Azrieli College of Engineering Jerusalem

עזריאלי מכללה אקדמית להנדסה ירושלים

הנדסת תוכנה

6. 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.ericsink.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

- **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 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, 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
  - 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_parable

The Git Parable

Johan Herland

johan@herland.net

The Git Parable

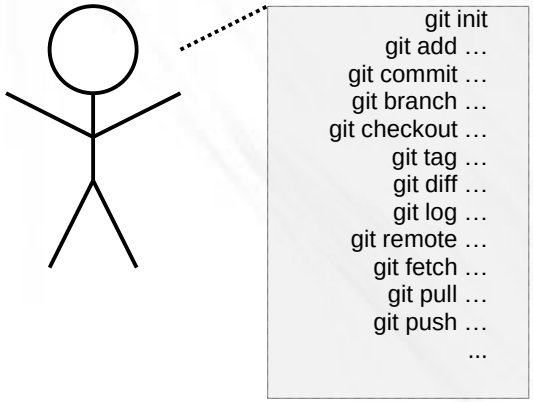
- Shamelessly stolen from Tom Preston-Werner
  http://tom.preston-werner.com/2009/05/19/the-git-parable.html
- I'm lazy...
- Also: Best introduction to Git I've found so far

The Git Parable

- Git - simple & powerful

The Git Parable

- Git - simple & powerful



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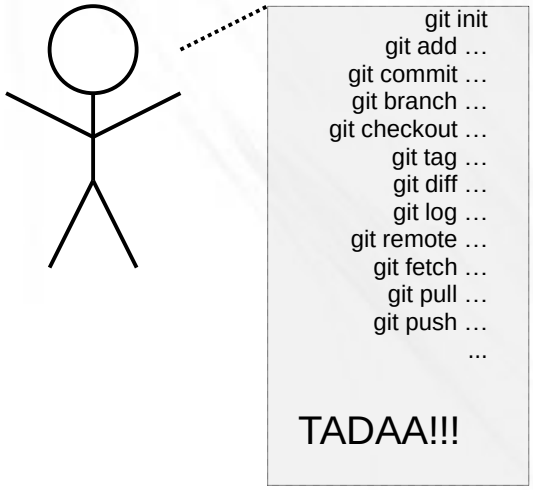

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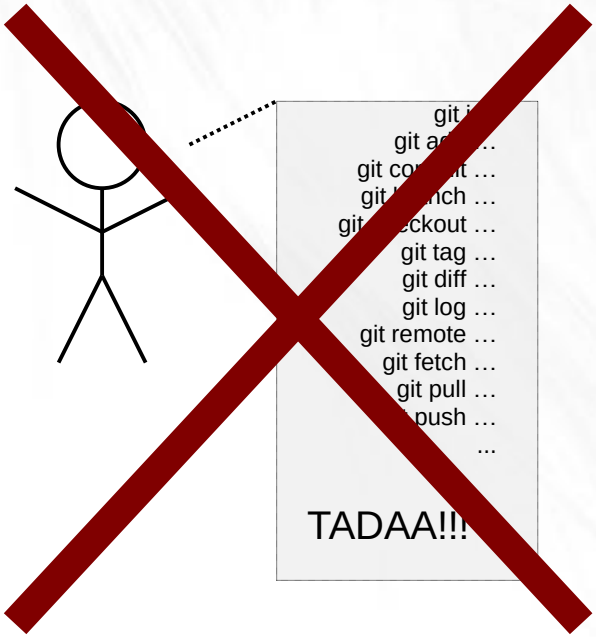

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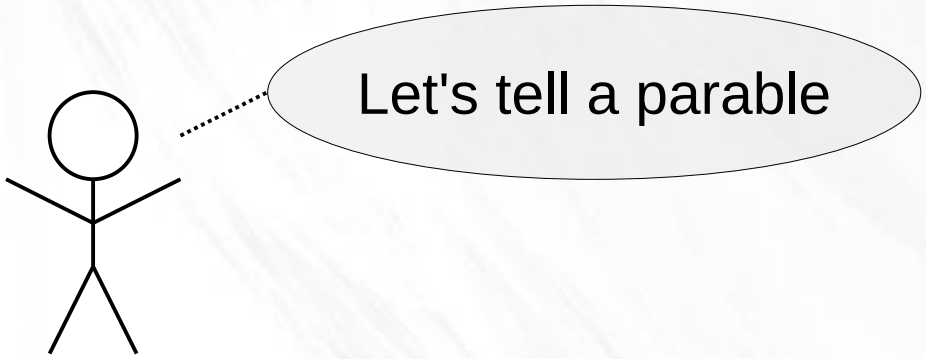

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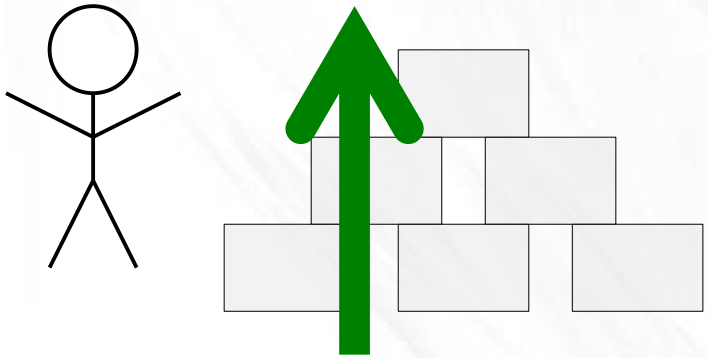

The Git Parable

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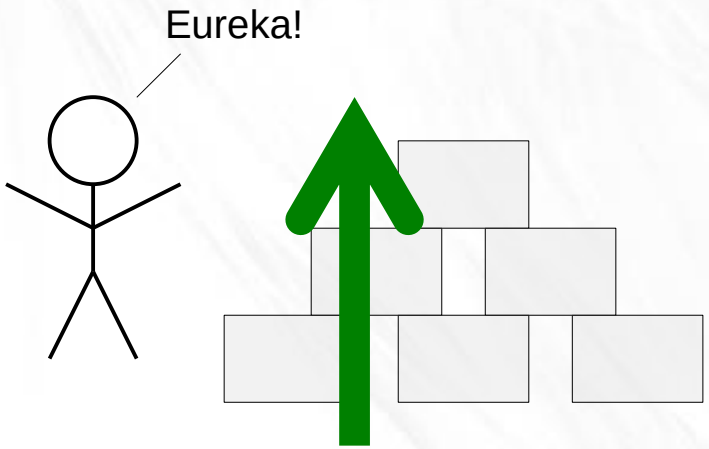
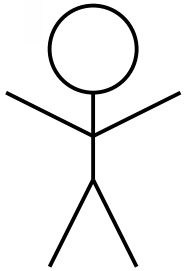


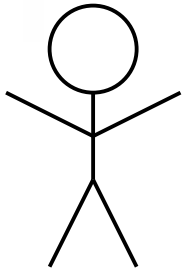
The Parable

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



The Parable

- Write a large software program

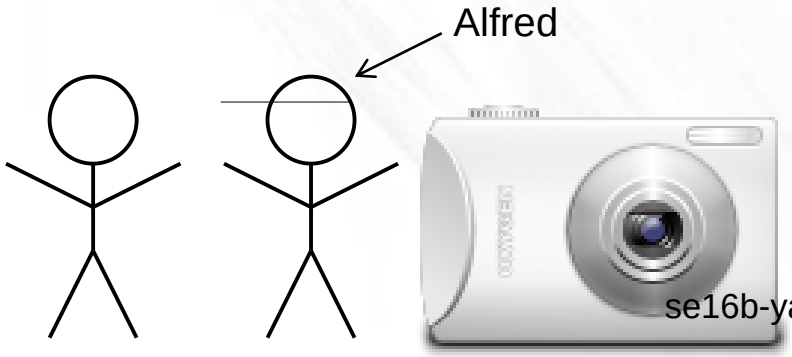


The Parable

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

Snapshots

- Alfred, the photographer



Snapshots

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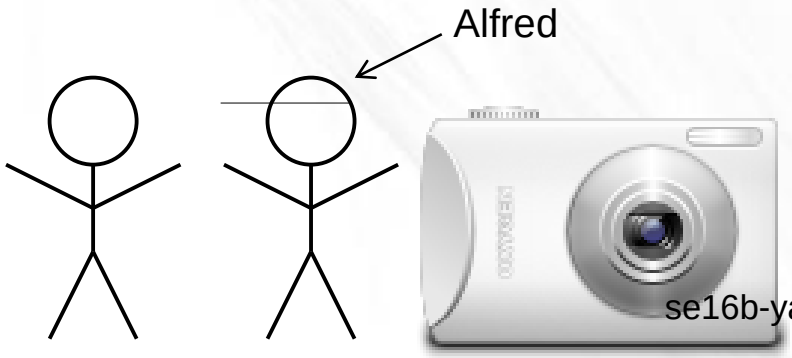
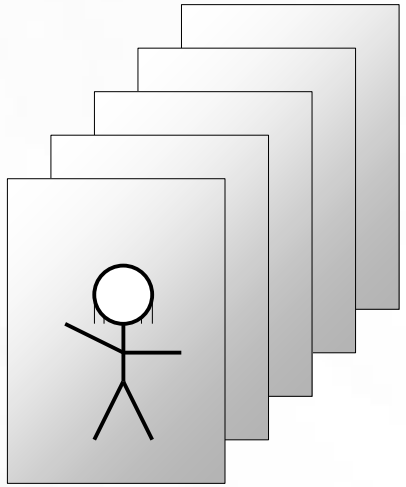


Snapshots

- 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
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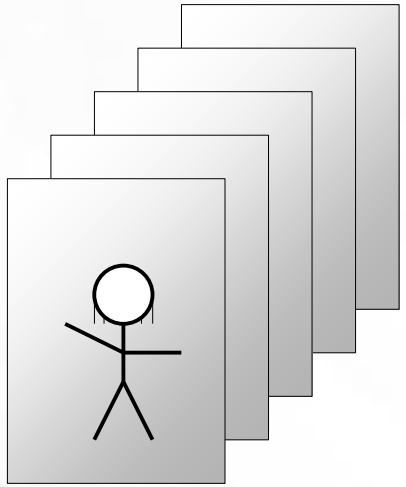
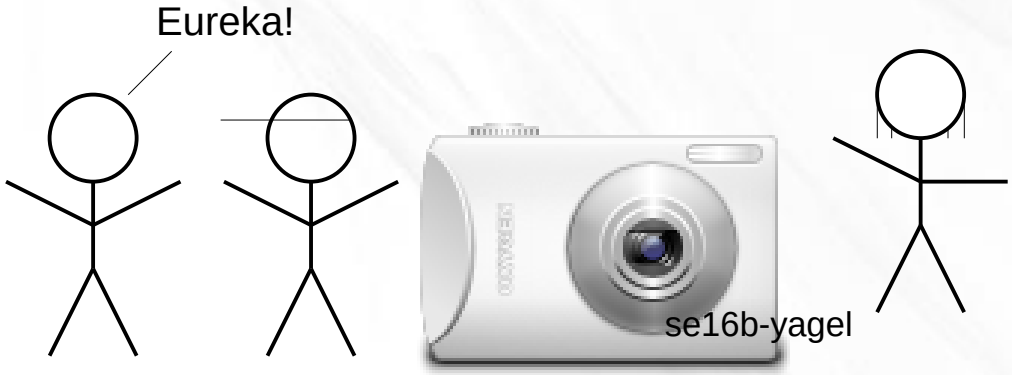
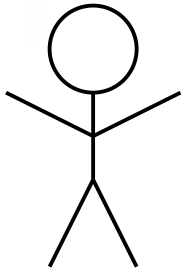


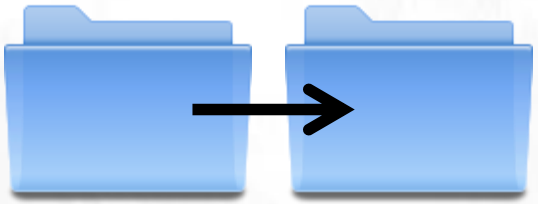


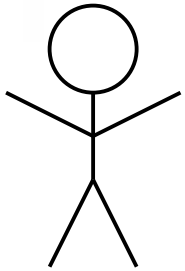
Snapshots

working

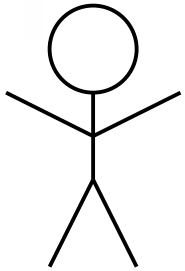


Snapshots

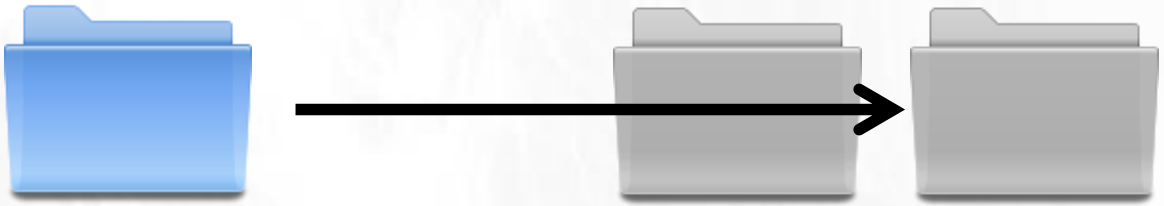


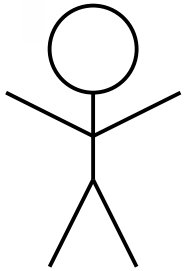


Snapshots



Snapshots

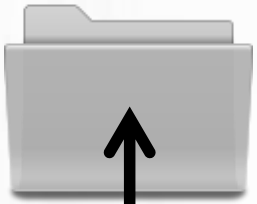




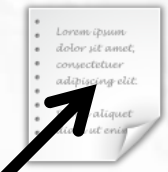
Snapshots

working

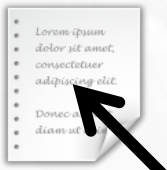
snapshot-0



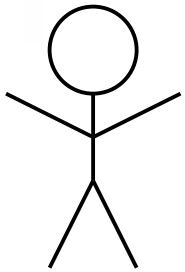
snapshot-1



message



message



2009-05-20 12:34:56

Initial version

2009-05-21 23:45:01

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

Branches

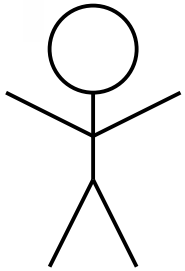
working

snapshot-0

snapshot-1

. . .

snapshot-99



Branches

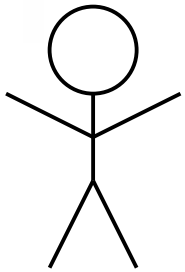
working

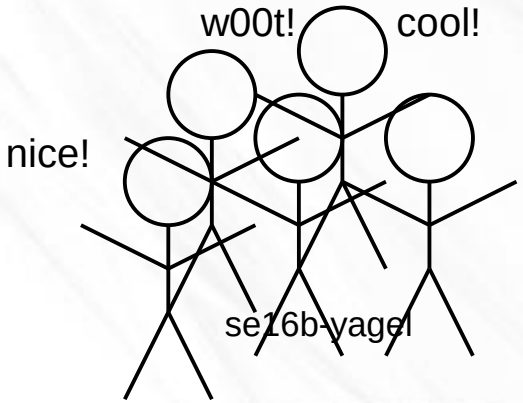
snapshot-0

snapshot-1

. . .

snapshot-99





Branches

working

snapshot-0

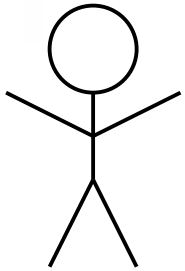
snapshot-1

. . .

snapshot-99

. . .

snapshot-109



Branches

working

snapshot-0

snapshot-1

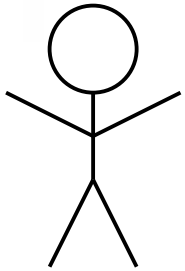
. . .

snapshot-99

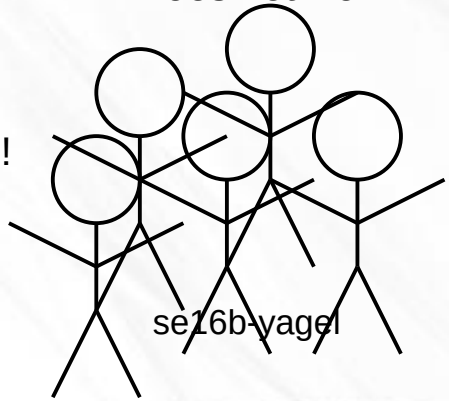
. . .

snapshot-109

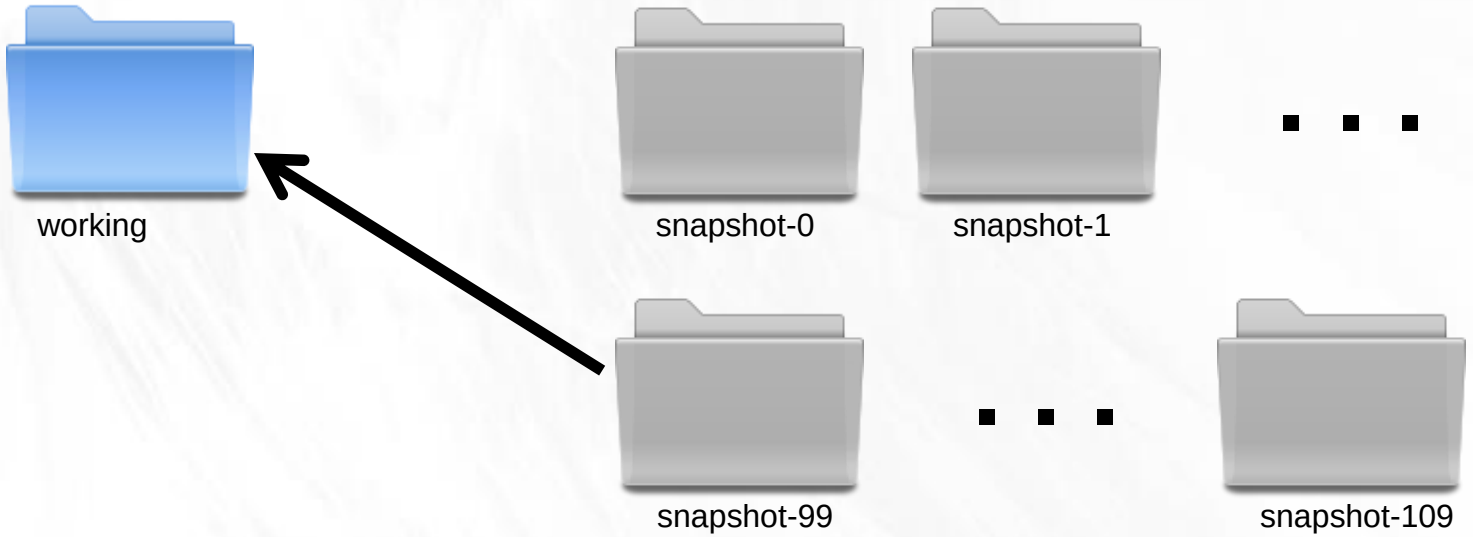
Does not work!

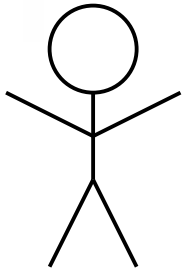


Boo!



Branches





Branches

working

snapshot-0

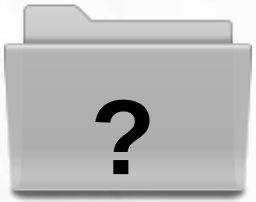
snapshot-1

. . .

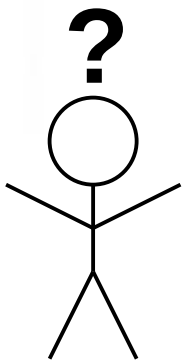
snapshot-99

. . .

snapshot-109



snapshot-110



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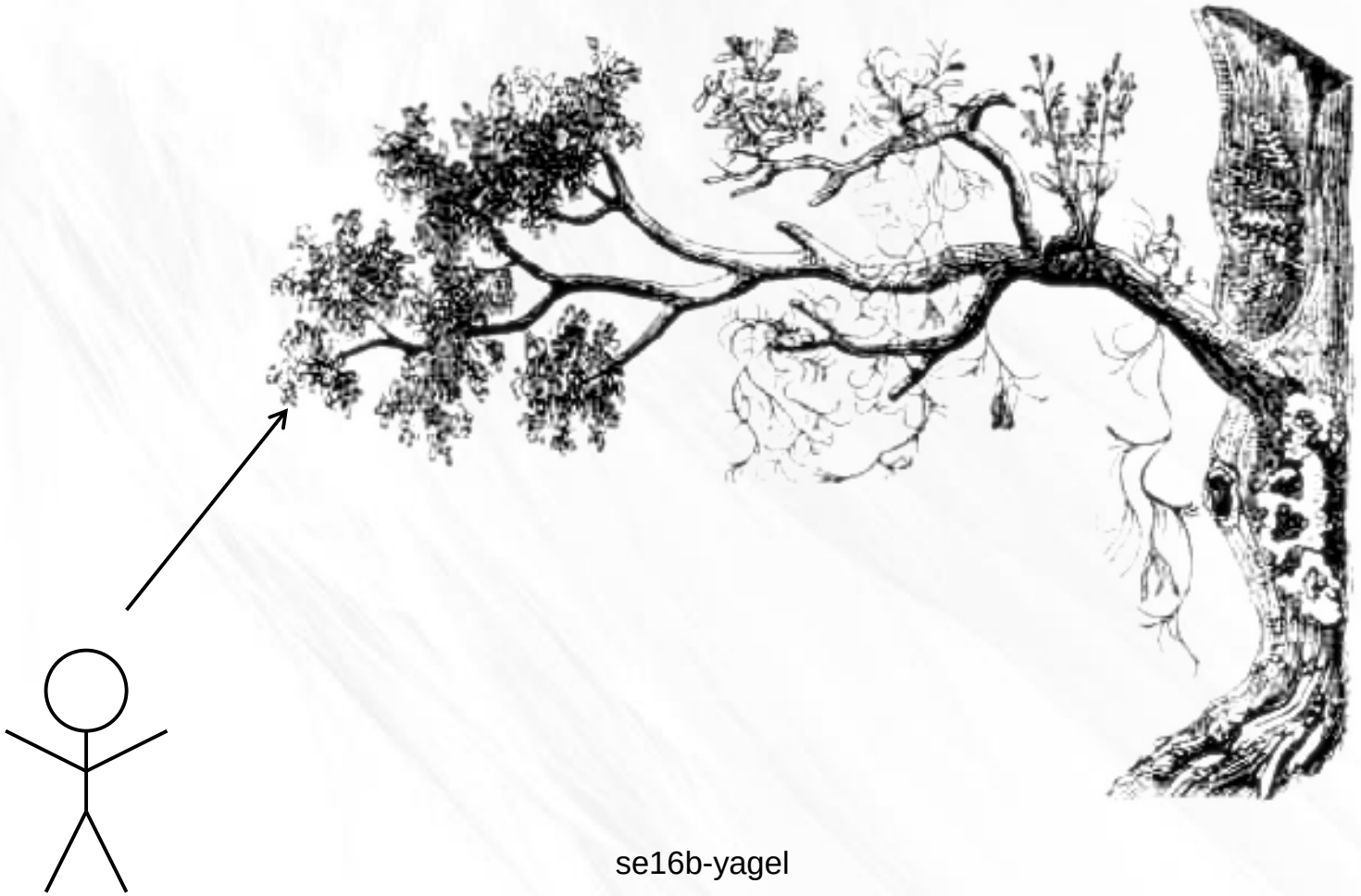

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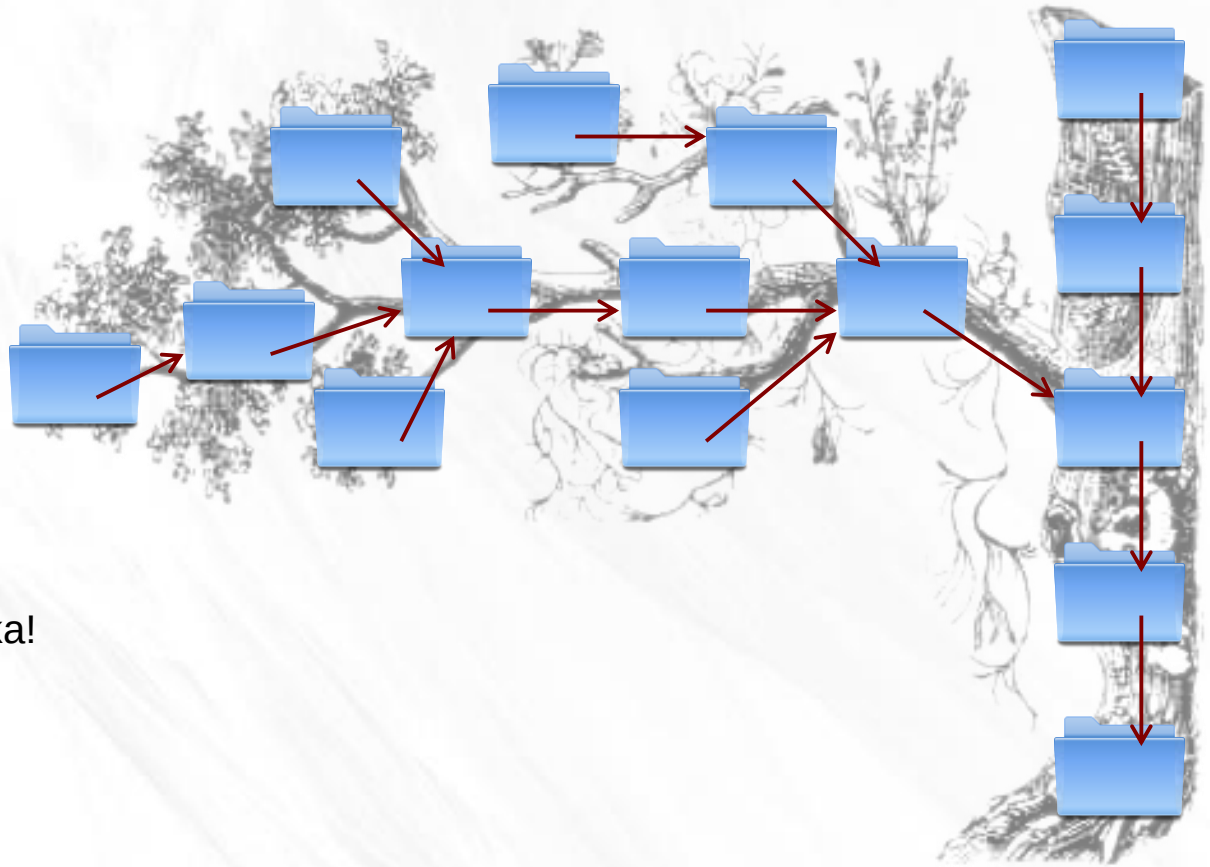

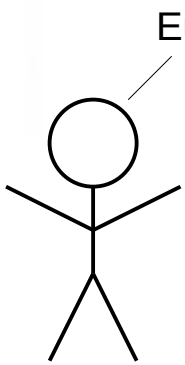

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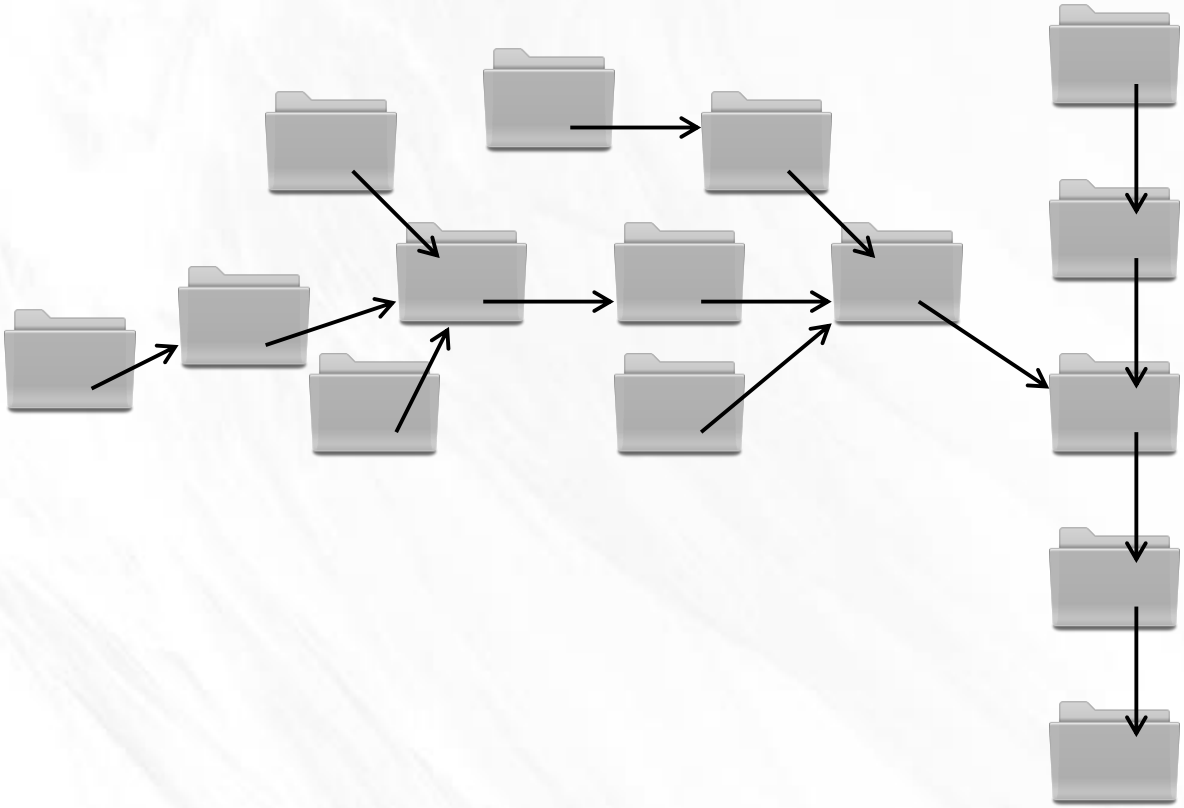

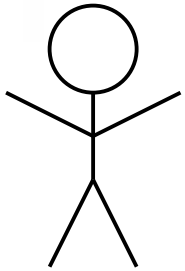

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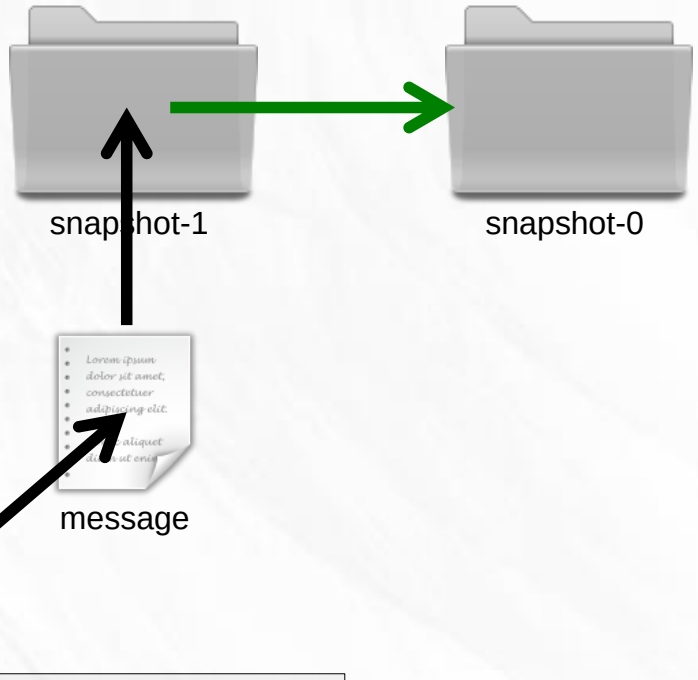
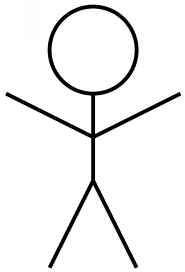


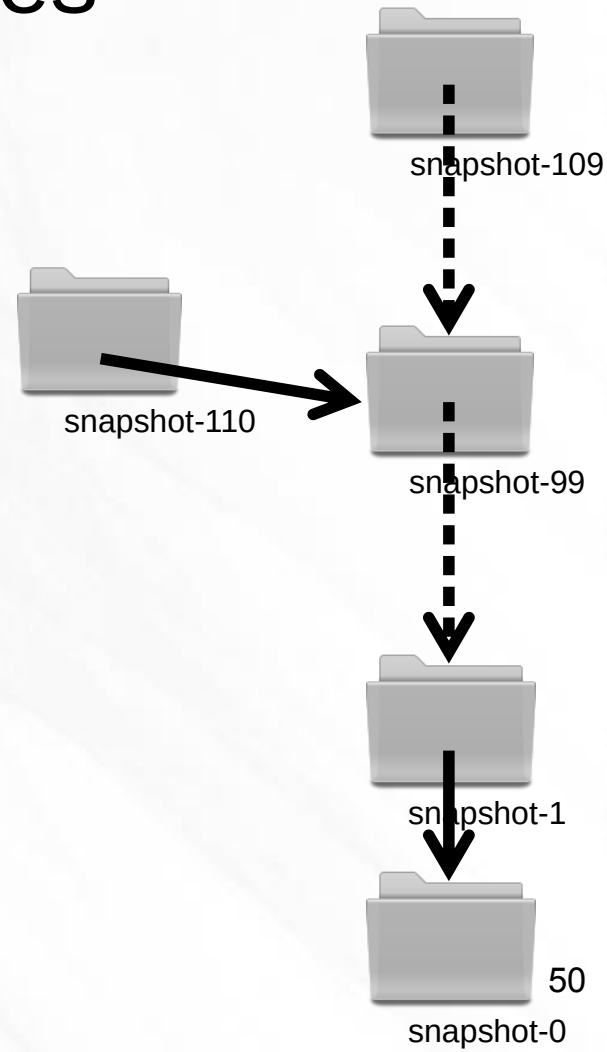


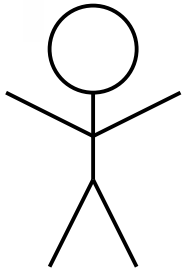
2009-05-21 23:45:01
parent: snapshot-0

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

Branch Names

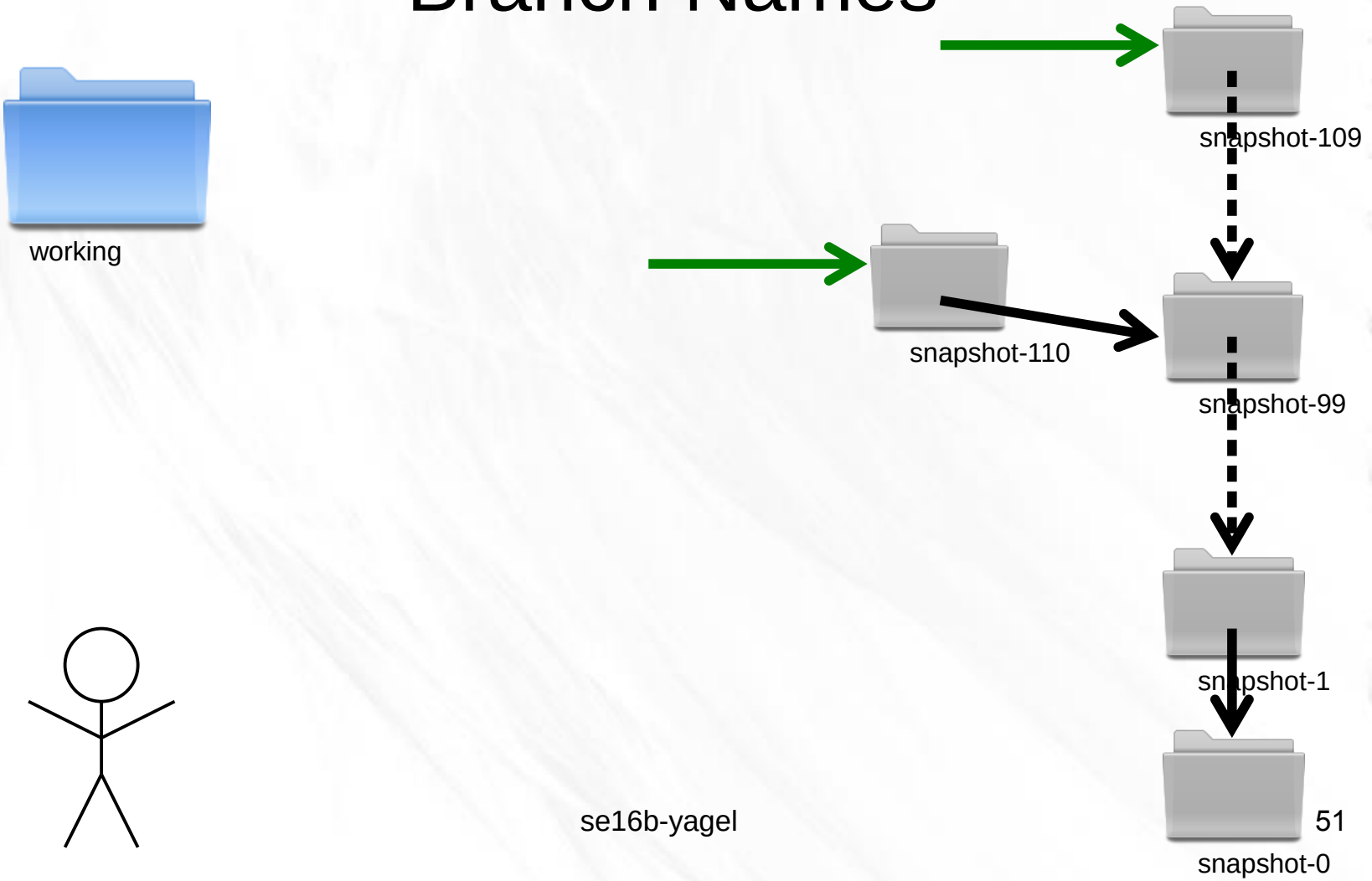
working





se16b-yagel

Branch Names



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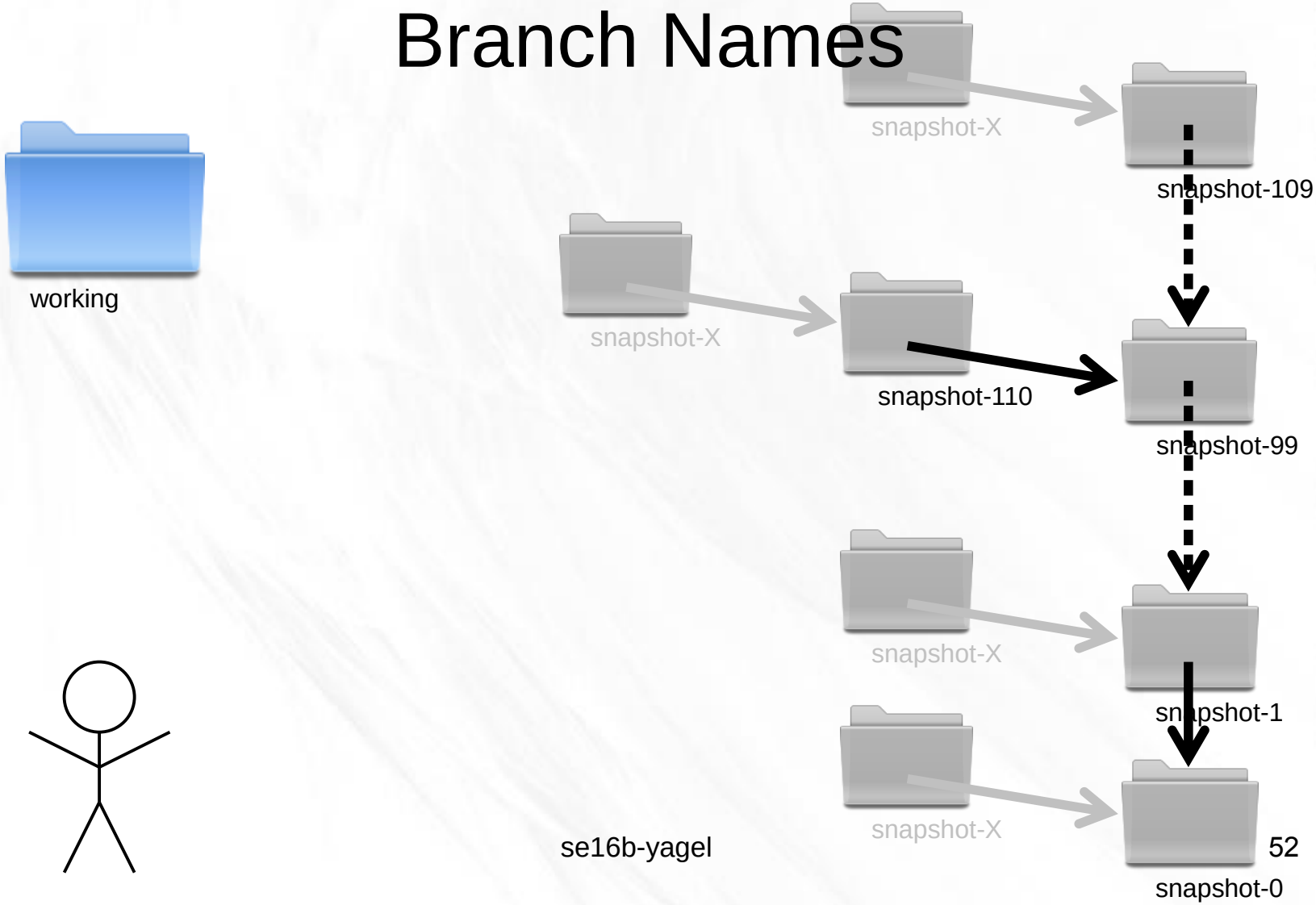

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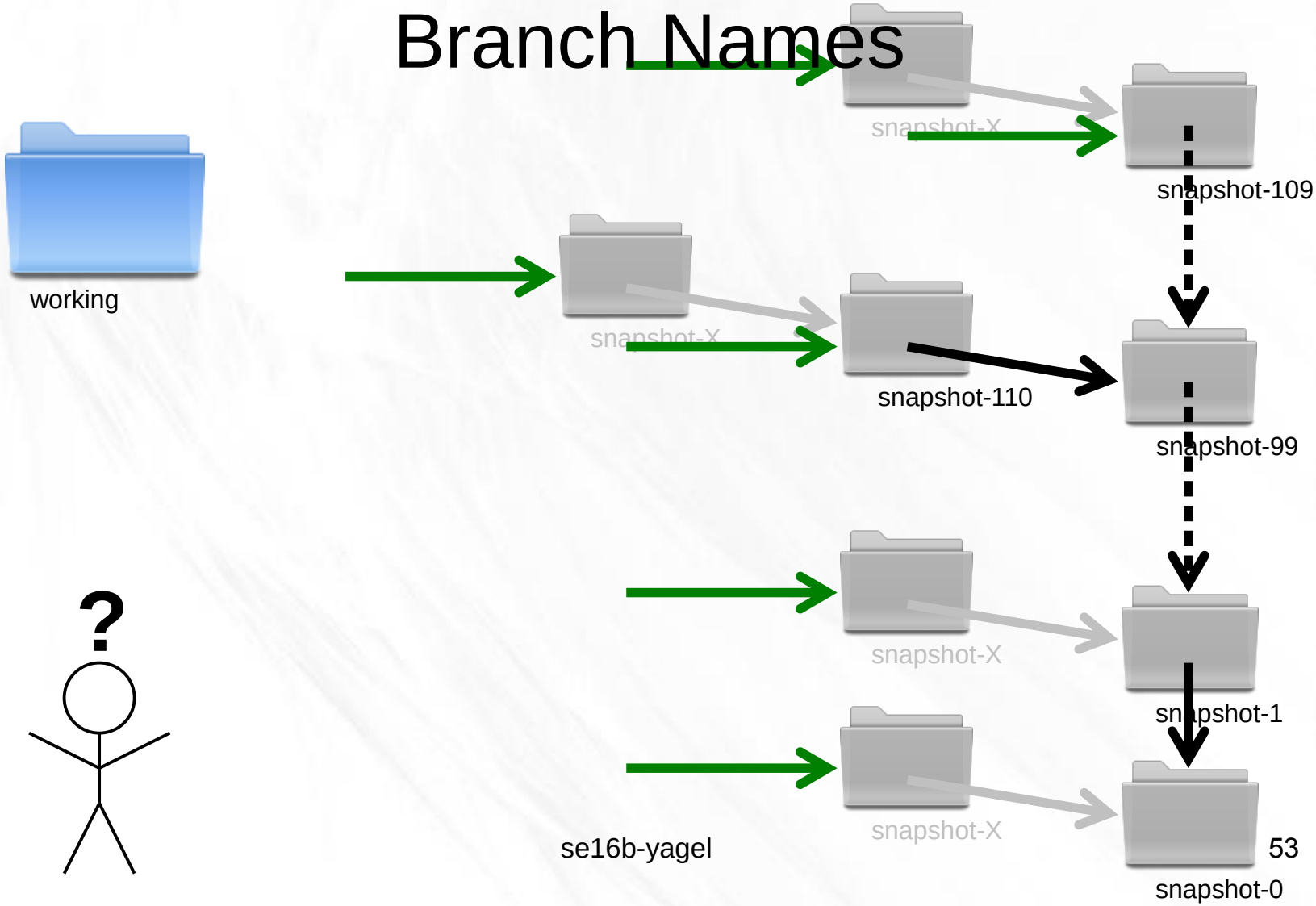

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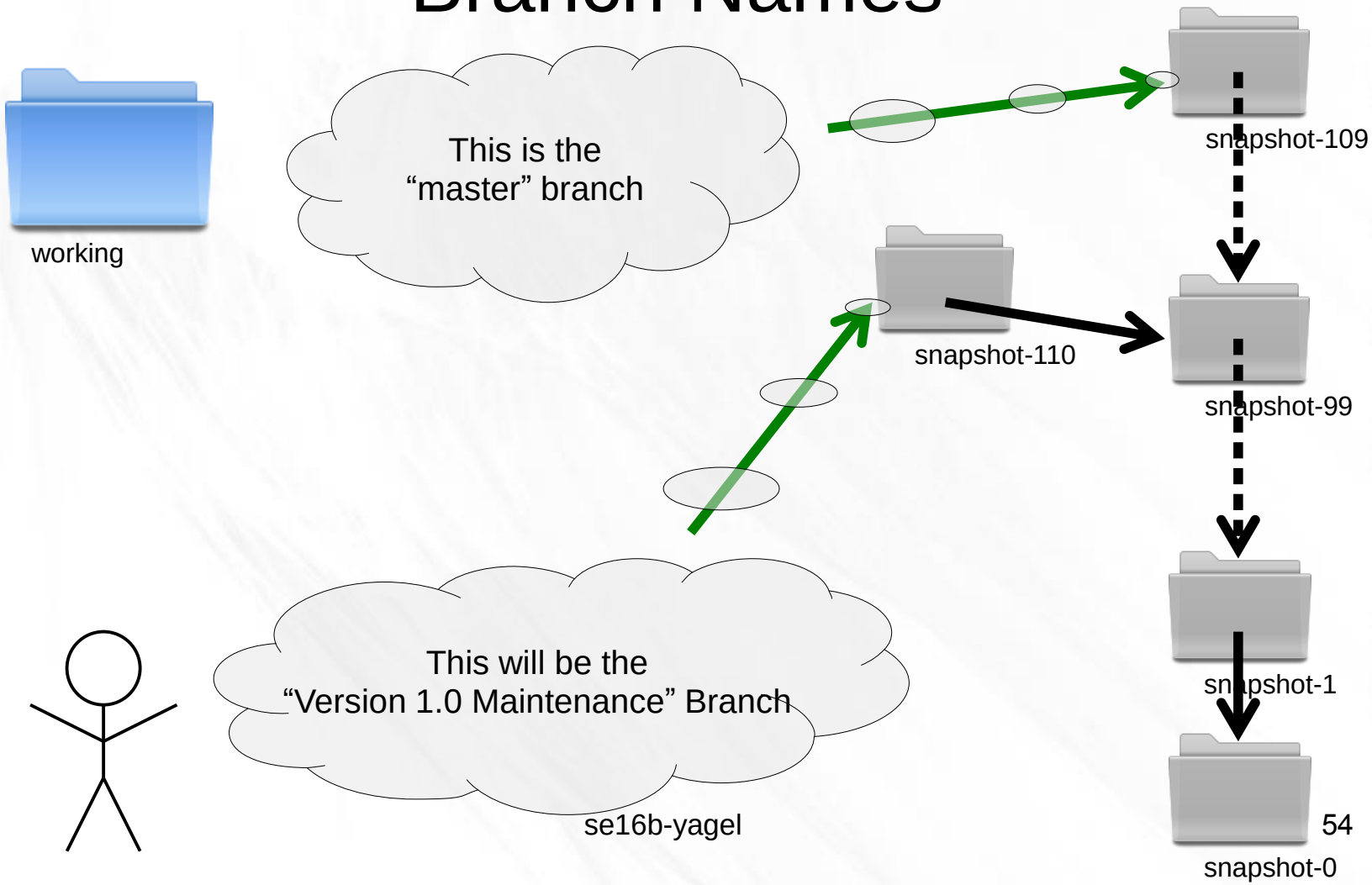

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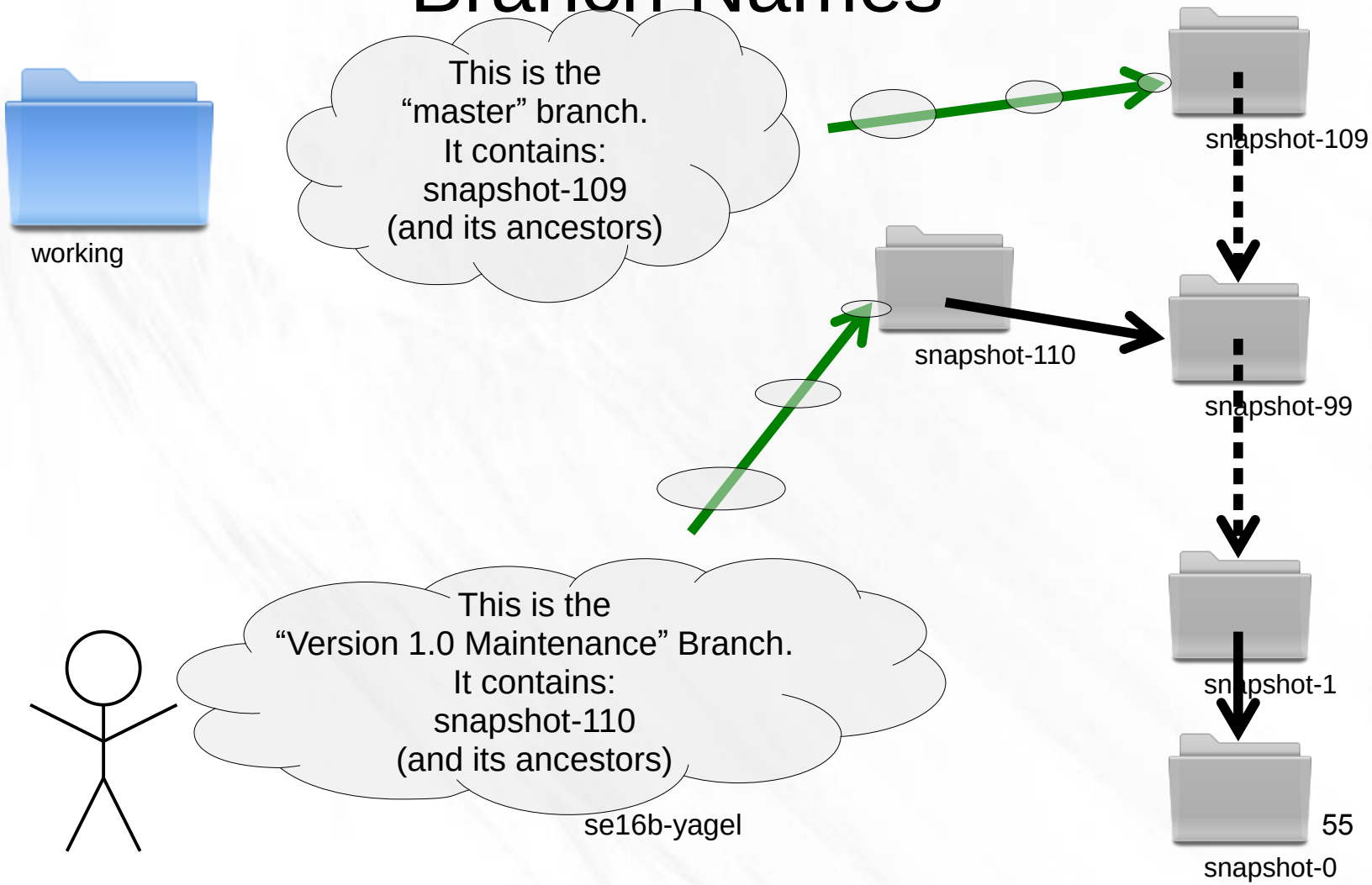

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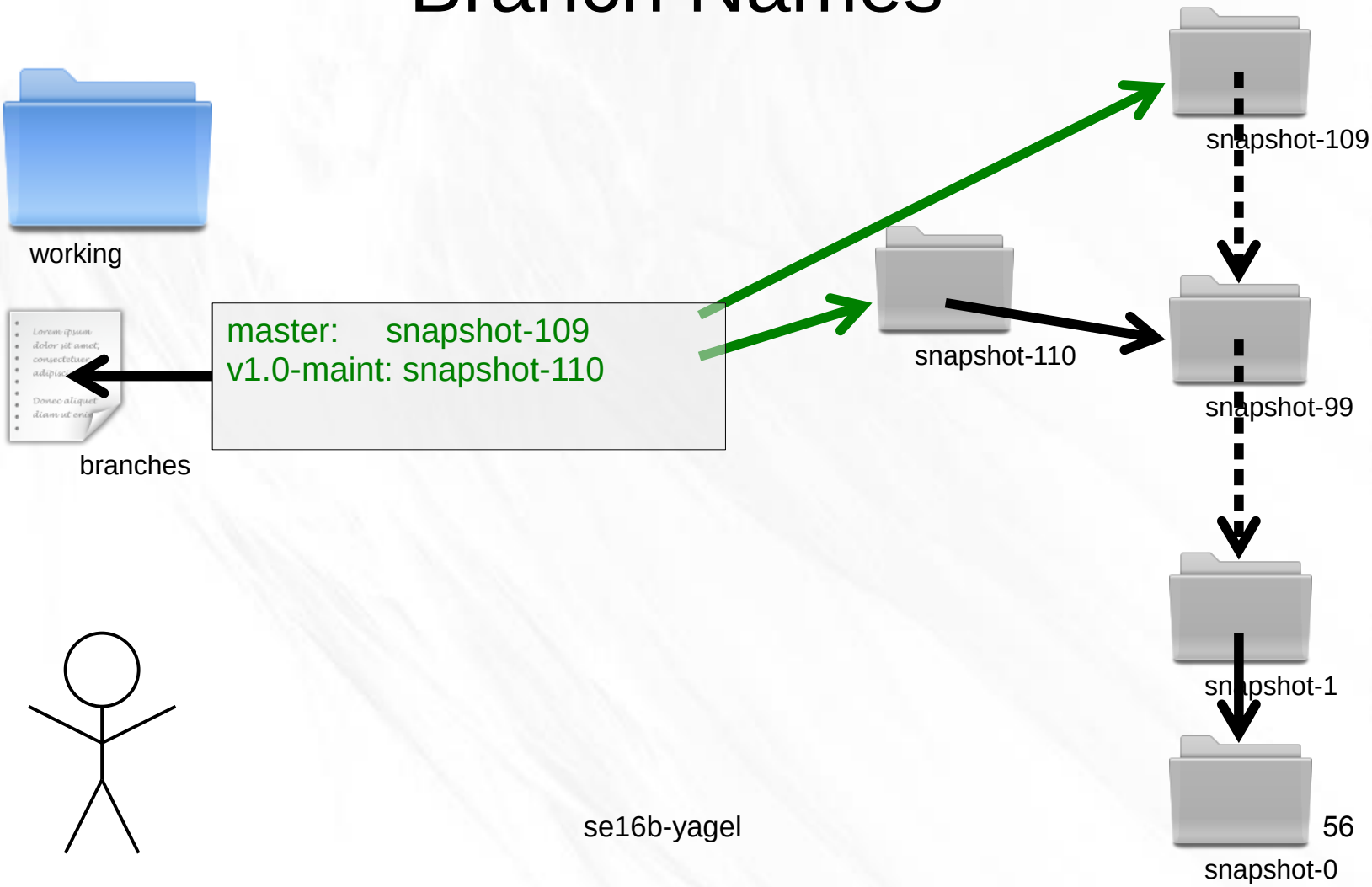

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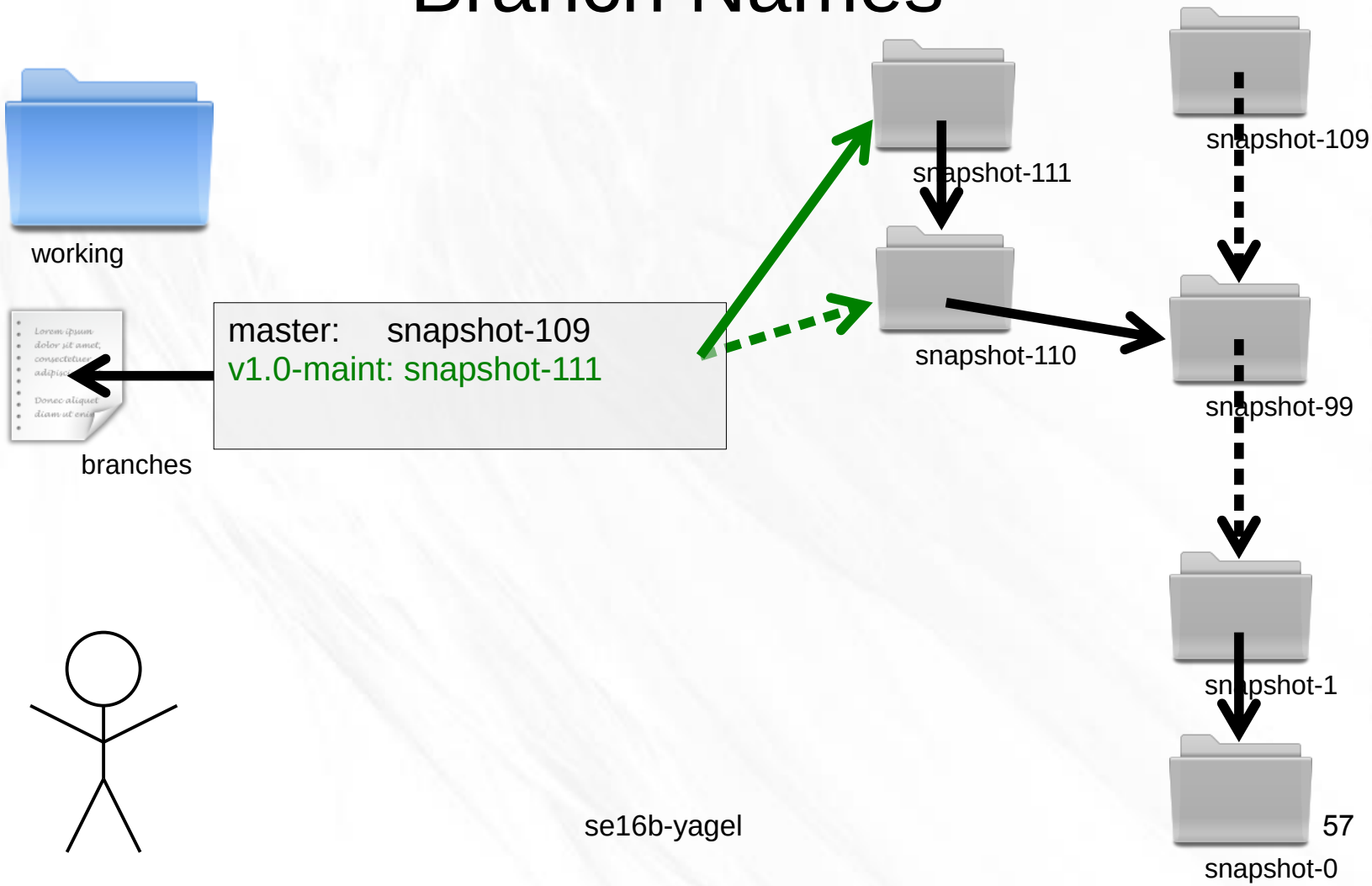

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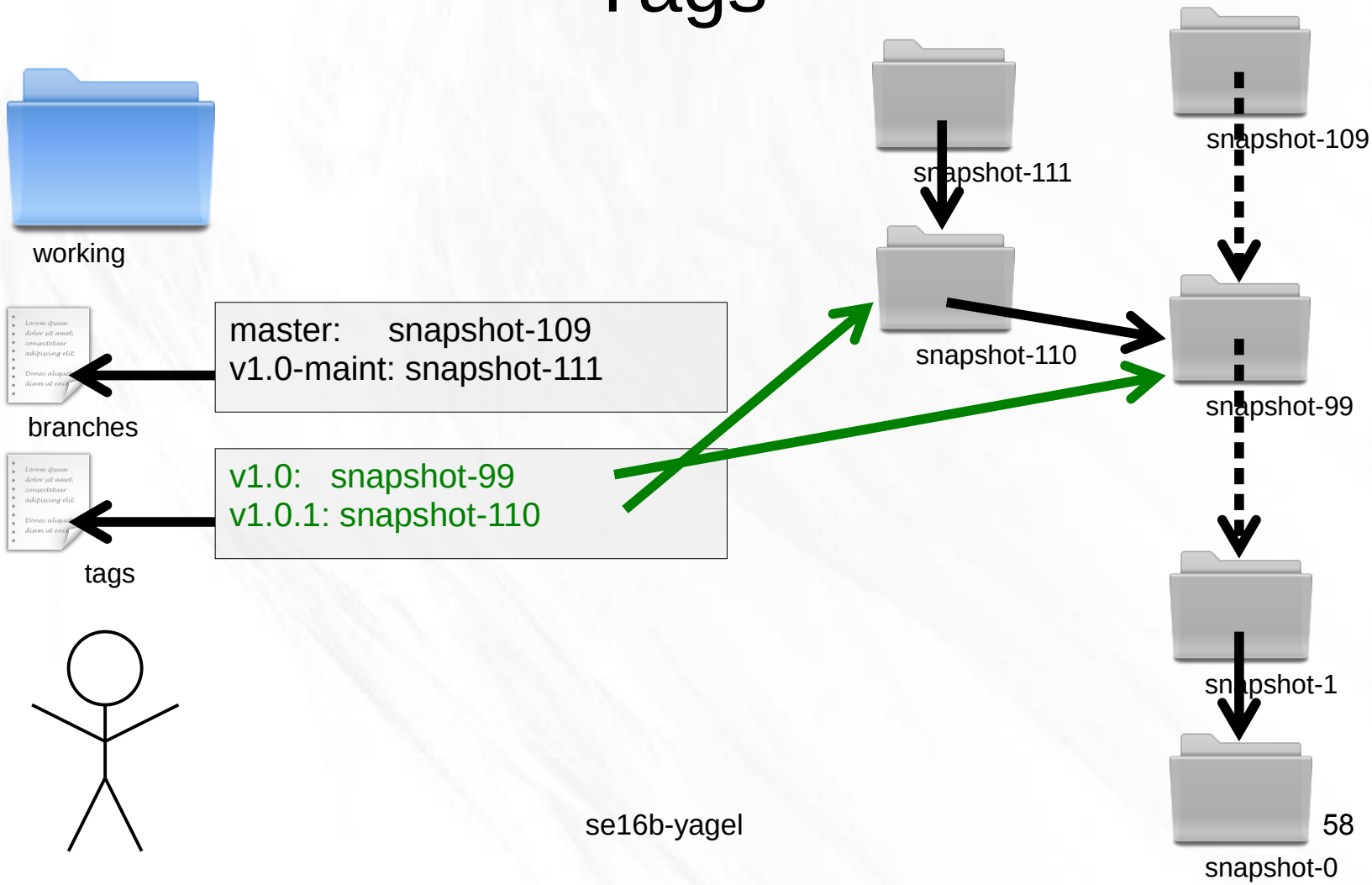
working
branches
tags
master: snapshot-109
v1.0-maint: snapshot-111
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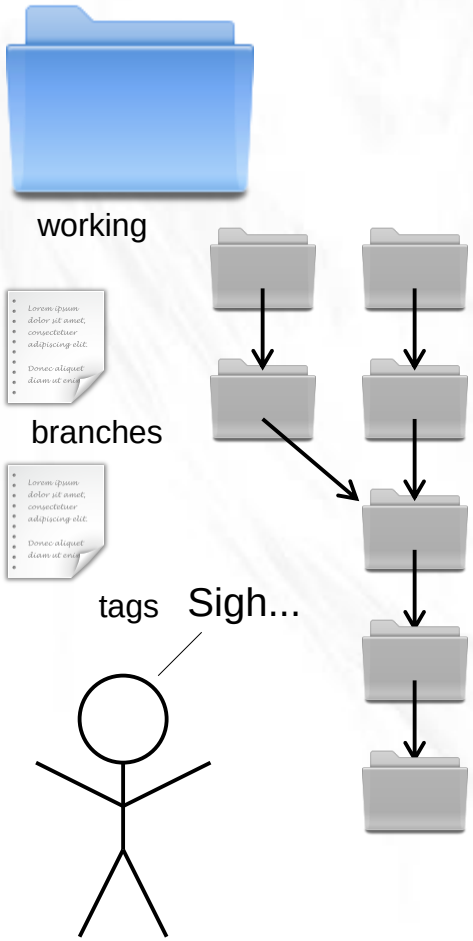

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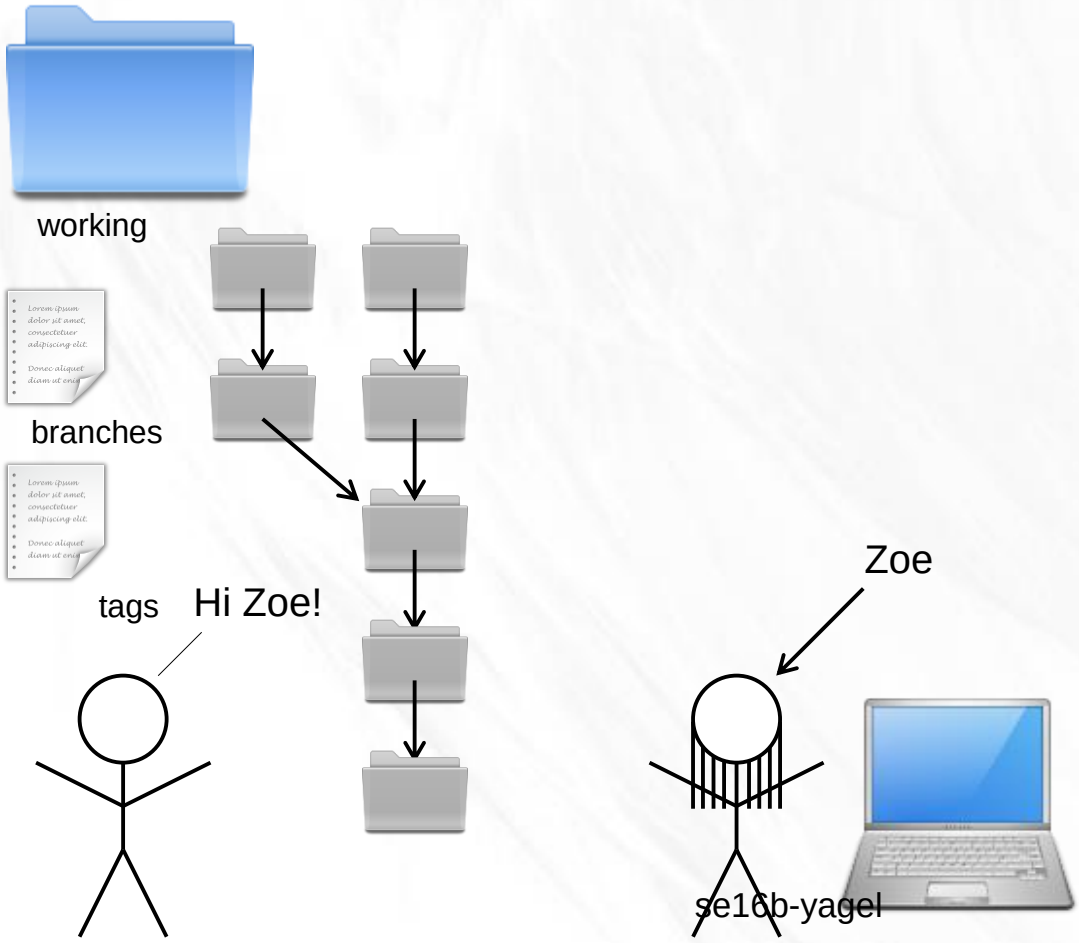

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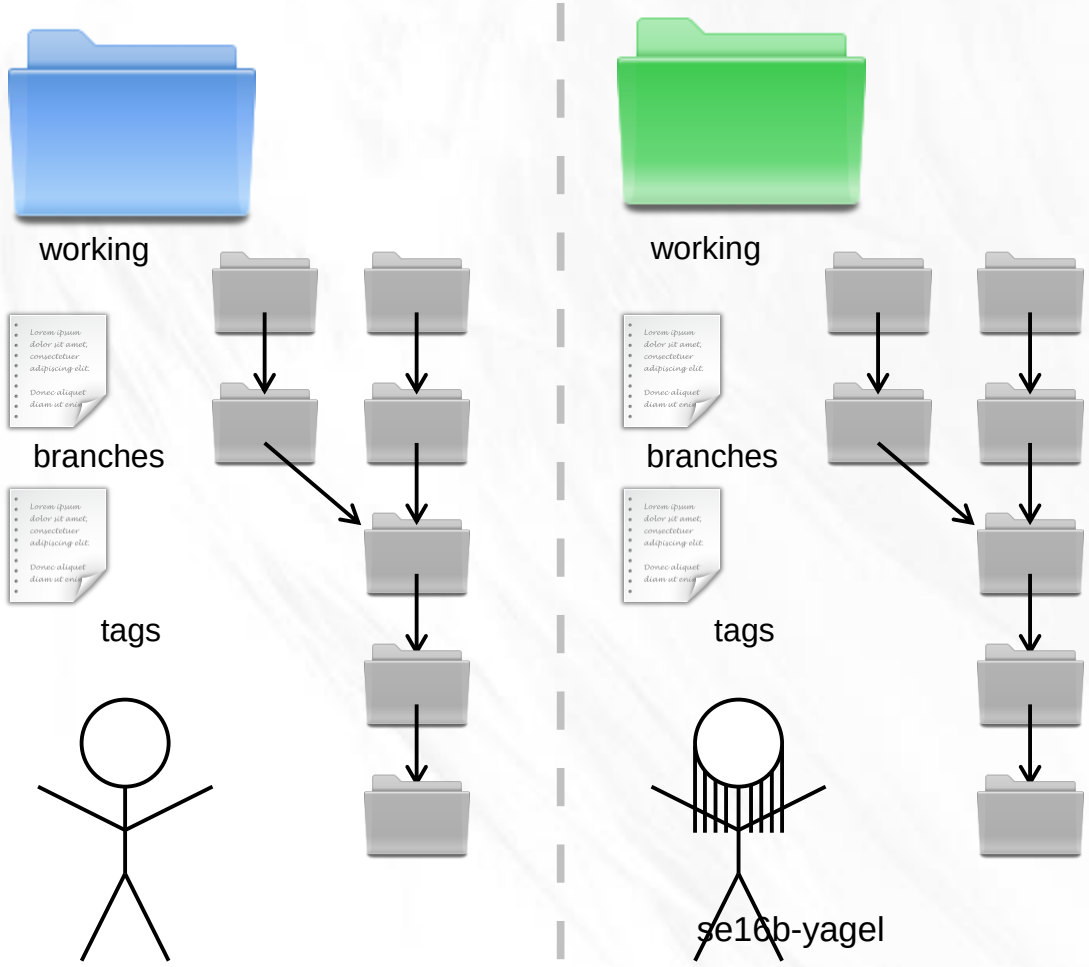

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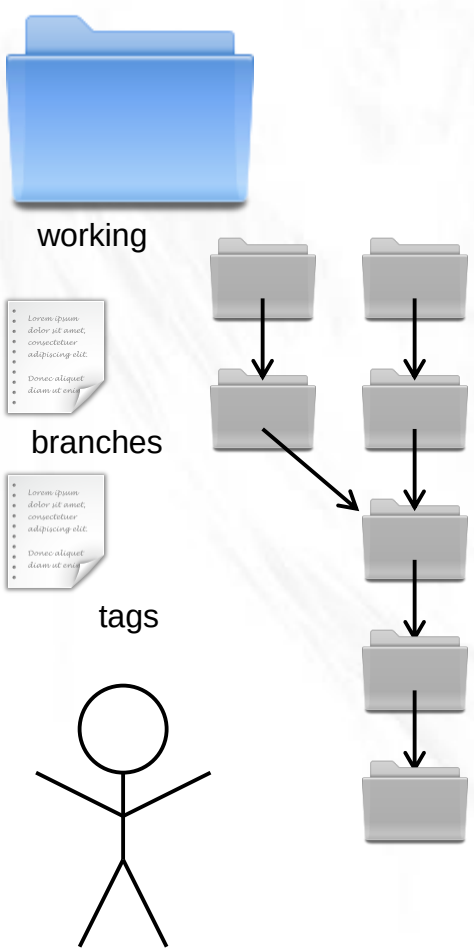

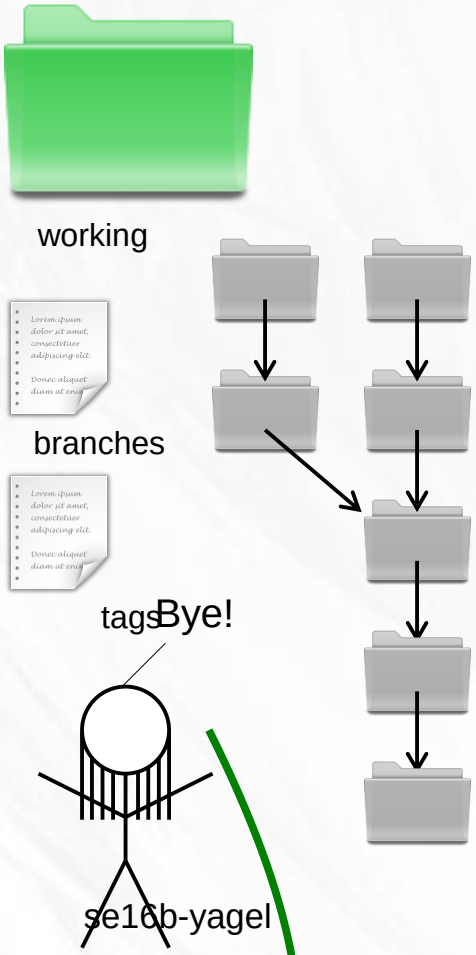

se16b-yagel

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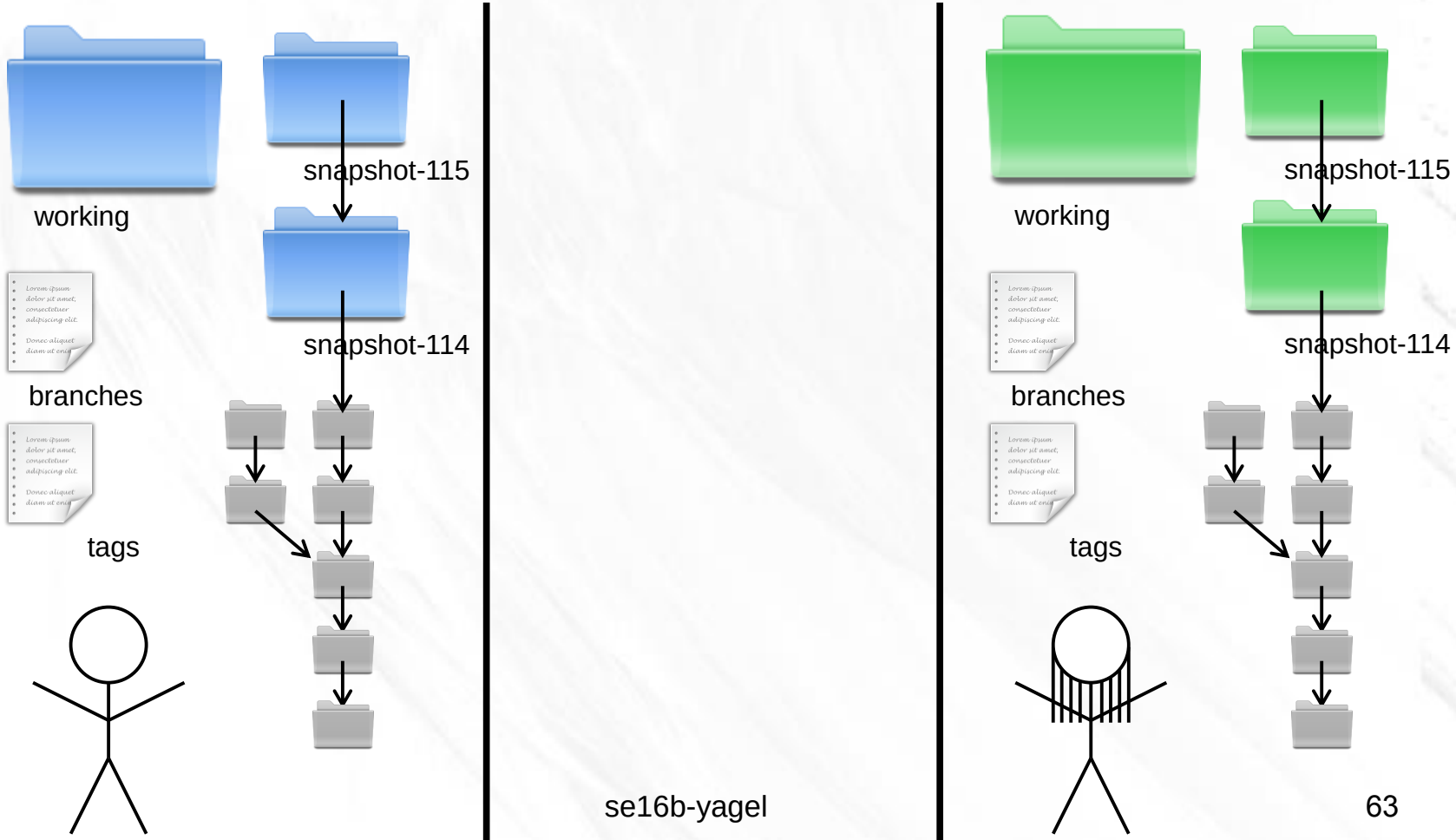

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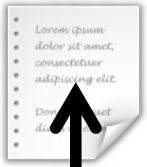
snapshot-114



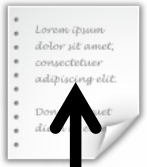
message

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

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

se16b-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 xyzzy.

Distributed

8ba3441b6b89cad23387ee875f2ae55069291f4b

SHA1

message

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

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

db9ecb5b5a6294a8733503ab57577db96ff2249e

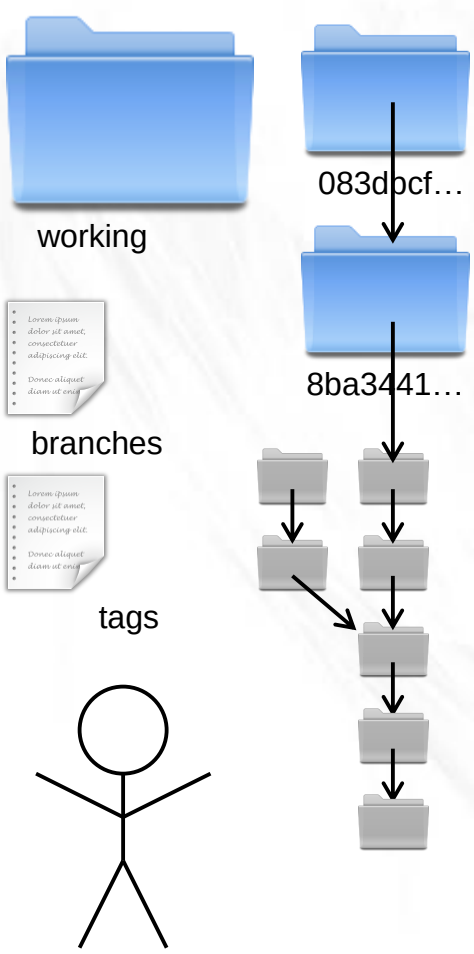
SHA1

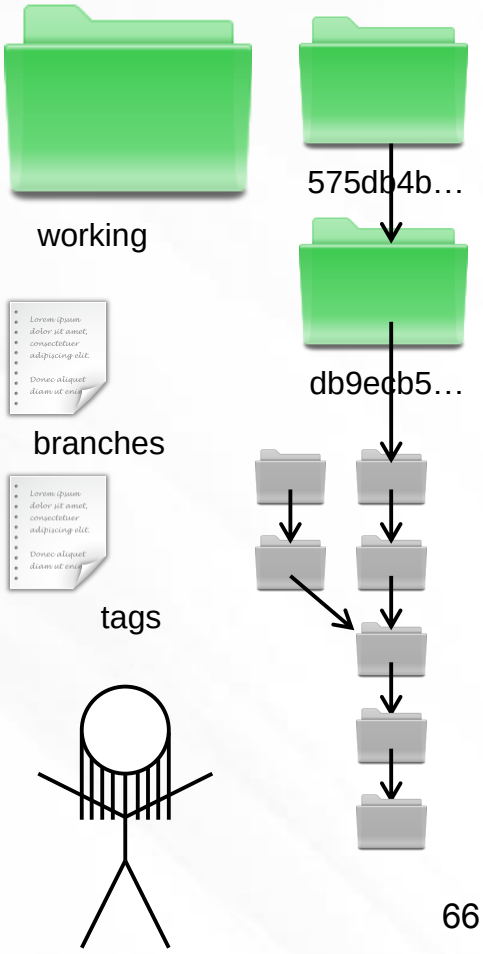
message

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

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

Distributed





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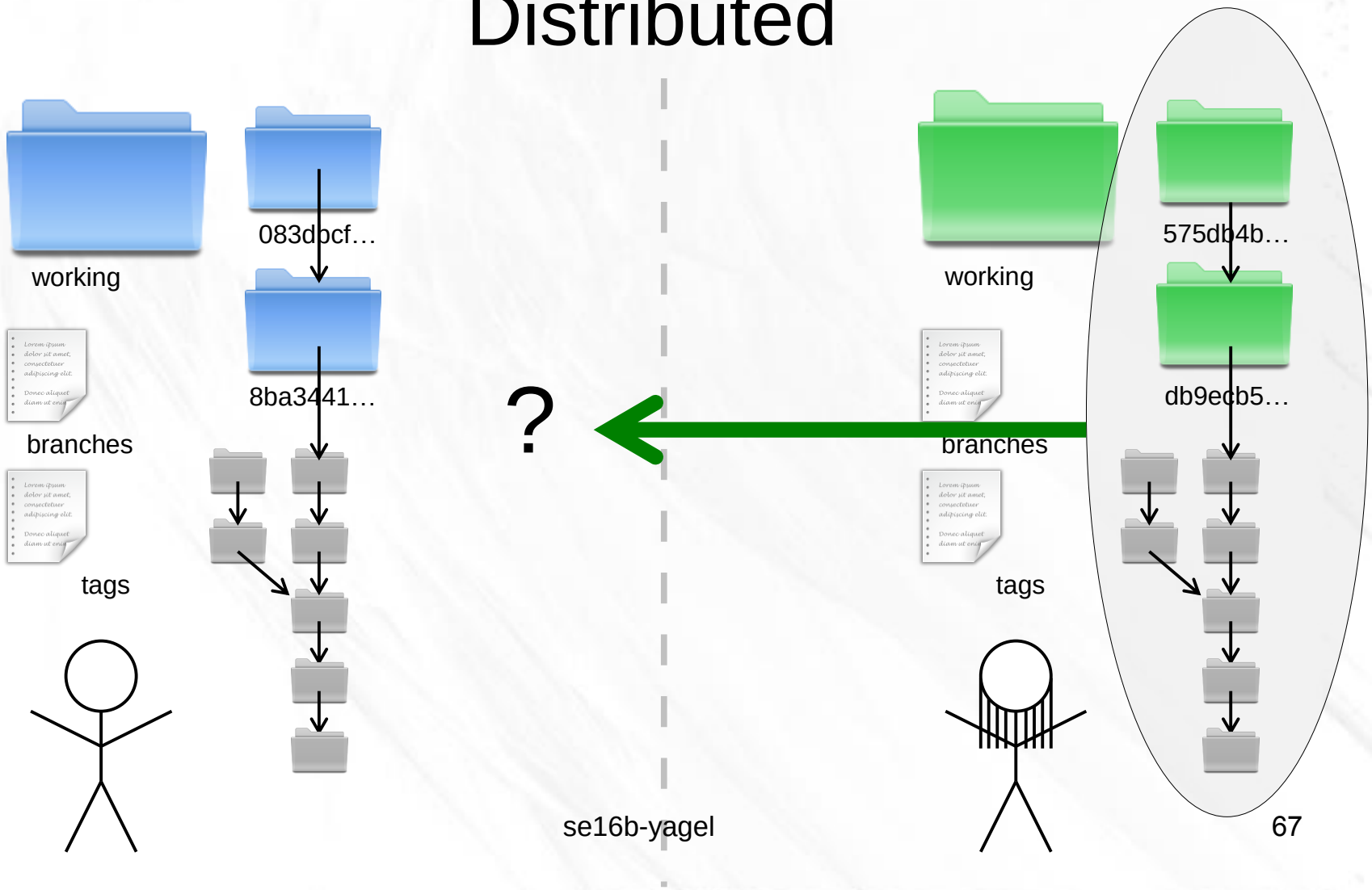

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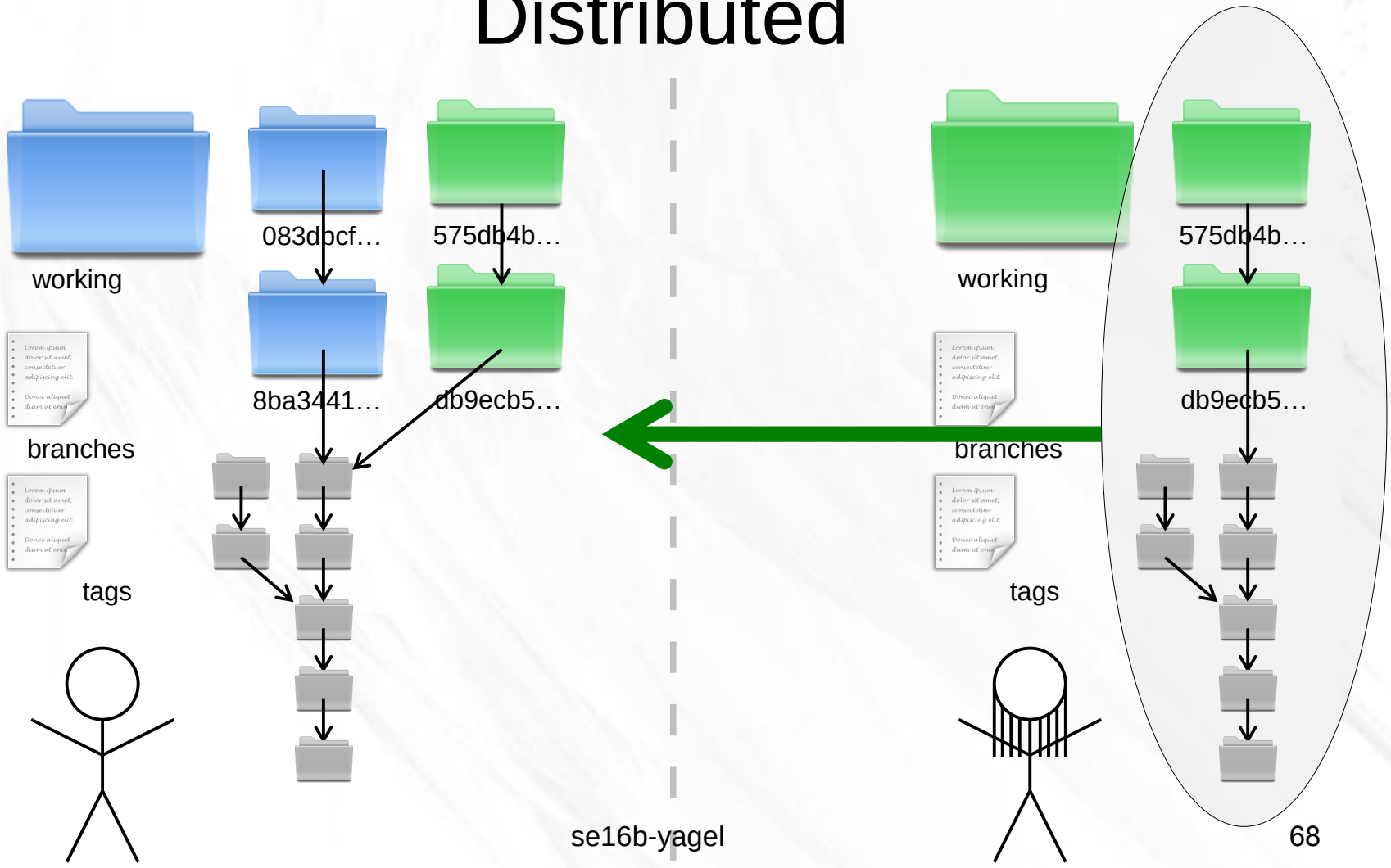

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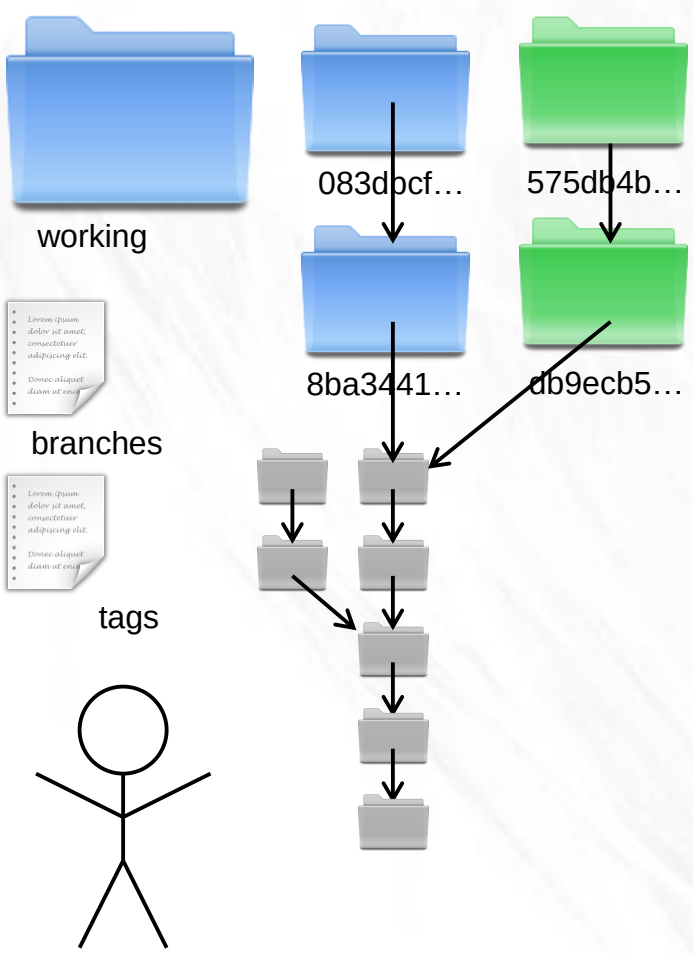

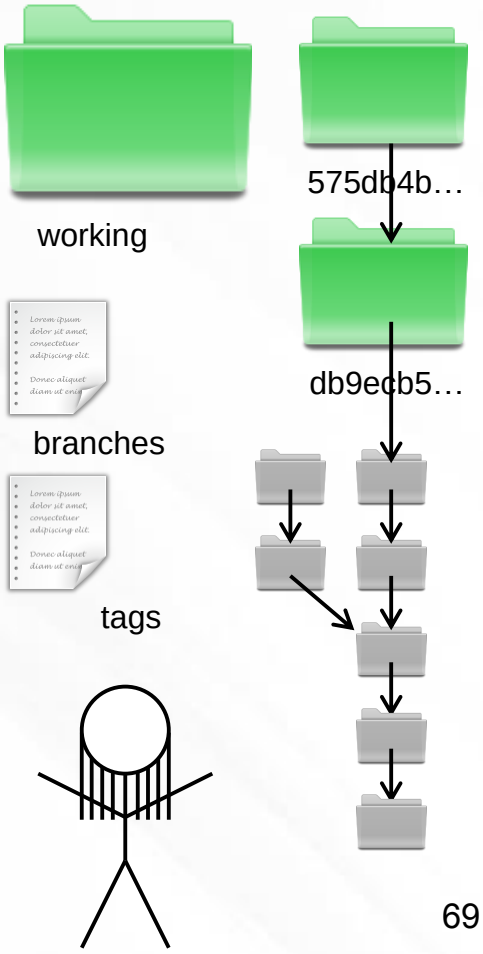

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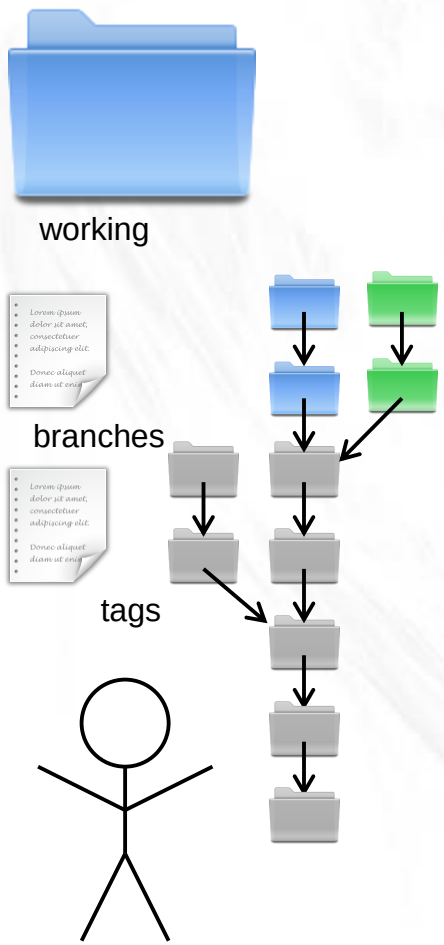

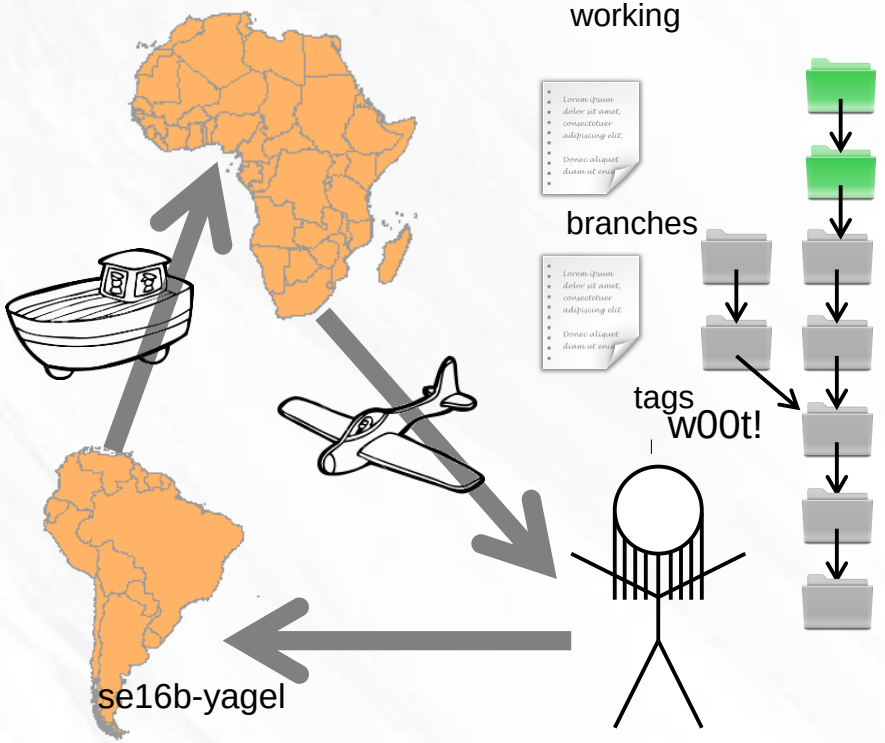

se16b-yagel

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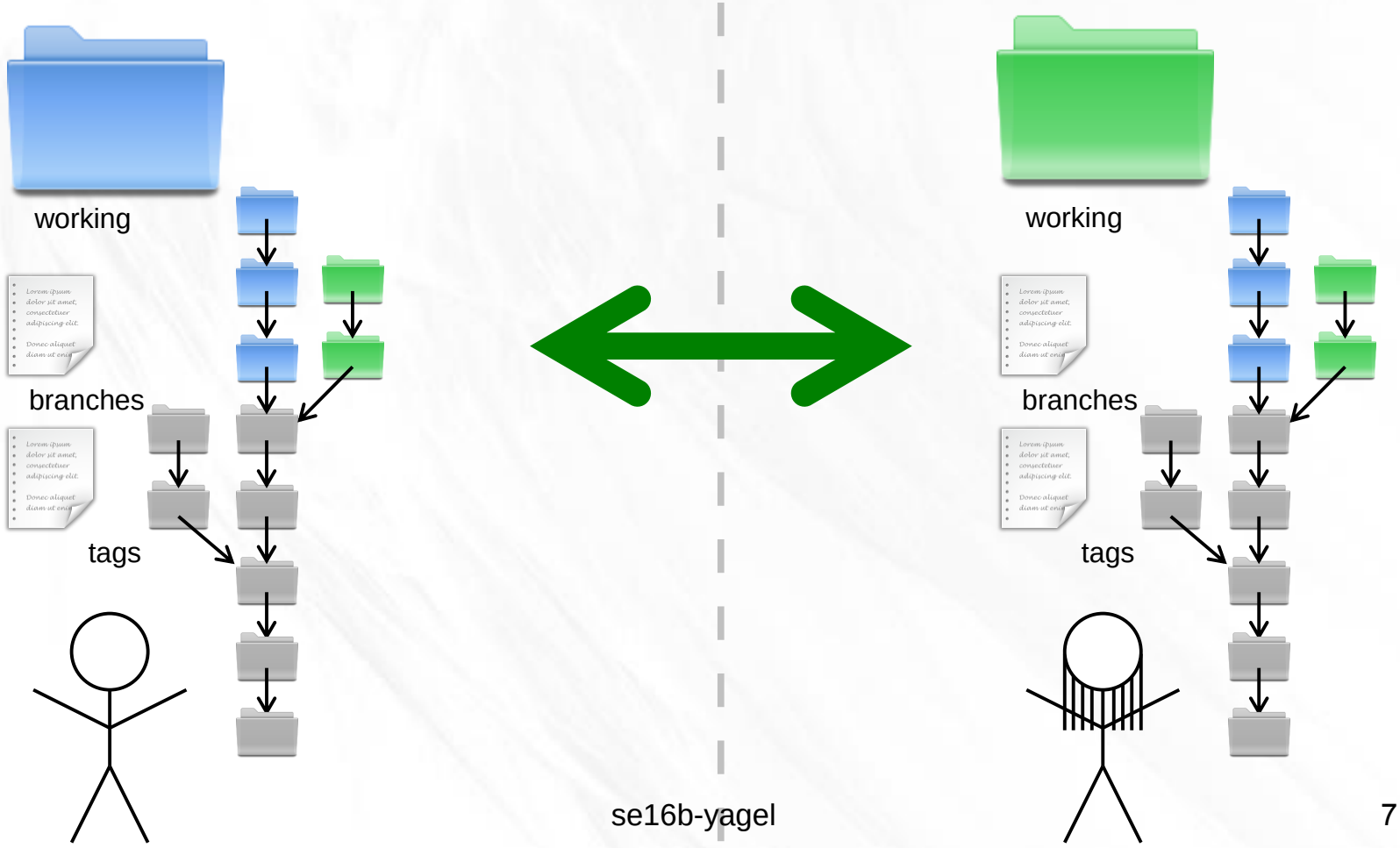
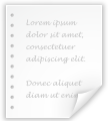


(simpler drawings)

working

branches



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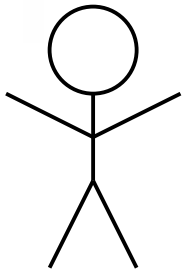
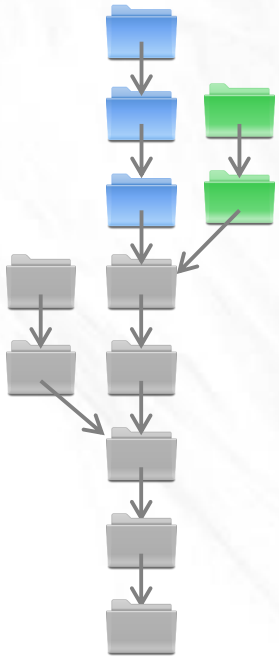
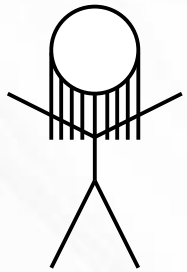


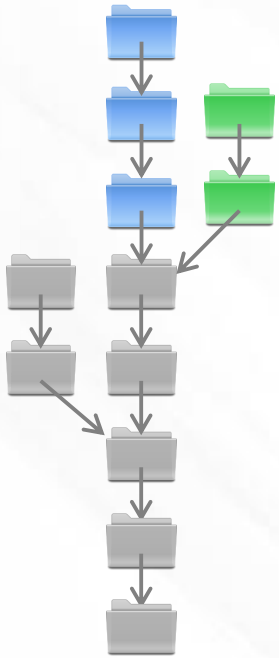


working

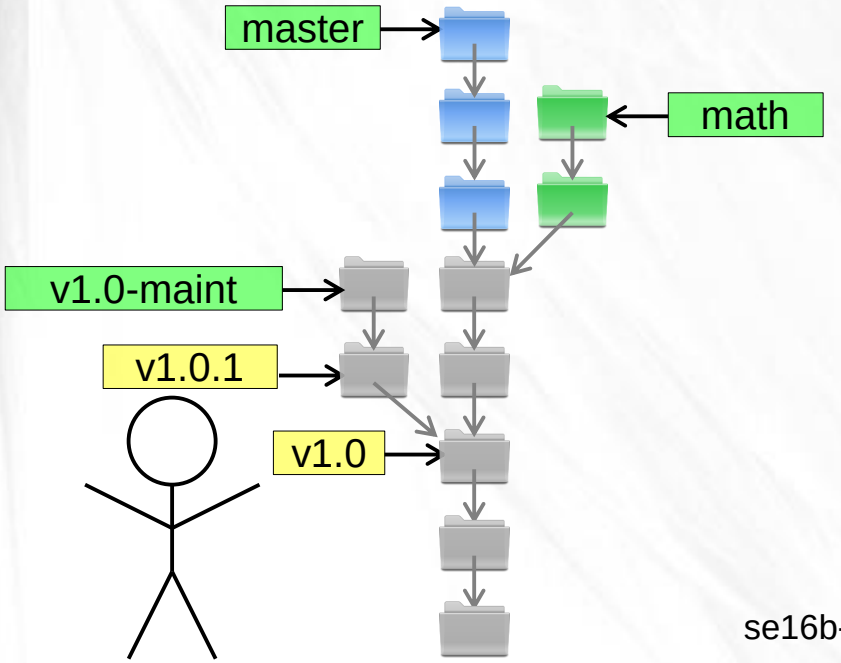
branches

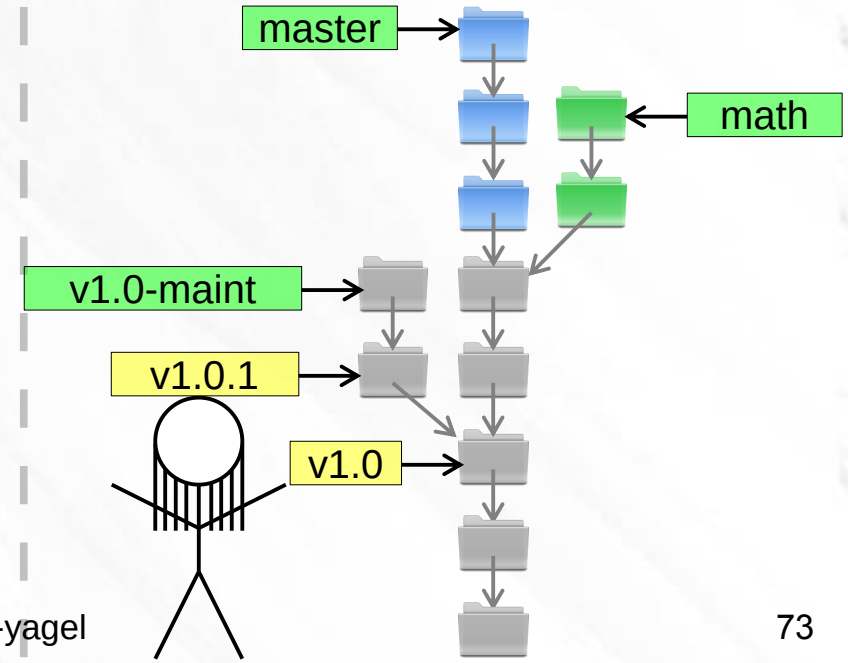
tags



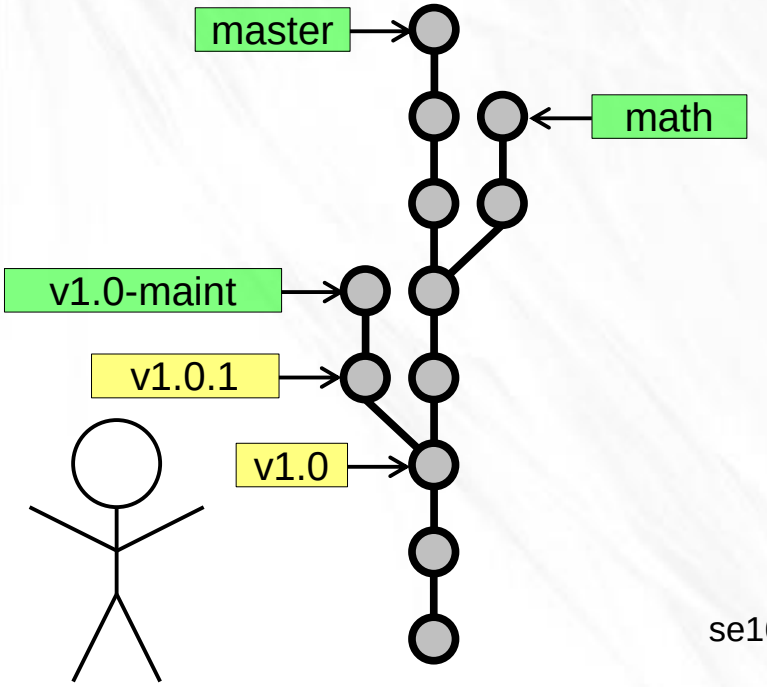


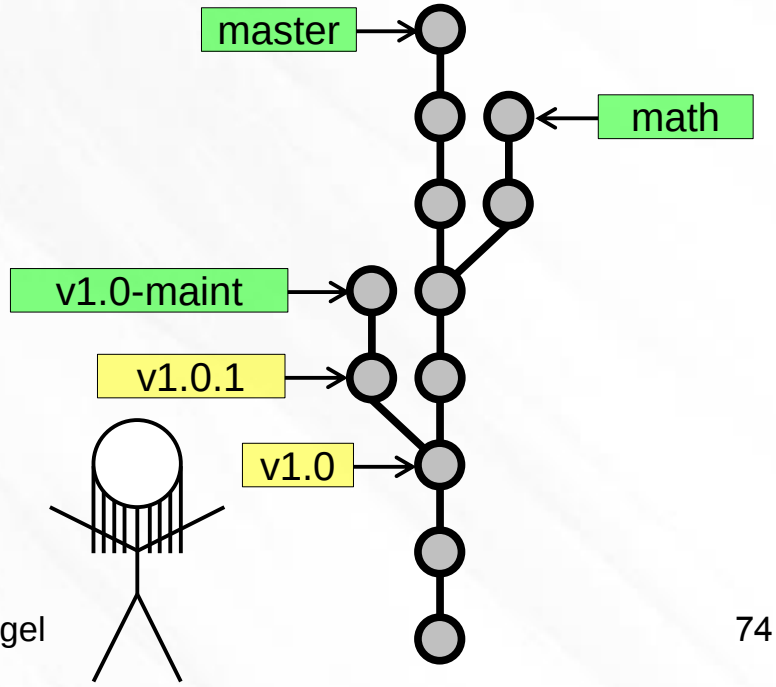
(simpler drawings)



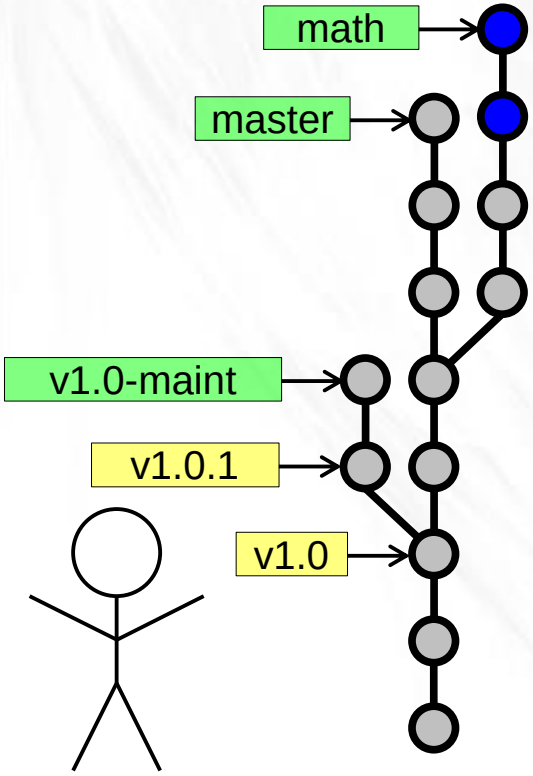


(simpler drawings)





Merges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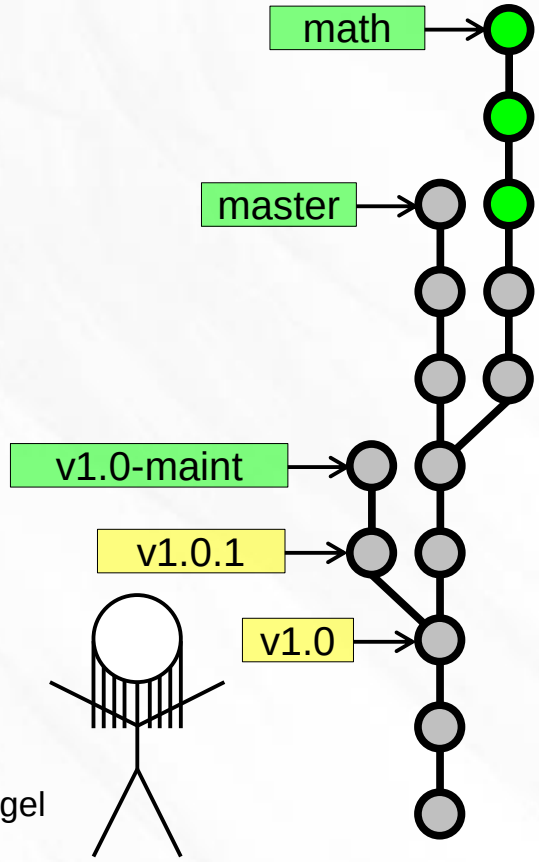
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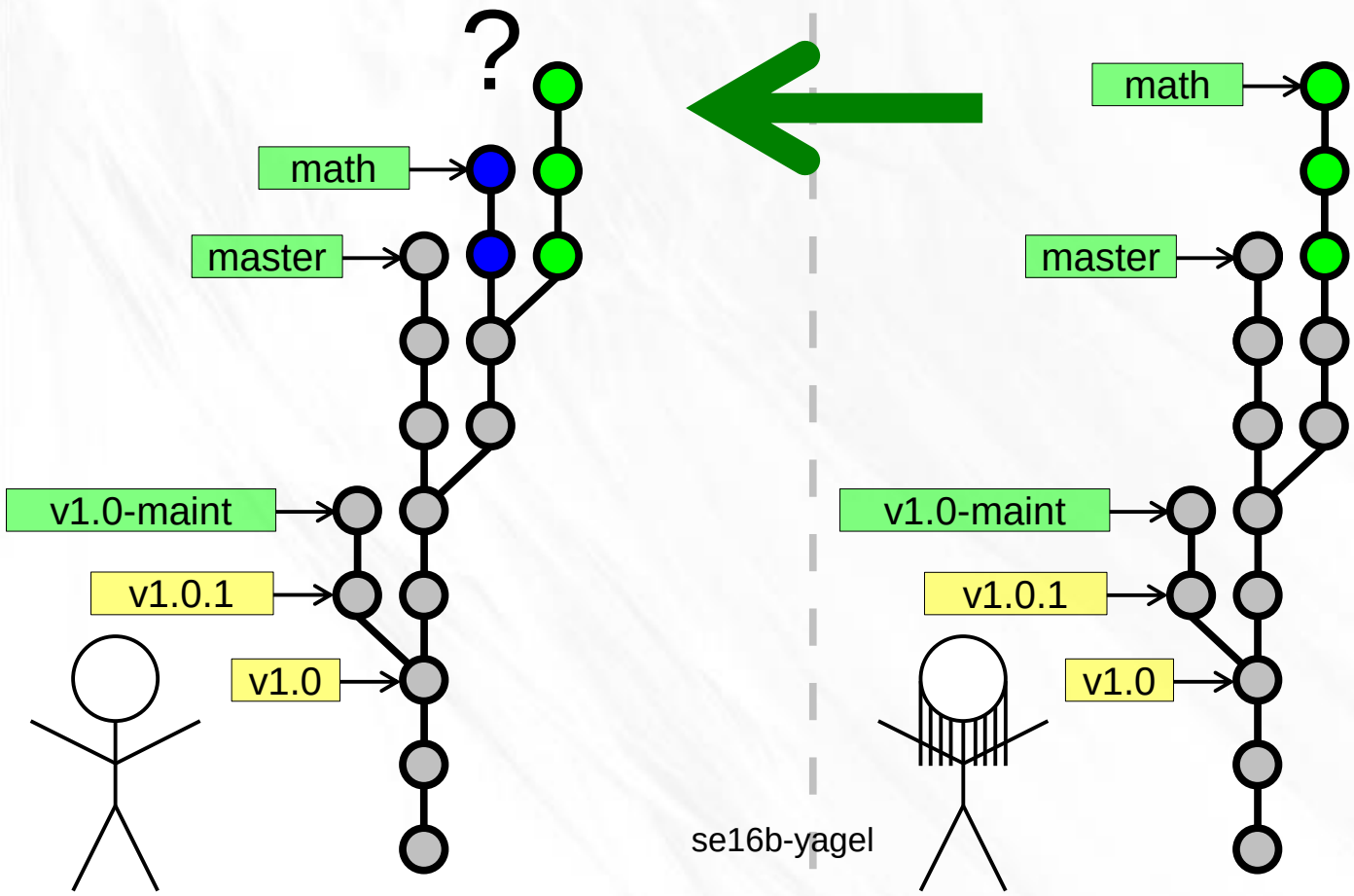
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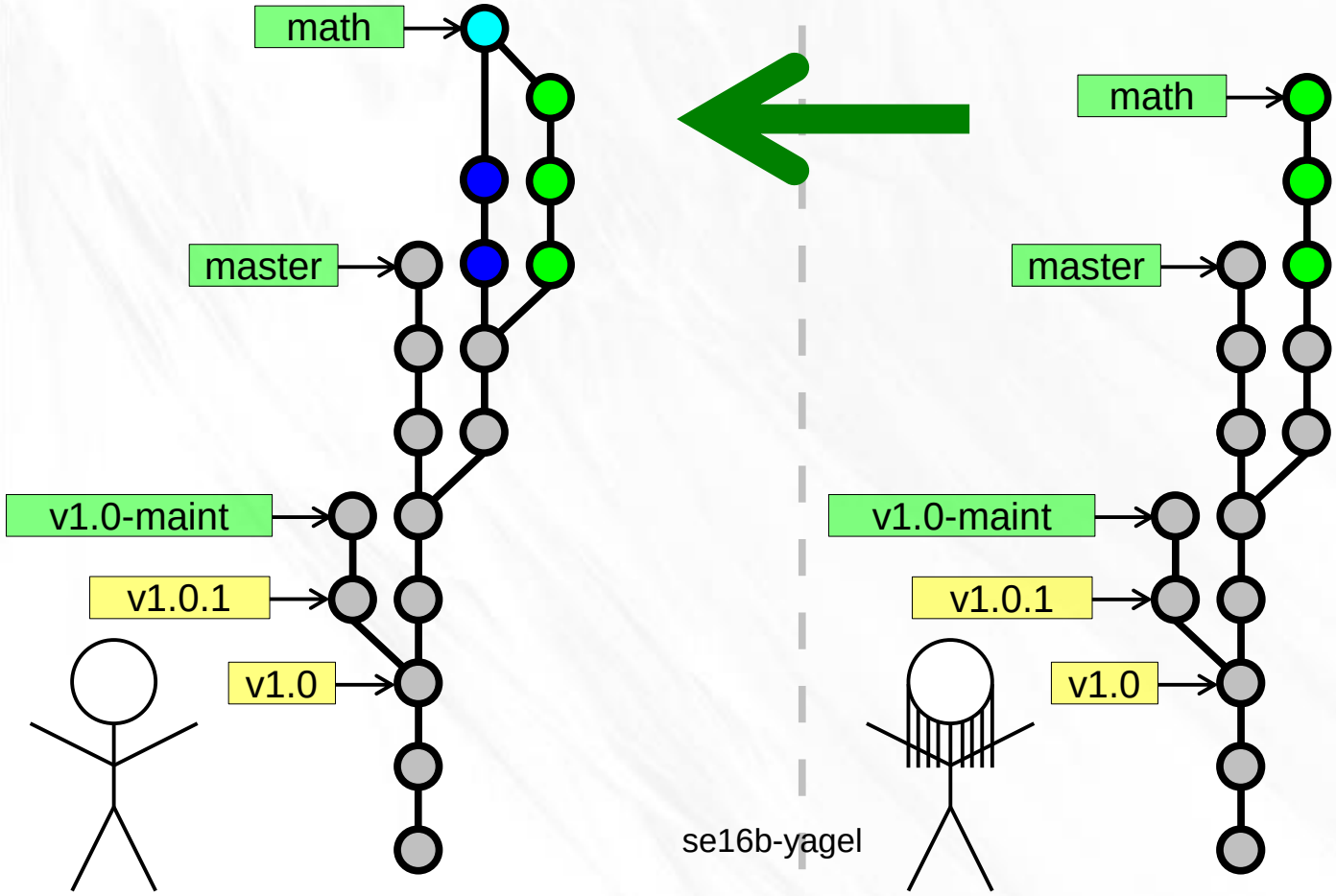
Merges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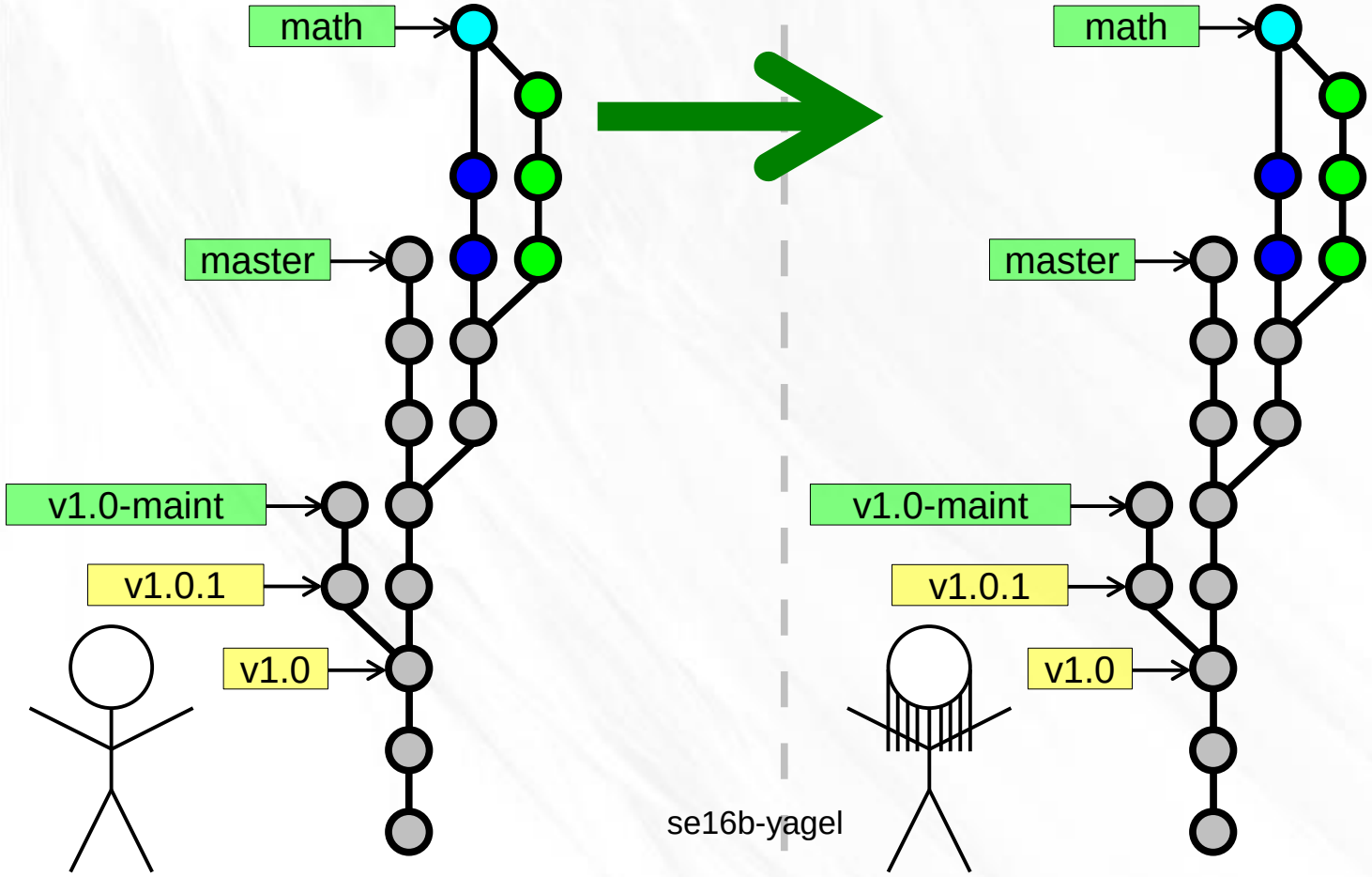
Merges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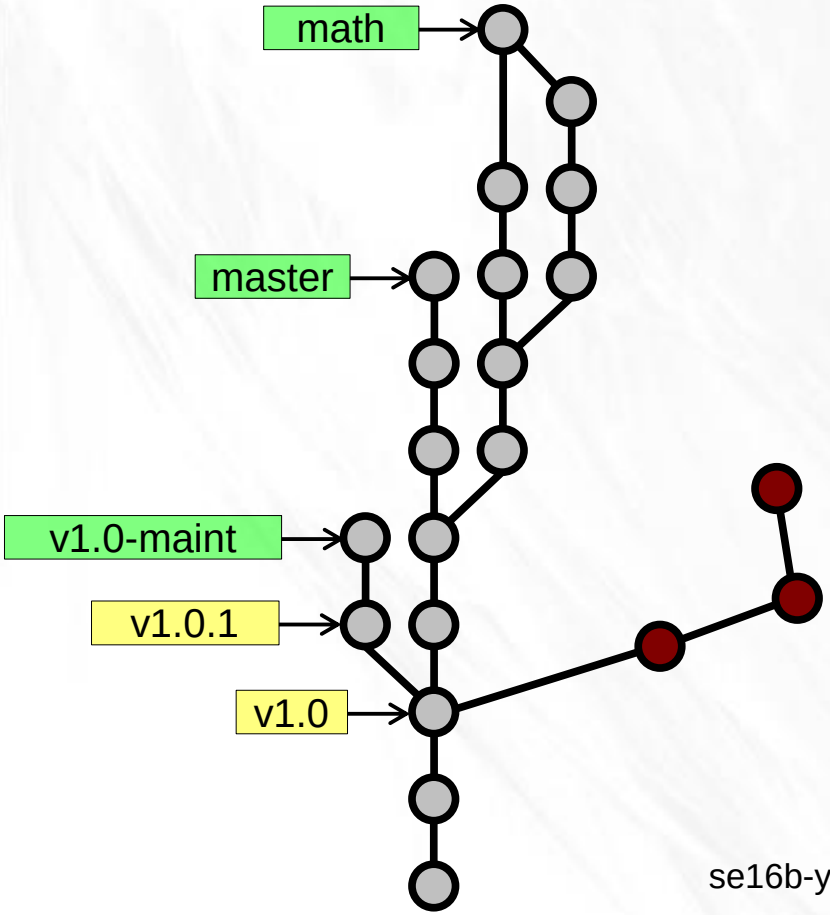
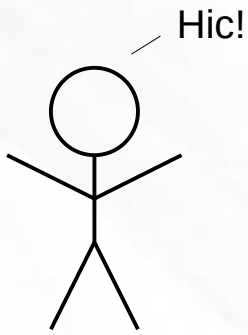
Rewriting History





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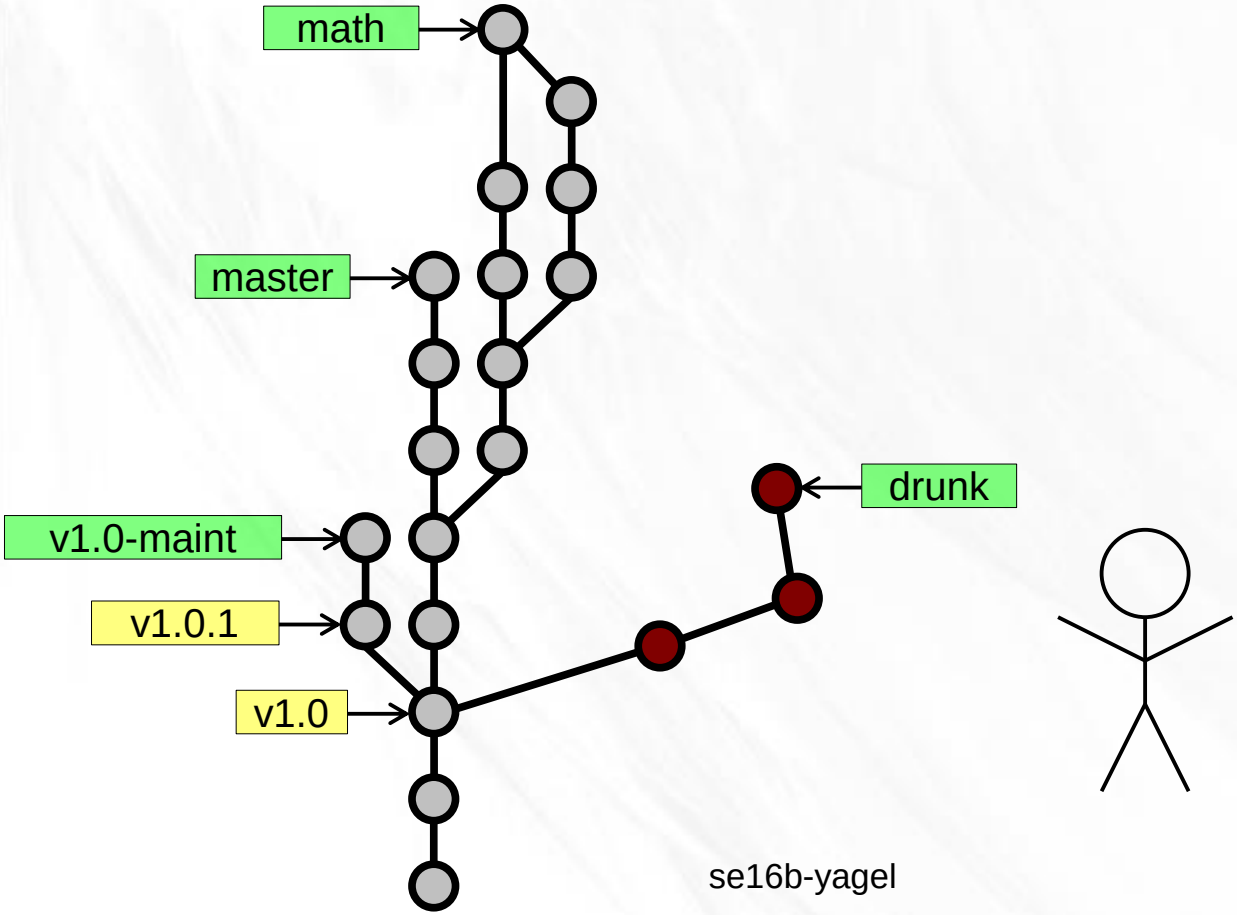

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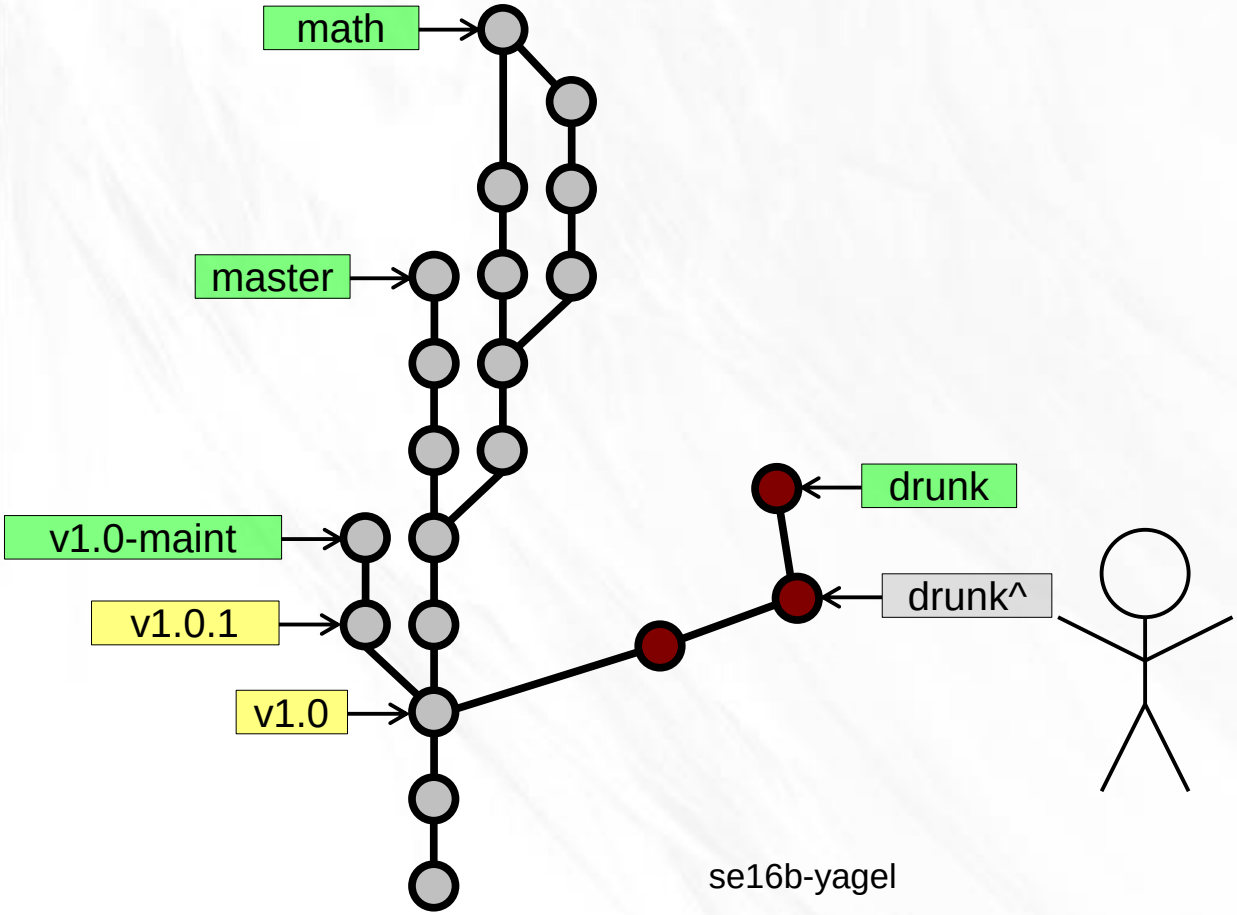

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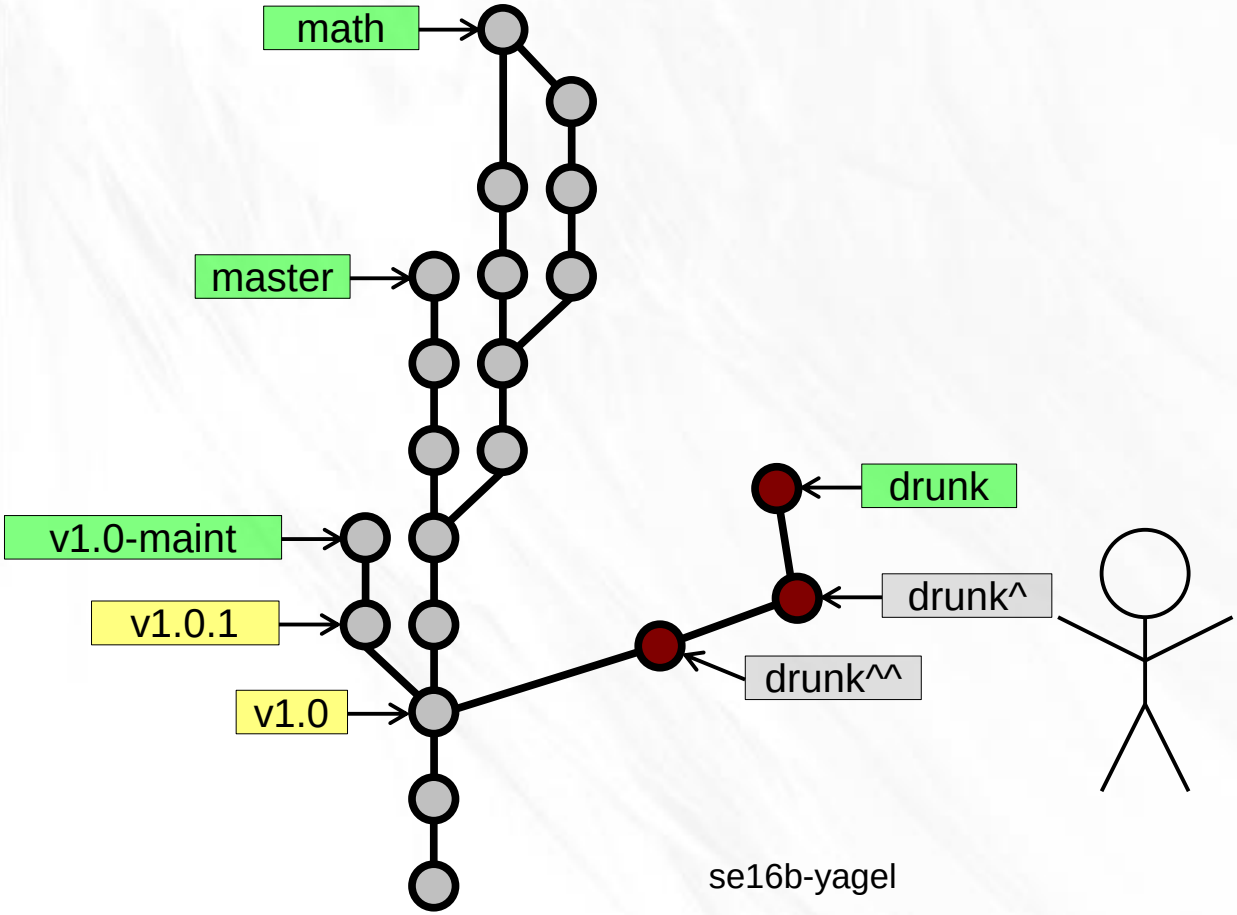

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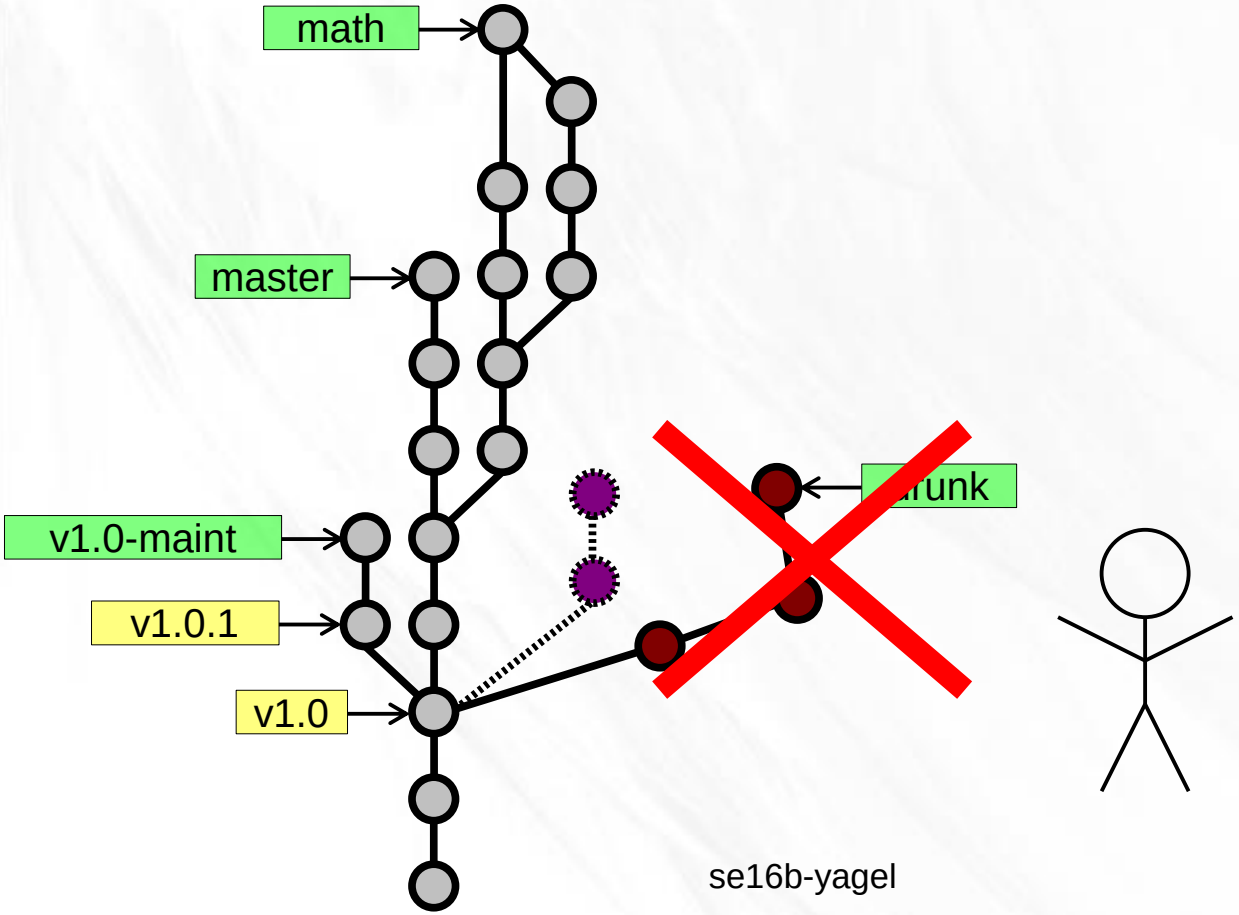

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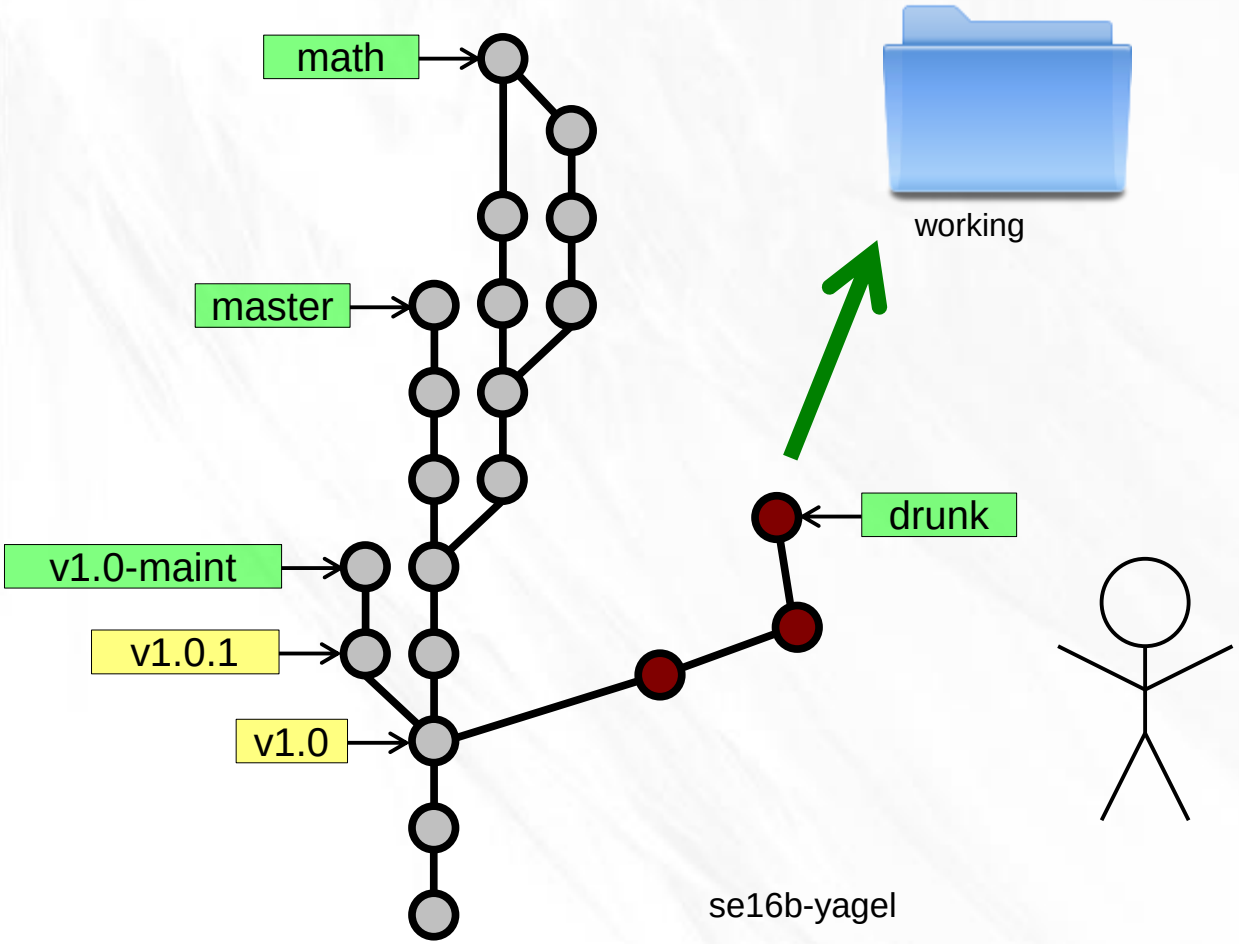

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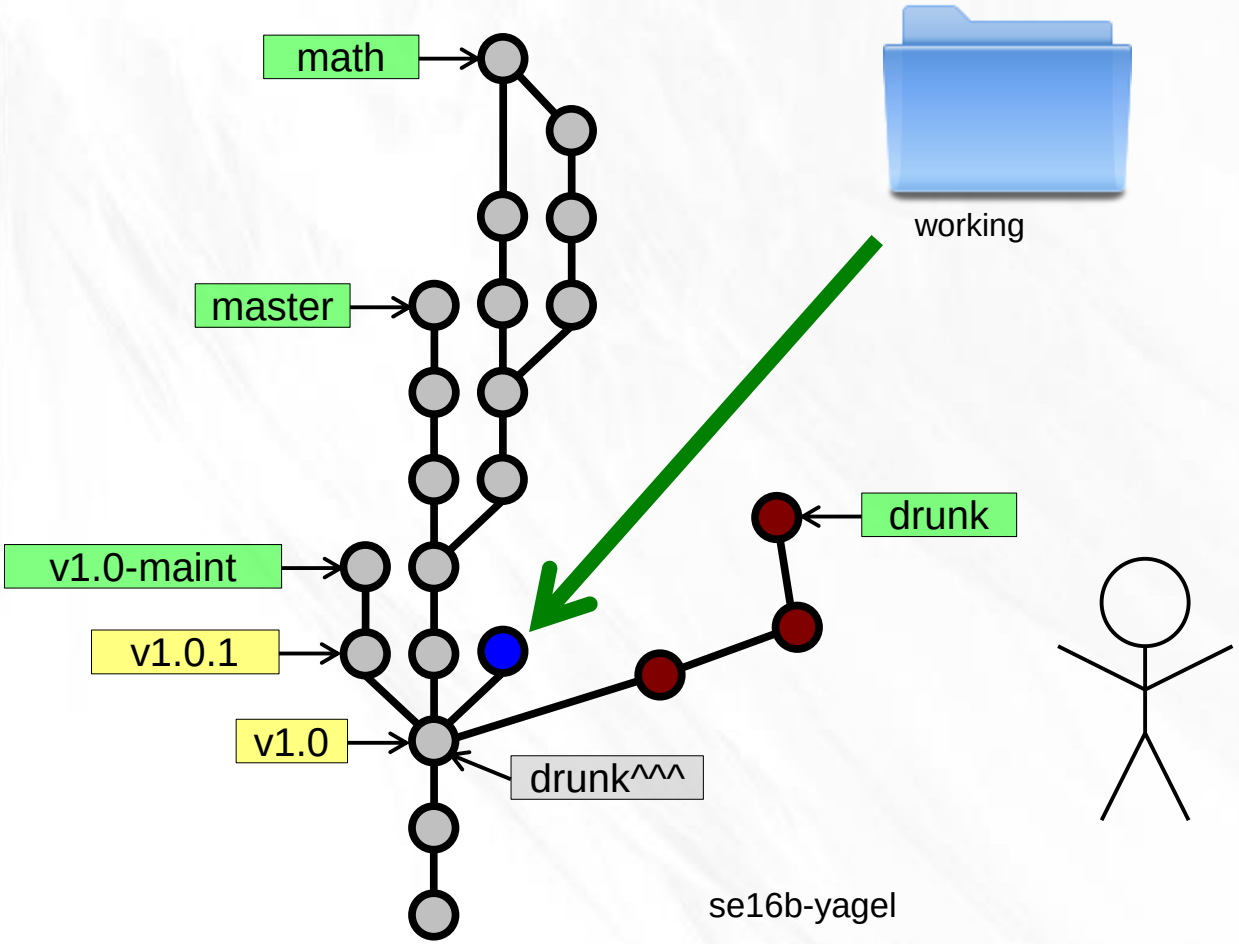

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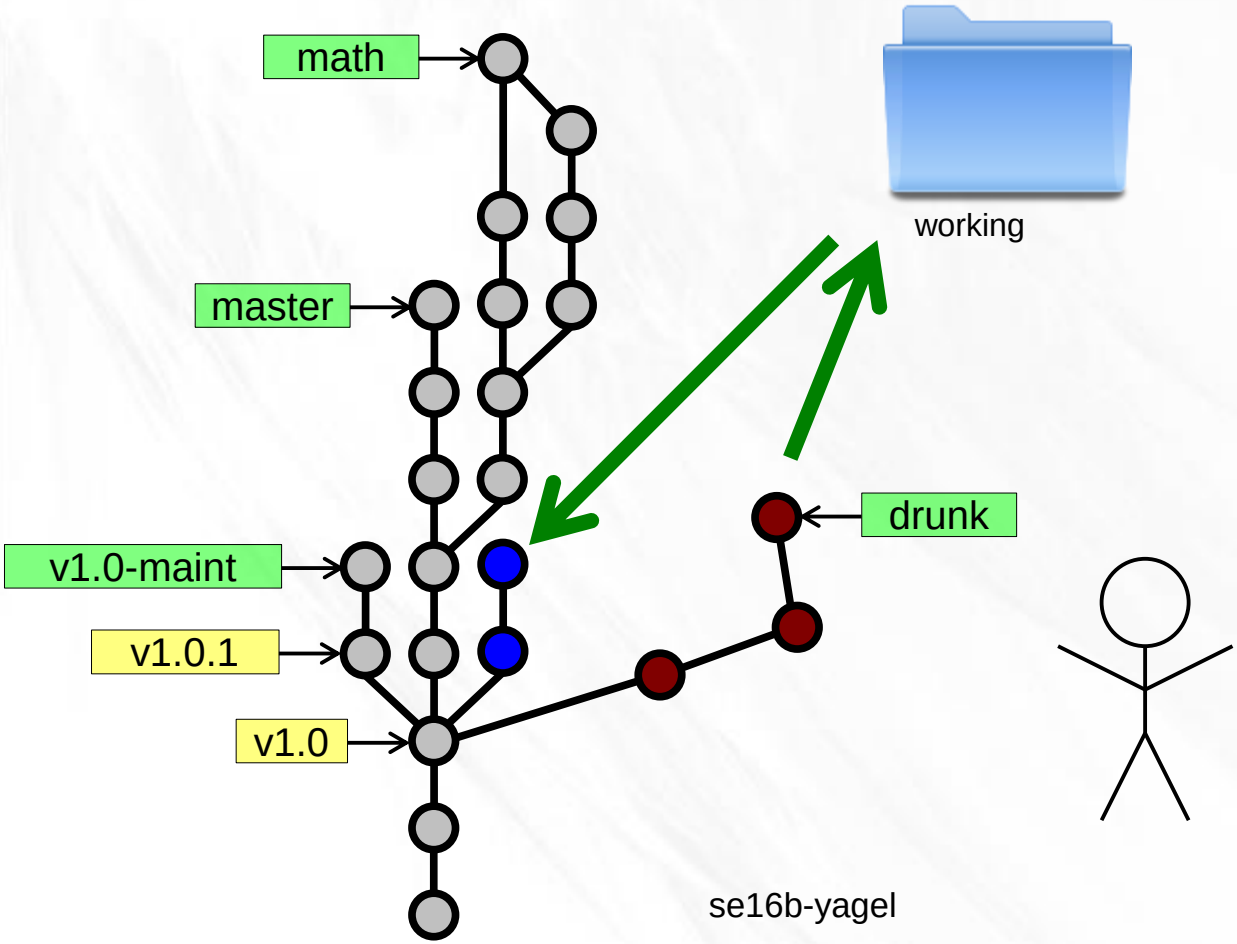

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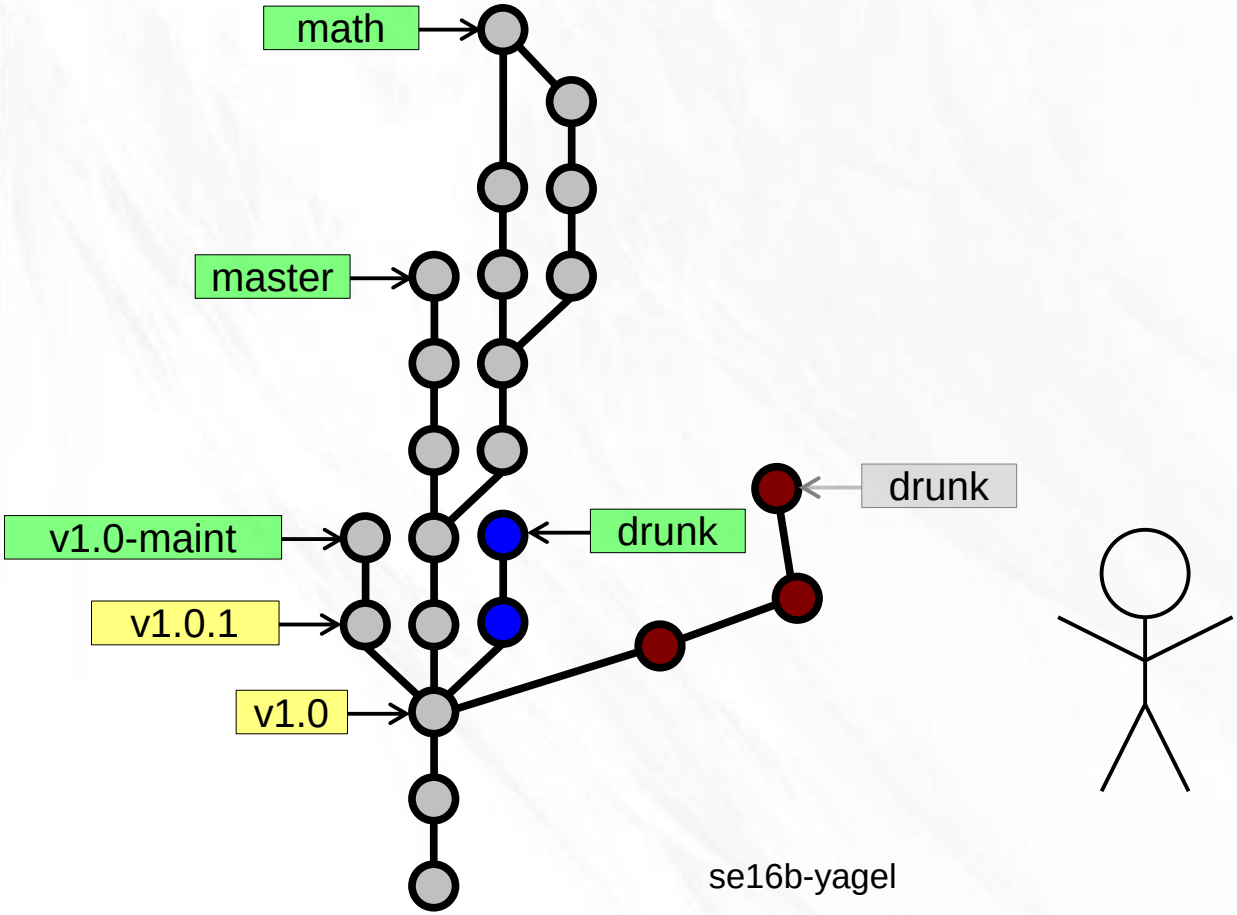

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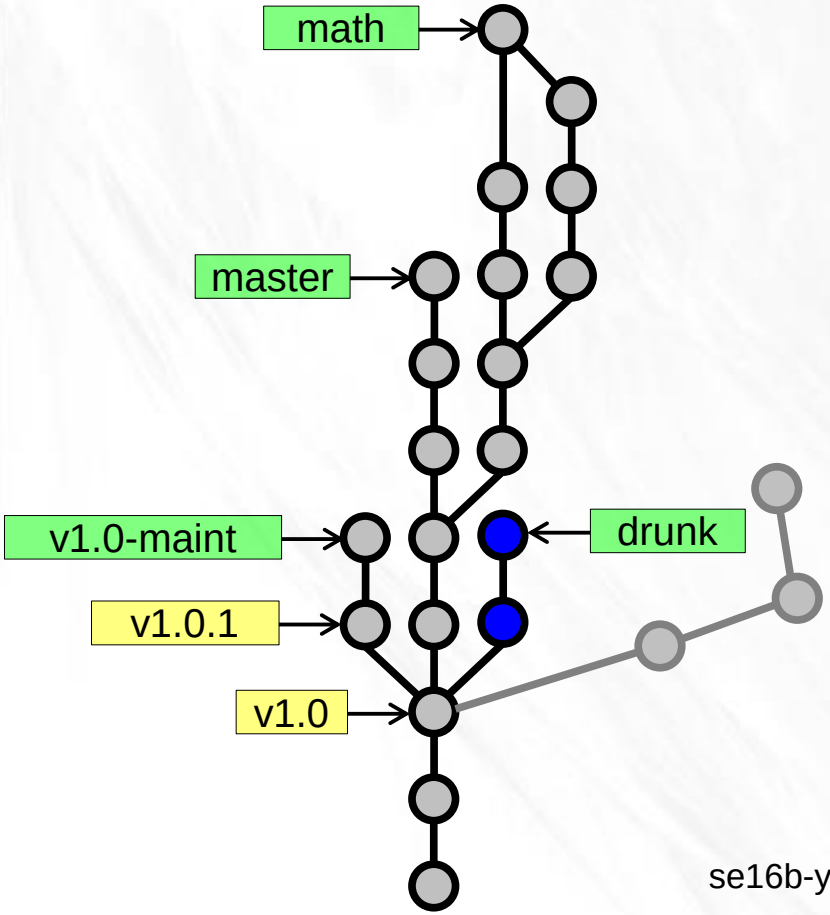
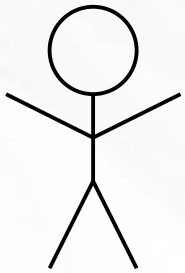
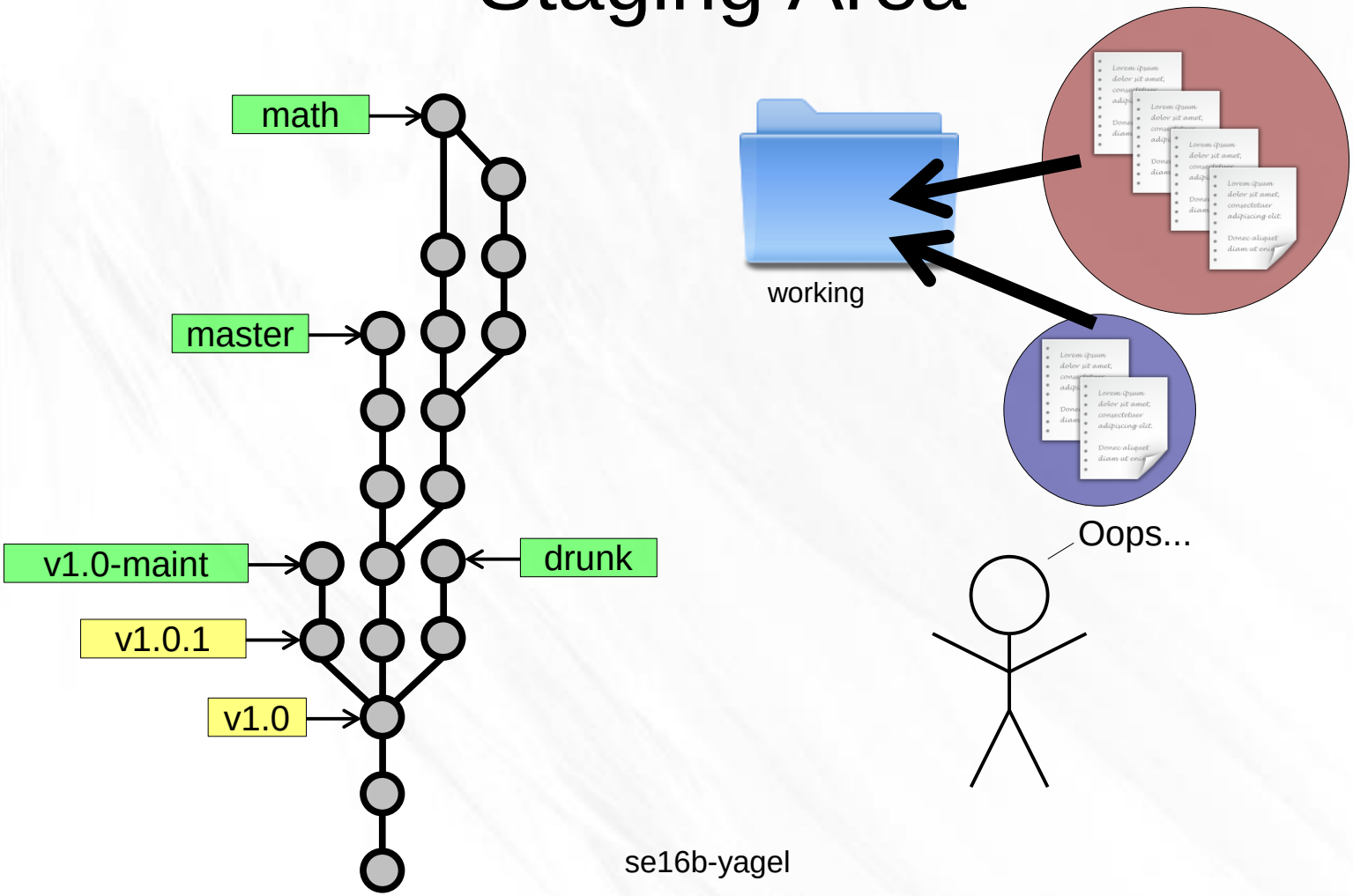




Staging Area



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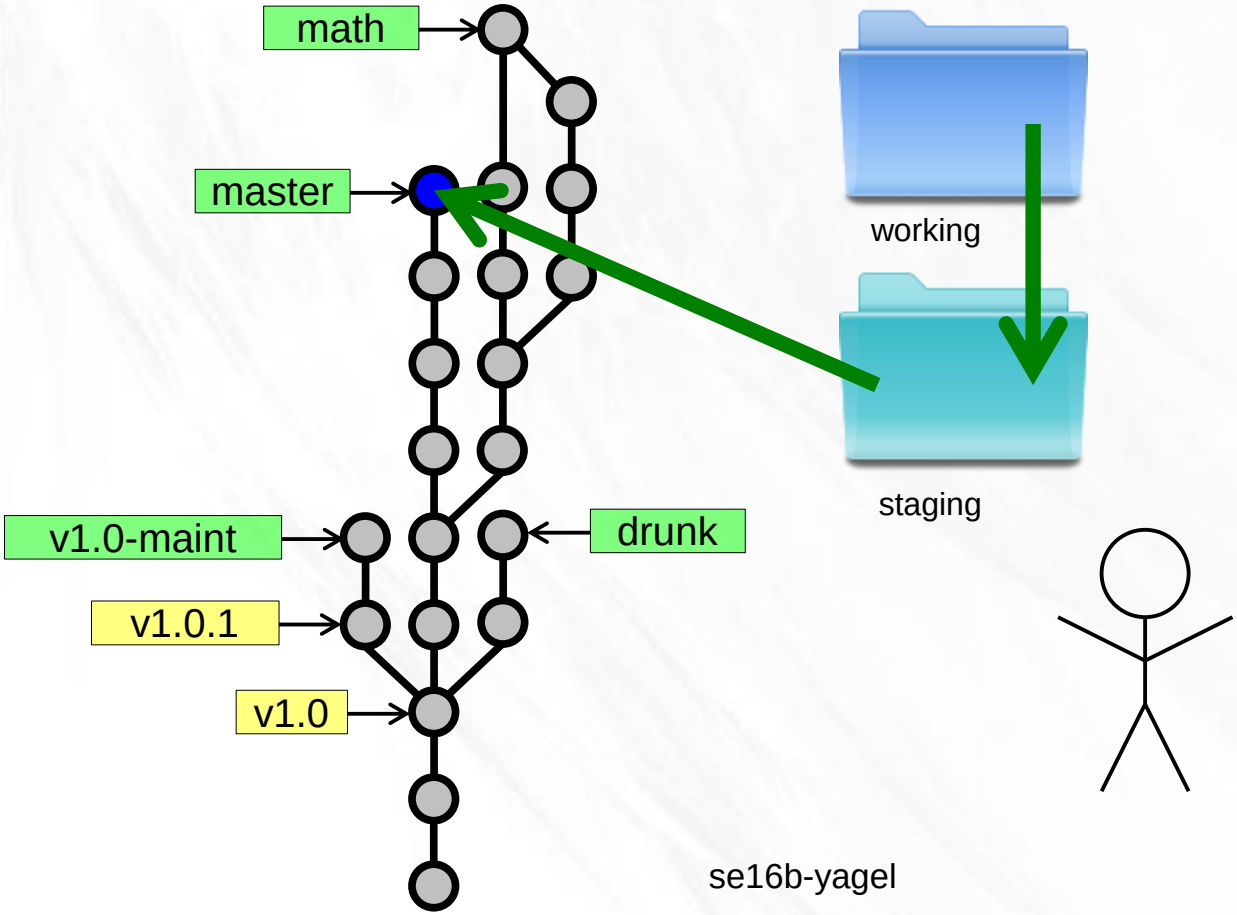

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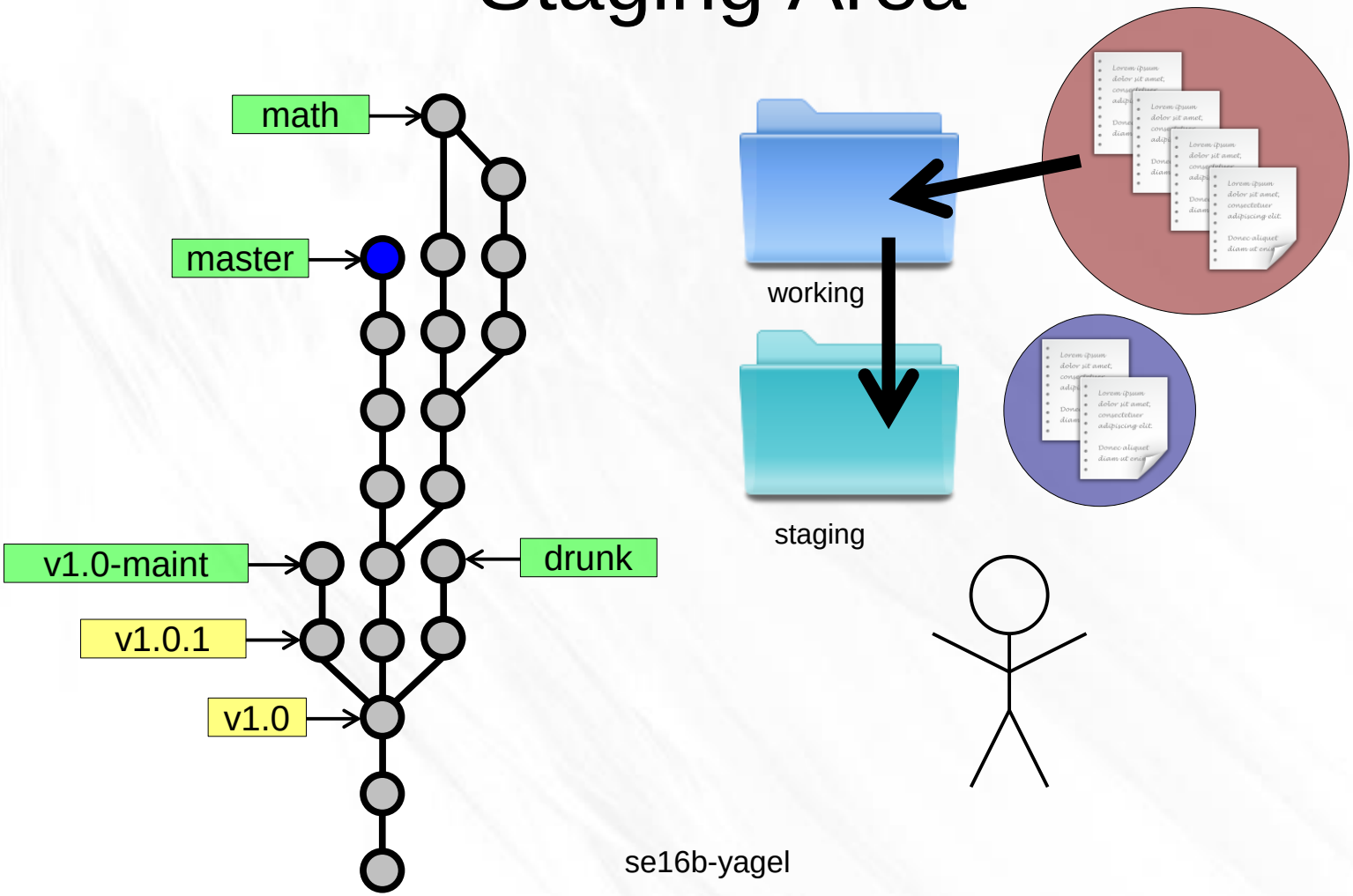
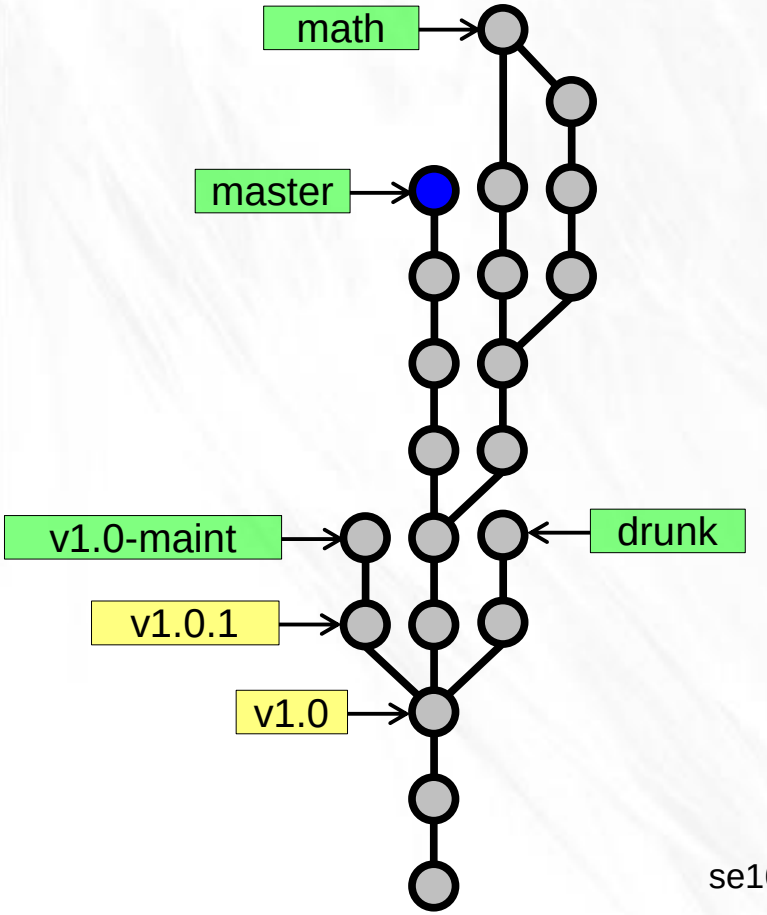
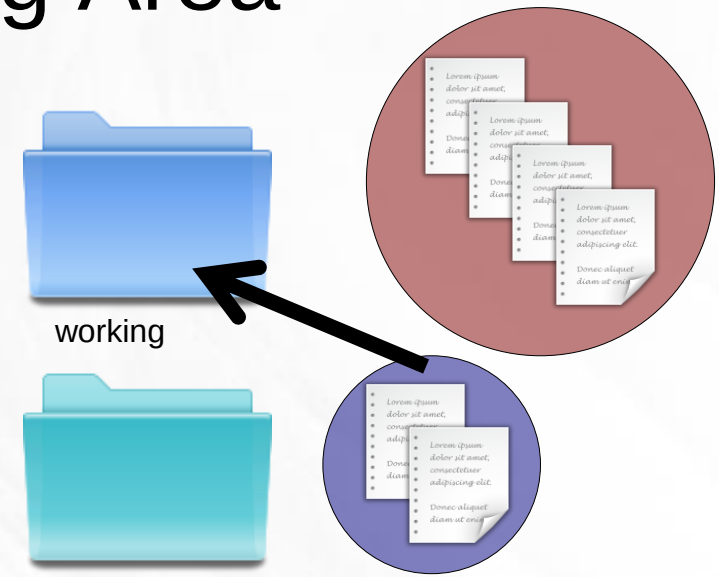
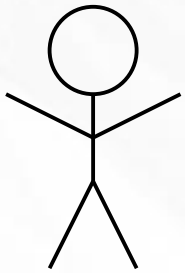


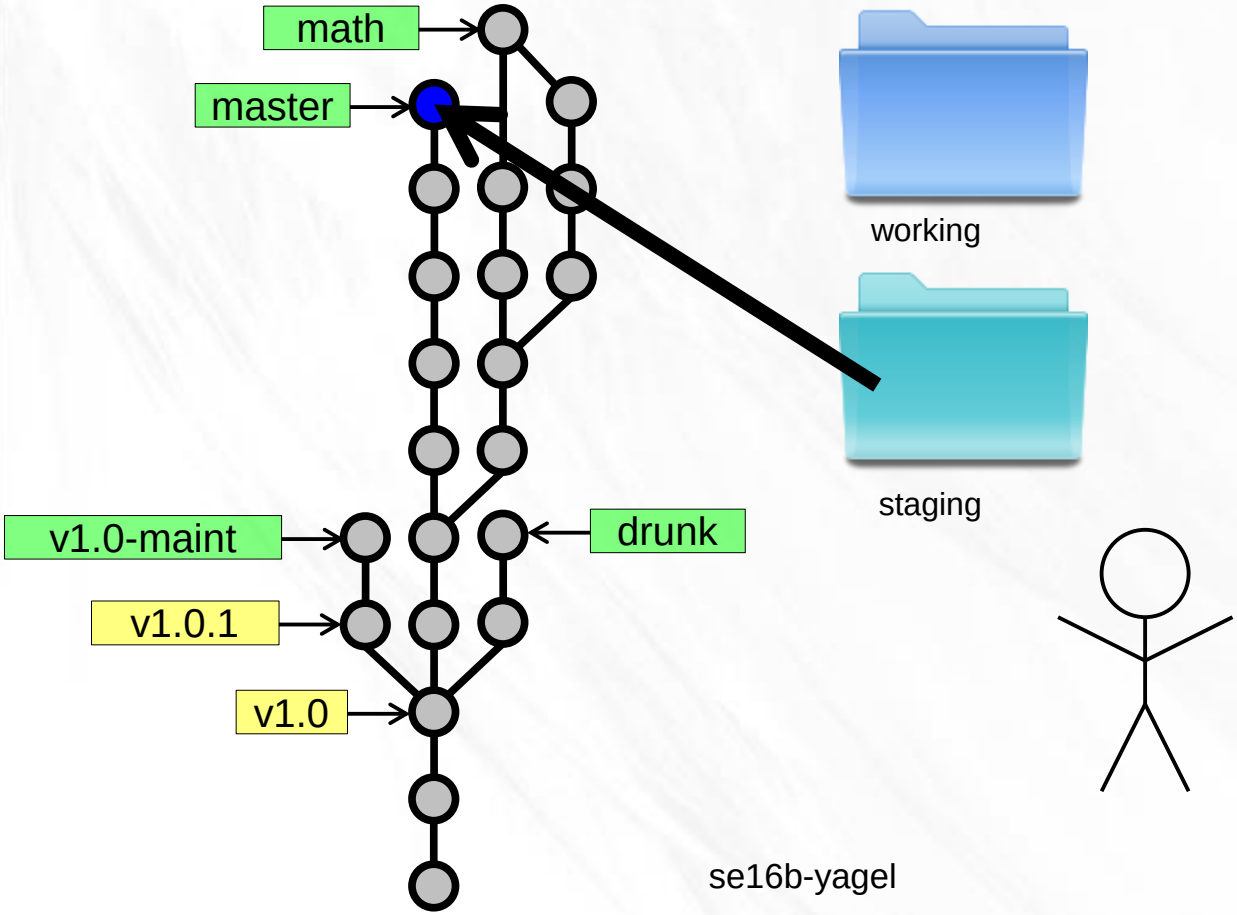
Staging Area



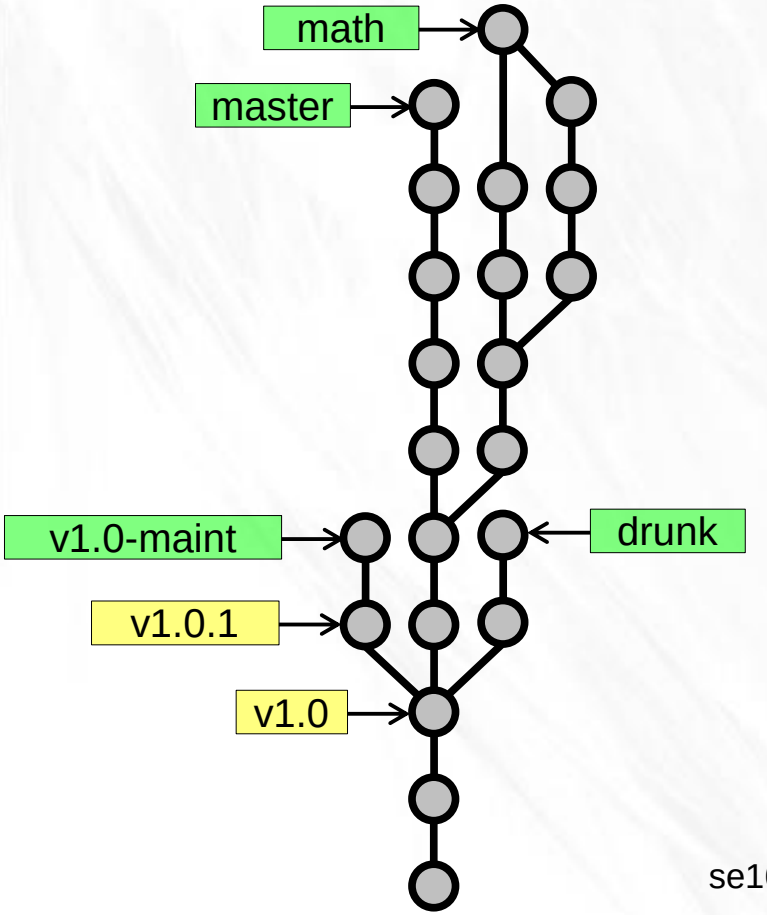


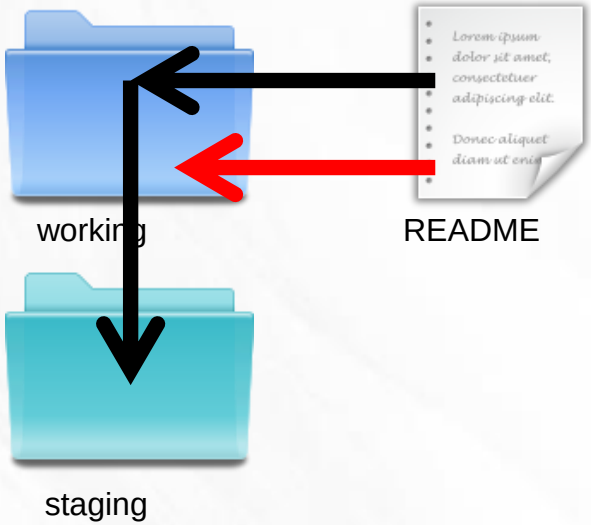


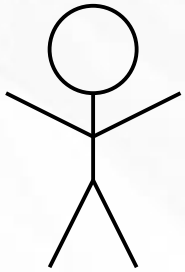
Staging Area



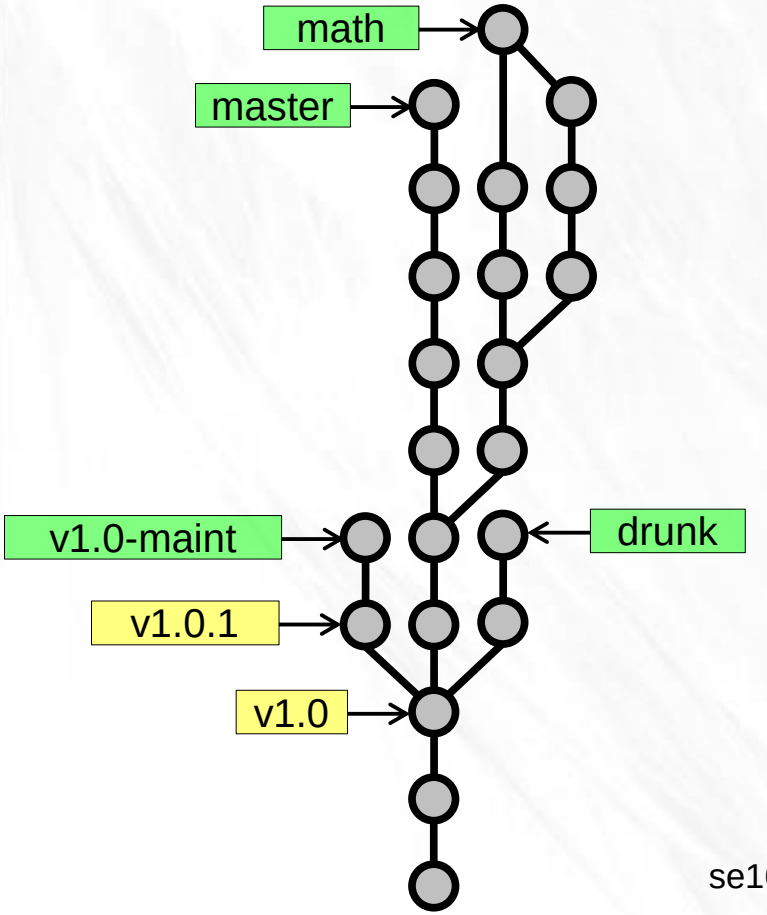
Staging Area







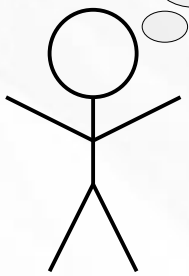
Diffs



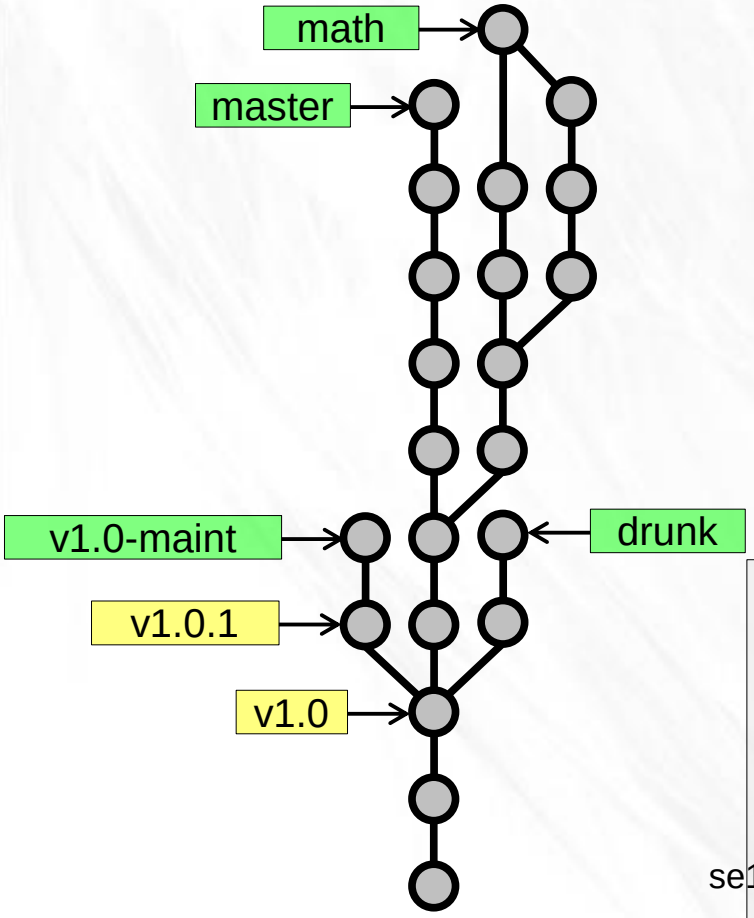
working

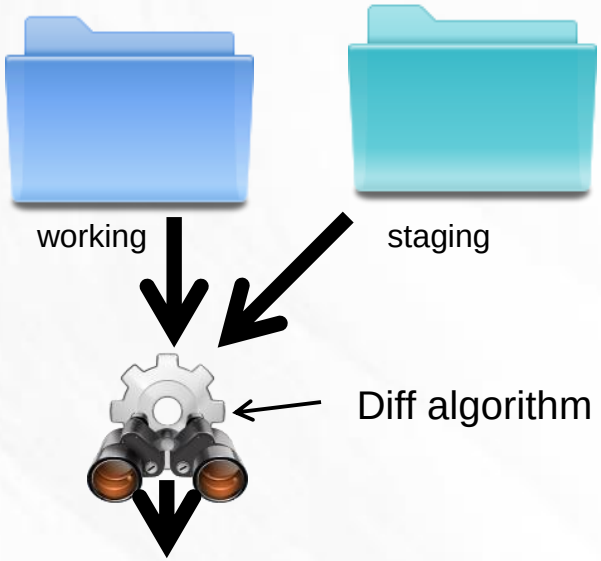
staging

What are the changes?
- working vs. staging
- working vs. snapshot X
- staging vs. snapshot X
- snapshot X vs. snapshot Y



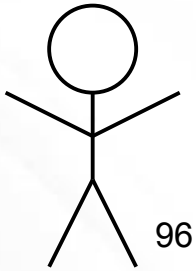
Diffs



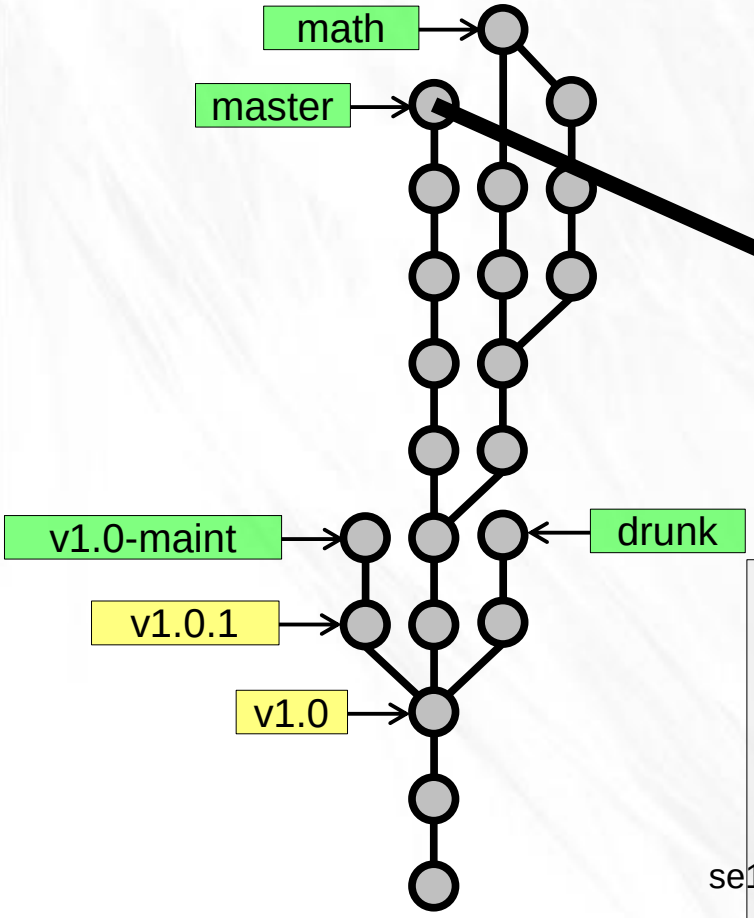



```
--- staging
+++ working

 foo
-baz
+bazzle
 xyzzy
```



Diffs



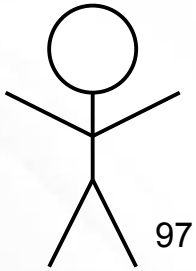
working

staging

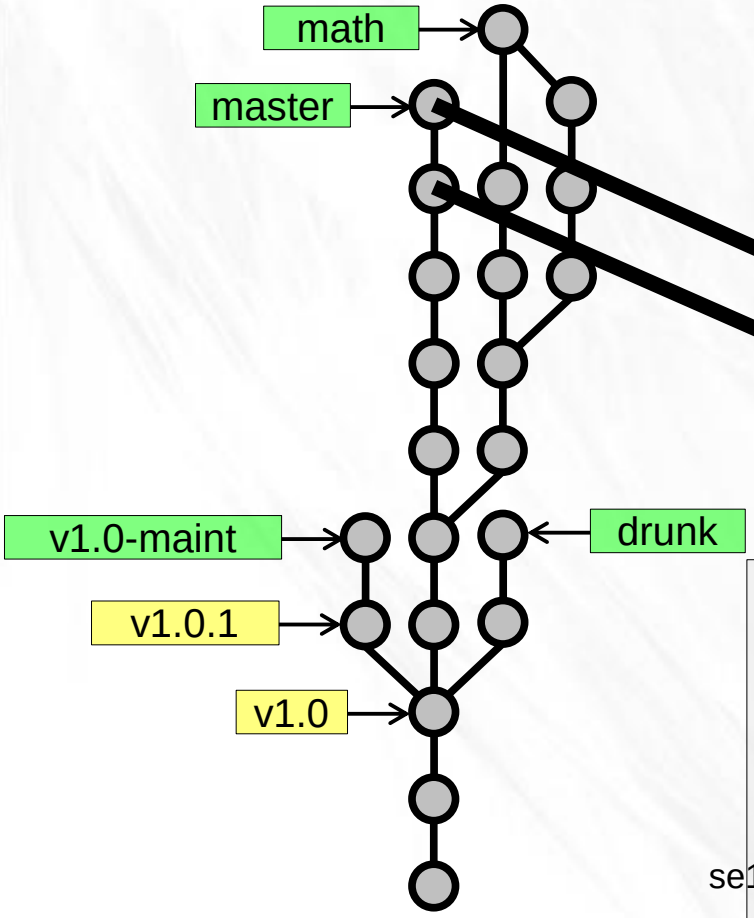
```
--- 90b69eb...
+++ staging

 foo
-bar
+baz
```

se16b yagel XYZZY



Diffs



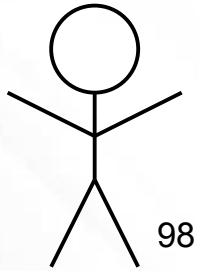
working

staging

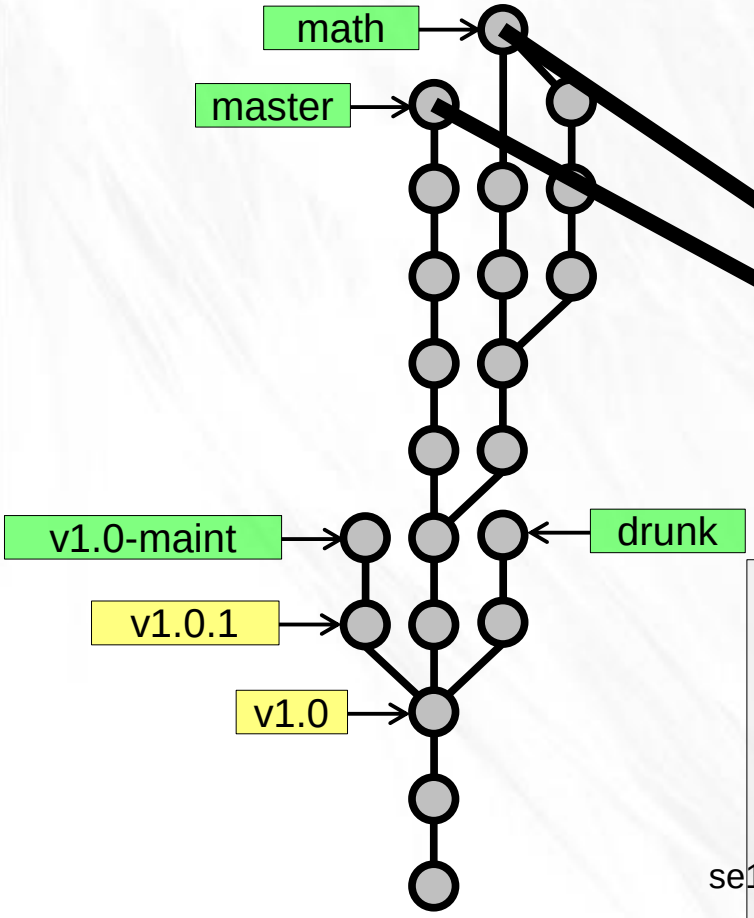
```
--- 1573d45...
+++ 90b69eb...

 foo
 bar
+xyzzy
```

se16b-yagel



Diffs

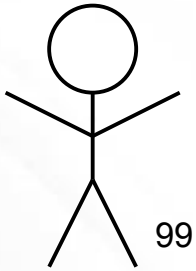


working

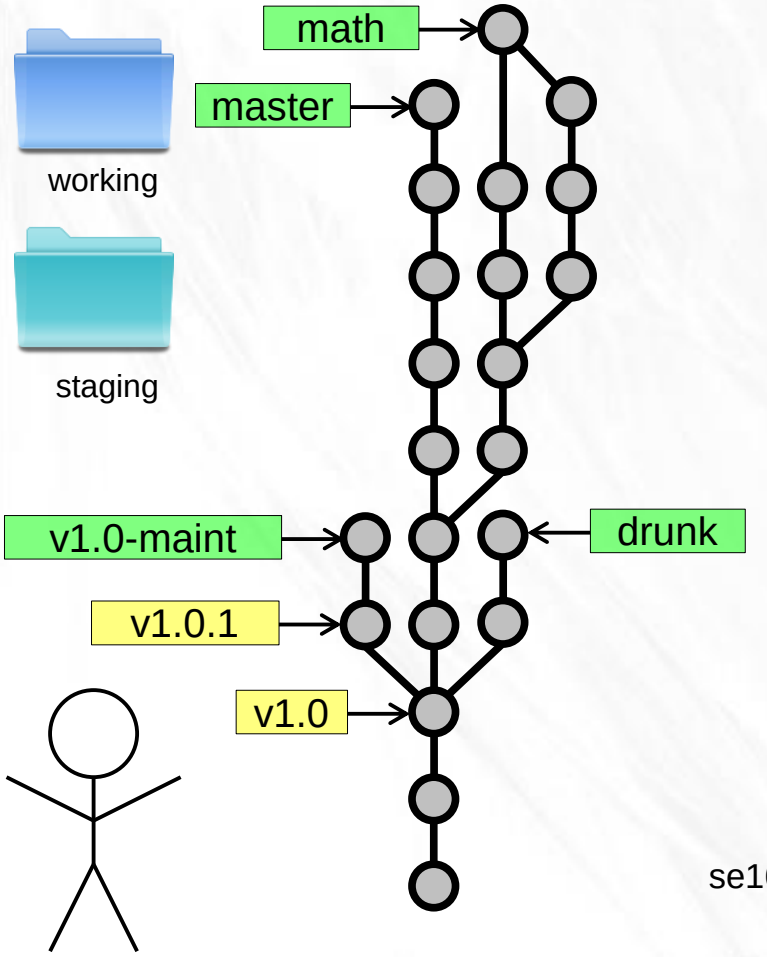
staging

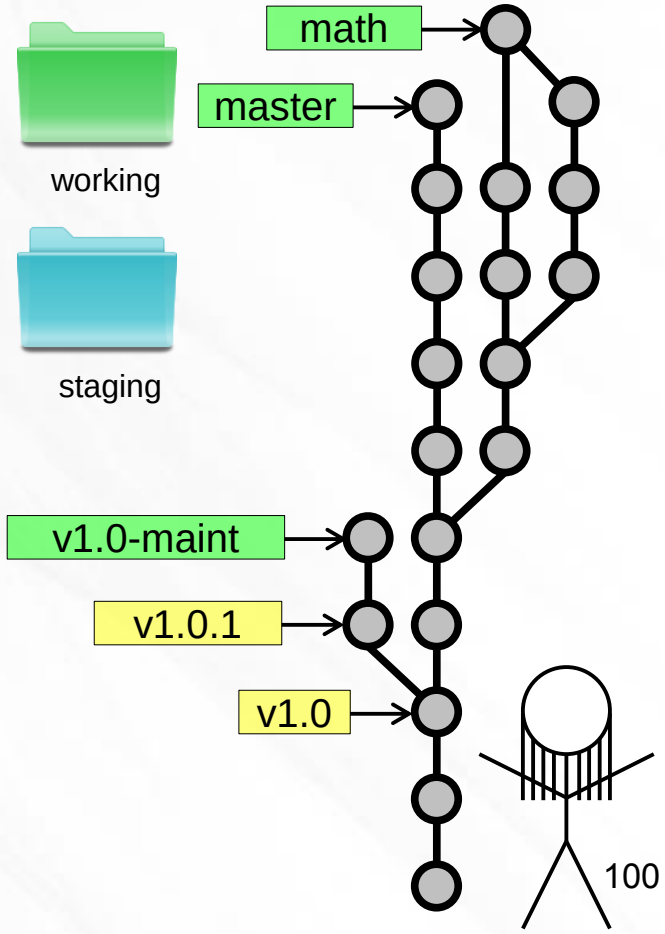
```
--- 90b69eb...
+++ 5fa5d28...

 foo
 bar
-xyzzy
+lorem ipsum dolor
+sit amet, ...
```

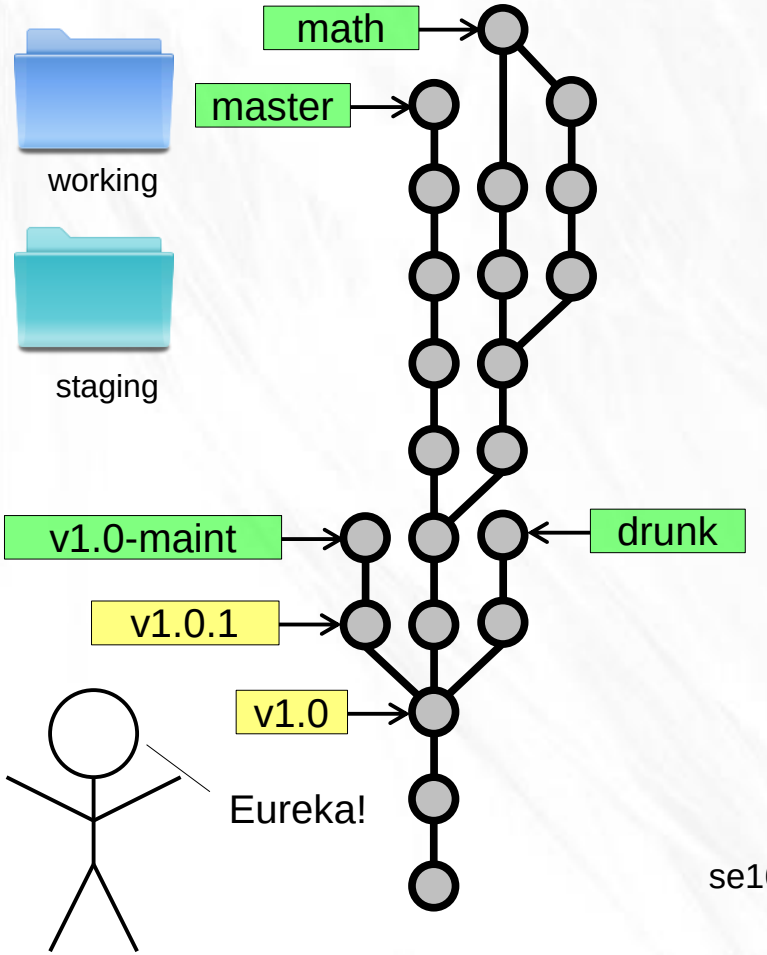


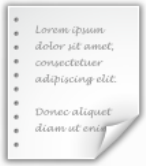
Eliminating Duplication





Eliminating Duplication



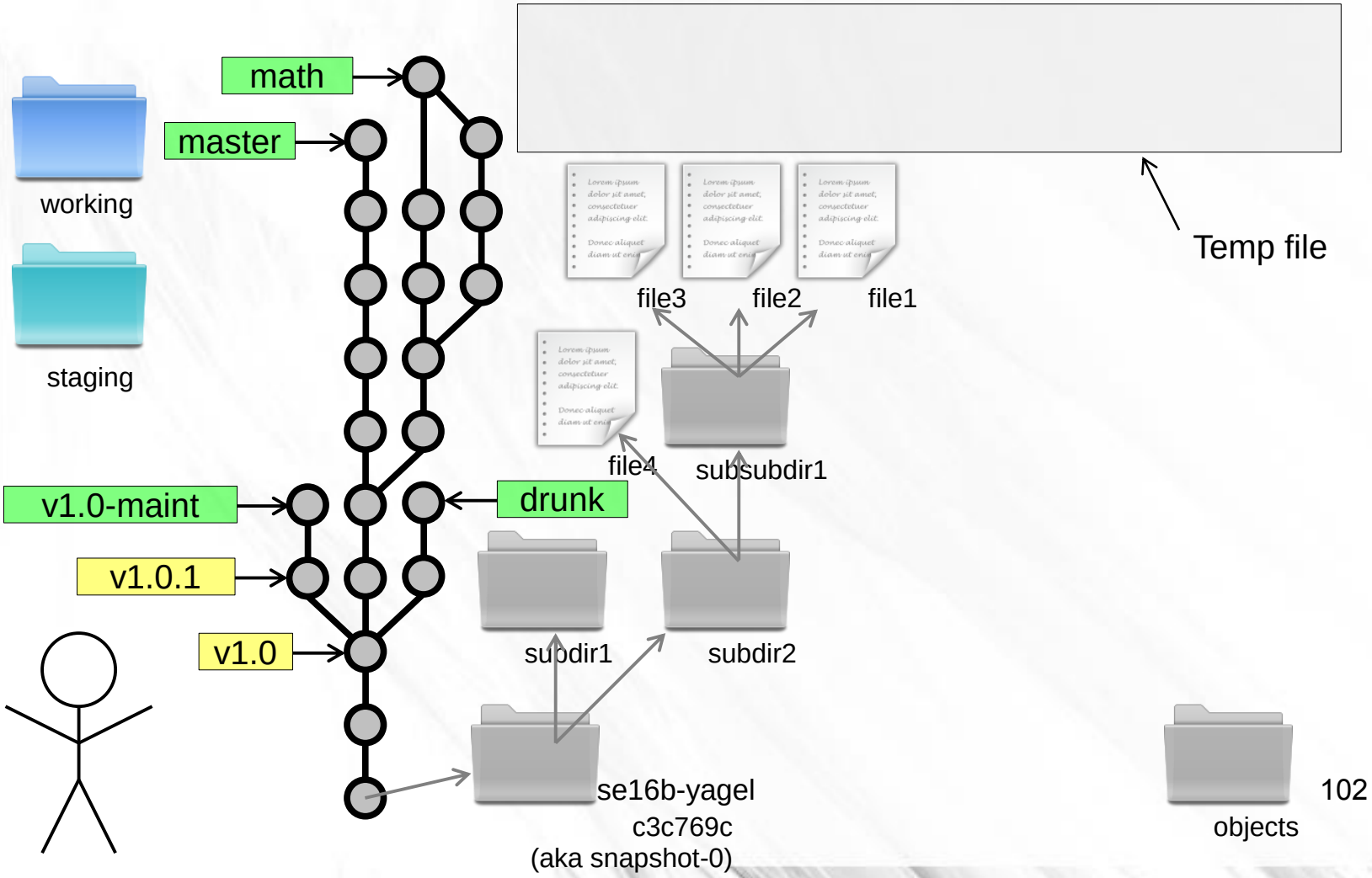


SHA1

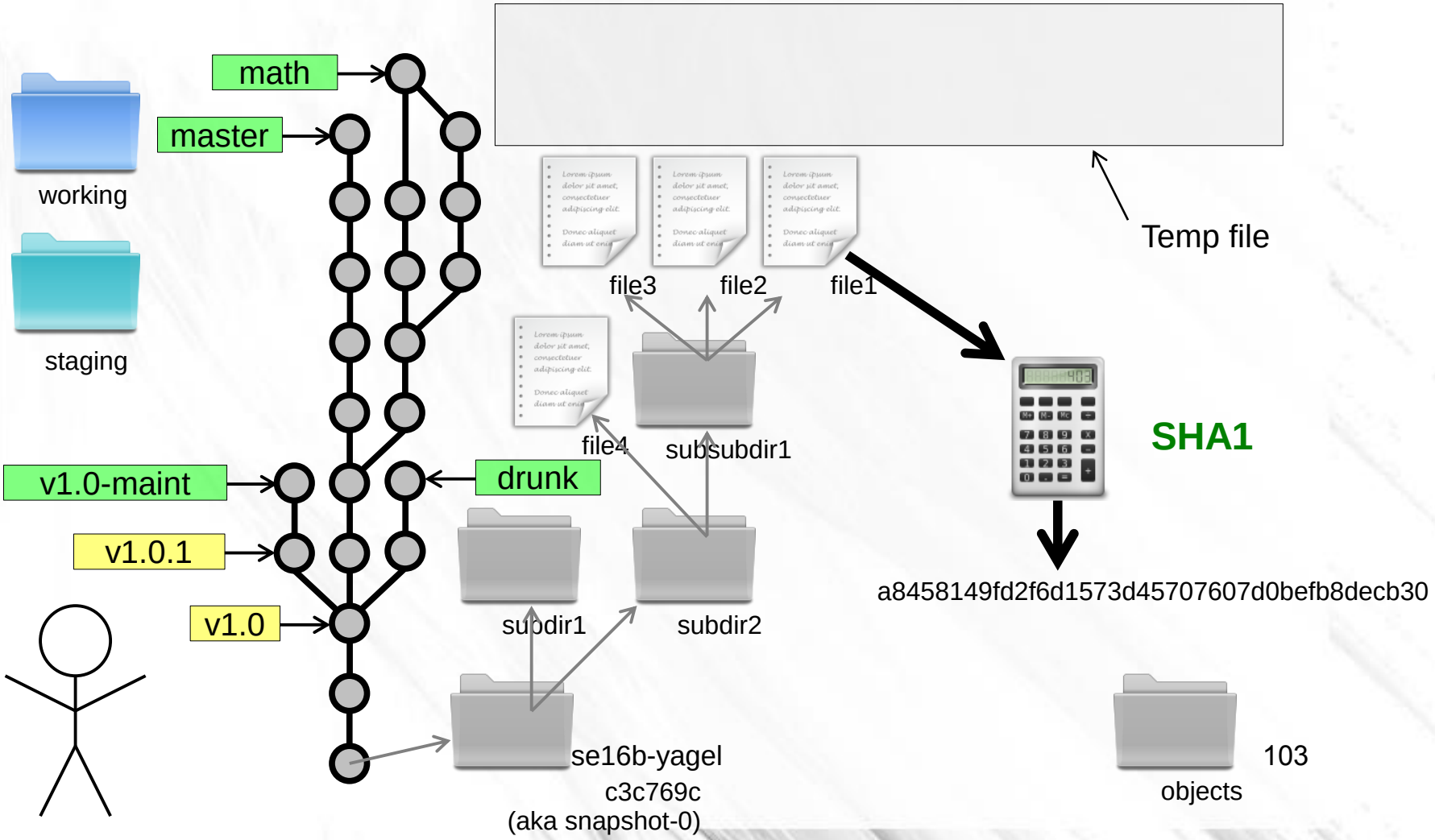
2804133755c3ed396d162028c7b30a1cbcfecded

objects

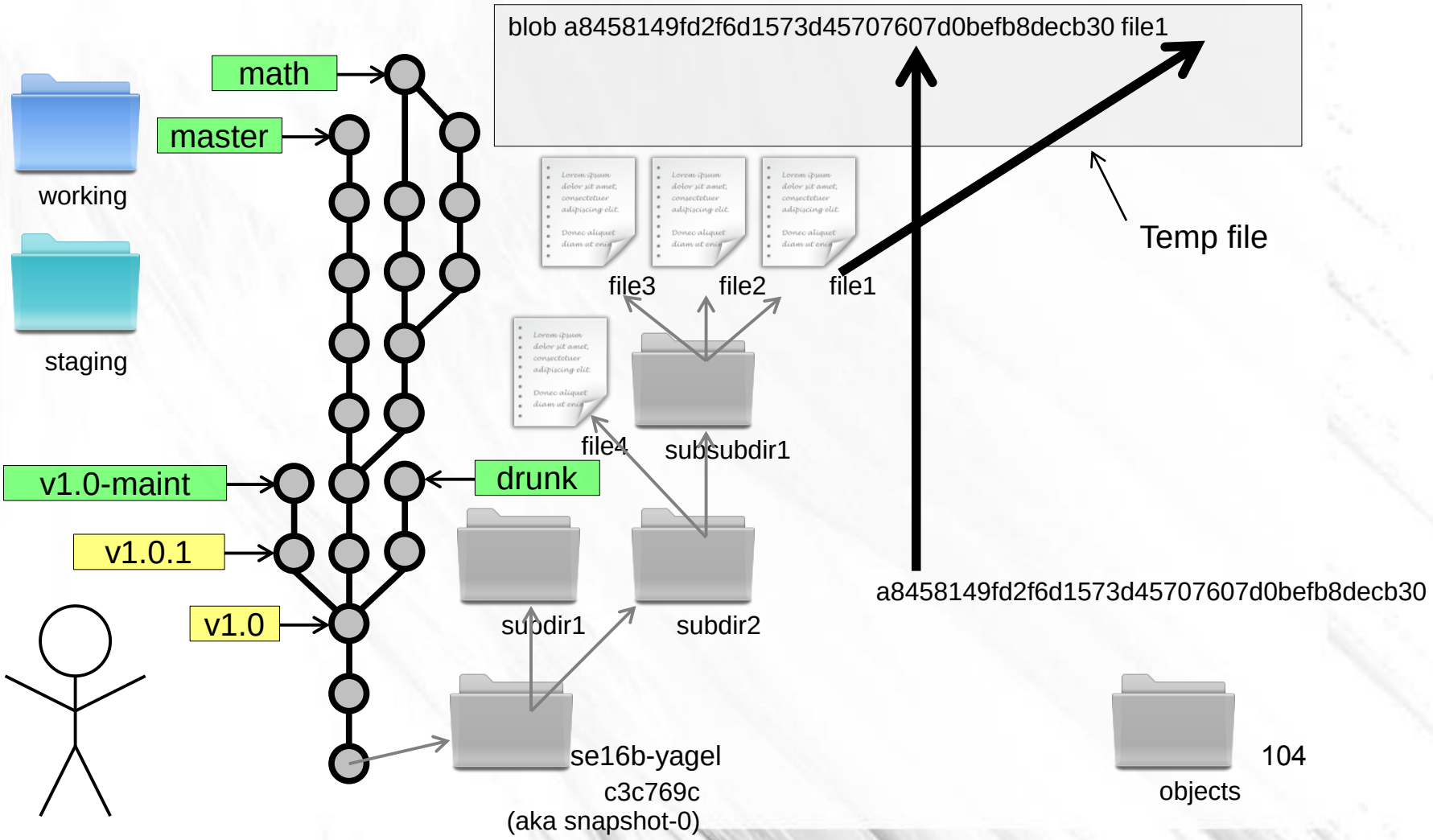
Eliminating Duplication



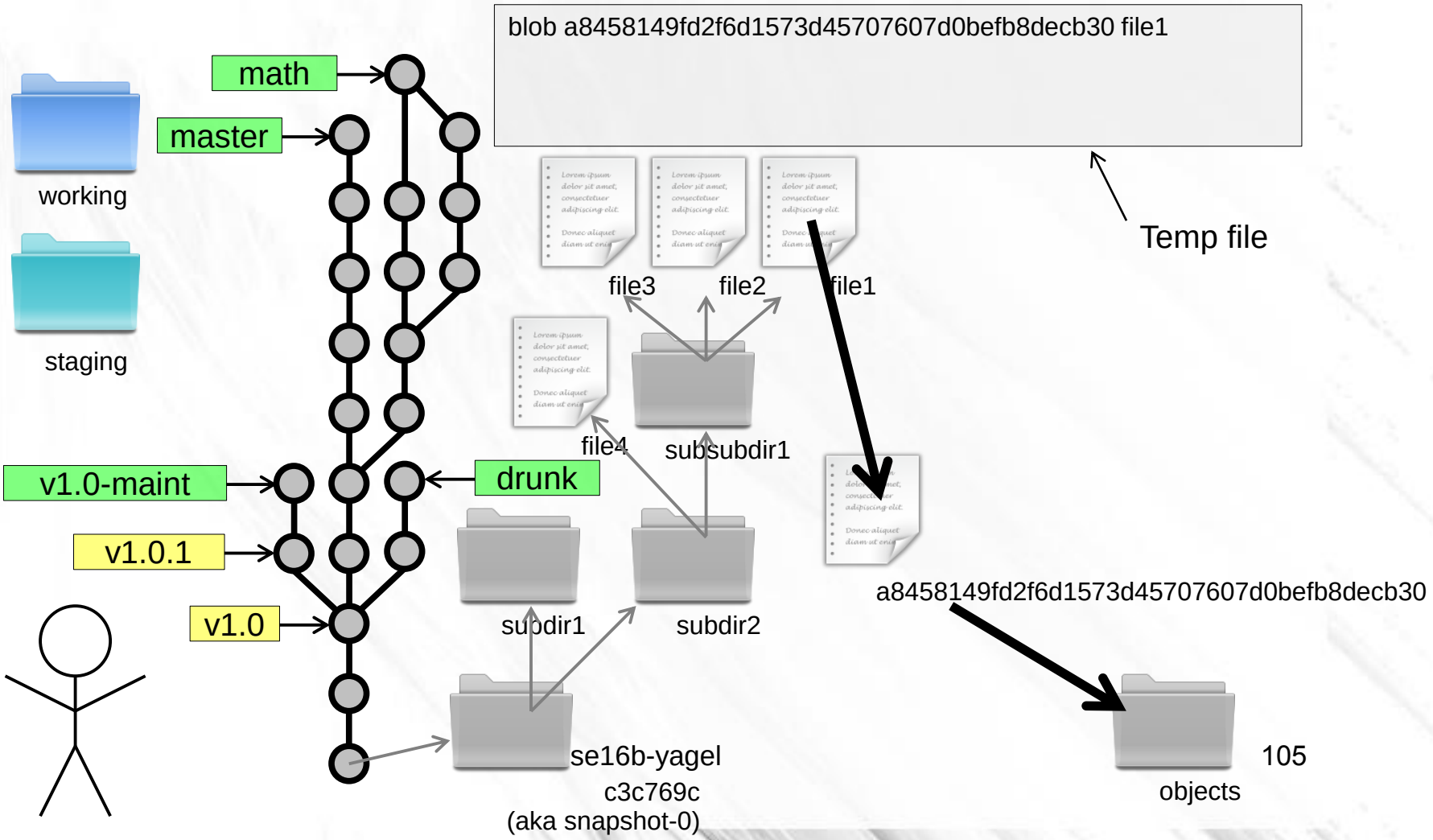
Eliminating Duplication



Eliminating Duplication



Eliminating Duplication



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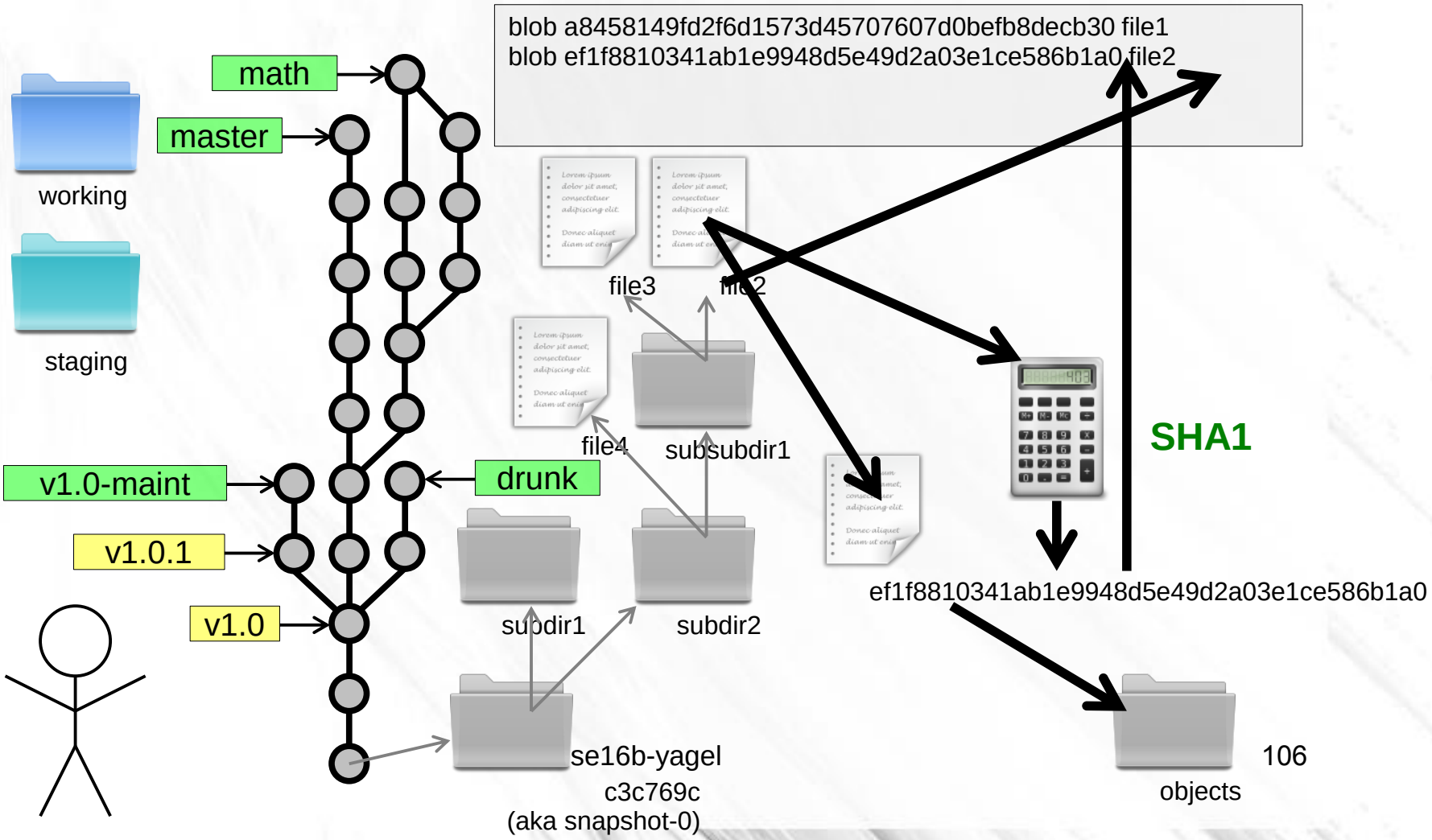
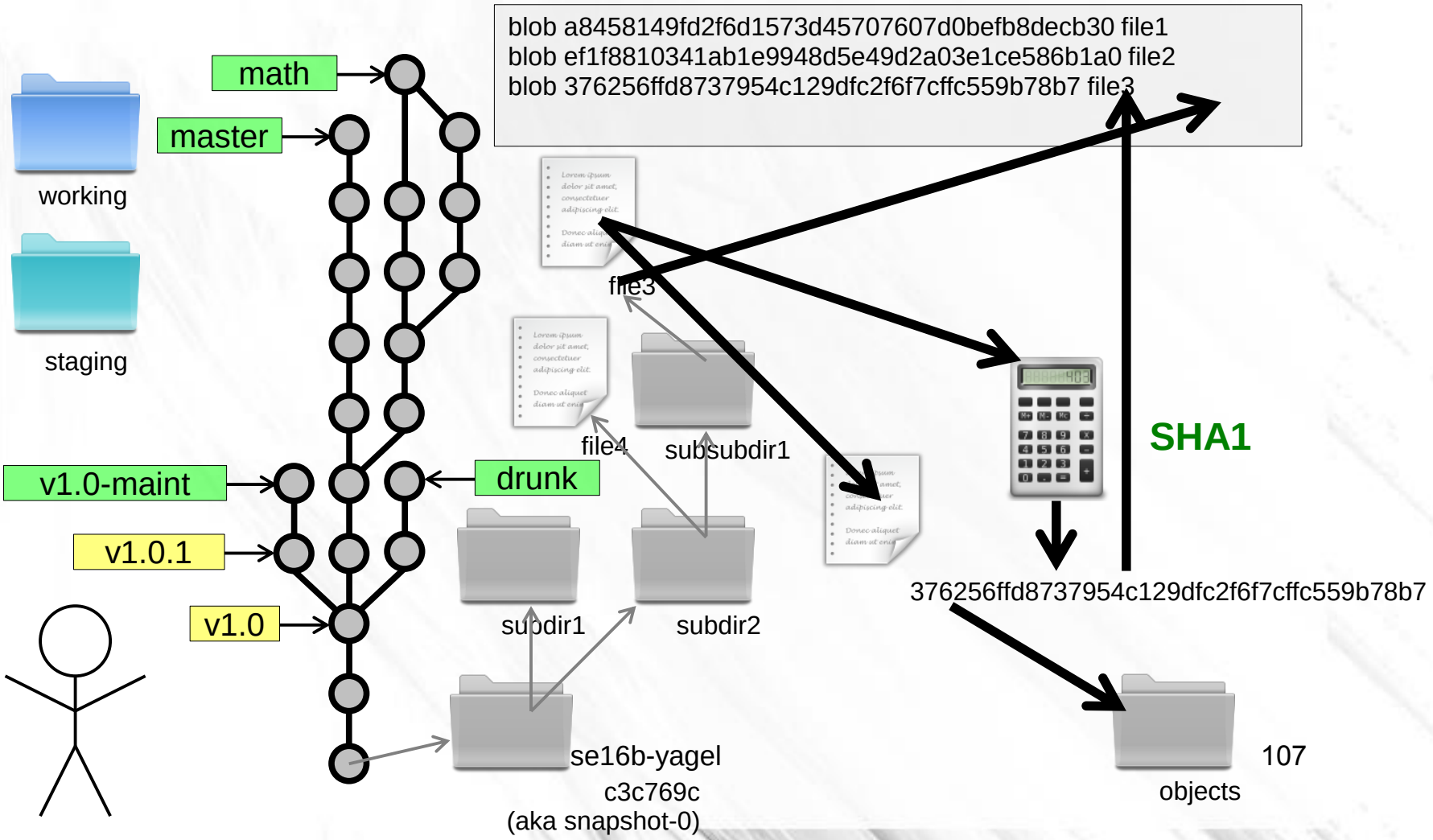
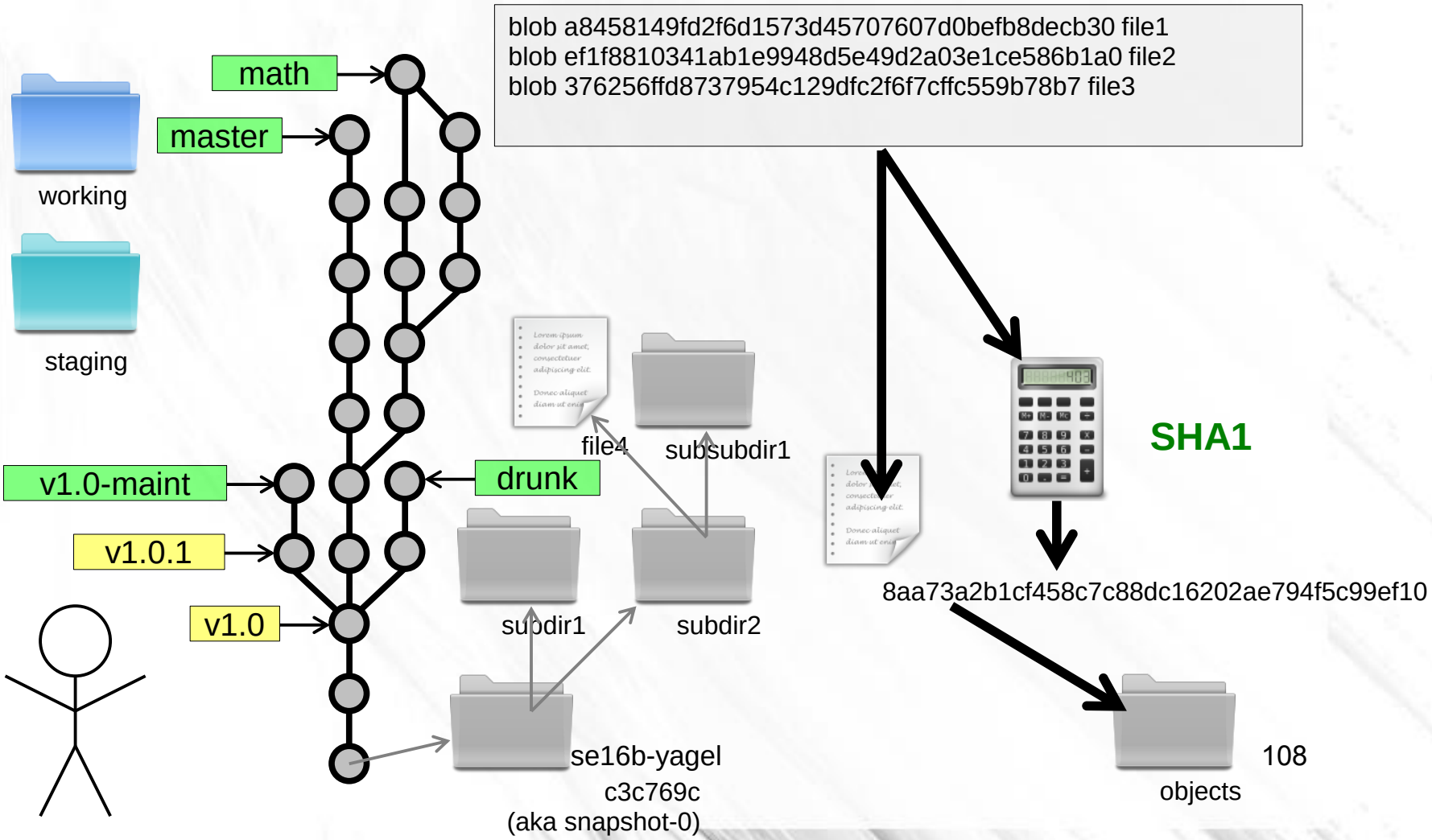


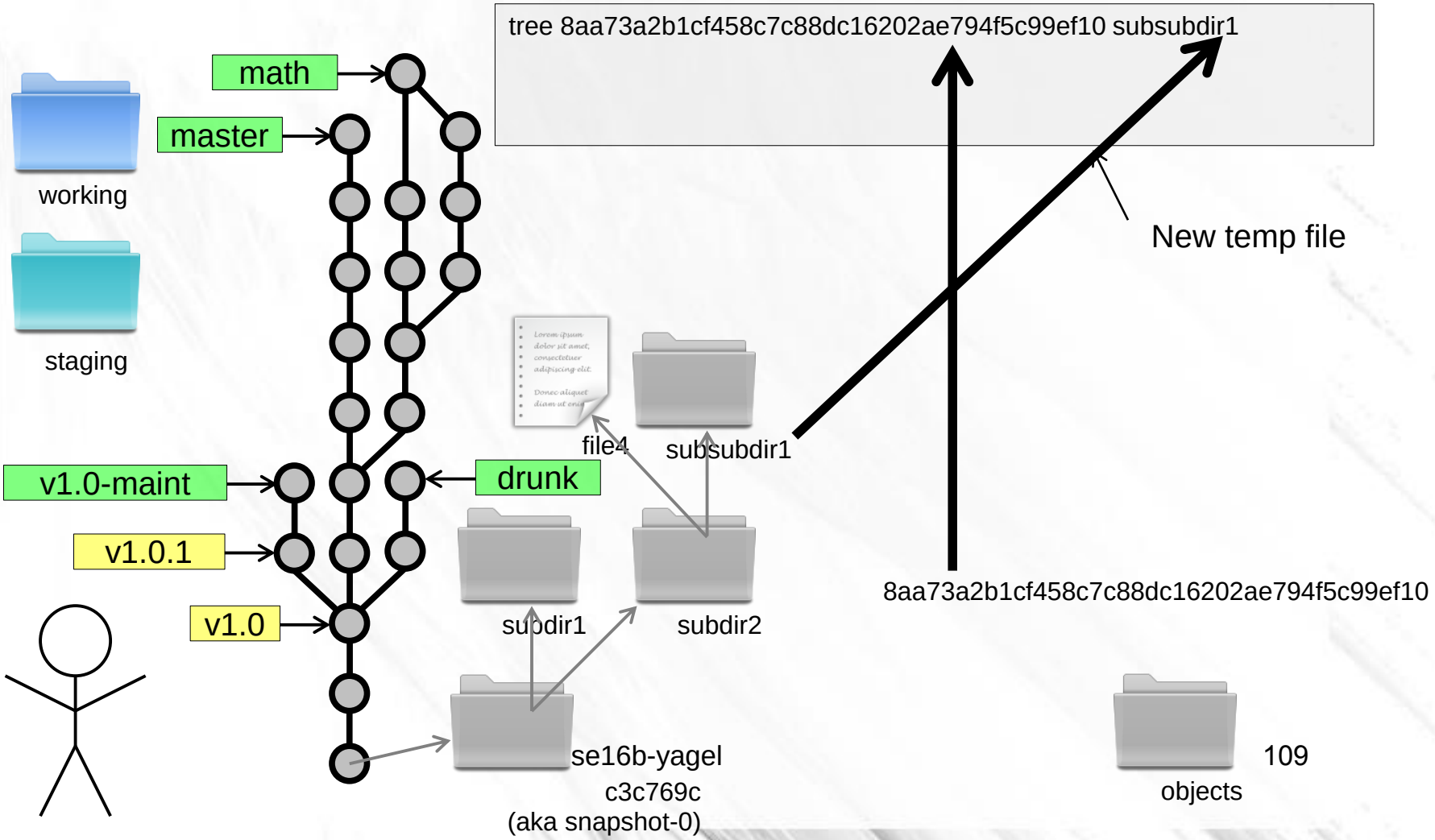
Eliminating Duplication



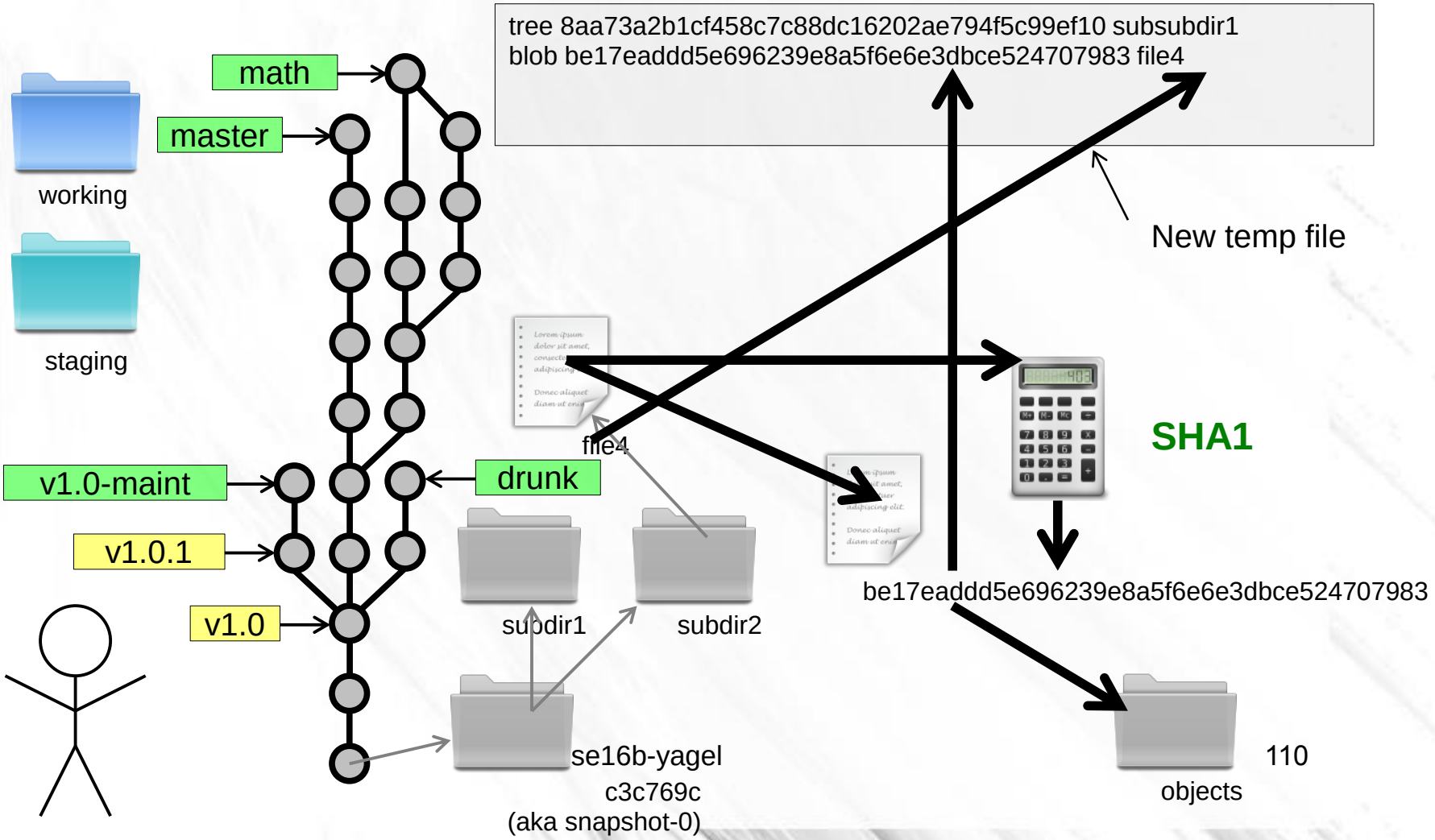
Eliminating Duplication



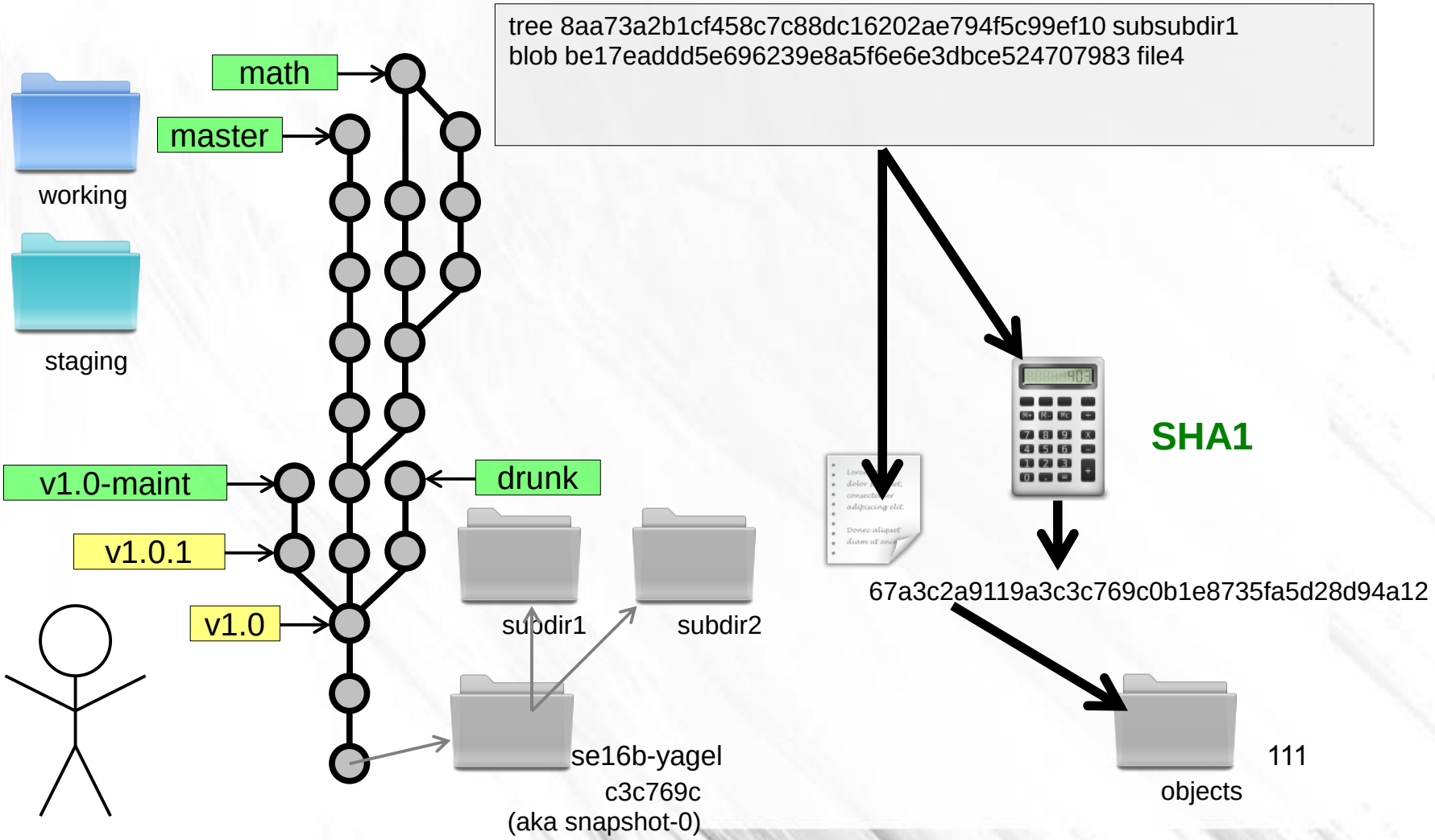
Eliminating Duplication



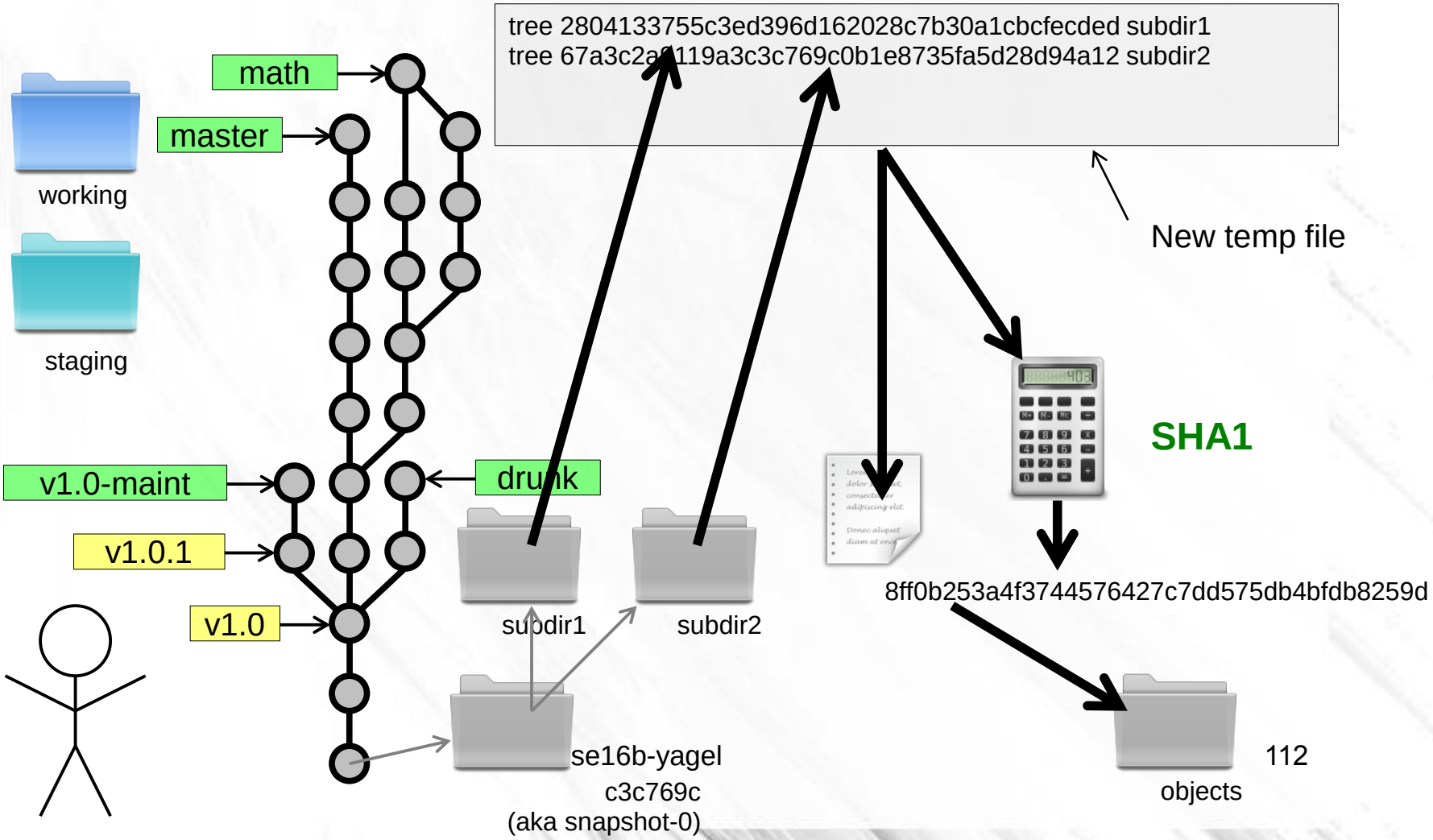
Eliminating Duplication



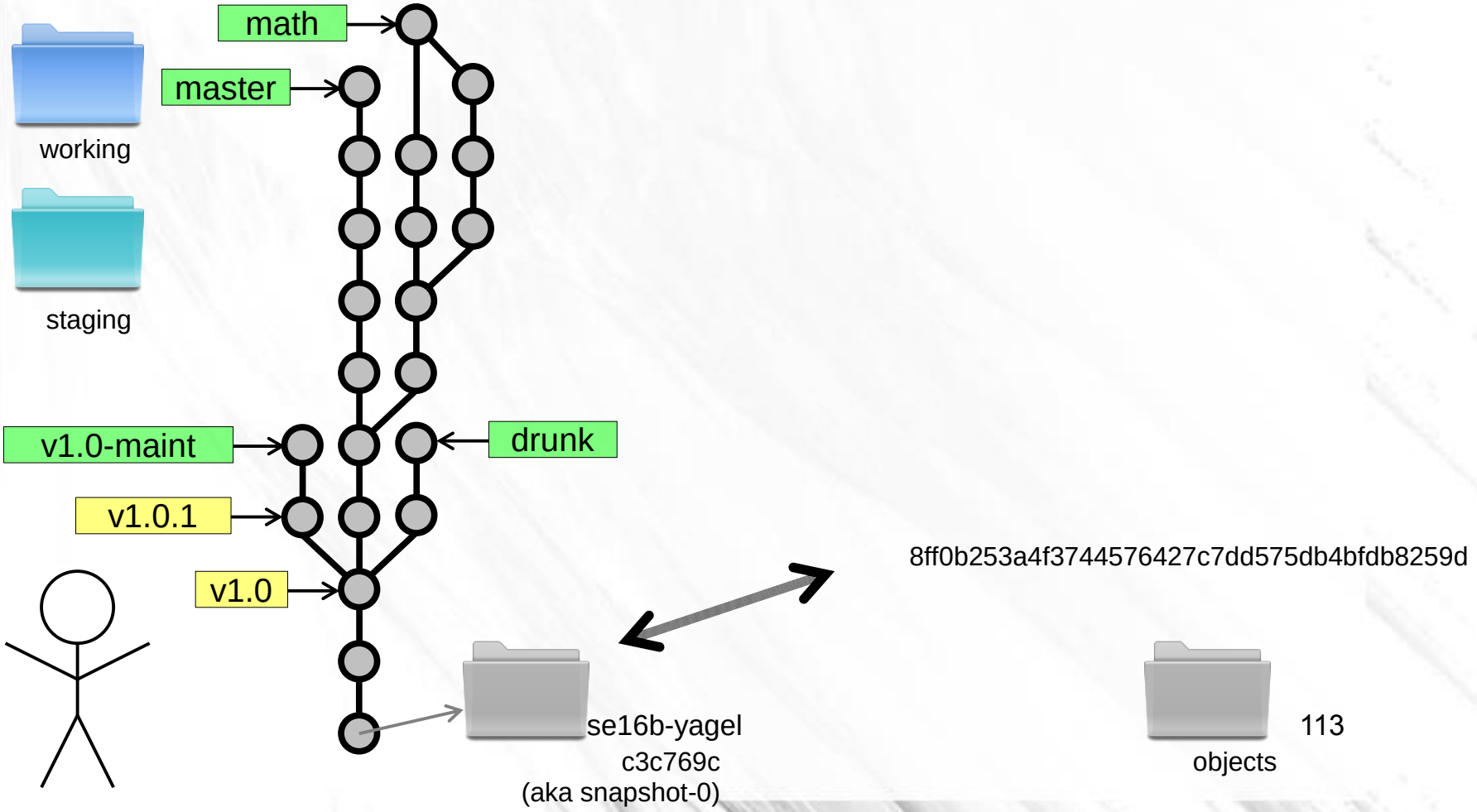
Eliminating Duplication



Eliminating Duplication



Eliminating Duplication



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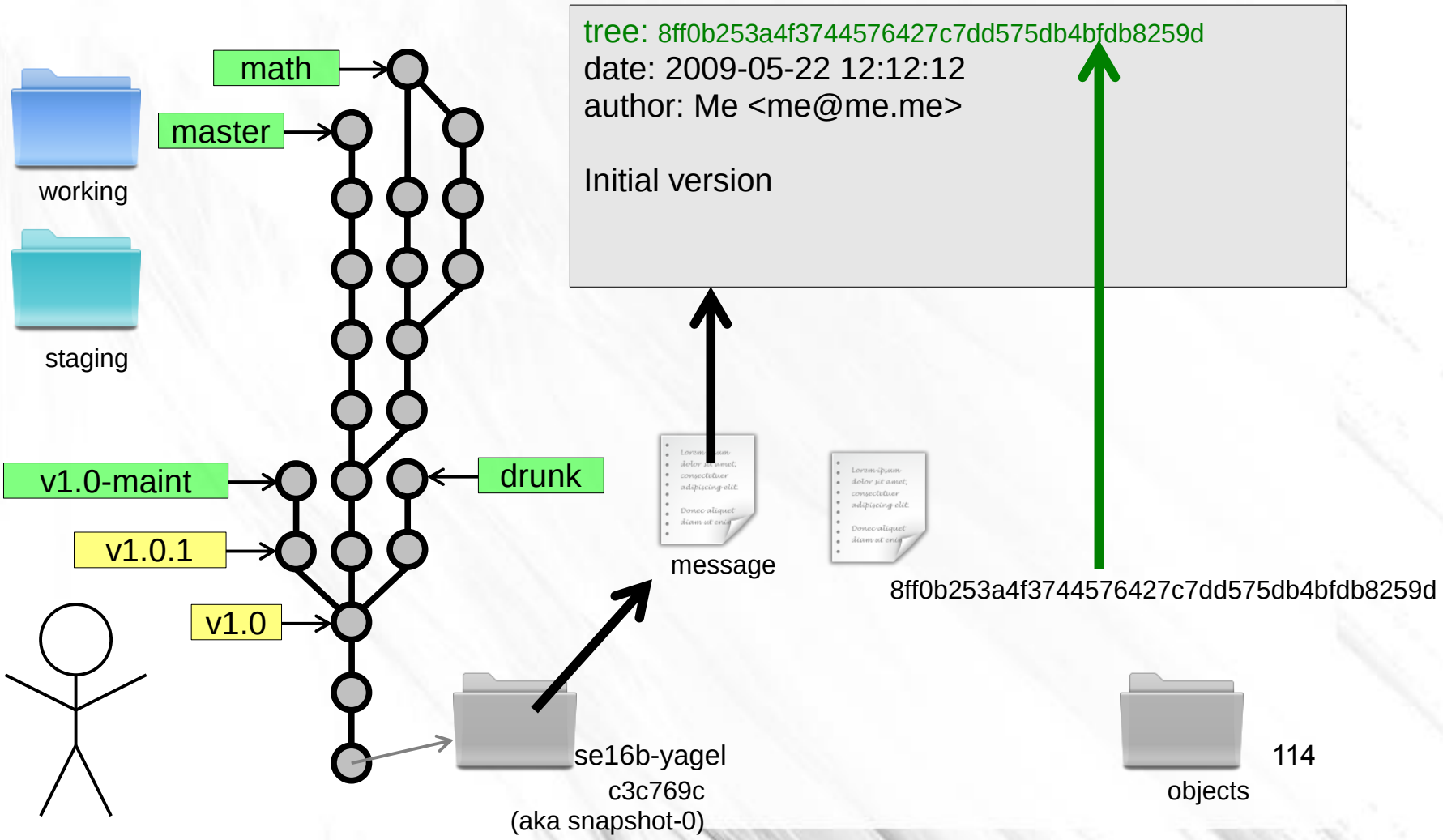

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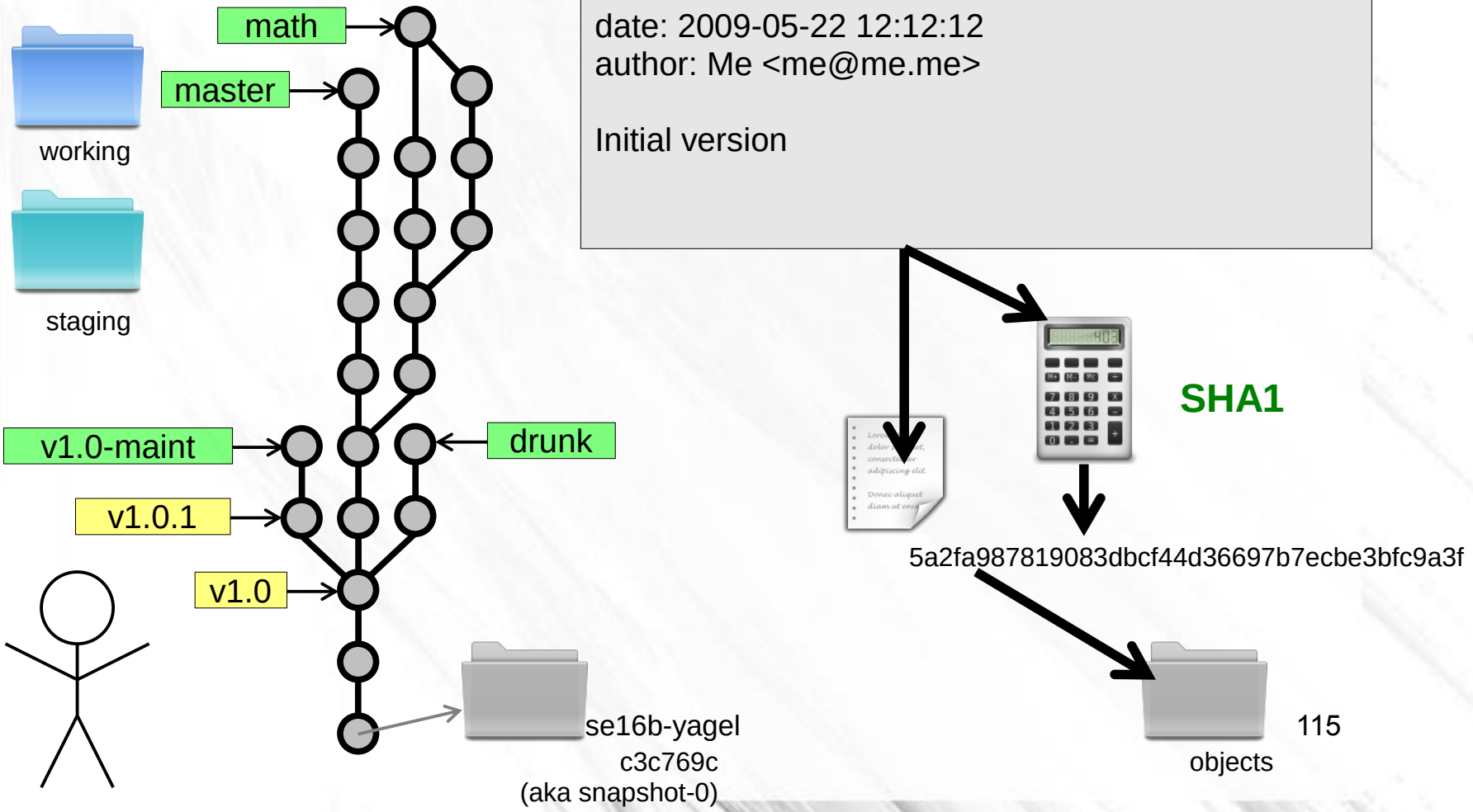
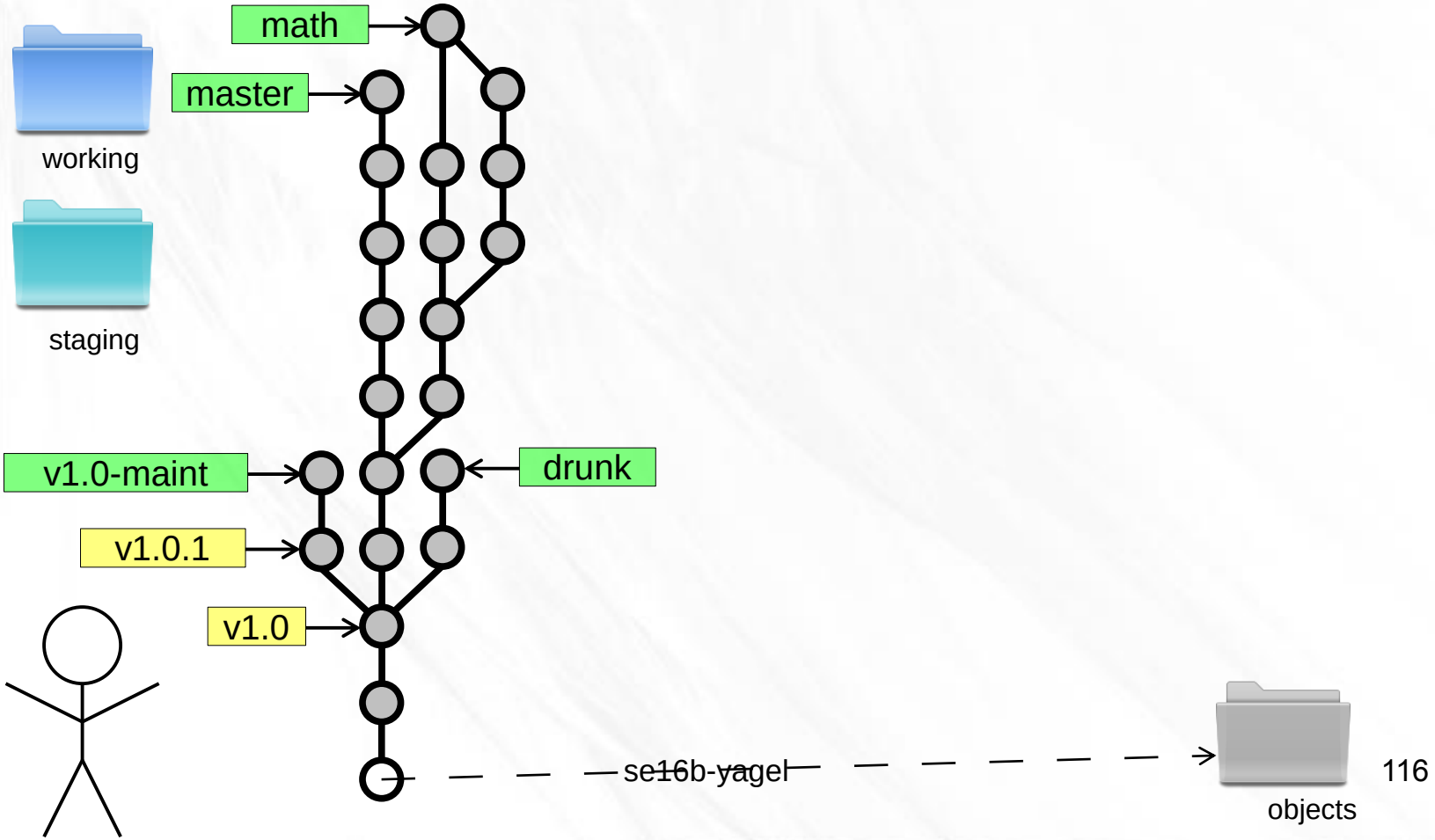
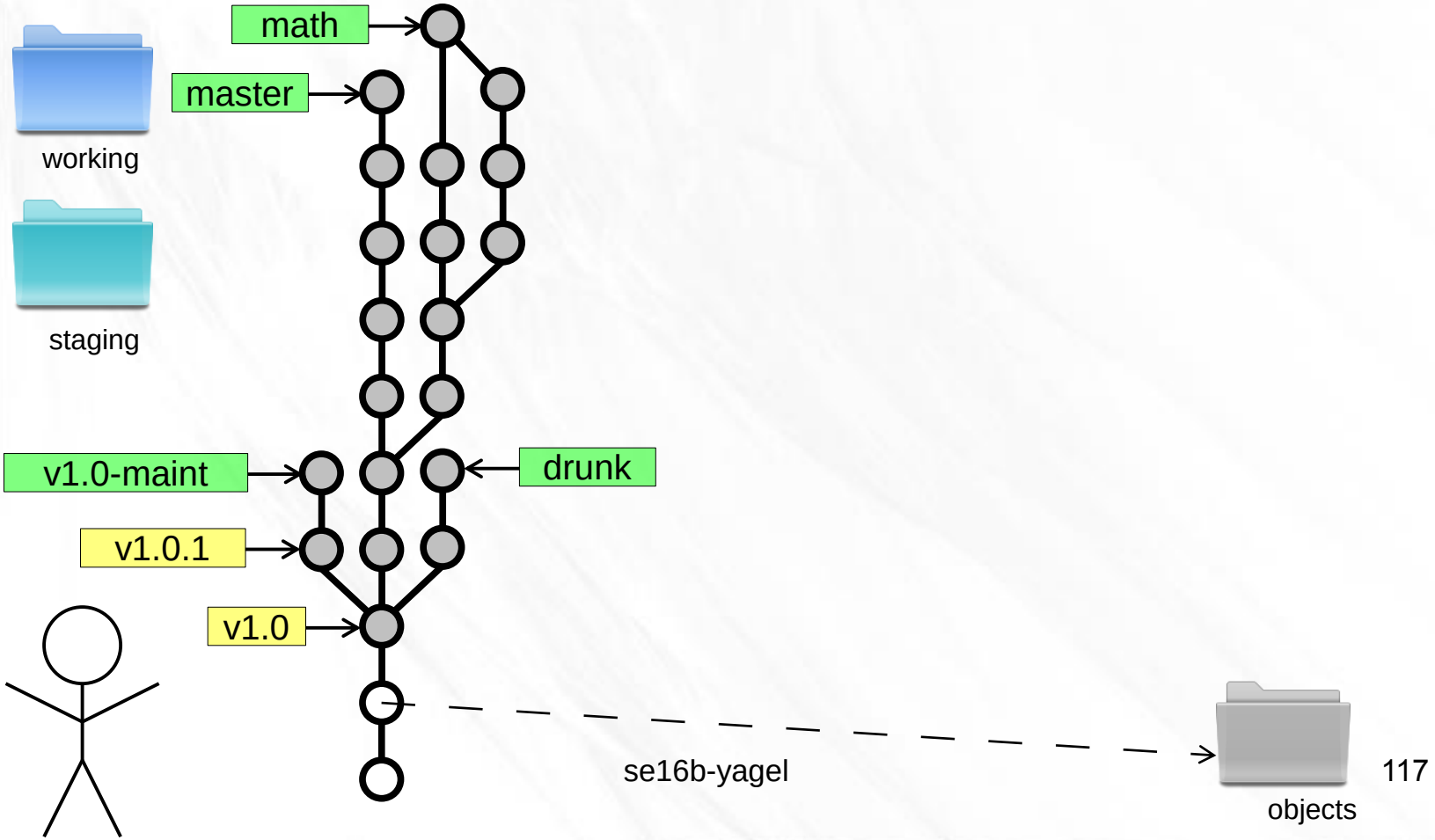


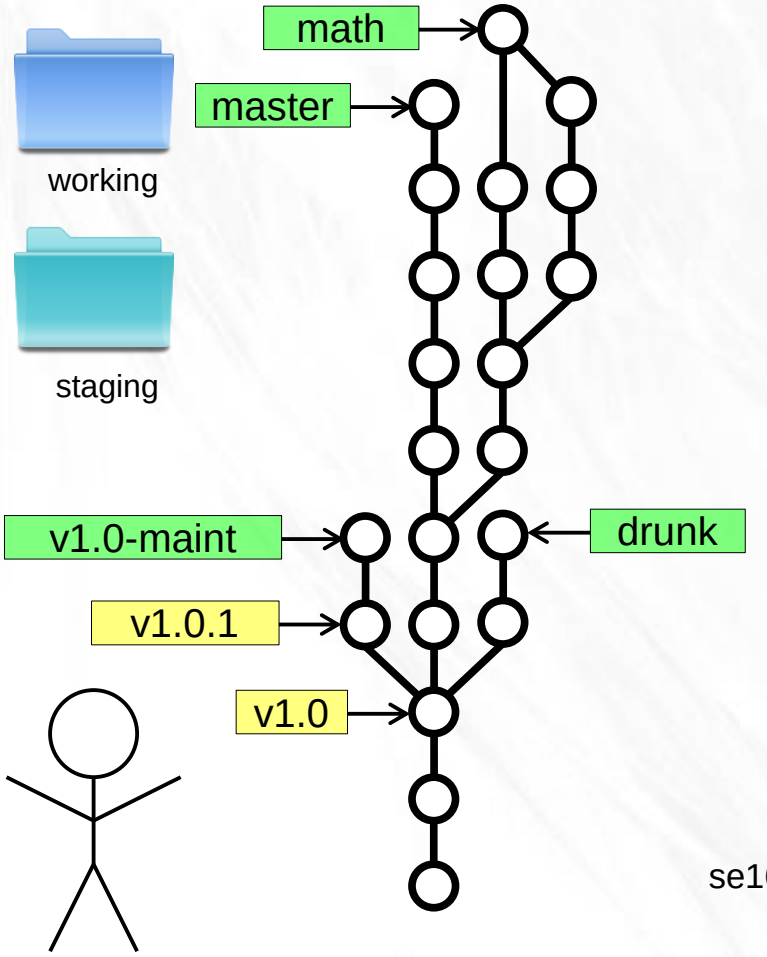
Eliminating Duplication



Eliminating Duplication

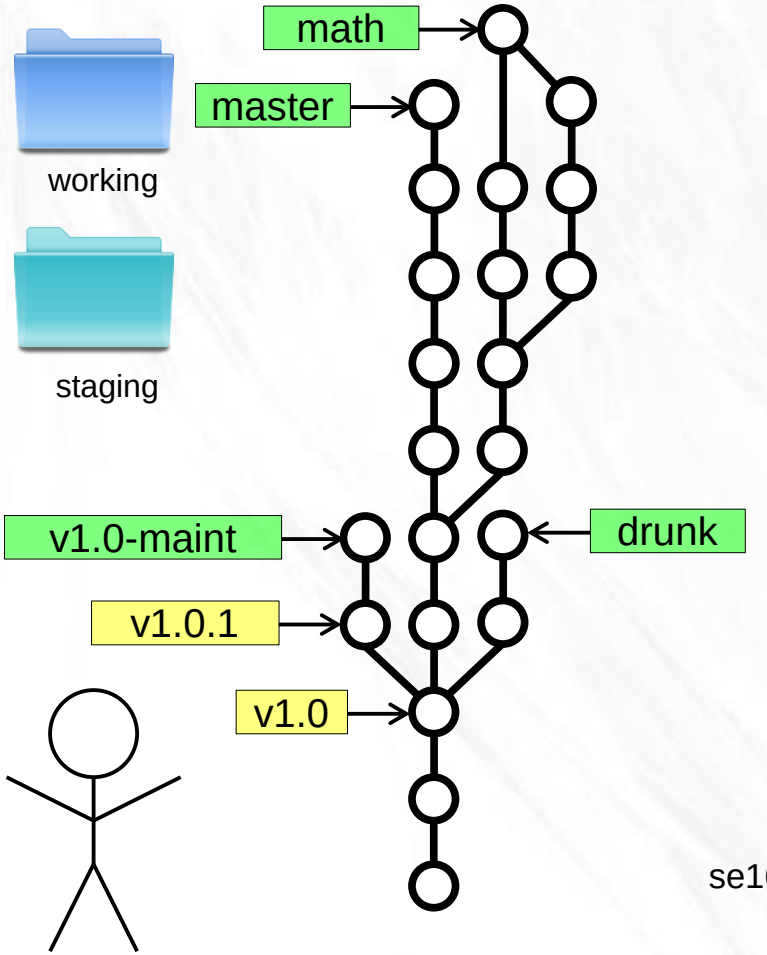


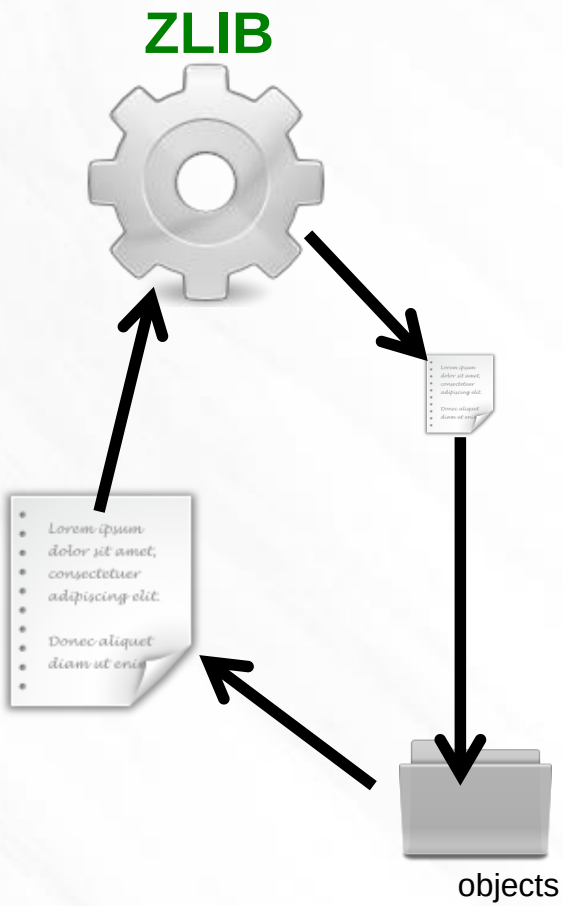
Eliminating Duplication



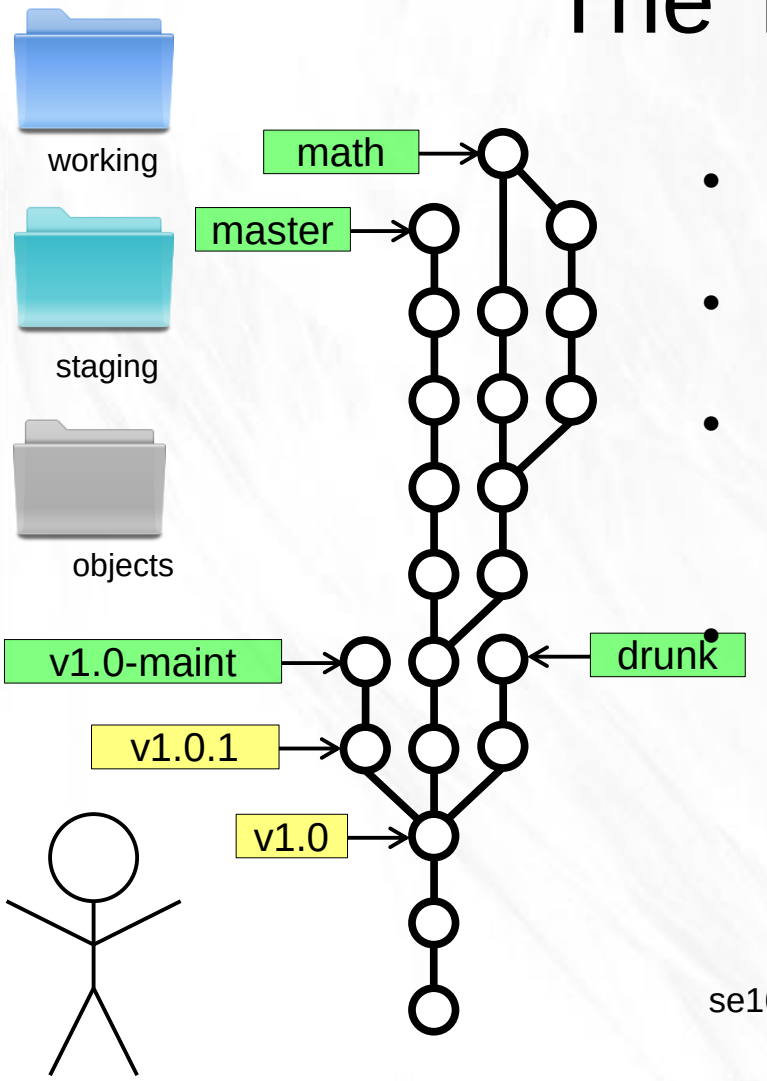
objects

Compressing Blobs





The True Git

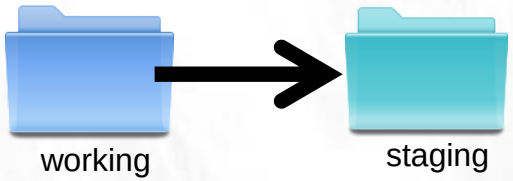


- TADAA!
- This is pretty much Git
- Nicer command line tools for all these operations
- Many, many other tools

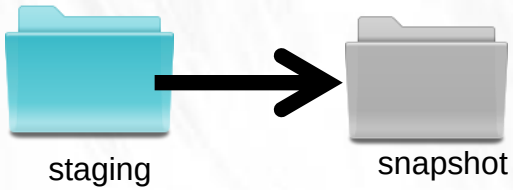
Commands: Getting Started

- 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



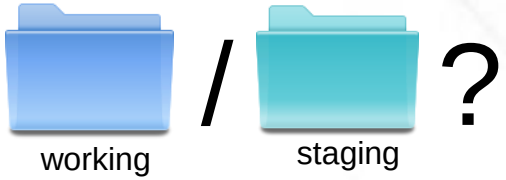
- git add



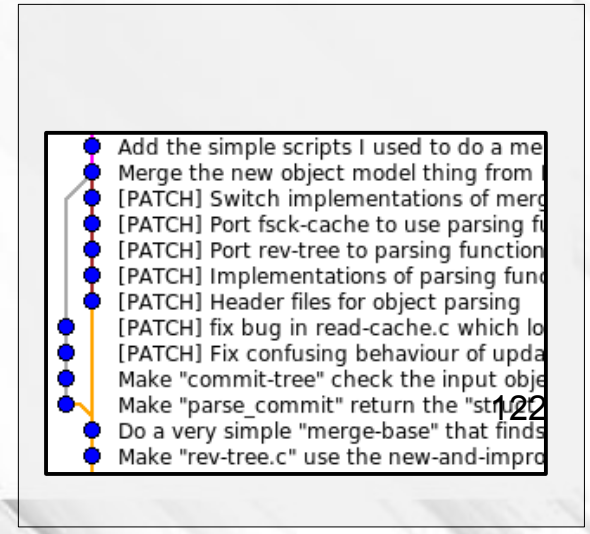
- git commit

} git commit -a

- git log



- git status



gith

Commands: Diffing

vs.

- git diff

vs.

- git diff --staged

vs.

- git diff HEAD

vs.

- git diff <from> <to>

Commands: Branches & Tags

- git branch
- git branch <branch>
- git checkout <branch>
- git tag -l
- git tag <tag>

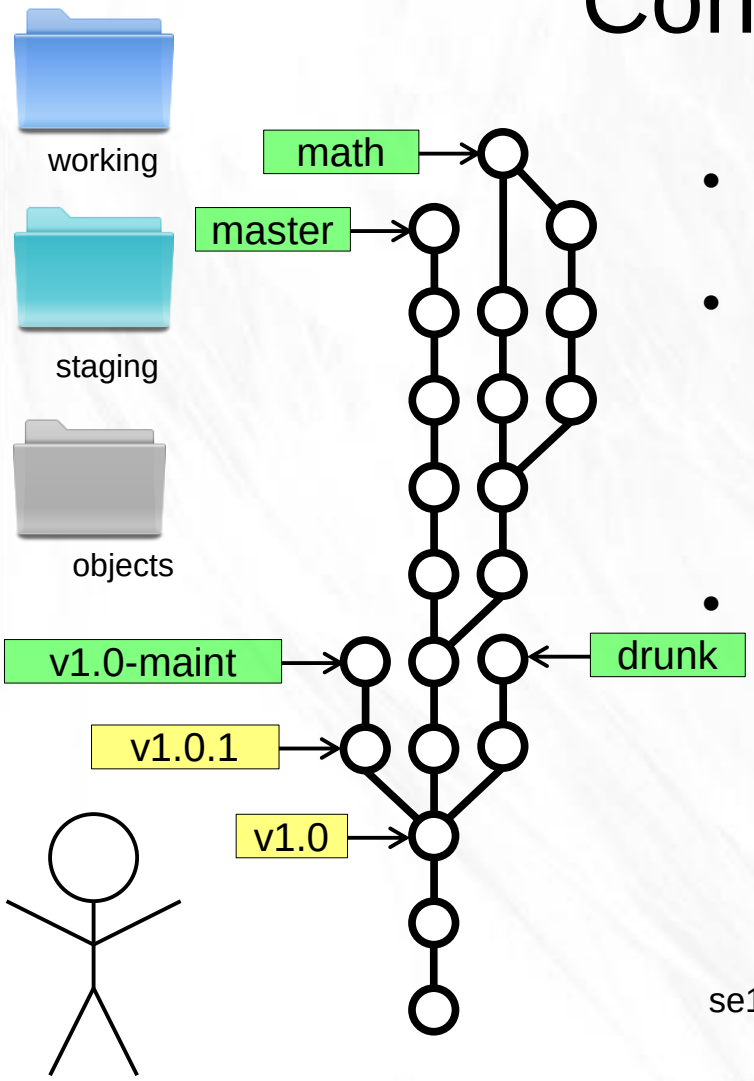
} git checkout -b ...

Commands: Fetching & Merging

- git remote add <name> <URL>
- git fetch <name>
- git merge <name>/<branch>

} git pull

Conclusion



- Keep this parable in mind
- Git is simple and powerful
- One more thing:

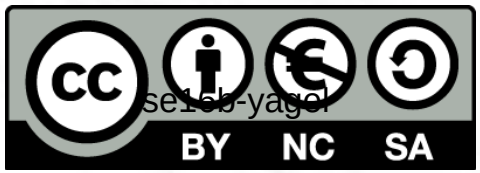
git reflog

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

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 (VS2013+ native)
  - Eclipse Egit
  - IntelliJ, Webstrom embedded
  - Brackets plugin

הדגמה \ שב 3- טיפים

- http://gitimmersion.com/

- 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

שיטות - Git Flow

- Pull request – מומלץ!
- למשל בפרויקטי קוד פתוח
- Git (hub) flow
- דוגמא: תהליך העבודה בפרויקט Nuget: Contributing a Bug Fix or Feature
- קישורים נוספים בויקי

בפעם הבאה

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

לסיכום

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