

# Versionshantering och git

Kai-Mikael Jää-Aro

# Problemet

Mjukvaruutveckling är inte en linjär process från en tom fil till  $n$  rader korrekt fungerande kod.

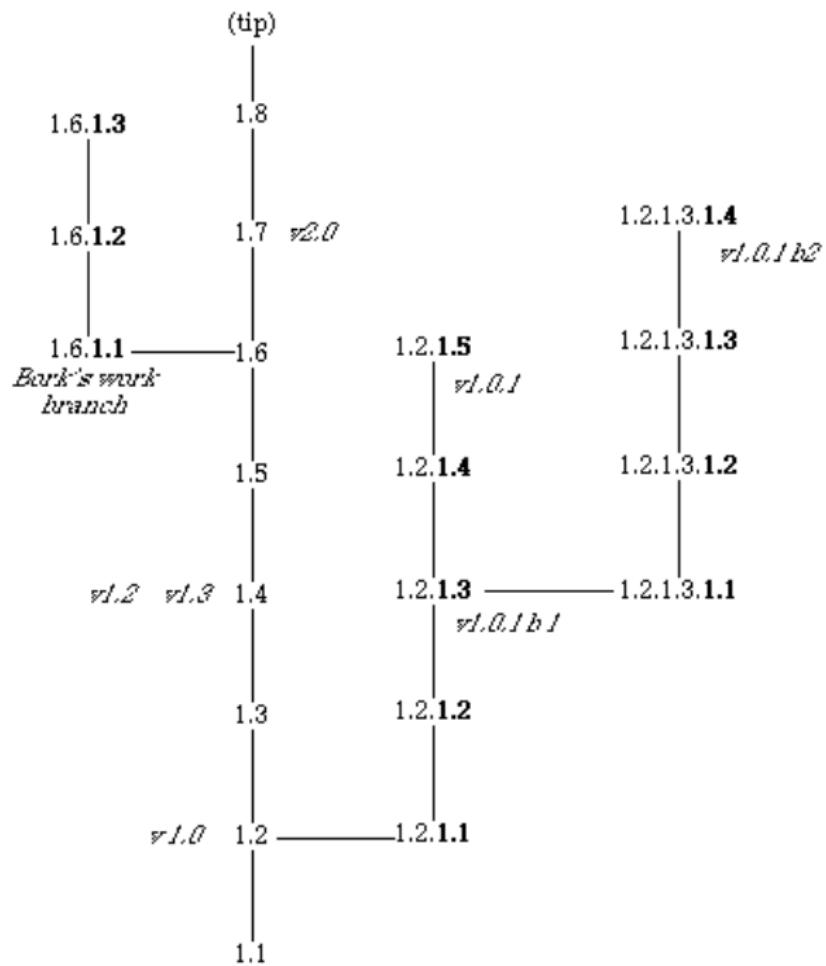
- ▶ Fel införs under arbetets gång.
- ▶ Vi provar alternativa lösningar.
- ▶ Flera parallella versioner krävs.

Därför måste vi:

- ▶ kunna återgå till en fungerande version av mjukvaran,
- ▶ arbeta med en av flera möjliga versioner.

# Versionskontroll är lösningen

- ▶ Ett arkiv.
- ▶ *Incheckning* av kod (*revisioner*) i arkivet.
- ▶ Hämta ut tidigare incheckningar.
- ▶ Trädstruktur för parallella versioner. (“tip”/“trunk”/“master” är huvudspåret.)
- ▶ Ändringar i parallella versioner kan föras tillbaka till master.
- ▶ Varje revision har en identitet, kan markeras med en *tag* som motsvarar släppt version eller annan milsten.



# Parallel utveckling

Flera utvecklare i samma projekt.

1. Checka ut aktuell version av koden.
2. Koda, testa.
3. Checka in *stabil* kod.
4. Hantera ev konflikter.
5. Repetera tills projektet klart.

# Git

Det finns ett stort antal versionshanteringssystem, här kommer vi att gå igenom git.

git är ett *distribuerat* versionskontrollsysteem. Man lagrar *alla* utvecklare en (komprimerad) kopia av hela databasen, men normalt utser man ett specifikt arkiv till att vara "origin", till vilket alla kopierar sitt material och som alla hämtar ifrån.

Dock är man inte beroende av det centrala arkivet utan kan arbeta offline med sin kopia tills man får kontakt med arkivet igen.

# Att använda git

Grunden för git är ett kommandoradsgränssnitt. Det finns flera olika grafiska gränssnitt. (Mera avancerade övningar kräver användning av kommandotolken)

GitHub (<https://github.com/>) gör tillgängligt både ett grafiskt gränssnitt till git och gratis server-utrymme för open source-projekt.

# Skapa en användare

The screenshot shows a Firefox browser window with the GitHub homepage loaded. The address bar displays "GitHub, Inc. [JS] https://github.com". The main content area features the GitHub logo and the tagline "Build software better, together." Below this, there's a call to action for "Powerful collaboration, code review, and code management for open source and private projects. Need private repositories? Upgraded plans start at \$7/mo." A large green button labeled "Sign up for GitHub" is prominently displayed. To the right of the button, a note states: "By clicking "Sign up for GitHub", you agree to our terms of service and privacy policy. We will send you account related emails occasionally." At the bottom of the page, it says "Introducing a faster, more flexible GitHub Enterprise." and "Now available on AWS." with a "Tell me more" button.

Firefox File Edit View History Bookmarks Tools Window Help

Google Kate... Leap Motion... Eevchron Me... A successful... UniMerge - Unity... Search results for... Search results for... Git - Book... Pex, Autom... SmartGit - Gi... GitHub - ... Wed 13:41 Kai-Mikael Jää-Aro

GitHub, Inc. [JS] https://github.com

Work admin Teaching Research Manuals Software Daily Most Visited

GitHub Search GitHub Explore Features Enterprise Blog Sign In

# Build software better, together.

Powerful collaboration, code review, and code management for open source and private projects. Need private repositories? Upgraded plans start at \$7/mo.

[Sign up for GitHub](#)

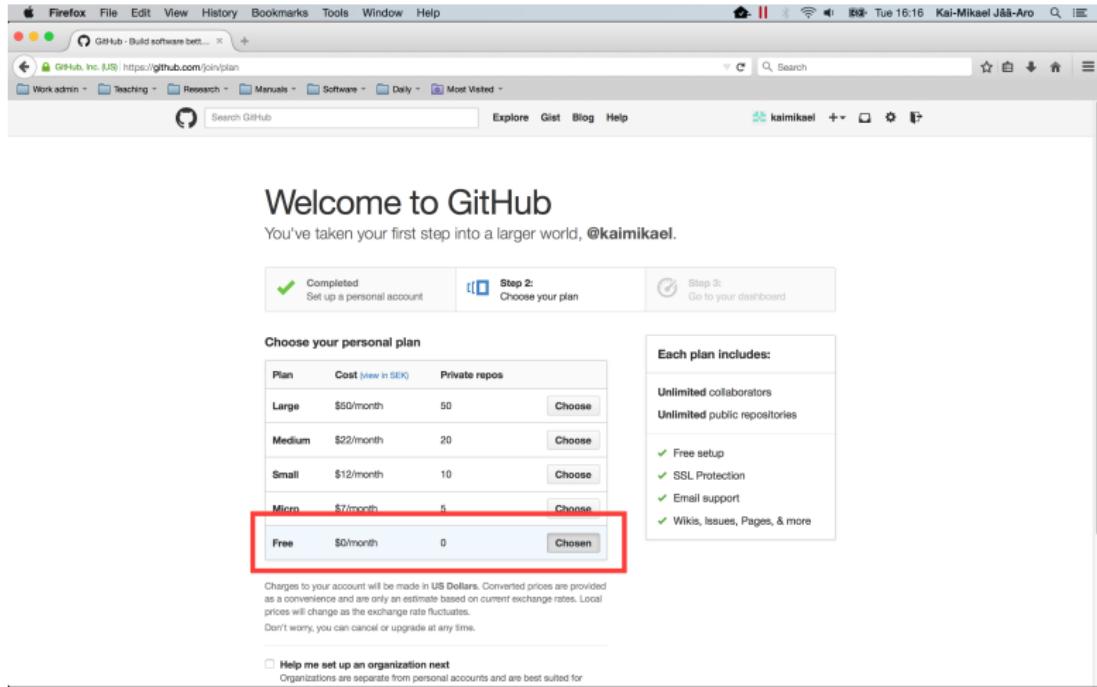
By clicking "Sign up for GitHub", you agree to our [terms of service](#) and [privacy policy](#). We will send you account related emails occasionally.

Introducing a faster, more flexible GitHub Enterprise.

Now available on AWS.

[Tell me more](#)

# Välj funktioner/kostnadsnivå



A screenshot of a Firefox browser window displaying the GitHub 'Join' page. The URL in the address bar is <https://github.com/join/plan>. The page title is 'Welcome to GitHub'. It shows three steps: 'Completed' (Set up a personal account), 'Step 2: Choose your plan' (highlighted with a red box), and 'Step 3: Go to your dashboard'. Below this, there's a table for 'Choose your personal plan' with four rows: Large (\$50/month), Medium (\$22/month), Small (\$12/month), and Free (\$7/month). The 'Free' row is also highlighted with a red box. To the right, a box lists 'Each plan includes:' with items like 'Unlimited collaborators', 'Unlimited public repositories', and several checked-off features: 'Free setup', 'SSL Protection', 'Email support', and 'Wikis, Issues, Pages, & more'.

Plan	Cost (view in SEK)	Private repos	Action
Large	\$50/month	50	<a href="#">Choose</a>
Medium	\$22/month	20	<a href="#">Choose</a>
Small	\$12/month	10	<a href="#">Choose</a>
Free	\$7/month	0	<a href="#">Choose</a>

Charges to your account will be made in US Dollars. Converted prices are provided as a convenience and are only an estimate based on current exchange rates. Local prices will change as the exchange rate fluctuates.  
Don't worry, you can cancel or upgrade at any time.

Help me set up an organization next  
Organizations are separate from personal accounts and are best suited for

# Skapa ett arkiv

The screenshot shows a Firefox browser window with the GitHub homepage loaded. The address bar displays "GitHub" and the URL "https://github.com". The top navigation bar includes links for "Work admin", "Teaching", "Research", "Manuals", "Software", "Daily", and "Most Visited". The main content area features a large callout box with the heading "Learn Git and GitHub without any code!" and a subtext explaining the "Hello World" guide. A green "Let's get started!" button is centered below the text. To the left, there's a sidebar with a user icon and the message "Welcome to GitHub! What's next? (a minute ago)". Below this are links for "Create a repository", "Tell us about yourself", "Browse interesting repositories", and "Follow @github on Twitter". A "ProTip!" link is also present. To the right, a section titled "Your repositories" shows a message "You don't have any repositories yet!" with a "Create your first repository or learn more about Git and GitHub." link. A red box highlights the "+ New repository" button. At the bottom, footer links include "Status", "API", "Training", "Shop", "Blog", and "About". The bottom right corner contains standard browser navigation icons.

# Konfigurera arkivet

The screenshot shows the GitHub interface for creating a new repository. At the top, the browser title bar reads "Create a New Repository". The main form has the following fields:

- Owner:** kaimikael
- Repository name:** demo\_rep
- Description (optional):** Demonstration repository
- Visibility:** Public (selected)
- Initialize this repository with a README:** checked (with explanatory text below)
- .gitignore:** Unity (highlighted with a red box)
- Add a license:** None

At the bottom is a green "Create repository" button.

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Status API Training Shop Blog About

# Lägg till medarbetare

A screenshot of a Firefox browser window displaying the GitHub repository settings for 'kalmikael / demo\_rep'. The 'Collaborators' tab is selected in the sidebar on the left. The main content area shows a table with one row, where the user 'kalmikael2' is listed under the 'Collaborators' column. A red box highlights the name 'kalmikael2'. The GitHub sidebar also shows other tabs like 'Options', 'Webhooks & Services', and 'Deploy keys'. The bottom of the screen shows the GitHub footer with links for Terms, Privacy, Security, Contact, Status, API, Training, Shop, Blog, and About.

Collaborators	Full access to the repository
kalmikael2	Add collaborator

# Gör en lokal arkiv-klon

A screenshot of a Firefox browser window showing a GitHub repository page. The URL in the address bar is [https://github.com/kaimikael/demo\\_rep](https://github.com/kaimikael/demo_rep). The repository name is **kaimikael / demo\_rep**. The page title is "Demonstration repository — Edit". On the right side, there is a sidebar with sections for Code, Issues, Pull Requests, Wiki, Pulse, Graphs, and Settings. A red box highlights the "HTTPS clone URL" section, which contains the URL [https://github.com/kaimikael/demo\\_rep](https://github.com/kaimikael/demo_rep), a note saying "You can clone with HTTPS, SSH, or Subversion.", and two buttons: "Clone in Desktop" and "Download ZIP".

Demonstration repository — Edit

2 commits · 1 branch · 0 releases · 1 contributor

branch: master → **demo\_rep** / +

Initial commit ···

**kaimikael** authored 19 seconds ago · latest commit `33a06fa1d6`

**gitignore** Initial commit 31 minutes ago

**README.md** Initial commit 31 minutes ago

**git.tex** Initial commit 38 seconds ago

**README.md**

**demo\_rep**

Demonstration repository

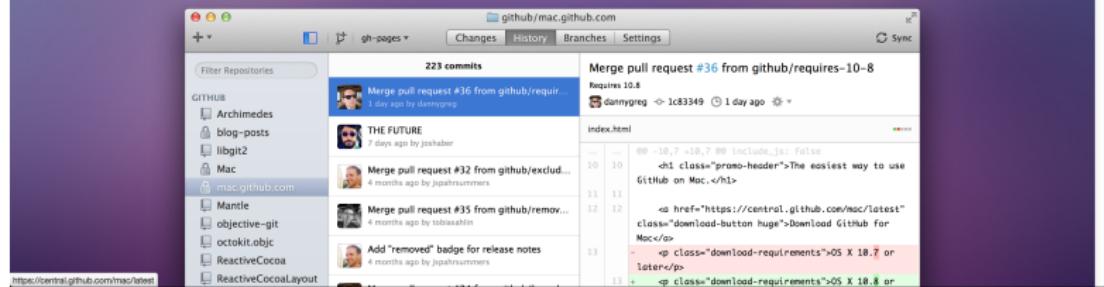
HTTPS clone URL  
[https://github.com/kaimikael/demo\\_rep](https://github.com/kaimikael/demo_rep)

You can clone with **HTTPS**, **SSH**, or **Subversion**.

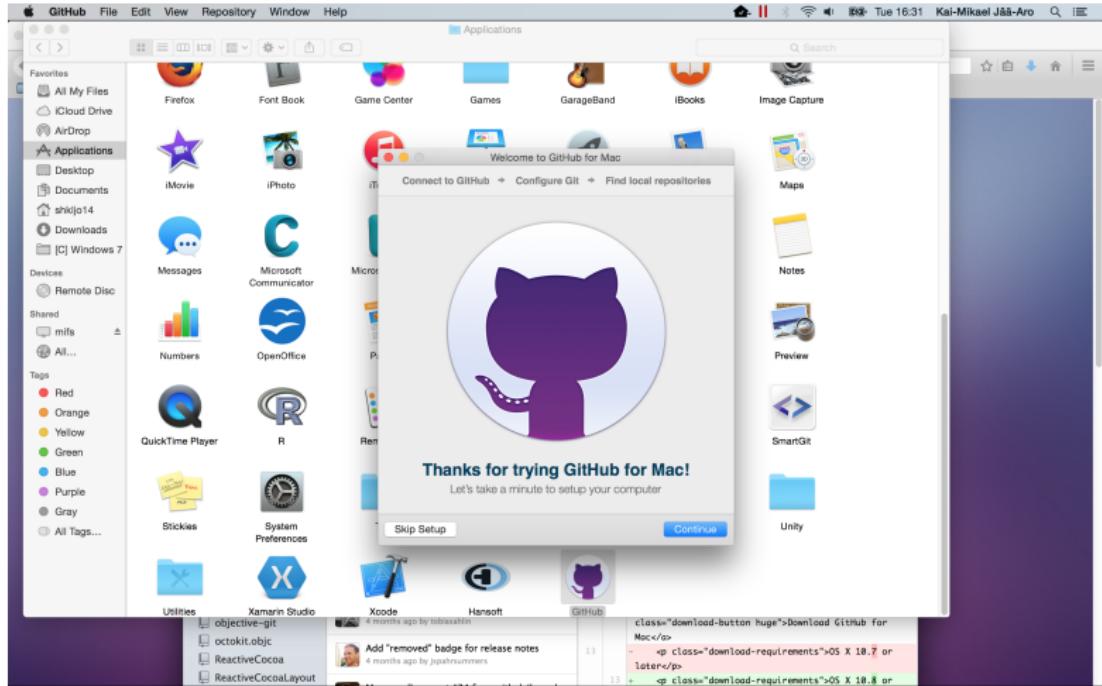
Clone in Desktop · Download ZIP

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# Hämta klienten



# Installera klienten



## Logga in på arkivet

```
GitHub File Edit View Repository Window Help
tmp -- bash - 124x51
serialisedread.csv:1: unexpected token: public
US Amigo, Alberto Carlsson, Robert Hillberg, Rasmus L
US Ankerborg, Victor Ek, Anton Jeppesen, Per N
US Bohman, Niclas Forsblom, Andre Larsson, Jonathan S
US kaismprob:HT2014 shklj0145 mv ~/Downloads/C-Upsatsets_SP12_Andre_Forsblom_A
US kaismprob:HT2014 shklj0145 mv ~/Downloads/Bohman_Stinson_C_Upsatsets_Final
US kaismprob:HT2014 shklj0145 ls -l Amigo\,, Alberto\,
total 4824
-rw-r--r-- 1 shklj014 KTDomain Users 868686 Jan 19 14:16 Albrecht.pdf
-rw-r--r-- 1 shklj014 KTDomain Users 738785 Dec 16 10:12 Albrecht.pdf
-rw-r--r-- 1 shklj014 KTDomain Users 868686 Jan 19 14:55 orig
kaismprob:HT2014 shklj0145 rm Amigo\,, Alberto\,original.Alberto.pdf
kaismprob:HT2014 shklj0145 rm Bohman\,, Niclas\,Bohman\,original.Bohman.pdf
C-Upsatsets_SP12_Andre_Norberg_Andreas.pdf originally
C-upsatsets_SP12_Andre_Forsblom_Andreas_Norberg.pdf originally
kaismprob:HT2014 shklj0145 ls -l Bohman\,, Andre\,
total 4768
-rw-r--r-- 1 shklj014 KTDomain Users 744588 Dec 16 18:13 C-Upsatsets_SP12_Andre_Forsblom_A
-rw-r--r-- 1 shklj014 KTDomain Users 845747 Jan 19 14:16 C-up
-rw-r--r-- 1 shklj014 KTDomain Users 845747 Jan 19 14:55 orig
kaismprob:HT2014 shklj0145 rm Bohman\,, Andre\,original.C-Upsatsets_SP12_Andre_Norberg_A
Bohman_Stinson_C_Upsatsets_Final_Draft.pdf originally
US Bohman,Stinson,C_Upsatsets_Final_Draft.pdf originally
kaismprob:HT2014 shklj0145 ls -l Stinson\,, Kimberly\,
kaismprob:HT2014 shklj0145 rm Stinson\,, Kimberly\,
kaismprob:HT2014 shklj0145 ls -l Stinson\,, Stinson\,
total 14584
-rw-r--r-- 1 shklj014 KTDomain Users 2498951 Jan 19 14:16 Bohman_Stinson_C_Upsatsets_Final_Draft.pdf
-rw-r--r-- 1 shklj014 KTDomain Users 2498951 Jan 19 14:55 orig
FB -rw-r--r-- 1 shklj014 KTDomain Users 2498951 Jan 19 14:55 orig
IM kaismprob:HT2014 shklj0145 rm Stinson\,, Kimberly\,original,Bohman
DE
Alberto_Amigo_Jonathan_Larsson_Fun_With_Bugs_and_Failures.pdf Alberto_Amigo_Jonathan_Larsson_Oppenning_CSA.pdf
IM kaismprob:HT2014 shklj0145 open Bohman\,, Niclas\,Bohman_Stinson_C_Upsatsets_Final_Draft.pdf Amigo\,, Alberto\,Alberto_Amigo_Jonathan_Larsson
IM Fun_With_Death_and_Failure.pdf Forsblom\,, Andre\,C-Upsatsets_SP12_Andre_Forsblom_A
IM kaismprob:HT2014 shklj0145 rm Bohman\,, Niclas\,Bohman_Stinson_C_Upsatsets_Final_Draft.pdf Amigo\,, Alberto\,Alberto_Amigo_Jonathan_Larsson
IM Fun_With_Death_and_Failure.pdf Forsblom\,, Andre\,C-Upsatsets_SP12_Andre_Forsblom_A
kaismprob:HT2014 shklj0145 less ~/Downloads/Work/dr/dr.drv
J_05_Store dr-abs-sv.tex dr-spik-en.tex dr.pdf kth-abs.tex parallel/ titleref.sty
CL changebar dr-bib1.tex dr-spik-sv.pdf dr-ps.gz pic2e.x.pdf
dr-bib2.pdf dr-spik-sv.pdf dr-ps.gz kth-abs.tex
dr-bib3.pdf dr-spik-sv.pdf dr-ps.gz kth-abs.tex
KB docx dr-prex.tex dr-bbl.tex kth-spik.tex test.pdf
dr-abs-en.tex dr-spik-en.pdf dr.blg fancyrb latexdiff.pl test.tex
LA kaismprob:HT2014 shklj0145 less ~/Downloads/Work/dr/dr.tex
kaismprob:HT2014 shklj0145
Last login: Tue Jan 20 15:00:10 on ttys004
kaismprob:HT2014 shklj0145

└── objective-git
    └── octokit.objc
        └── ReactiveCocoa
            └── ReactiveCocoaLayout
                └── Add "removed" badge for release notes
                    4 months ago by jpmccarthy
                    <a href="#" class="download-button nubl">Download GitHub for Mac</a>
                    - <p class="download-requirements">OS X 10.7 or later</p>
                    + <p class="download-requirements">OS X 10.8 or later</p>
```

The screenshot shows a Mac OS X desktop with several open windows. In the top-left, a terminal window titled 'GitHub' displays a command-line session for a file named 'serialisedread.cs:6:1: unexpected token: public'. The session includes a large list of file paths and names, many of which contain 'shklj014' and 'shklj045'. The total size listed is 14584 bytes.

In the top-right, another terminal window titled 'GitHub' shows a command-line interface for GitHub, with the URL 'tmp -- bash - 106x34' at the top. It has sections for 'Connect to GitHub', 'Configure Git', and 'Find local repositories'. A search bar contains the text 'Kai-Mikael Jää-Aro'. Below it, a message says 'This is used to identify the commits you create. Anyone will be able to see this information if you publish commits.' A 'Continue' button is visible.

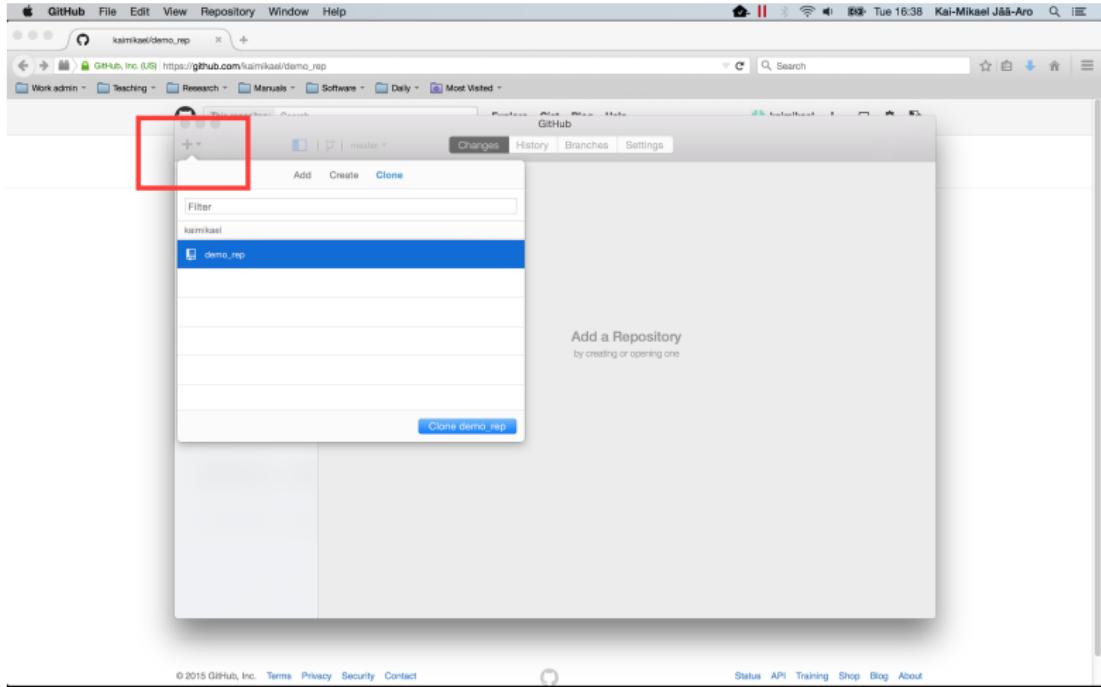
At the bottom, there's a GitHub pull request interface for a file named 'U.S. Amigo, Alberto -> Carlsson, Robert -> Hillberg, Rasmus -> Ek, Anton -> Forsblom, André -> Jeppson, Per -> Larsson, Jonathan -> Larsson, Kimberly -> Bohman, Niclas -> Stinson, C -> Uppsmats, Final\_Draft.pdf'. The PR summary is 'Fun with Death and Failure.pdf' and the status is 'MERGED'. The PR number is 14584. The GitHub interface includes a sidebar with 'octokitobjc', 'Add "removed" badge for release notes', 'ReactiveCocoa', and 'ReactiveCocoaLayout'.

# Hitta lokala arkiv

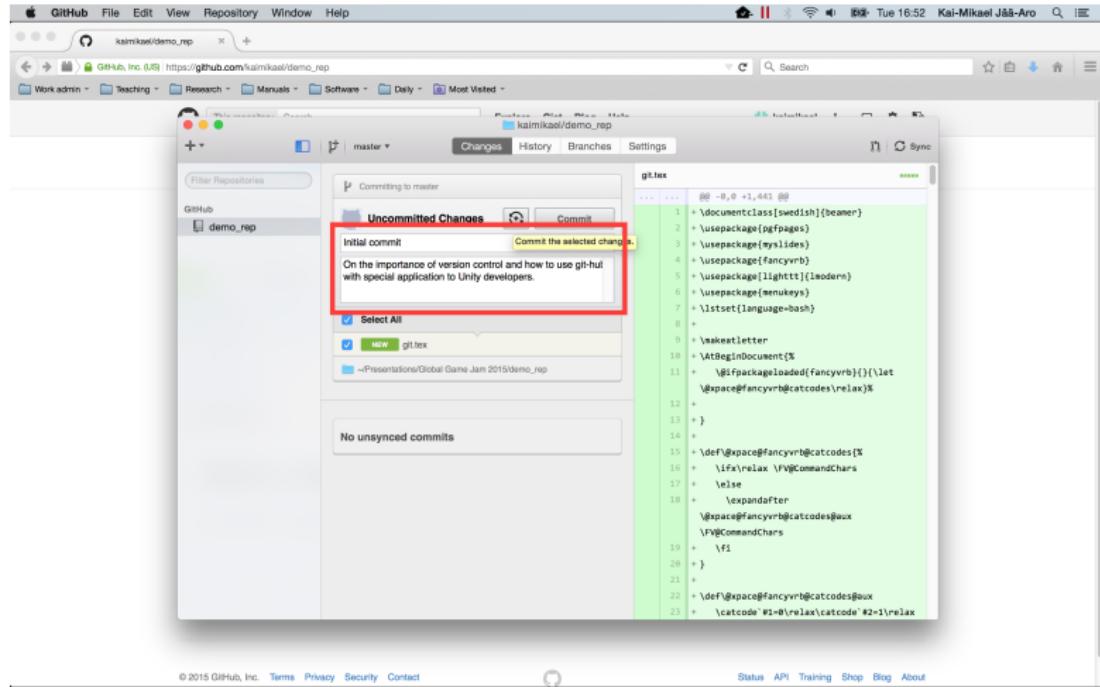
A screenshot of a Mac OS X desktop environment. In the foreground, a terminal window titled "HT2014 - bash" is open, displaying a command-line session. The user has run a command that resulted in an error message: "serialisedread.cs:8:1: unexpected token: public". The terminal shows several log entries, including file operations like mv and rm, and various PDF files being processed. A progress bar at the bottom of the terminal indicates the command is still running.

```
serialisedread.cs:8:1: unexpected token: public
US Amigo, Alberto Carlsson, Robert Hillberg, Rasmus L
US Ankarberg, Victor Ek, Anton Jeppson, Per N
US Bozman, Niclas Forsblom, Andre Larsson, Jonathan S
** kalsimpro@HT2014 shklj0145 ls ~
kalsimpro@HT2014 shklj0145 mv ~/Downloads/Alberto_Amigo_Jonathan_Larsson_and_Victor_Ek_C_Upsat...
kalsimpro@HT2014 shklj0145 mv ~/Downloads/Bohman_Stinson_C_Uppsats_Final...
kalsimpro@HT2014 shklj0145 ls -l Amigo, Alberto/
total 4624
-rw-r--r-- 1 shklj014 KTD\Domain Users 866866 Jan 19 14:16 Alberto_A...
-rw-r--r-- 1 shklj014 KTD\Domain Users 738754 Dec 16 10:12 Andre...
-rw-r--r-- 1 shklj014 KTD\Domain Users 866866 Jan 19 14:05 eris...
kalsimpro@HT2014 shklj0145 ls -l Alberto_Amigo_Jonathan_Larsson_and_Victor_E...
kalsimpro@HT2014 shklj0145 ls -l Bohman_Stinson_C_Uppsats_Final...
kalsimpro@HT2014 shklj0145 ls -l Forsblom, Andre...
C-Uppsats_Forsblom, Andre_Norberg_Andreas.pdf originali...
C-Uppsats_SP12_Andre_Forsblom,Andreas_Norberg.pdf
kalsimpro@HT2014 shklj0145 ls -l Forsblom, Andre...
total 4784
-rw-r--r-- 1 shklj014 KTD\Domain Users 744598 Dec 16 10:13 C-U...
-rw-r--r-- 1 shklj014 KTD\Domain Users 845747 Jan 19 14:16 C-U...
-rw-r--r-- 1 shklj014 KTD\Domain Users 845747 Jan 19 14:05 eris...
kalsimpro@HT2014 shklj0145 ls -l Bohman_Stinson_C_Upps...
kalsimpro@HT2014 shklj0145 ls -l Stinson, Kimberly...
US Bohman_Stinson_C_Uppsats_Final_Draft.pdf originali...
US Bohman_Stinson_C_Uppsater_Draft_C_Uppsats.pdf
CL [removed] -> 1 shklj014 KTD\Domain Users 14 Dec 16 11:16 Stinson...
kalsimpro@HT2014 shklj0145 ls -l Kimberly...
ME total 14504
LW -rw-r--r-- 1 shklj014 KTD\Domain Users 2498851 Jan 19 13:16 Boh...
ZM -rw-r--r-- 1 shklj014 KTD\Domain Users 2498851 Jan 19 13:16 Boh...
FO -rw-r--r-- 1 shklj014 KTD\Domain Users 2498851 Jan 19 14:05 or...
IM kalsimpro@HT2014 shklj0145 ls Stinson, Kimberly/originali...Bohm...
kalsimpro@HT2014 shklj0145 open Bohman,\ Niclas\Bohman_Stinson_C...
DE
IF Alberto_Amigo_Jonathan_Larsson_Fun with Death and Failure.pdf Alt...
IN kalsimpro@HT2014 shklj0145 open Bohman,\ Niclas\Bohman_Stinson_C...
_C_Fun with Death and Failure.pdf Forsblom,\ Andre/C-U...
C-Uppsats_Forsblom,Andreas_Norberg_Andreas.pdf...
C-Uppsats_SP12...
IN kalsimpro@HT2014 shklj0145 open Bohman,\ Niclas\Bohman_Stinson_C...
IF _Fun with Death and Failure.pdf Forsblom,\ Andre/C-Uppsats_SP12...
kalsimpro@HT2014 shklj0145 less ~/Downloads/work/dr/...
LJ _DS_Store dr-abs->tex dr-spik-en.tex dr_per...
CU _DS_Store dr-abs->tex dr-spik-en.tex dr_per...
** chap7.pdf dr-old.tex dr-spik-sv.tex dr.tex...
kd docs/ dr-prev.tex dr_bb1 dr_toc...
dr-abs-en.tex dr-spik-en.pdf dr_bb1 fancyvrb/...
La kalsimpro@HT2014 shklj0145 less ~/Downloads/work/dr/dr.tex...
kalsimpro@HT2014 shklj0145
[removed]
Last login: Tue Jan 20 15:00:19 on ttys004
kalsimpro@HT2014 shklj0145 [~]
```

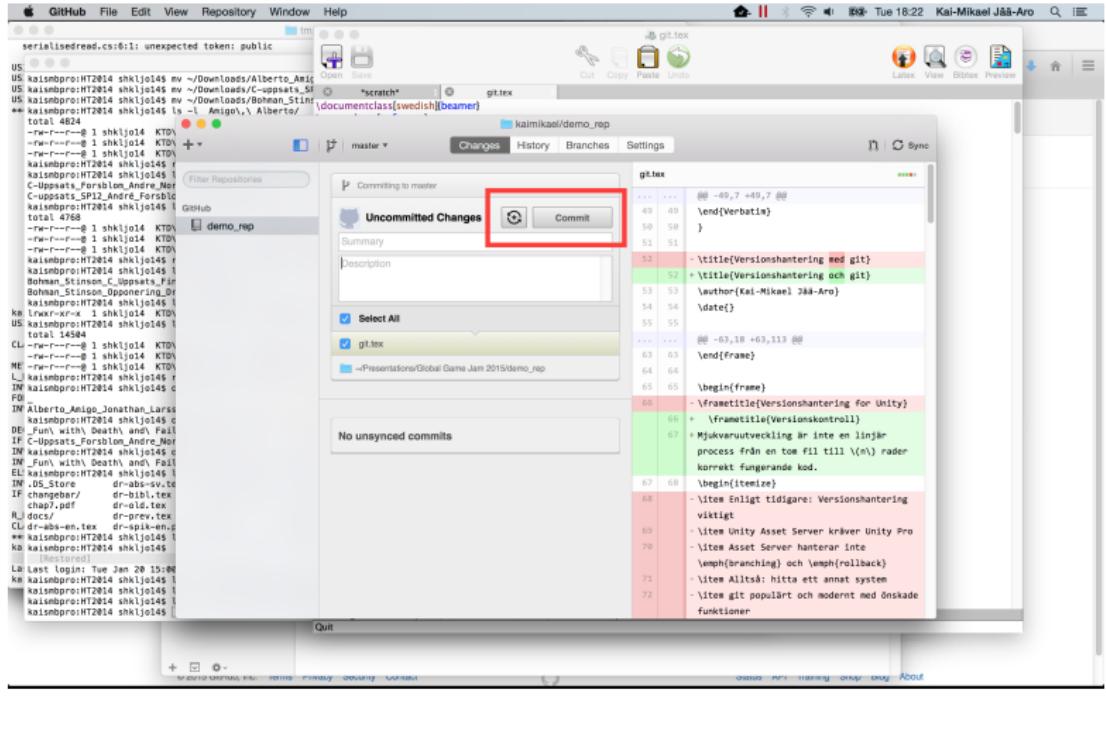
In the background, a GitHub browser window is open, showing a repository named "KTD-EHT2014". The "Find local repositories" search bar is active. A modal dialog box is displayed, asking "Which repositories would you like to use?", with "Git" selected. Below the modal, a progress bar indicates the download of "GitHub for Mac" is 100% complete. The GitHub interface shows a list of repositories and a sidebar with navigation links like "Home", "About", "Help", and "Log in".



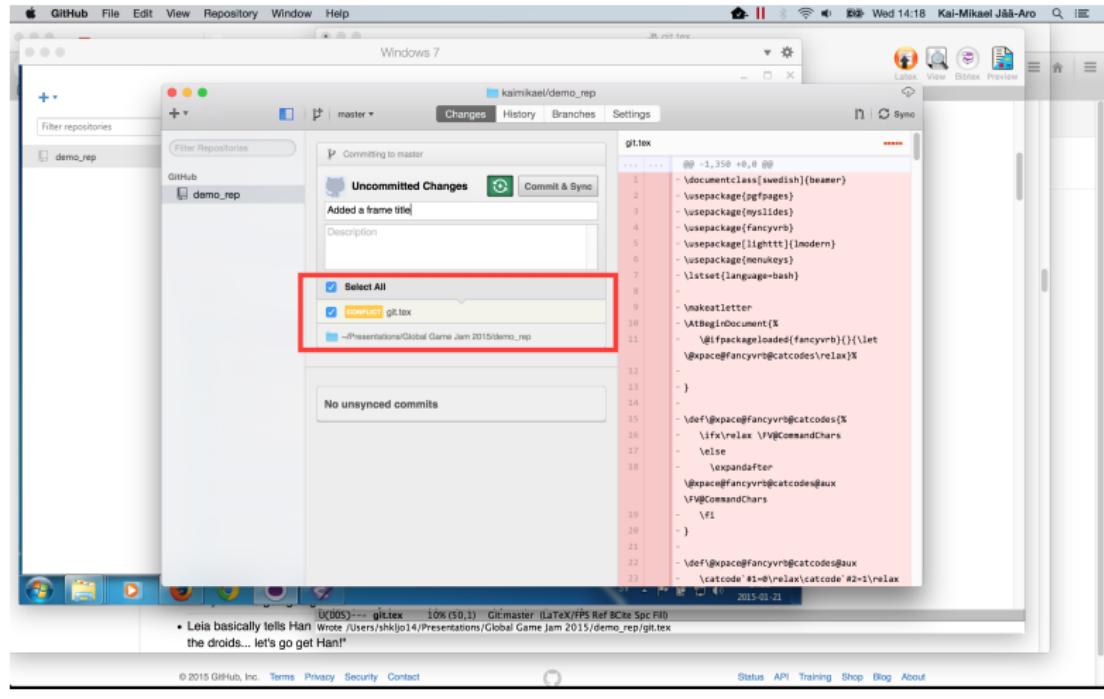
## Lägg till filer i arkivet



## Checka in uppdaterade filer



Om flera utvecklare ändrar på samma ställe i en fil uppstår en **konflikt**. Detta markeras i klienten, men måste lösas manuellt.



# Den synkroniserade filen har markörer vid konflikt punkten.

The screenshot shows the Aquamacs interface with a LaTeX file named "git.tex". The file contains several LaTeX commands, including frame environments and fragile text. A red box highlights a specific section of the code where conflict markers are present. The code snippet is as follows:

```
\begin{frame}
\includegraphics[GitHubCloneRepository]
\end{frame}

\begin{frame}[fragile]
\includegraphics[GitHubWebInterface]
\end{frame}

\begin{frame}[fragile]
r-theorem-dictiona
No r file git.nav.
[1] /usr/local/tex
pdftex.map]
(/usr/local/texlive
(/usr/local/texlive
(/usr/local/texlive
(/usr/local/texlive
(/usr/local/texlive
[2] [3]

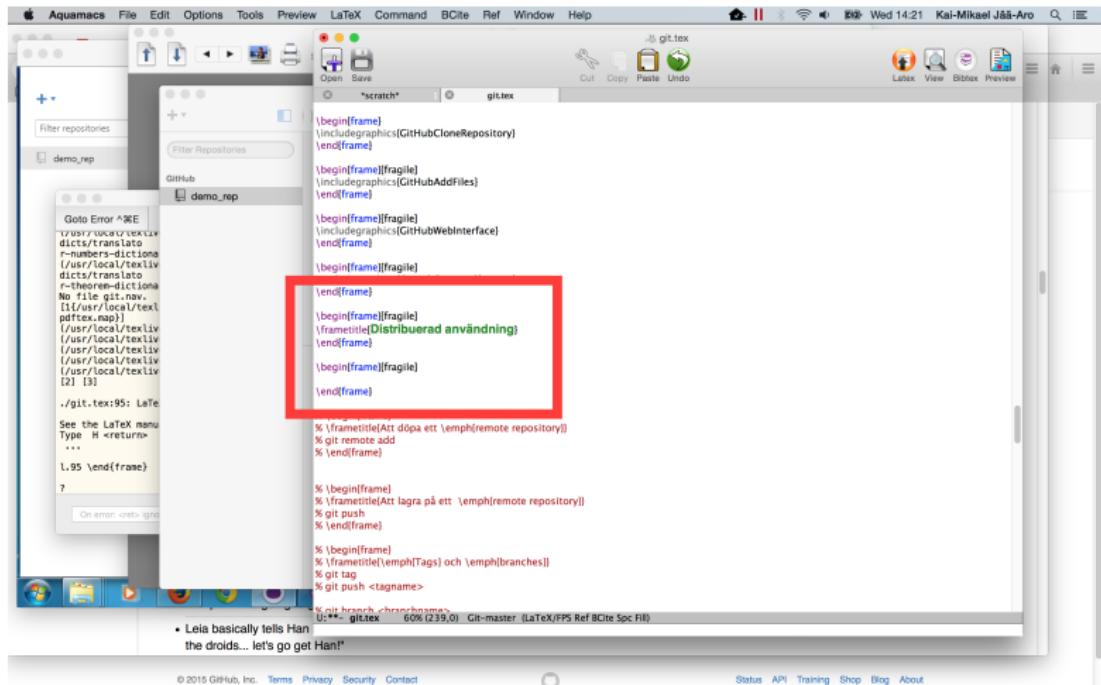
./git.tex:95: Late
See the LaTeX manu
Type H <return>
...
L.95 \end{frame}
?

On error: <ctrl> iglo
```

Below the code, a note reads: • Leia basically tells Han the droids... let's go get Han!

At the bottom of the window, there is a status bar with the following information: © 2015 GitHub, Inc. Terms Privacy Security Contact Status API Training Shop Blog About. The status bar also shows the file path U:++\*.git.tex 59% (238,24) Git-master (LaTeX/FPS Ref BCite SPC Fil).

Dessa ska hanteras manuellt och filen kan sedan checkas in igen.



The screenshot shows the Aquamacs LaTeX editor interface. The menu bar includes File, Edit, Options, Tools, Preview, LaTeX, Command, BCite, Ref, Window, Help. The toolbar has icons for Open, Save, Cut, Copy, Paste, Undo, and a magnifying glass. The status bar shows 'Wed 14:21' and 'Kai-Mikael Jää-Aro'. The main window displays a LaTeX file named 'git.tex' with the following content:

```
\begin{frame}
\includegraphics[GitHubCloneRepository]
\end{frame}

\begin{frame}[fragile]
\includegraphics[GitHubWebInterface]
\end{frame}

\begin{frame}[fragile]
r-theorem-dictiona
No r file git.nav.
[1/usr/local/tex
pdftex.map]
[1/usr/local/texliv
[1/usr/local/texliv
[1/usr/local/texliv
[1/usr/local/texliv
[1/usr/local/texliv
[2] [3]

.git.tex:95: Late
See the LaTeX manu
Type H <return>
...
L.95 \end{frame}
?

On error: <ctrl> ign
```

A red box highlights the following text in the file:

```
\end{frame}

\begin{frame}[fragile]
\frametitle{Distribuerad användning}
\end{frame}

\begin{frame}[fragile]
\frametitle{Att döpa ett \emph{remote repository}}
\git remote add
\end{frame}
```

Below the code, the status bar shows 'U:++ git.tex 60% (239,0) Git-master (LaTeX/FPS Ref BCite Spc Fil)'.

At the bottom left, there is a note: • Leia basically tells Han the droids... let's go get Han!

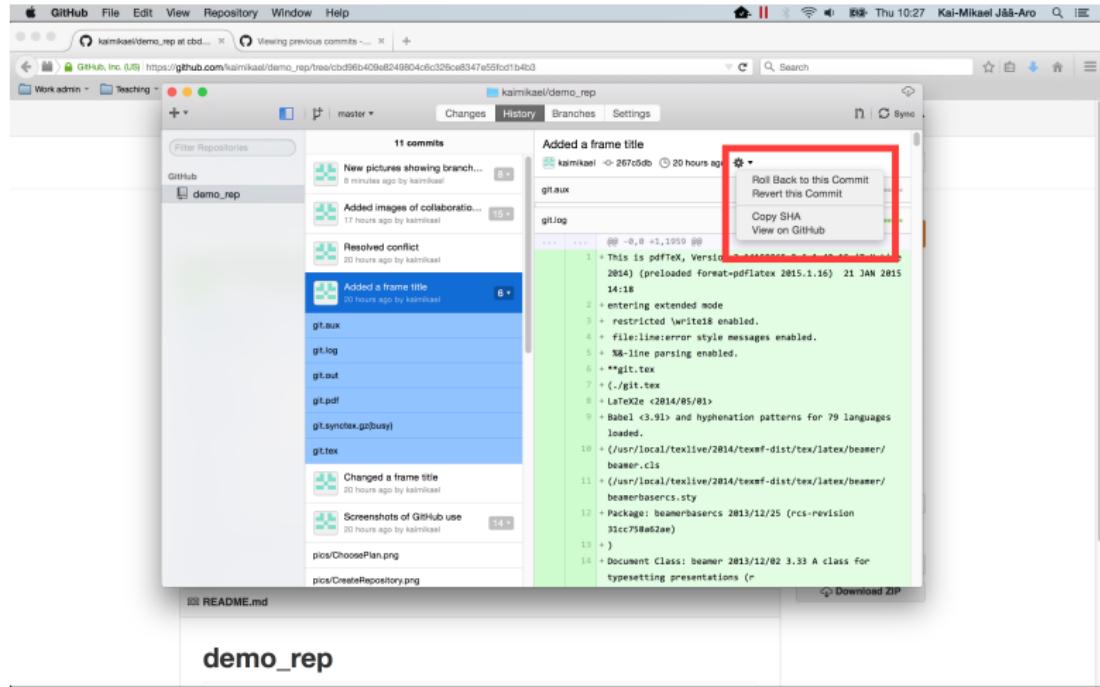
The footer includes links for GitHub, Inc., Terms, Privacy, Security, Contact, Status, API, Training, Shop, Blog, and About.

**Obs!** Git förstår bara filer som en sträng text. Konflikter förstås som ändringar på samma position av flera utvecklare, men om någon skulle ändra en funktion

```
public void func1(int par1, int par2) till  
public void func1(int par1) invalideras alla anrop till func1, men  
git varnar inte för detta.
```

Därför bör alla incheckningar följas av ett *bygge* för att kontrollera att allt fortfarande fungerar.

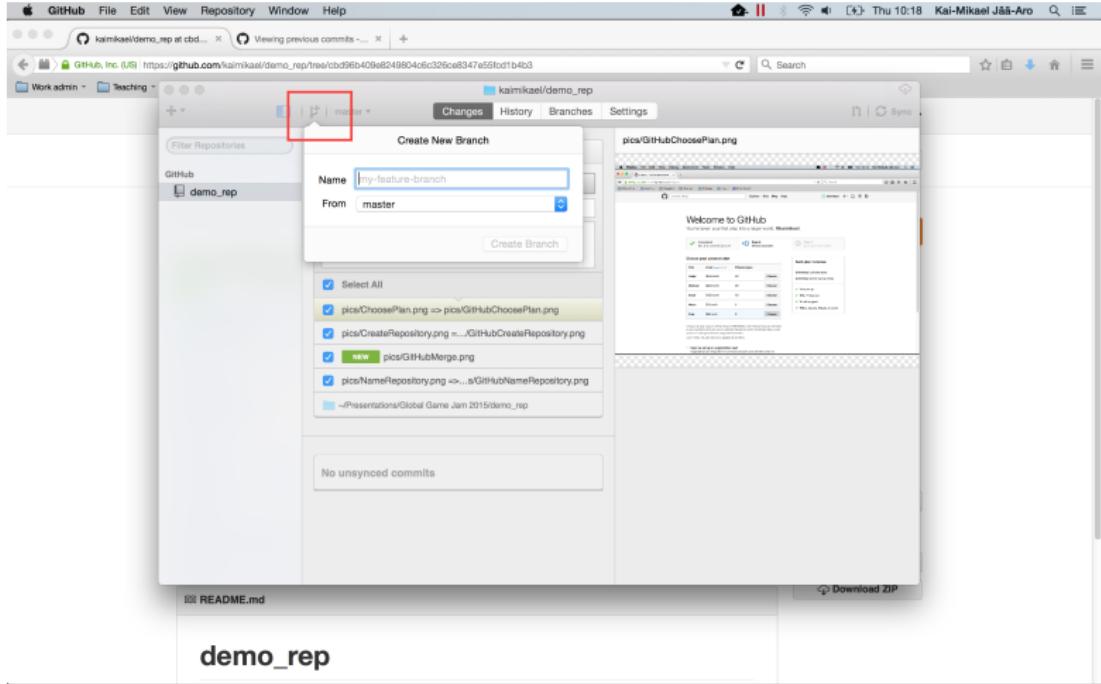
## Att ångra sig



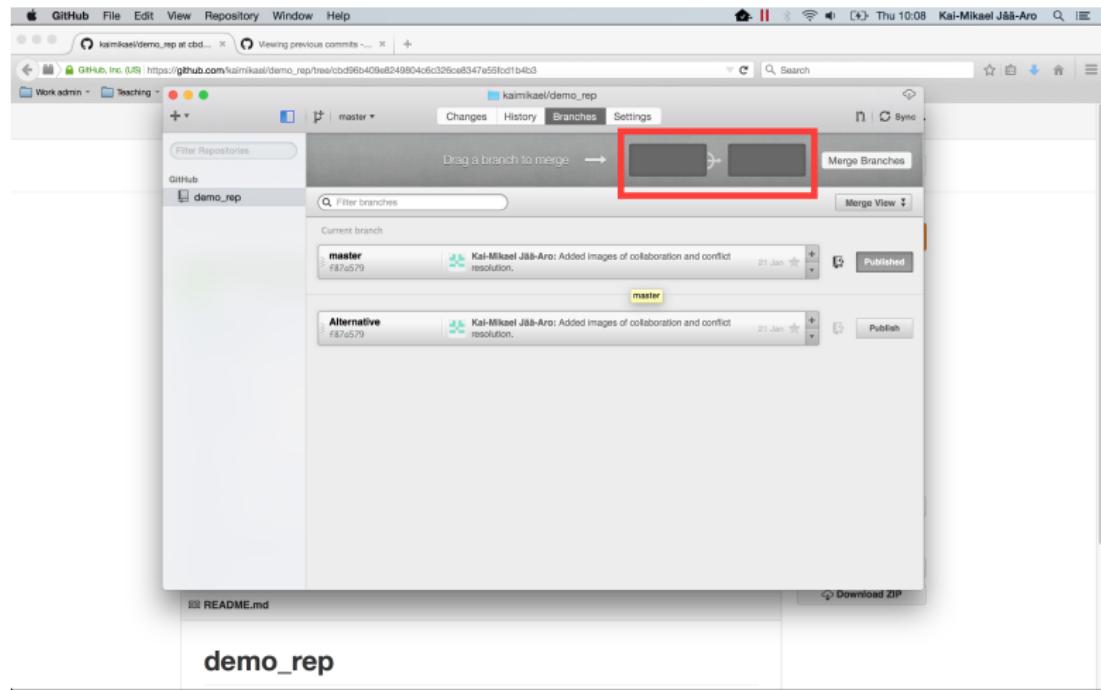
## Att ha en privat utvecklingsgren

Ett vanligt arbetsflöde är att man har en *master branch*, där koden är garanterad att vara stabil och körbar. Olika utvecklare kan sedan lätt skapa en egen gren att koda och testa i. Om något blir fel kan man alltid backa i denna gren och hålla mastern stabil. Man kan självfallet göra ytterligare grenar för olika tester.

git-arkiven är uppbyggda så att de låter oss arbeta på vilken punkt i trädet vi vill. Man kan se det som att man har en pekare in i trädet som pekar ut den aktuella uppsättningen filer som vi arbetar på. Vid behov kan vi flytta pekaren från en annanstans och arbeta där istället.



# Merge



## *merge* av binära filer

git klarar inte av att göra merge på binära filer – m a o texturer, animationer, osv. Somliga installationer kan ha en mergetool som kan hjälpa till, men i allmänhet måste man manuellt hämta de binära filer man vill ha.

# Mer läsning

*Pro Git, 2nd Edition*, Scott Chacon & Ben Straub.