

הנדסת תוכנה

+ 6-7. בקרת תצורה

git / github

[Pragmatic Programmer Tip](#) :

Always Use Source Code Control

Source code control is a time machine for your work—you can go back.

השבוע

- בקרת תצורה \ קוד – Version Control
- כלים: git / github
- משימה אישית 3
- סקר ZFR
- פרויקט 6: תחילת סבבים – סבב 1 MVP
- תרגיל – סקר ZFR
(+ השלמת back-end)



בקרת גרסאות קוד - מקורות

- Sink, Version Control by Example
- Google Tech Talk: [Linus Torvalds on git](#)
- Spolsky, Hg Init: a Mercurial tutorial
<http://hginit.com>
- Sink, Source Control HOWTO
http://www.ericssink.com/scm/source_control.html
- Intro to Distributed Version Control
<http://betterexplained.com/articles/intro-to-distributed-version-control-illustrated/>

VCS Links

- Eric Raymond on [vcs](#)
- [The 10 commandments of good source control management](#), blog 2011
- FogBugz and Kiln [video](#), 2011
 - DVCS University Slides ([*](#))
- [Spolsky, Hg Init: a Mercurial tutorial](#)
- Azad, [A Visual Guide to Version Control](#)
 - [Intro to Distributed Version Control \(Illustrated\)](#)
- [Eric Sink, Source Control HOWTO](#)

Git Links (see wiki links)

- <http://git-scm.com/> ([getting started](#))
- Set Up Git (Win), [ssh issues](#)
<http://help.github.com/win-set-up-git/>
- Info: <http://git-scm.com>, gitref.org,
progit.org (book, [basic](#)), [Git In The Trenches](#)
- [Windows client list](#), O'Reilly Webcast:
[Git in One Hour](#)
- [git internals](#) video

More Git / Github Links

- [Git branching with git-flow](#), Heb. Video, 2013
- Videos: [Git For Ages 4 And Up](#), [Git Going](#)(oredev'12), [Think like a Git](#)
- [learn.github.com/](#), [try.github.com/](#)
[Gitflow](#)
- saastv: [Using Branches with Git](#)
- [no branches at flickr](#)
- [Insider Guide to GitHub](#) (video)
- Articles: [article](#) (including .gitignore), [post](#),
[difficulties](#),



איפה אנחנו בפרויקט (בקורס)?

- למה?
בעיה (פלט: הצעת פרויקט\חזון\SOW)
- מי?
צוות (Inception, אתחול\תכנון פרויקט)
- מה?
דרישות (SRS)
- איך?
תיכון (ארכיטקטורה) (SDS)
- מתי?
תכנון וניהול – (ZFR)
- **בניה**
(סבבי פיתוח)



בקרת תצורה (SCM)

- לפרויקט תוכנה תוצרים שונים:
- מסמכי דרישות ותיכון, קוד, executables, מדריכי שימוש, בדיקות, ...
- פרויקט תוכנה משתמש בכלים שונים:
- מהדרים, עורכים, צד ג', שת"פ, (מ"ה), ...

בקרת תצורה

- מבחינת תהליך זה אלו נקראים
CI – Configuration Items
- לכל אחד יכולים להיות גרסאות ועותקים שונים
- אנו צריכים יכולת לזהות, לעקוב ולאחסן אותם
- נתמקד בנושא של גרסאות

בקרת גרסאות – Version Control

- איך (האם?) אתם שומרים את תוצרי העבודה שלכם?
- האם אפשר לשפר?
- האם יש הבדל בין מפתח בודד לחברה גדולה?
- שמות שונים:
 - בקרת תצורה
 - Revision Control
 - Software Configuration Management
 - Source-Code/**Version Control System**

Joel Test (~2000 / stackoverflow)

1. Do you use source control?

וגם היום...

"You've just spent twenty minutes doing a presentation for your teammates on **adopting source control**. Yeah, they don't do source control at all. Yep, **not at all—it's as if the last 20 years of computer science never happened**. But better late than never, and frankly any source control is better than none, because disaster is one errant delete away."

- "Driving Technical Change: Why People on Your Team Don't Act on Good Ideas, and How to Convince Them They Should", chap. [The Cynic](#)

בקרת גרסאות – בשביל מה? יעדים



- איסוף כל הגרסאות ומעקב אחרי שינויים
 - חזרה לגרסה מסוימת, השוואה
 - מאפשר מחיקת קוד
- ניהול מספר גרסאות במקביל
- גיבוי והצלה
- שיתוף מספר מפתחים (מרוחקים) בו זמנית
 - טיפול בסתירות
- מאגר מעודכן של תוצרי הפרויקט
 - במיוחד עם Continuous Integration\daily build

בפרויקט תדרשו להדגים את בקרת
התצורה שלכם

פעולות נדרשות

- בקרת שינויים
 - זיהוי ותיעוד (למשל מי משנה, הסיבה, זמן וכדו')
 - ניתוח והערכה (של שינוי)
 - אישור \ דחיה
 - אימות, מימש ושחרור
- בקרת גרסאות
 - מאגר
 - הכנסה והוצאה
 - ענפים ומיזוגים
 - תיוג



כלים: היסטוריה (השוואה)

Generation	Networking	Operations	Concurrency	Examples
1	None	One file at a time	Locks	RCS, SCCS
2	Centralized	Multi-file	Merge before commit	CVS, SourceSafe, Subversion, Team Foundation Server, IBM Rational ClearCase
3	Distributed	Changesets	Commit before merge	Bazaar, Git, Mercurial

40 Years of Version Control



SCCS & RCS (1970s)



CVS (1986)



Subversion (2001)



Git (2005)

Image © TheSun.au

Git

- Successful open source project
 - <https://git.wiki.kernel.org/index.php/GitProjects>
 - <https://github.com/google>, [microsoft](https://github.com/microsoft), facebook, twitter...
 - <http://stackoverflow.com/research/developer-survey-2015#tech-sourcecontrol>
- Problems / Issues:
 - Usability!
 - Mainly a scripted / toolset (by now IDE integration and GUIs)
 - Binary/big file (by now, e.g., git-lfs)
 - Enterprise (e.g. locking)

משל גיט

- Tom Preston-Werner
<http://tom.preston-werner.com/2009/05/19/the-git-parable.html>
- Herland,
<http://www.infoq.com/presentations/git-details>, slides:
https://github.com/jherland/git_pparable

The Git Parable

Johan Herland

johan@herland.net

The Git Parable

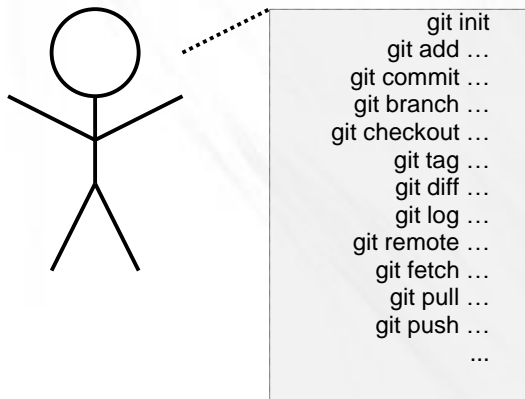
- Shamelessly stolen from Tom Preston-Werner
<http://tom.preston-werner.com/2009/05/19/the-git-parable.html>
- I'm lazy...
- Also: Best introduction to Git I've found so far

The Git Parable

- Git - simple & powerful

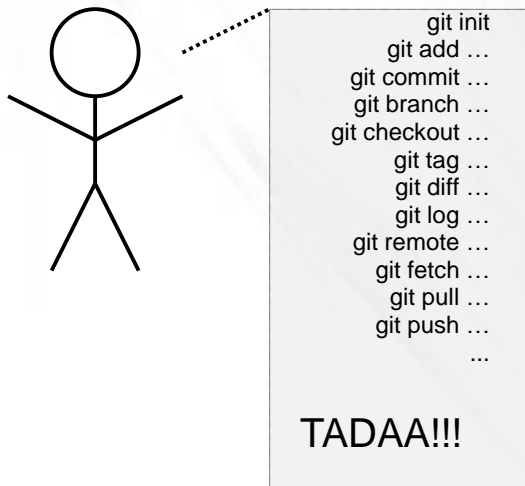
The Git Parable

- Git - simple & powerful



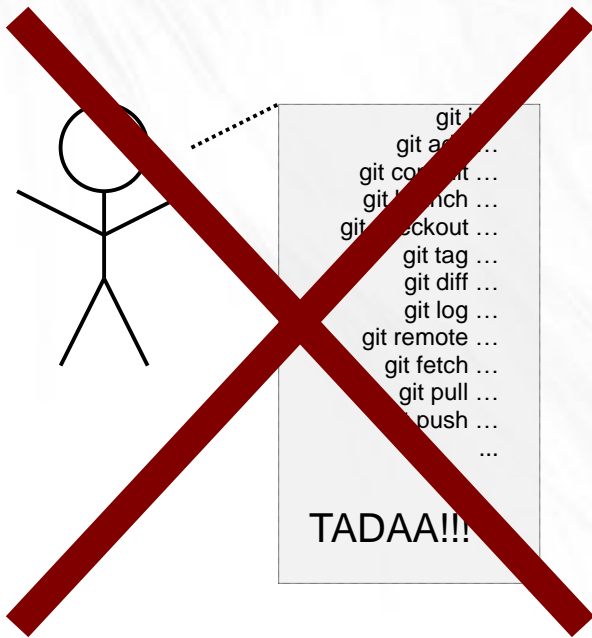
The Git Parable

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The Git Parable

- Git - simple & powerful



se17b-yagel

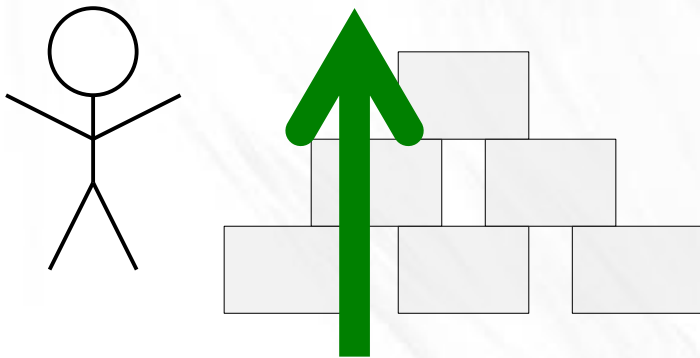
The Git Parable

- Git - simple & powerful



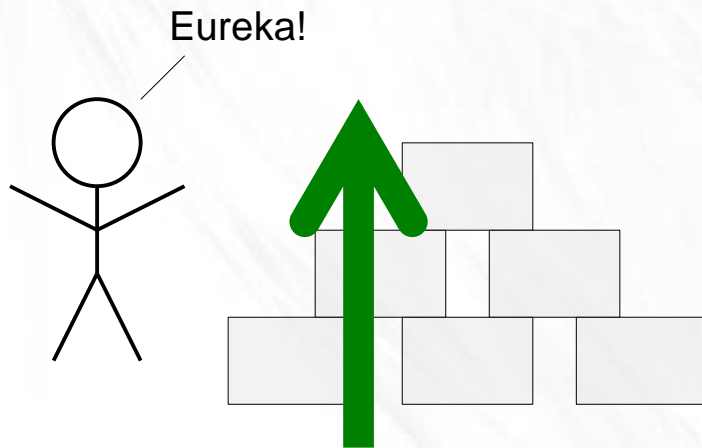
The Git Parable

- Git - simple & powerful



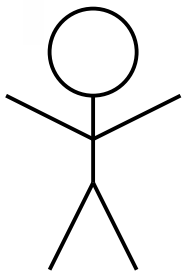
The Git Parable

- Git - simple & powerful



The Parable

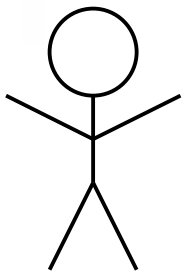
- A simple computer
 - A text editor
 - A few filesystem commands



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The Parable

- Write a large software program

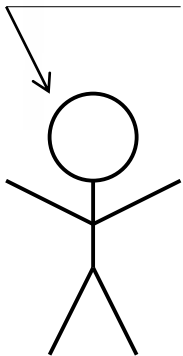


se17b-yagel

The Parable

- Write a large software program
- Invent some method to keep track of versions
 - retrieve code that you changed/deleted

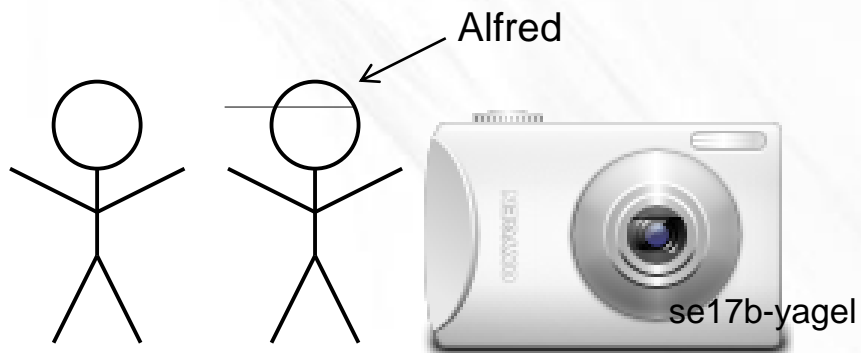
Responsible!



se17b-yagel

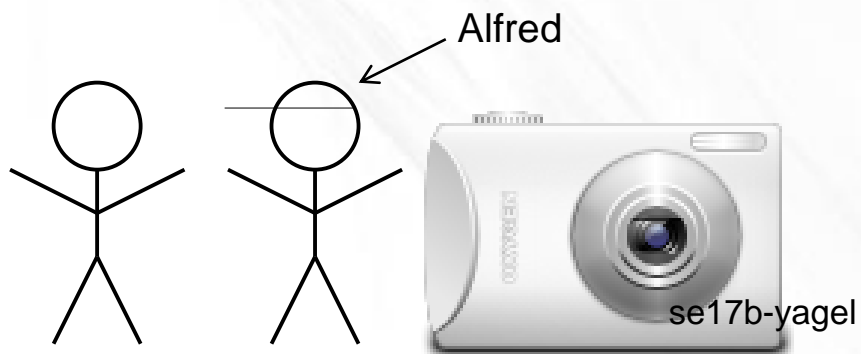
Snapshots

- Alfred, the photographer



Snapshots

- Alfred, the photographer



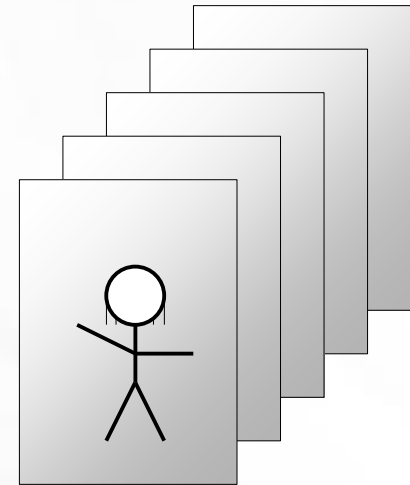
Snapshots

- Alfred, the photographer
- Hazel and her daughter



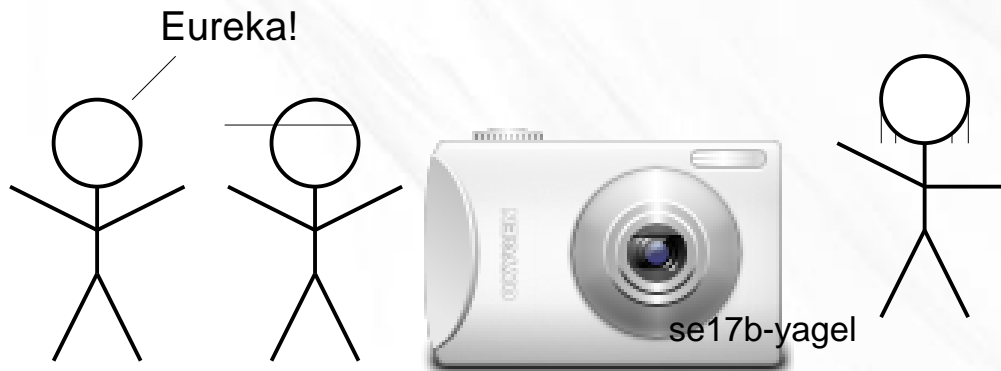
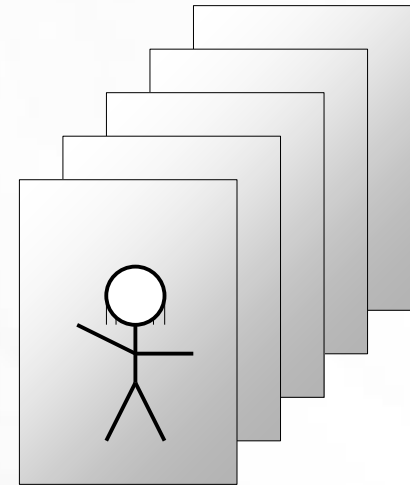
Snapshots

- Alfred, the photographer
- Hazel and her daughter
 - Remember what the daughter was like at each different stage



Snapshots

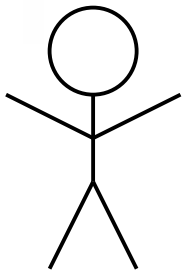
- Alfred, the photographer
- Hazel and her daughter
 - Remember what the daughter was like at each different stage



Snapshots



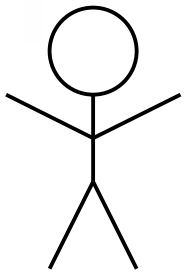
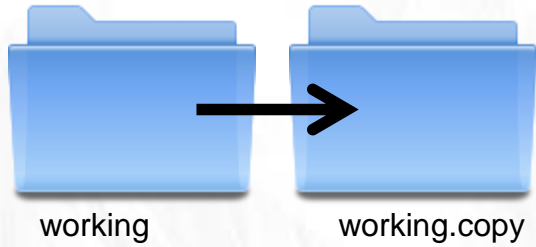
working



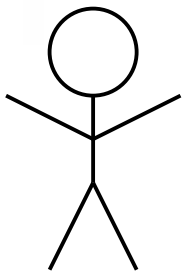
se17b-yagel

35

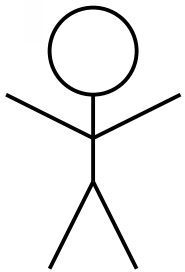
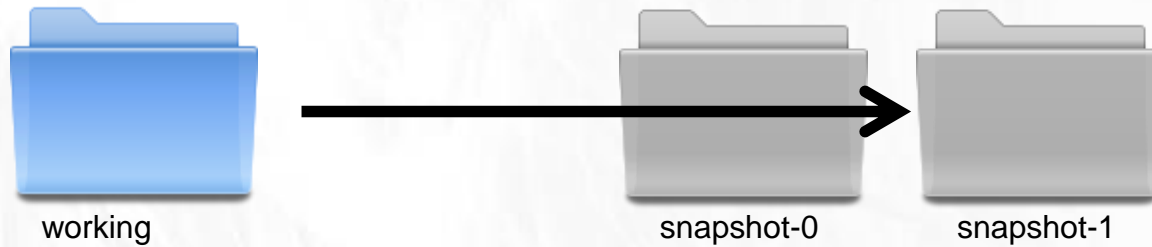
Snapshots



Snapshots



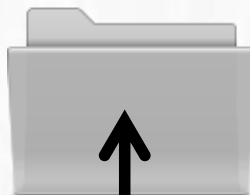
Snapshots



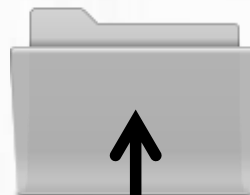
Snapshots



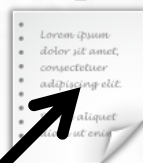
working



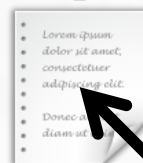
snapshot-0



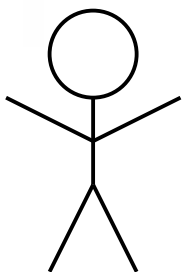
snapshot-1



message



message



2009-05-20 12:34:56

Initial version

se17b-yagel

2009-05-21 23:45:01

Introduced a new foo,
and reset the bar to
xyzzy.

Branches



working



snapshot-0

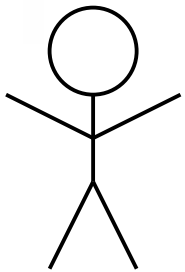


snapshot-1

...



snapshot-99



se17b-yagel

Branches



working



snapshot-0

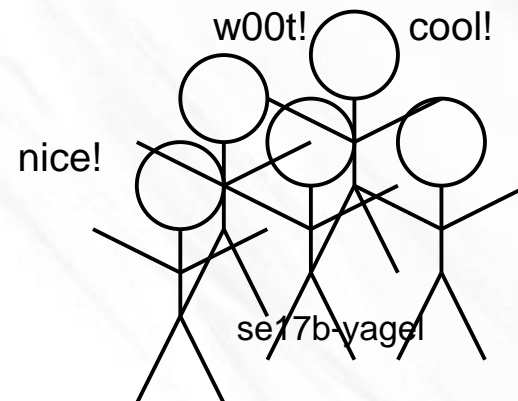
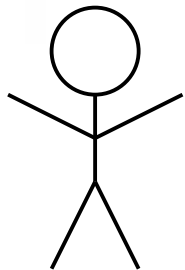


snapshot-1

...



snapshot-99



Branches



working



snapshot-0



snapshot-1

...

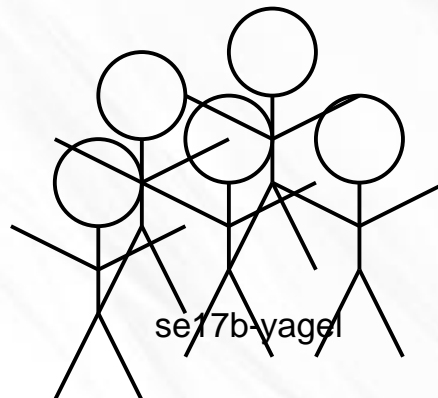
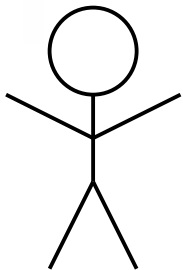


snapshot-99

...



snapshot-109



Branches



working



snapshot-0



snapshot-1

...



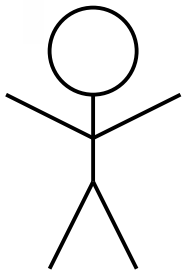
snapshot-99

...

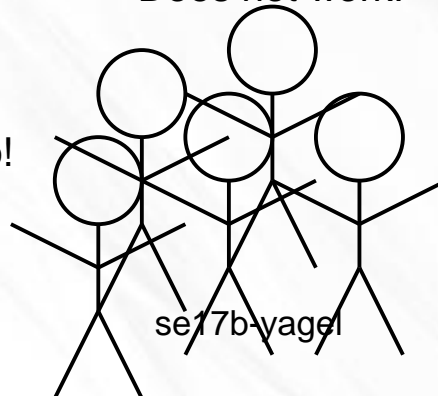


snapshot-109

Does not work!

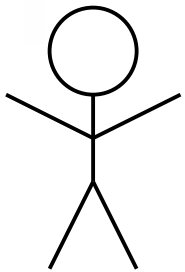
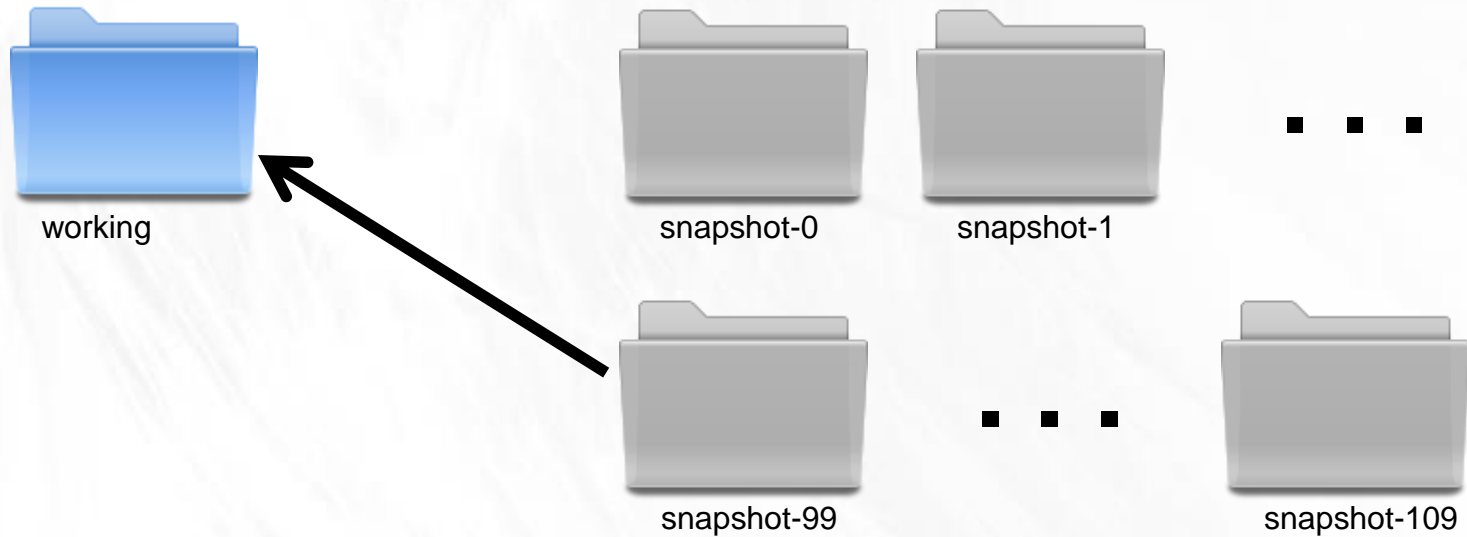


Boo!



se17b-yager

Branches



Branches



working



snapshot-0



snapshot-1

...



snapshot-99

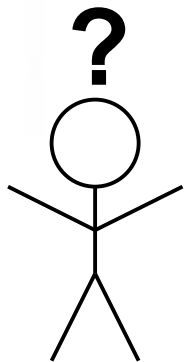
...



snapshot-109

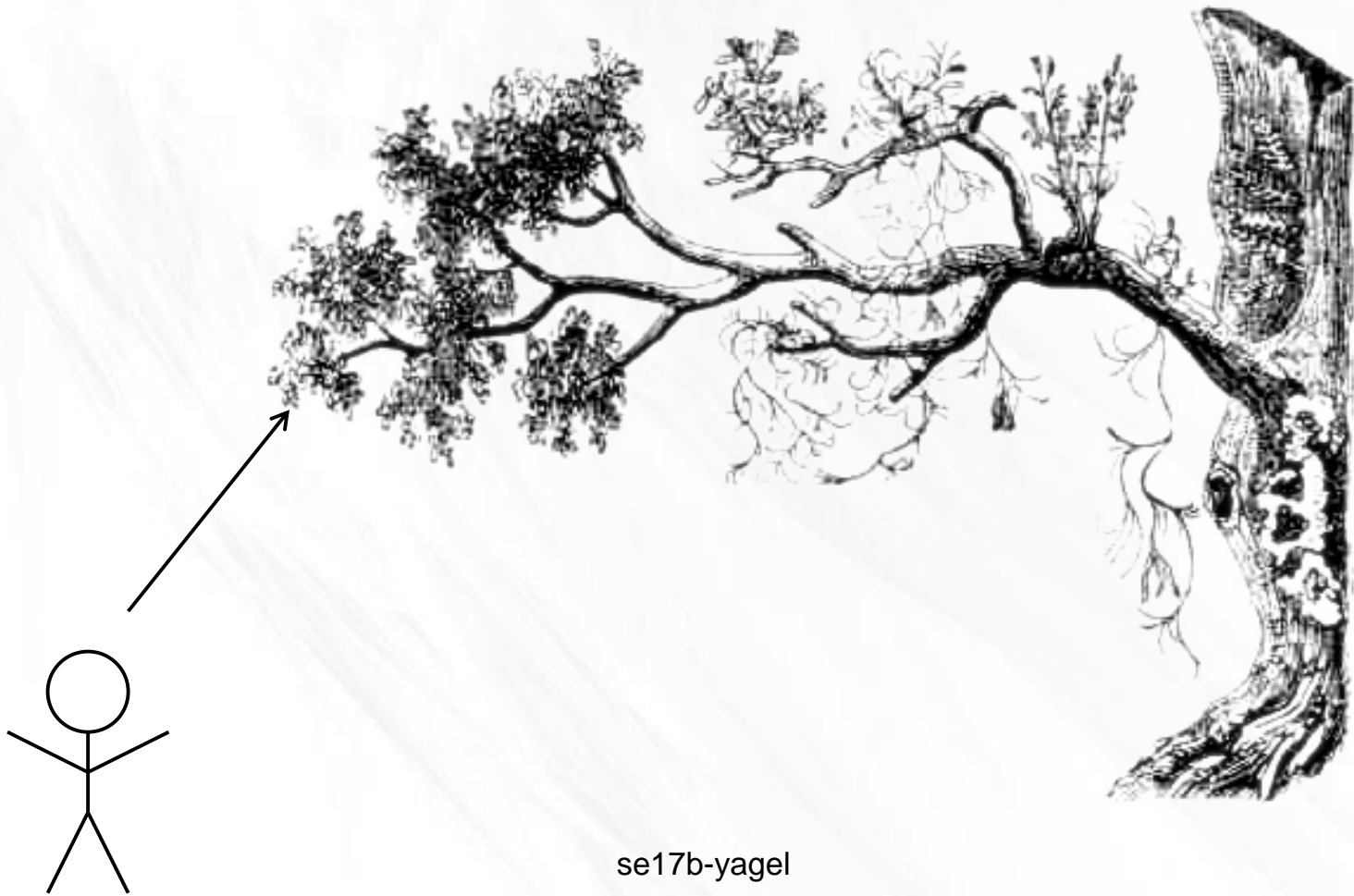


snapshot-110



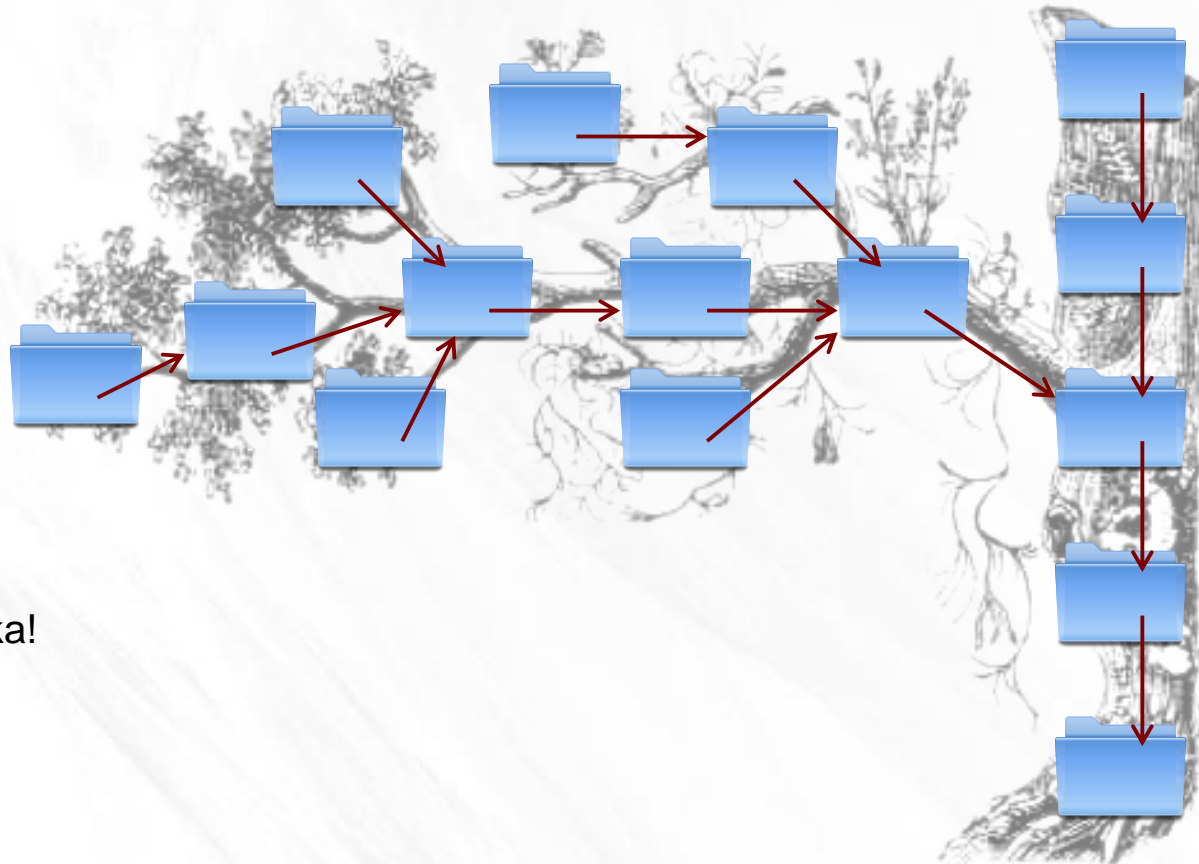
se17b-yagel

Branches

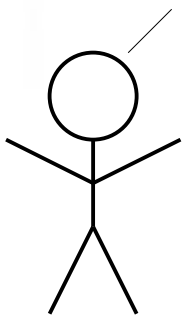


se17b-yagel

Branches

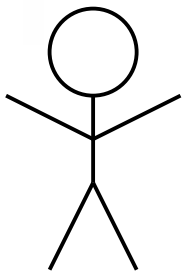
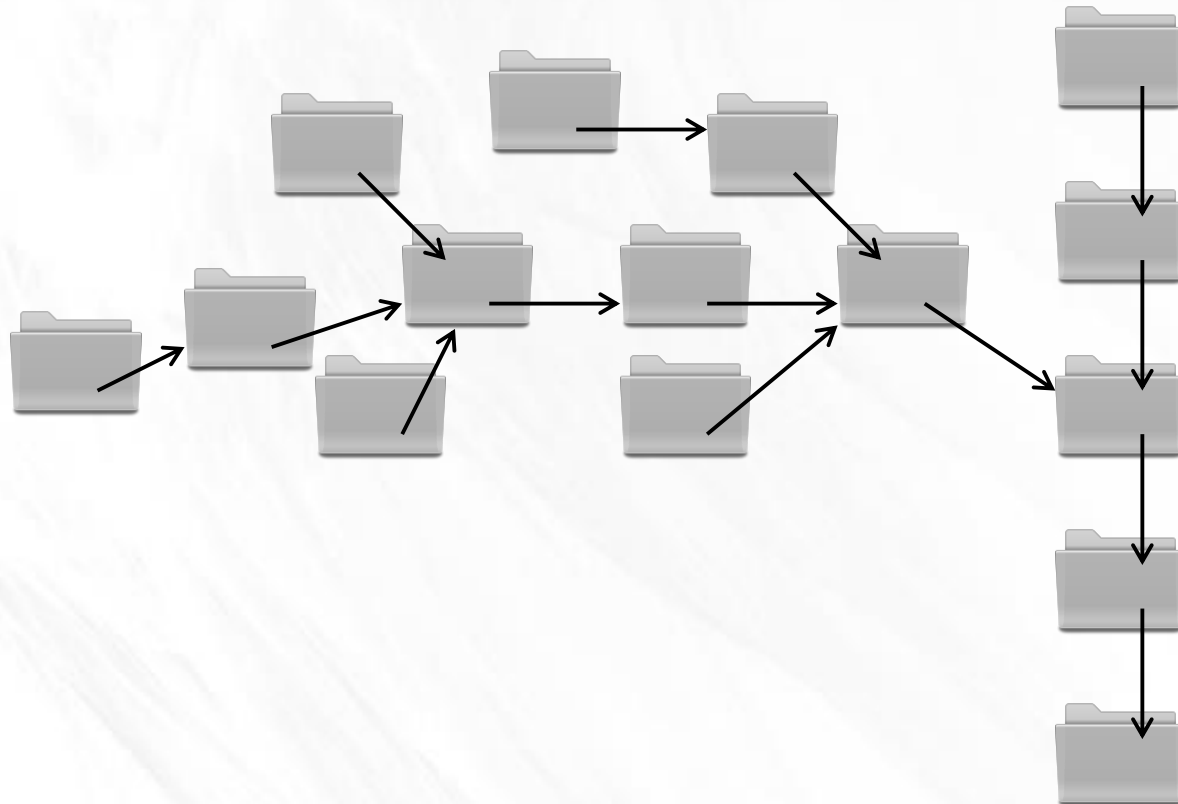


Eureka!

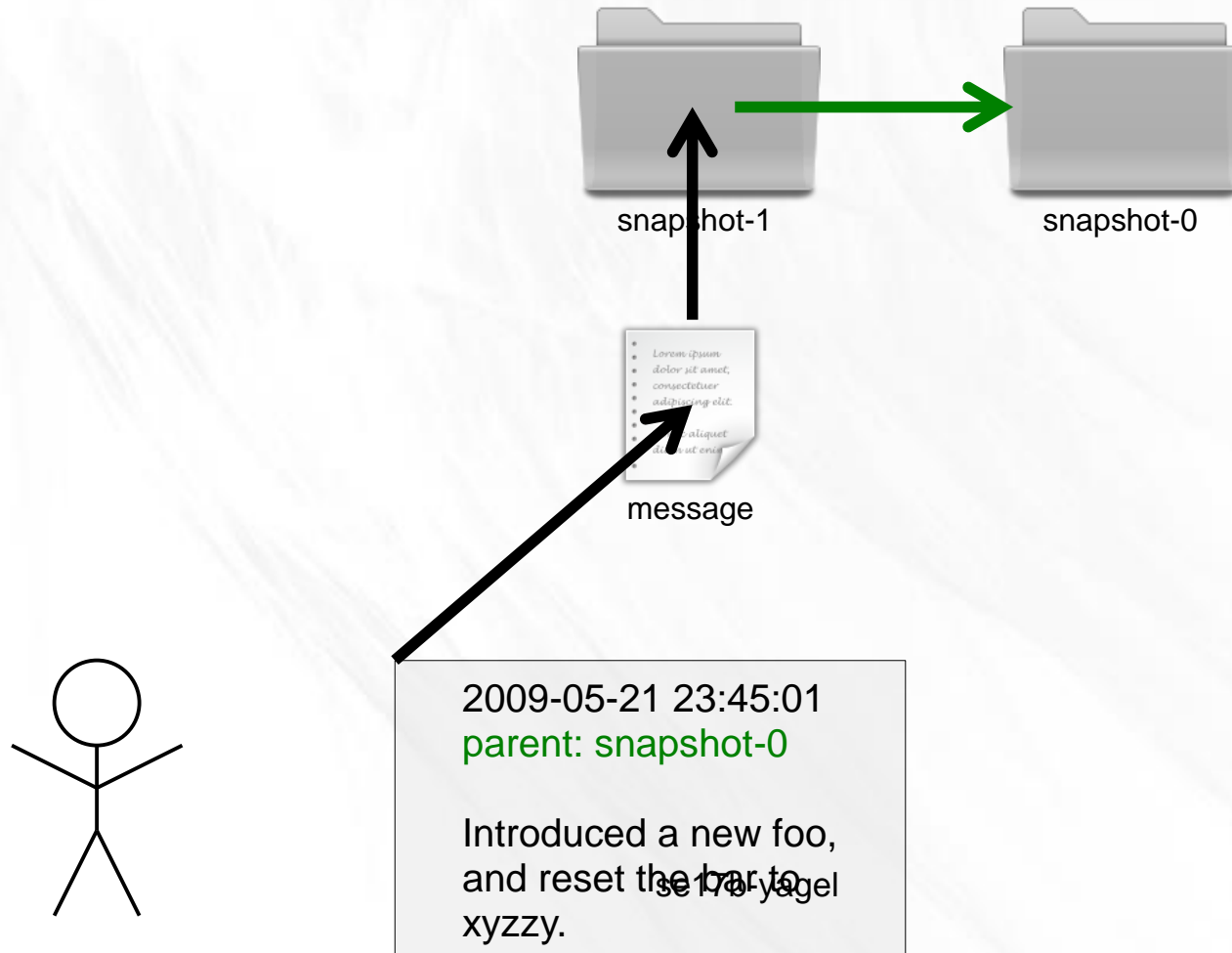


se17b-yagel

Branches



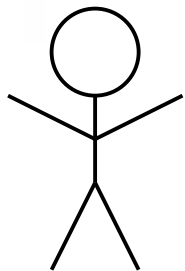
Branches



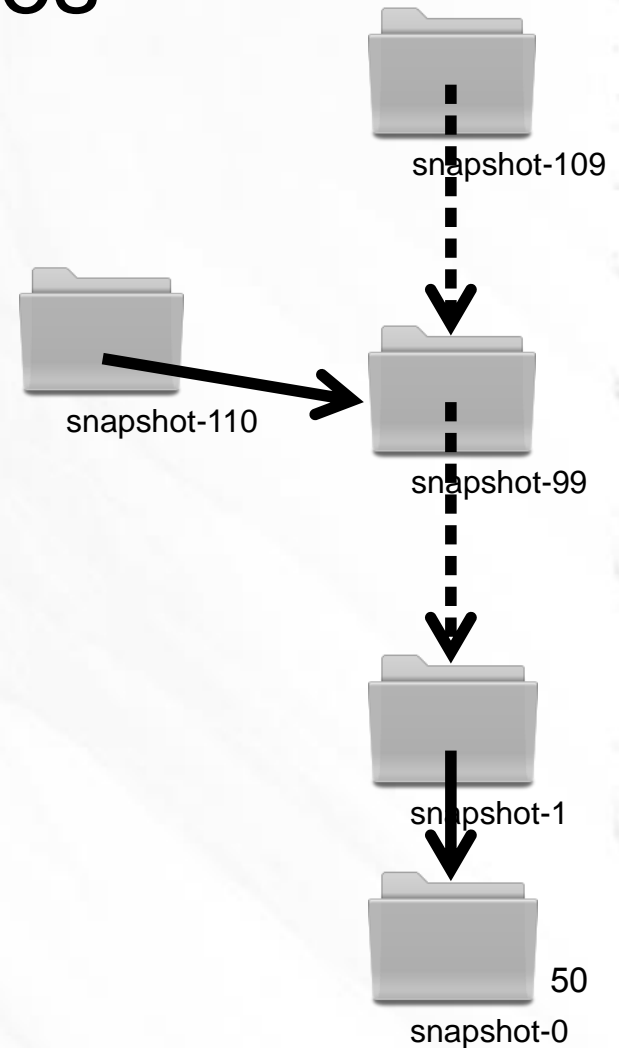
Branch Names



working



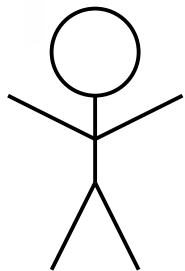
se17b-yagel



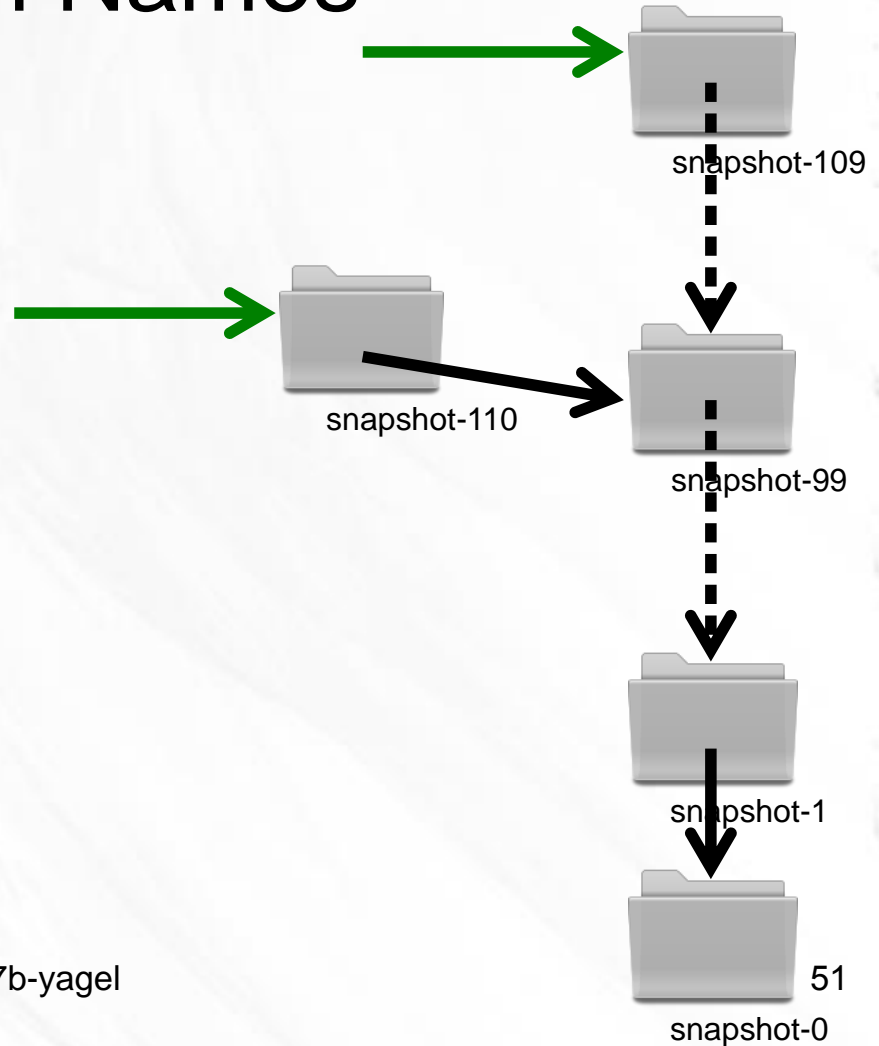
Branch Names



working



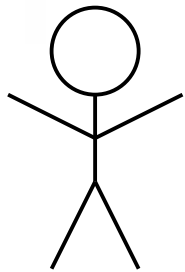
se17b-yagel



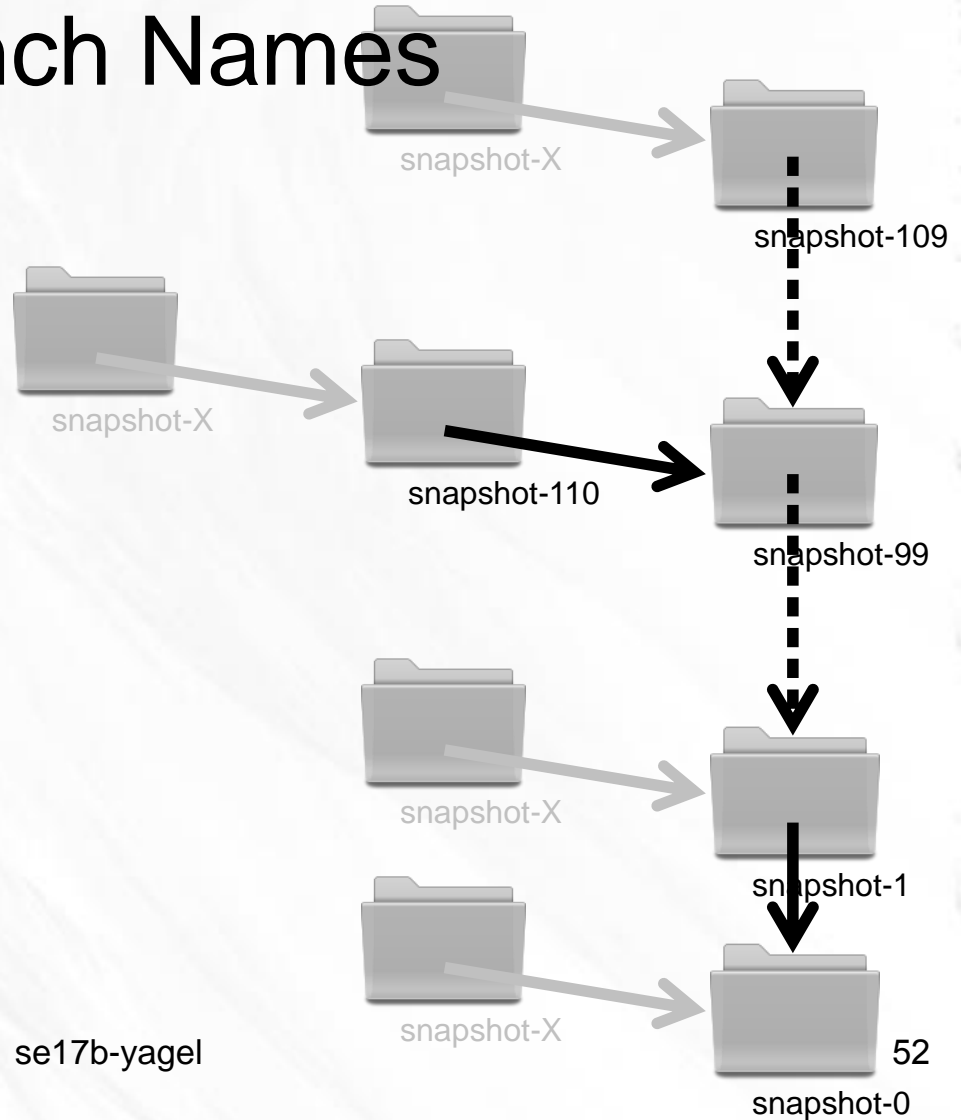
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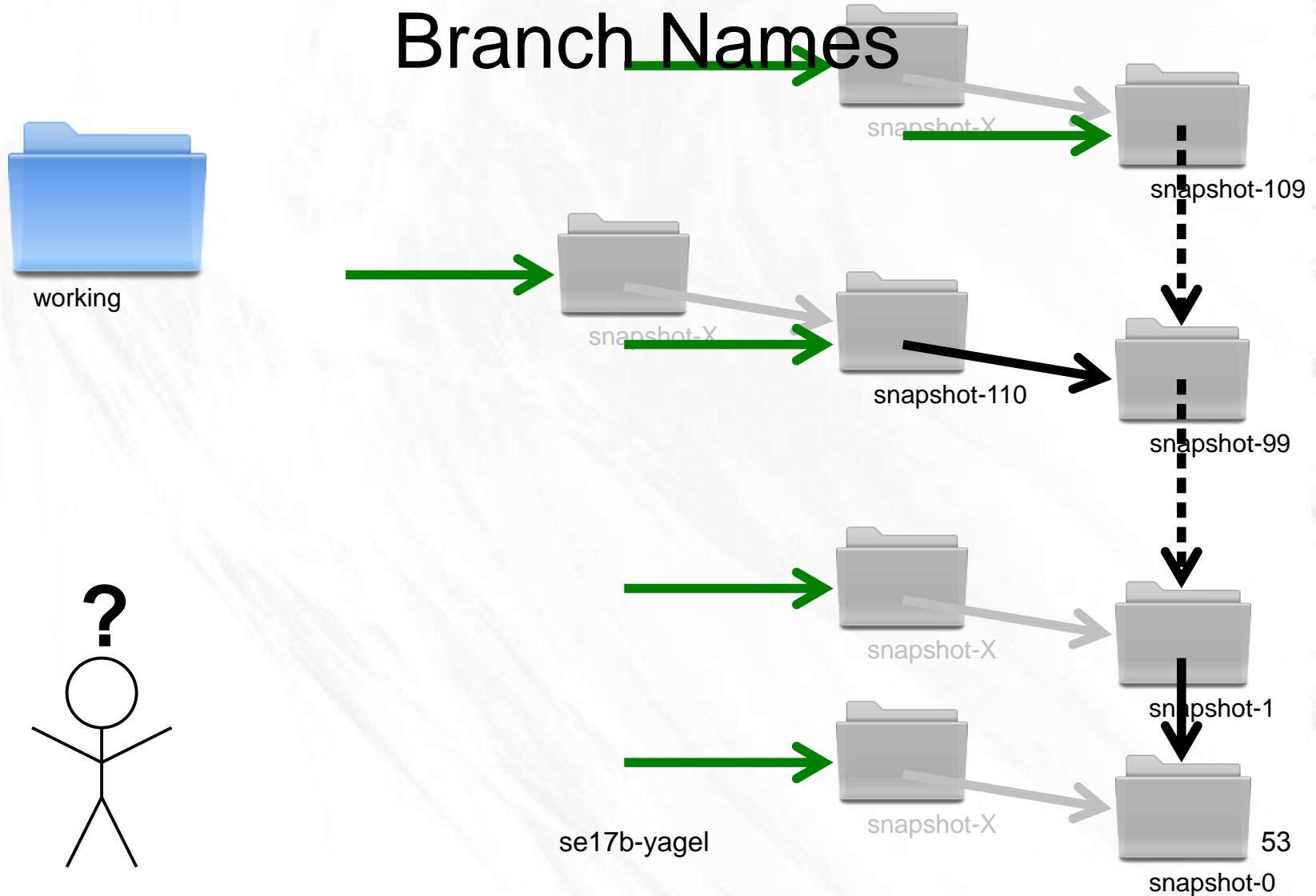
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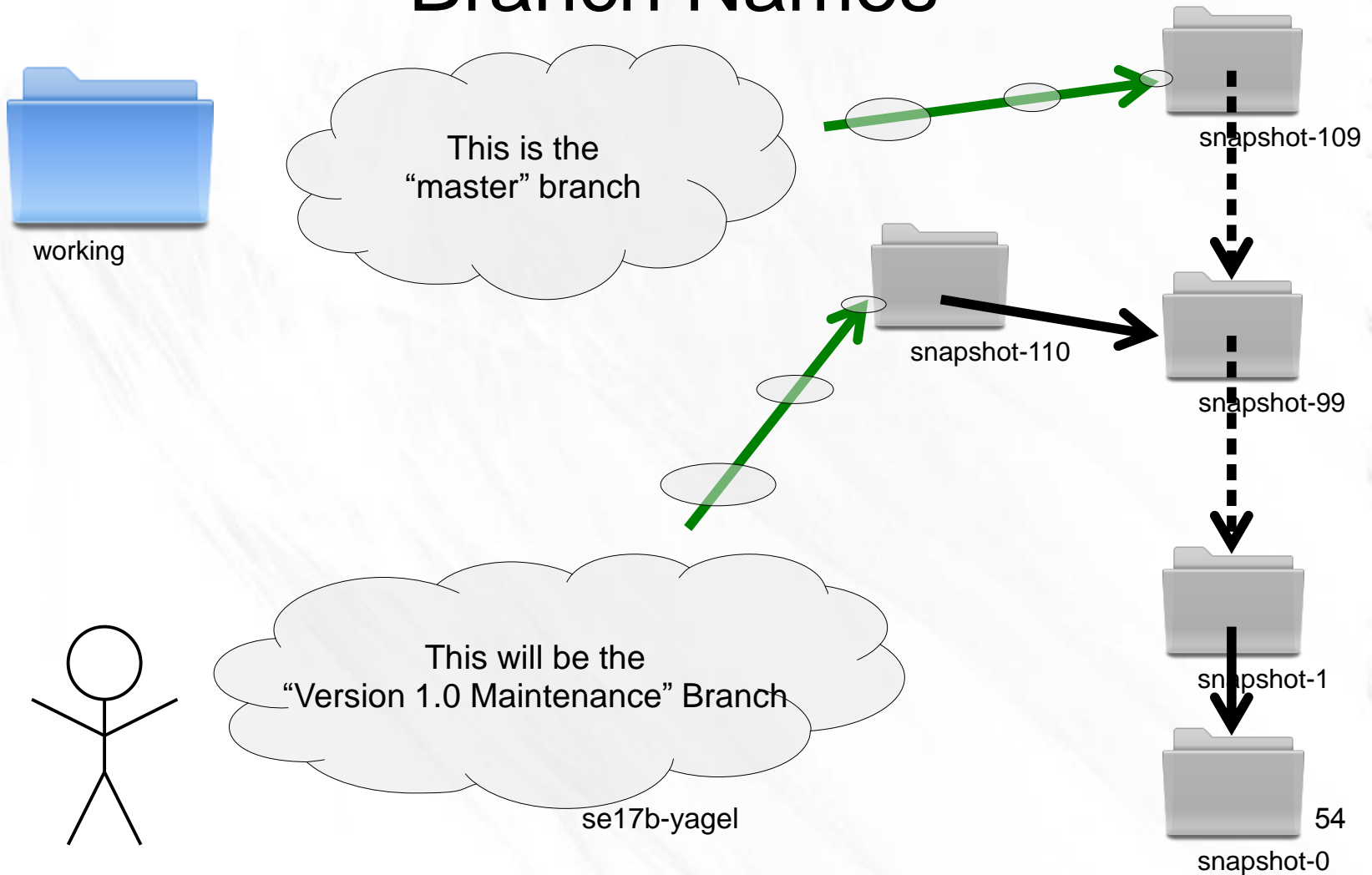
se17b-yagel



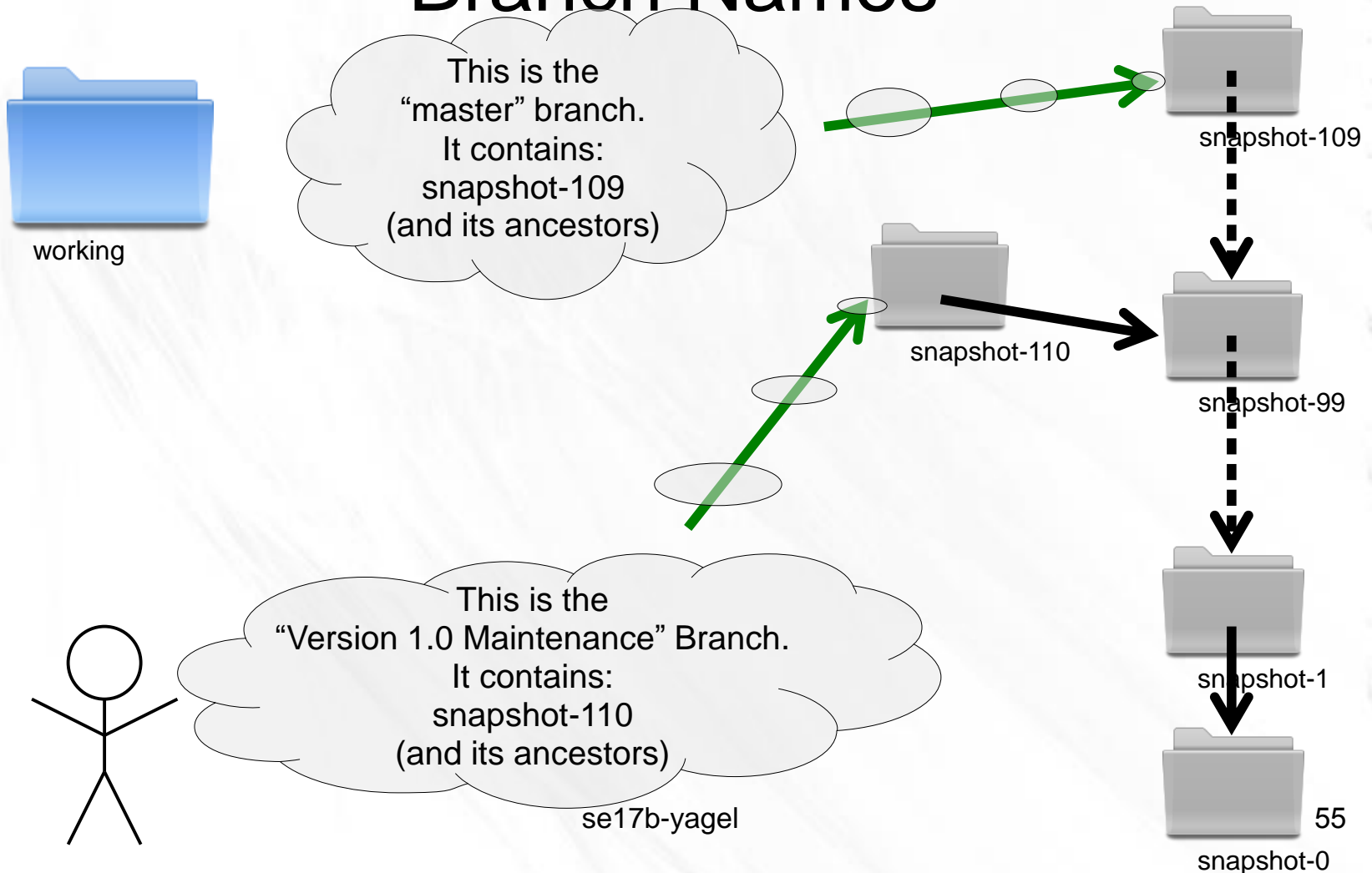
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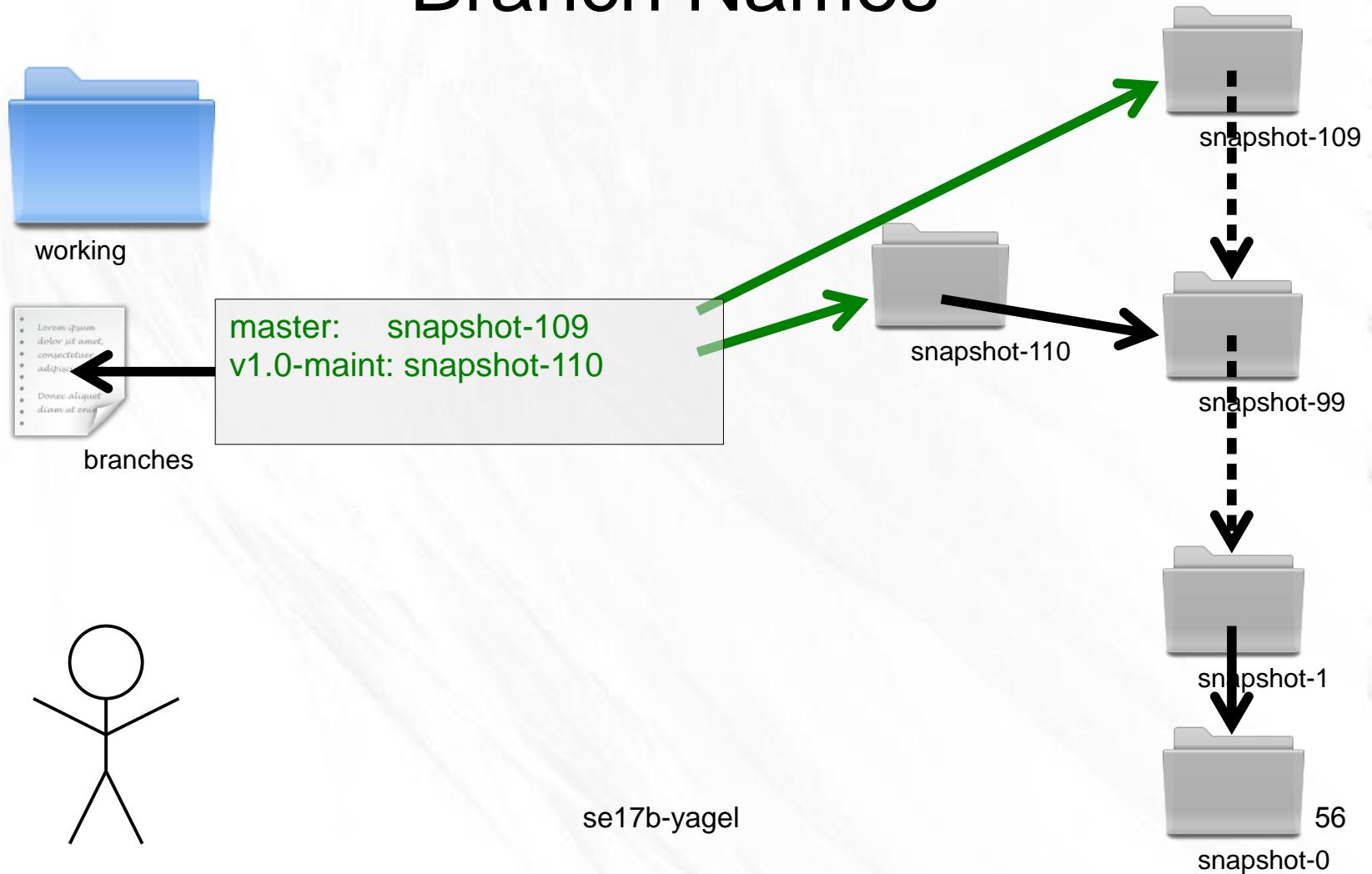
Branch Names



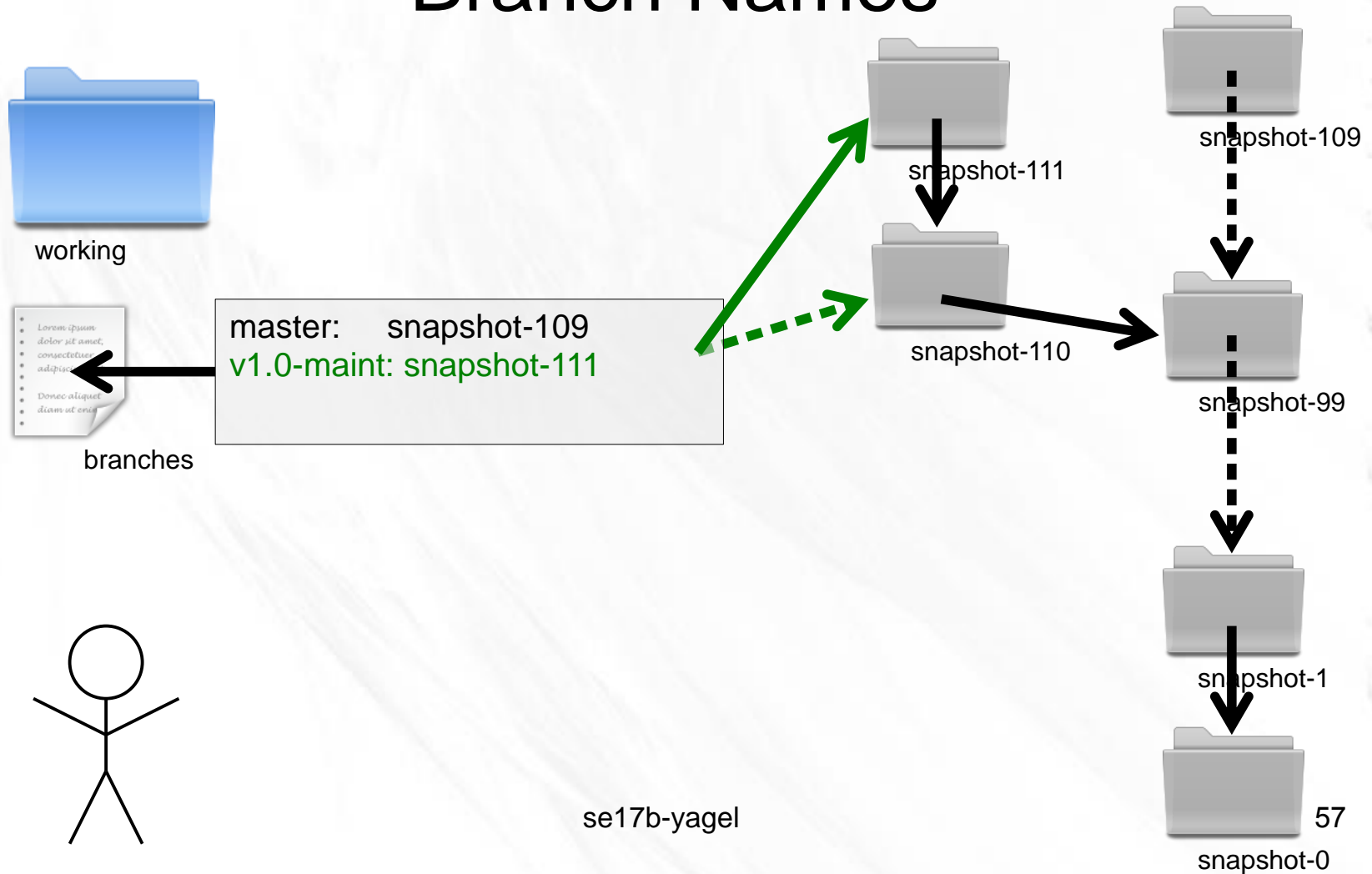
Branch Names



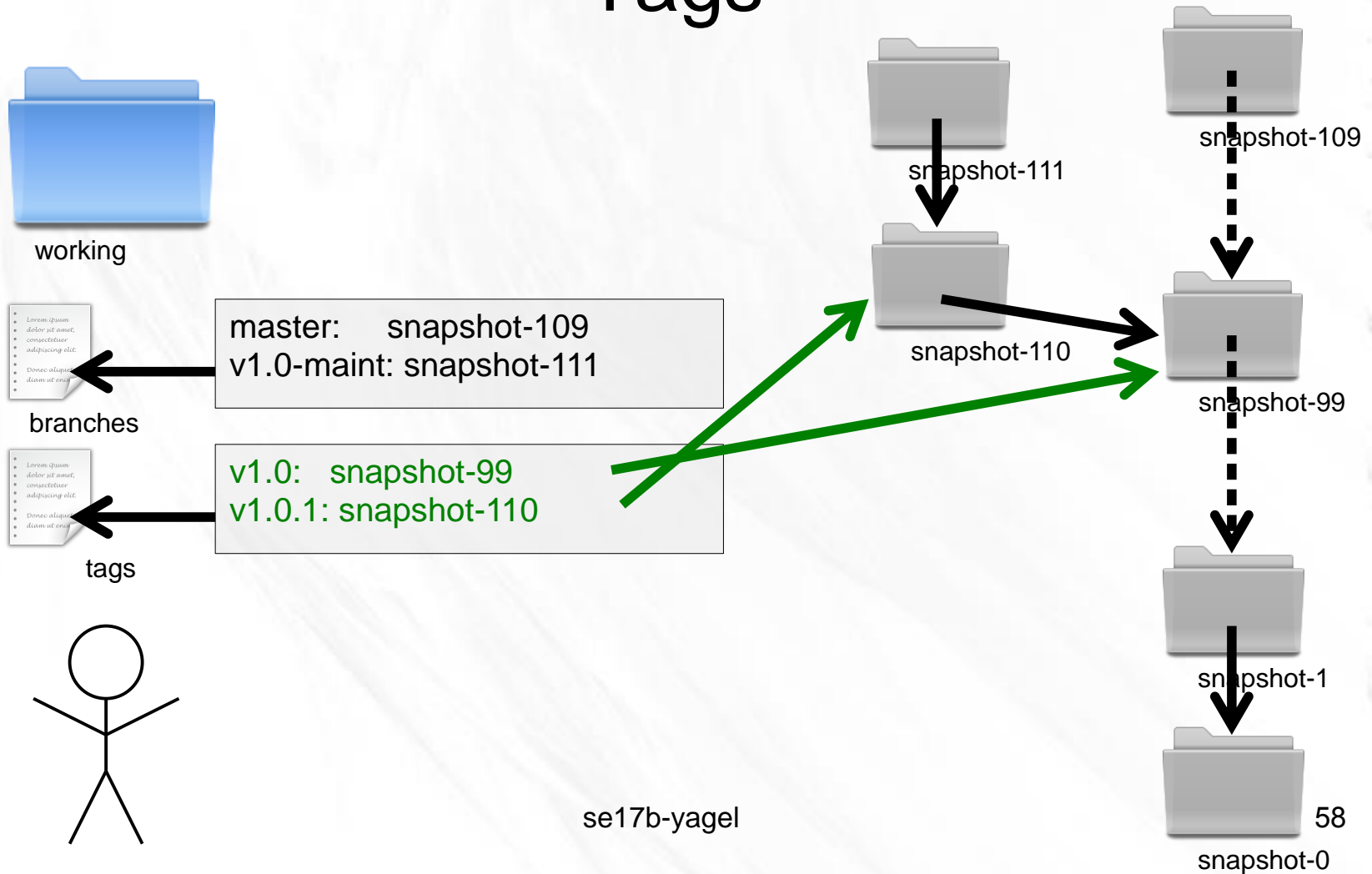
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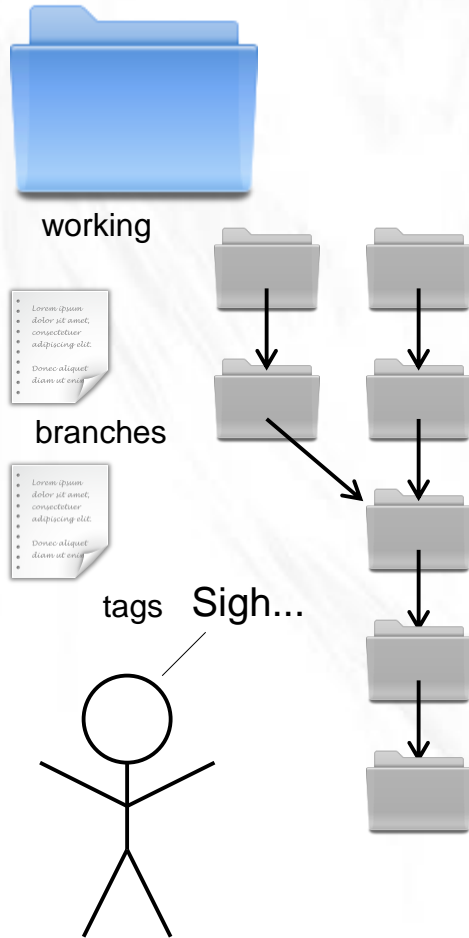
Branch Names



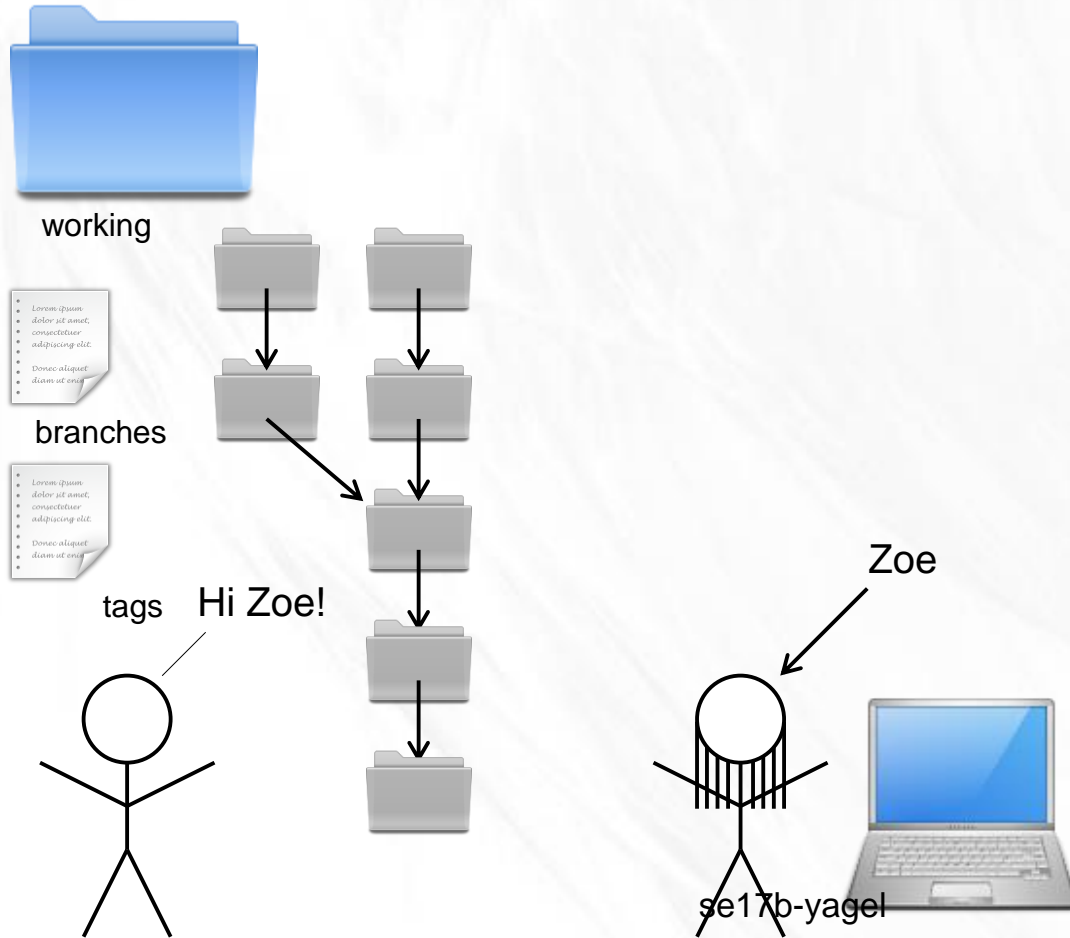
Tags



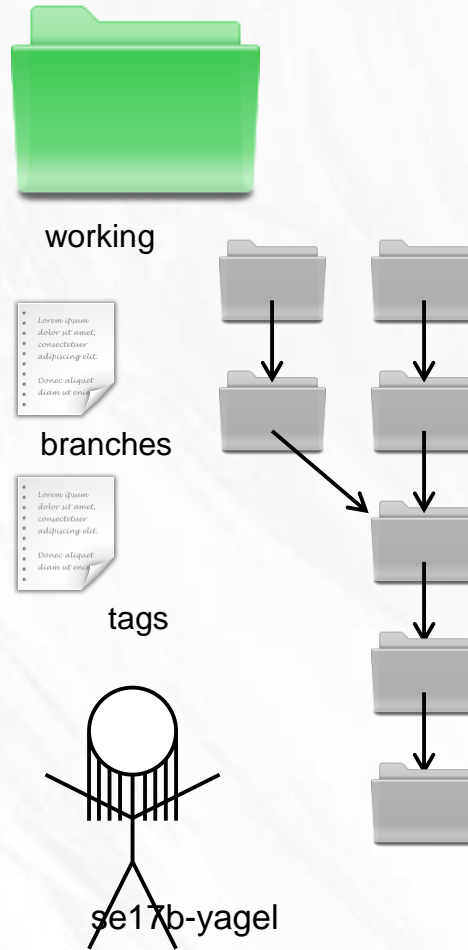
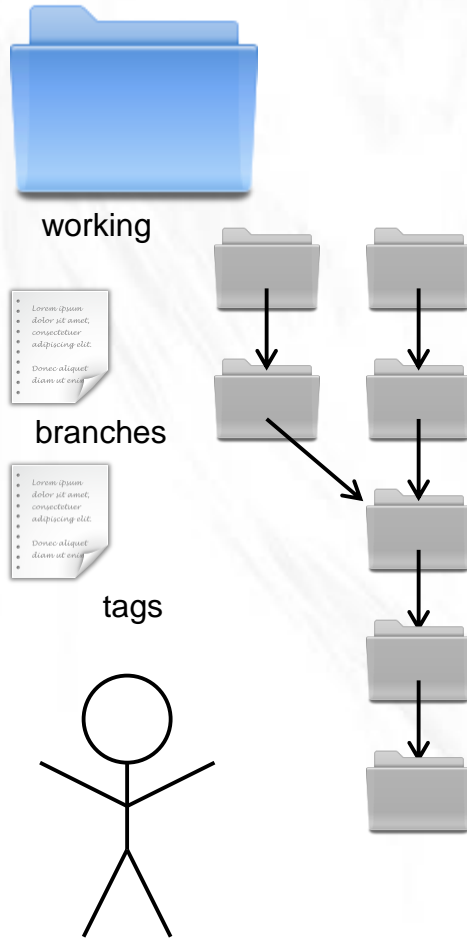
Distributed



Distributed



Distributed



Distributed



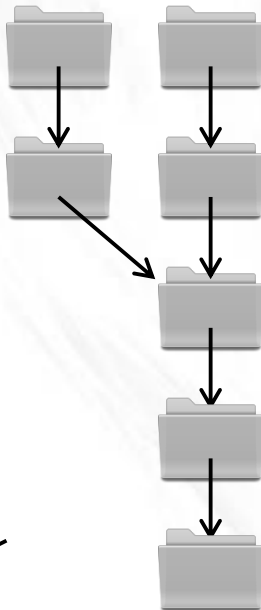
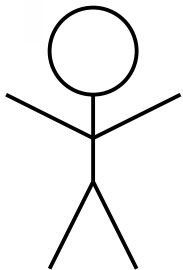
working



branches



tags



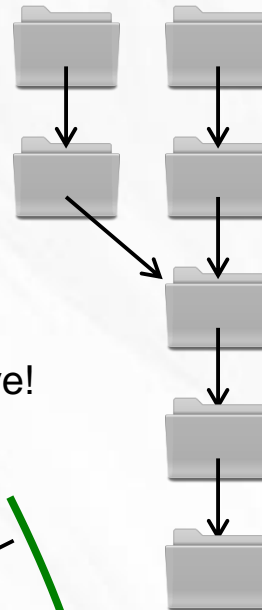
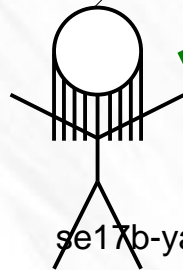
working



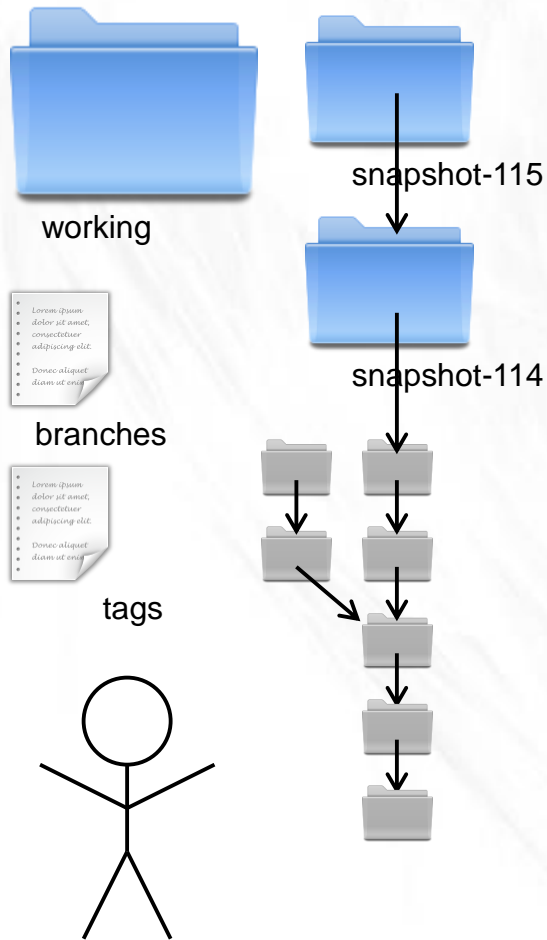
branches



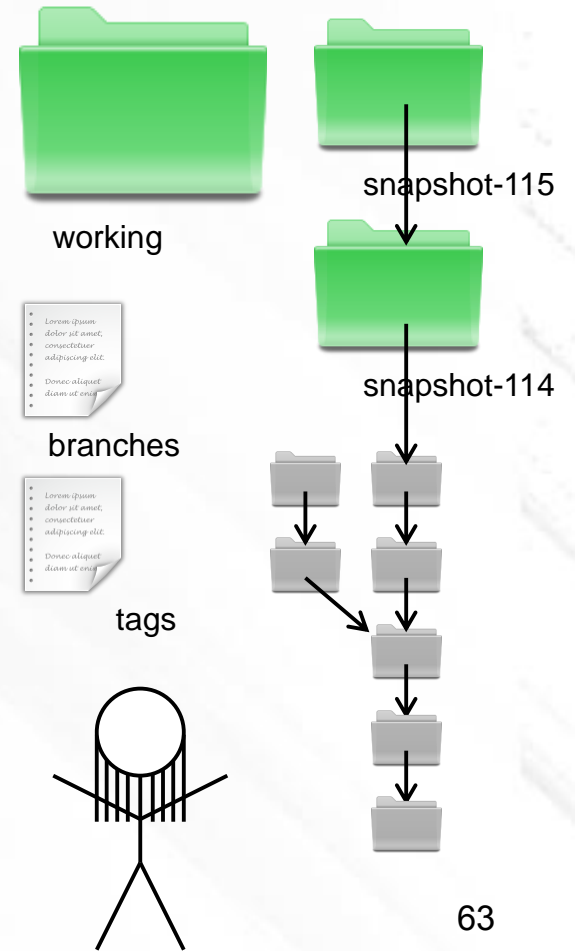
tags



Distributed



se17b-yagel

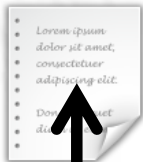


63

Distributed



snapshot-114



message

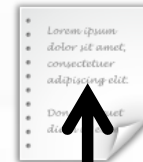
2009-05-22 12:12:12
parent: snapshot-113
author: Me <me@me.me>

Blarfle, a cool new
feature; extends the
existing blog.

se17b-yagel



snapshot-114

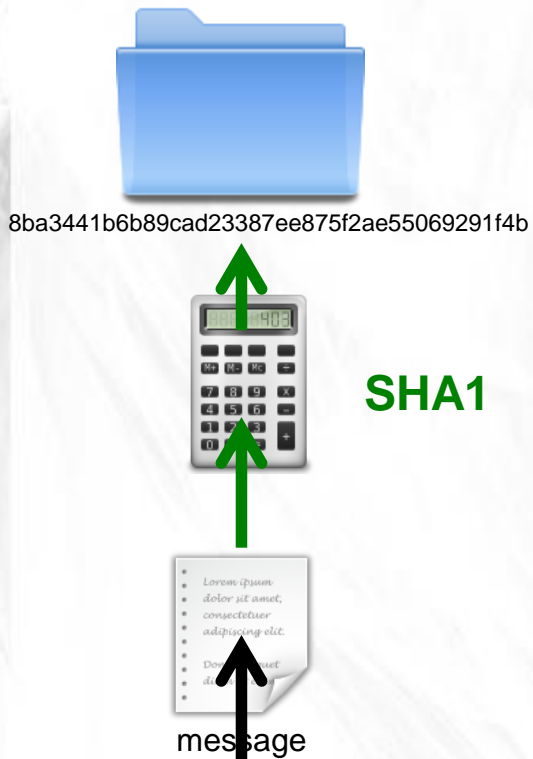


message

2009-05-21 23:45:01
parent: snapshot-113
author: Zoe <zoe@z.oe>

Introduced a new foo,
and reset the bar to 64
xyzyy.

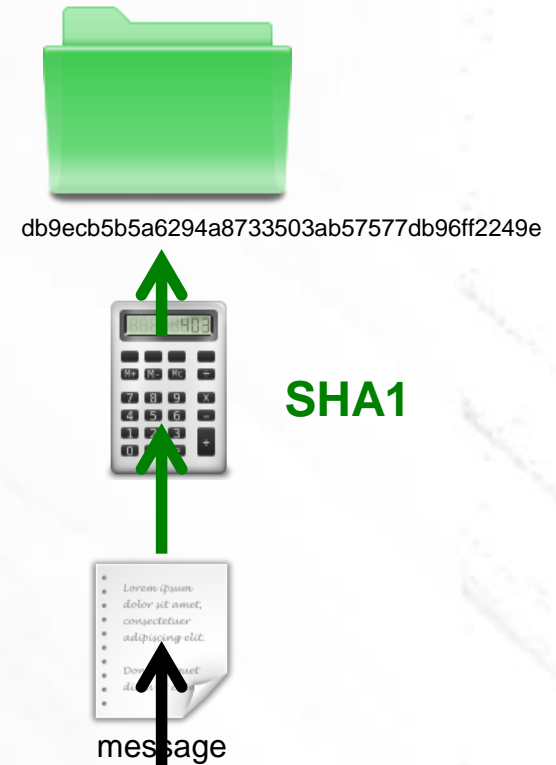
Distributed



2009-05-22 12:12:12
parent: snapshot-113
author: Me <me@me.me>

Blarfle, a cool new
feature; extends the
existing blog.

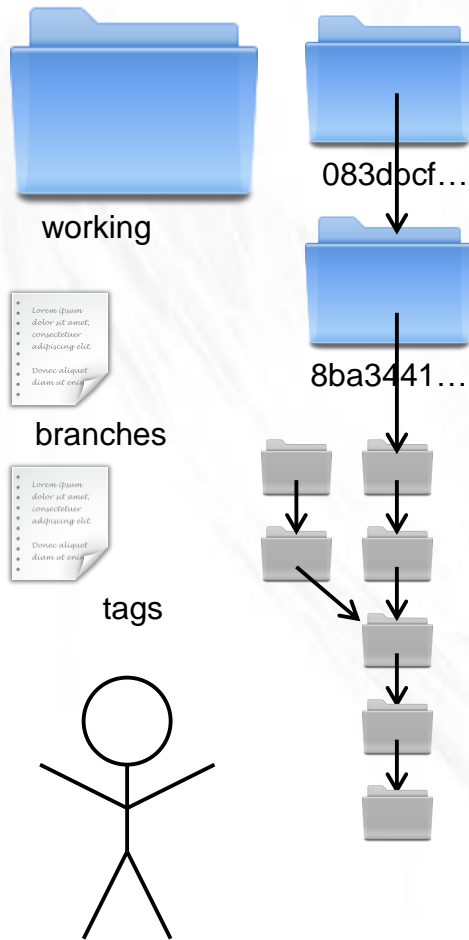
se17b-yagel



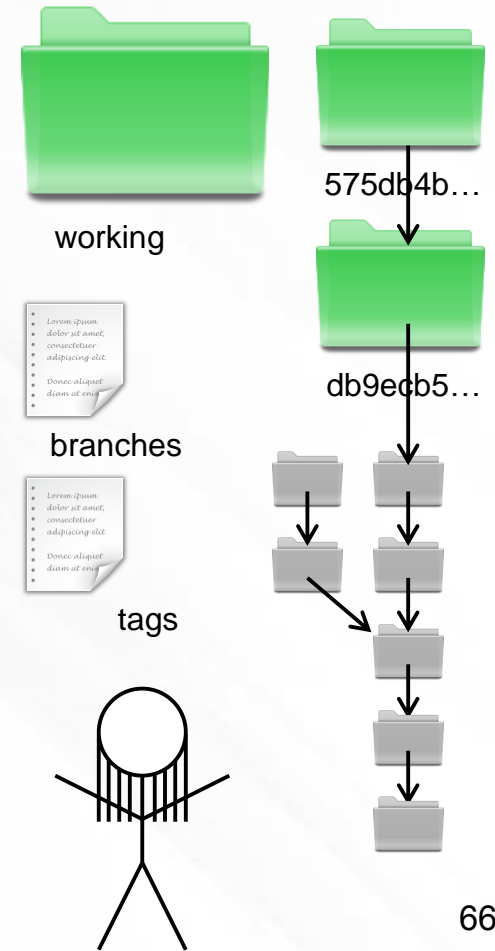
2009-05-21 23:45:01
parent: snapshot-113
author: Zoe <zoe@z.oe>

Introduced a new foo, 65
and reset the bar to
xyzyz.

Distributed

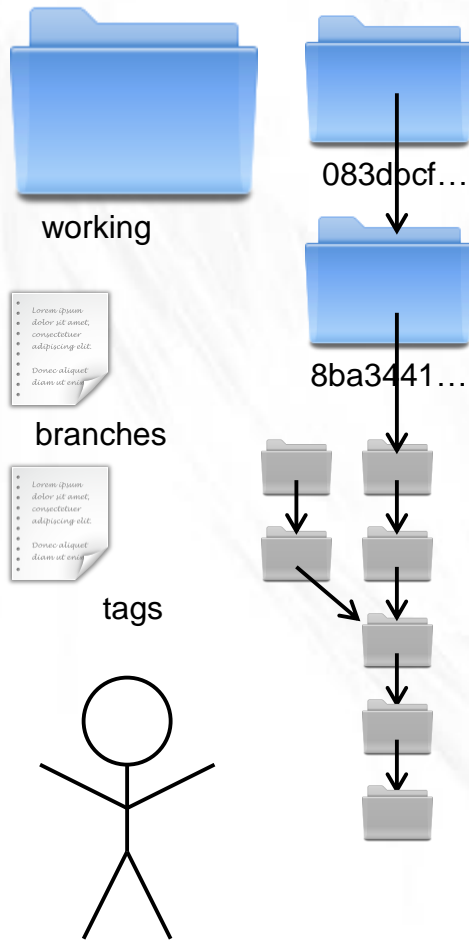


se17b-yagel

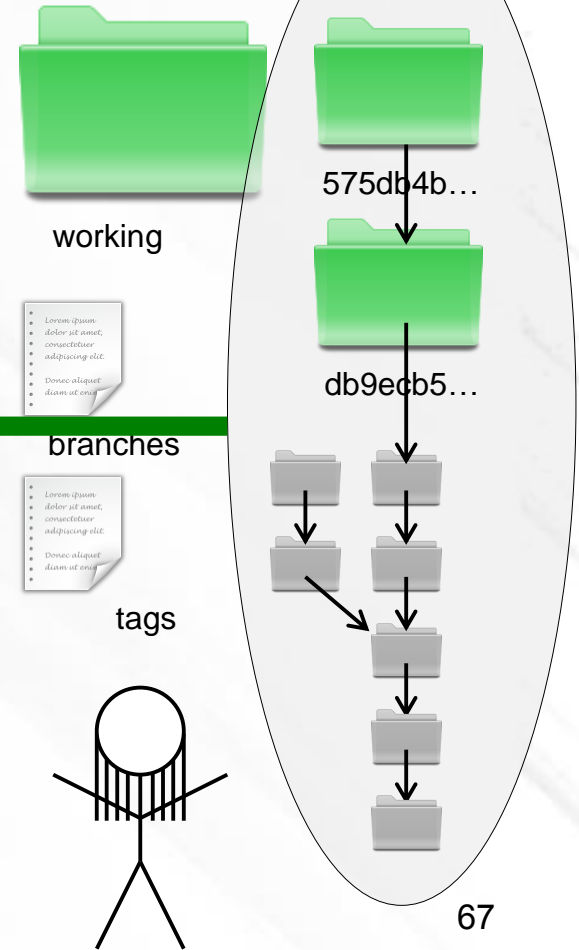
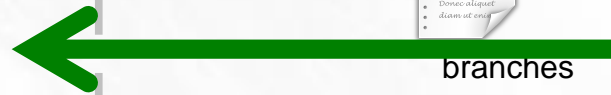


66

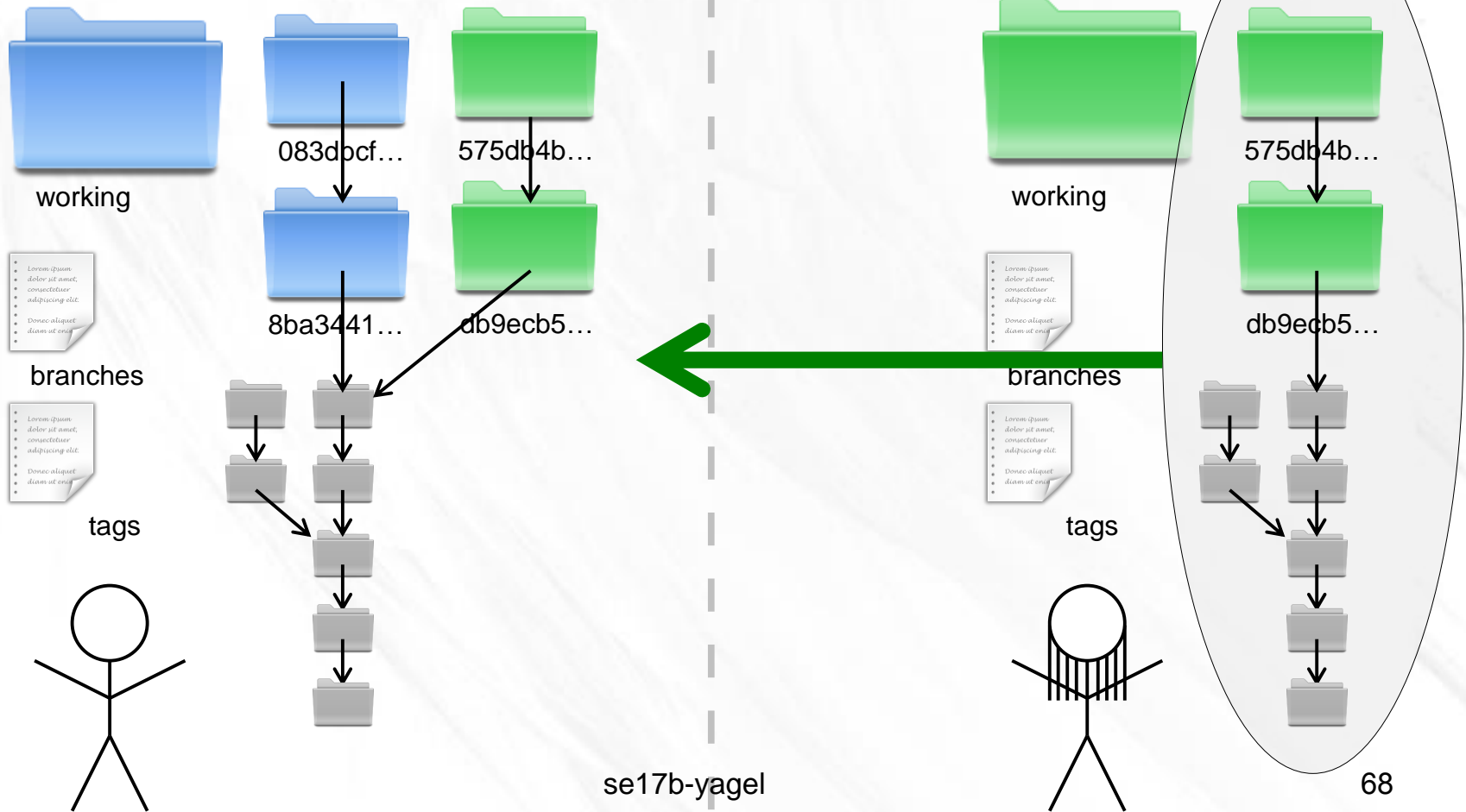
Distributed



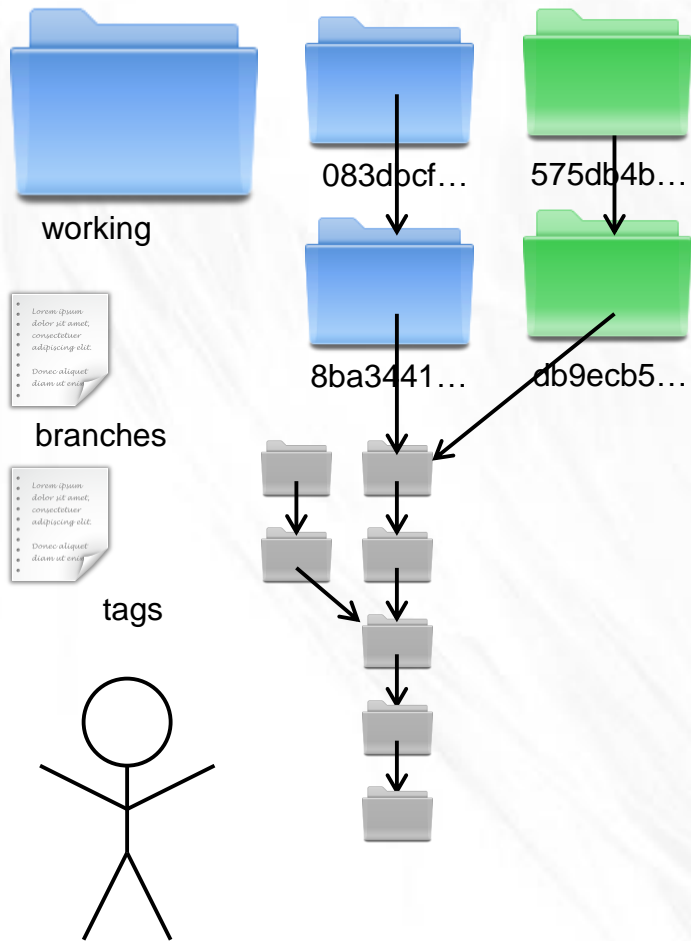
?



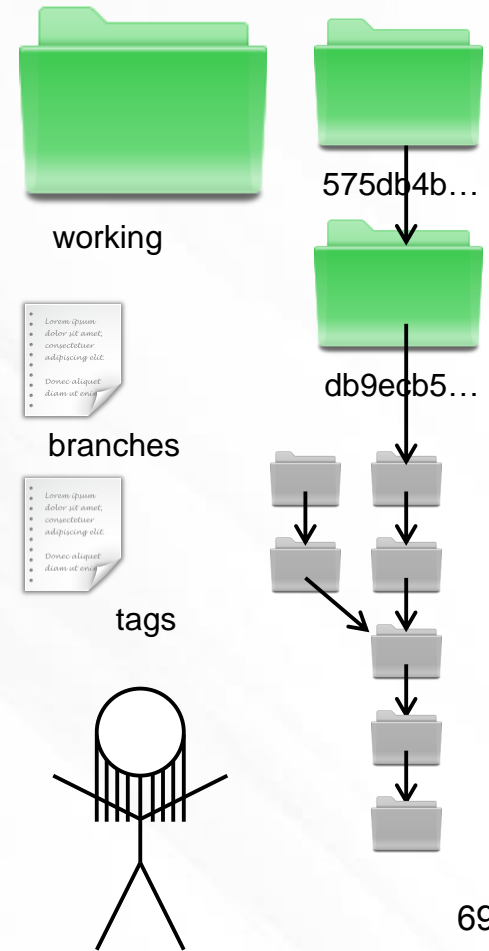
Distributed



Distributed

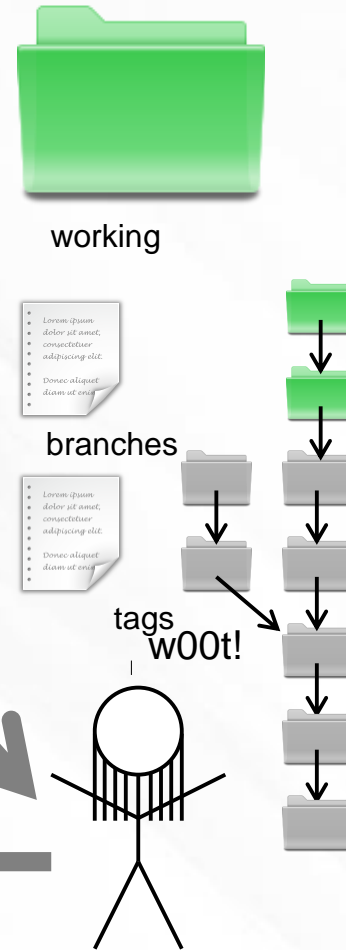
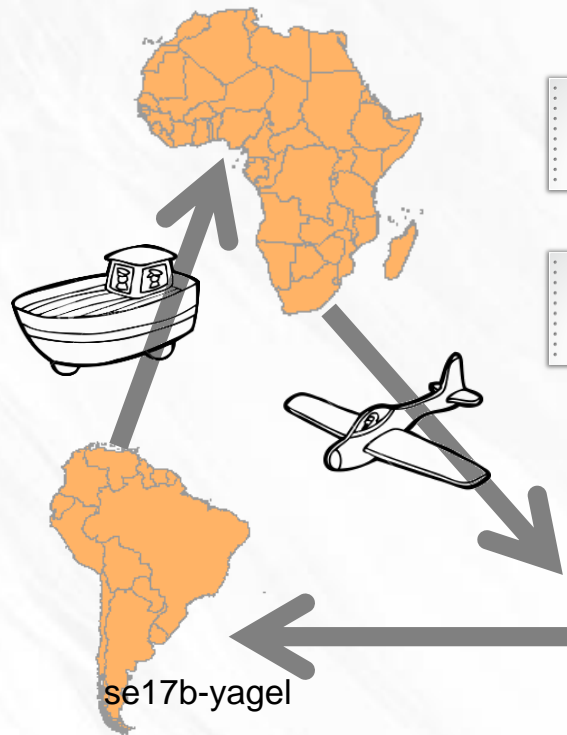
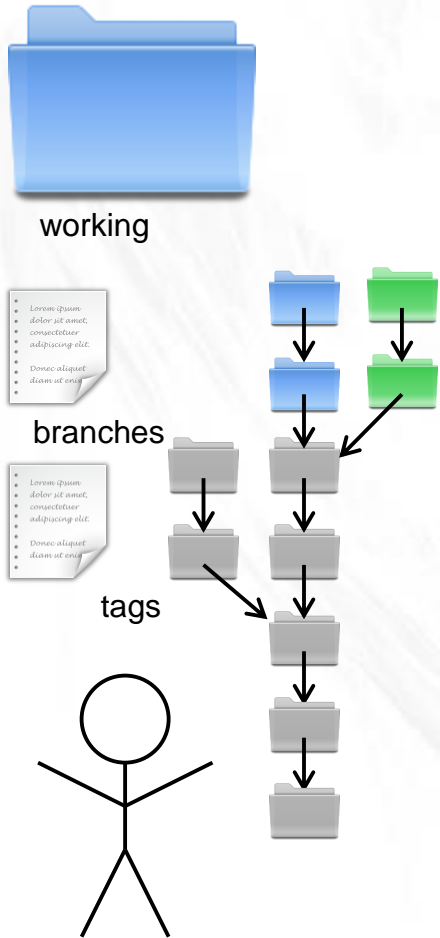


se17b-yagel

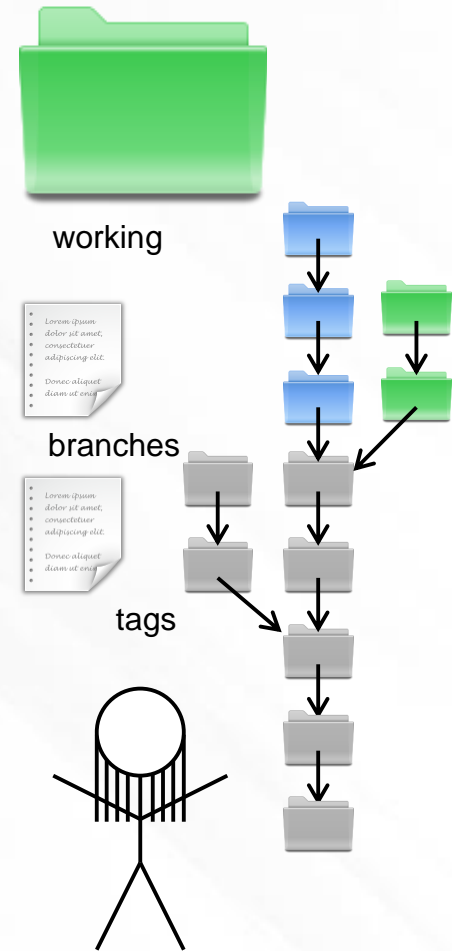
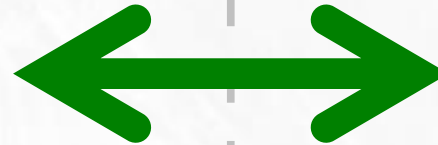
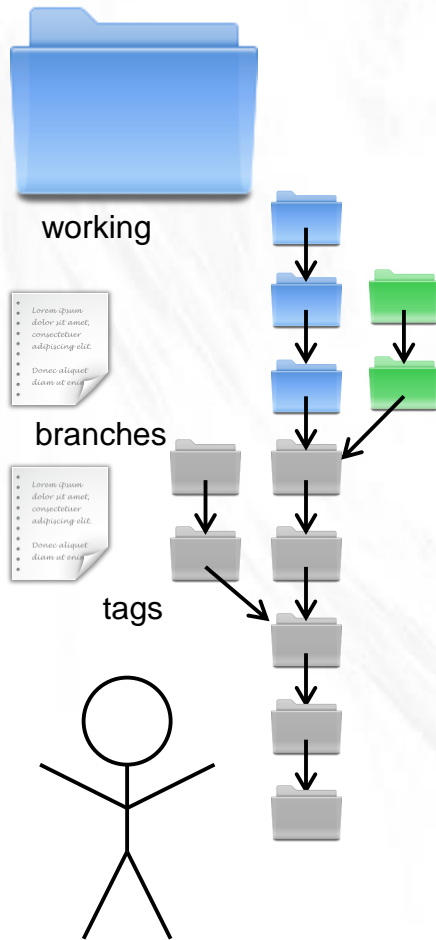


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Offline



Offline



se17b-yagel

(simpler drawings)

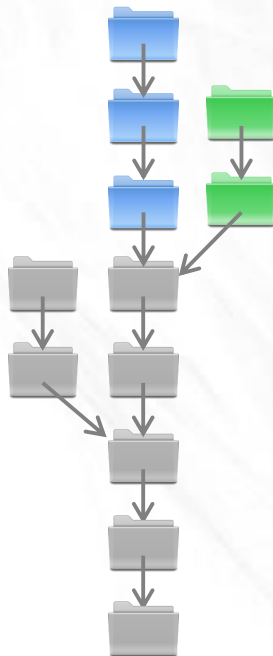
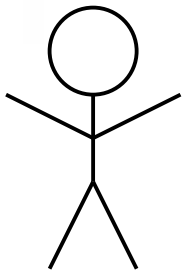
working



branches



tags



se17b-yagel

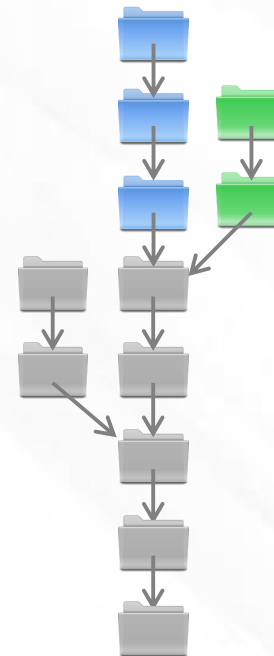
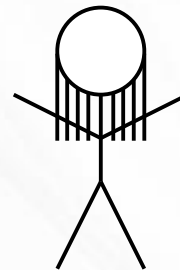
working



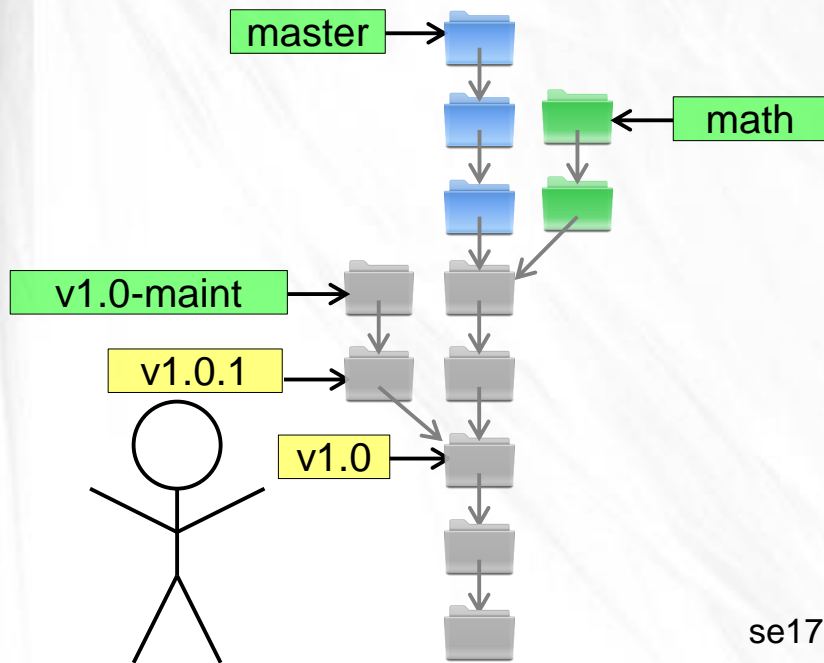
branches



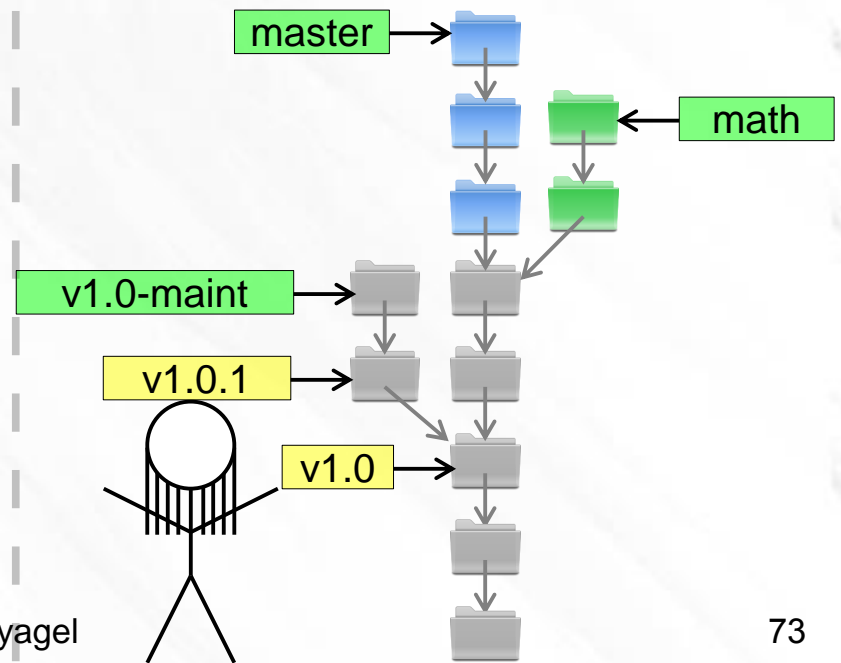
tags



(simpler drawings)

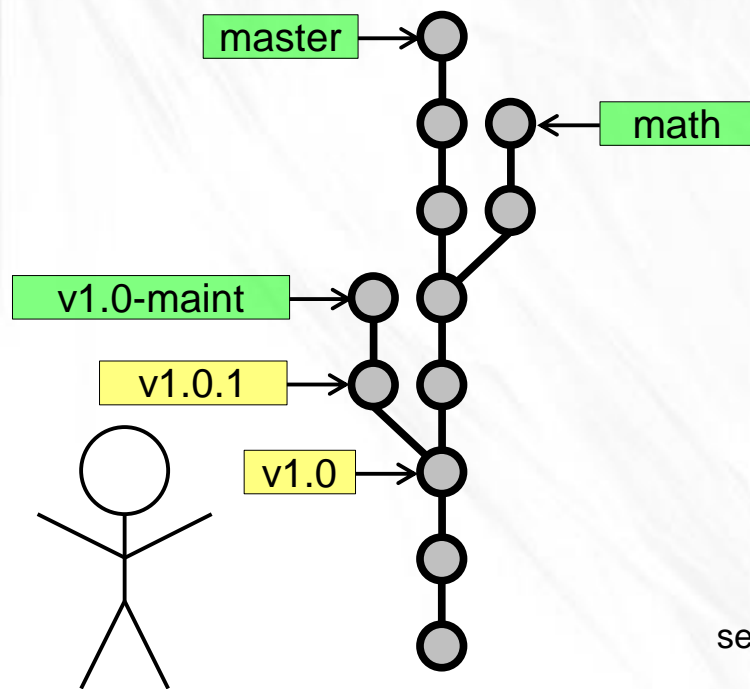


se17b-yagel

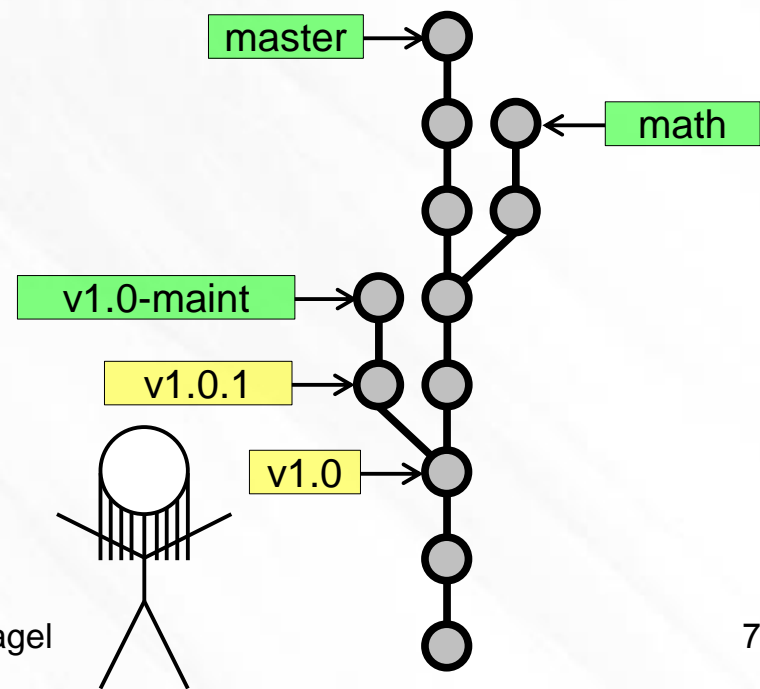


73

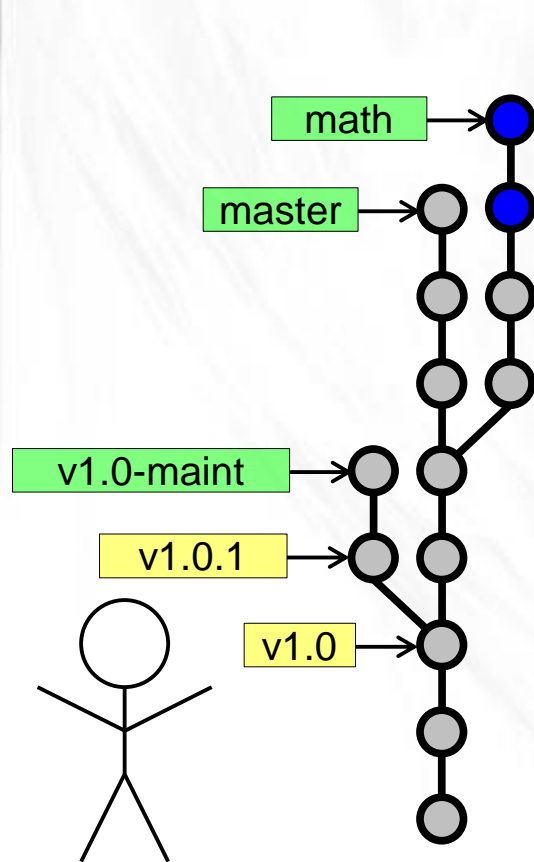
(simpler drawings)



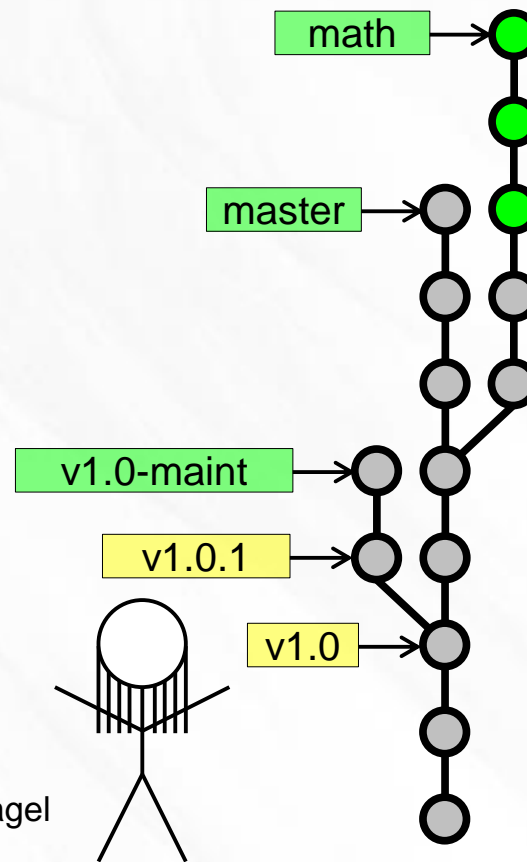
se17b-yagel



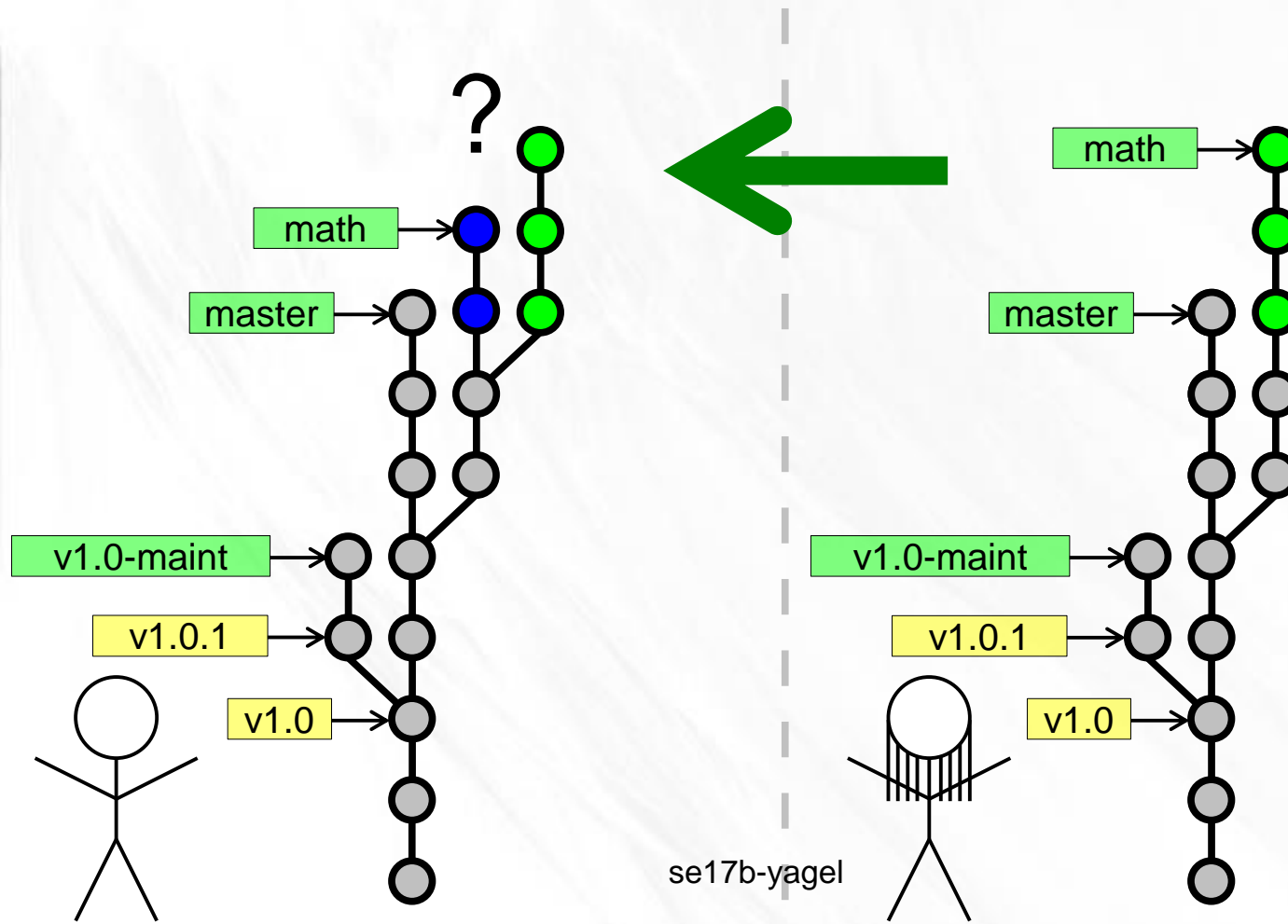
Merges



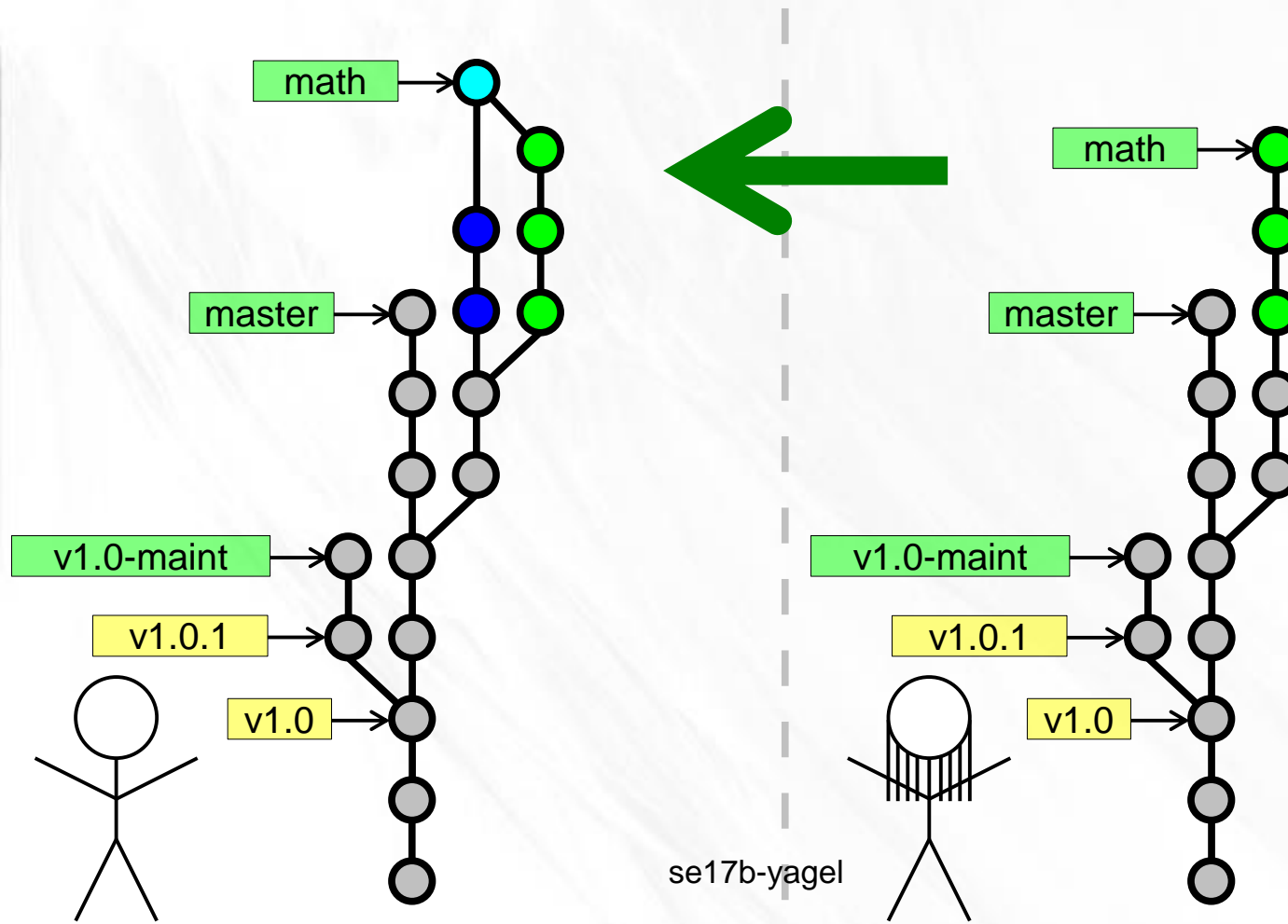
se17b-yagel



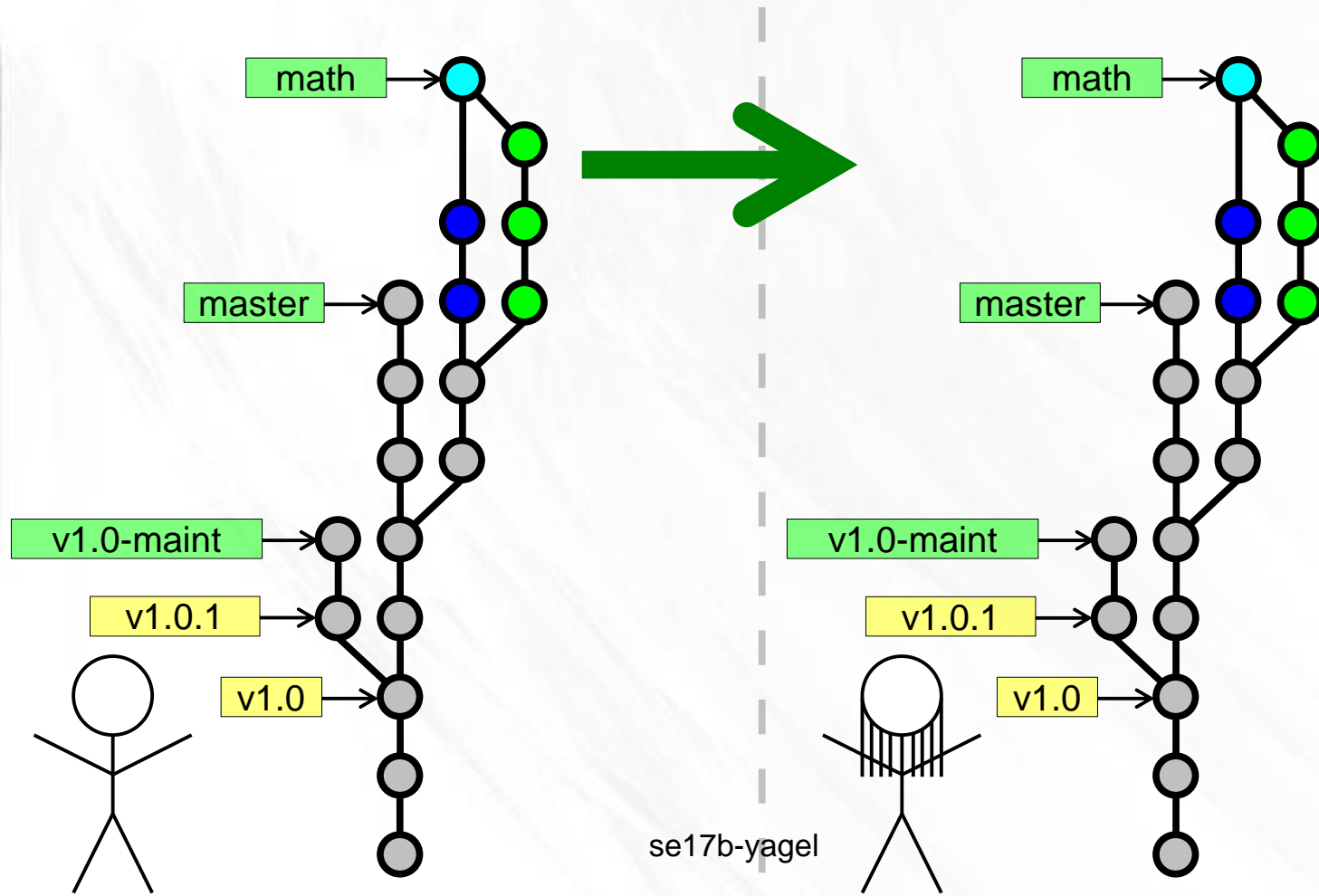
Merges



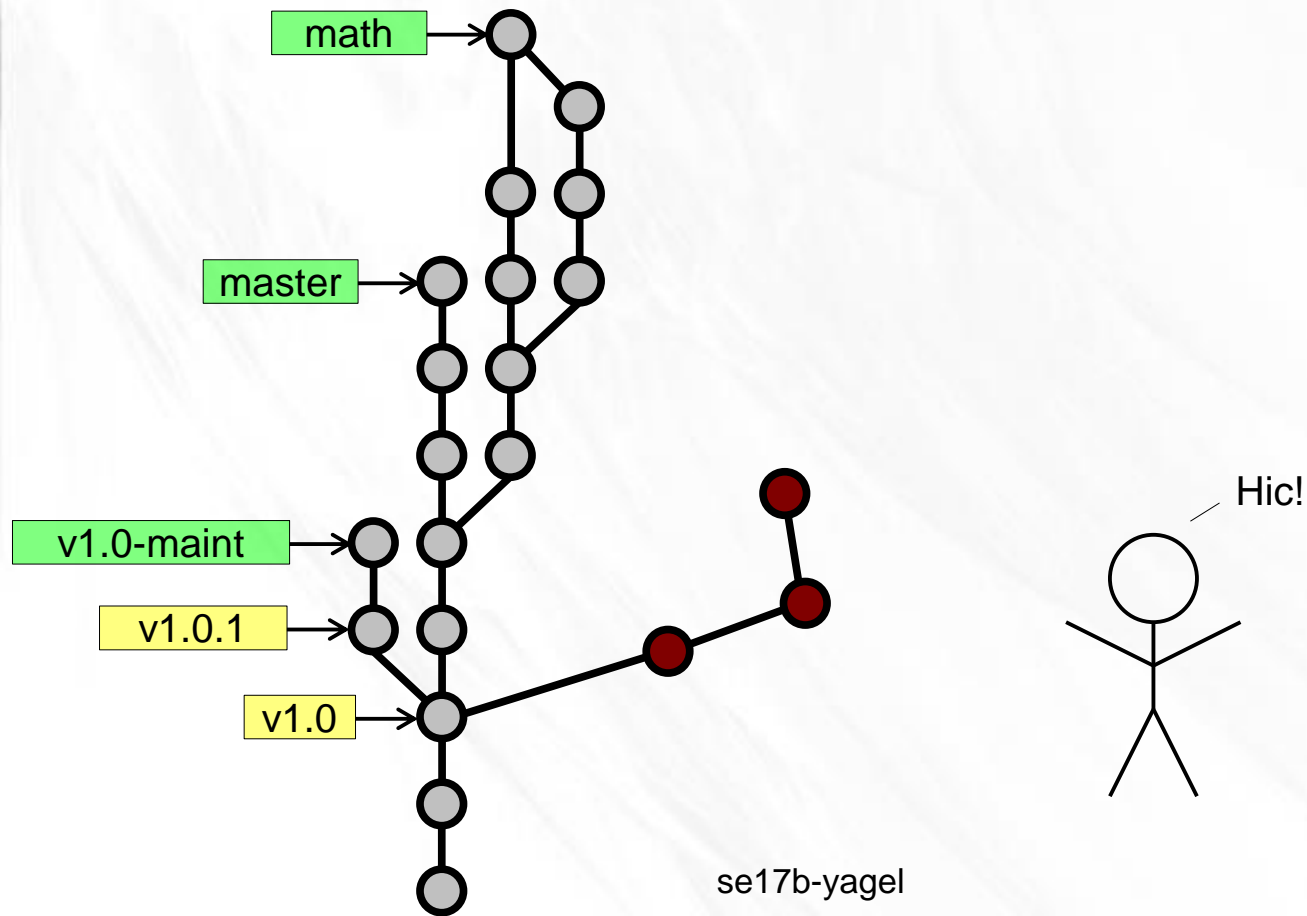
Merges



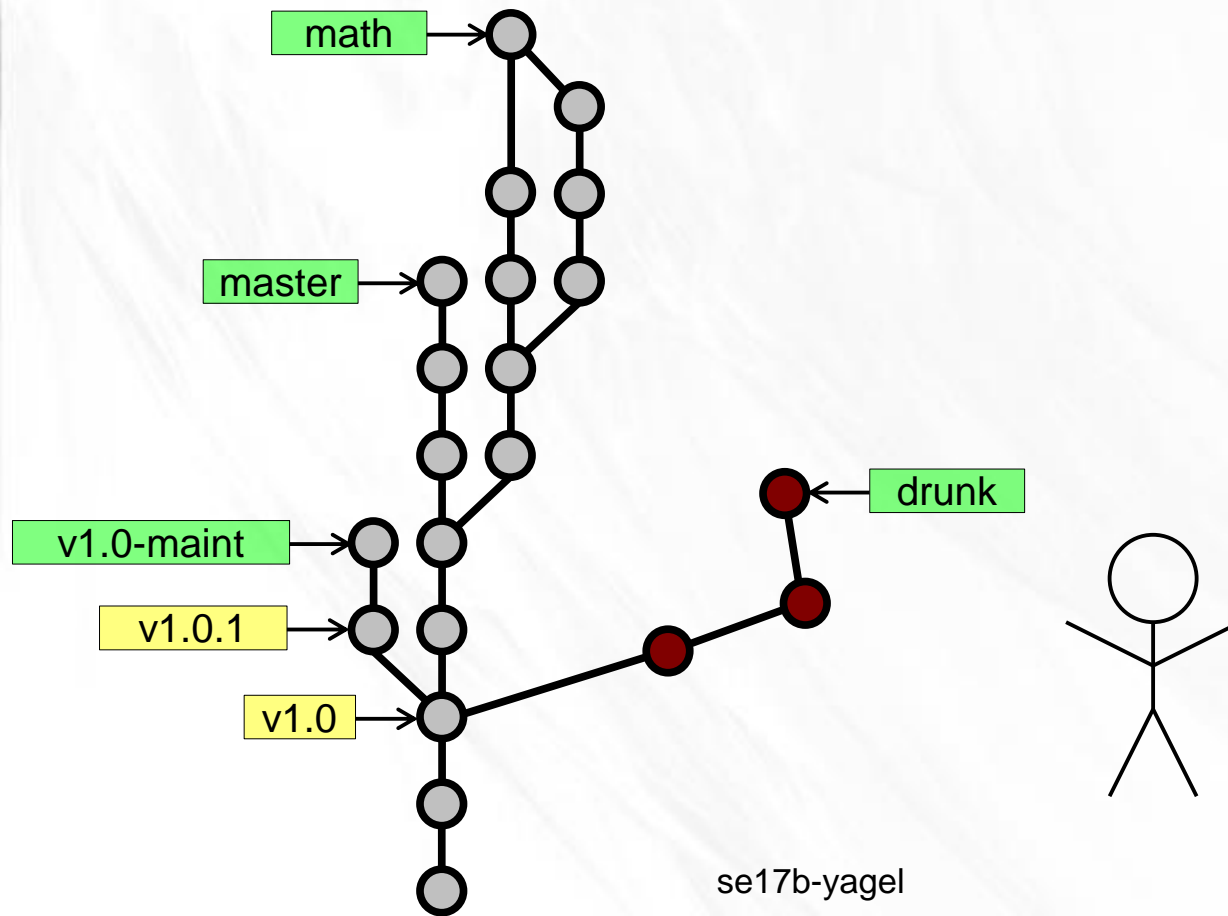
Merges



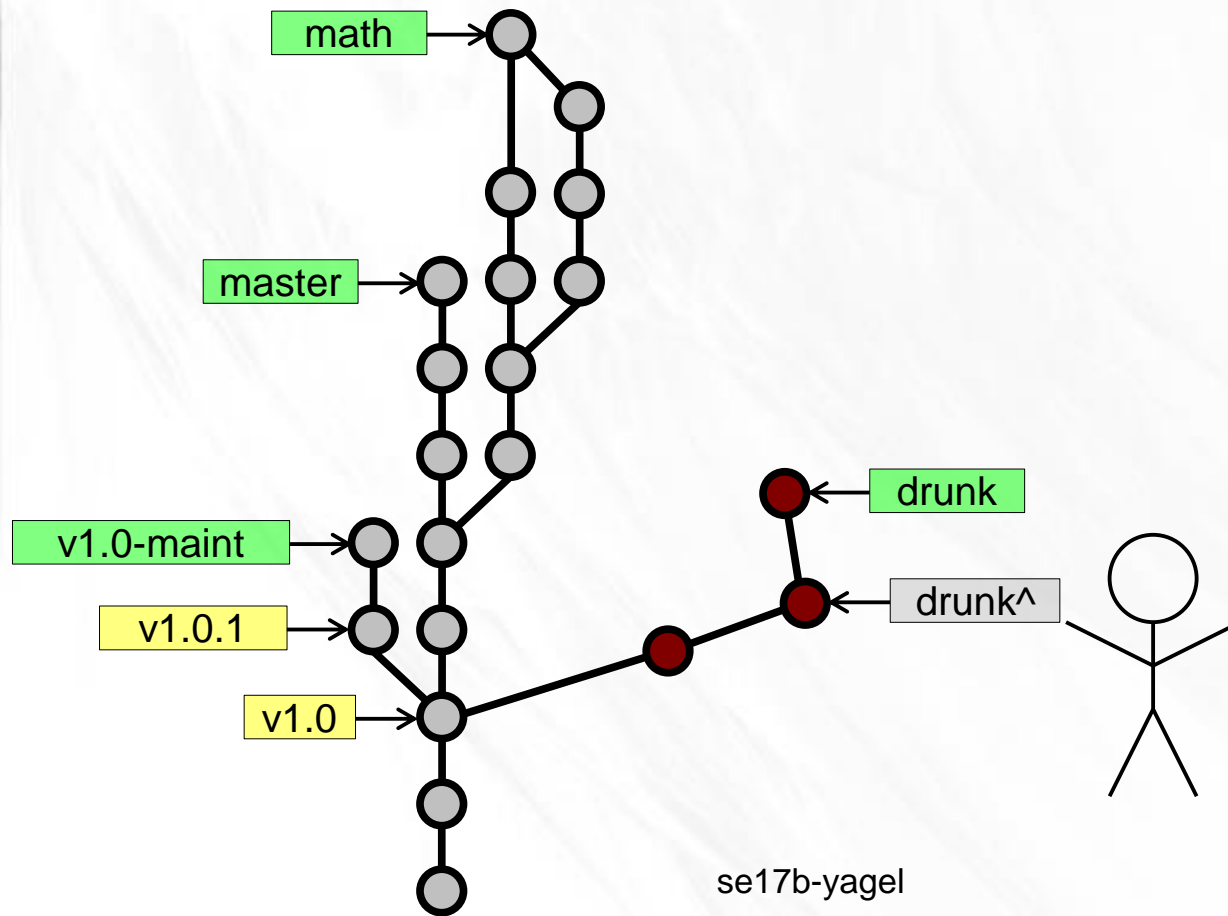
Rewriting History



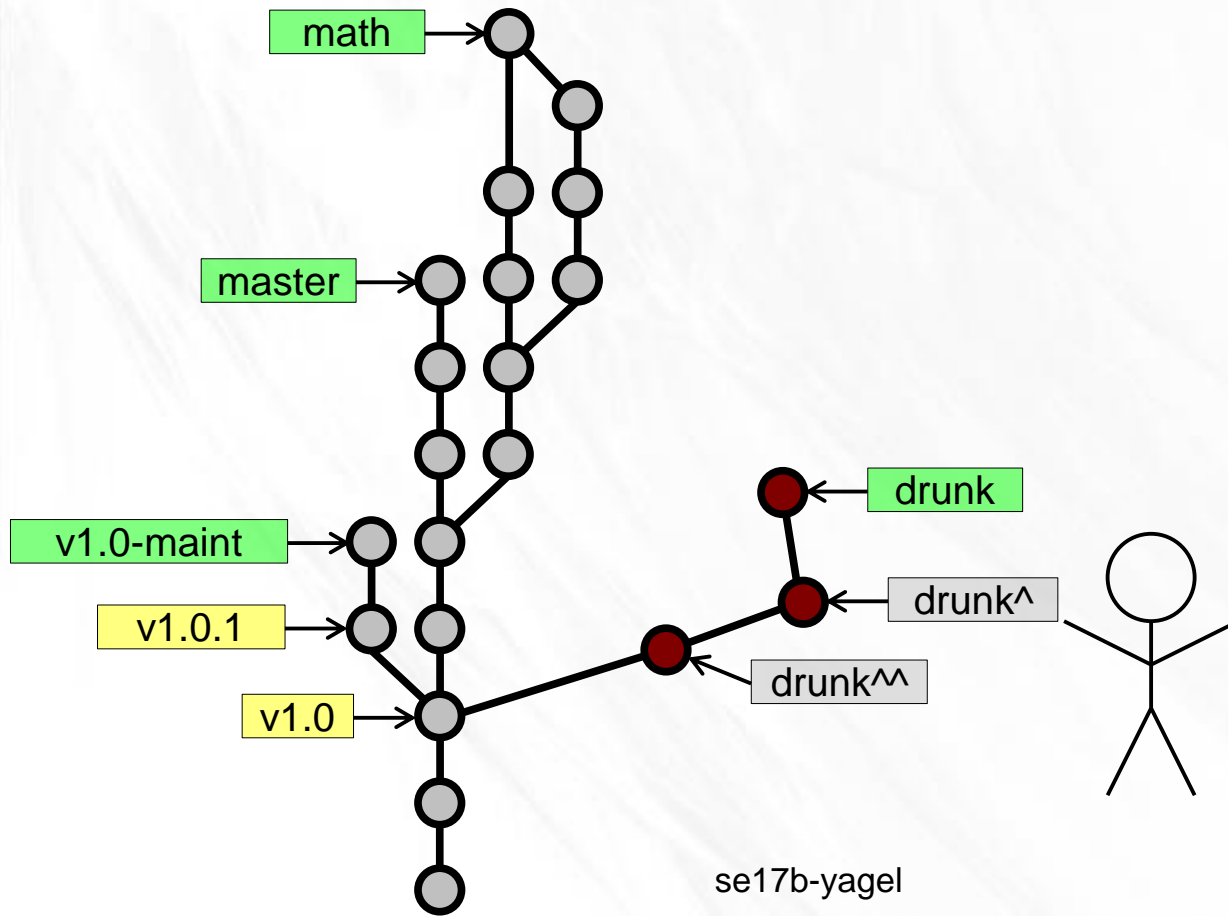
Rewriting History



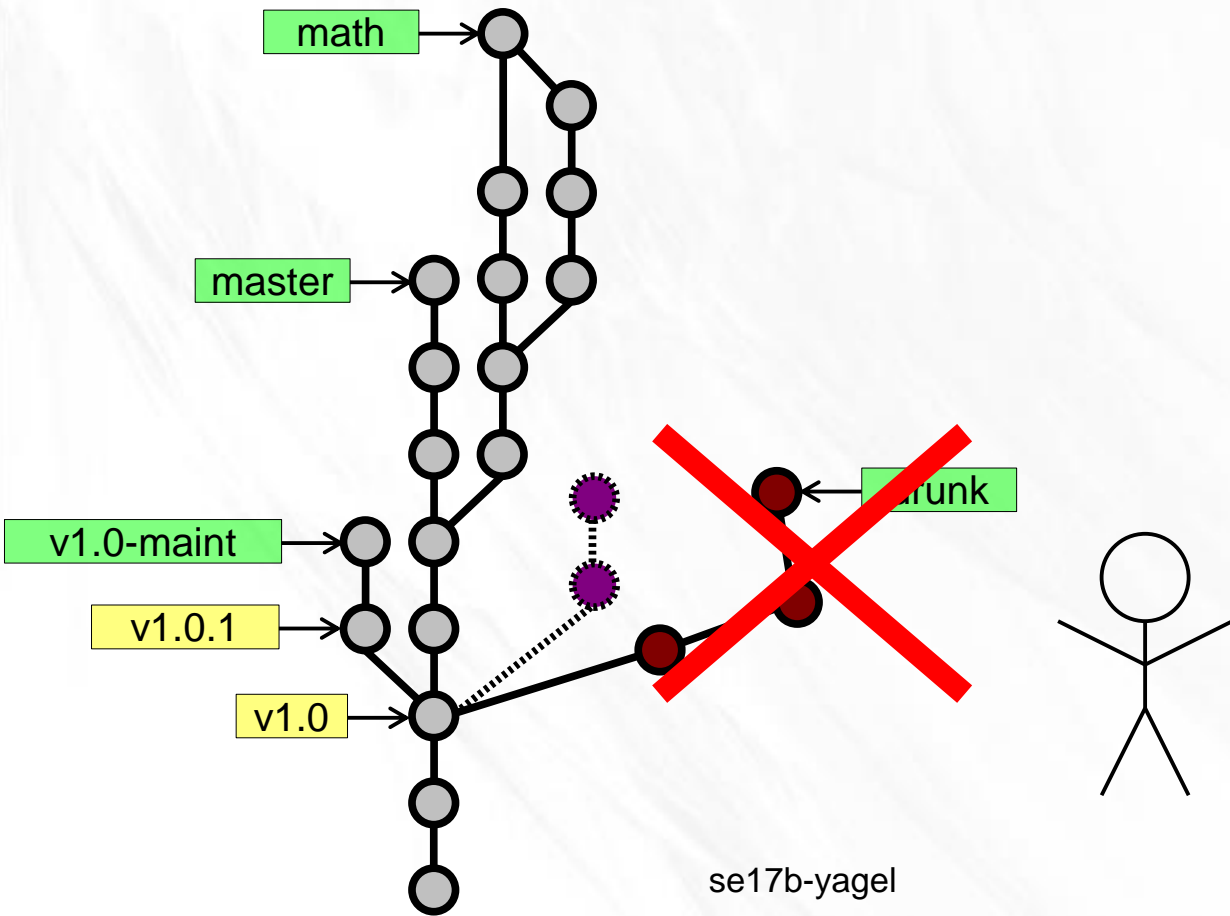
Rewriting History



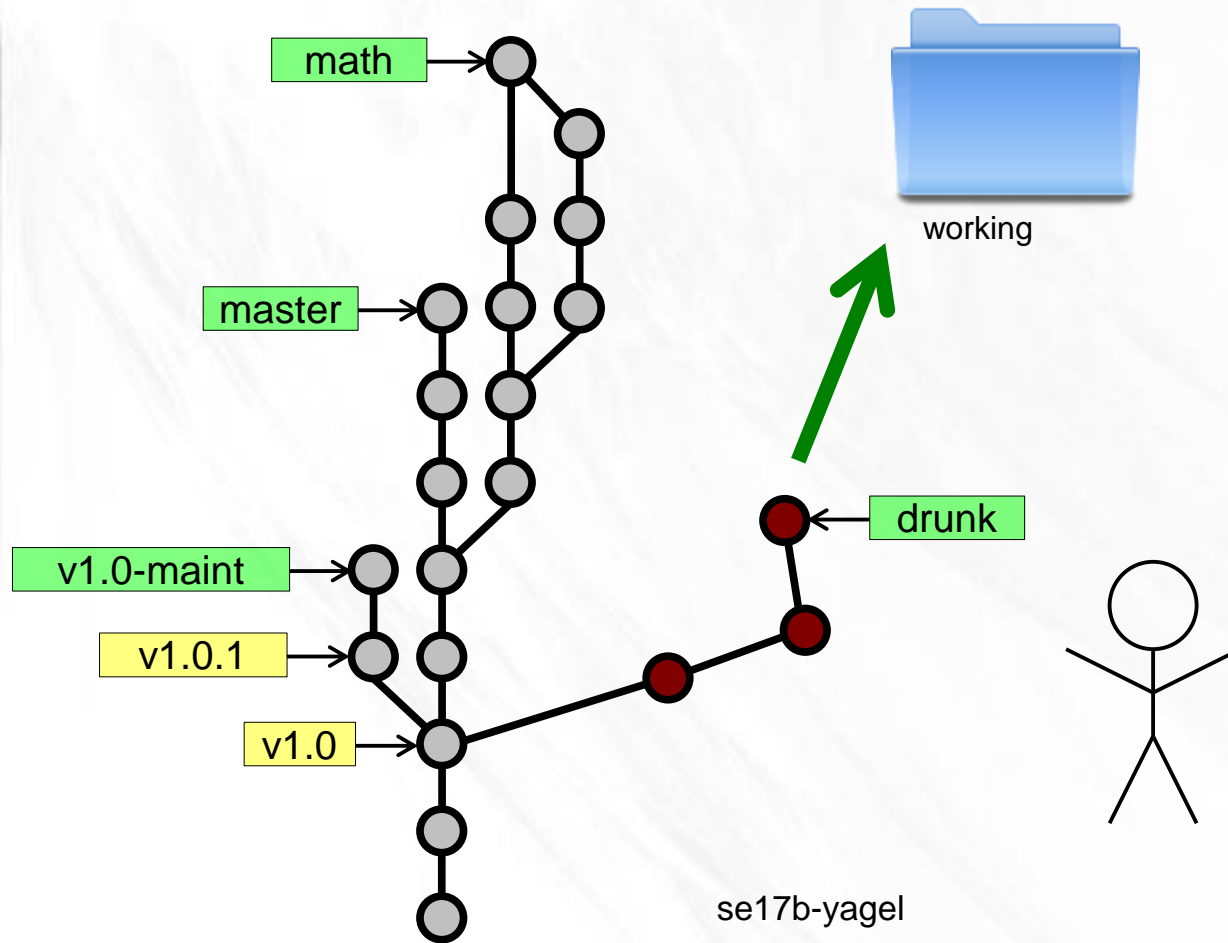
Rewriting History



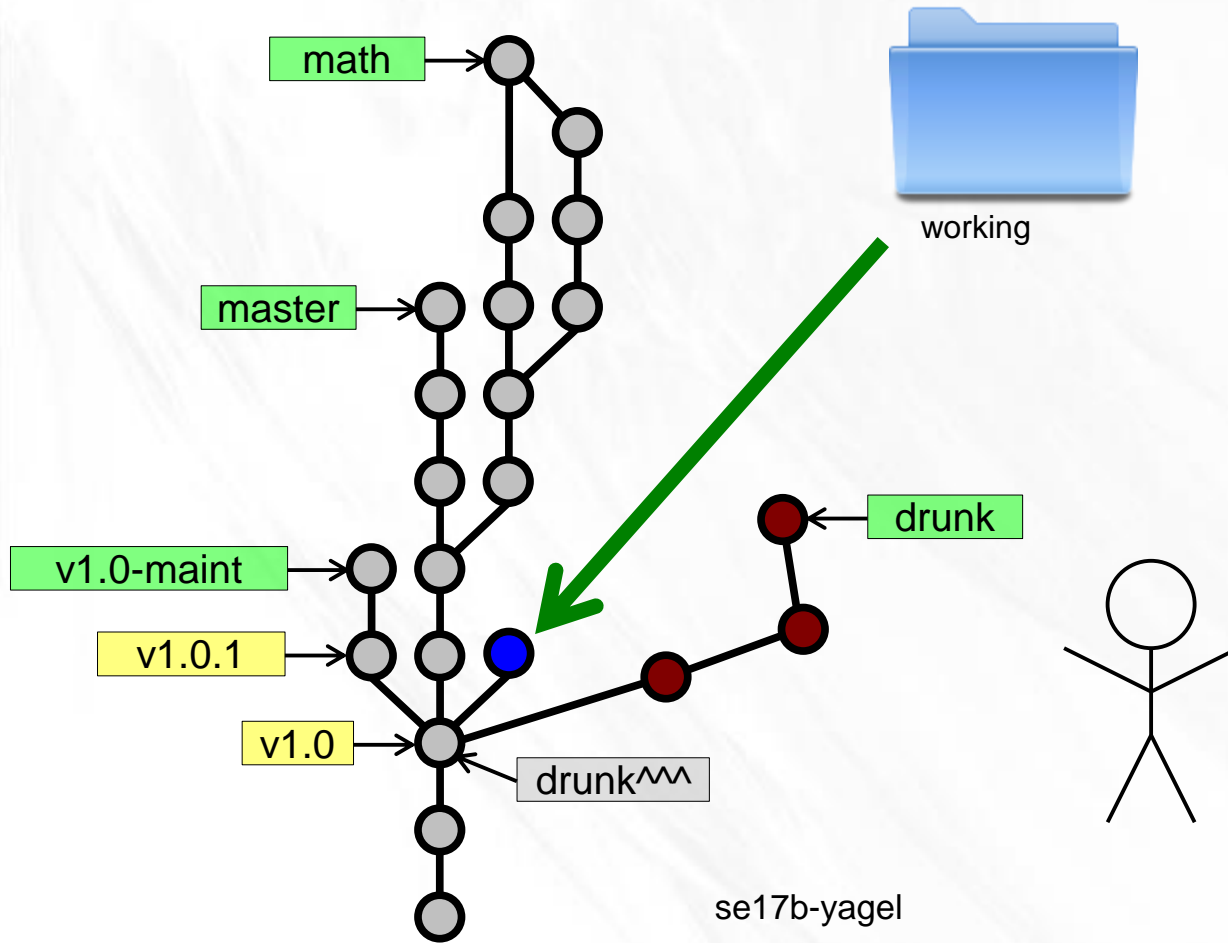
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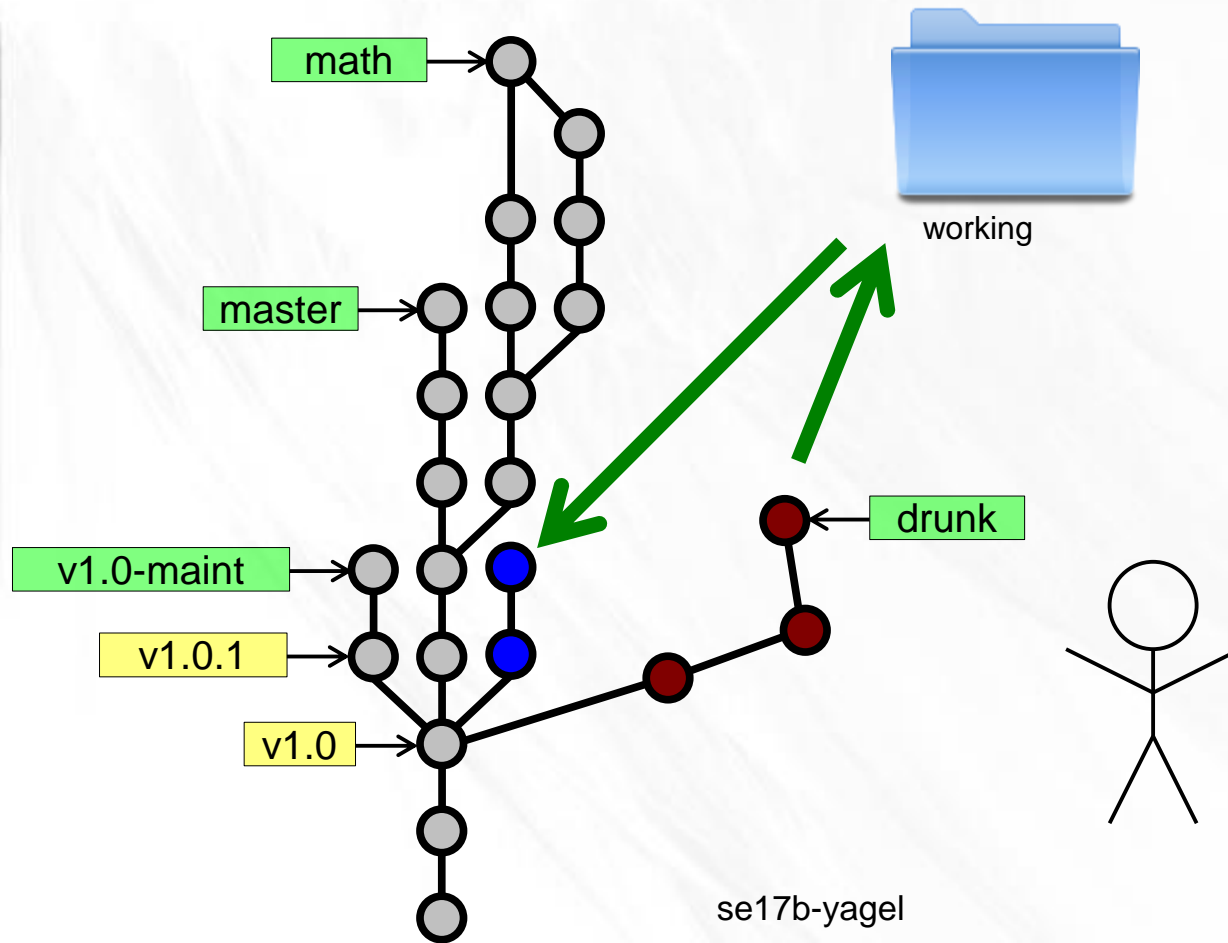
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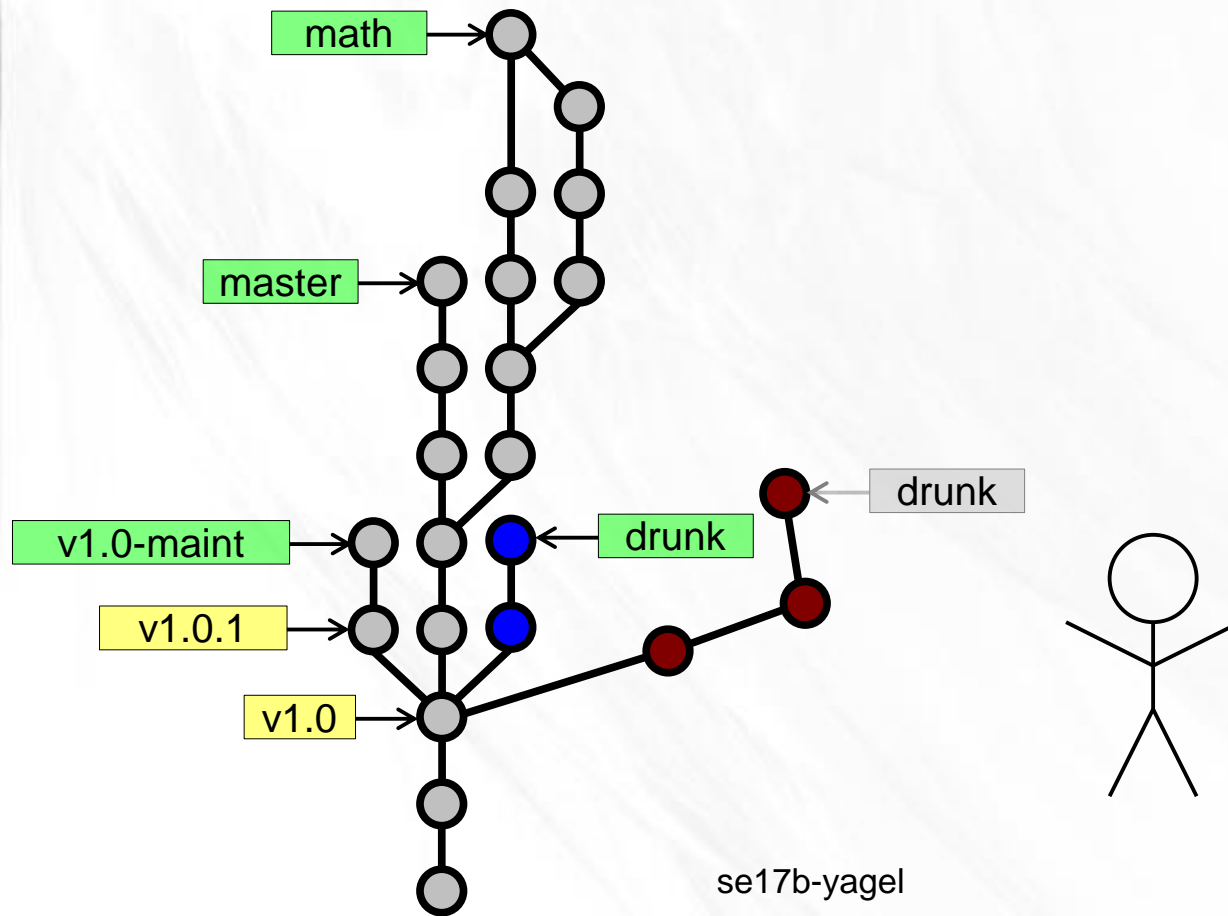
Rewriting History



Rewriting History

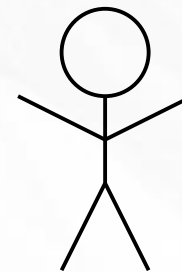
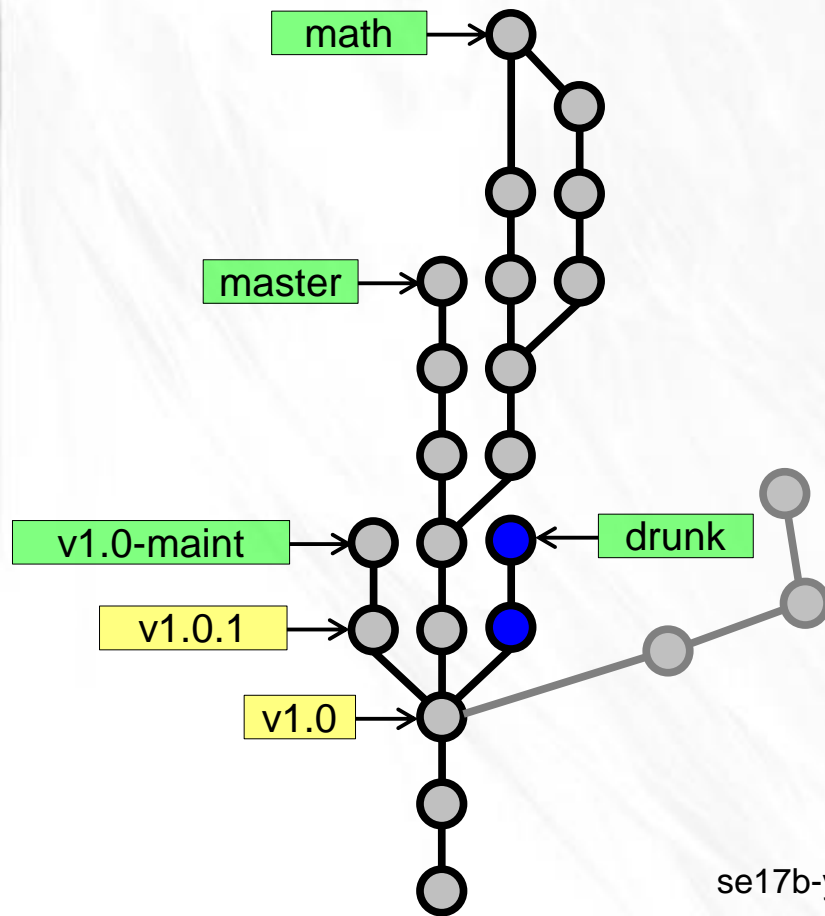


Rewriting History



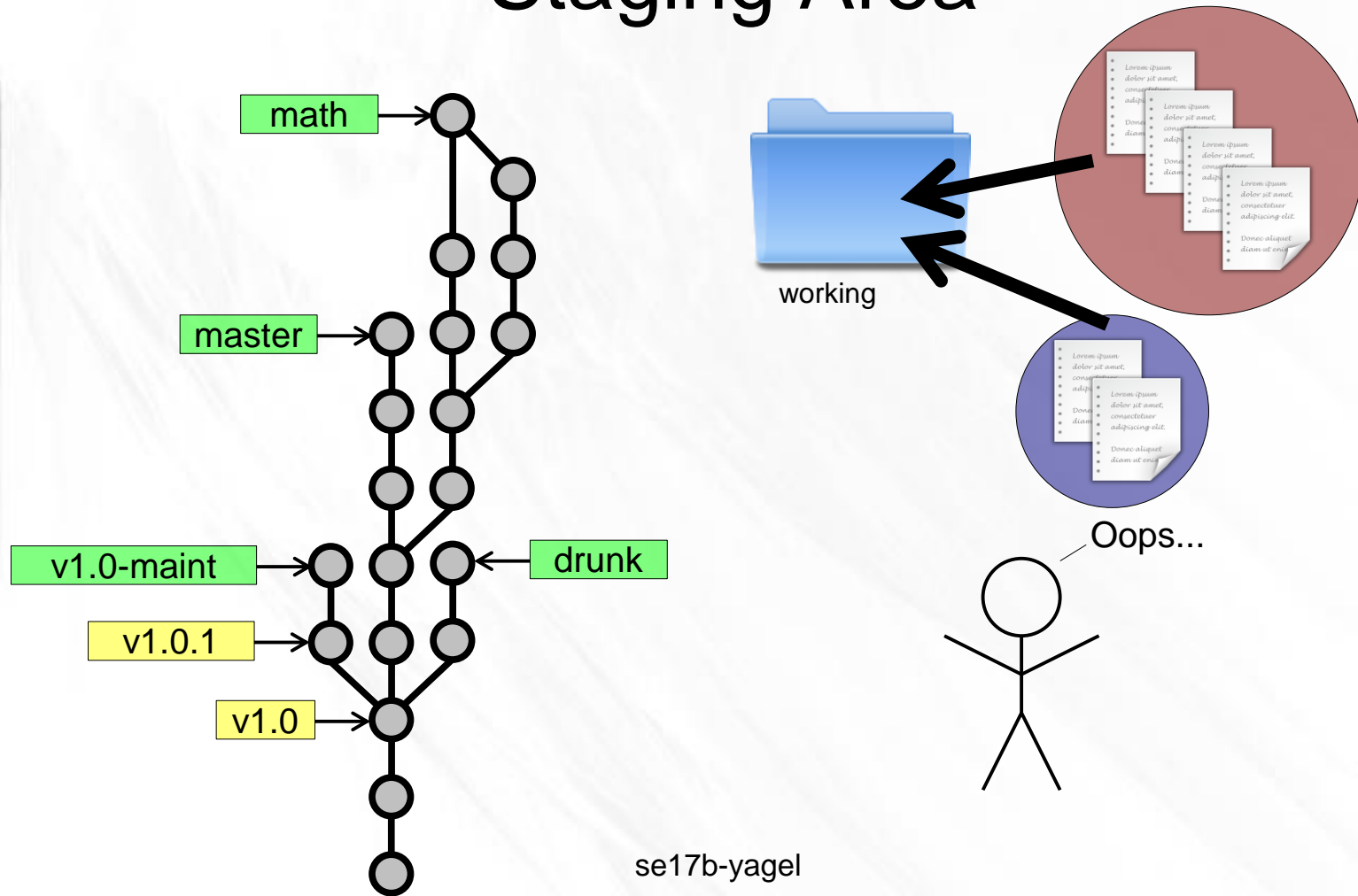
se17b-yagel

Rewriting History

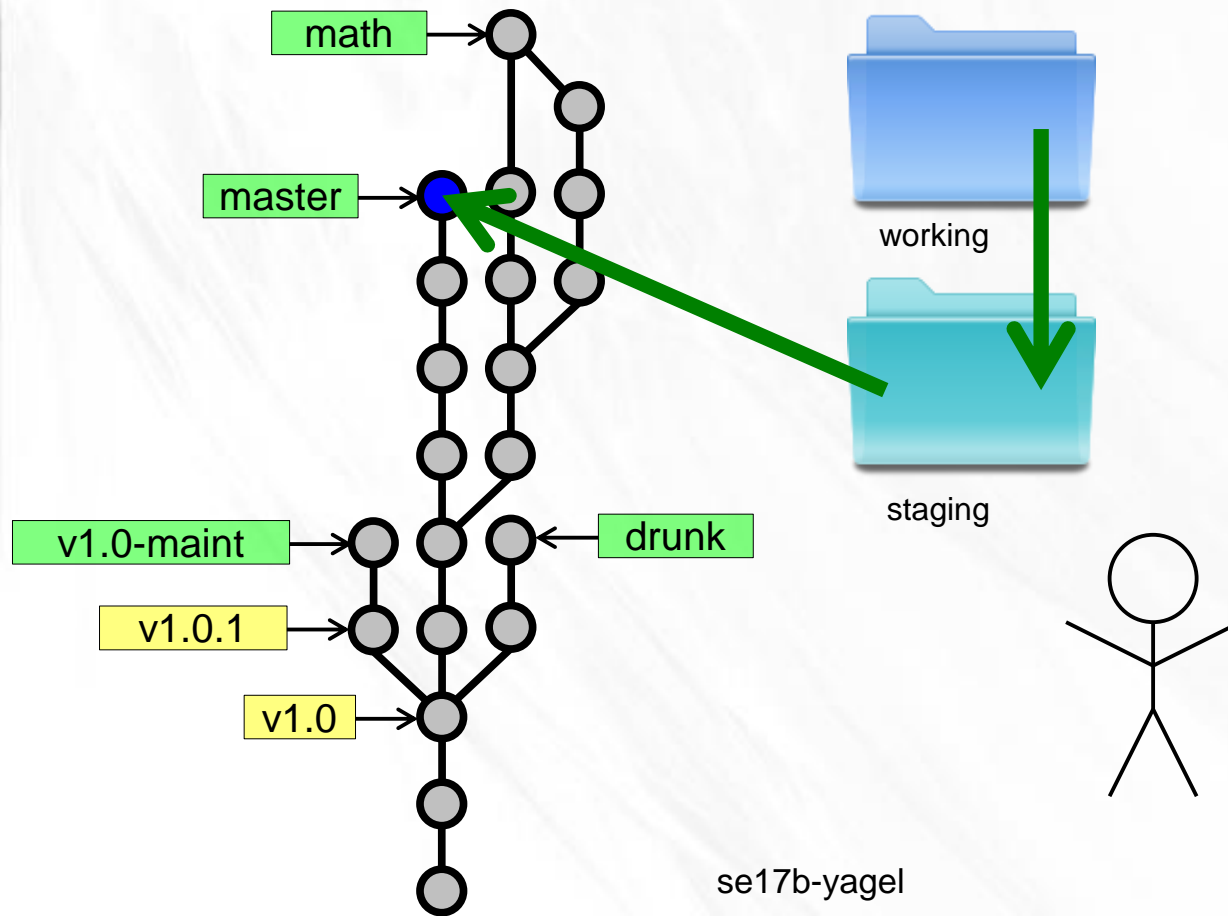


se17b-yagel

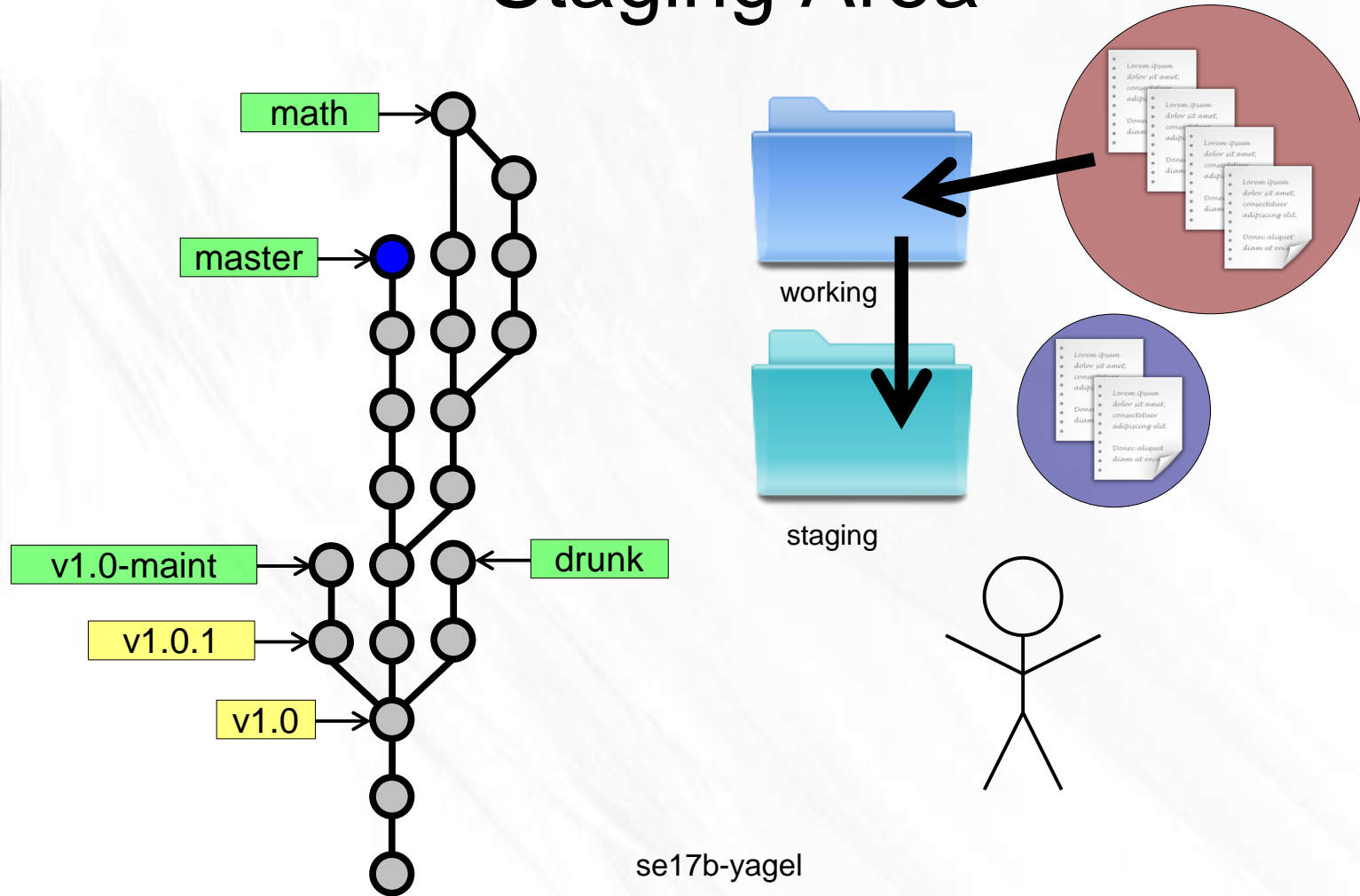
Staging Area



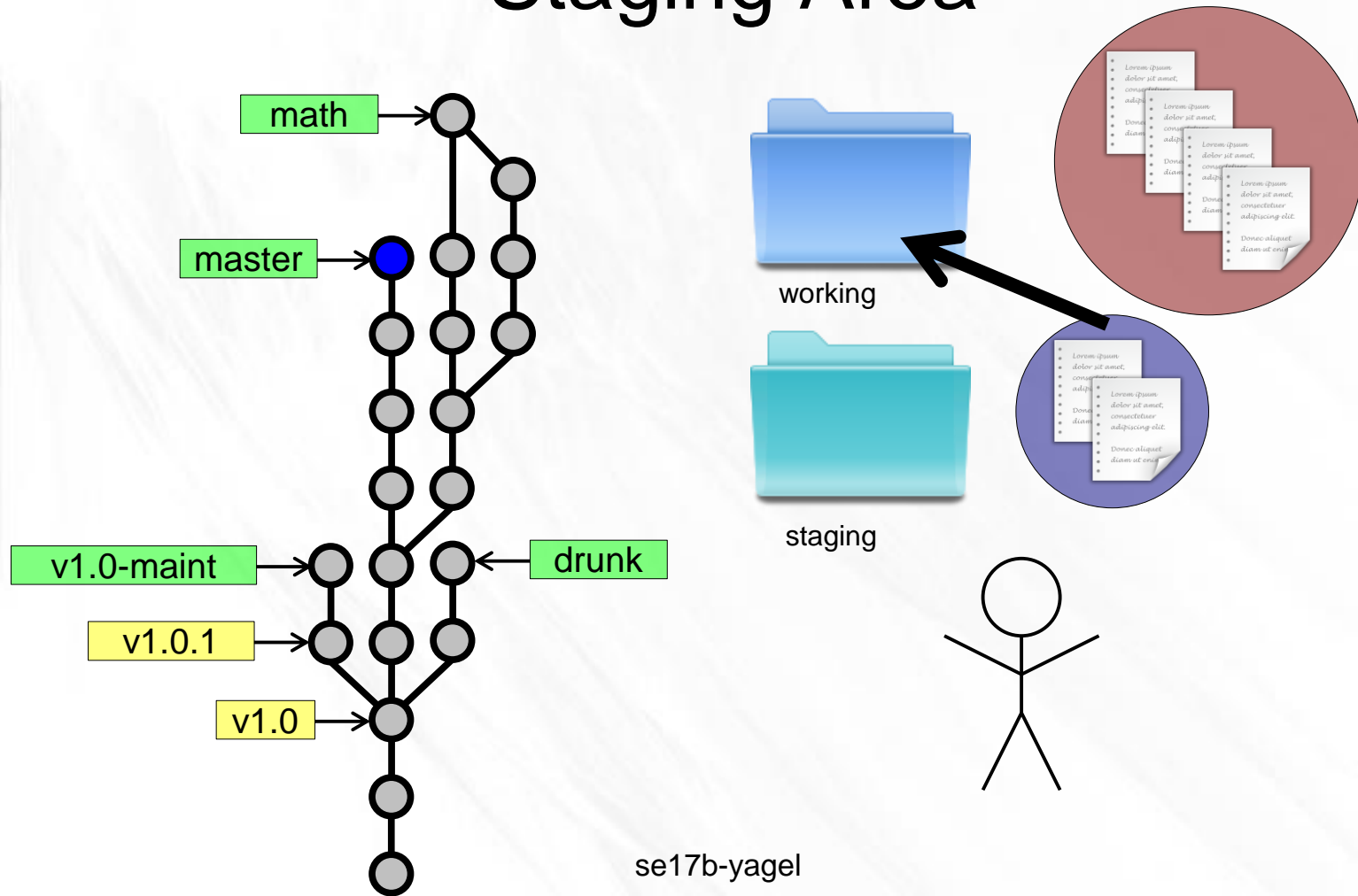
Staging Area



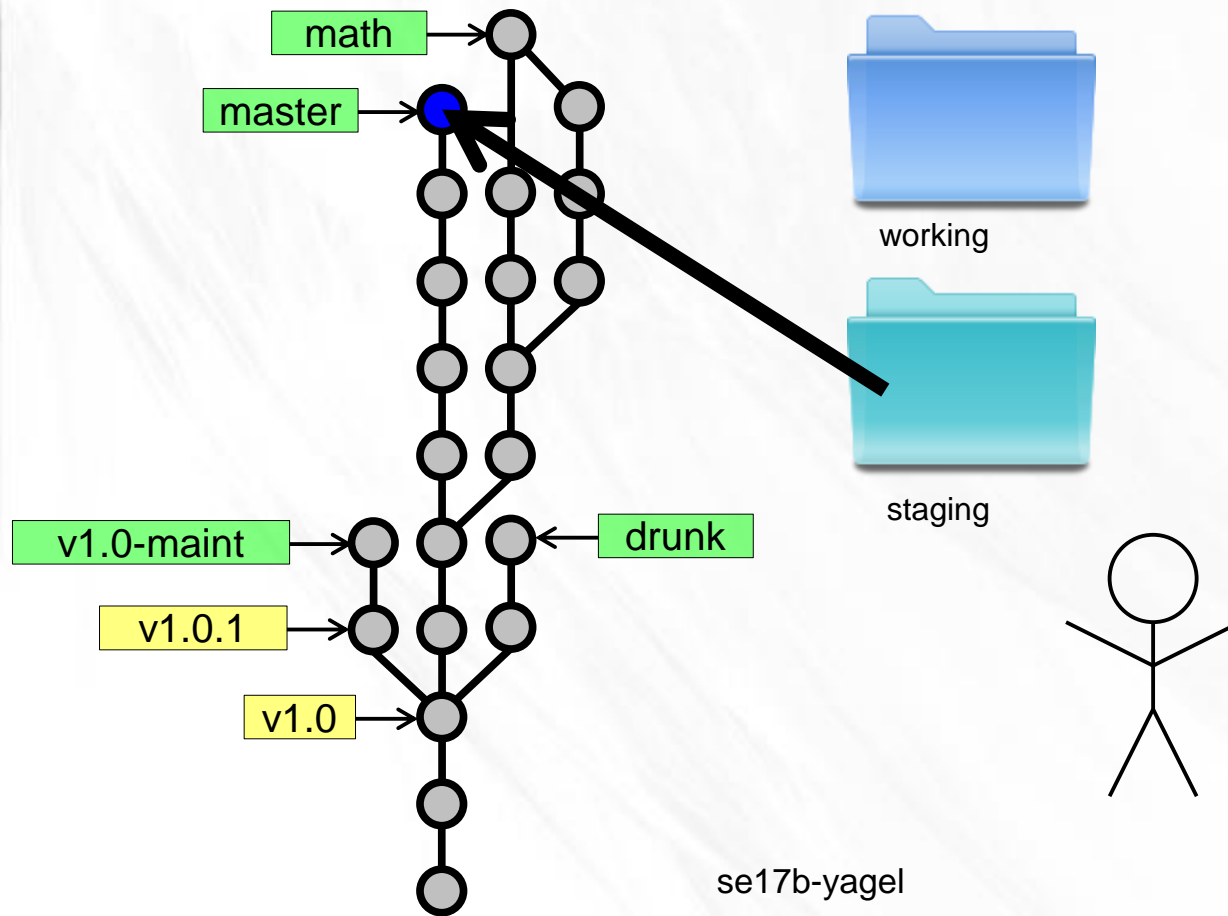
Staging Area



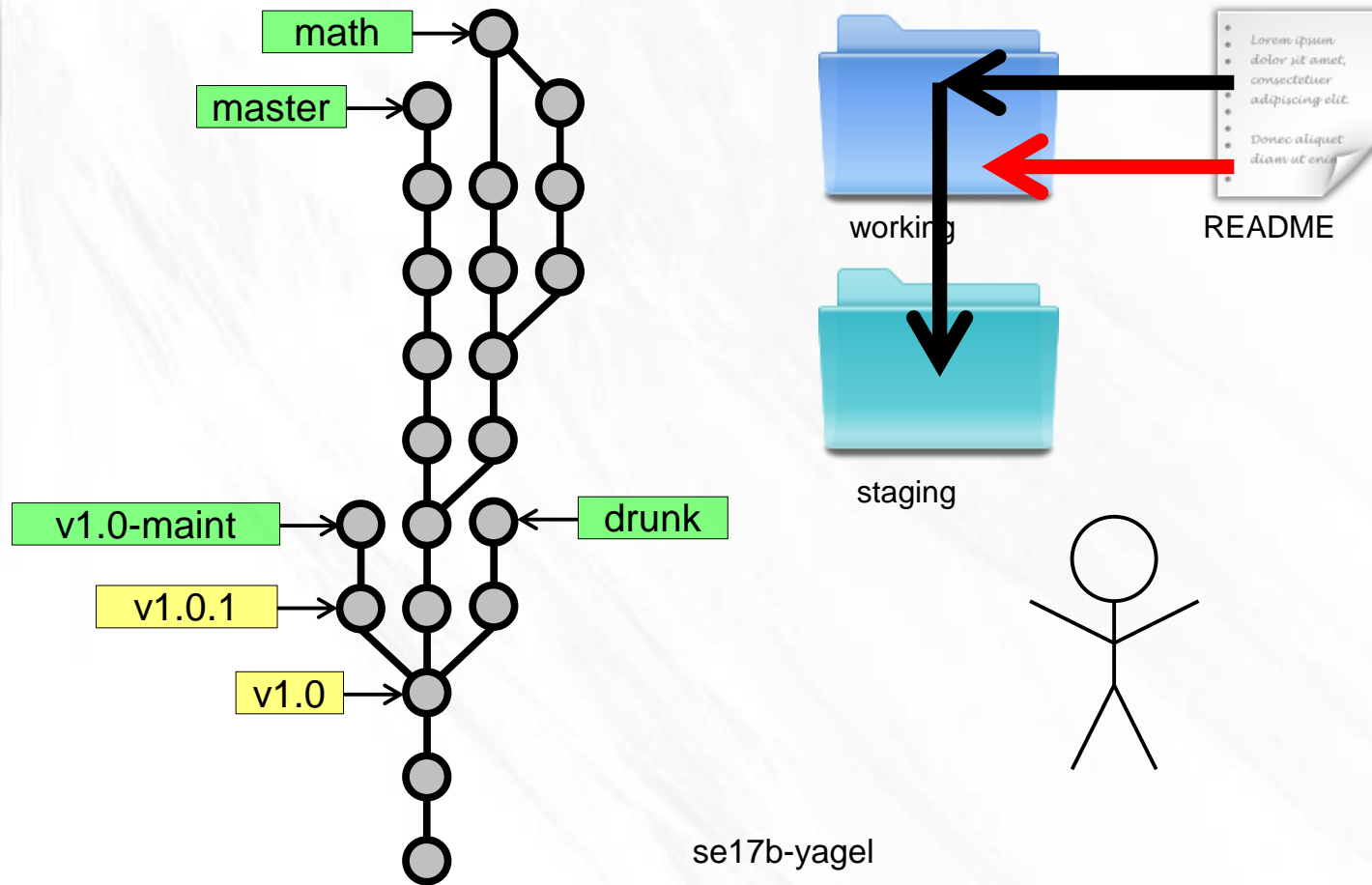
Staging Area



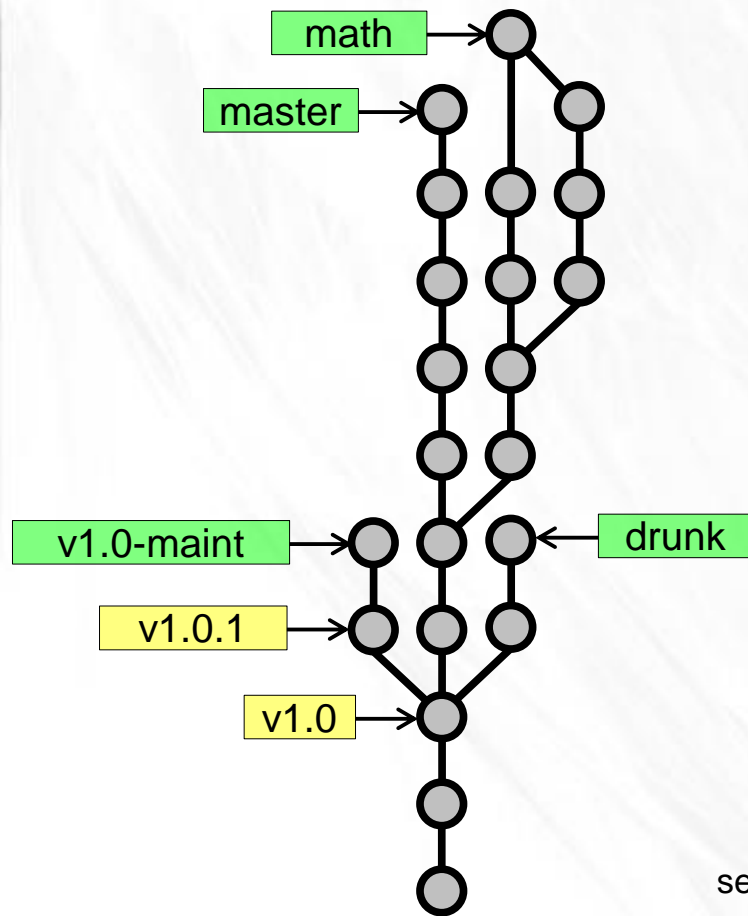
Staging Area



Staging Area



Diffs



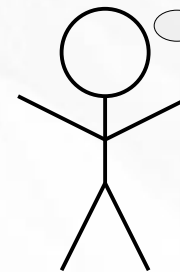
working



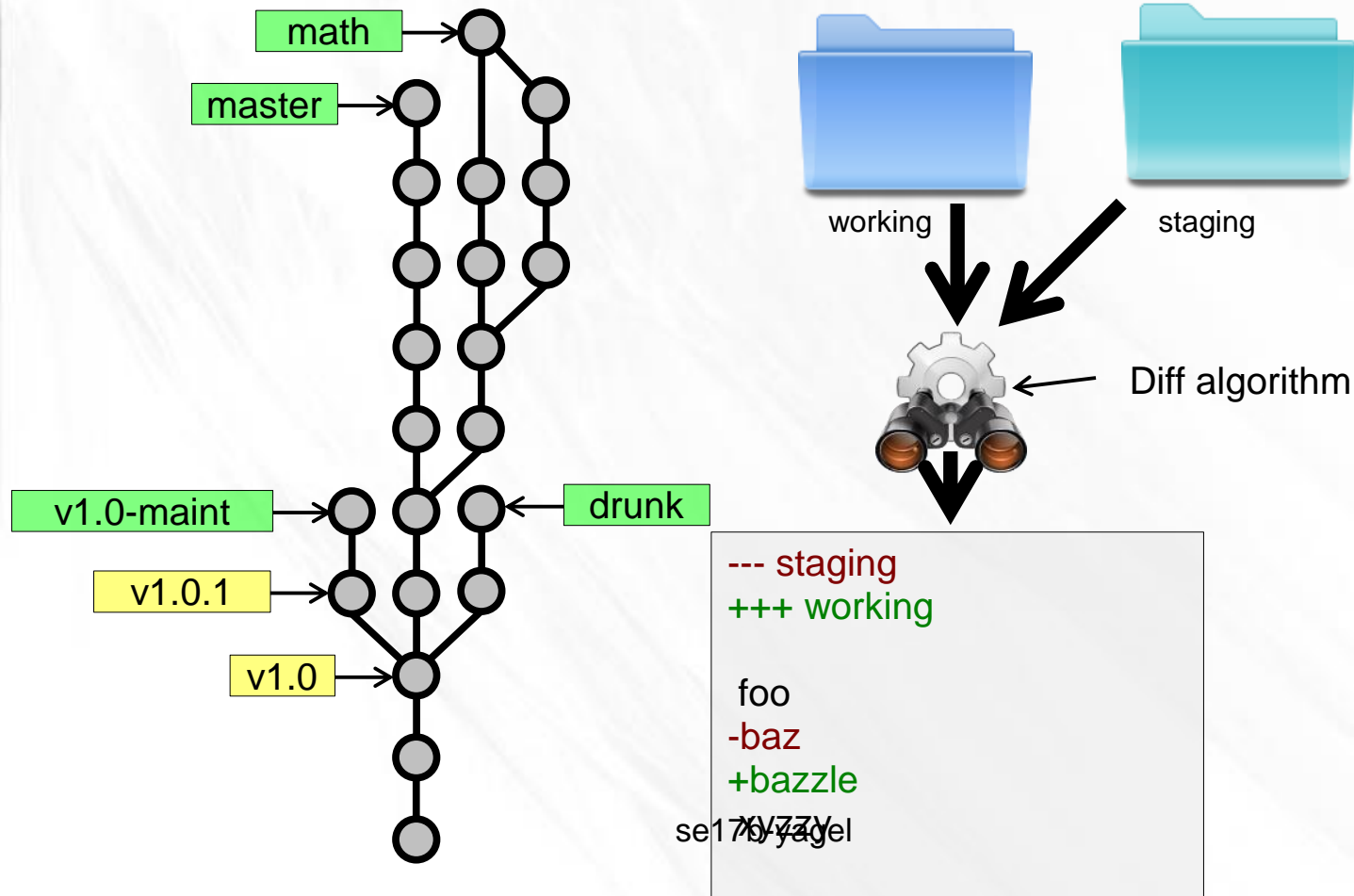
staging

What are the changes?

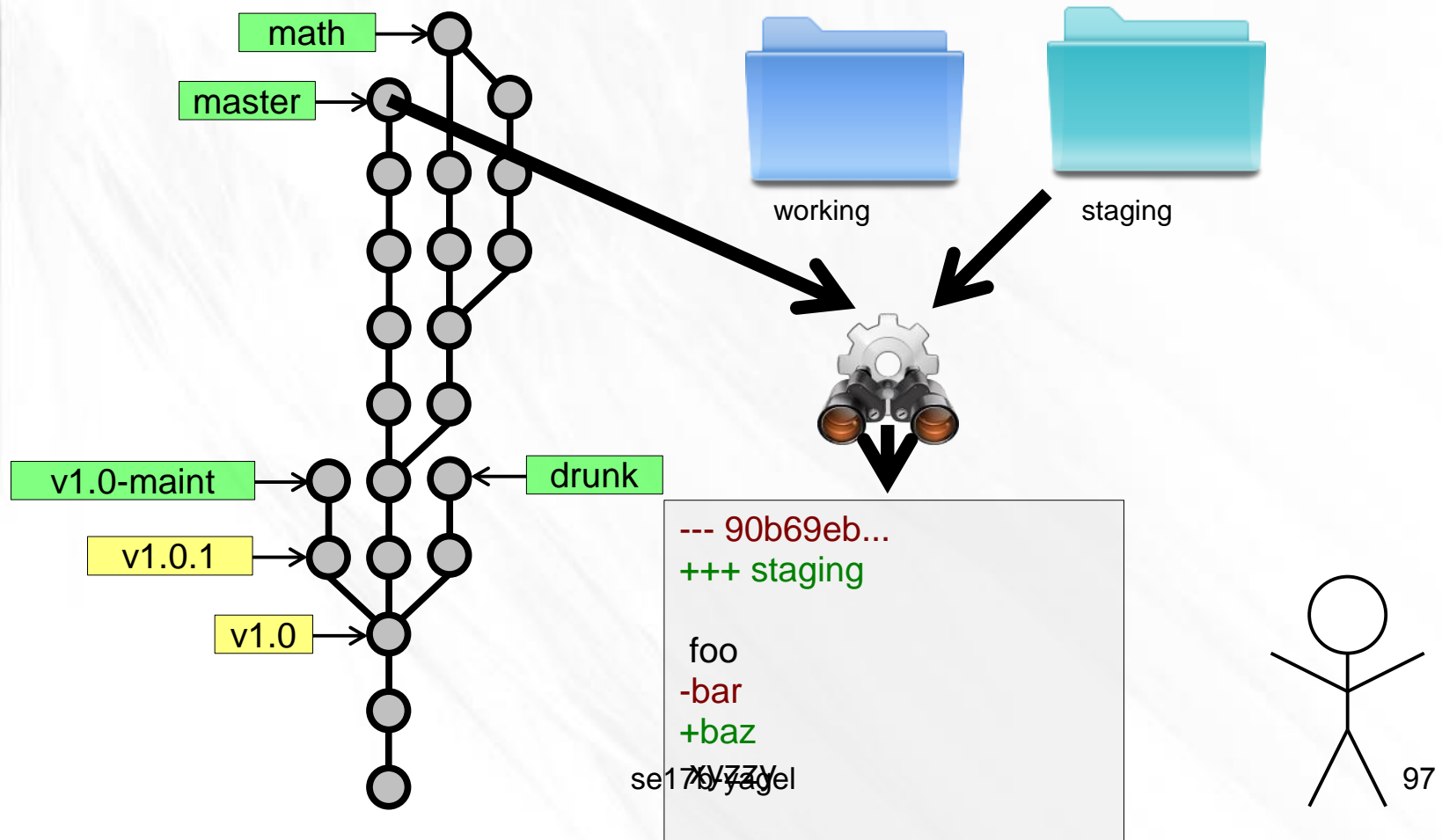
- working vs. staging
- working vs. snapshot X
- staging vs. snapshot X
- snapshot X vs. snapshot Y



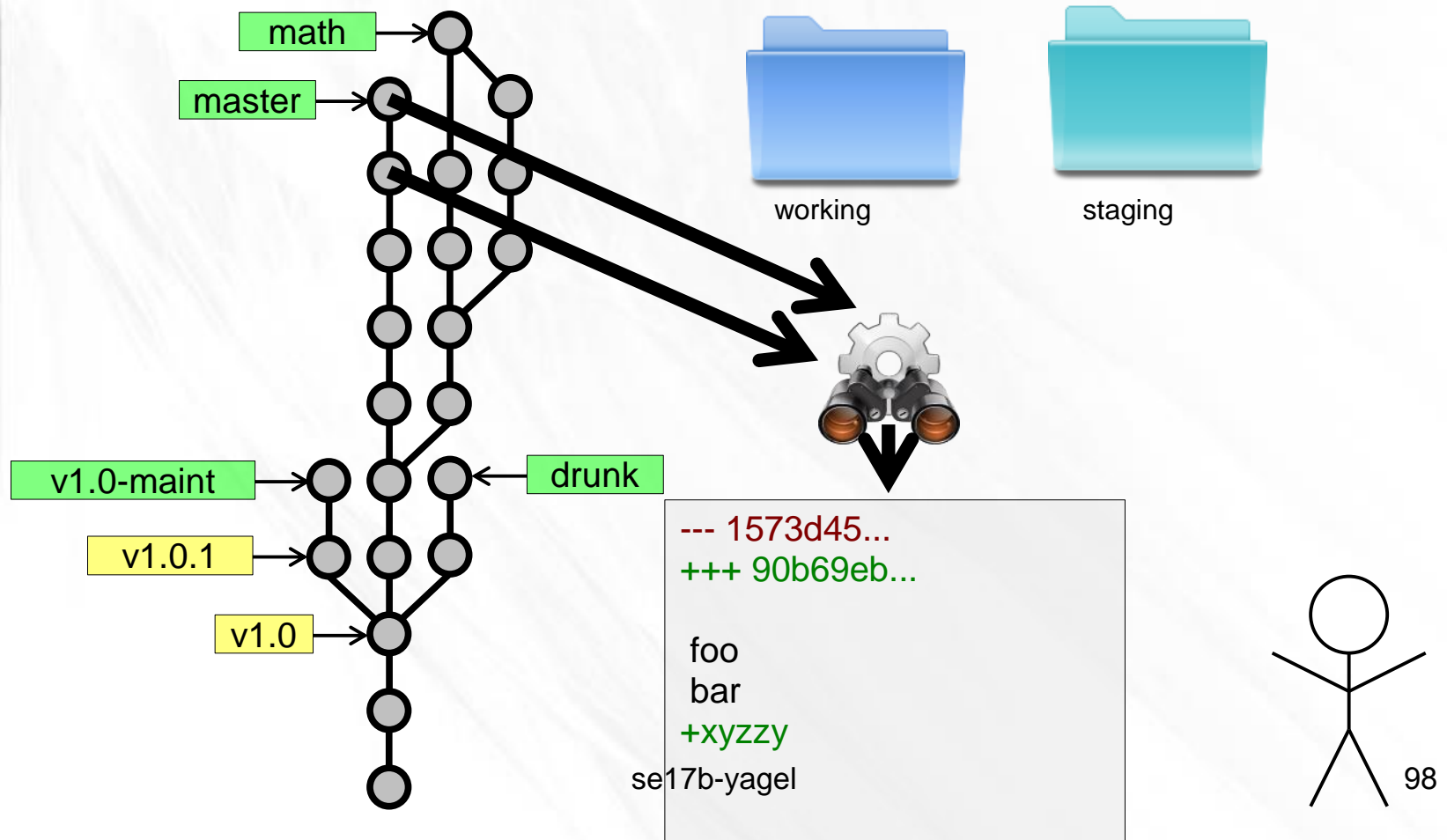
Diffs



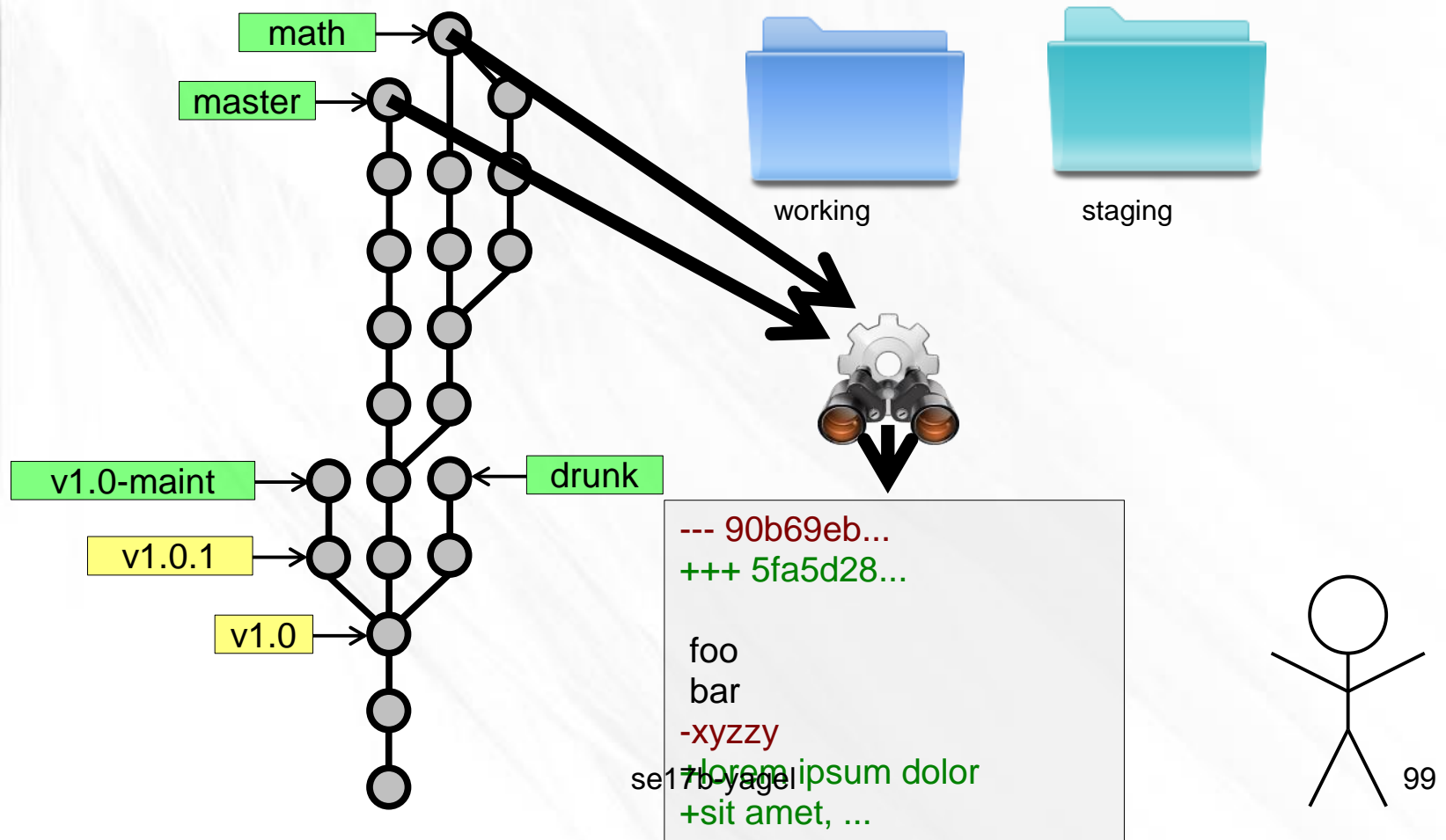
Diffs



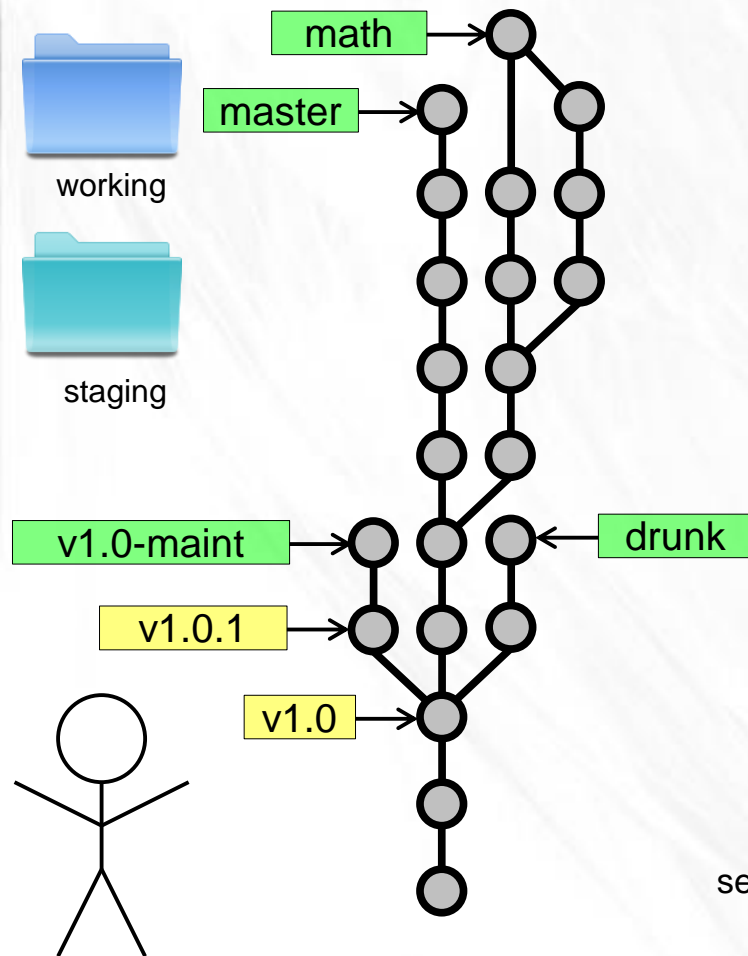
Diffs



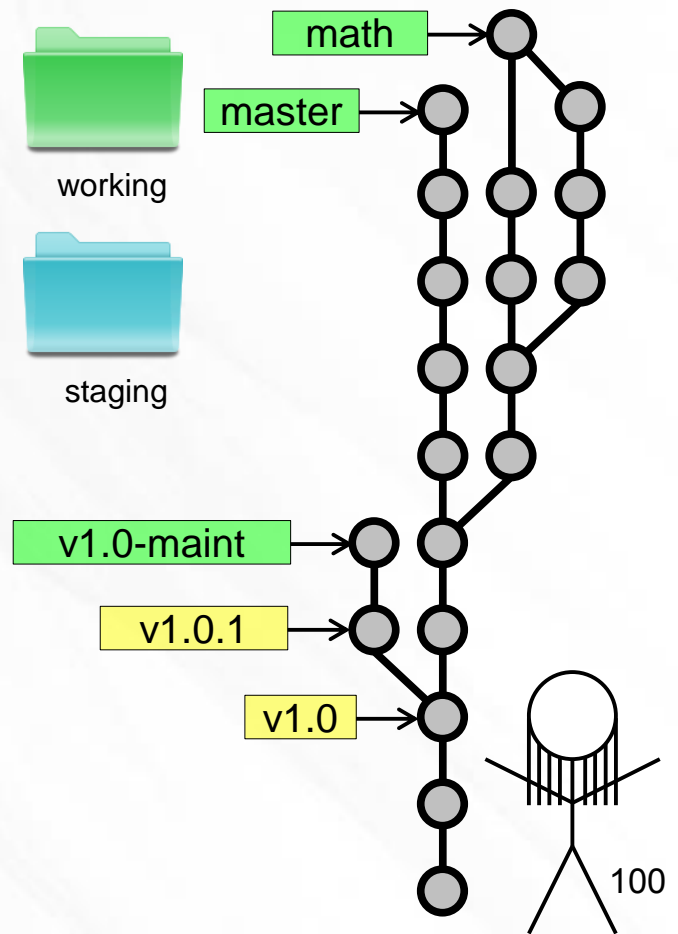
Diffs



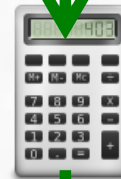
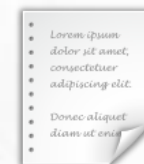
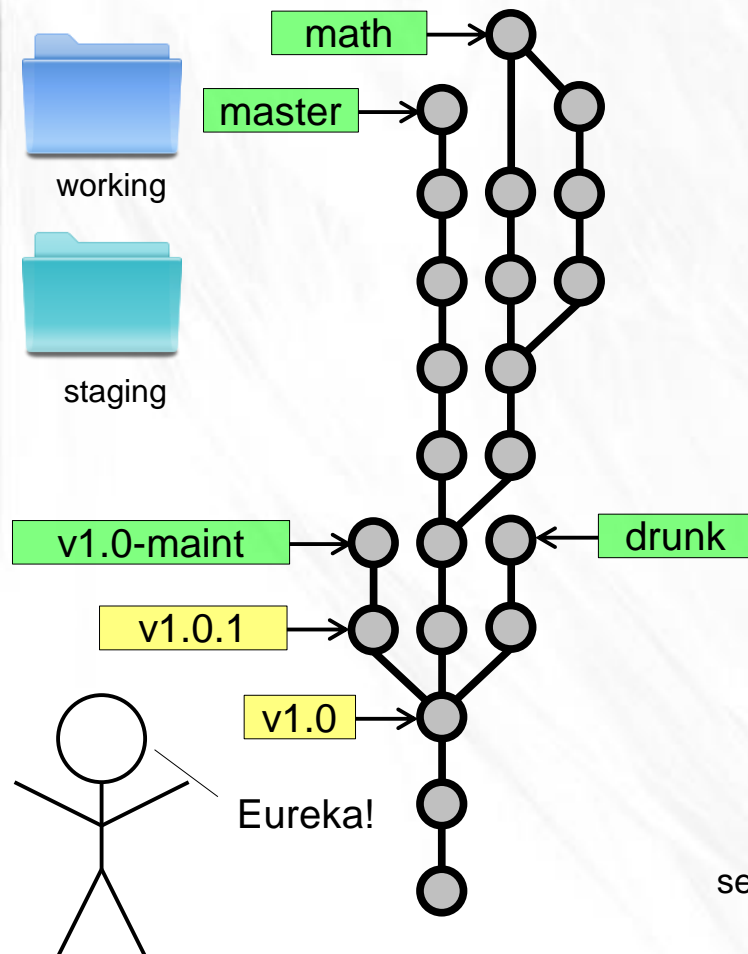
Eliminating Duplication



se17b-yagel



Eliminating Duplication



SHA1

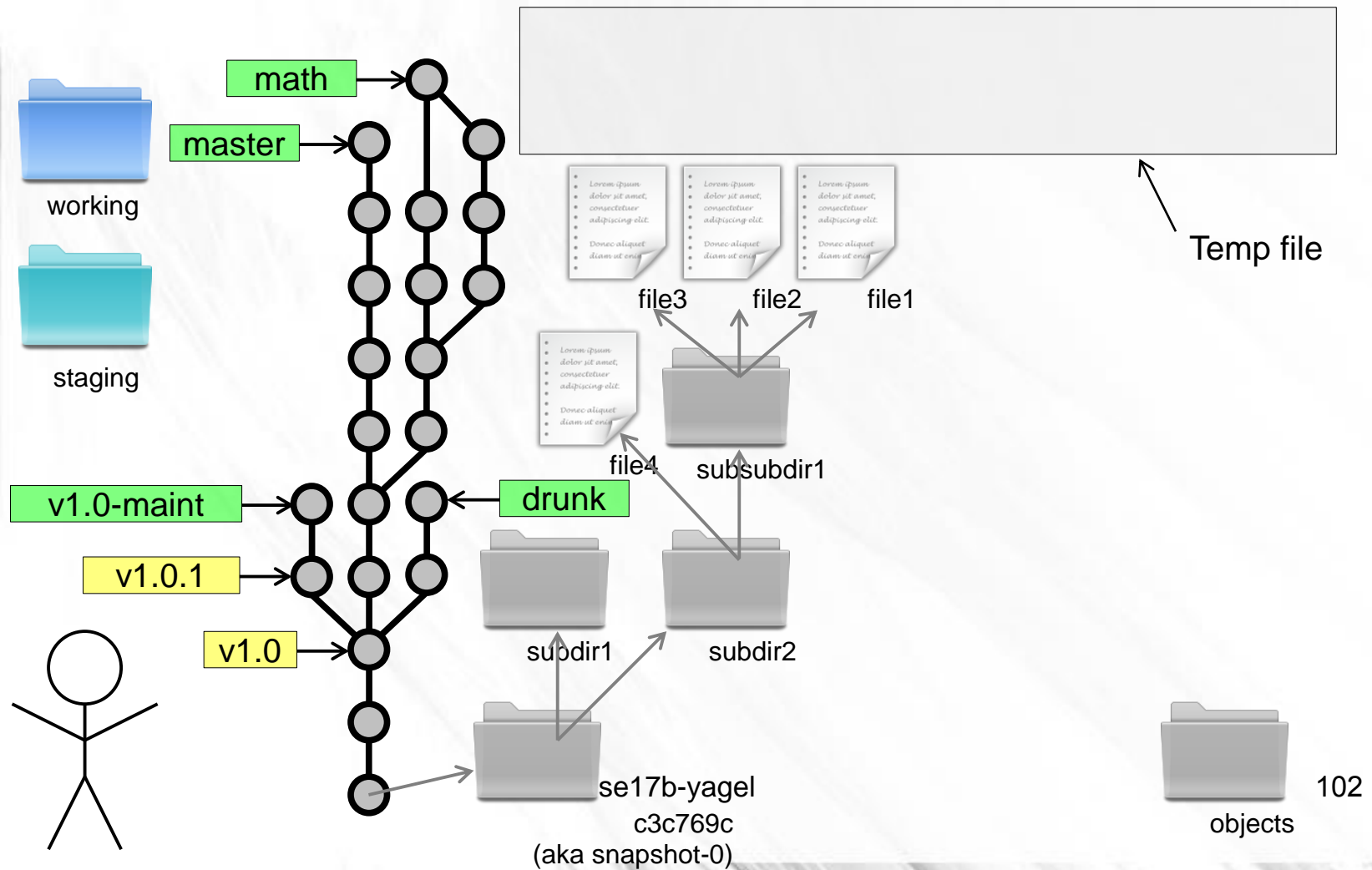
2804133755c3ed396d162028c7b30a1cbcfecded



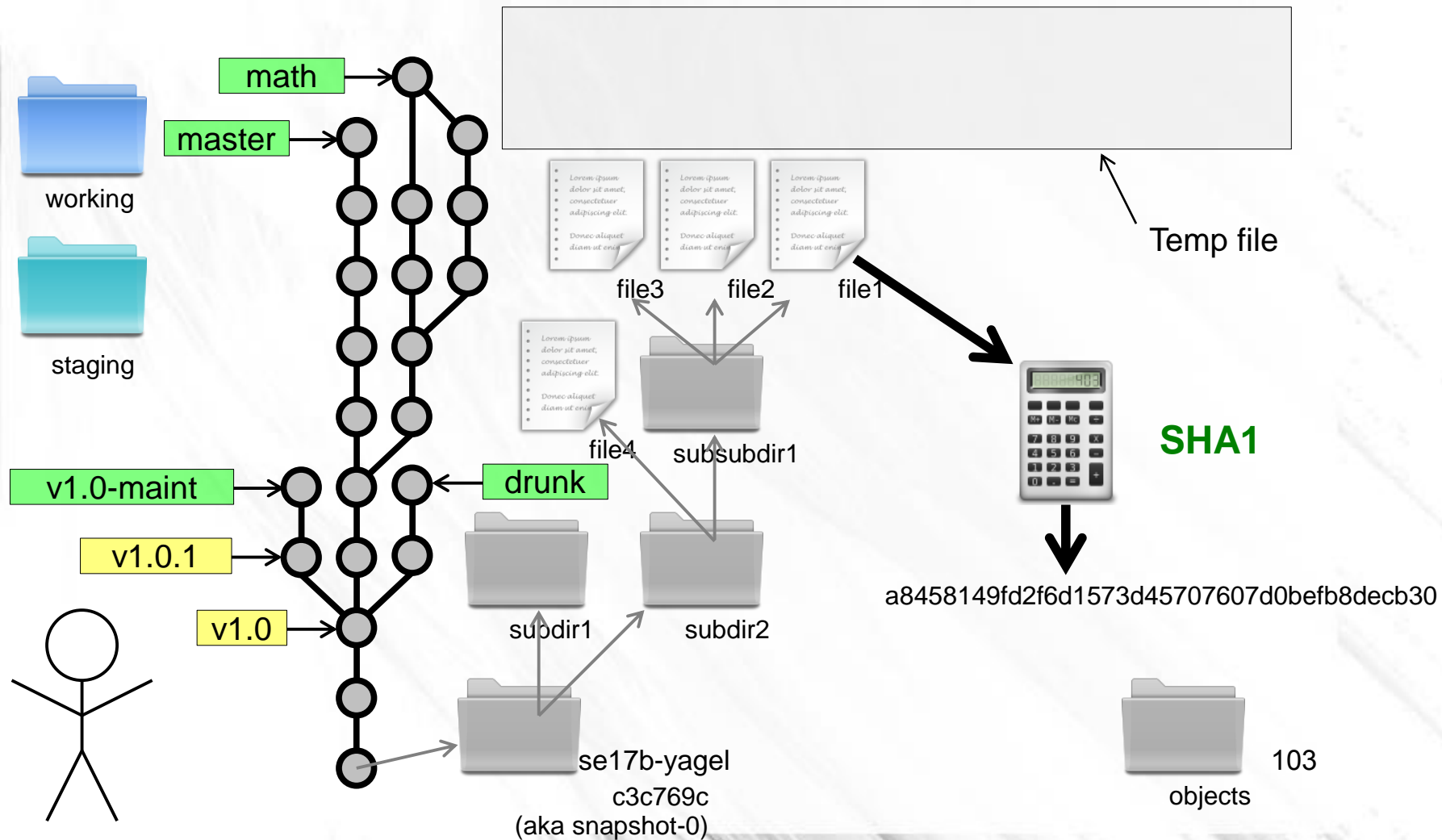
101

objects

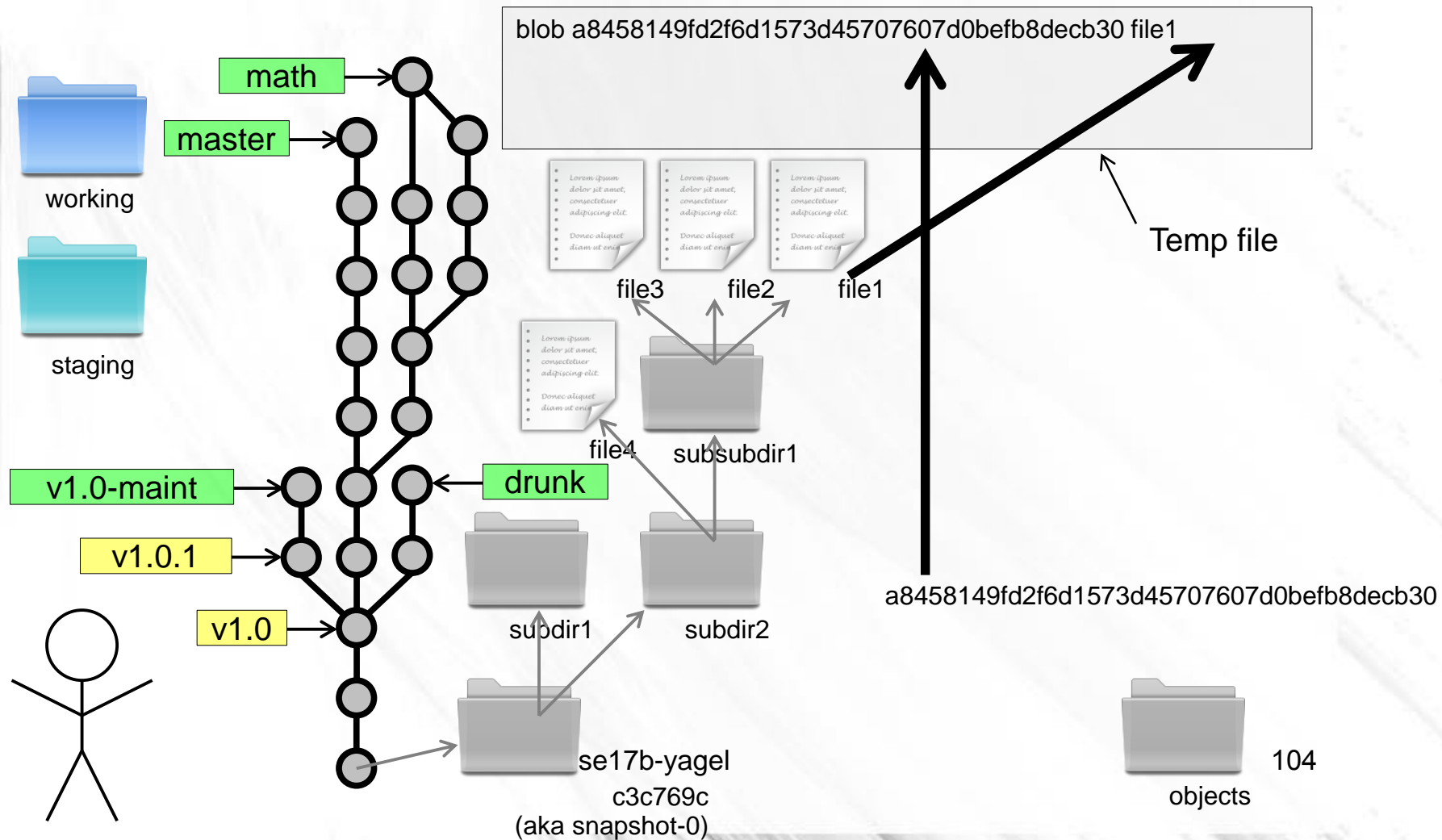
Eliminating Duplication



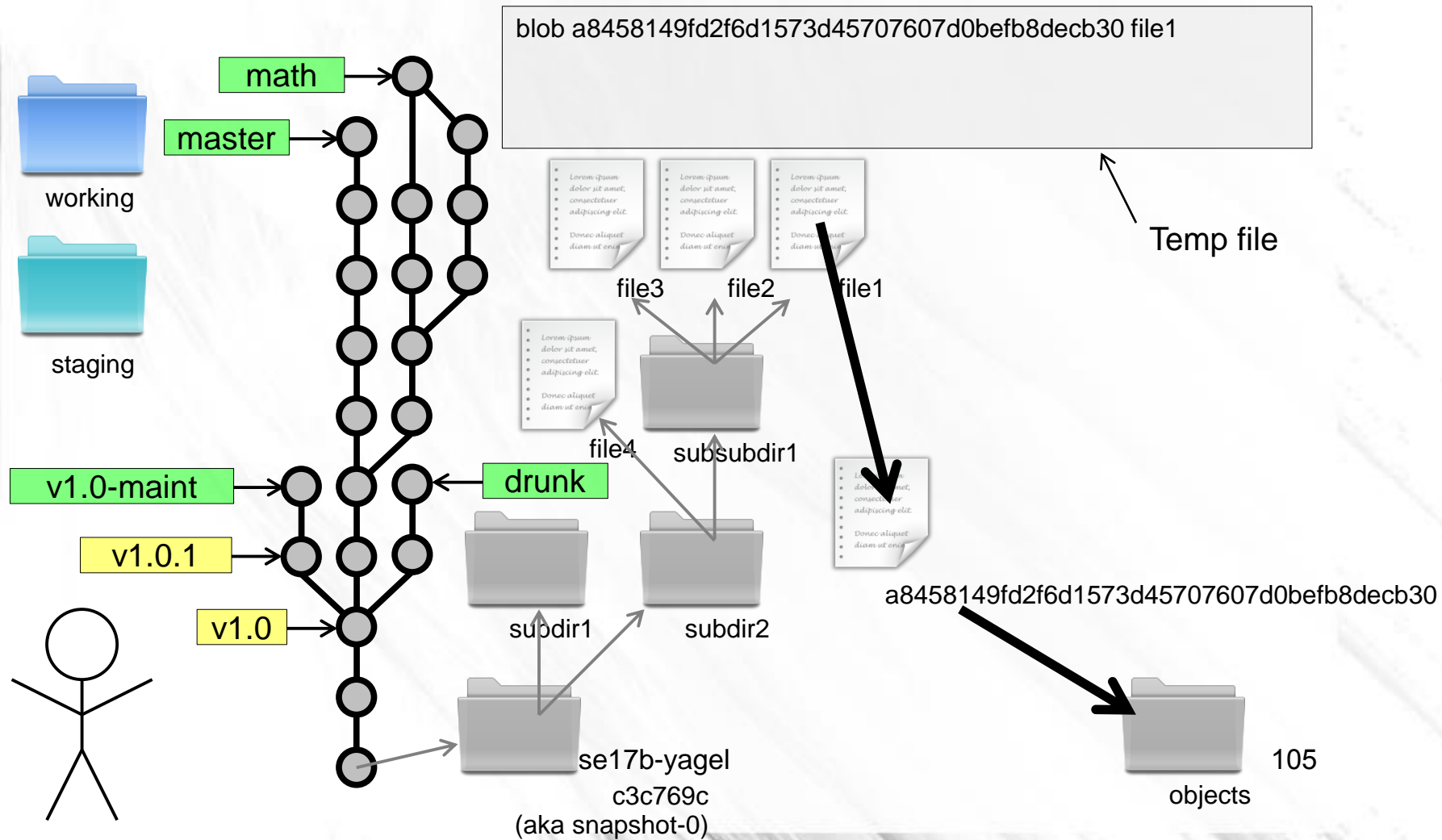
Eliminating Duplication



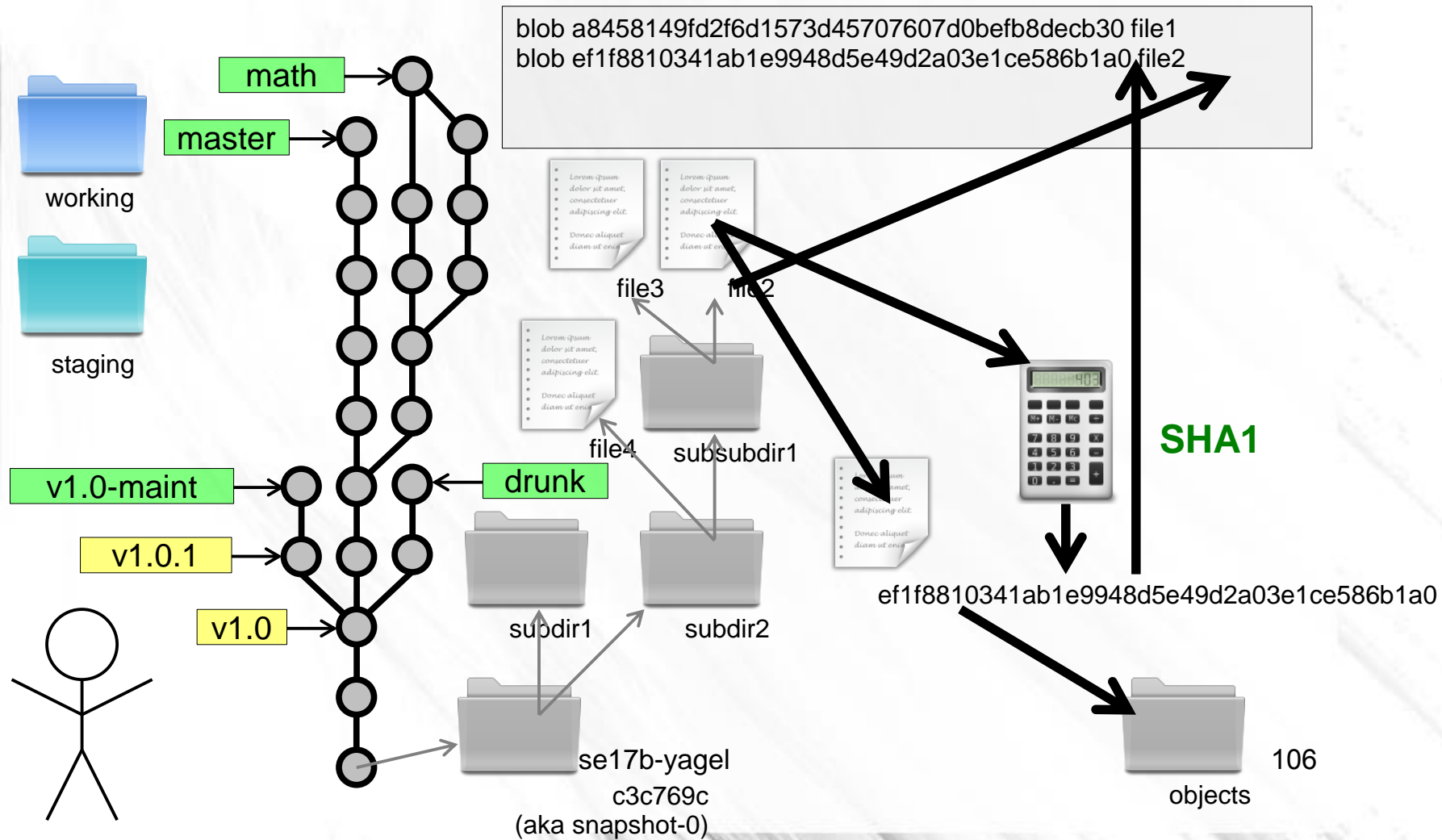
Eliminating Duplication



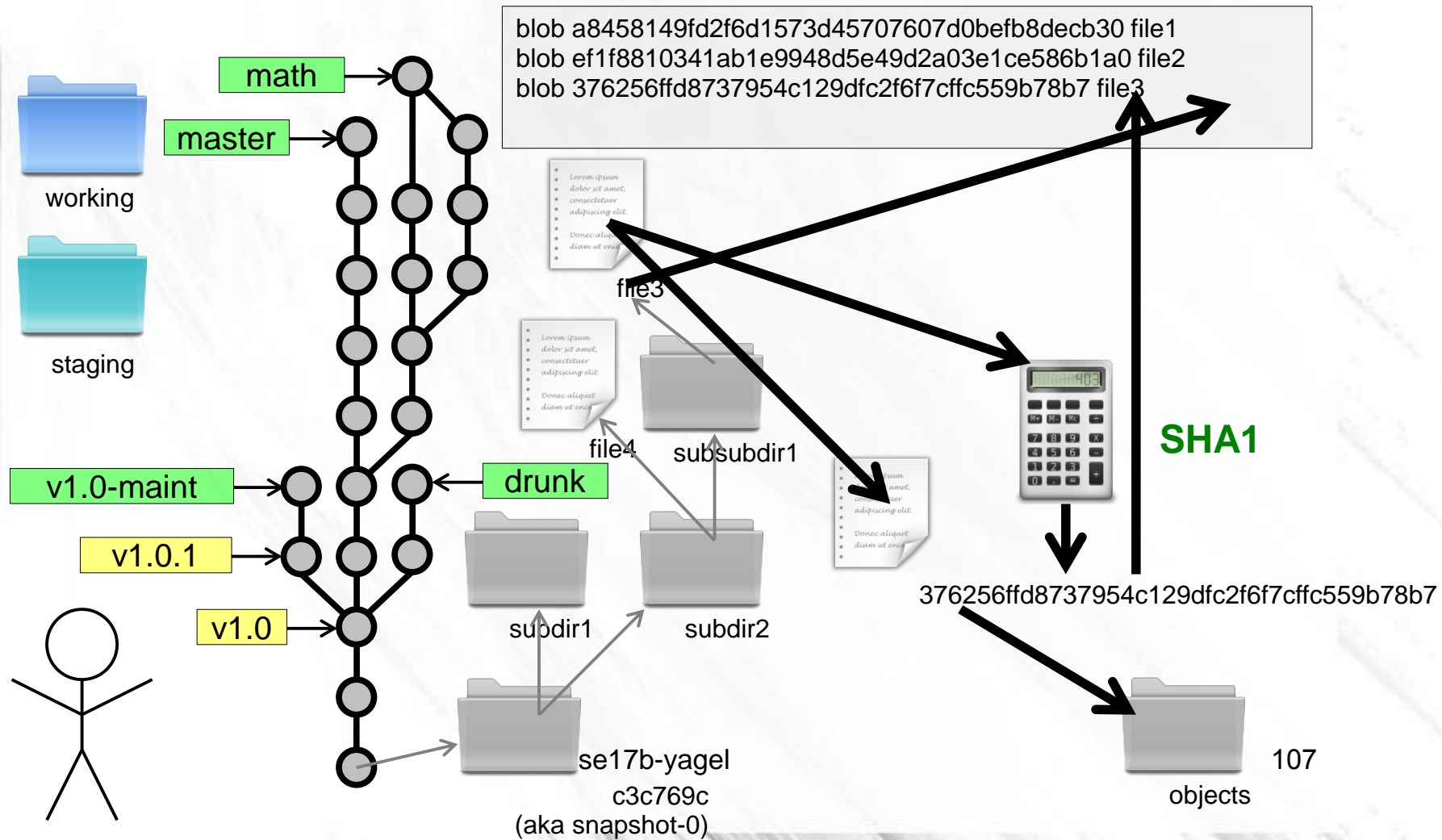
Eliminating Duplication



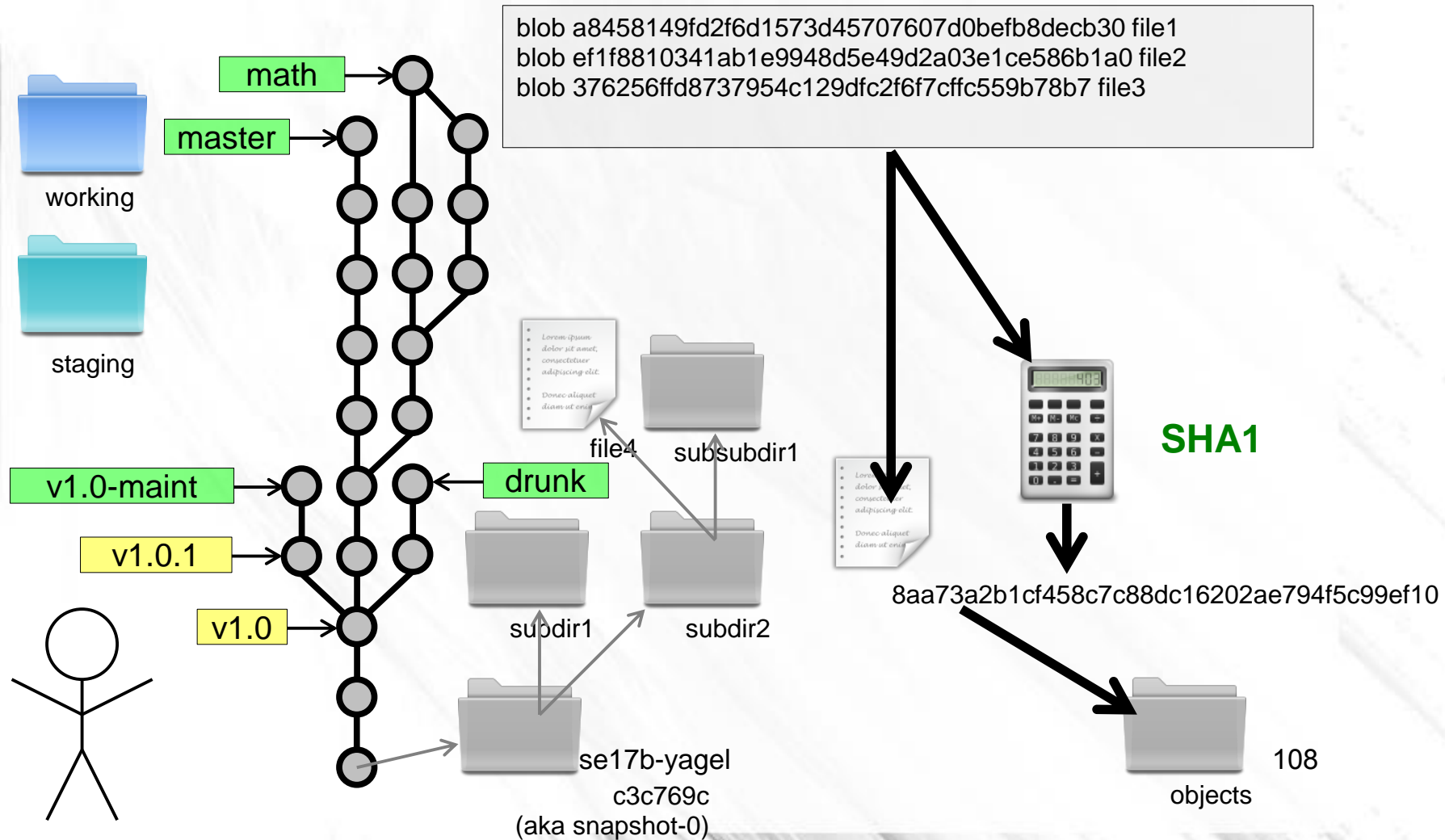
Eliminating Duplication



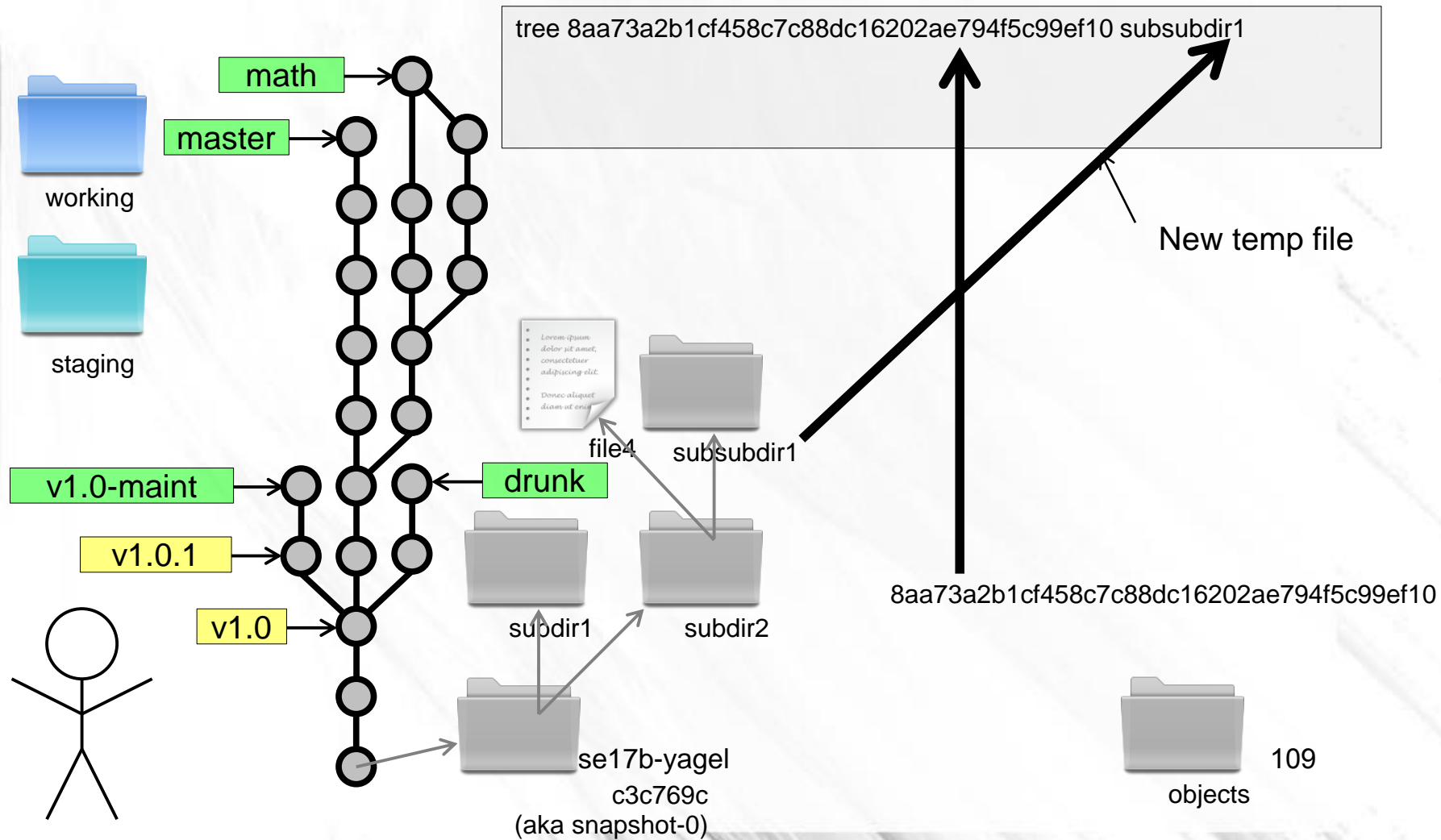
Eliminating Duplication



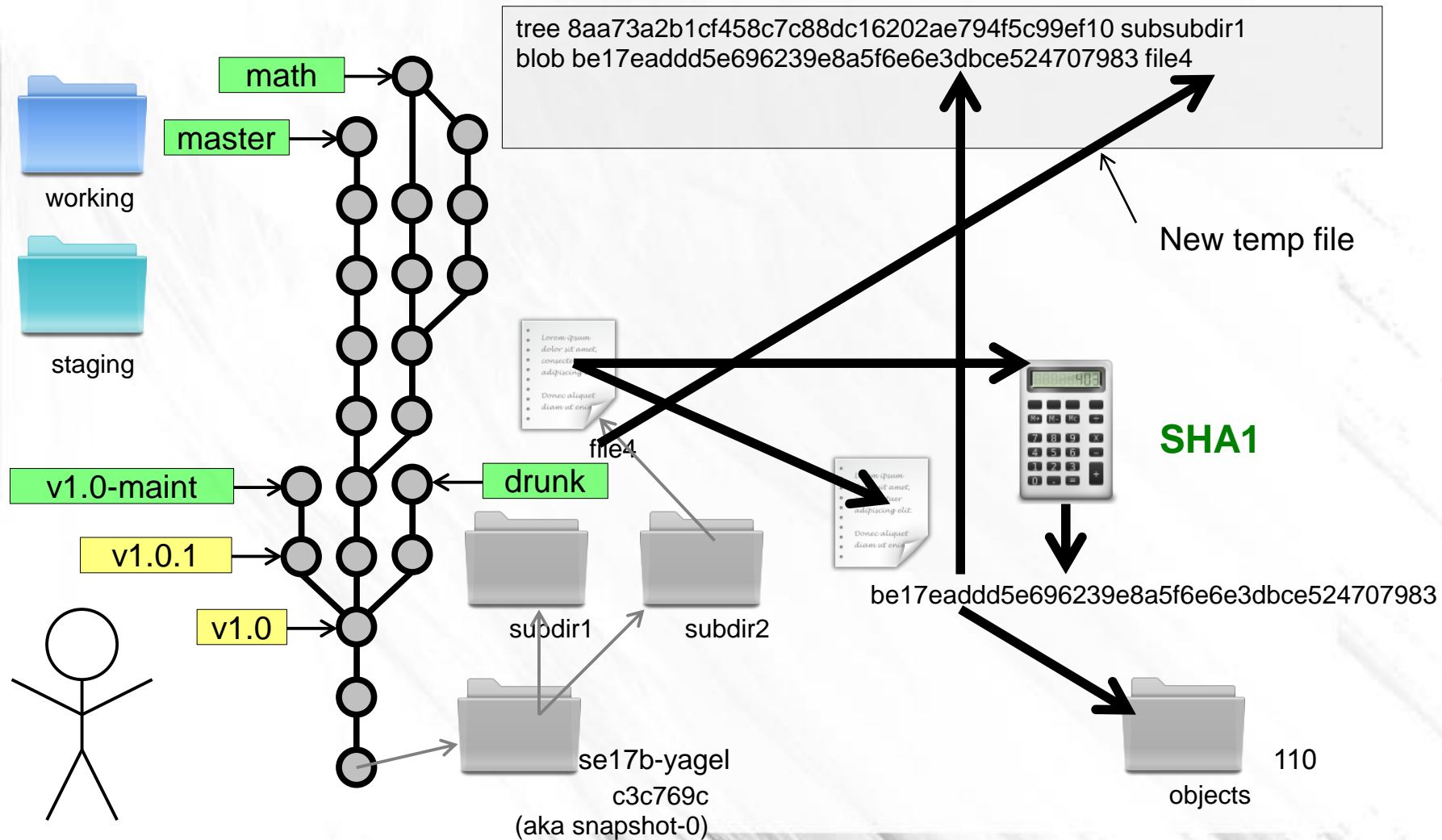
Eliminating Duplication



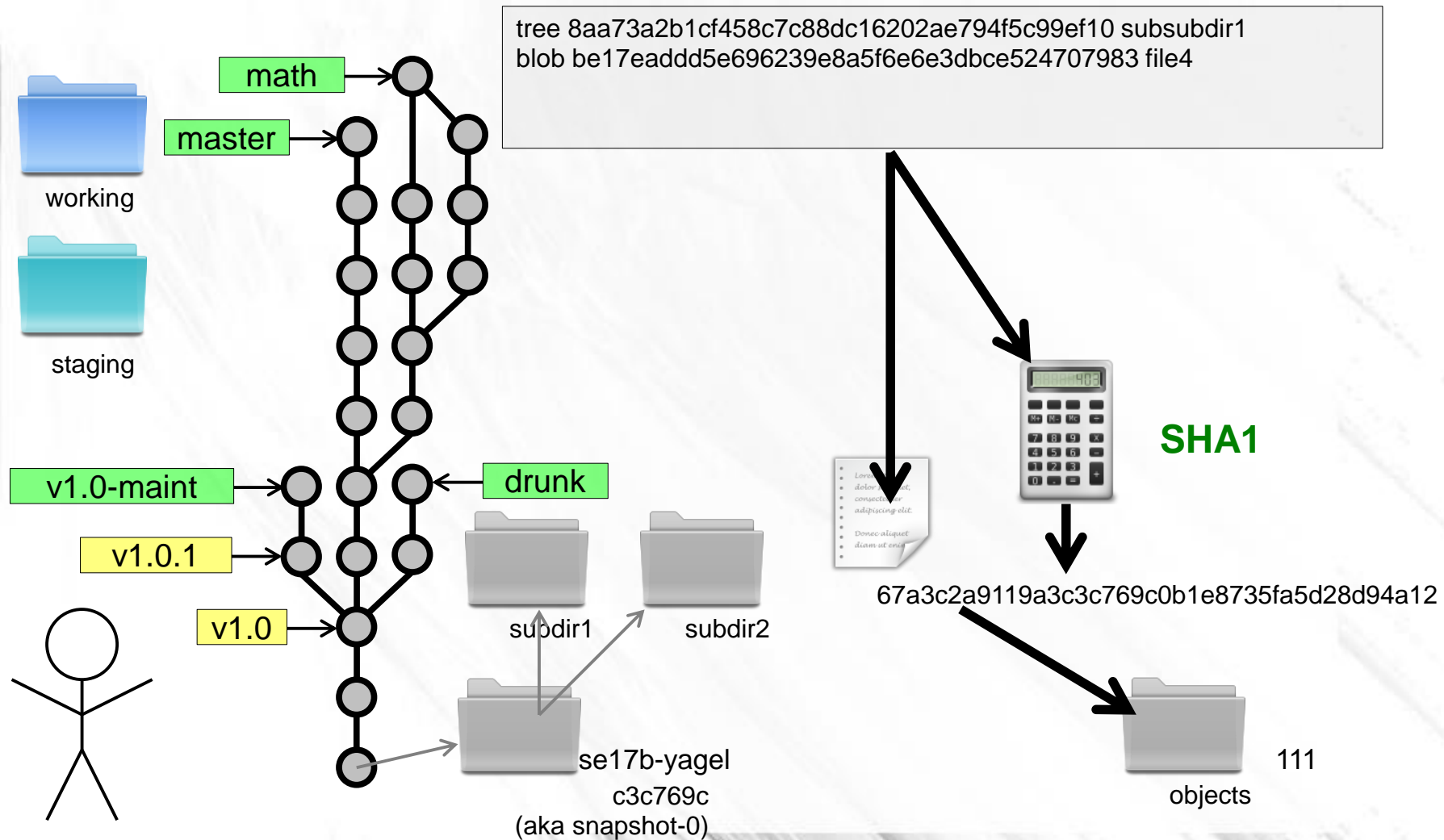
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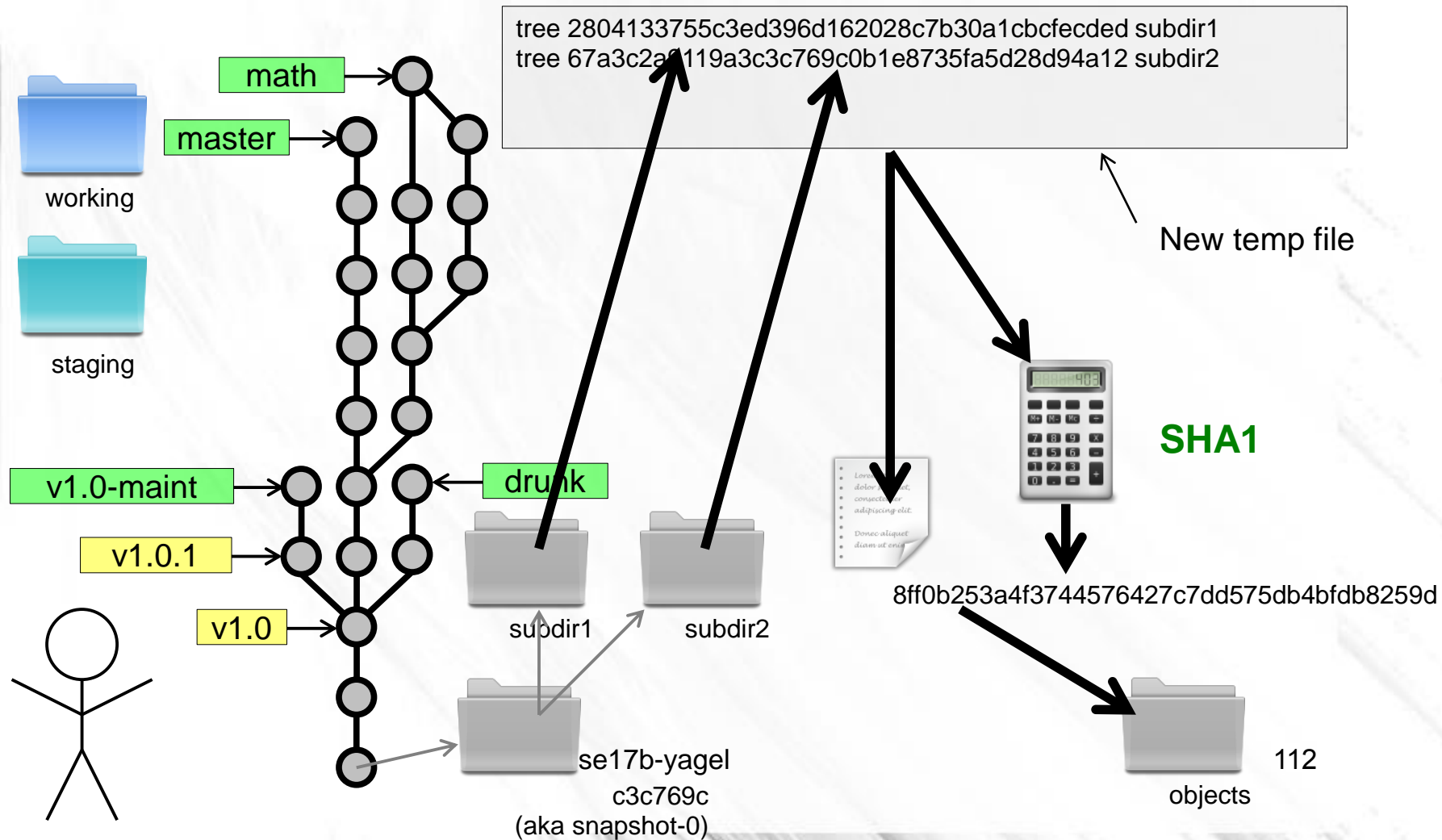
Eliminating Duplication



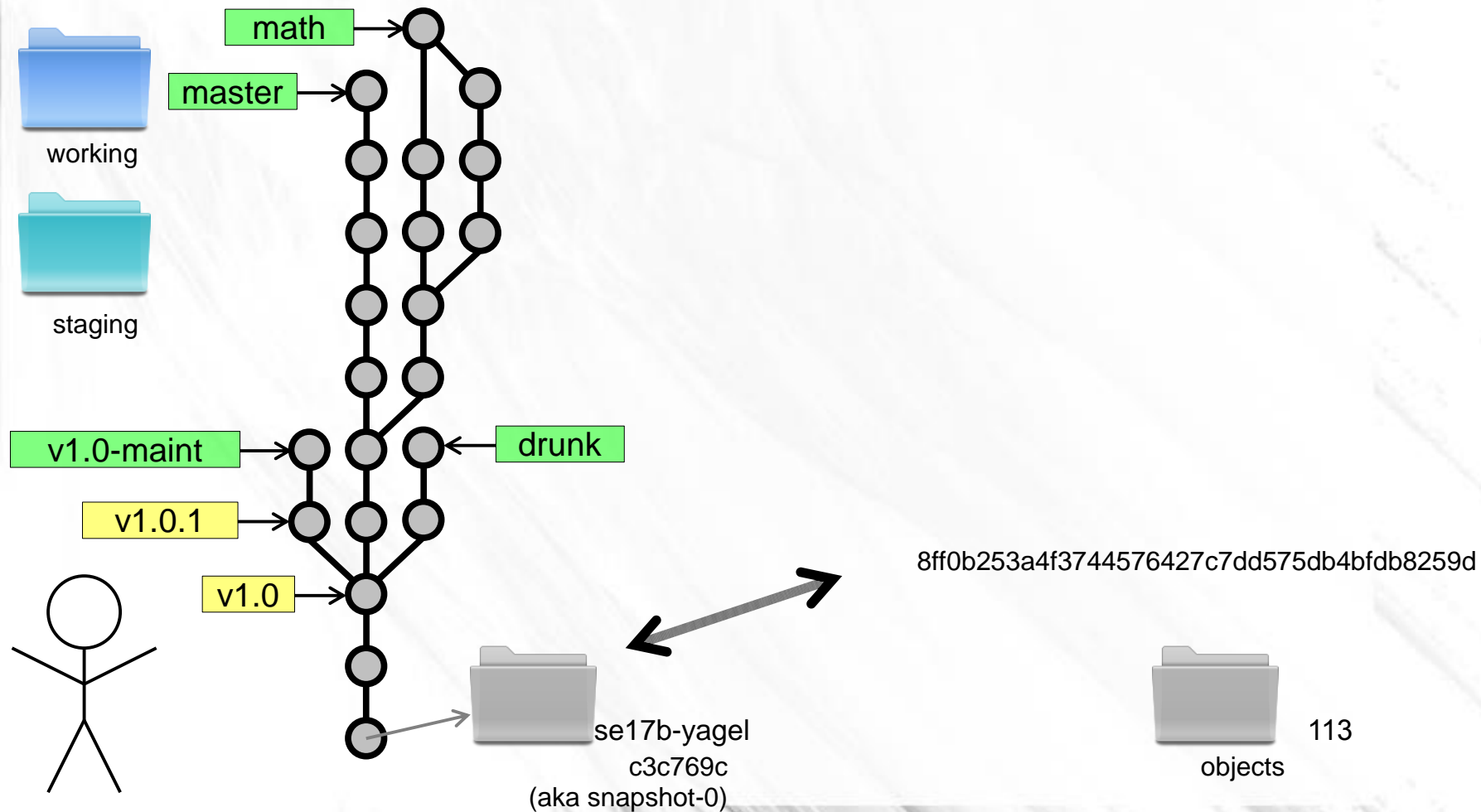
Eliminating Duplication



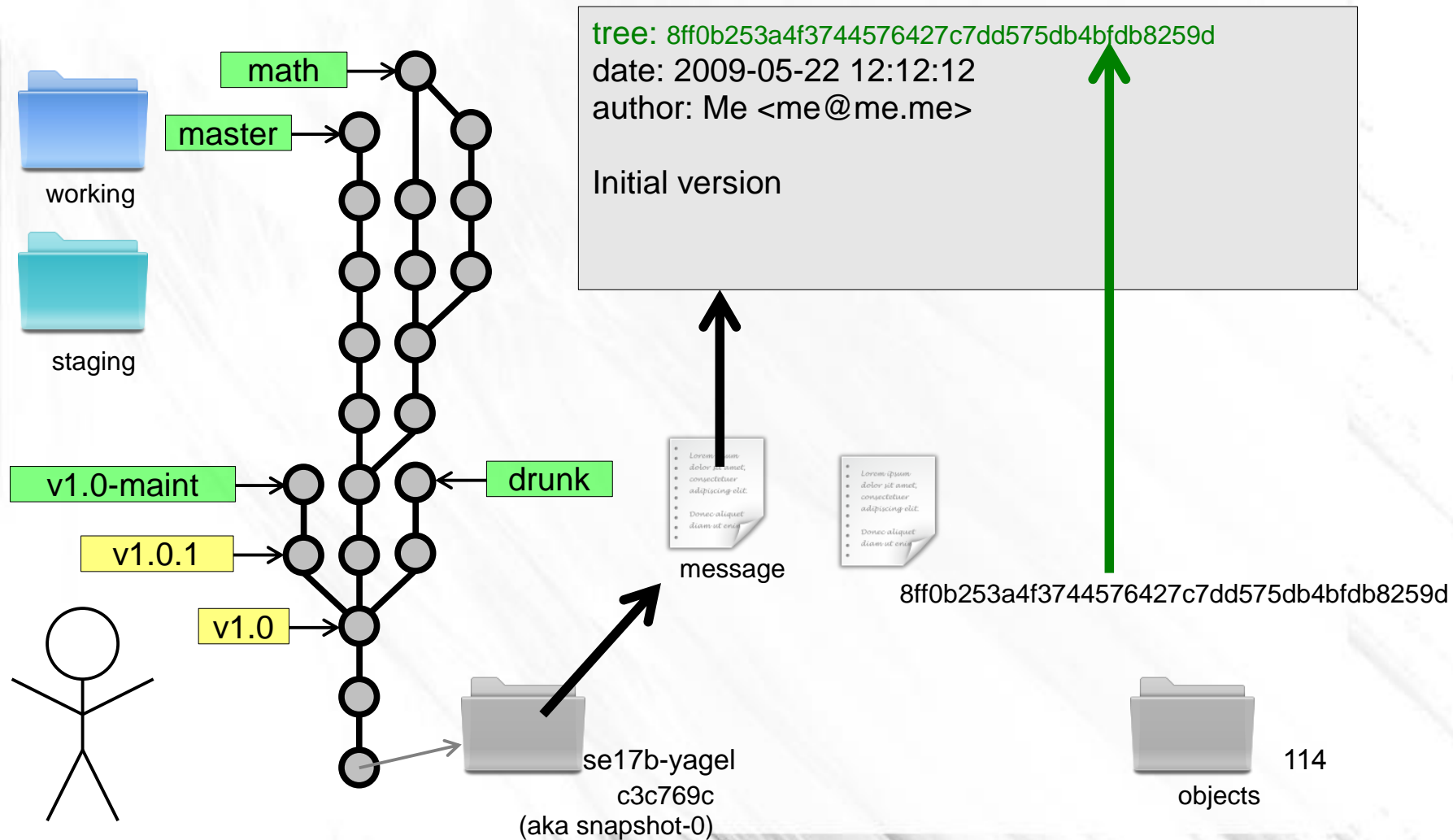
Eliminating Duplication



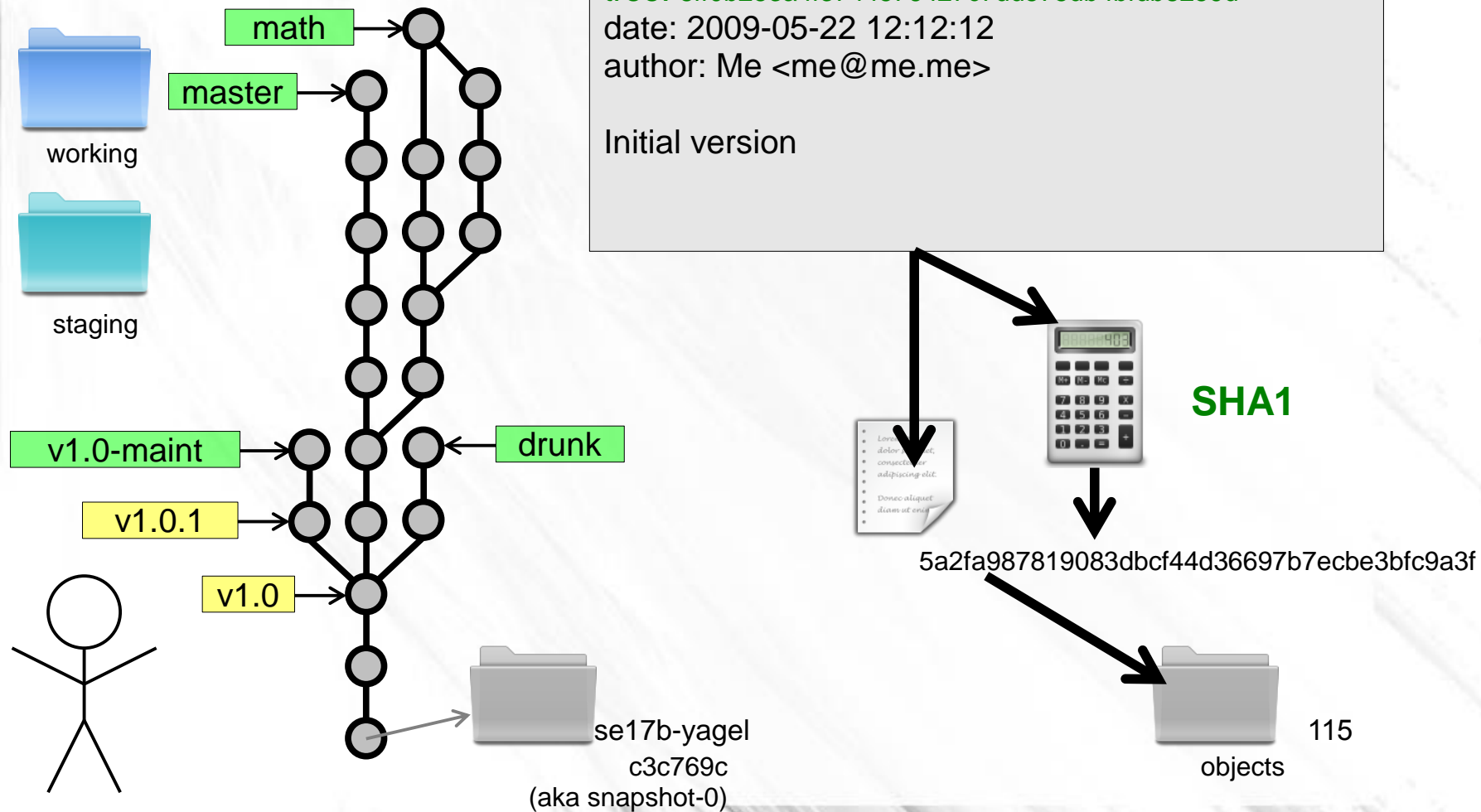
Eliminating Duplication



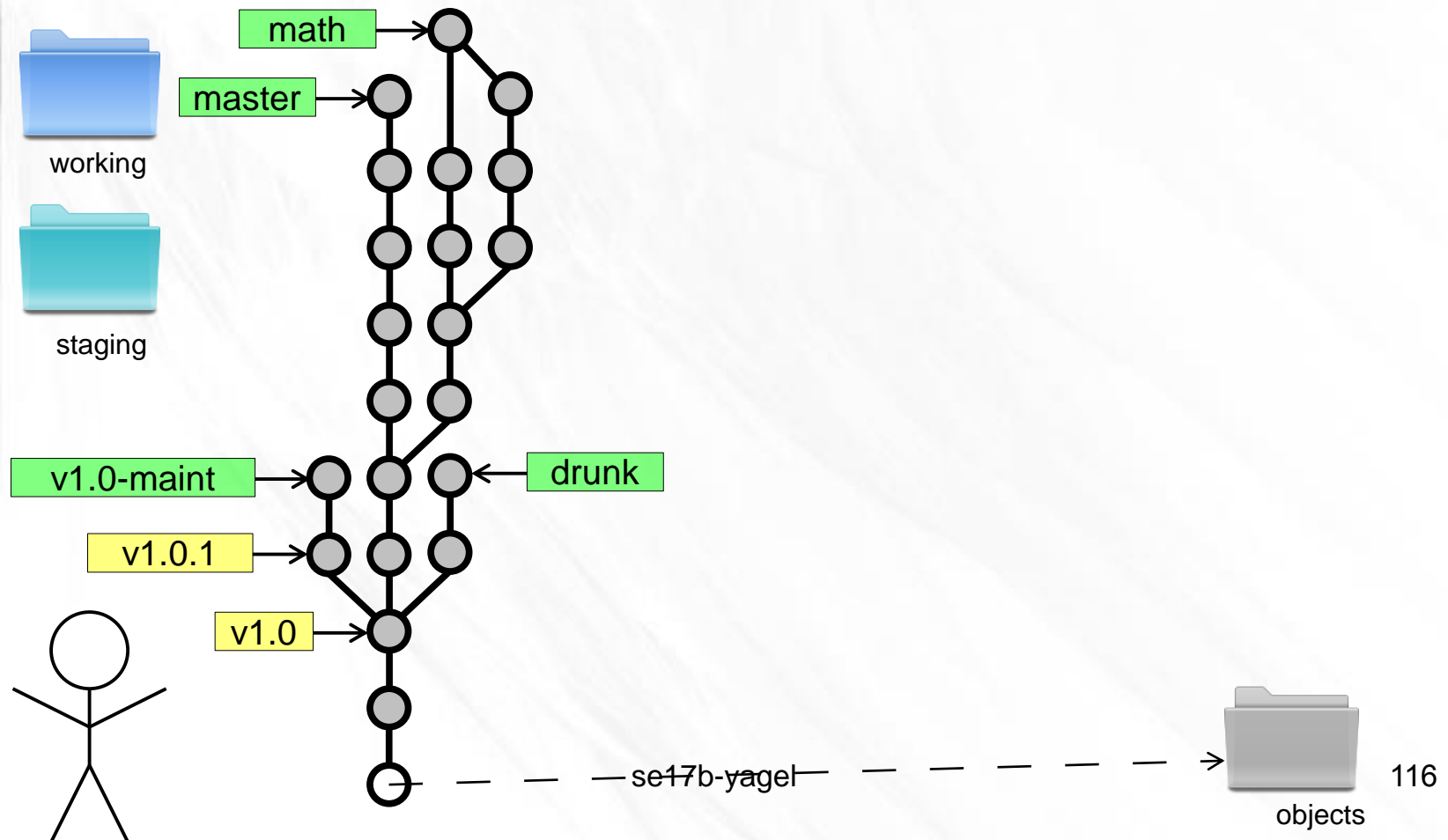
Eliminating Duplication



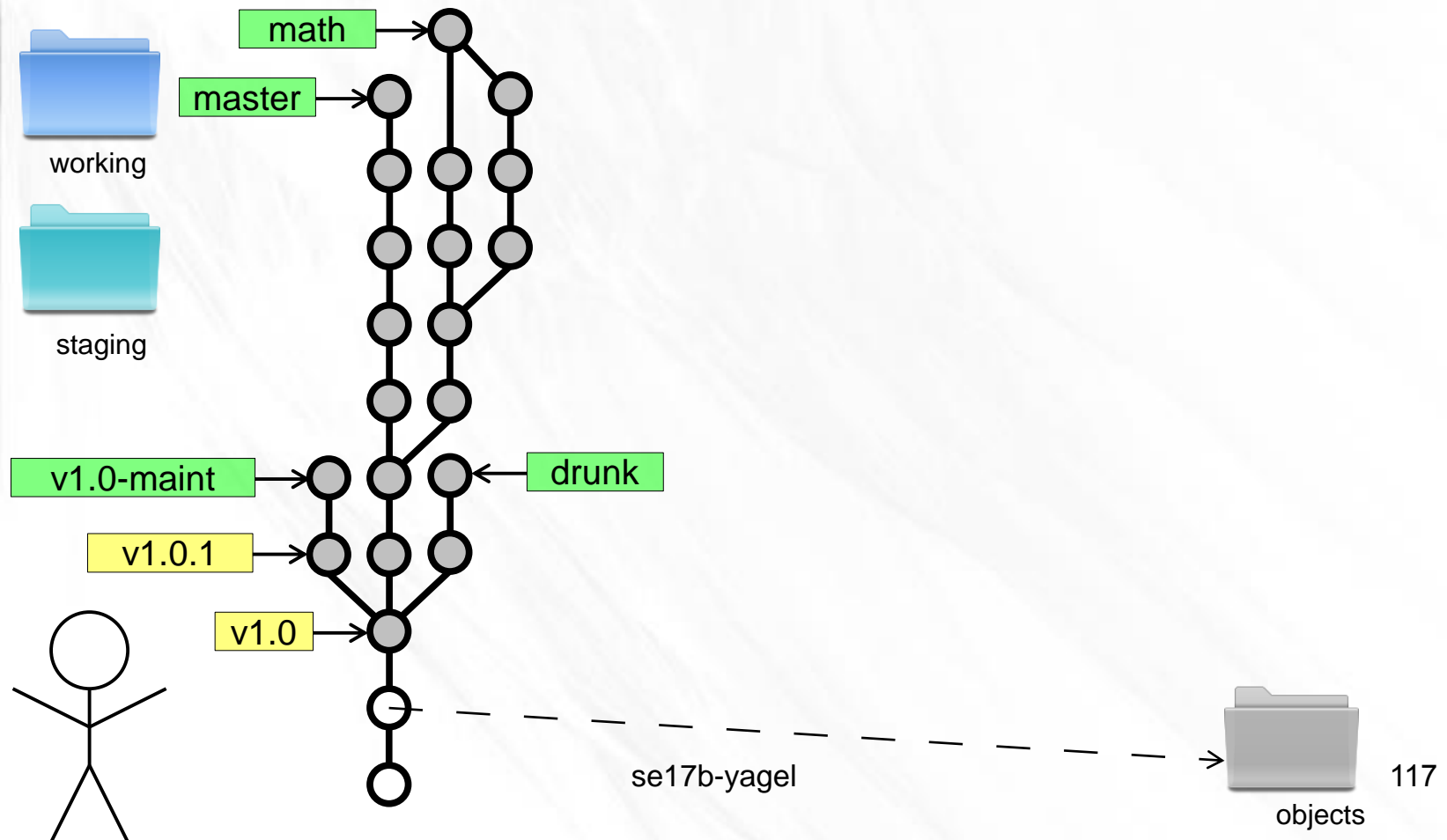
Eliminating Duplication



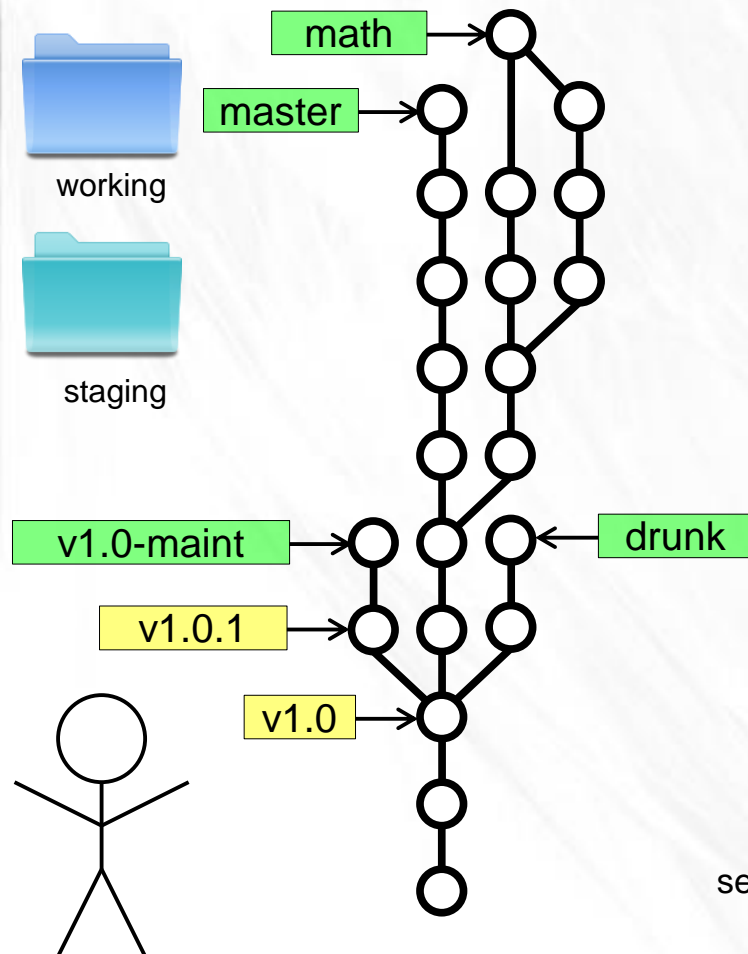
Eliminating Duplication



Eliminating Duplication



Eliminating Duplication



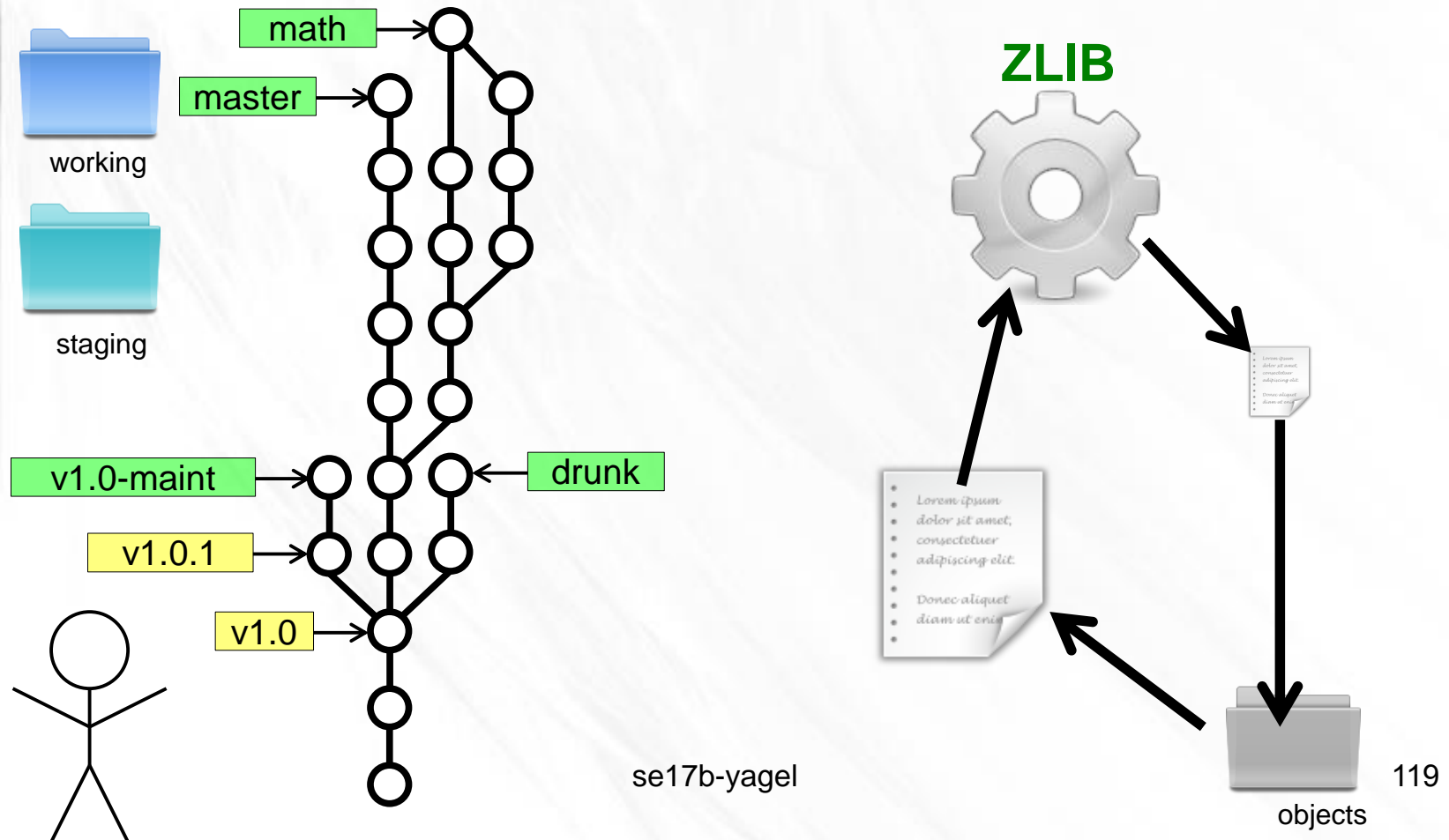
se17b-yagel



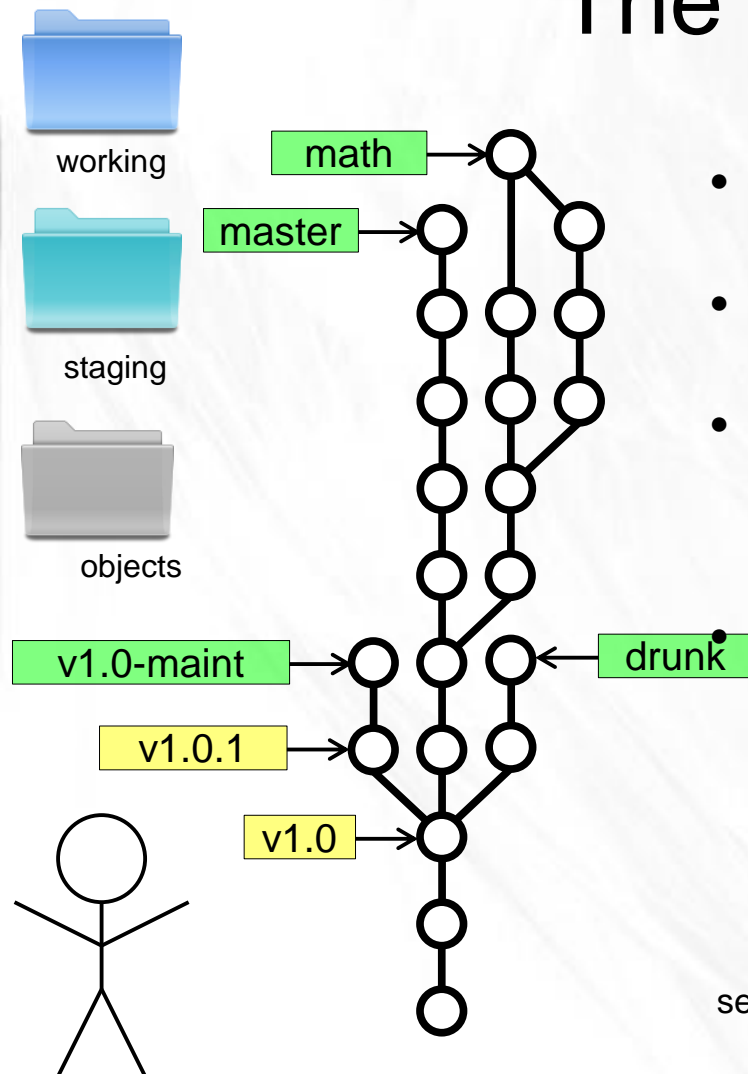
objects

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Compressing Blobs



The True Git

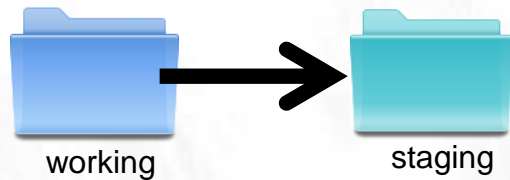


- TADAA!
- This is pretty much Git
- Nicer command line tools for all these operations
- Many, many other tools

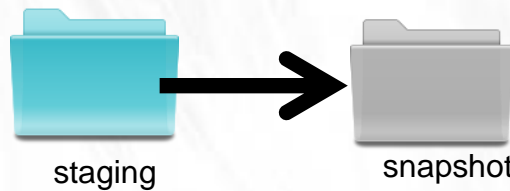
Commands: Getting Started

- First, tell Git who you are:
 - `git config --global user.name "My Name"`
 - `git config --global user.email "my@email.address"`
- Get help:
 - `git <command> -h`
 - `git help <command>`
- Start a new Git repository:
 - `git init`

Commands: Making snapshots



• git add



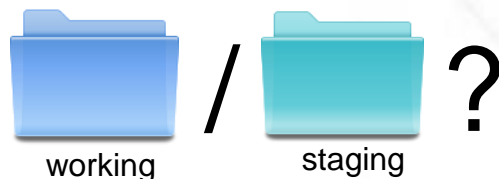
• git commit



git commit -a



• git log



se17b-yagel

• git status

Add the simple scripts I used to do a me
Merge the new object model thing from
[PATCH] Switch implementations of merg
[PATCH] Port fsck-cache to use parsing fi
[PATCH] Port rev-tree to parsing function
[PATCH] Implementations of parsing fund
[PATCH] Header files for object parsing
[PATCH] fix bug in read-cache.c which lo
[PATCH] Fix confusing behaviour of upda
Make "commit-tree" check the input obje
Make "parse_commit" return the "str122
Do a very simple "merge-base" that finds
Make "rev-tree.c" use the new-and-impro

gith

Commands: Diffing



vs.



- `git diff`



vs.



- `git diff --staged`



vs.



- `git diff HEAD`



vs.



se17b-yagel

- `git diff <from> <to>`

Commands: Branches & Tags

- git branch
 - git branch <branch>
 - git checkout <branch>
 - git tag -l
 - git tag <tag>
- } git checkout -b ...

Commands: Fetching & Merging

- `git remote add <name> <URL>`

- `git fetch <name>`

}

`git pull`

- `git merge <name>/<branch>`

- # git reflog

Where to go next?

- Git homepage: <http://git-scm.com>
- Pro Git: <http://git-scm.com/book>
- Git Reference: <http://gitref.org>
- GitHub: <http://github.com>
- Gitorious: <http://gitorious.org>
- **Gitlab**

Questions?

- Thanks for your attention!
- These slides are available at:
https://github.com/jherland/git_parable
- Reach me at <johan@herland.net>



Git Clients (Windows)

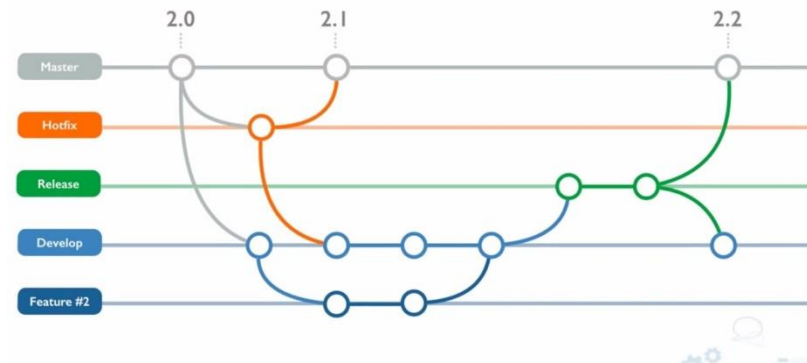
- CLI Shell: Git Bash
- Windows Explorer Shell
- Github Desktop (+powershell)
- Bitbucket SourceTree
- IDE Integration
 - Visual Studio (Code / VS2013+ native)
 - Eclipse Egit
 - IntelliJ, Webstorm embedded
 - Brackets plugin

הדגמה \ טיפים

- <http://learn.github.com/> (education.. - free student account)
- <http://help.github.com/create-a-repo/>
Local user settings:
git config user.name <user>
git config user.email user@example.com
- git pull
- git add: add / stage
- git commit -a == add+commit

Git Workflows - שיטות

- Centralized Workflow
- Feature Branch Workflow
- Gitflow Workflow
- Forking Workflow (OSS)



- Github Flow
- Pull request – בפרויקט?
- דוגמא: תהליך העבודה בפרויקט Nuget:
Contributing a Bug Fix or Feature
- קישורים נוספים בויקי

בפעם הבאה

- פרויקט: פיתוח בסבבים
- משימה אישית מס' 3 – ליווי גם בהרצאה
- בקרת גרסאות II – תרחישים נוספים עם git -
Workflows
- שעה שלישית – מעבדה (משימה אישית 3+4,
להביא מחשבים)
- בהמשך
 - בדיקות, פיתוח מונחה מפרטים
 - עקרונות תיכון מונחה עצמים ועוד

לסיכום

- תהליך: בקרת תצורה וגרסאות
- כלים: git / github
- שיטות: למשל git flow