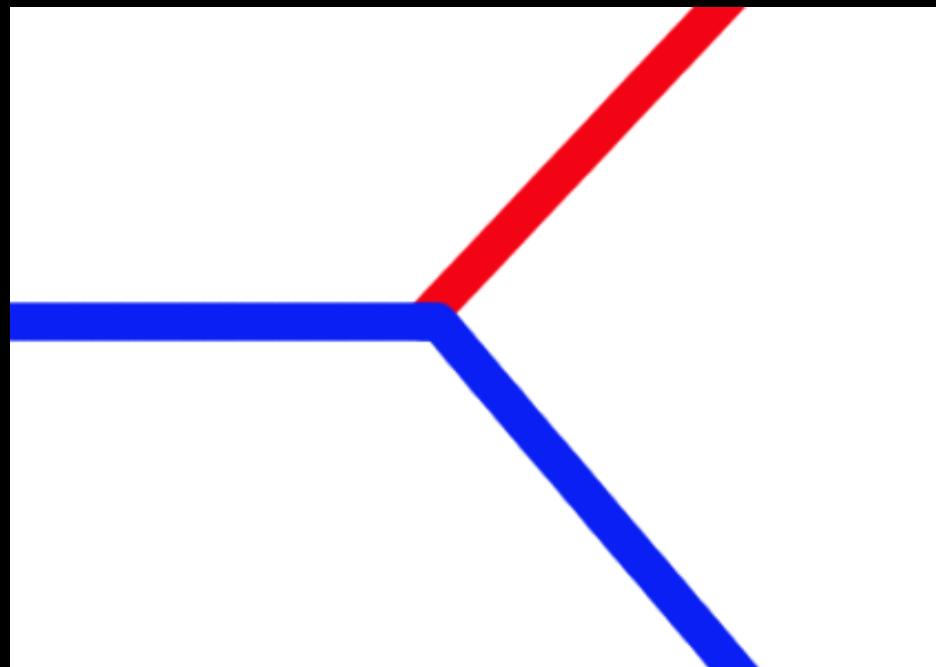
意味著 fork 嗎？

- 通常軟體專案的 fork 意味著，由不同團體的開發者接手維護並控制衍生的專案
- fork == branch ?

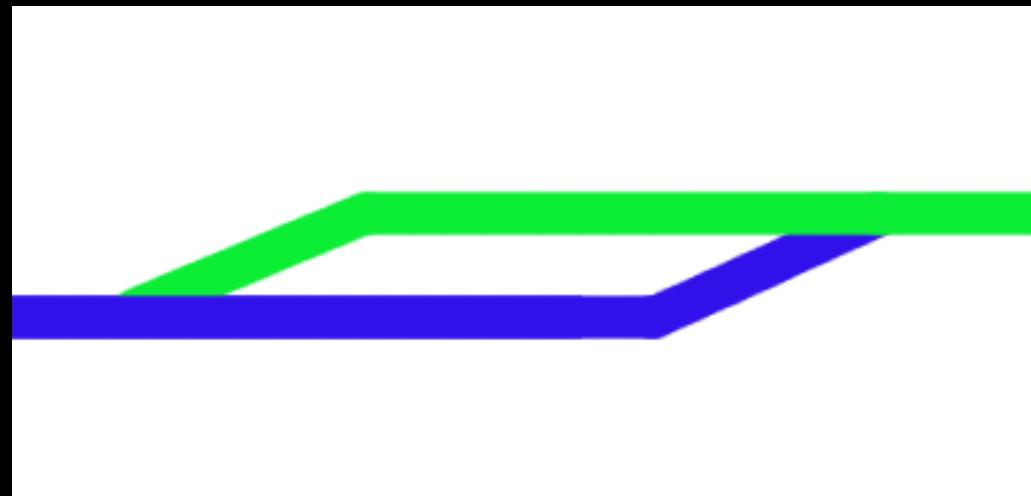
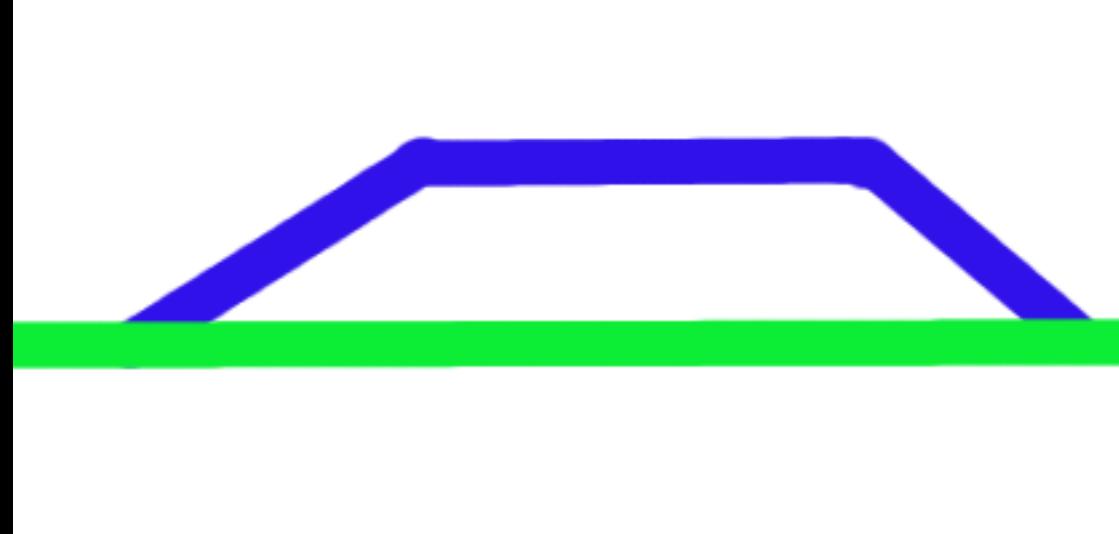


遊戲規則悄悄轉變： Fork/Branch

- 基於不同的需求，特別是涉及商業模式
- 基於某些功能 / 平台的獨立開發是有必要的，如 GCC 與 Xorg 等大型專案



Fork/Branch 的「整合」



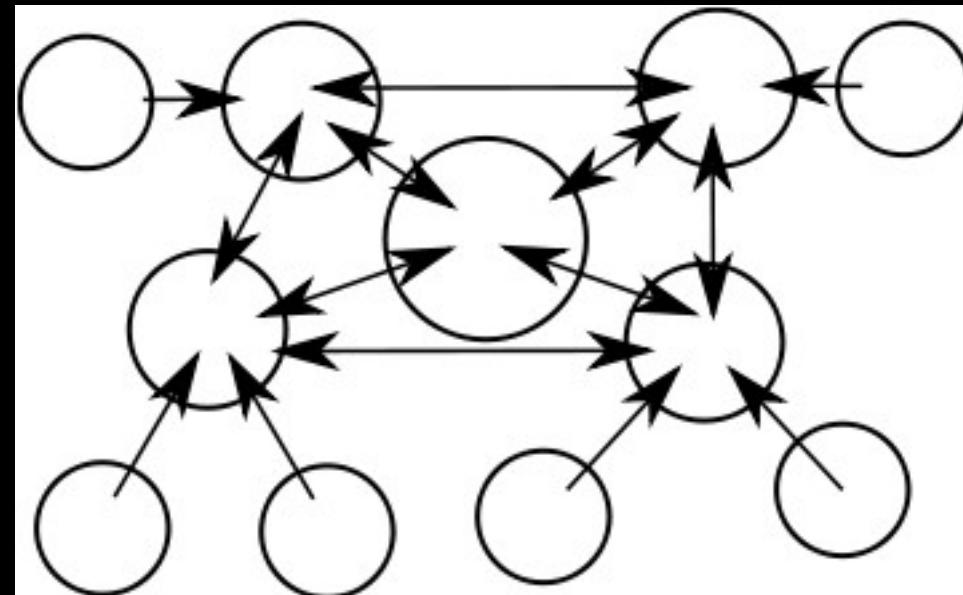
分散式版本控制系統概念

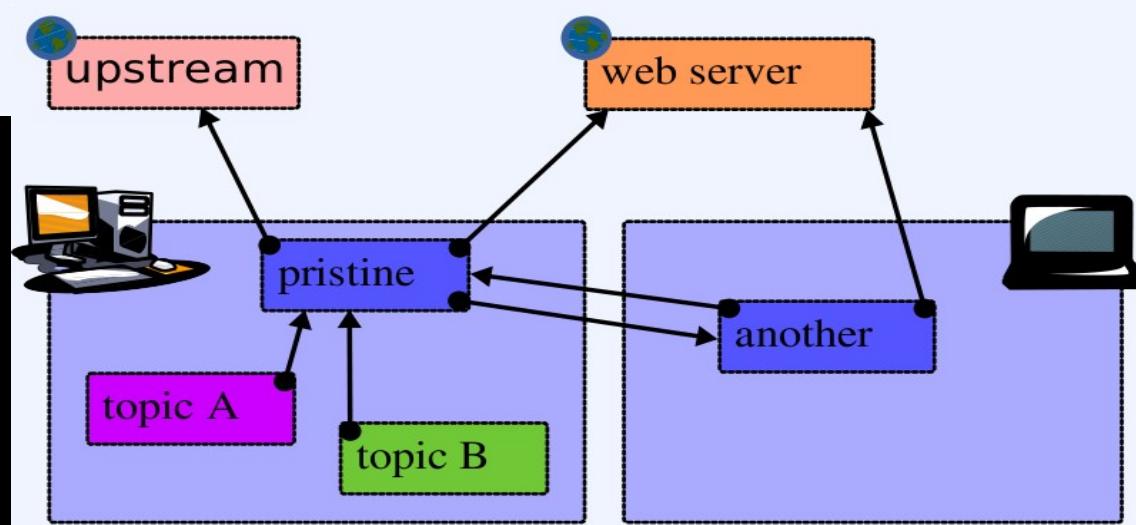
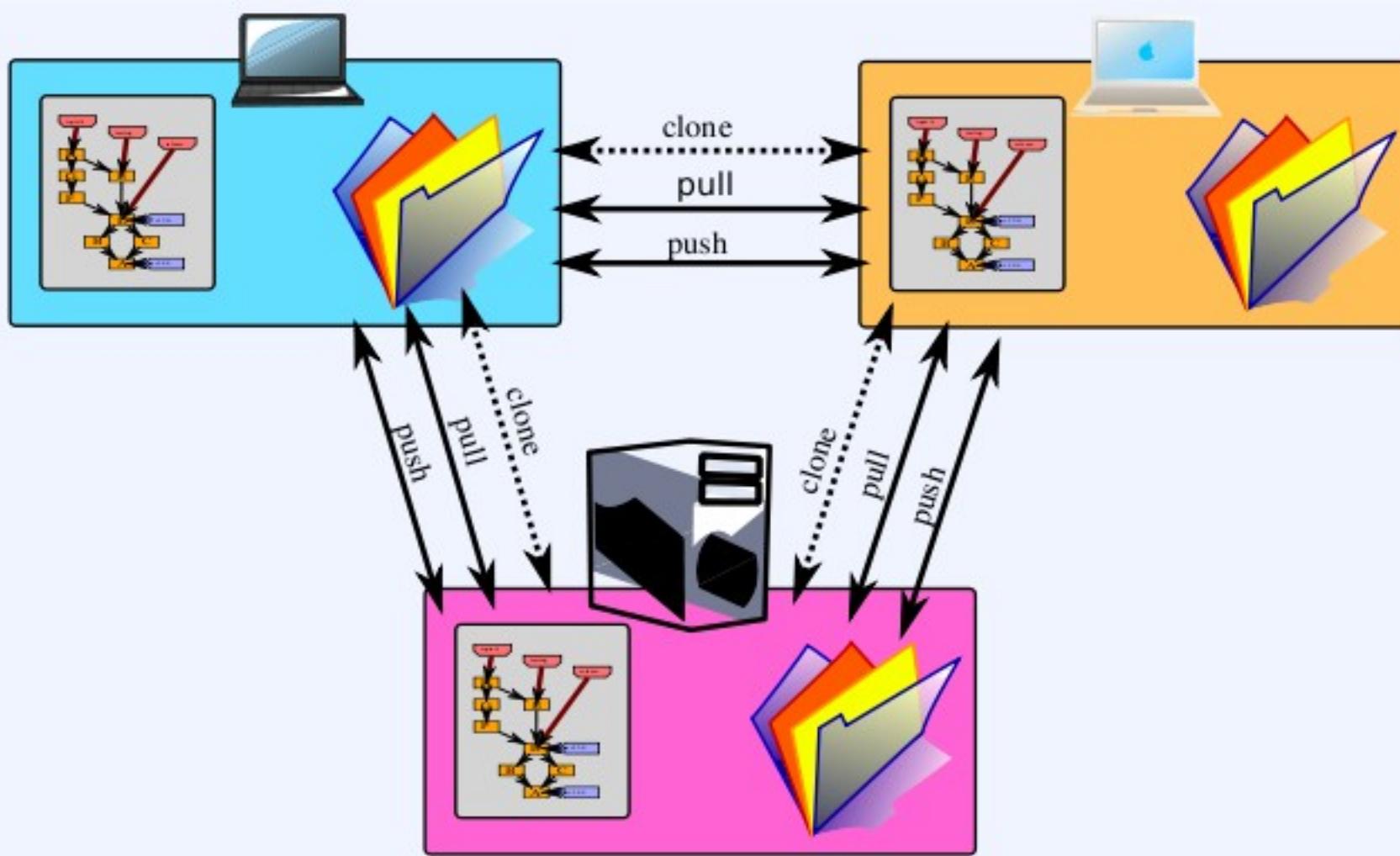
- 不只一處 Repository
- 每個使用者都擁有一份完整 Repository 並可讀寫存取的動作
- 開發者可公佈 (publish) 自己的 repository 並要求 merge



分散式版本控制系統概念

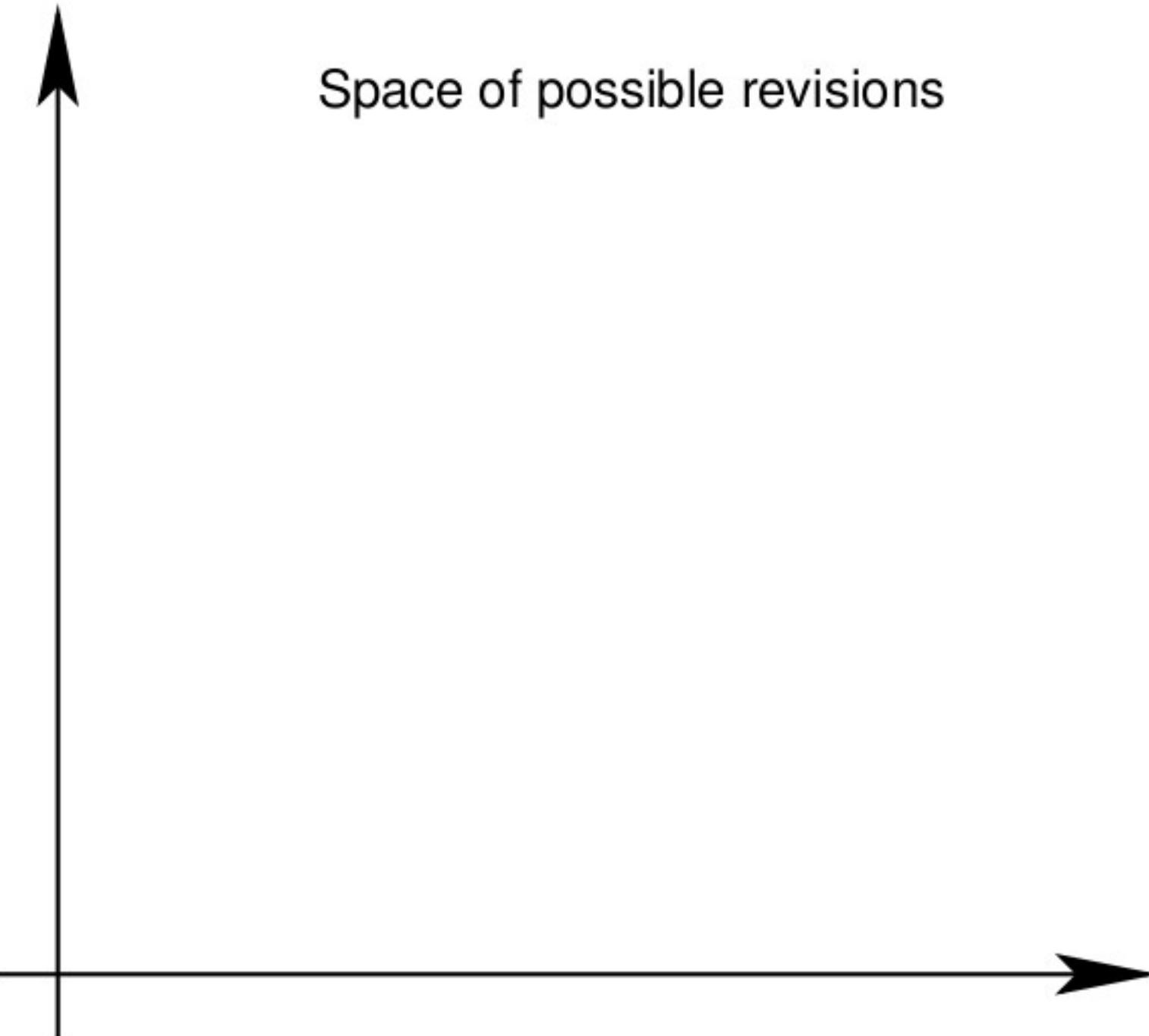
- 分散：不集中一處
- Branching 變成理所當然的行為（核心想法）
- 對大型專案來說，有效加速開發速度
- 社群 (Web 2.0 式？) 開發



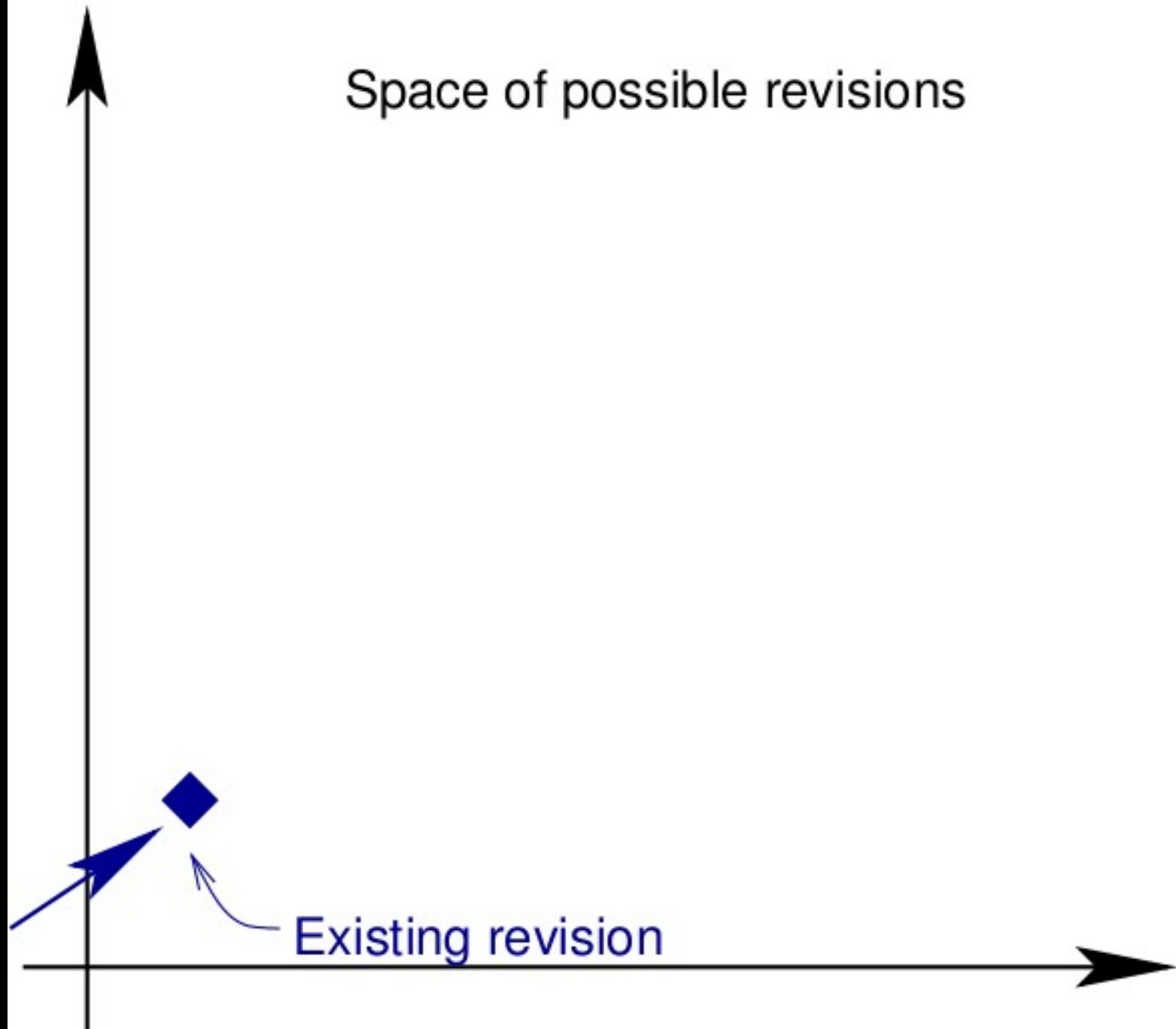


Merging

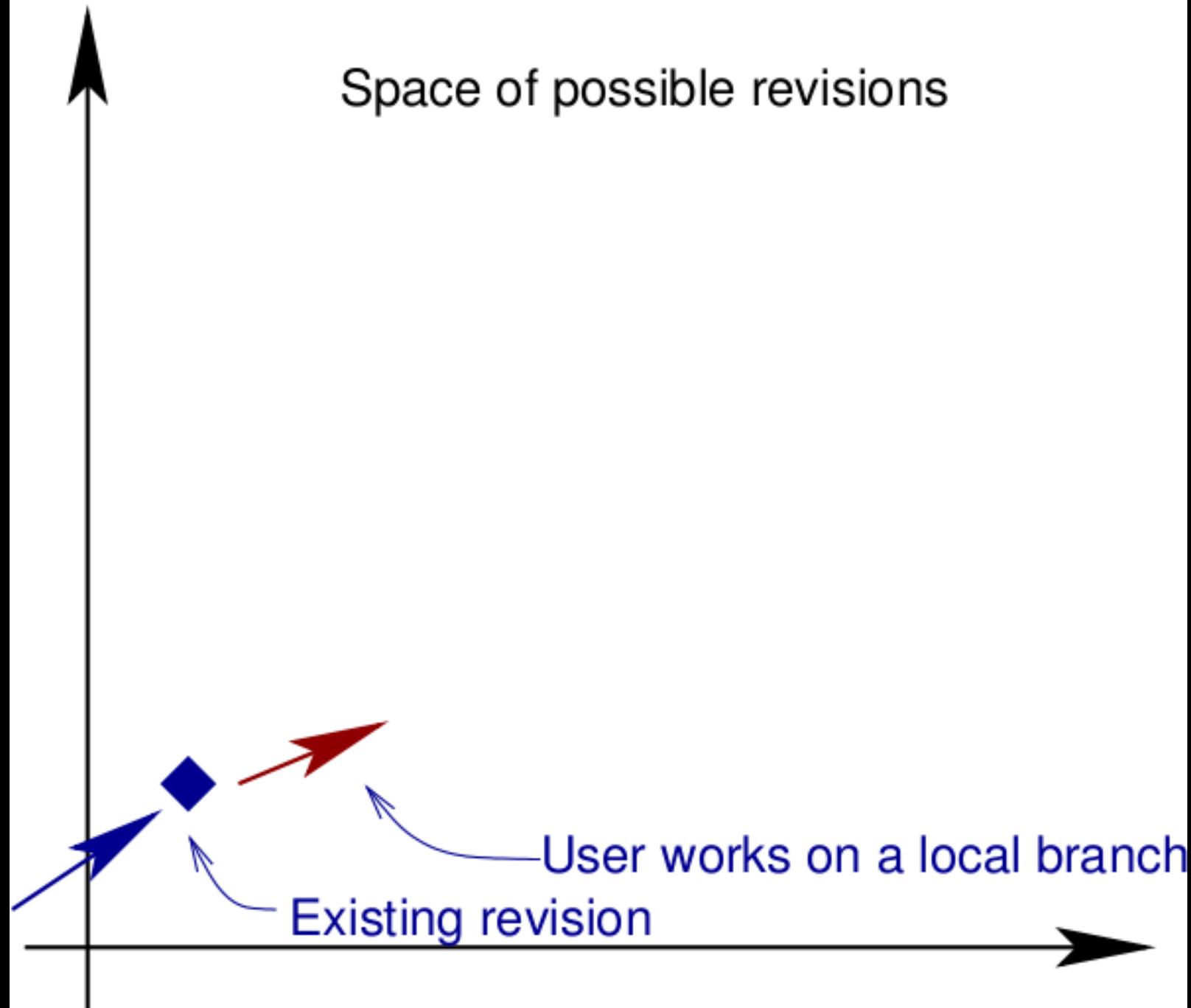
Space of possible revisions



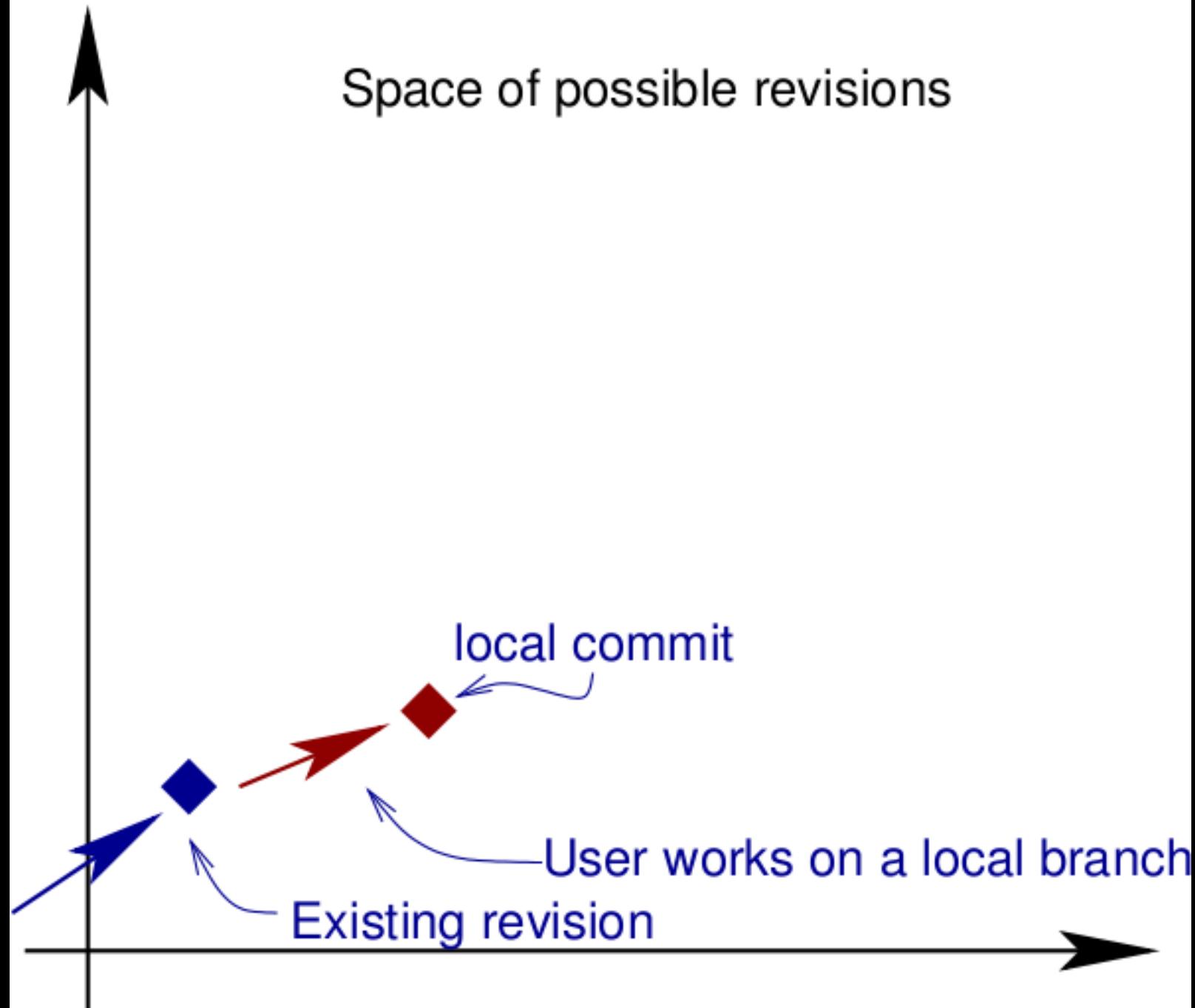
Merging



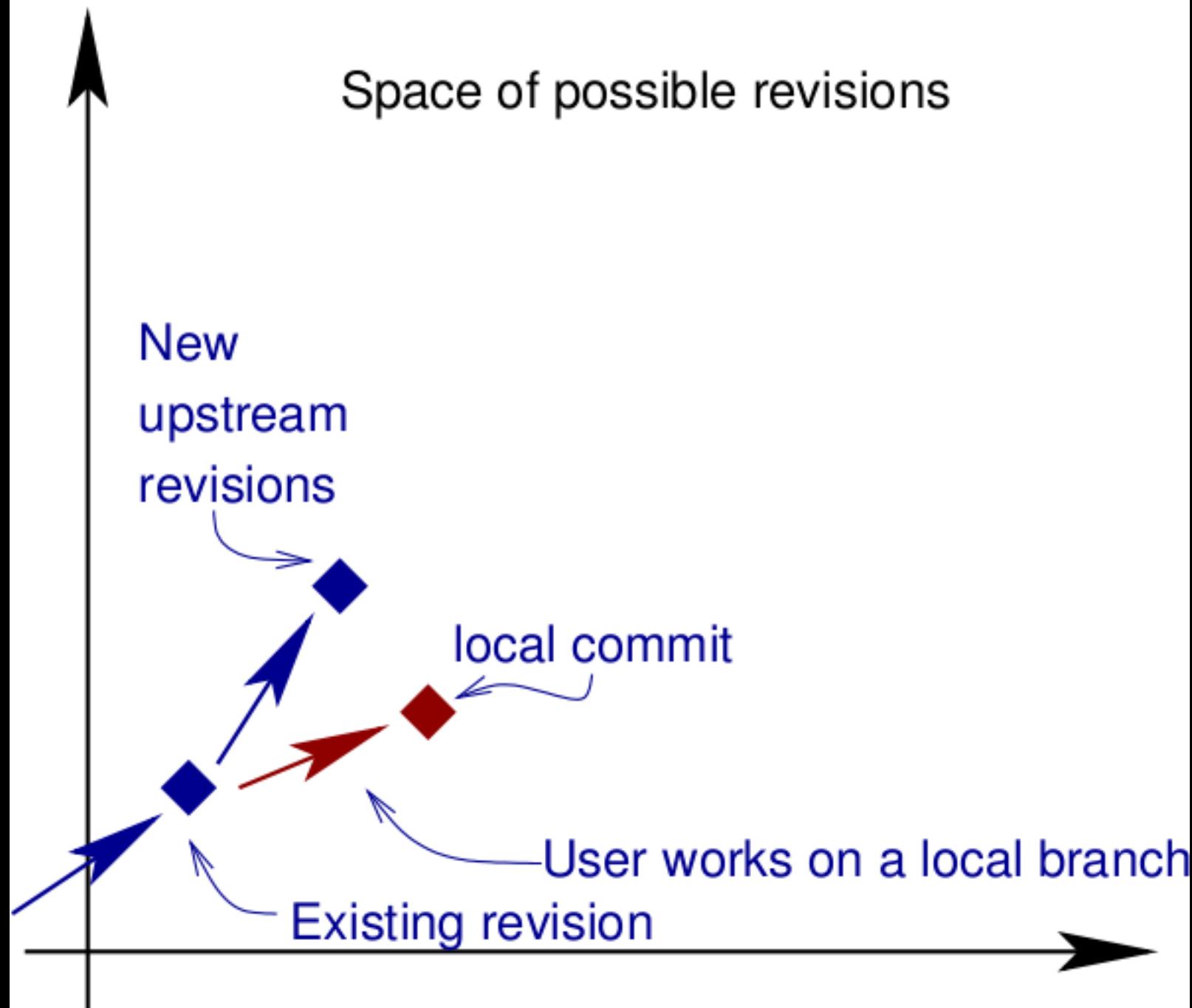
Merging



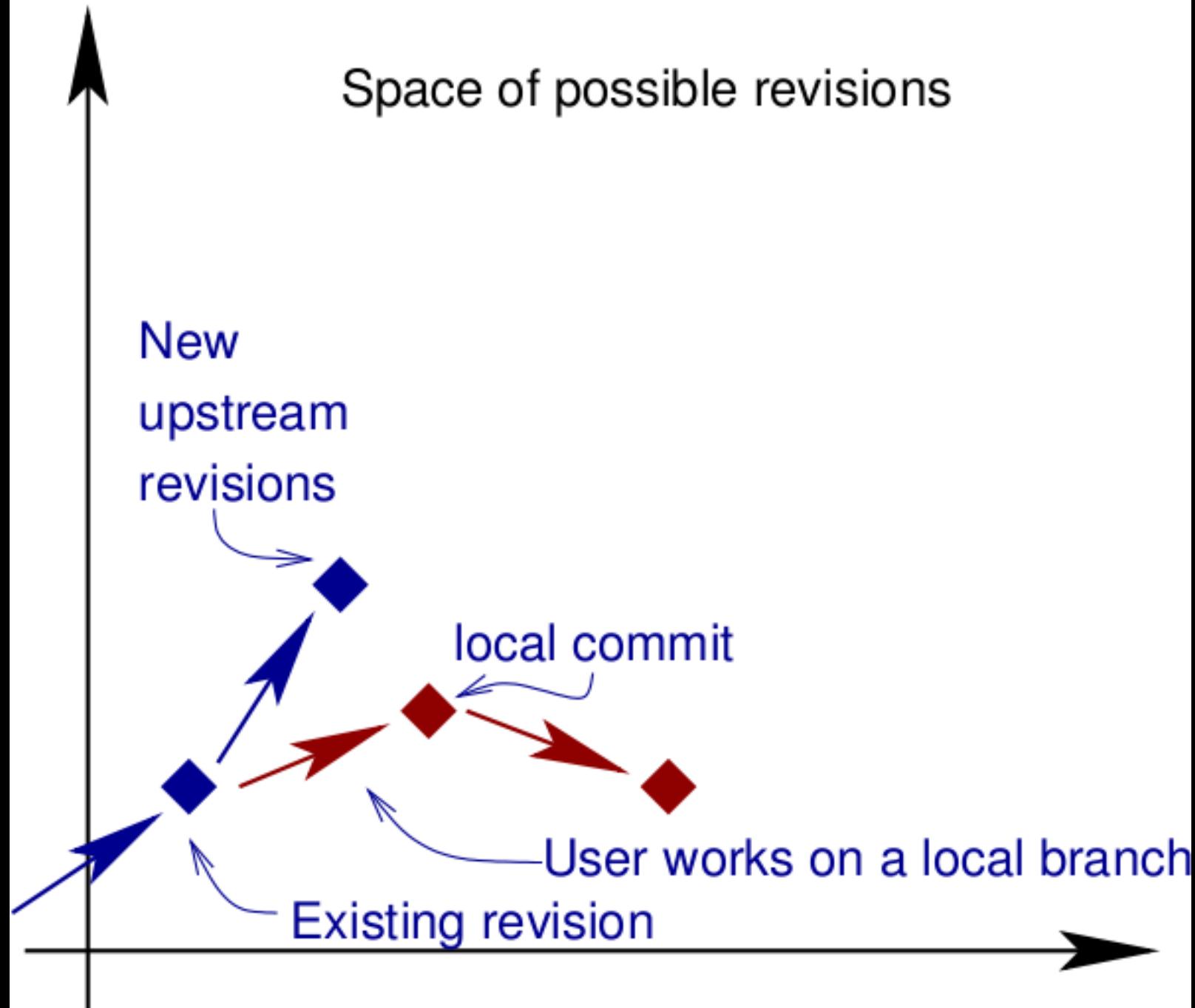
Merging



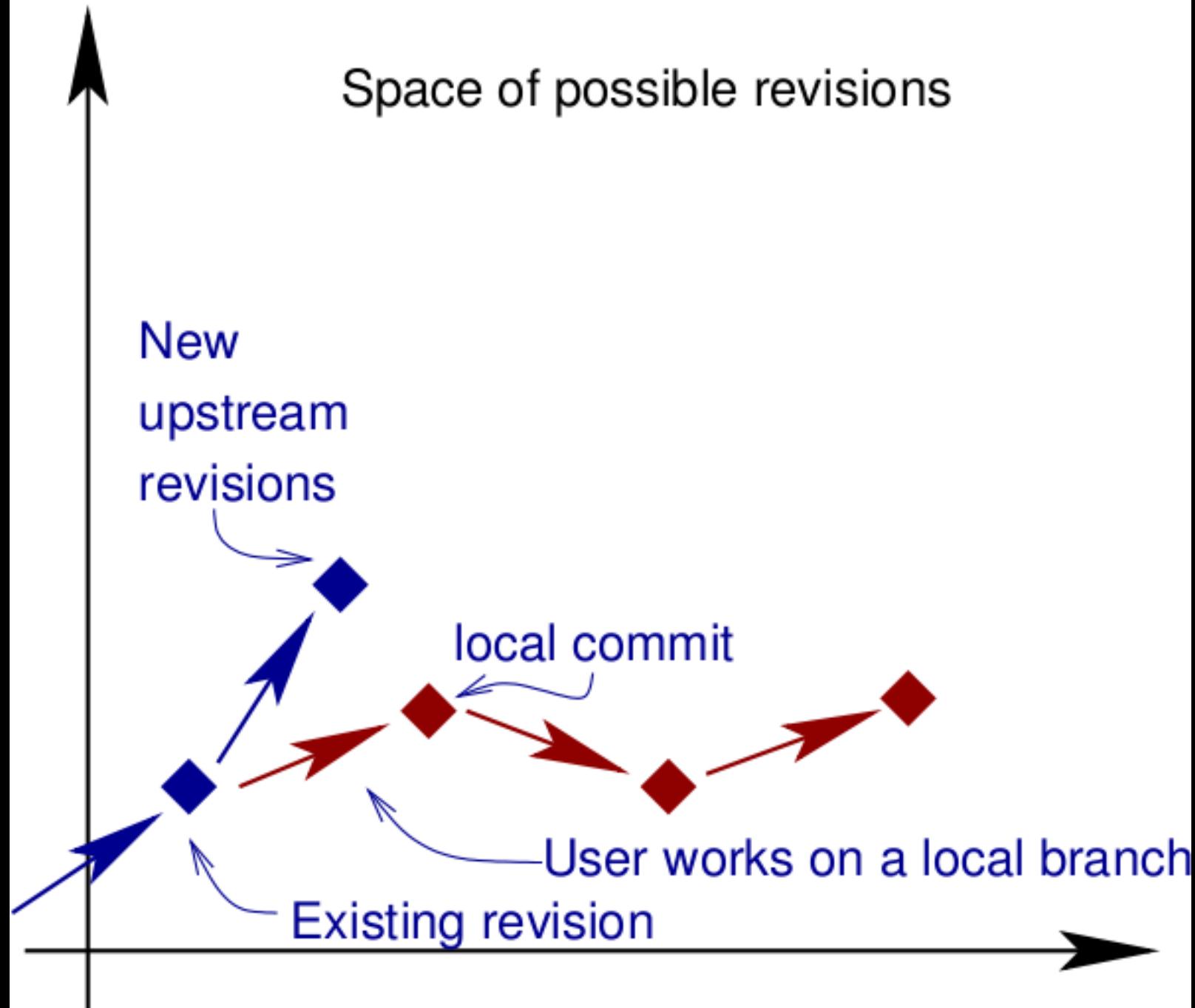
Merging



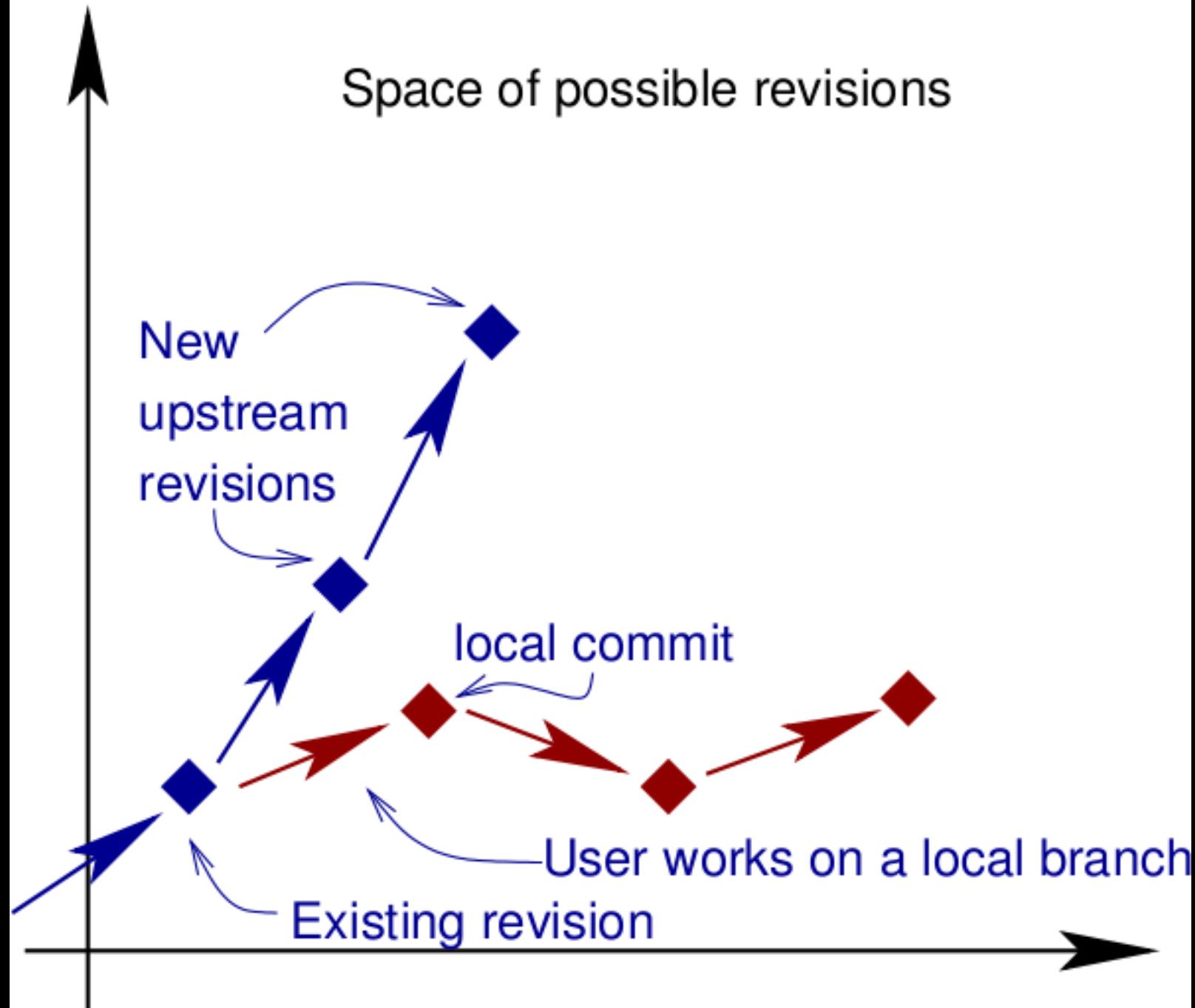
Merging



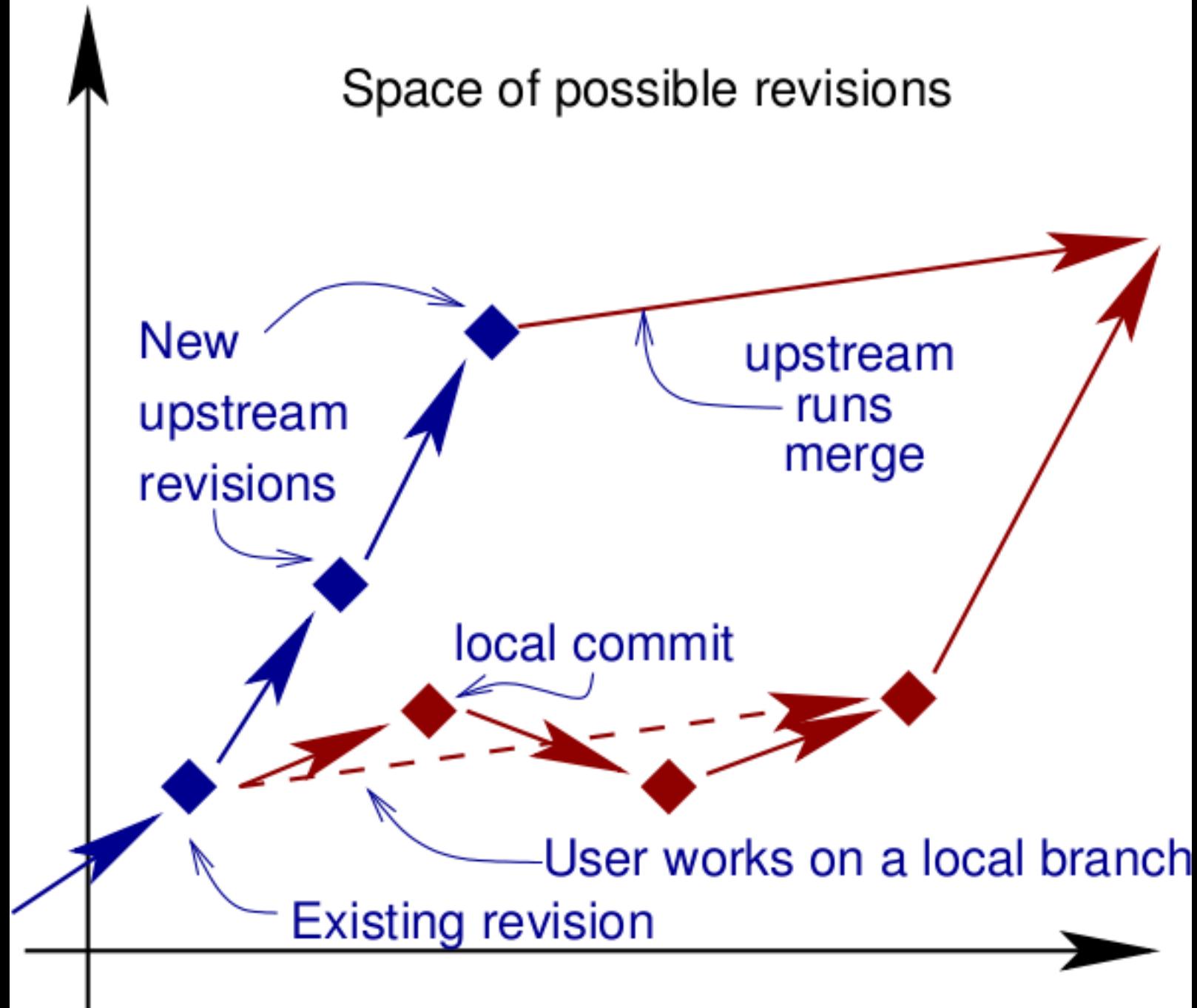
Merging



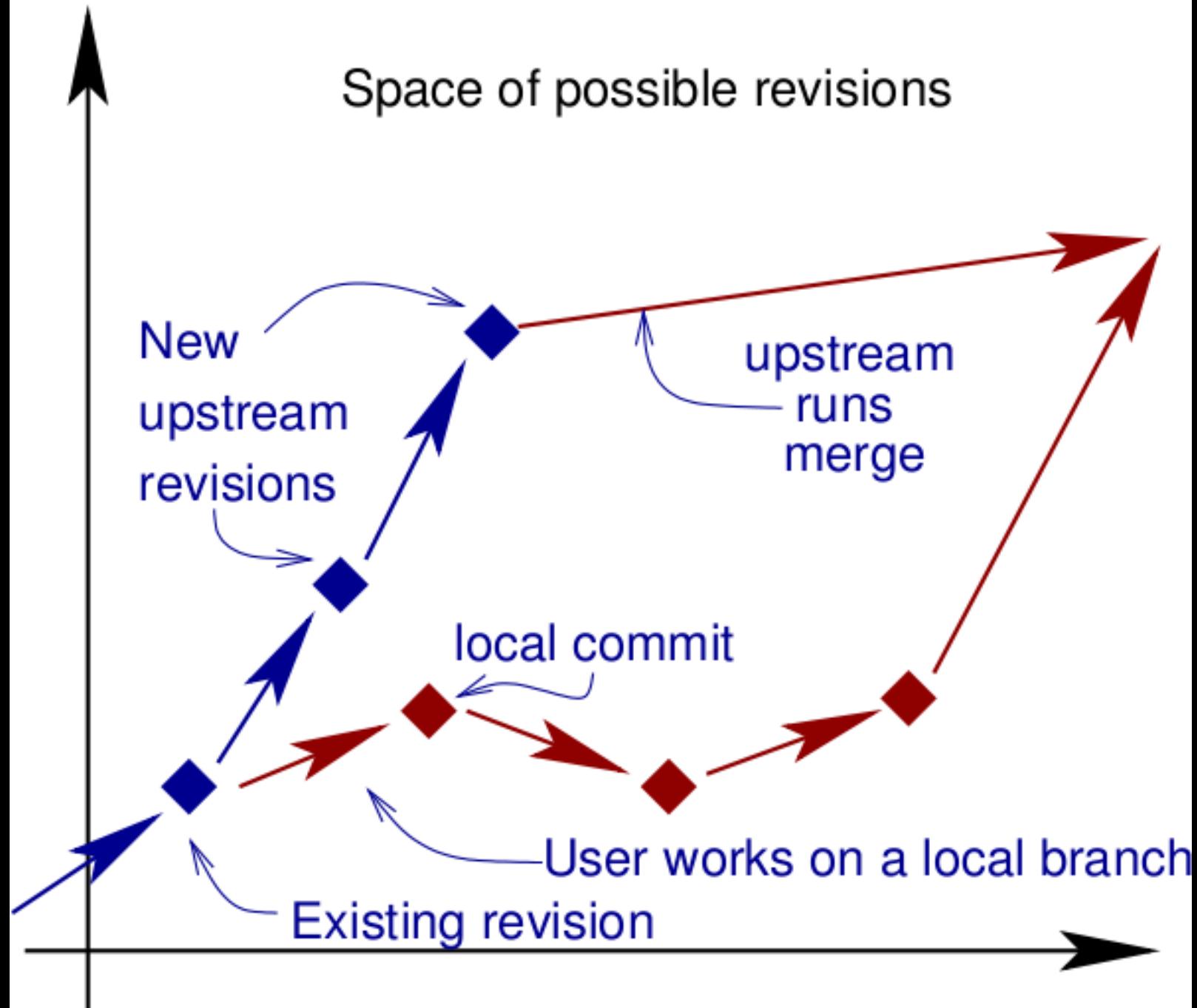
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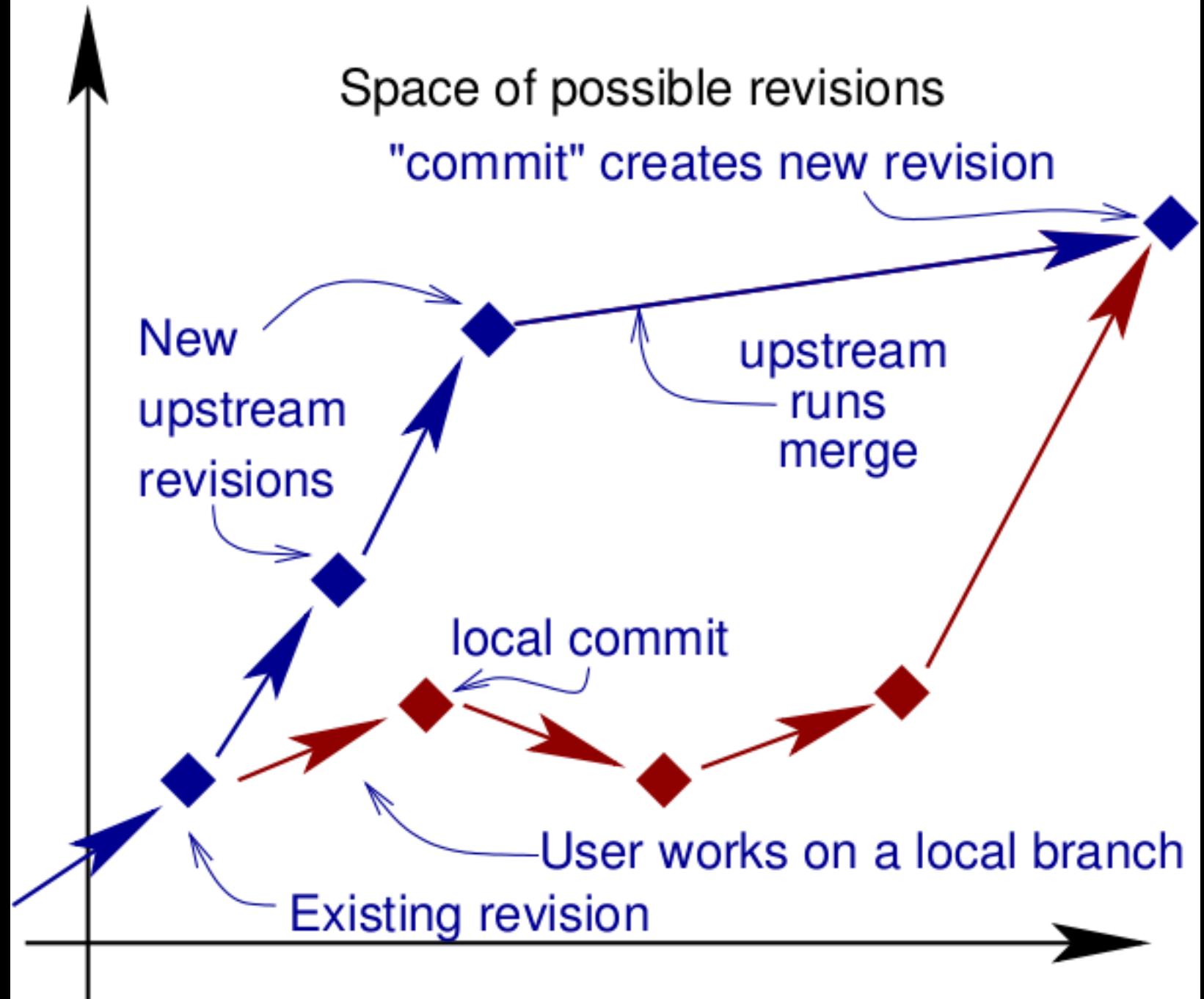
Merging



Merging



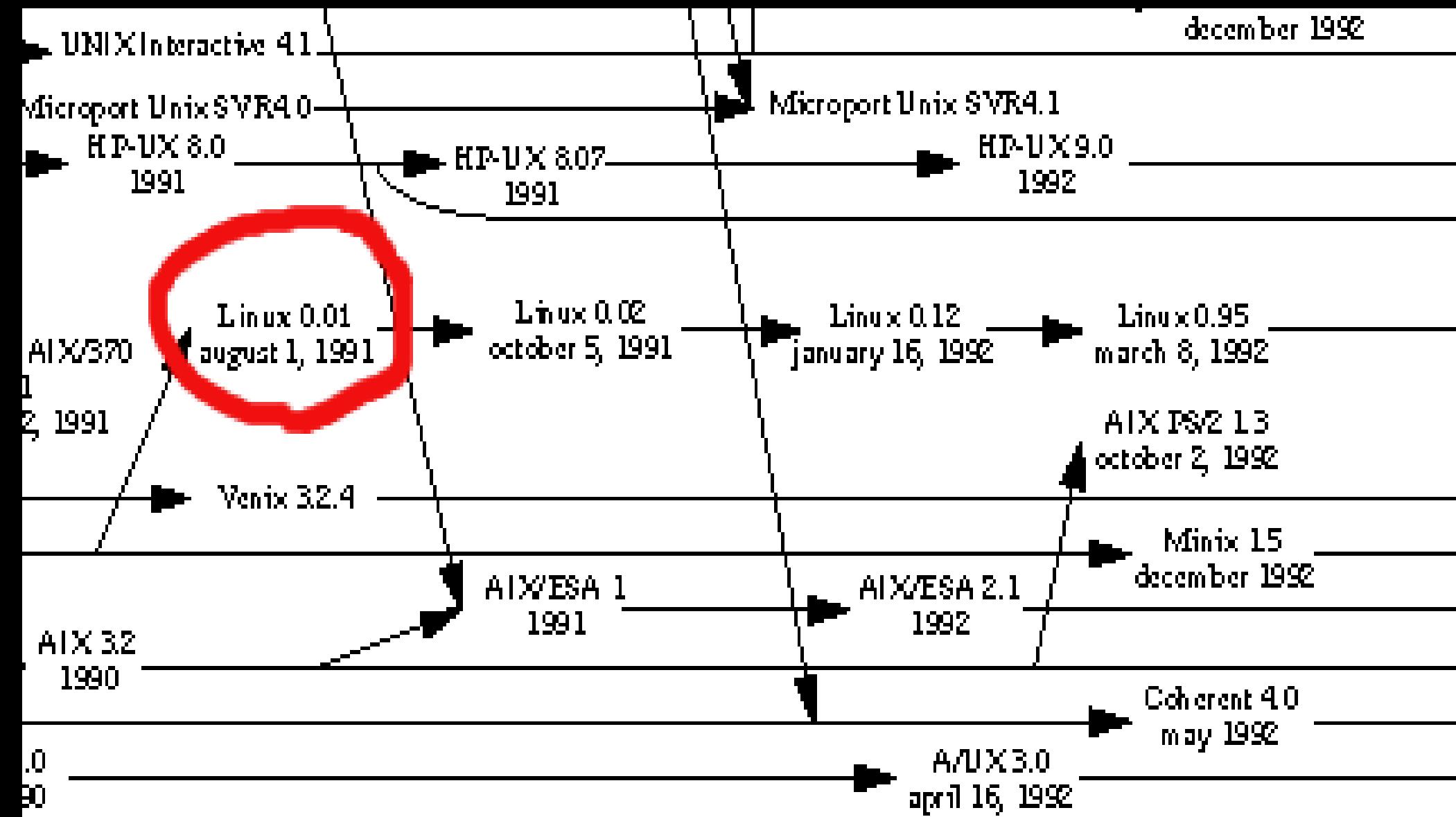
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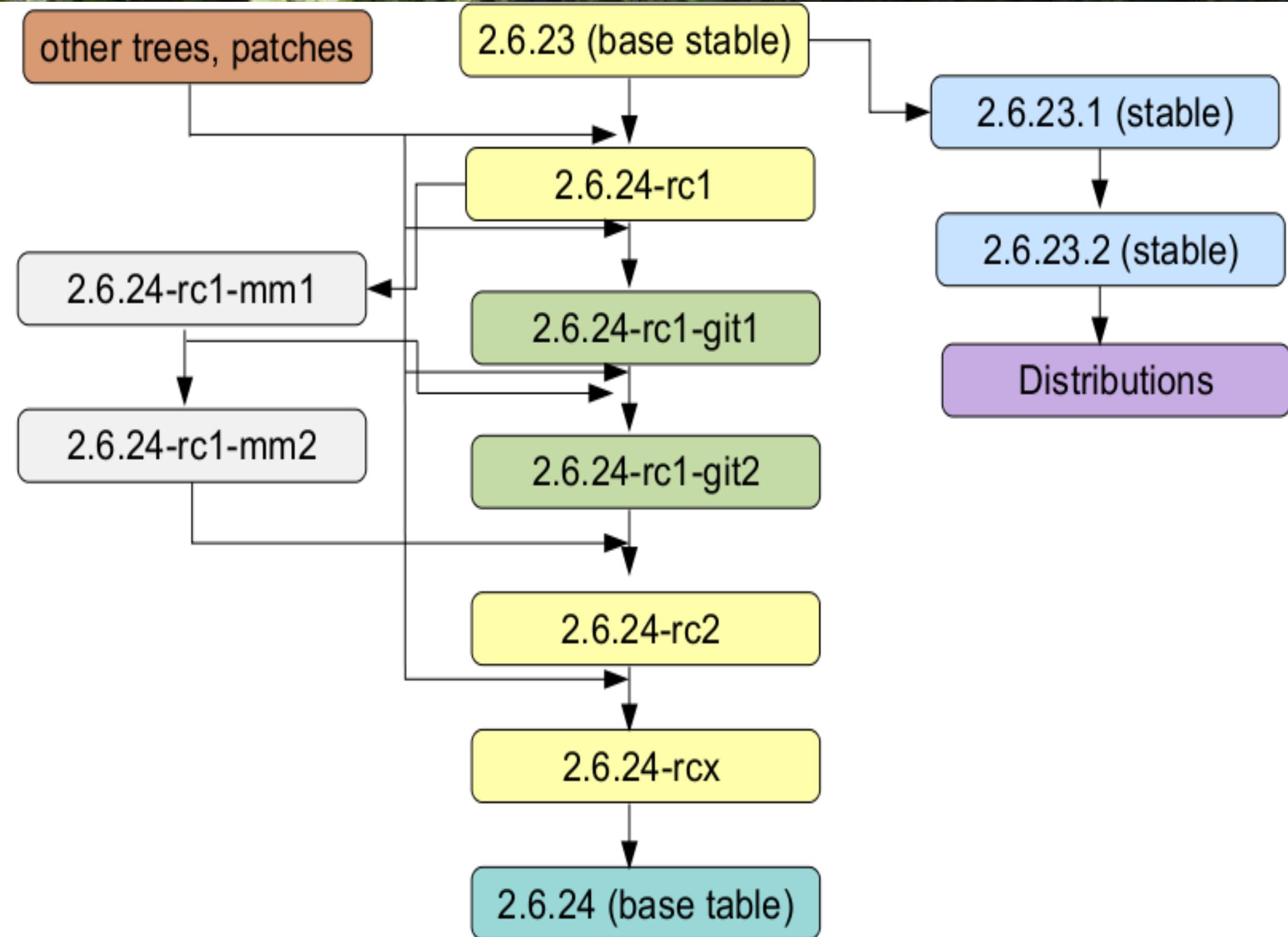


Git 核心概念

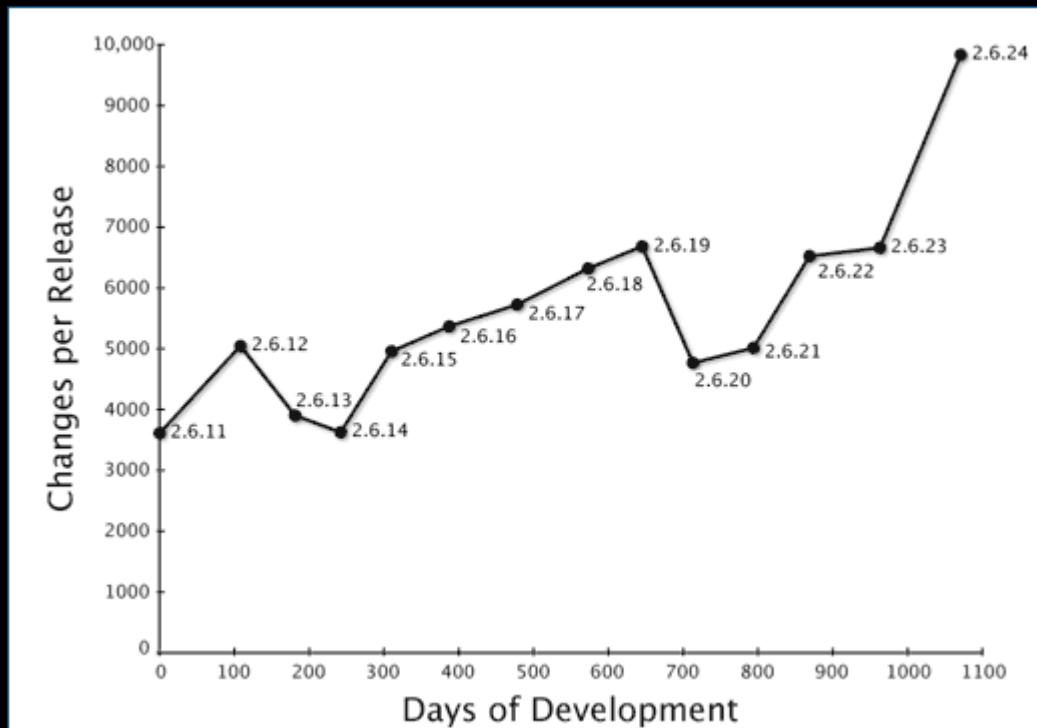


- 芬蘭赫爾辛基大學生 Linus Trovards 於 1991 年新聞組群發表所寫的 386/486 PC 用的作業系統 Linux
- 指標性的自由軟體





- 平均以每小時 **85.6** 行的速度增加
- 2.6.24 版本為例，每小時 **7** 次更動
- 資料來源：
 - Linux Kernel Development
 - How Fast it is Going, Who is Doing It, What They are Doing, and Who is Sponsoring It- Greg Kroah-Hartman , OLS-2007.
 - <http://tree.celinuxforum.org/gitstat/index.php>



/src/x11/xserver - QGit

File Edit View Actions Help

Short Log

Rev list Patch Merge branch 'randr-12-ori...' |

Graph Short Log Author Author Date

Merge branch origin into randr-12	Keith Packard <keithp@nekok...	西元2006年11月07日 17時21分28秒
Merge master back to randr-12	Keith Packard <keithp@nekok...	西元2006年11月05日 09時46分26秒
Merge branch 'randr-12-origin' into randr-12	Keith Packard <keithp@nekok...	西元2006年11月05日 09時43分19秒
Don't bump the refcnt if the new mode is NULL.	Eric Anholt <eric@anholt.net>	西元2006年11月04日 08時36分34秒
Allow X server to build against libdrm 21	Keith Packard <keithp@nekok...	西元2006年11月05日 09時41分25秒
Add DIX_CFLAGS to hw/vfb/Makefile.am	Keith Packard <keithp@nekok...	西元2006年11月05日 09時41分09秒
Define fbHasVisualTypes in fb.h as it is exported	Keith Packard <keithp@nekok...	西元2006年11月05日 09時40分34秒
Merge branch 'origin' into randr-12	Keith Packard <keithp@nekok...	西元2006年11月03日 11時00分35秒

File Edit View

Rev list Patch

Graph Sh Bu Bu Bu Bu Bu Bu Fi Co Co Coverity #82: Dead variable elimination. Coverity #271: Fix an unbelievably bonehead...

Child: Merge master back to randr-12
Branch: master ([Bump video driver ABI version](#))
Follows: xorg-server-11.99.3 ([remove filename tar](#)), XORG-CURRENT-CLOSED ([Fix for http://pdx.freedesktop.org/cgi-bin/bugzilla](#))
Merge branch 'randr-12-origin' into randr-12

Author: Adam Jackson <ajax@nwnk.net>
Date: 西元2006年04月04日 05時16分30秒
Parent: [Bug #6346: Build fix when using gcc -mno-sse.](#) (J...
Child: [Bug #4766: Convert all Xprint drivers to fb.](#)
Follows: xorg-server-1_1_99_1 ([Bump to 11.99.1](#))
Precedes: xorg-server-1_0_99_901 ([Bump the ABI version up...](#))
Bug #5478: More use of fbSolidFillmmx. (Jim Huang)

configure.ac
fb/fb.h
hw/vfb/Makefile.am
hw/xfree86/Makefile.am
hw/xfree86/common/xf86Config.c
hw/xfree86/os-support/drm/xf86di...
.../xf86os.../os.../xf86di...
西元2006年04月03日 10時12分11秒
西元2006年04月03日 10時09分05秒

ChangeLog
fb/fbfill.c
fb/fbwindow.c

I'm right.
git
a lot!

Git 背景

- 2002 年左右 Linus Torvald 採用封閉的 BitKeeper(bk) 分散式版本控制系統，降低日趨複雜的核心開發的難度
- Richard Stallman 為此提出警示，包含 Alan Cox 在內的重要核心開發拒絕使用 bk
 - 違反” freedom is more important than convenience.” 的信念



Git 背景

- 2005 年 Linus Torvald 著手實做期望中的 Decentralized SCM -- git
- Linux Kernel 的獨特性：或許不是最大的自由軟體專案，但是最活躍的
- Linus: “And then realize that nothing is perfect. Git is just *closer* to perfect than any other SCM out there.”



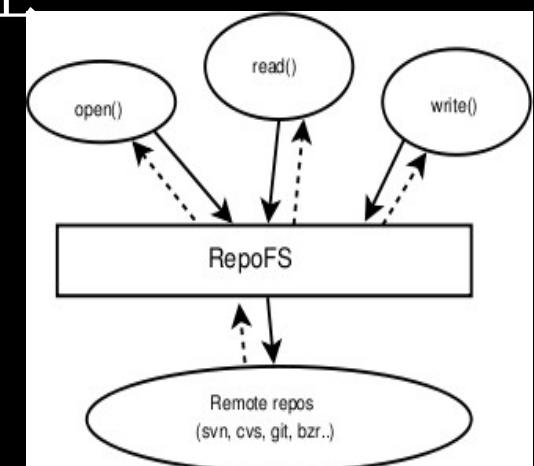
Git 背景

- 考量 SCM 變遷
 - 集中式: 單一 repository 僅能由 core team 寫入
 - CVS, Subversion, ...
 - 分散式: 到處都有 repository 並有完整的歷史紀錄 + 本地端更動
 - GNU Arch, Bzr, ...
 - git: 不僅分散，而且 SCM 應該是「檔案工具」，而不是限制開發者的「制度」



Git 目標 (1)

- 完全的分散性
- 沒有集中 repository
- Peer-to-Peer：輕易建立以特定遠端 repository 為基礎的 repository，並重新發佈
- 支援複雜的 merge 處理



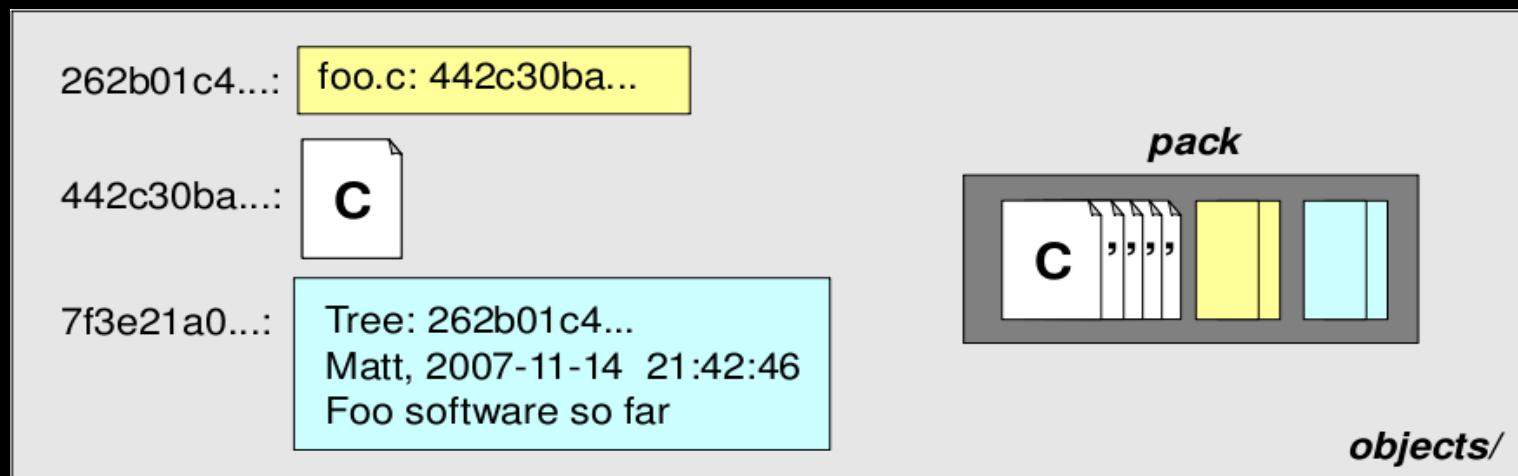
Git 目標 (2)

- 高效能、經濟的空間使用
- Branching 與 merge 是低度衝擊的動作
- 快速的 Diff：通常只要 1 秒！
- KDE tree 的比較
 - Git：小於 2 Gb 的空間
 - SVN：約 8 GB 的空間



Git 目標 (3)

- 高度可靠
 - 無須顧慮檔案、記憶體毀損等議題
 - Git 追蹤整個 repository 的檔案，並非只考慮檔名
 - 採用 SHA1 hash 以確保一致性：
 - file, commit, repo... (object)



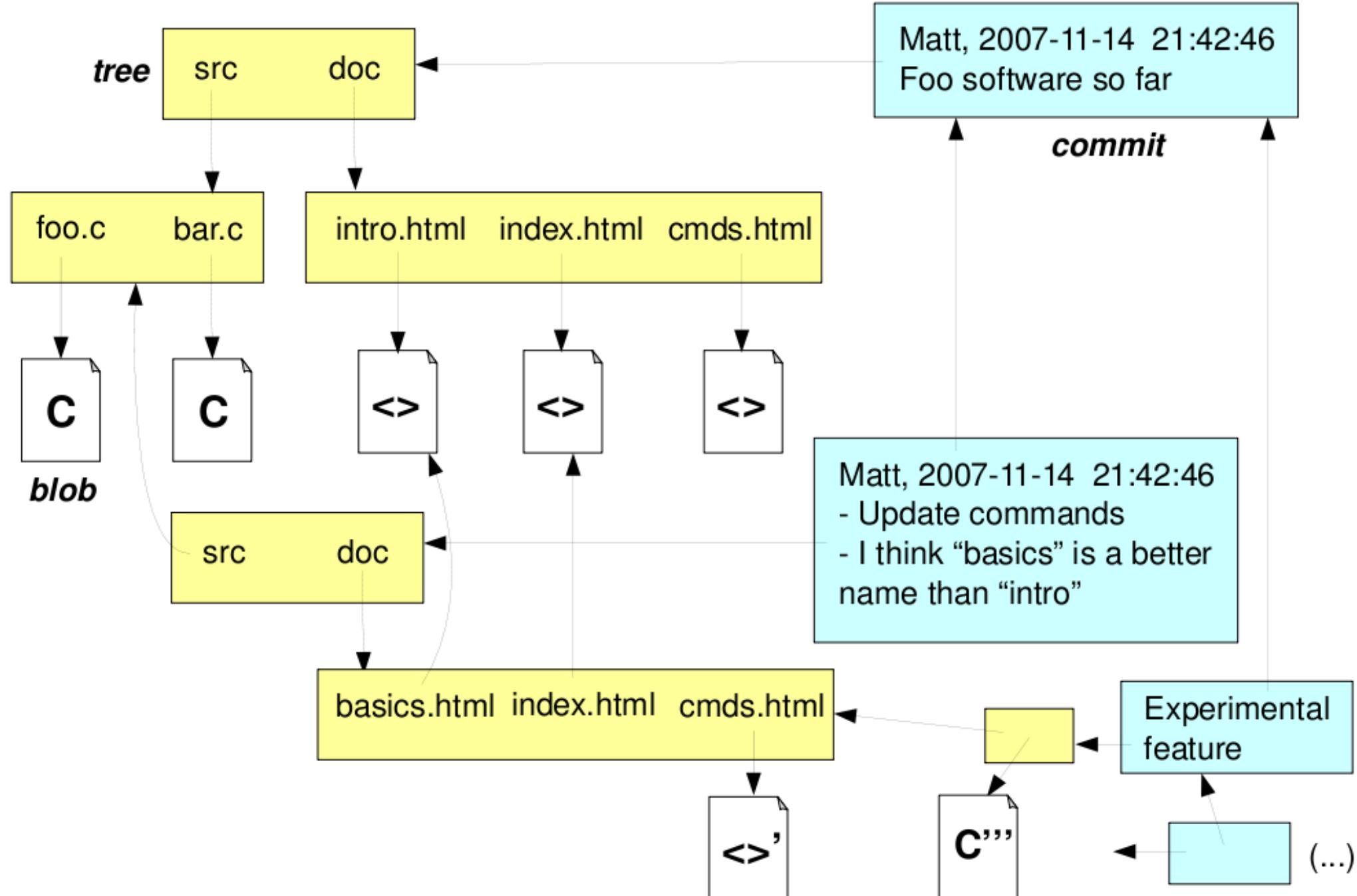
Git 目標 (4)

- 良好的工具整合性
 - 與其他 SCM 互通
 - 「清理」 repository – fsck, prune, gc, ...
 - 與檔案管理、郵件、數位簽章等工具整合

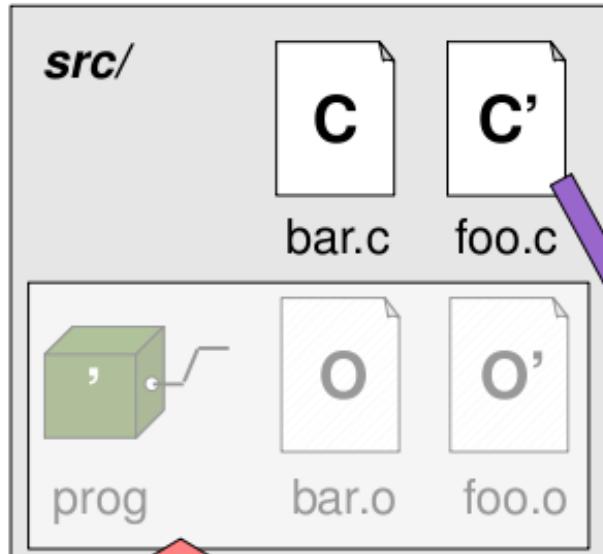
```
$ git-  
Display all 131  
possibilities?
```



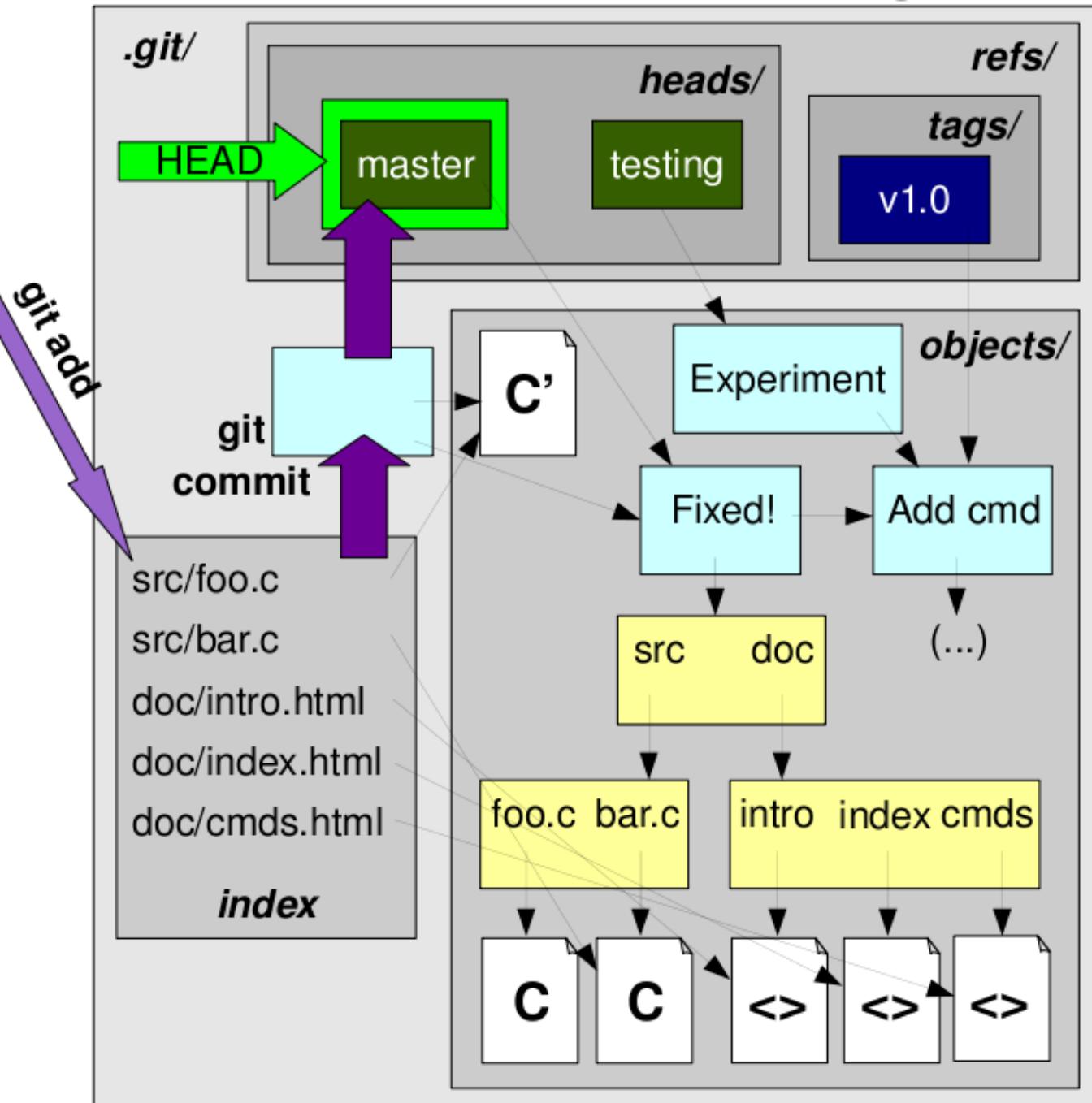
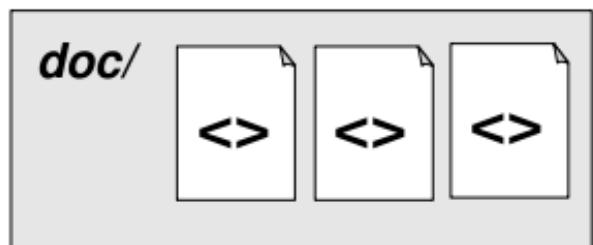
History representation: “objects”



Refs, the index, and committing



.gitignore



Git 相關工具

- 低階、內建
 - git-write-tree
 - Git-commit-tree
- 高階、外部
 - StGit – quilt for git
 - qgit, git gui, gitk – graphical tools
 - Gitweb
 - Cogito – cvs command like syntax (depricated)



Git 快速上手

- 設定個人資料 (郵件、簽章整合)
 - git config –global user.name “Jim Huang”
 - git config –global user.email “jserv.tw@gmail.com”
- 建立 Repository
 - git init
 - clone
 - git clone git://git.kernel.org/scm/git/git.git



Git 快速上手

- HEAD: the commit that you are working on
- HEAD^, HEAD^^, HEAD~3 = HEAD^^^,
- HEAD^1, HEAD^2



Git 快速上手

- 建立 branch:
 - `git branch <name>`
 - `git branch <name> <commit-id>`
- 移除 branch
 - `git branch -d <name>`
- 顯示 branch 列表
 - `git branch`
- 採用 /Jump 到某個 commit
 - `git checkout <commit-id>`
 - `git checkout -b <name> <commit-id>`



Git 快速上手

- 紿予遠端 Repository 清楚的識別 (如 min)
 - git remote add min
ssh://<username>@git.kernel.org/scm/git/git.git
- 自指定的識別抓取修改
 - git fetch min
- 整合 min repository 到 master branch
 - “get merge min/master”
 - 或者： git pull min



Git 快速上手

- 顯示 commit 的 SHA1
 - `git rev-list HEAD^..HEAD`
- 顯示紀錄
 - `git log`
 - `git log HEAD~4..HEAD`
 - `git log --pretty=oneline v1.0..v2.0 | wc-l`
 - `git log --raw -r --abbrev=40 --pretty=oneline origin..HEAD`
 - `git archive --format=tar --prefix=project/ HEAD | gzip >latest.tar.gz`
 - `git blame <filename>`



Git 快速上手

- 產生 commit(於 local)
 - git diff –cached
 - git add .
 - git diff HEAD
 - git commit



Git 快速上手

- Git merge

- git pull min 或 git fetch min 搭配 git merge min
- 解決衝突
 - \$ git show :1:file.txt # the file in a common ancestor of both branches
 - \$ git show :2:file.txt # the version from HEAD, but including any
 - # nonconflicting changes from MERGE_HEAD
 - \$ git show :3:file.txt # the version from MERGE_HEAD, but including any
 - # nonconflicting changes from HEAD.
- 解決 conflicts / reset 並尋求協助



Git 快速上手

- Reset the conflicted merge: use git-reset
- `git reset –mixed <commit-id>`
 - Reset the index database to the moment before merging
- `git reset –hard <commit-id>`
 - Reset the index database and the working data
- `git reset –soft <commit-id>`
 - 此命令可在不觸及工作區資料與 index 資料庫的前提下，進行錯誤修正



Source Control Solutions

- Subversion <http://subversion.tigris.org>
- CVS <http://www.nongnu.org/cvs/>
- GIT <http://git.or.cz/>
- Github <http://github.com/>
- Bazaar <http://bazaar-vcs.org/>
- Visual Source Safe

參考資料

- Comparative Development Methodologies, Dell Zhang
- Git: a modern version control system, Matt McCutchen

