

# **„GIT STARTED“**

## **FÜR FORTGESCHRITTENE**

*Konzepte, Funktionsweise  
und Best Practices*

# Wer ist **Benjamin**?



B.SCHMID@EXXCELLENT.DE



@BENTOLOR



[HTTP://WWW.EXXCELLENT.DE](http://www.excellent.de)



Warum?



**git**

**VERTEILT**

**LEICHTGEWICHTIGE  
BRANCHES**

**LEISTUNGSFÄHIG**

**KRYPTOGRAPHISCH**  
**GESICHERT**





**Repository** Format

+

bash/C **Skripte**

Junio C Hamano



BIT

**ARCHITEKTUR**



Git

# ARCHITEKTUR

DATENHALTUNG

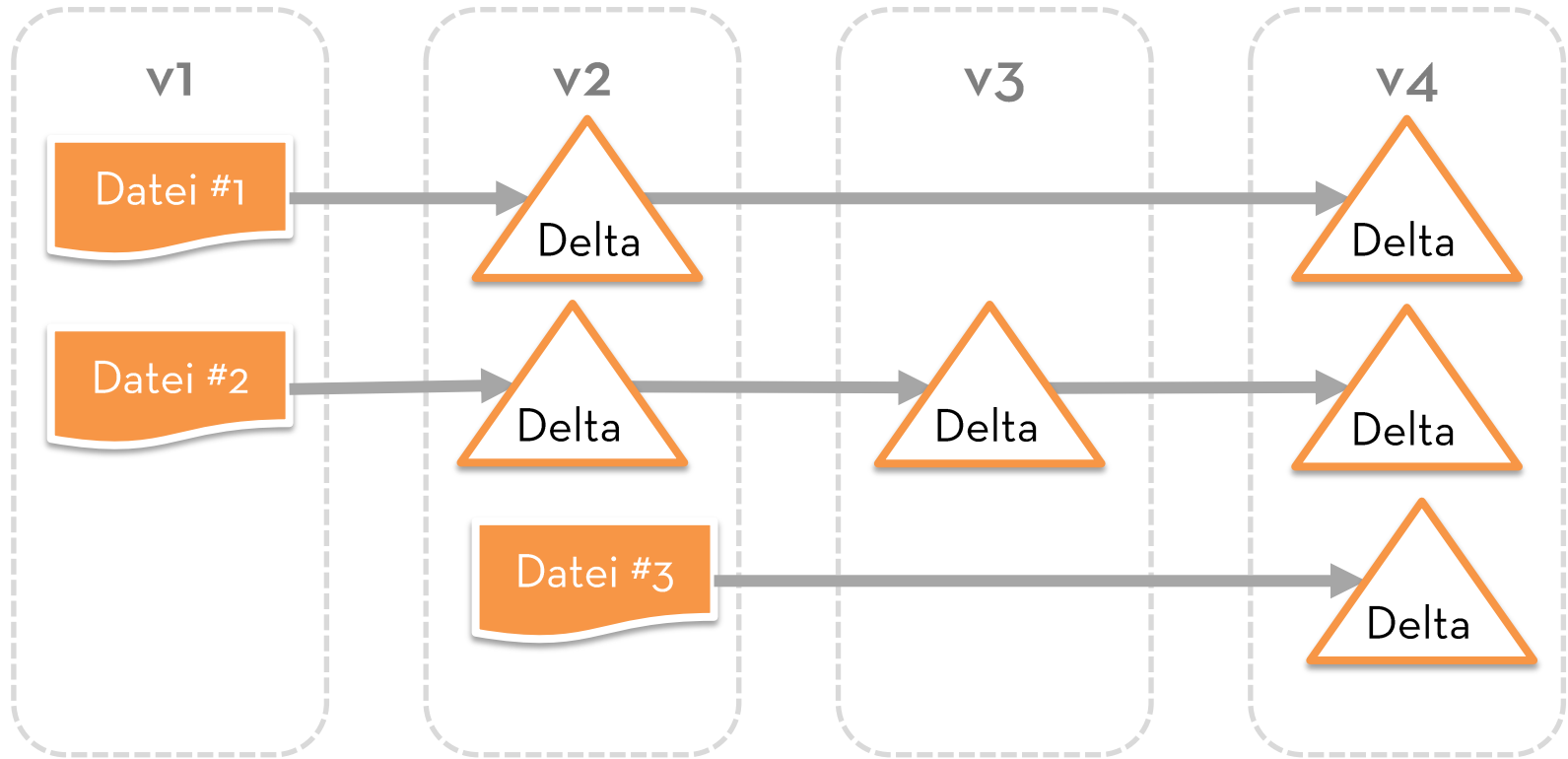
VERSIONS-HISTORIE

BRANCHES

MERGING

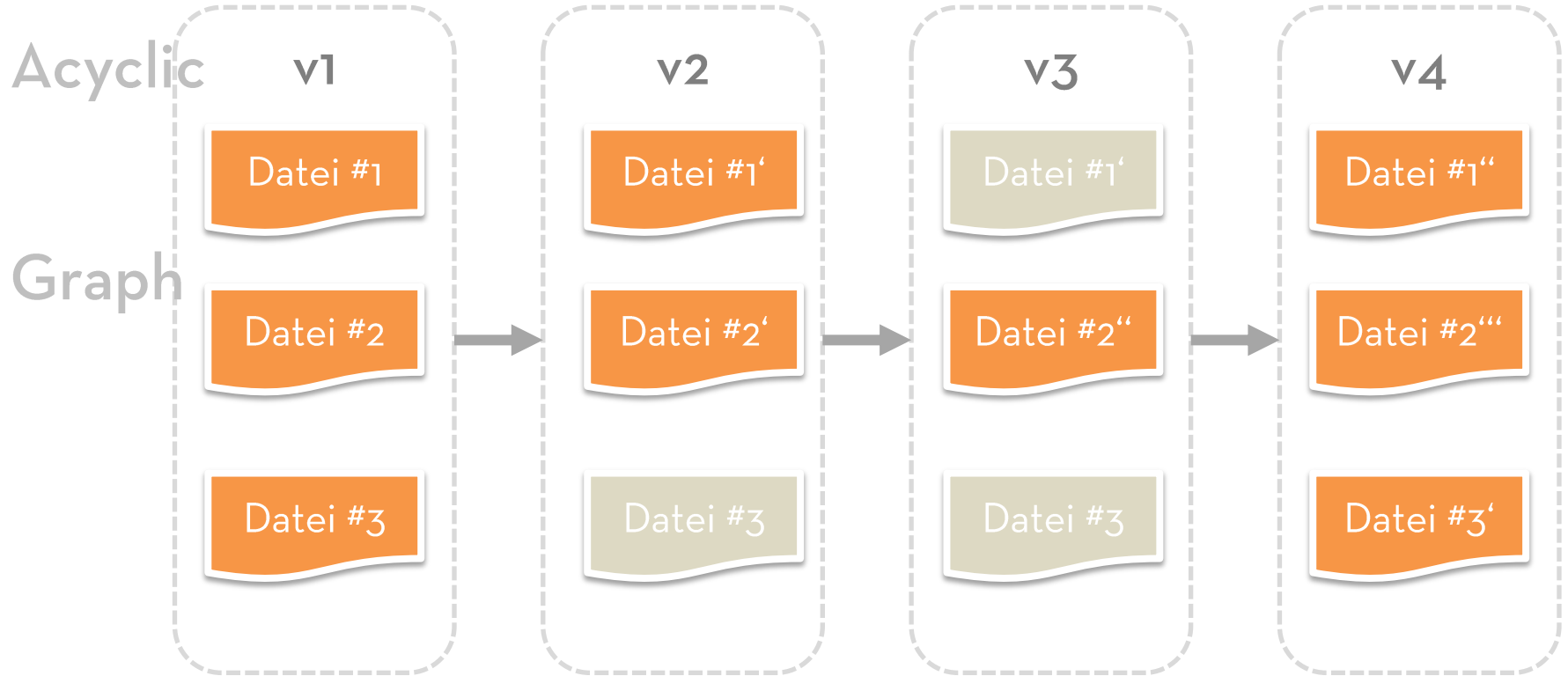


# Exkurs: Subversion & Co







Jeder Git **Commit** =  
*vollständige* 1:1 Kopie  
der *gesamten* Dateibaums

# DAG IN GIT



Quasi: `$ cp -r projekt repository/projekt.v2`

# GIT OBJECTS

-  **blob**      Dateiinhalt
-  **tree**      Verzeichnis
-  **commit**
-  **tag**      signierter Name

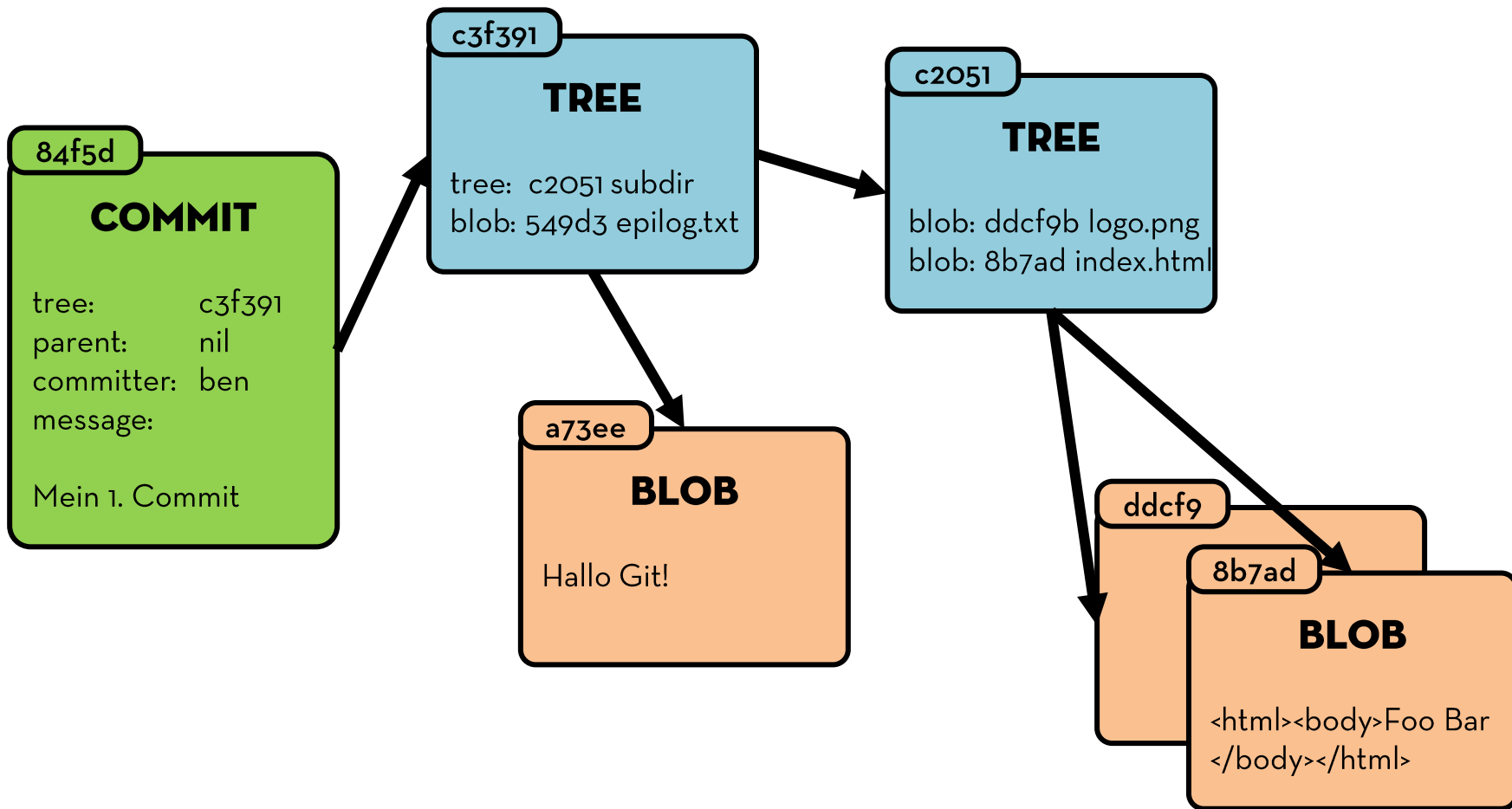




Objekte werden anhand  
**SHA1-Hash** ihres Inhalts  
**identifiziert &**  
**abgespeichert**

a94d7c21aa85415a9a721033807ea5bd4b95e98d

Kurzform: a94d7c

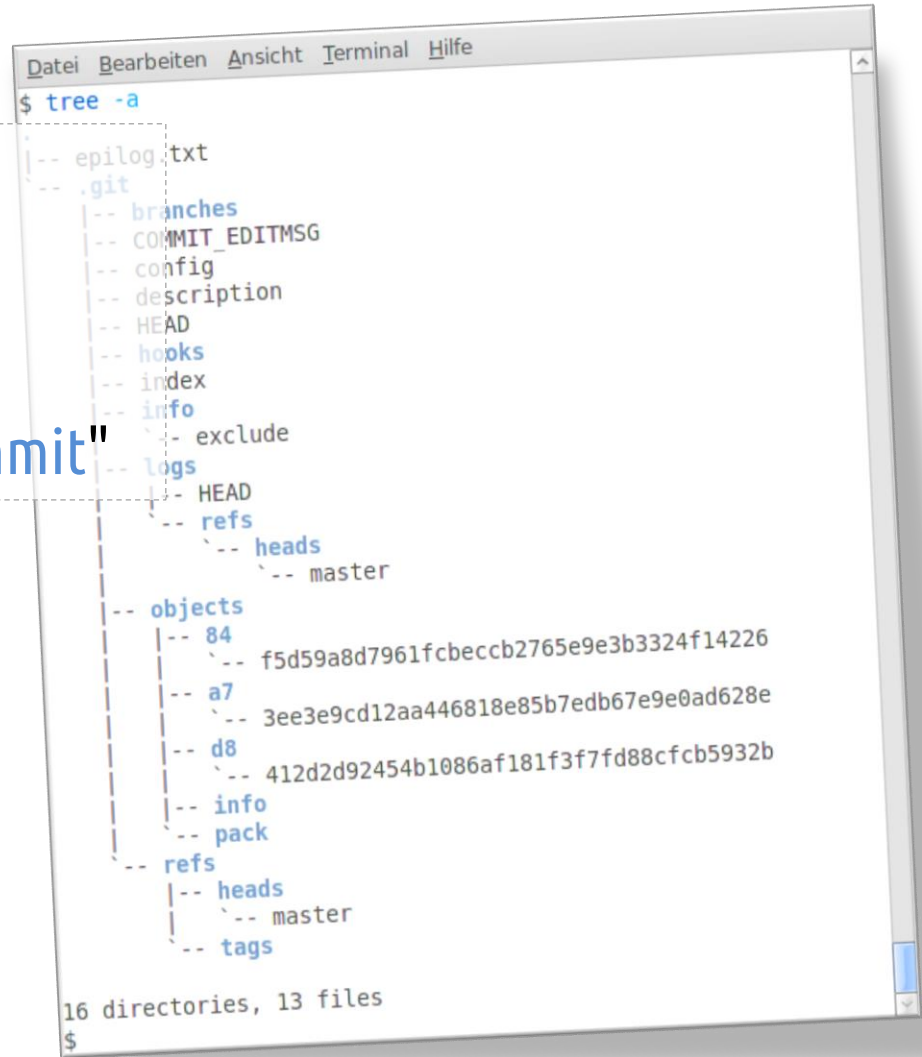


```
$ git init
```

```
$ echo "Hallo Git!" > epilog.txt
```

```
$ git add epilog.txt
```

```
$ git commit -m "Mein erster Commit"
```



```
Datei Bearbeiten Ansicht Terminal Hilfe
$ tree -a
|-- epilog.txt
|-- .git
|   |-- branches
|   |-- COMMIT_EDITMSG
|   |-- config
|   |-- description
|   |-- HEAD
|   |-- hooks
|   |-- index
|   |-- info
|   |-- exclude
|   |-- logs
|   |-- HEAD
|   |-- refs
|       |-- heads
|       |-- master
|   |-- objects
|       |-- 84
|       |-- f5d59a8d7961fcbeccb2765e9e3b3324f14226
|       |-- a7
|       |-- 3ee3e9cd12aa446818e85b7edb67e9e0ad628e
|       |-- d8
|       |-- 412d2d92454b1086af181f3f7fd88cfcb5932b
|       |-- info
|       |-- pack
|   |-- refs
|       |-- heads
|       |-- master
|       |-- tags
16 directories, 13 files
$
```

```
$ printf "blob 11\000Hallo Git!\n" | shasum
```

```
a73ee3e9cd12aa446818e85b7edb67e9e0ad628e -
```

```

Datei Bearbeiten Ansicht Terminal Hilfe
$ tree -a
.
|-- .git
|   |-- config
|   |-- description
|   |-- hooks
|   |-- index
|   |-- info
|   |-- logs
|   |-- refs
|   |-- HEAD
|   |-- HEAD
|   |-- heads
|   |-- master
|   |-- objects
|   |-- 84
|   |-- f5d59a8d7961fcbeccb2765e9e3b3324f14226
|   |-- a7
|   |-- 3ee3e9cd12aa446818e85b7edb67e9e0ad628e
|   |-- d8
|   |-- 412d2d92454b1086af181f3f7fd88cfcb5932b
|   |-- info
|   |-- pack
|   |-- refs
|   |-- heads
|   |-- master
|   |-- tags
|-- .gitignore
|-- .gitlog.txt
|-- branches
|-- COMMIT_EDITMSG
|-- COMMIT_EDITMSG.locked
|-- description
|-- description.locked
|-- HEAD
|-- HEAD.locked
|-- hooks
|-- index
|-- info
|-- info.locked
|-- logs
|-- refs
|-- HEAD
|-- HEAD.locked
|-- heads
|-- master
|-- objects
|-- 84
|-- f5d59a8d7961fcbeccb2765e9e3b3324f14226
|-- a7
|-- 3ee3e9cd12aa446818e85b7edb67e9e0ad628e
|-- d8
|-- 412d2d92454b1086af181f3f7fd88cfcb5932b
|-- info
|-- pack
|-- refs
|-- heads
|-- master
|-- tags
16 directories, 13 files
$
```

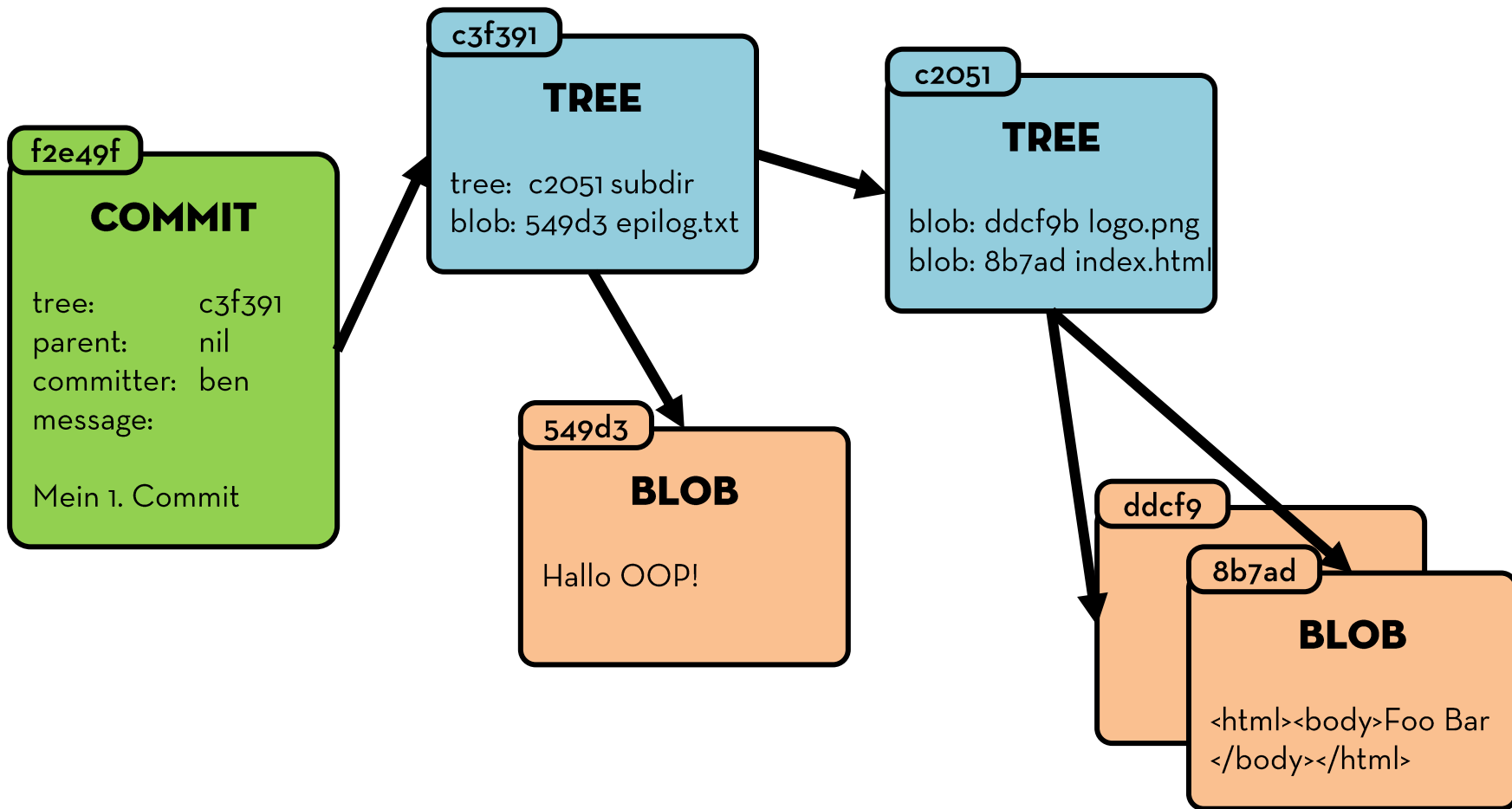
```
$ cat .git/objects/84/f5d59a8d7961fcbeccb2765e9e3b3324f14226 |  
zlib-flate -uncompress; echo
```

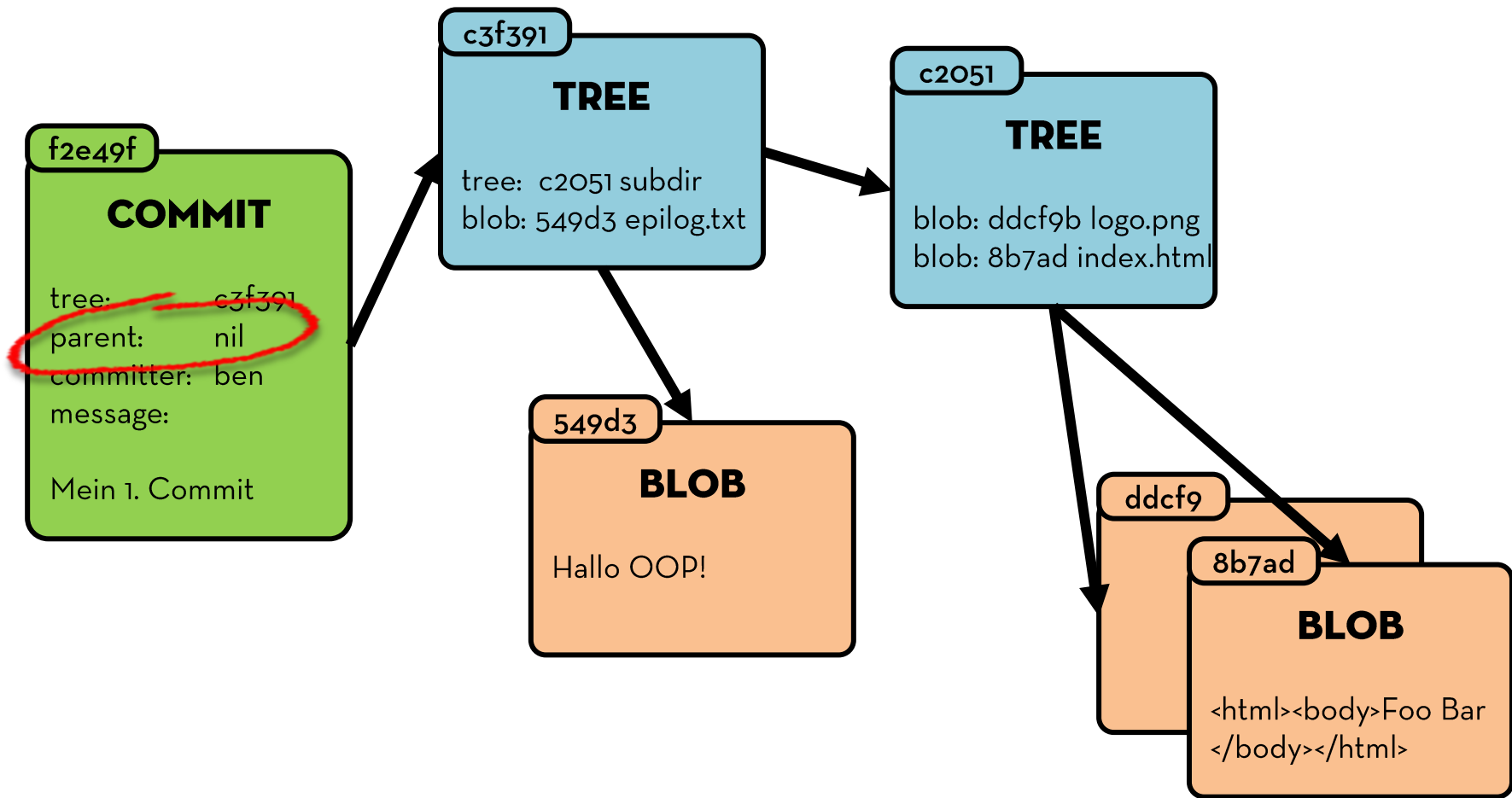
```
commit 181tree d8412d2d92454b1086af181f3f7fd88cfcb5932b  
author Benjamin Schmid <foo@bar.com> 1389744782 +0100  
committer Benjamin Schmid <foo@bar.com> 1389744782 +0100
```

Mein erster Commit

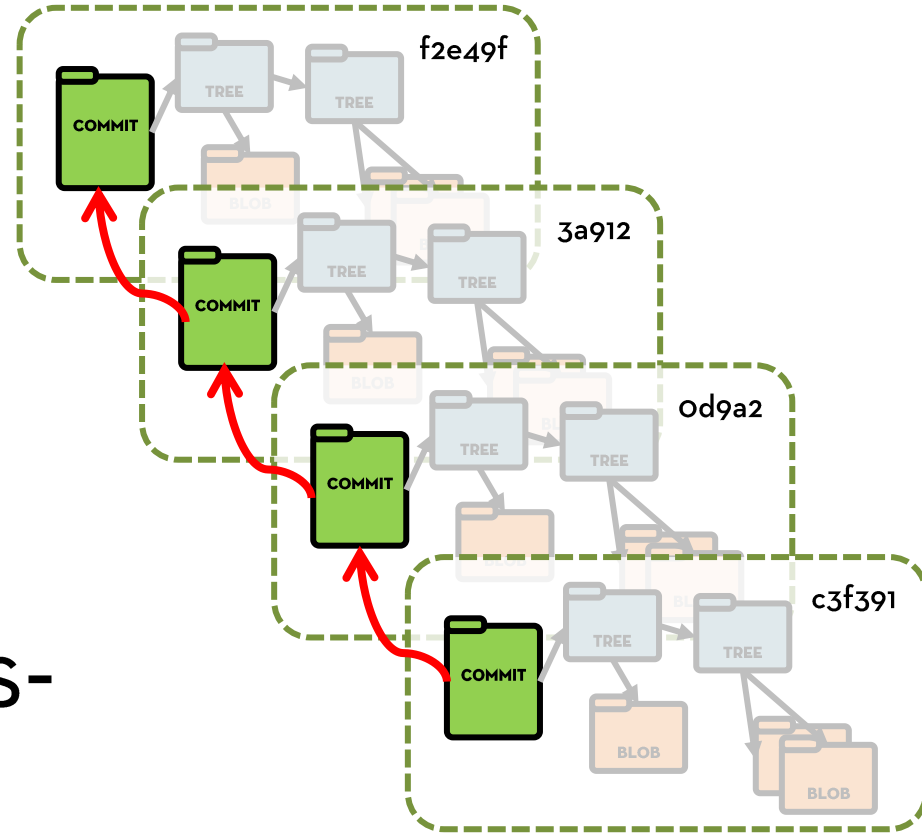


```
$ tree -a  
|-- epilog.txt  
|-- COMMIT_EDITMSG  
|-- config  
|-- description  
|-- HEAD  
|-- index  
|-- info  
|-- exclude  
|-- logs  
|-- HEAD  
|-- refs  
|-- heads  
|-- master  
-- objects  
  |-- 84  
  |-- f5d59a8d7961fcbeccb2765e9e3b3324f14226  
  |-- a7  
  |-- 3ee3e9cd12aa446818e85b7edb67e9e0ad628e  
  |-- d8  
  |-- 412d2d92454b1086af181f3f7fd88cfcb5932b  
  |-- info  
  |-- pack  
-- refs  
  |-- heads  
  |-- master  
  |-- tags  
  
16 directories, 13 files  
$
```





# Versions- Historie





84f5d59a8d7961fcbecb  
2765e9e3b3324f14226



Branches

```
$ cat .git/refs/heads/master
```

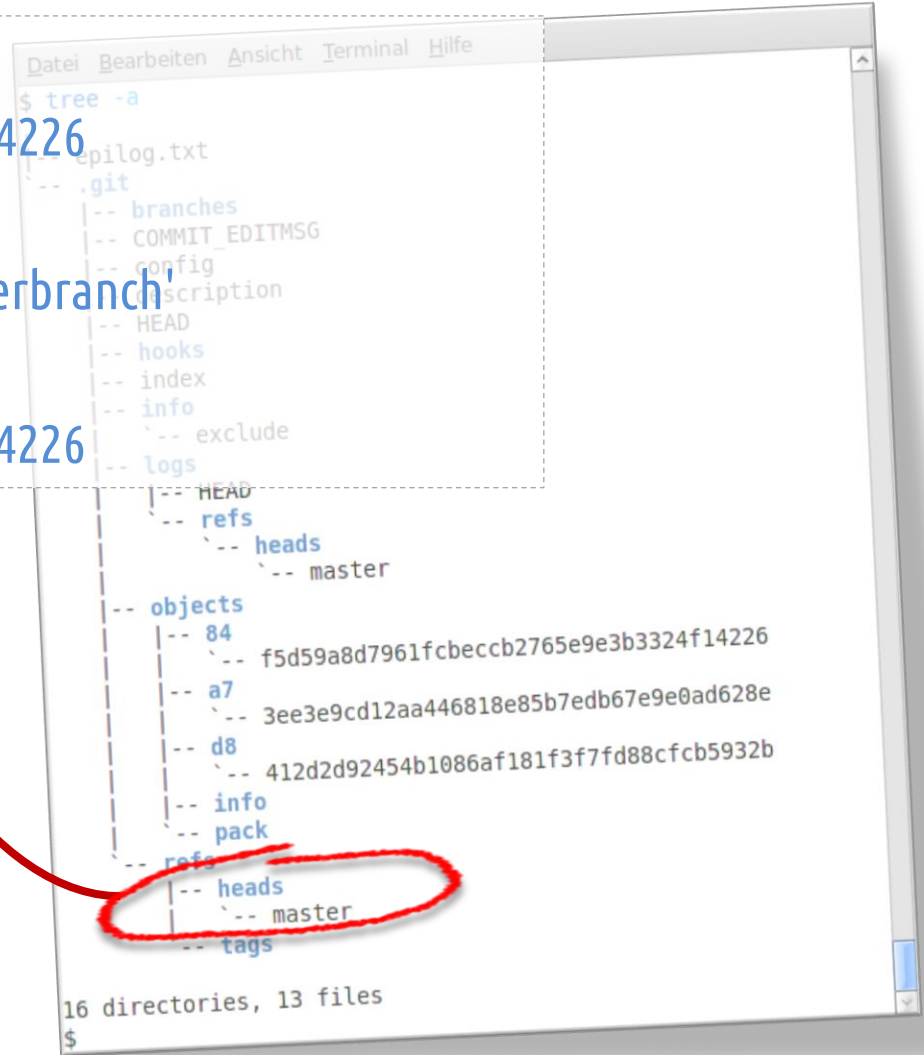
```
84f5d59a8d7961fcbeccb2765e9e3b3324f14226
```

```
$ git checkout -b neuerbranch
```

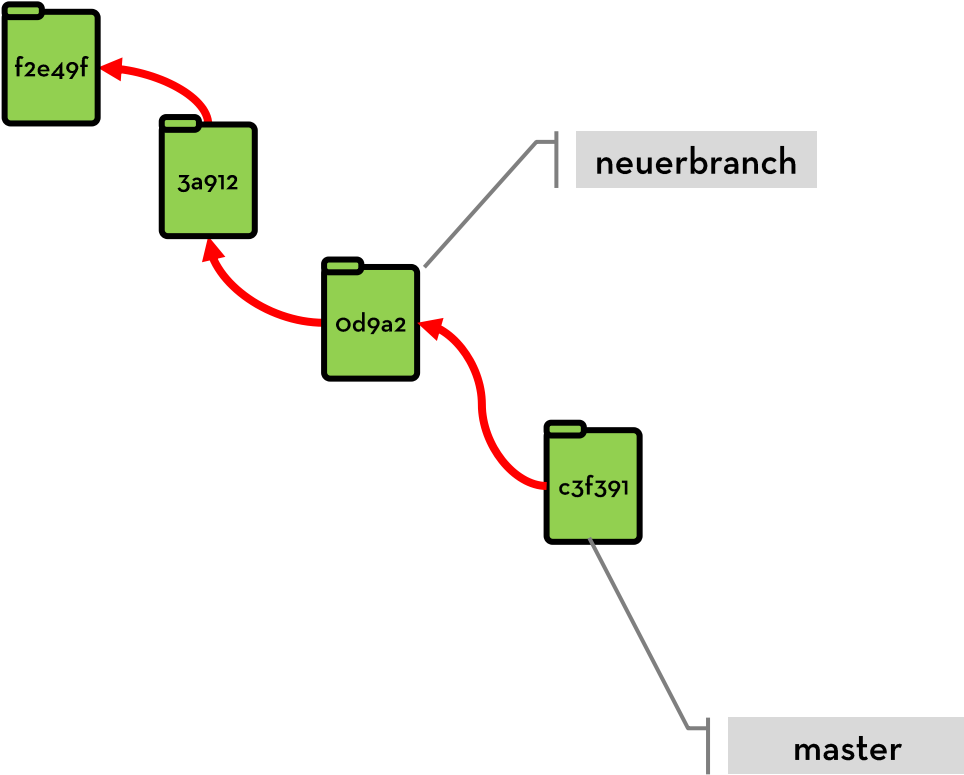
Gewechselt zu einem neuem Branch 'neuerbranch'

```
$ cat .git/refs/heads/neuerbranch
```

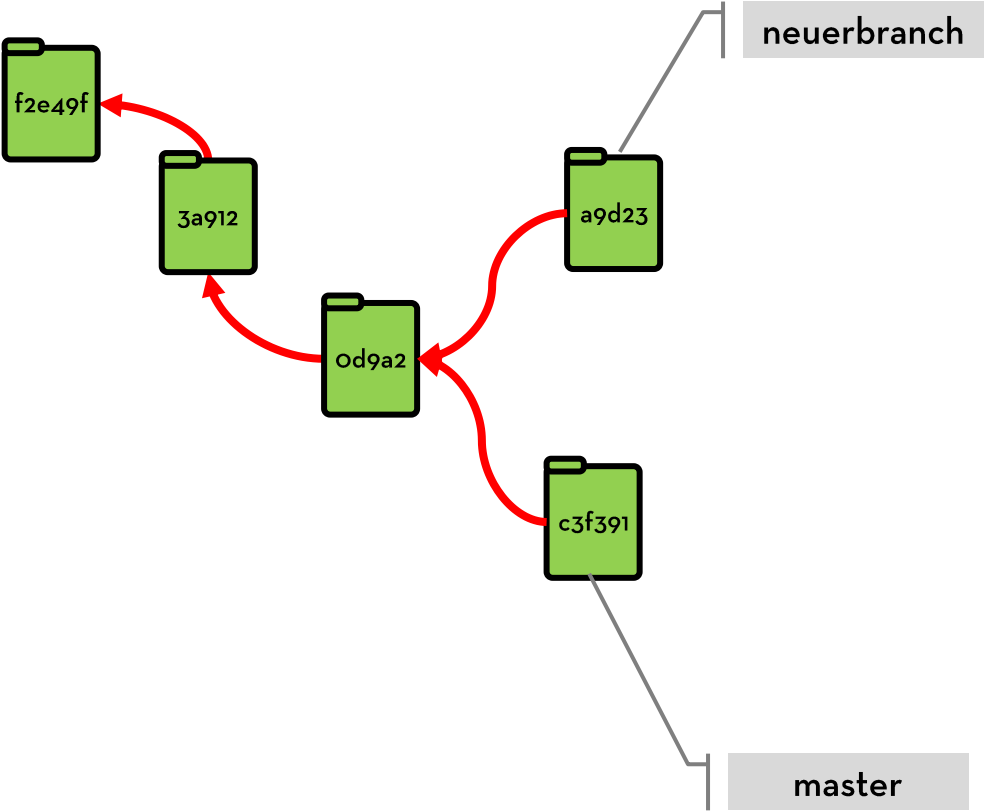
```
84f5d59a8d7961fcbeccb2765e9e3b3324f14226
```



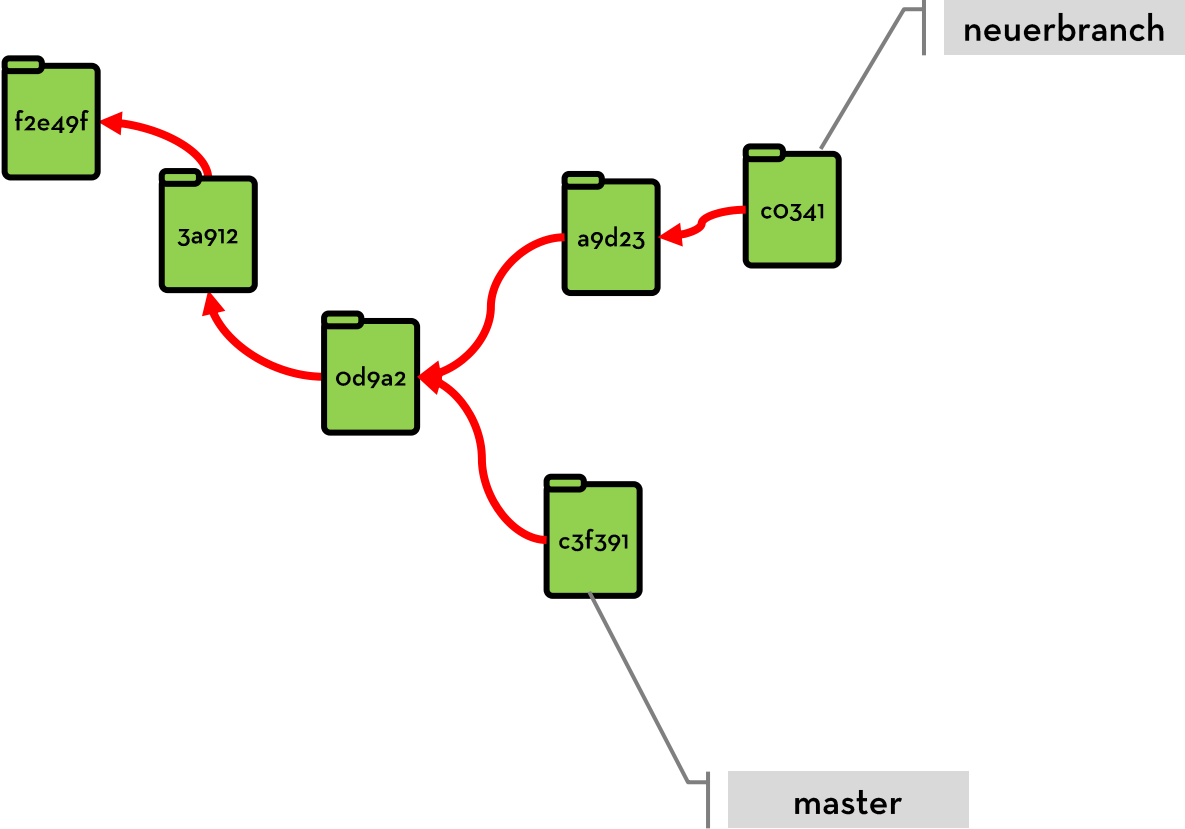
# Branches & Commits



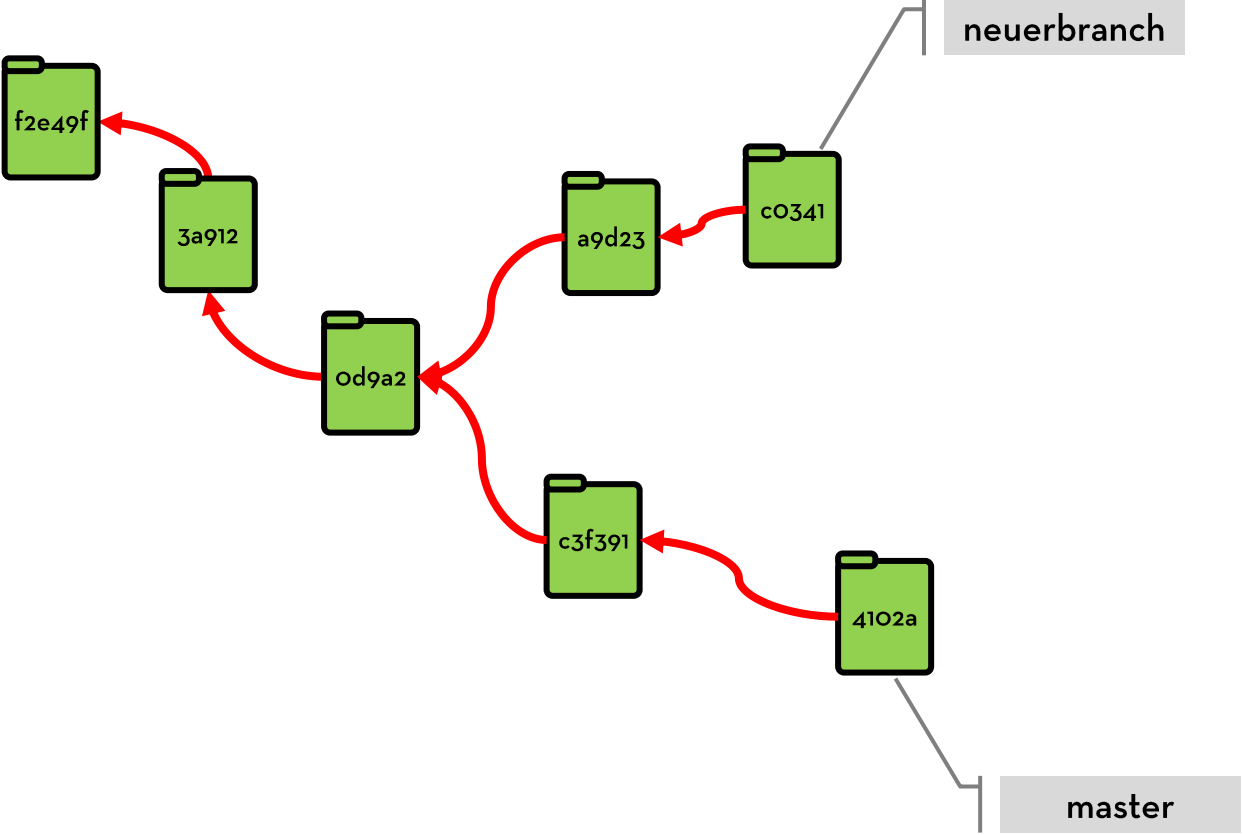
# Branches & Commits



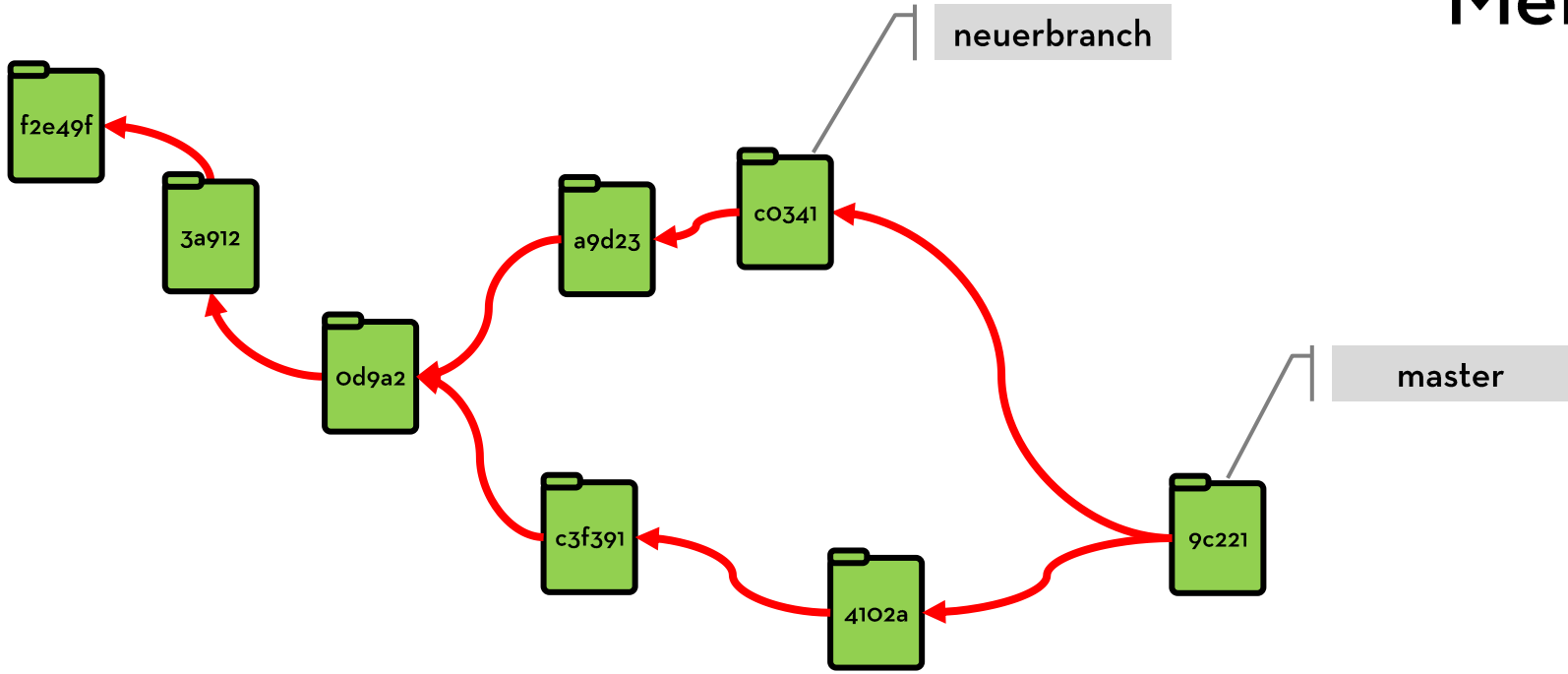
# Branches & Commits



# Branches & Commits

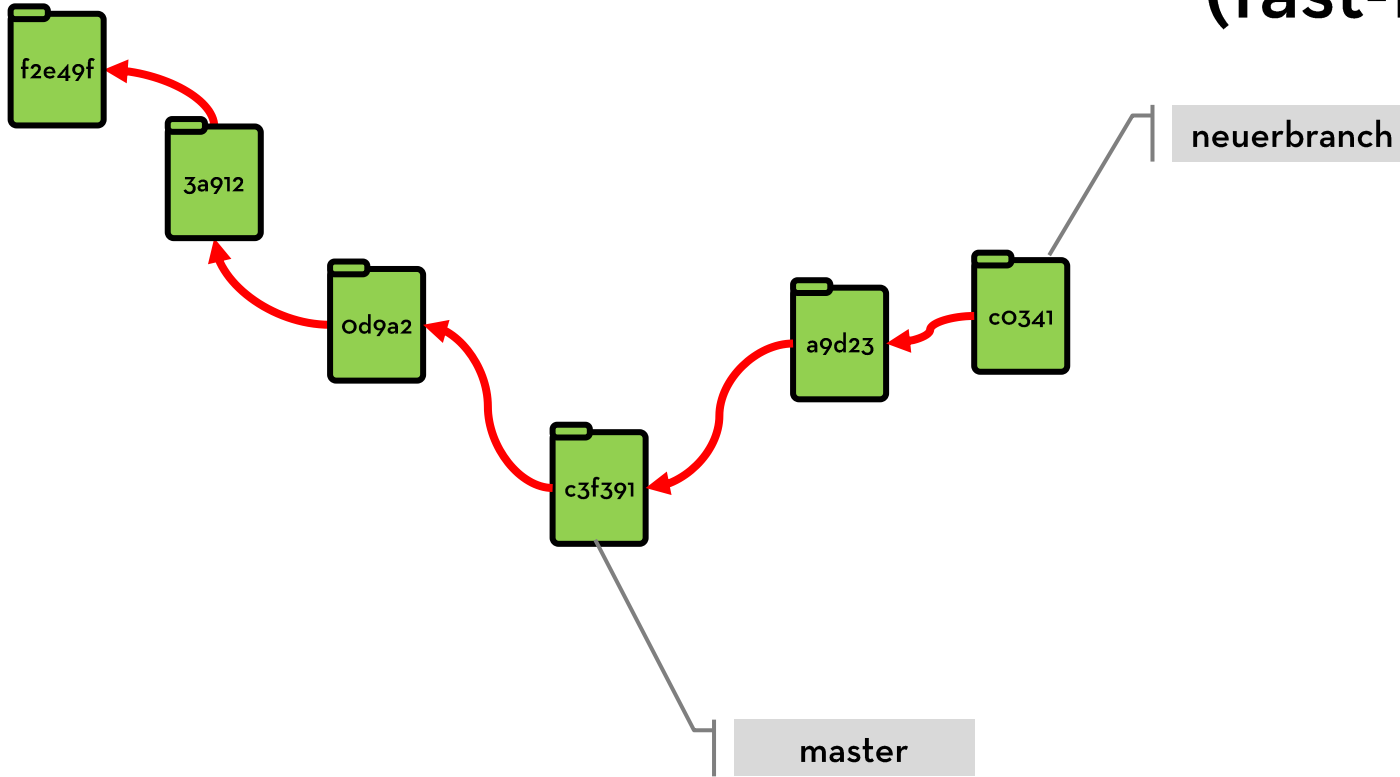


# Merge



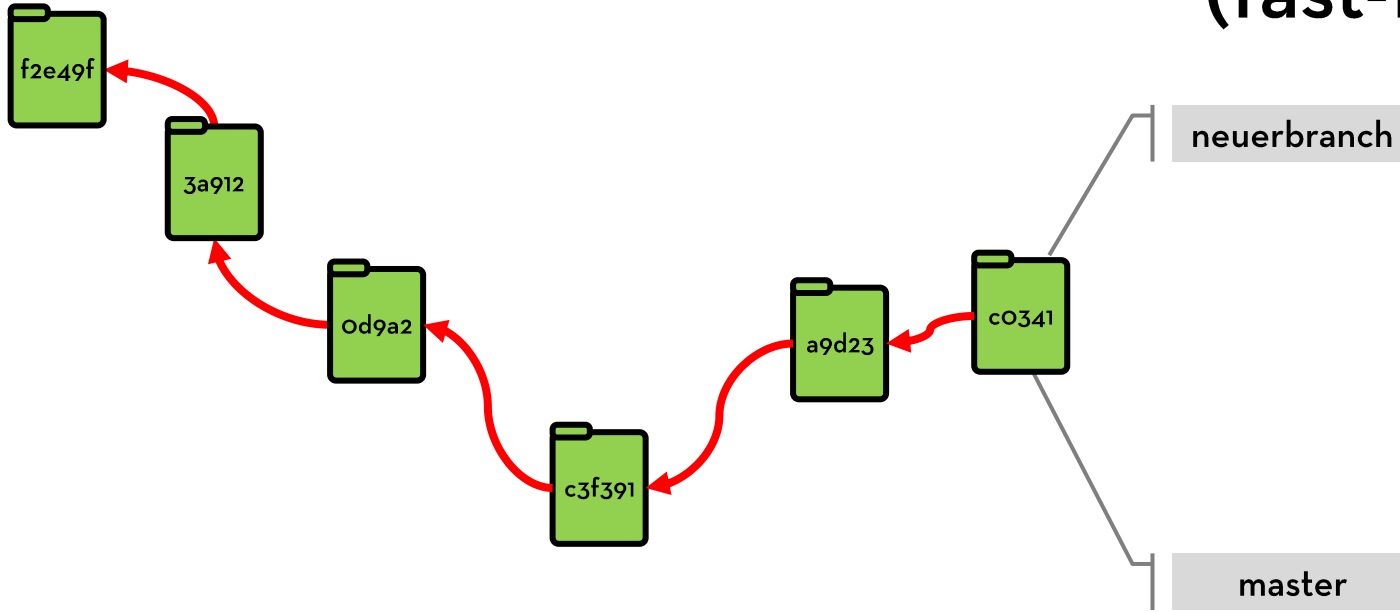
*2 Parents!*

# Merge (fast-forward)





# Merge (fast-forward)



# Commitish in a nutshell

Eine Git-Version (Hash) umfasst stets

- ◆ alle Inhalte
- ◆ alle Datei(-ordner)
- ◆ alle Commit-Nachrichten

des Commits und aller Vorgänger

*Nagelprobe:  
git fsck*

**WORKSPACE**



*add*

**STAGING AREA**

(auch: „Index“ oder „Cache“)



*commit*

**COMMIT**

**git**

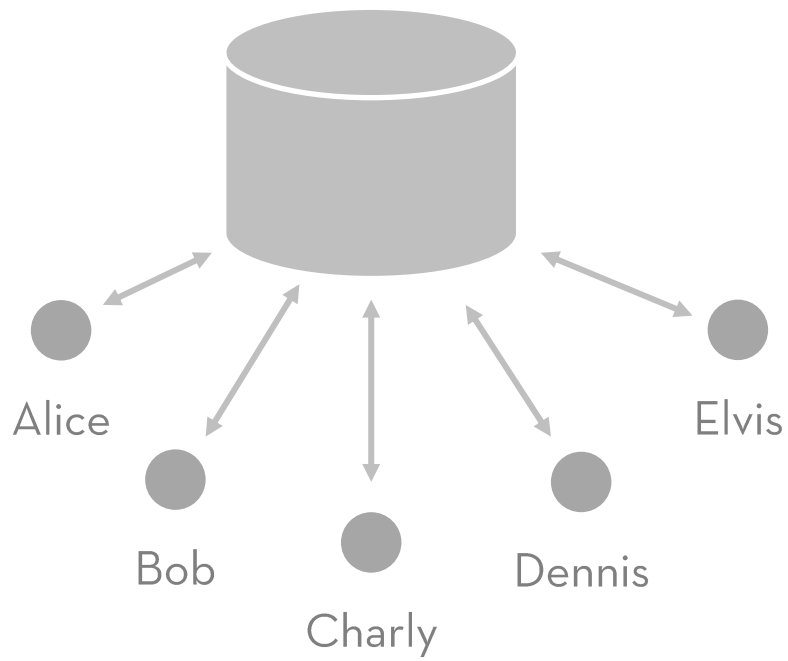
**GIT IM TEAM**

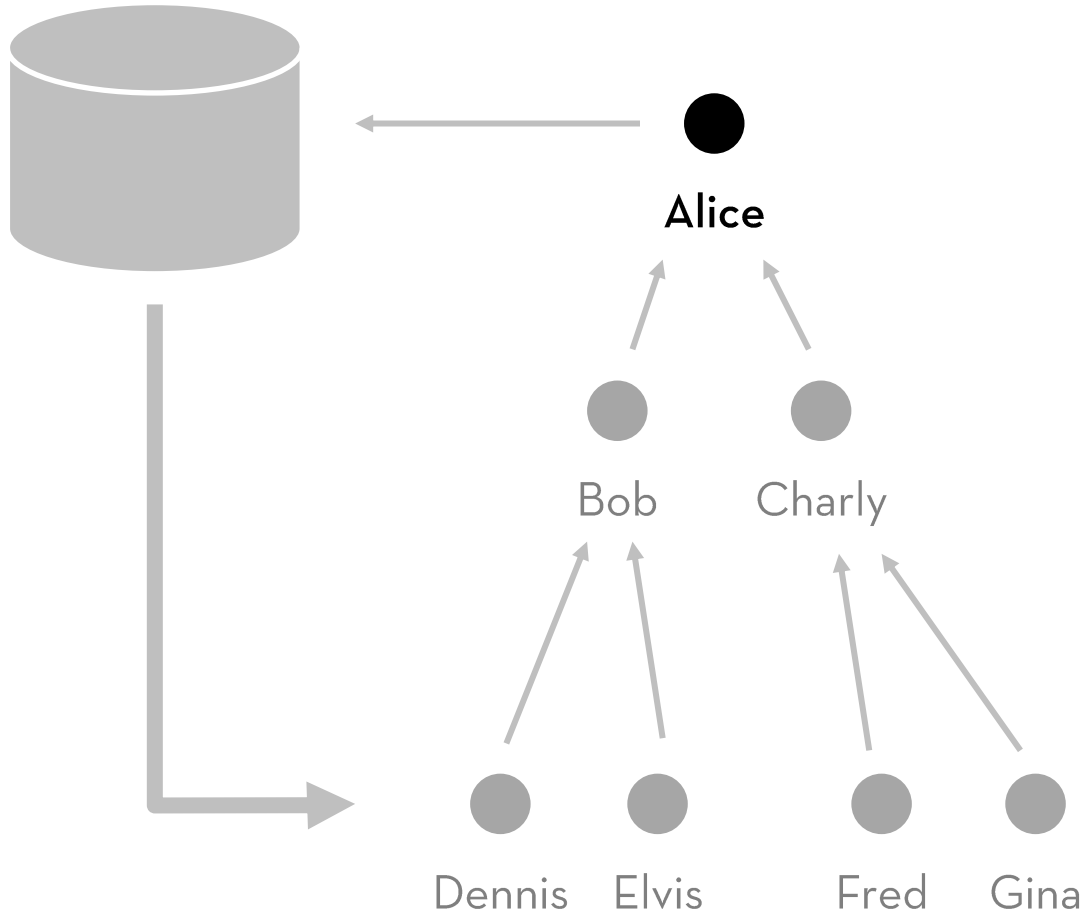


# DATEN-AUSTAUSCH

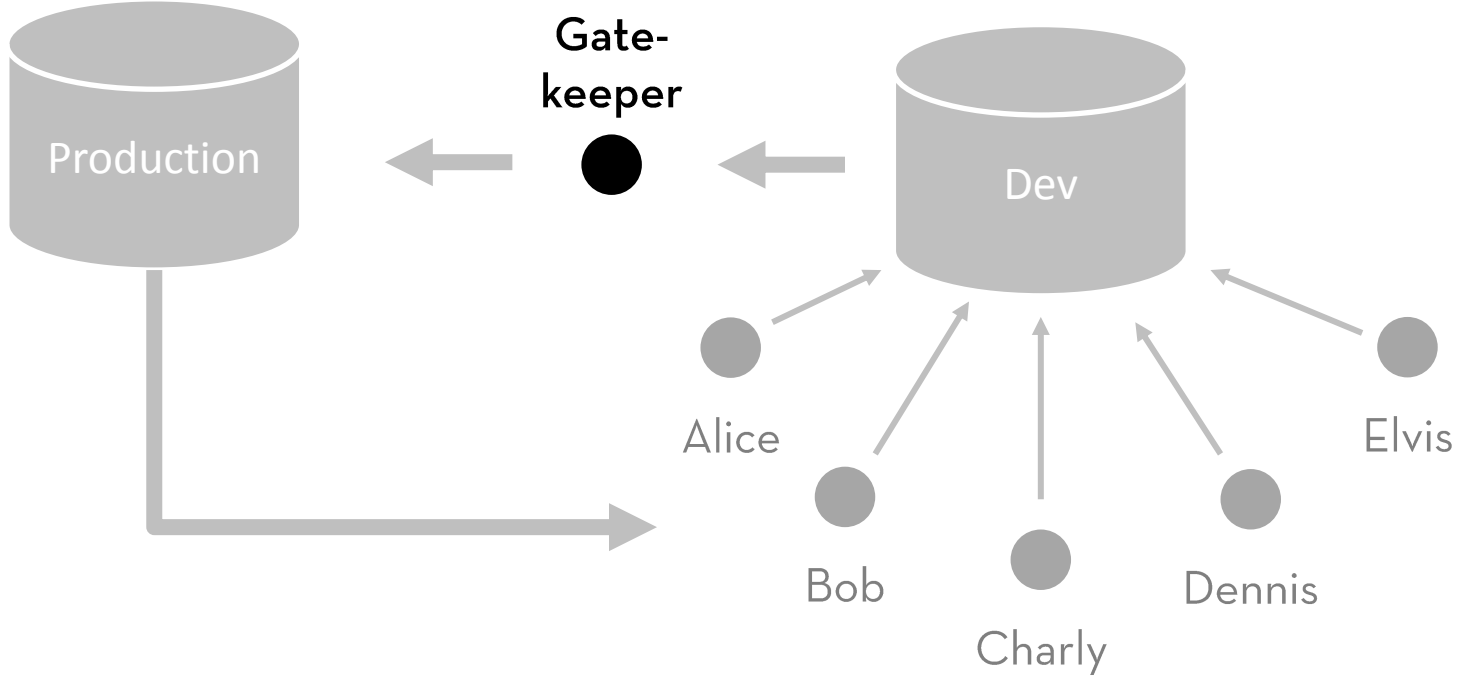


**N:M**









# INDIVIDUELLE PROZESSE

## Branch

- ◆ Feature-basiert
- ◆ Trunk-basiert
- ◆ Basisprodukt +  
Varianten
- ◆ ...

## Repository

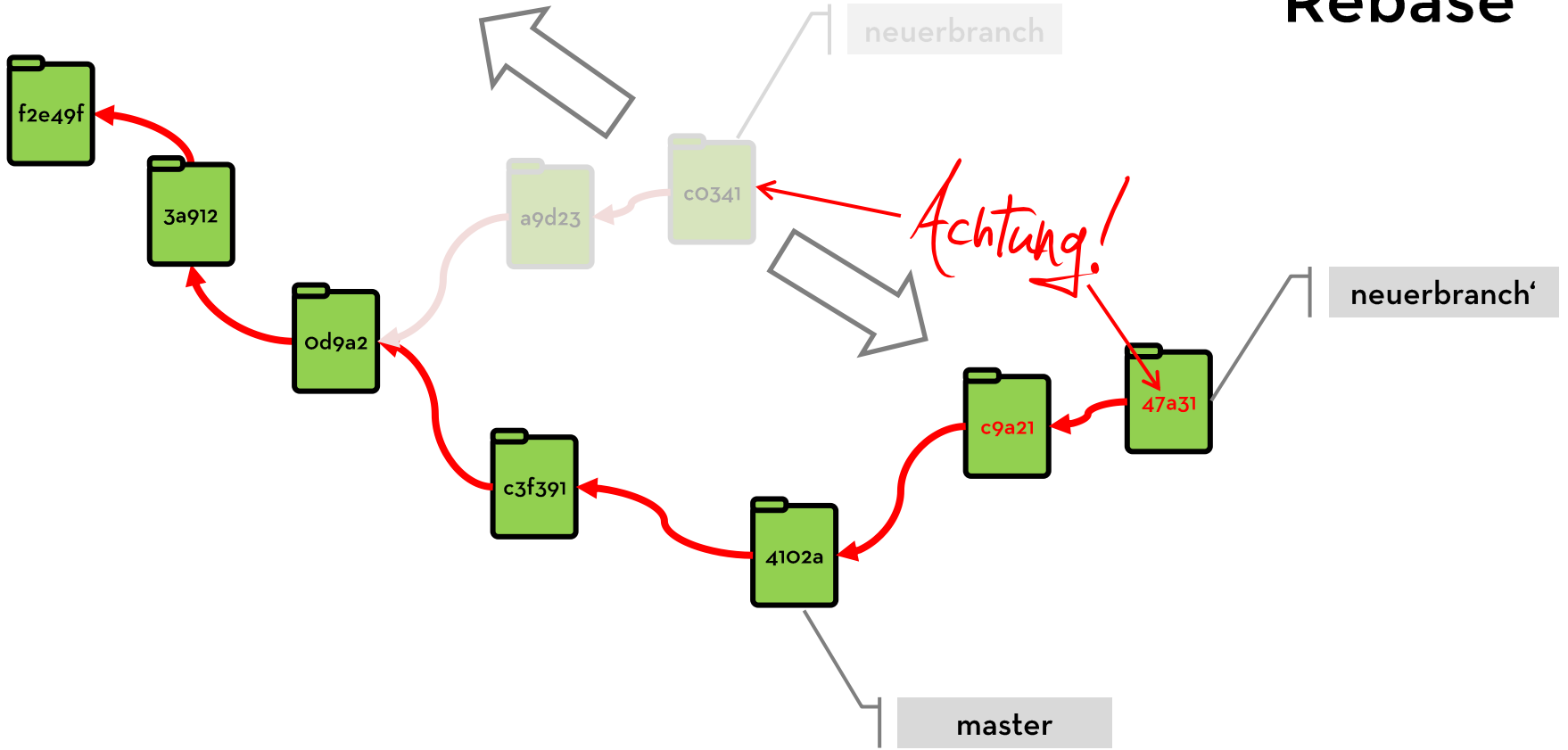
- ◆ Zentral
- ◆ Hierarchisch
- ◆ Gatekeeper
- ◆ ...

OSIT

# ADVANCED FEATURES



# Rebase



# interactive rebase

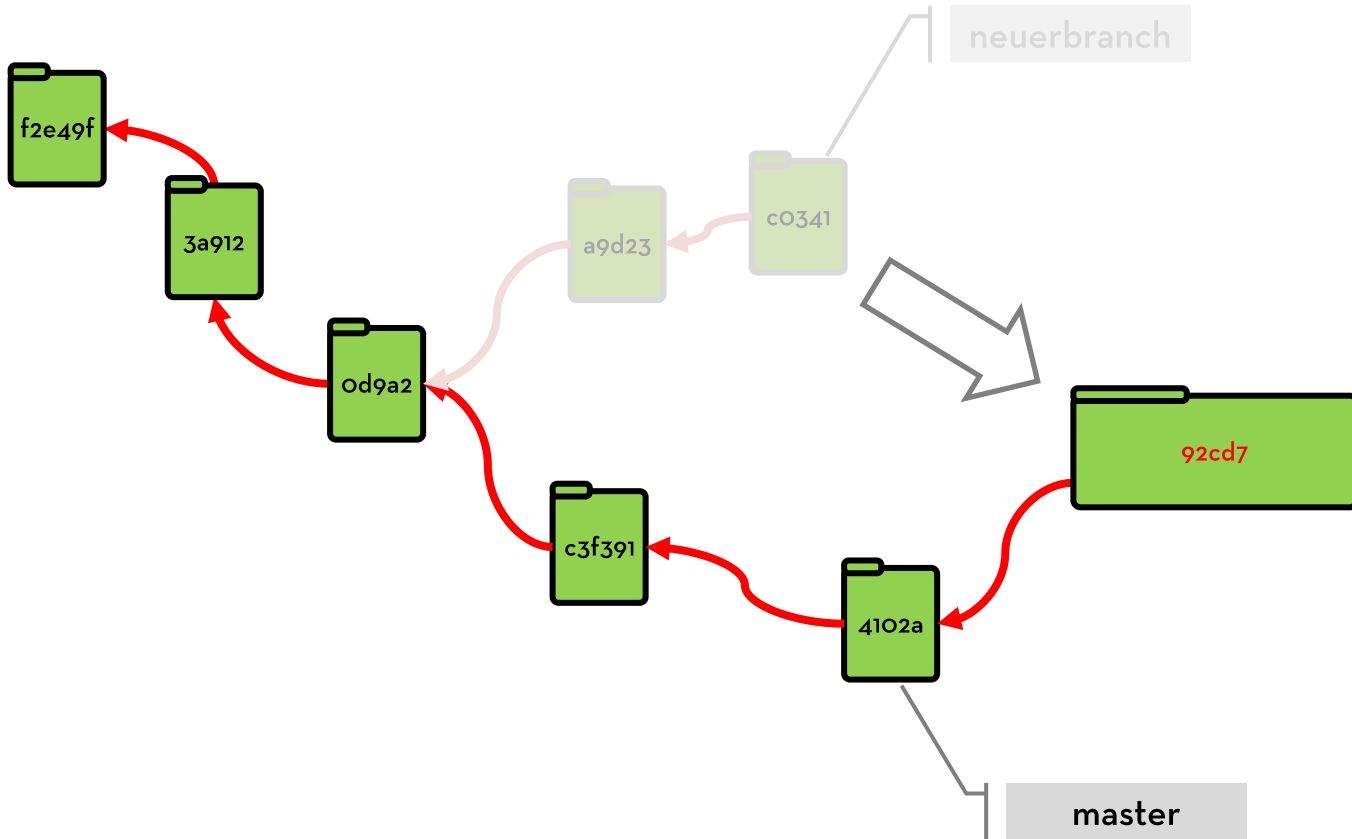
Commits

... zusammenfassen

... weglassen

... ändern

# Interactive Rebase



Commits  
zusammenfassen  
weglassen  
ändern

**bisect**

Welcher Commit ist  
Auslöser des Bugs?

# git-svn | Arbeiten gegen Subversion-Repo

<http://subgit.com/> Kommerzielle, serverbasierte Alternative  
mit weniger Einschränkungen ( git/svn Mirroring )



Best

# BEST PRACTICES



**commit often**  
**commit early**

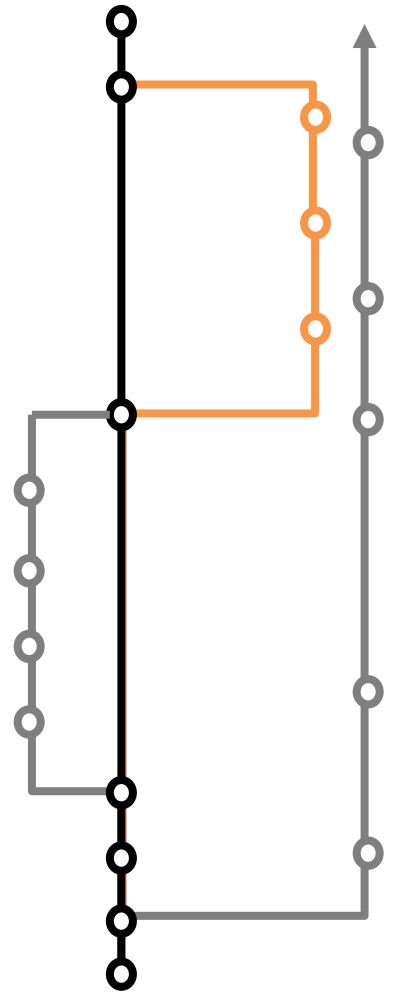
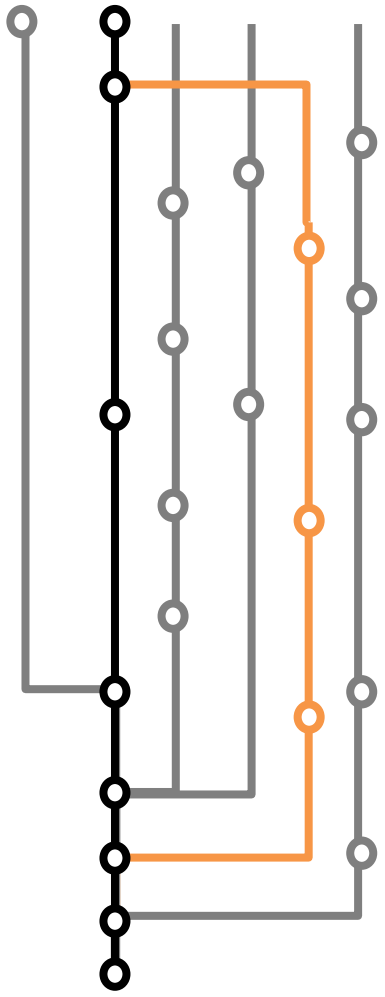
Kleine Änderungen  
Isolierte Änderungen  
Intensives Branching  
Cleanup am Ende

# Klares Branching-Modell

Angemessen  
Verständlich  
Dokumentiert

# Lineare Historie anstreben

Kurzlaufende Branches  
Rebasing



Historie  
**intakt** halten

Keine Änderungen an  
veröffentlichten  
Commits  
(z.B. Rebase)

**Ordnung** halten

Cherry-Picks  
dokumentieren  
Branch-Inhalte  
Branch-Naming  
Commit-Kommentare

BIT

**FALLSTRICKE**





**Windows**

Vieles besser geworden  
dank ~~msysgit~~, GitHub & Co.

# Windows

Umlaute

Line-Endings

Performance

File Execution Bits

2.te Klasse

```
git push --force
```

Falscher Workflow

BIT

**CLIENTS**



# CLI (Shell)

```
fish /home/ben/projects/echo3.git
Datei Bearbeiten Ansicht Suchen Terminal Hilfe
→ echo3.git git:(master) X git status
Auf Branch master
Ihr Branch ist auf dem selben Stand wie 'official/master'.

Änderungen, die nicht zum Commit vorgemerkt sind:
(benutzen Sie "git add <Datei>..." um die Änderungen zum Commit vorzumerken)
(benutzen Sie "git checkout -- <Datei>..." um die Änderungen im Arbeitsverzeichnis zu verwerfen)

    geändert:   .idea/runConfigurations/HelloWorld__JavaScript_version_.xml
    geändert:   .idea/runConfigurations/Interactive_Testapp__JavaScript_version_.xml
    geändert:   .idea/runConfigurations/NumberGuess__JavaScript_version_.xml
    geändert:   .idea/runConfigurations/TestApp__Java_.xml

Unbeobachtete Dateien:
(benutzen Sie "git add <Datei>..." um die Änderungen zum Commit vorzumerken)

    atlassian-ide-plugin.xml
    projectFilesBackup/

keine Änderungen zum Commit vorgemerkt (benutzen Sie "git add" und/oder "git commit -a")
→ echo3.git git:(master) X git log @~4... --oneline
5b1756a Merge tag 'v3.0.2' for easier merging.
5af0e5a Merge pull request #78 from ceari/feature/visual-hint-for-modal-windows
a97efc9 WindowPane: Fix NPE in modal overlay handling when component is unregistered
d9bf957 Merge branch 'hotfix/invalid-colors' of github.com:ceari/echo3
4d1e873 Fix color handling in Sync.Color.renderClear()
bc76577 Merge branch 'feature/invalid-response-handling' of github.com:ceari/echo3
f31c2b9 Merge branch 'feature/invalid-response-handling' of github.com:ceari/echo3 into stable-3.0.x
2193a58 Configurable handling of invalid Ajax responses
7a22a33 Merge branch 'feature/outdated-browser-noscript-hints' of github.com:ceari/echo3 into stable-3.0.x
28d1606 Release Echo v3.0.2
→ echo3.git git:(master) X
```

# GitHub for Windows/Mac

The screenshot shows the GitHub desktop application interface. At the top, the repository path is `octokit/octokit.net`. The current branch is `master`. The main content area displays a merge pull request #253 from `pmacn/feature/documentation` by `Brendan Forster` (commit `60def6e`). The pull request title is `Documentation`. Below the title, the file `Octokit\Clients\ActivitiesClient.cs` is selected, showing a diff view. The diff highlights the following code changes:

```
old new
... ...
@@ -2,6 +2,10 @@
2 2 {
3 3     public class ActivitiesClient : ApiClient, IActivitiesClient
4 4     {
5 +     /// <summary>
6 +     /// Instantiate a new GitHub Activities API client.
7 +     /// </summary>
8 +     /// <param name="apiConnection">An API connection</param>
5 9     public ActivitiesClient(IApiConnection apiConnection)
6 10         : base(apiConnection)
7 11     {
```

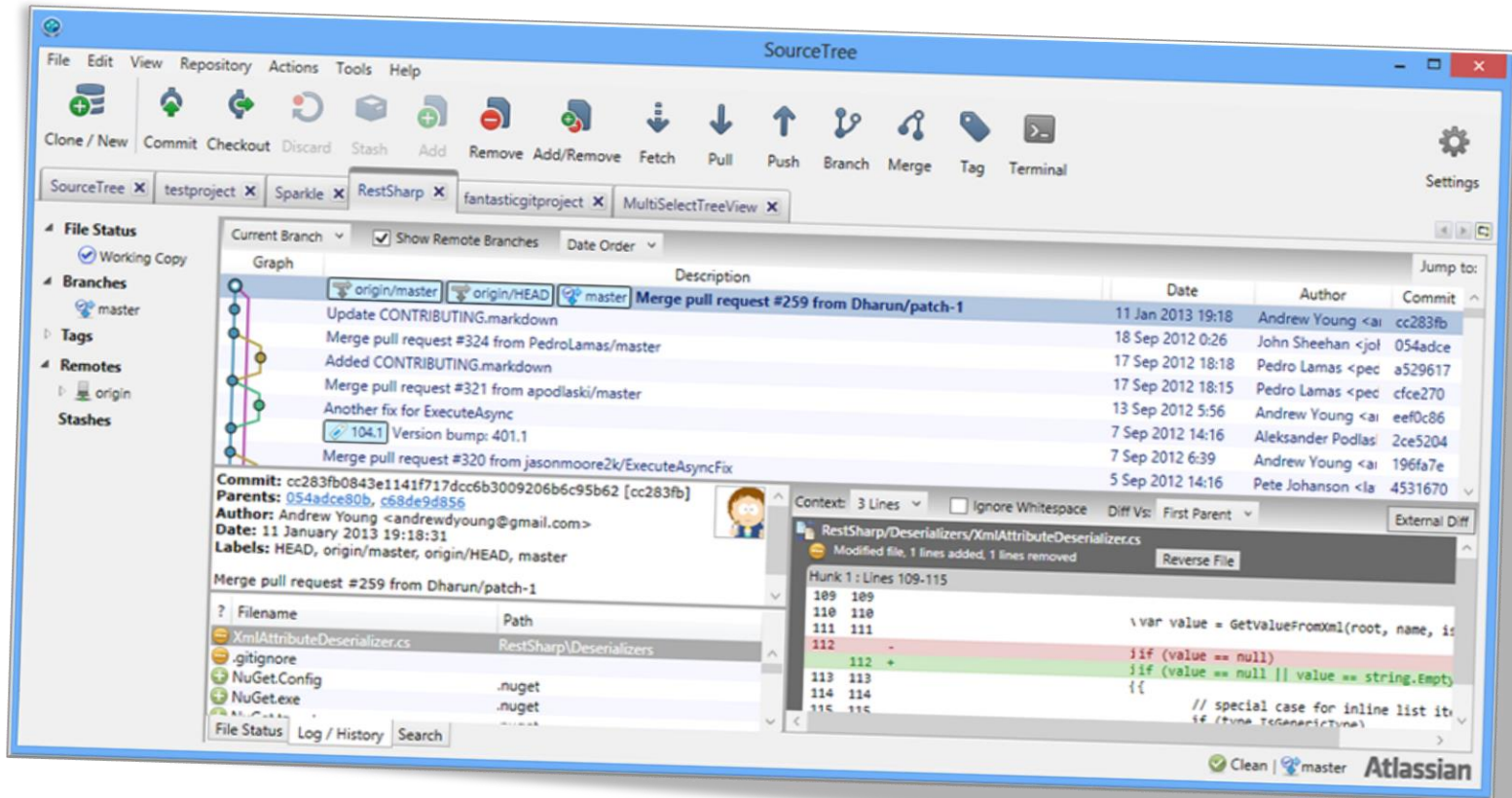
Below the diff view, a list of other client files is shown with expandable arrows:

- ▶ `Octokit\Clients\AssigneesClient.cs`
- ▶ `Octokit\Clients\BlobsClient.cs`
- ▶ `Octokit\Clients\CommitsClient.cs`
- ▶ `Octokit\Clients\EventsClient.cs`

On the left side, the `history` panel shows a list of recent commits and pull requests:

- Phil Haack, 13 hours ago: Merge pull request #260 from octokit/...
- Haacked, 13 hours ago: Add comments to concrete types
- Phil Haack, 13 hours ago: Merge pull request #257 from pmacn/...
- Peter MacNaughton, 3 days ago: Updating CustomBuildTask.dll. Change...
- Peter MacNaughton, 3 days ago: Modified Octokit project to run custo...
- Brendan Forster, 1 day ago: Merge pull request #253 from pmacn/...**
- Brendan Forster, 3 days ago: Merge pull request #256 from andrero...
- Andre Rodrigues, 3 days ago: Add null checks in constructor
- Andre Rodrigues, 3 days ago: Remove null check
- Andre Rodrigues, 3 days ago: Update regex expression

# Source Tree (Win/Mac)





# Weitere gute Clients

◆ IDE: IntelliJ

Nahtlos

◆ TortoiseGit

Explorer-Integration

◆ Tower (Mac, 49€)

Sehr leistungsfähig

BIT

# TOOLS & ÖKOSYSTEM



# GitHub Clones

„Pull Requests“  
Issue Tracking  
Code Browser & Review  
Wiki  
Security & Permissions

<https://github.com/takezoe/gitbucket>

<http://gitblit.com/>

<http://gitlabhq.com/>

Scala-basierter Clone

Java-basiert

Populär. Etwas komplexer Betrieb

# Code Review Tools

<http://code.google.com/p/gerrit/>  
<http://phabricator.org/>

Git-basiertes Code-Review System  
Code Review & Repo-Browser

# Continuous Integration Continuous Delivery

CI als Gatekeeper  
Tests vor Code-  
Integration

<https://travis-ci.org/>  
<http://jenkins-ci.org/>

Hosted CI. Frei für FOSS-Projekte  
Populärer, FOSS CI Server



file | 15 lines (12 sloc) | 0.614 kb

Edit

Raw

Blame

History

Delete

```
1 language: java
2
3 # Snapshot deployment to Sonatype Maven repository
4 # The password is encrypted using "travis encrypt -r echo3/echo3 SONATYPE_PASSWORD=password"
5 # and only decrypted and set as environment variable by travis-ci if the build runs in the context of
6 # the echo3/echo3 github repository.
7
8 env:
9   global:
10    - SONATYPE_USERNAME=bschmid
11    - secure: "UTEI77pRoUliei20VAnOTJ7C0SuR234w3lbdR3NqBxvItyMJBHpv+/1nxNLhtvbx0L7DX0vdqqUnAn2vFPXmUtJFUq+G038FjNKhHHVki9YKN9+"
12
13 after_success:
14 - python resource/travis-ci/addServer.py
15 - ant travis.mvn.snapshot
```

[My Repositories](#)
[Recent](#)

[echo3/echo3](#) 134

4 min 7 sec

Finished: a day ago

[excellent/echolot](#) 15

48 sec

Finished: 2 months ago

[excellent/echo3](#) 15

1 min 59 sec

Finished: 3 months ago

[echo3/echo3filetransfer](#) 17

54 sec

Finished: 3 months ago

[echo3/echo3extras](#) 38

52 sec

Finished: 4 months ago

[bschmid/echo3](#) 5

2 min 22 sec

Finished: 6 months ago

[excellent/echo3filetransfer](#) 3

31 sec

Finished: 8 months ago

[excellent/echo3extras](#) 4

## echo3/echo3

build passing

Echo is a platform for building web-based applications that approach the capabilities of rich clients. The applications are developed using a component-oriented and event-driven API, eliminating the need to deal with the "page-based" nature of browsers. To the developer, Echo works just like a user interface toolkit. The latest iteration, Echo3, features the ability to write applications in either server-side Java or client-side JavaScript. Server-side applications run in any Java Servlet Container and do not require developer knowledge of HTML, HTTP, or JavaScript. Client-side JavaScript-based applications do not require any server at all, but can of course communicate with one via XML or JSON over HTTP. Cross-platform AJAX technology is used for rendering, and no browser plugins are required. Echo is open-source software, dual-licensed under the Mozilla Public License and LGPL.

[Current](#)
[Build History](#)
[Pull Requests](#)
[Branch Summary](#)


Build	<a href="#">134</a>	Commit	<a href="#">7148107 (master)</a>
State	Passed	Compare	<a href="#">3ad182b4219e...7148107b2a7c</a>
Finished	a day ago	Author	Scott Knick
Duration	4 min 7 sec	Committer	Benjamin Schmid
Message	Scrub README.md from minor formatting & spelling issues		

Removed line breaks in middle of hyphenated words as this put a space in the word in the Markdown view. Made other minor grammar/capitalization changes.

Fixes [#84](#)

Signed-off-by: Benjamin Schmid <B.Schmid@excellent.de>

```

1 Using worker: worker-linux-9-2.bb.travis-ci.org:travis-linux-12
2
3 $ export SONATYPE_USERNAME=bschmid
4 $ export SONATYPE_PASSWORD=[secure]
5 $ git clone --depth=50 --branch=master git://github.com/echo3/echo3.git echo3/echo3
12 $ cd echo3/echo3
13 $ git checkout -qf 7148107b2a7c0018f38eb0e29c8d8591073a3d44
14 $ git submodule init
15 $ git submodule update
16 $ java -version
17 java version "1.7.0_45"
18 Java(TM) SE Runtime Environment (build 1.7.0_45-b18)
19 Java HotSpot(TM) 64-Bit Server VM (build 24.45-b08, mixed mode)
20 $ javac -version
21 javac 1.7.0_45
    
```

FAZIT

**FAZIT**





# ◆ Innovatives & lebendiges Ökosystem & Tools!

◆ „Distributed“

◆ Arbeiten mit leichtgewichtigen Branches

◆ ‚Einfache‘ & Effiziente Konzepte

◆ Große Freiheitsgrade (Workflow, Undo, ...)

- ◆ Teils steile Lernkurve
- ◆ Mächtige Mittel zur Manipulation der Historie
- ◆ Keine Teil-Checkout möglich
- ◆ Kein Rename-Tracking
- ◆ Kanten unter Windows

BIT

**WEITERFÜHRENDE  
INFORMATIONEN**



# LERNEN & DOKUMENTATION

„Pro Git“ – Freies Online-Buch mit deutscher Übersetzung!

<http://git-scm.com/book/de>

„Try Git“ – Interaktives Tutorial im Browser zum Einstieg

<http://try.github.io/>

„Learn Git Branching“ – Sehr gutes, Interaktives Tutorial welches Rebasing & Co. vermittelt

<http://pcottle.github.io/learnGitBranching/>

*Empfehlung!*

# WORKFLOW & BEST PRACTICES

„Simple Git workflow is simple“

<https://blogs.atlassian.com/2014/01/simple-git-workflow-simple/> &  
<https://gist.github.com/jbenet/ee6c9ac48068889b0912>

*agile Projekte*

„Git Flow“ – Relativ populäres, aber auch komplexes Modell

<http://nvie.com/posts/a-successful-git-branching-model/>

*Produkt-É  
Variantenpflege*

„Commit Often, Perfect Later, Publish Once: Git Best Practices“

<http://sethrobertson.github.io/GitBestPractices/>

# **FRAGEN & ANTWORTEN**