



COMMON EUROPE CONGRESS 2026

14 - 17 June
Lyon, France

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EVENTS DE LYON



Git for Beginners

Jesse Gorzinski
Senior Business Architect, IBM

Agenda

- 1. Introduction**
- 2. What is Git?**
- 3. Git install/configuration**
- 4. Git basics**
- 5. Git workflow on IBM i**
- 6. Setting up a private Git server**
- 7. Git integrations**
- 8. Collaborative coding examples**

What is Git?

Git: A powerful version-control system

- Linus Torvalds – “inventor of Linux” wanted a better source control system – so he wrote one



- Very popular in the open source community and increasingly in enterprises
- Distributed Version Control System

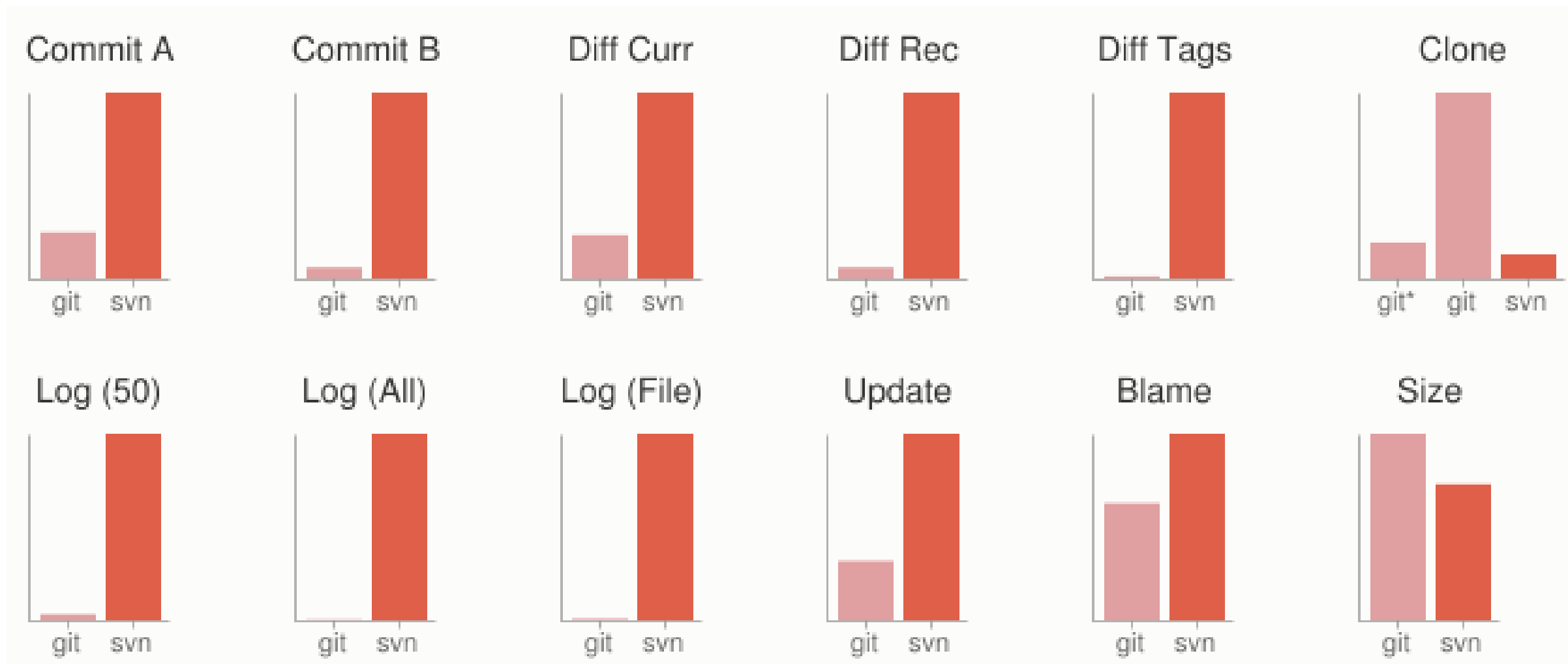


Git: fundamentally different

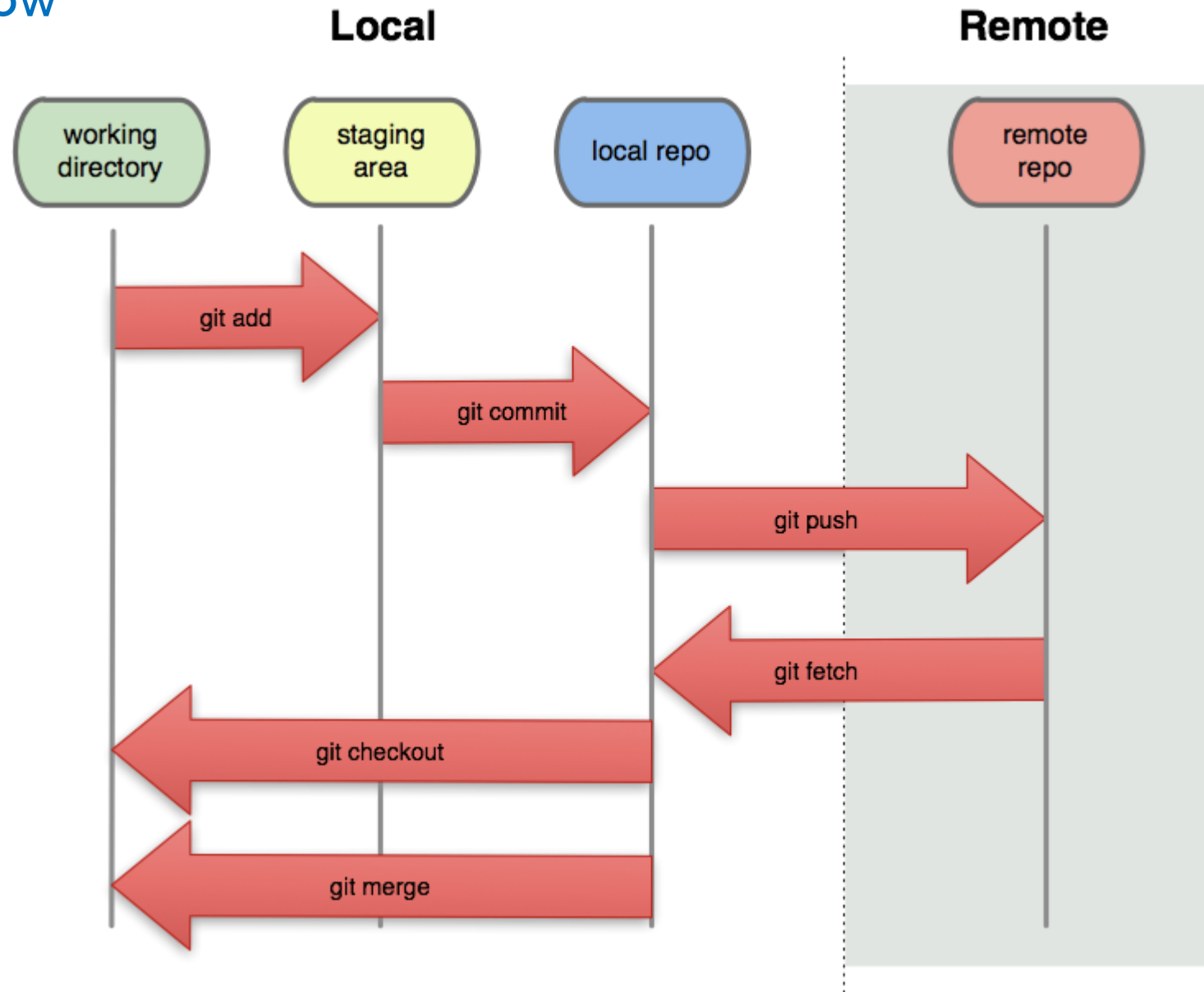
- Technically:
 - NOT a server! NOT a service! Just a simple executable
 - Best practice is to run through SSH
 - Distributed (people work on their own copy)
 - Stores all of its meta data in one special `.git/` directory
 - Very fast !
- Philosophically:
 - Social Coding
 - Unfettered concurrent development



Small & Fast!

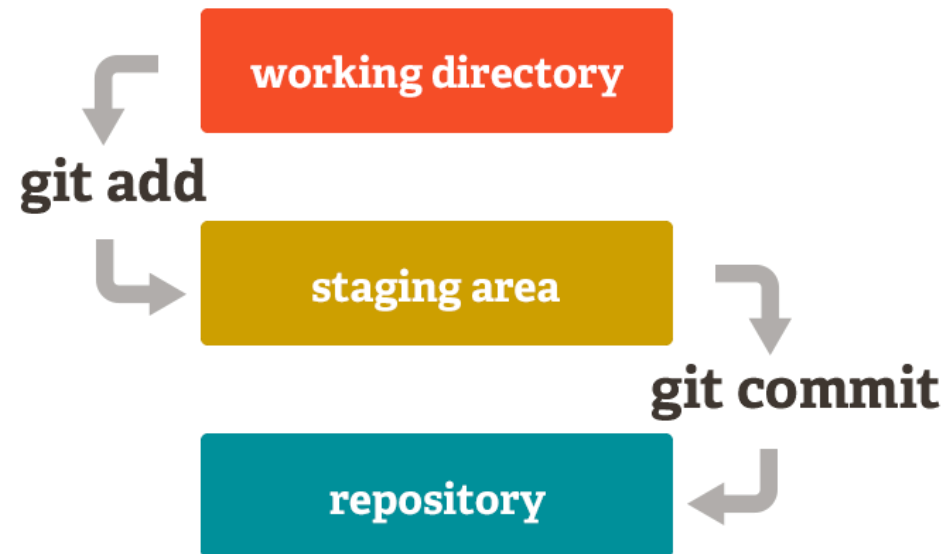


High-level flow



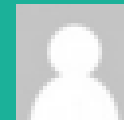
Staging area?

- Before the commit, files get "staged"
- Why?
 - Commit only one of several changed files
 - Commit only a portion of a changed file!



Hash codes

- All content is check-summed into a SHA-1 hash code
 - From then on the change is referred to by that hash code
 - Probability of collision is very small ~ # of sand grains on earth
 - => the content is tracked so empty directories are not
-
- Commits are also referred to by a hash code



From a tablet

Awesome Orion on 5/11/2016, 11:00:15 AM
committed by Awesome Orion
<Awesome.Orion@Common.org>

commit

abba2da966aa747cfd0e25744f56d2d89f426998

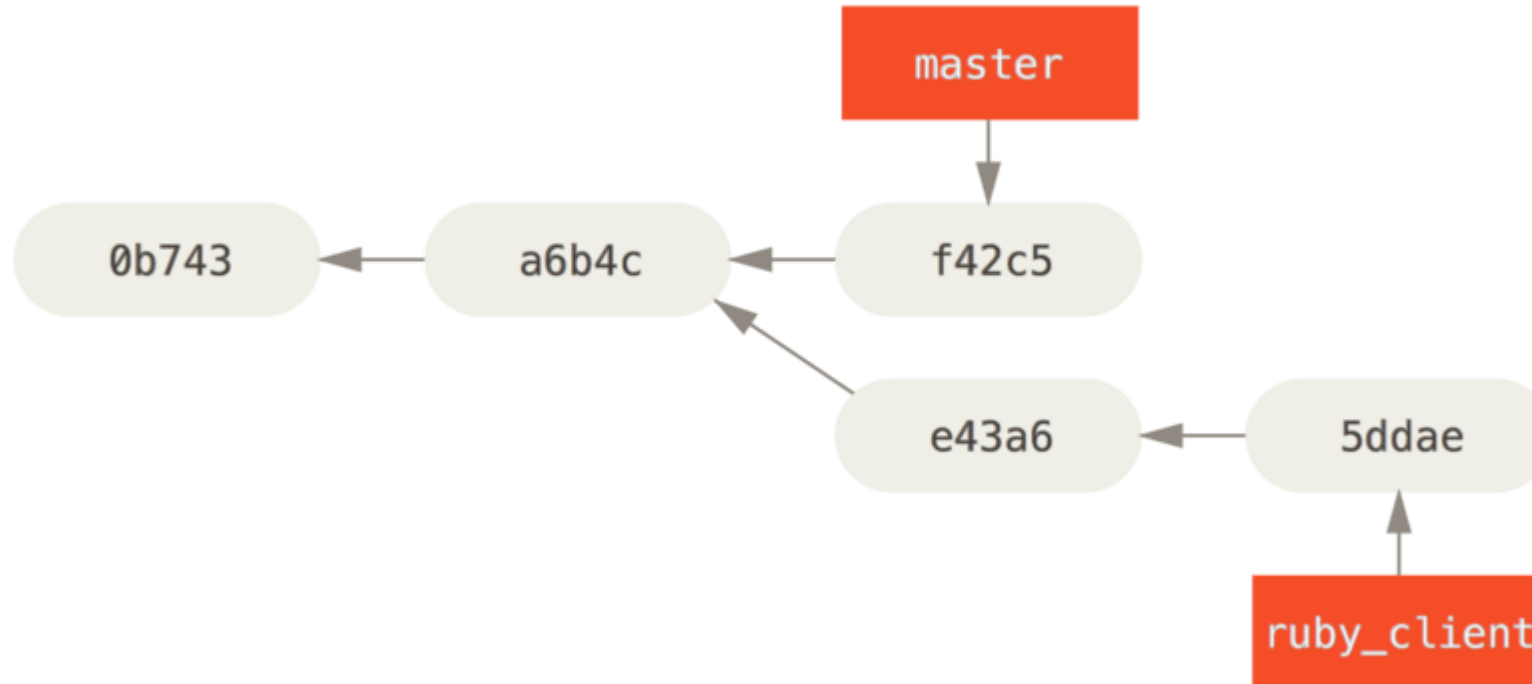
branches: master origin/master

Branching and Merging

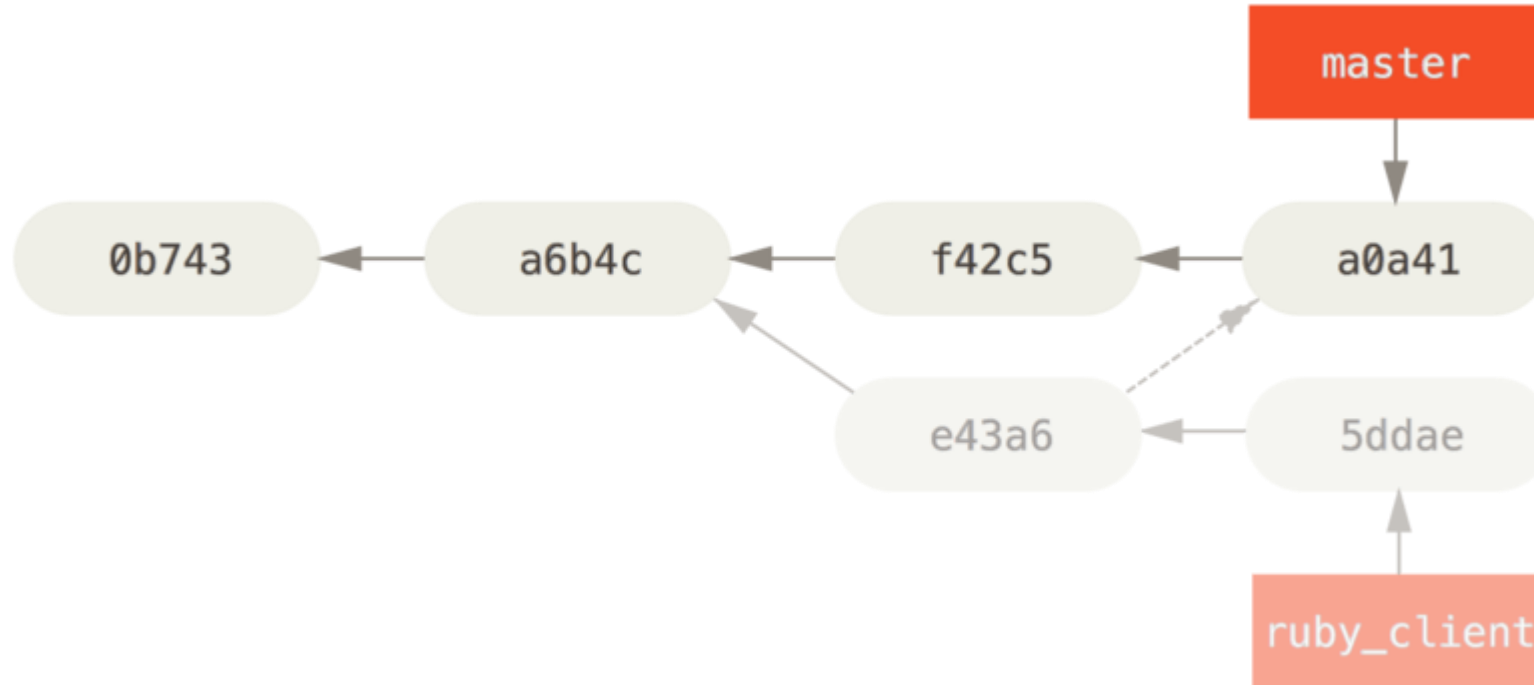


image source= <https://git-scm.com/about>

Cherry-picking



Cherry-picking



Git hooks

- To install a git hook, just put an executable file in the hooks directory
- The name of the file is the hook
- Example, to install a post-receive hook, do this from the `.git/hooks` directory (depending on how you created the repository, the hooks directory may need to be created)

```
$ touch post-receive
$ chmod 755 post-receive
```

- Then, populate the file with the commands needed

git hooks (<https://git-scm.com/docs/githooks>)

- applypatch-msg
- pre-applypatch
- post-applypatch
- pre-commit
- prepare-commit-msg
- commit-msg
- post-commit
- pre-rebase
- post-checkout
- post-merge
- pre-push
- pre-receive
- update
- post-receive
- post-update
- push-to-checkout
- pre-auto-gc
- post-rewrite
- rebase

Two Best Attributes of Git?

1. The efficiency of branching and merging



2. The integration with the rest of the ecosystem

- Jenkins
- Jira
- Custom git hooks
- Visual Studio Code
- Git-based websites (GitHub, BitBucket, GitLab, etc)
- GitHub Desktop
- Rational Developer for i



Git installation and configuration

How to install Git client on IBM i

- Installing git is easy!
- It can be installed simply with your package manager
- In this particular example git is installed directly on an IBM i, but it can be installed anywhere

```
-bash-5.2$ yum install git
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package git.ppc64 0:2.39.3-3 will be installed
--> Finished Dependency Resolution

Dependencies Resolved


```

Package	Arch	Version	Repository	Size
Installing: git	ppc64	2.39.3-3	ibmi-base	13 M

```
Transaction Summary

Install      1 Package

Total size: 13 M
Installed size: 13 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : git-2.39.3-3.ppc64                                1/1

Installed:
  git.ppc64 0:2.39.3-3

Complete!
```

Configure your git name and email

- Use the git config command to configure the email address and name that will be associated with your commits
- If you want to configure a specific project to use a different email or name than the globally configured one, run the git config command without the --global option

```
-bash-5.2$ git config --global user.email Jonathan.Zak@ibm.com  
-bash-5.2$ git config --global user.name "Jonathan Zak"
```

Git Basics

Staging a file

- git add

```
● → gitDemo git:(main) x git status
```

```
On branch main
```

```
No commits yet
```

```
Untracked files:
```

```
(use "git add <file>..." to include in what will be committed)
```

```
helloWorld.js
```

```
nothing added to commit but untracked files present (use "git add" to track)
```

```
● → gitDemo git:(main) x git add helloWorld.js
```

```
● → gitDemo git:(main) x git status
```

```
On branch main
```

```
No commits yet
```

```
Changes to be committed:
```

```
(use "git rm --cached <file>..." to unstage)
```

```
new file:   helloWorld.js
```

Committing a change

- git commit

```
JS helloWorld.js ×
```

```
JS helloWorld.js
```

```
1 console.log("Hello world!");
```

PROBLEMS

TERMINAL

DEBUG CONSOLE

PORTS

IBM I JOB LOG

```
● → gitDemo git:(main) x git commit -m "Added helloWorld.js"  
[main (root-commit) 9313080] Added helloWorld.js  
1 file changed, 1 insertion(+)  
create mode 100644 helloWorld.js
```

Pushing a change to remote

- Git push (complex example)

```
→ gitDemo git:(main) git remote add origin https://github.com/jonnyz32/gitdemo.git
→ gitDemo git:(main) git push
fatal: The current branch main has no upstream branch.
To push the current branch and set the remote as upstream, use

    git push --set-upstream origin main

To have this happen automatically for branches without a tracking
upstream, see 'push.autoSetupRemote' in 'git help config'.

→ gitDemo git:(main) git push --set-upstream origin main
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Writing objects: 100% (3/3), 251 bytes | 251.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/jonnyz32/gitdemo.git
 * [new branch]      main -> main
branch 'main' set up to track 'origin/main'.
```

Some popular commands

- Clone: Clone a remote repo to your local system
- Init: Initialize a new git project
- Status: Show the current status
- Add: add file(s) to staging area
- Commit: Commit files in staging area
- Push: Push code to remote git repo
- Merge: Pull changes from another branch onto current branch
- Remote add: Add a remote repo
- Checkout: Checkout a branch or commit
- Branch: Work with branches
- Pull: Pull updates from remote branch onto your local system

Git workflow on IBM i

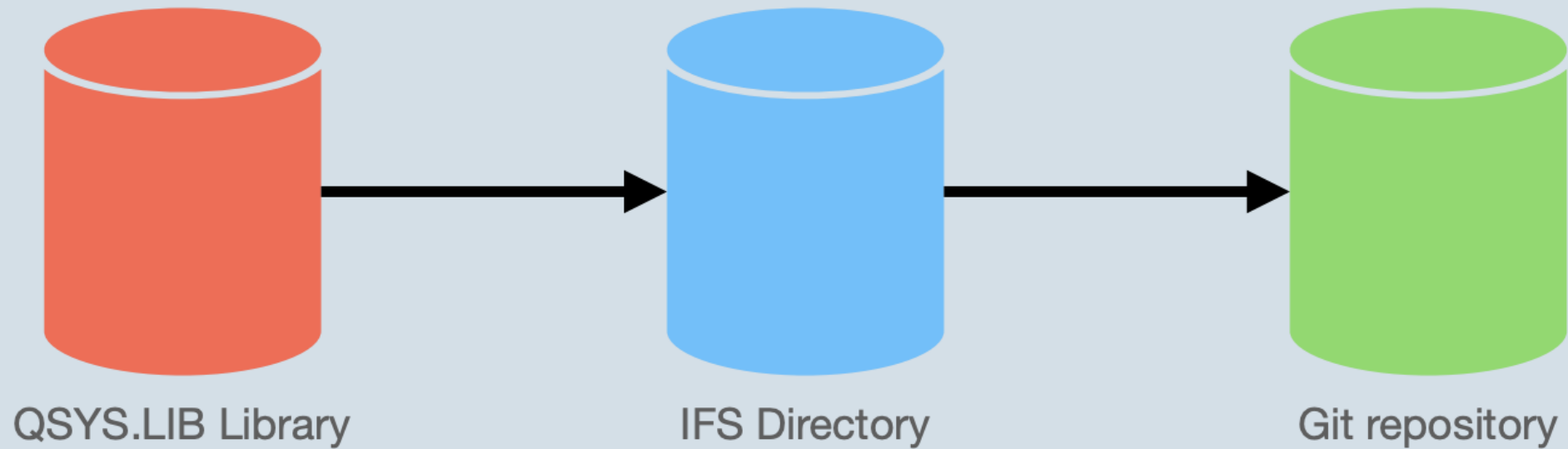
Can we use the same Git strategy on QSYS?

```
-bash-5.2$ ls -lrt  
total 72  
-rwx---rwx 1 reinhard 0 51714 Sep 18 2023 PAYROLL.MBR  
-bash-5.2$ git init  
/QSYS.LIB/PAYROLLORG.LIB/QRPGLESRC.FILE/.git: Error 3014 occurred.
```

No! Git only works in UNIX like environments

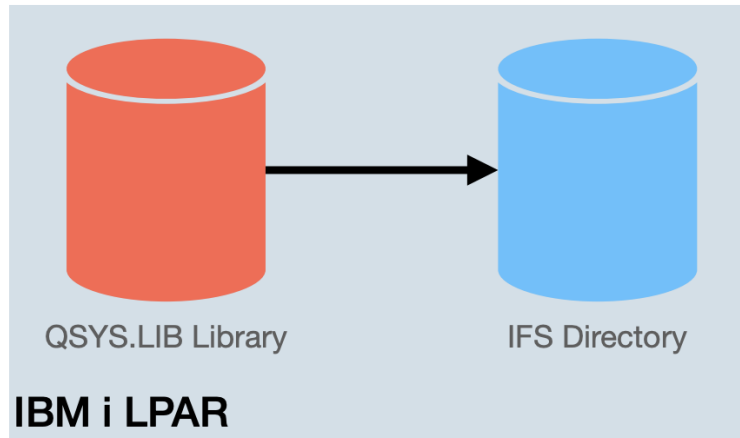
- In that case, we need some way to migrate our QSYS files to the IFS
- CPYTOSTMF
- MIGSRCPF
- BOB: <https://ibm.github.io/ibmi-bob/#/>
- Source orbit: <https://ibm.github.io/sourceorbit/#/>
- Vendor tools
- (many other approaches...)

Moving source code into Git



IBM i LPAR

From QSYS to IFS



CPYTOSTMF

```
CPYTOSTMF  
FROMMBR('/QSYS.lib/DEVLIB.lib/QRPGLESRC.file/PROGRAMA.mbr')  
TOSTMF('/home/barry/myproject/qrpglesrc/programa.rpgle')  
STMFOPT(*REPLACE) STMFCCSID(1208)
```

ibmi-tobi cvtsrcpf (FOSS)

```
cd myproject/qrpglesrc  
makei cvtsrcpf qrpglesrc testproj
```

Migrate Tool (FOSS)

```
MIGSRC PF LIBRARY(TESTPROJ) SOURCEPF(QRPGLESRC)  
OUTDIR('/home/BARRY/myproject')
```

Vendor tools

Converting source physical members

- We can use TOBi to convert source physical members to source code files on the IFS
- `makei cvtsrcpf [-h] [-t] [-c <CCSID>] <file> <library>`

```
-bash-5.2$ cd PAYROLLORG
-bash-5.2$ makei cvtsrcpf -t QRPGLSRC PAYROLLORG
1 source members found.
Converting PAYROLL to PAYROLL.RPGLE
> CPYTOSTMF FROMMBR('/QSYS.LIB/PAYROLLORG.LIB/QRPGLSRC.FILE/PAYROLL.MBR') TOSTMF('/home/jonathan/PAYROLLORG/PAYROLL.RPGLE')
ENDLINFMT(*LF) STMFCSSID(1208) STMFOPT(*REPLACE)
Successfully imported member text!
-bash-5.2$ ls -lrt
total 32
-rwx----- 1 jonathan 0 13978 Oct 22 13:25 PAYROLL.RPGLE
-bash-5.2$ git init
hint: Using 'master' as the name for the initial branch. This default branch name
hint: is subject to change. To configure the initial branch name to use in all
hint: of your new repositories, which will suppress this warning, call:
hint:
hint:     git config --global init.defaultBranch <name>
hint:
hint: Names commonly chosen instead of 'master' are 'main', 'trunk' and
hint: 'development'. The just-created branch can be renamed via this command:
hint:
hint:     git branch -m <name>
Initialized empty Git repository in /home/jonathan/PAYROLLORG/.git/
```

And now it's just like a regular git repo...

- Any git command will work in the IFS

```
-bash-5.2$ cd PAYROLLORG
-bash-5.2$ makei cvtsrcpf -t QRPGLSRC PAYROLLORG
1 source members found.
Converting PAYROLL to PAYROLL.RPGLE
> CPYTOSTMF FROMMBR('/QSYS.LIB/PAYROLLORG.LIB/QRPGLSRC.FILE/PAYROLL.MBR') TOSTMF('/home/jonathan/PAYROLLORG/PAYROLL.RPGLE')
ENDLINFMT(*LF) STMFCCSID(1208) STMFOPT(*REPLACE)
Successfully imported member text!
-bash-5.2$ ls -lrt
total 32
-rwx----- 1 jonathan 0 13978 Oct 22 13:25 PAYROLL.RPGLE
-bash-5.2$ git init
hint: Using 'master' as the name for the initial branch. This default branch name
hint: is subject to change. To configure the initial branch name to use in all
hint: of your new repositories, which will suppress this warning, call:
hint:
hint:     git config --global init.defaultBranch <name>
hint:
hint: Names commonly chosen instead of 'master' are 'main', 'trunk' and
hint: 'development'. The just-created branch can be renamed via this command:
hint:
hint:     git branch -m <name>
Initialized empty Git repository in /home/jonathan/PAYROLLORG/.git/
```

Setting up a private Git server

Git client / Git hosting service

□ Git client

Git client is used to interact with hosted Git repositories.

<https://git-scm.com/downloads>

<https://git-scm.com/book/en/v2>

<https://www.atlassian.com/git>

□ Git hosting service

- GitHub – Third party hosted, more features available, offers enterprise solutions
- GitBucket – Self hosted, better for privacy, more customizability, opensource, can be run on IBM i
- GitLab – Self hosted, better for privacy, more customizability, AI integration, community and enterprise options available

Git server options

Option	Key Features	Best For
GitHub	<ul style="list-style-type: none">- Public/private repos- GitHub Actions (CI/CD)- Large community support	Open-source, collaborative projects
GitLab	<ul style="list-style-type: none">- Self-hosting available- Integrated CI/CD- DevOps-friendly tools	Enterprises, CI/CD workflows
GitBucket	<ul style="list-style-type: none">- Lightweight, self-hosted Git solution- Extensible with plugins- Easy to set up	Small teams, self-hosted environments

Installing GitLab CE in a container environment

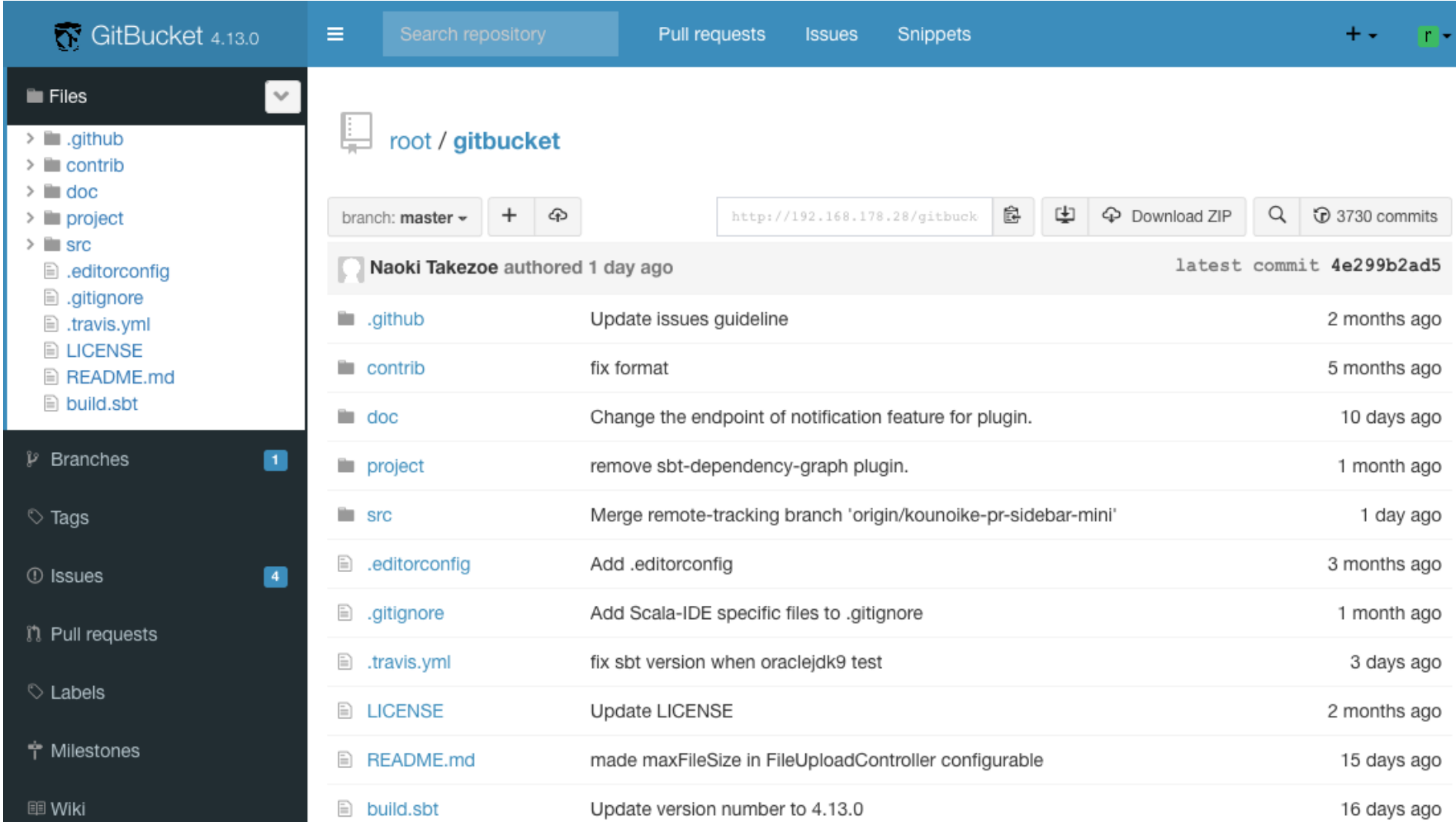
```
podman run --name gitlab -p 80:80 -p 443:443 -p 22:22 -v  
./config:/etc/gitlab -v ./data:/var/opt/gitlab -v  
./logs:/var/log/gitlab gitlab/gitlab-ce:latest
```

Main aspects:

- --name
- -p
- -v
- Tag name

```
podman exec -it gitlab gitlab-rake "gitlab:password:reset[root]"
```

Today we will explore GitBucket



The screenshot displays the GitBucket 4.13.0 interface. The top navigation bar includes a search bar, links for Pull requests, Issues, and Snippets, and a user profile icon. The left sidebar shows a file tree with folders like .github, contrib, doc, project, and src, and files like .editorconfig, .gitignore, .travis.yml, LICENSE, README.md, and build.sbt. The main content area shows the repository 'root / gitbucket' with a branch selector set to 'master', a URL 'http://192.168.178.28/gitbucket', and a 'Download ZIP' button. Below this, a commit by Naoki Takezoe is highlighted, followed by a list of recent commits and files.

File	Commit Message	Time Ago
.github	Update issues guideline	2 months ago
contrib	fix format	5 months ago
doc	Change the endpoint of notification feature for plugin.	10 days ago
project	remove sbt-dependency-graph plugin.	1 month ago
src	Merge remote-tracking branch 'origin/kounoike-pr-sidebar-mini'	1 day ago
.editorconfig	Add .editorconfig	3 months ago
.gitignore	Add Scala-IDE specific files to .gitignore	1 month ago
.travis.yml	fix sbt version when oraclejdk9 test	3 days ago
LICENSE	Update LICENSE	2 months ago
README.md	made maxFileSize in FileUploadController configurable	15 days ago
build.sbt	Update version number to 4.13.0	16 days ago

How to download GitBucket

- Go to the GitBucket releases page
<https://github.com/gitbucket/gitbucket/releases>
- Copy the link address of the latest war file

May 18
takezoe
4.41.0
598f289
Compare

4.41.0 Latest

- Simplify pull request UI
- Keyword search for issues and pull requests
- New settings for max files and lines limit in showing diff
- Adjust the default branch automatically when cloning external repository
- Fix layout of branch selector
- Performance improvement for listing branches
- Upgrade internal libraries

▼ Assets 6

gitbucket.war	74.8 MB	May 18
gitbucket.war	32 Bytes	May 18
gitbucket.war	40 Bytes	May 18
gitbucket.war	64 Bytes	May 18
Source code		May 18
Source code		May 18

9 people reacted

How to download GitBucket

- Login to your IBM i using an ssh terminal
- Use wget to download the war file

```
-bash-5.2$ wget https://github.com/gitbucket/gitbucket/releases/download/4.41.0/gitbucket.war
--2024-09-09 17:19:24-- https://github.com/gitbucket/gitbucket/releases/download/4.41.0/gitbucket.war
Resolving github.com... 140.82.112.3
Connecting to github.com|140.82.112.3|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/9350746/faa5a869-4bd0-4881-ae82-d719785ed0fd?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=releaseassetproduction%2F20240909%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20240909T171925Z&X-Amz-Expires=300&X-Amz-Signature=5543668302a050979915a844241cc36b784dbadb168172c79c659ad5c5efe01c&X-Amz-SignedHeaders=host&actor_id=0&key_id=9350746&response-content-disposition=attachment%3B%20filename%3Dgitbucket.war&response-content-type=application%2Foctet-stream [following]
--2024-09-09 17:19:24-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/9350746/faa5a869-4bd0-4881-ae82-d719785ed0fd?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=releaseassetproduction%2F20240909%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20240909T171925Z&X-Amz-Expires=300&X-Amz-Signature=5543668302a050979915a844241cc36b784dbadb168172c79c659ad5c5efe01c&X-Amz-SignedHeaders=host&actor_id=0&key_id=9350746&response-content-disposition=attachment%3B%20filename%3Dgitbucket.war&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com... 185.199.111.133, 185.199.108.133, 185.199.109.133, ...
Connecting to objects.githubusercontent.com|185.199.111.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 78454565 (75M) [application/octet-stream]
Saving to: 'gitbucket.war'

gitbucket.war          100%[=====>] 74.82M  2.34MB/s   in 32s

2024-09-09 17:19:57 (2.34 MB/s) - 'gitbucket.war' saved [78454565/78454565]
```

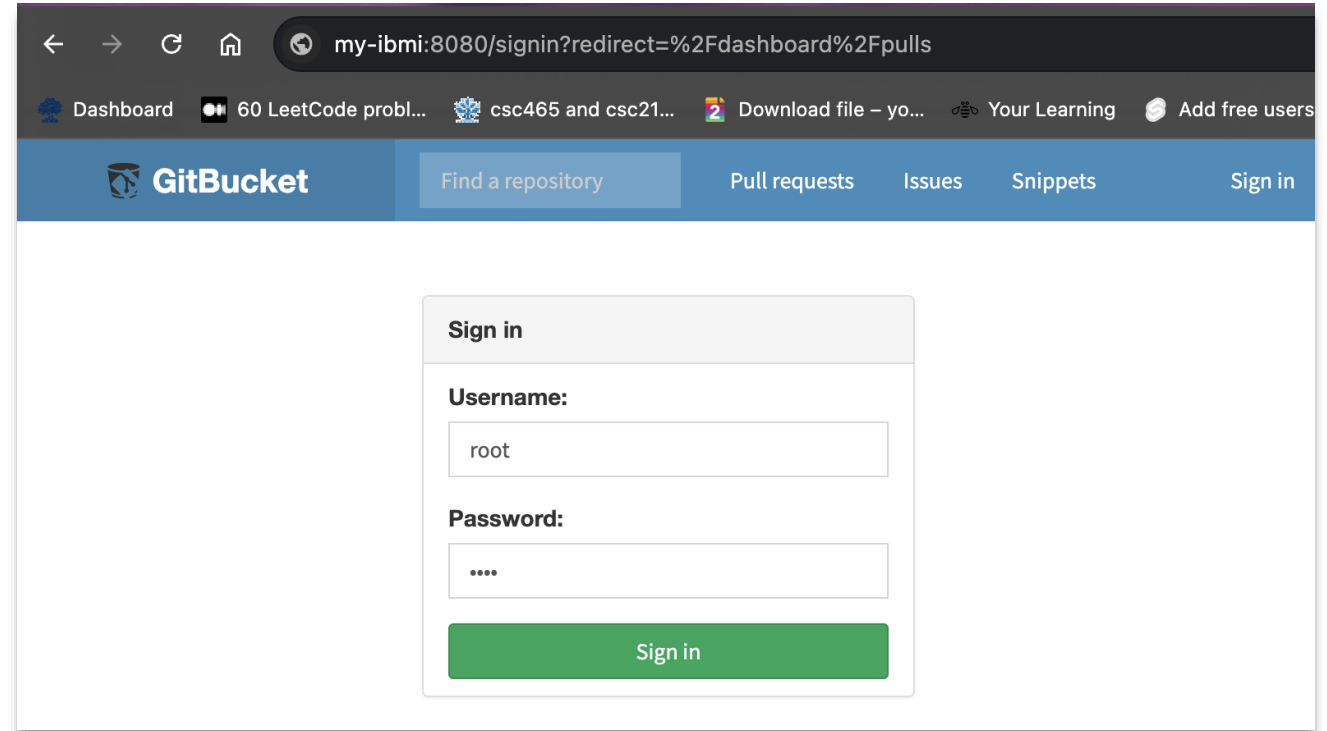
How to run GitBucket

- Now that you've downloaded GitBucket, it is time to launch it
- Using Java 11 or higher, run the command `java -jar gitbucket.war`
- Ignore SIGHUP with a program such as nohup,
or <https://github.com/ThePrez/ServiceCommander-IBMi>

```
-bash-5.2$ /QOpenSys/QIBM/ProdData/JavaVM/jdk17/64bit/bin/java -jar gitbucket.war
SLF4J: No SLF4J providers were found.
SLF4J: Defaulting to no-operation (NOP) logger implementation
SLF4J: See https://www.slf4j.org/codes.html#noProviders for further details.
17:29:18.650 [main] INFO com.zaxxer.hikari.HikariDataSource - HikariPool-1 - Starting...
17:29:19.331 [main] INFO com.zaxxer.hikari.pool.HikariPool - HikariPool-1 - Added connection conn0: url=jdbc
c:h2:/home/ZAKJONAT/.gitbucket/data user=SA
17:29:19.336 [main] INFO com.zaxxer.hikari.HikariDataSource - HikariPool-1 - Start completed.
17:29:19.407 [main] INFO g.core.servlet.InitializeListener - Check version
17:29:19.407 [main] INFO g.core.servlet.InitializeListener - Start schema update
17:29:19.659 [main] INFO g.core.servlet.InitializeListener - Extract bundled plugins...
17:29:19.706 [main] INFO g.core.servlet.InitializeListener - Extract to /home/ZAKJONAT/.gitbucket/plugins/g
itbucket-notifications-plugin-1.11.0.jar
```

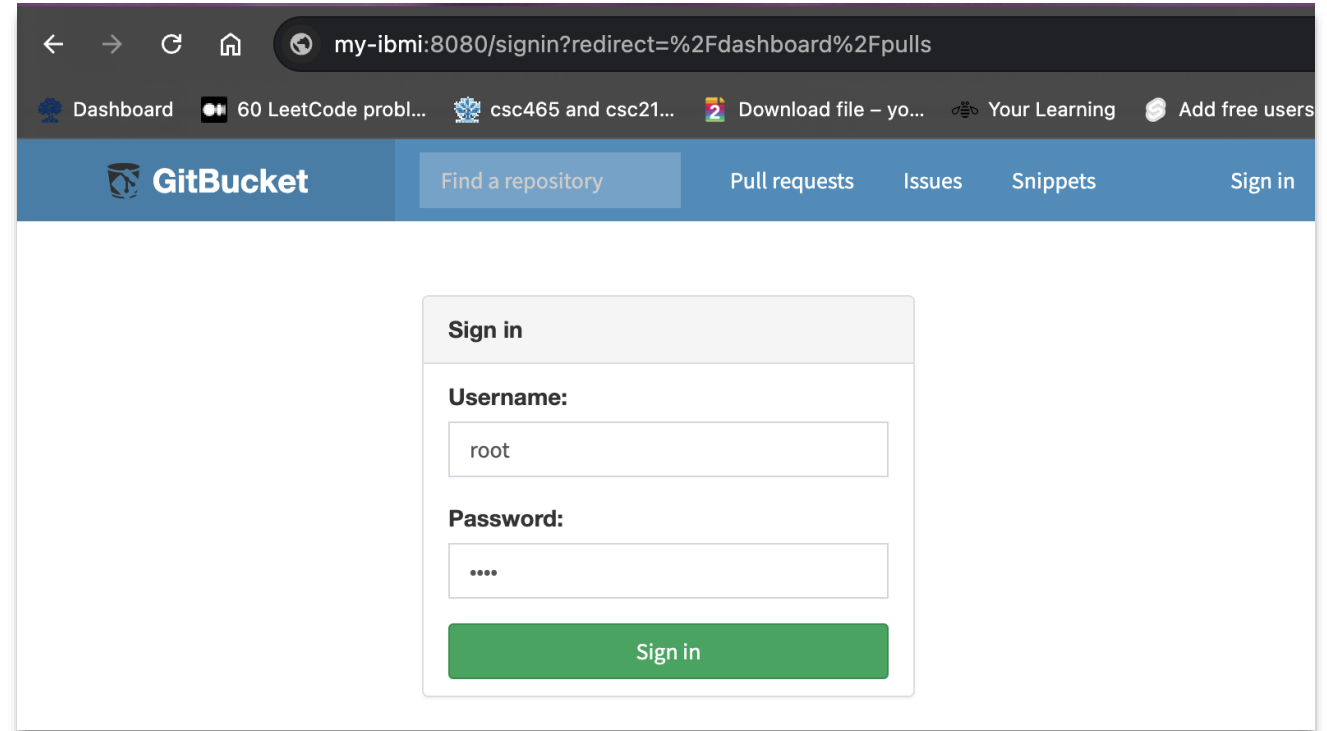
Access GitBucket from your local computer

- To access gitbucket, go to the url `http://<IBMi-hostname>:8080` (replace <IBMi-hostname> with the hostname of the IBM i running GitBucket)
- Login using the default credentials



How to run GitBucket over https

- Configure an application server such as Tomcat or WildFly to use HTTPS that will host the GitBucket application
- Use a reverse proxy such as nginx, caddy, httpd



Change your password

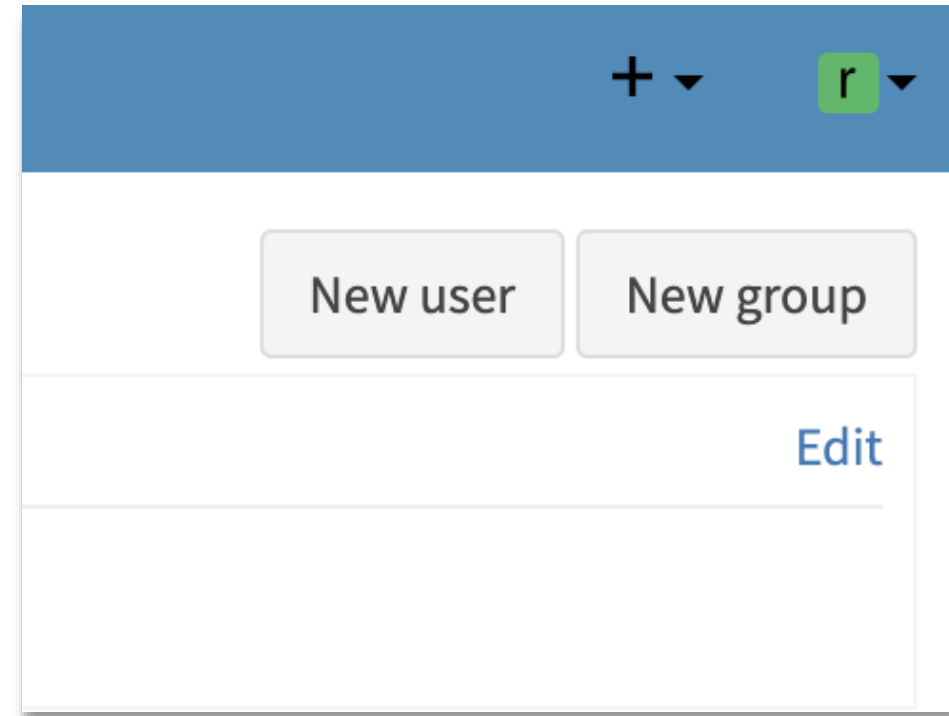
- Go to Account settings to change the root password

Profile

Password (input to change password): <input type="password"/>	Image (optional): <div style="border: 1px dashed gray; padding: 10px; text-align: center;">Upload Image</div>
Full Name: <input type="text" value="root"/>	
Mail Address: <input type="text" value="root@localhost"/>	
Additional Mail Address: <input type="text"/>	
URL (optional): <input type="text" value="https://github.com/gitbucket/gitbucket"/>	
Bio (optional): <input type="text"/>	

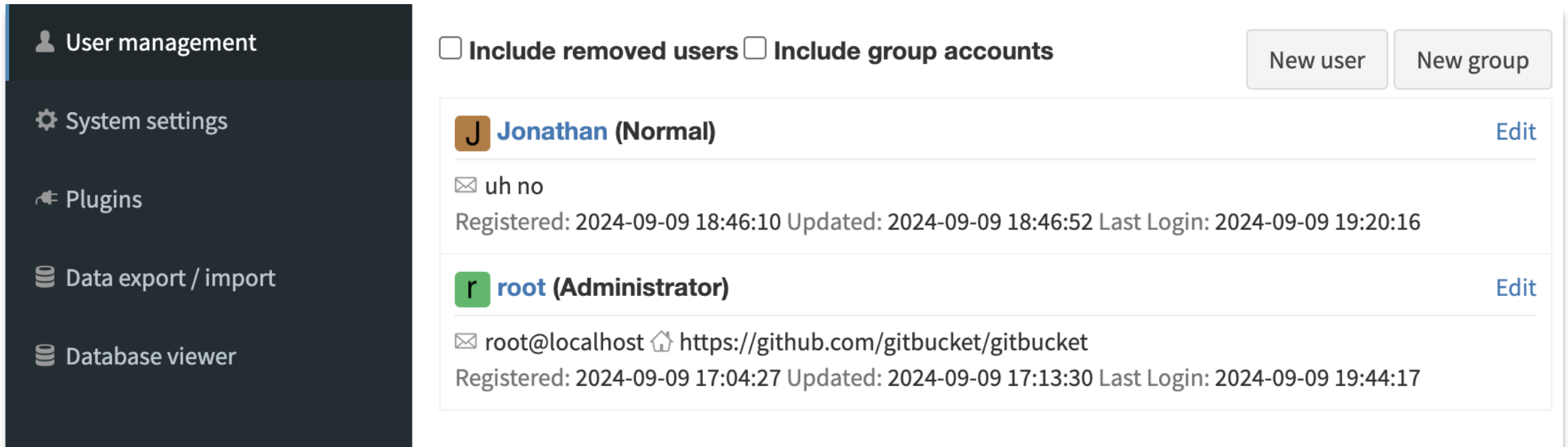
Add users, and groups to your organization

- From the System administration page you can add a new user or a new group
- A group is a collection of users and repositories where each user is able to view each repository



Create a user

- Click the "New user" button



The screenshot shows a user management interface. On the left is a dark sidebar with navigation options: "User management" (selected), "System settings", "Plugins", "Data export / import", and "Database viewer". The main content area has two checkboxes: "Include removed users" and "Include group accounts", both unchecked. To the right are two buttons: "New user" and "New group". Below these are two user entries. The first entry is for "Jonathan (Normal)" with a blue 'J' icon, email "uh no", and login history: "Registered: 2024-09-09 18:46:10 Updated: 2024-09-09 18:46:52 Last Login: 2024-09-09 19:20:16". The second entry is for "root (Administrator)" with a green 'r' icon, email "root@localhost", and home directory "https://github.com/gitbucket/gitbucket", with login history: "Registered: 2024-09-09 17:04:27 Updated: 2024-09-09 17:13:30 Last Login: 2024-09-09 19:44:17". Each entry has an "Edit" link on the right.

Create a user

- Fill in the information and click "Create group"

Username:

Password :

Full Name:

Mail Address:

Additional Mail Address:

User Type:

Normal

Administrator

URL (Optional):

Bio (Optional):

Image (Optional)

Upload Image

Using IBM i auth (LDAP)

LDAP host	localhost
LDAP port	389
Bind DN	os400-profile=JGORZINS
Bind password	*****
Base DN	os400-sys=idevphp.idevcloud.com
User name attribute	os400-profile

Create a group

- Click the "New group" button

The screenshot displays the user management interface. On the left is a dark sidebar with navigation items: "User management" (selected), "System settings", "Plugins", "Data export / import", and "Database viewer". The main content area has two checkboxes: "Include removed users" and "Include group accounts". To the right are "New user" and "New group" buttons. Below these are two user entries:

<input type="checkbox"/> Include removed users	<input type="checkbox"/> Include group accounts	New user	New group
J Jonathan (Normal)	Edit		
✉ uh no	Registered: 2024-09-09 18:46:10 Updated: 2024-09-09 18:46:52 Last Login: 2024-09-09 19:20:16		
r root (Administrator)	Edit		
✉ root@localhost 🏠 https://github.com/gitbucket/gitbucket	Registered: 2024-09-09 17:04:27 Updated: 2024-09-09 17:13:30 Last Login: 2024-09-09 19:44:17		

Create a group

- Add members and click “Create group”

Group name
hello-world-members

URL (Optional)

Description (Optional)

Image (Optional)
Upload Image

Members

Member	Manager	Jonathan	×
Member	Manager	root	×

Add

Create group Cancel


Add a repo

- From the new repository page, there are several options provided to you to add a new repo

Create a new repository

A repository contains all your project's files, including revision history.

Owner

 root ▾

Repository name

Description (optional):

 **Public**

Anyone can see this repository. You choose who can commit.

 **Private**

You choose who can see and commit to this repository.

Create an empty repository

Create an empty repository. You must initialize it yourself.

Initialize this repository with an empty commit

Create an empty repository with an empty commit. You can clone the repository immediately.

Initialize this repository with a README

Create a repository and commit README.md. You can clone the repository immediately.

Copy existing git repository

Create a new repository by cloning an existing git repository.

Source git repository URL...

Create repository

An example of how to push a new repository

- In this case, I've selected the option "Create an empty repository" because I have local source code I would like to check in
- The source code can be added to GitBucket by running the commands shown on the screen

 root / [hello-world](#)

Quick setup — if you've done this kind of thing before
via [HTTP](#)

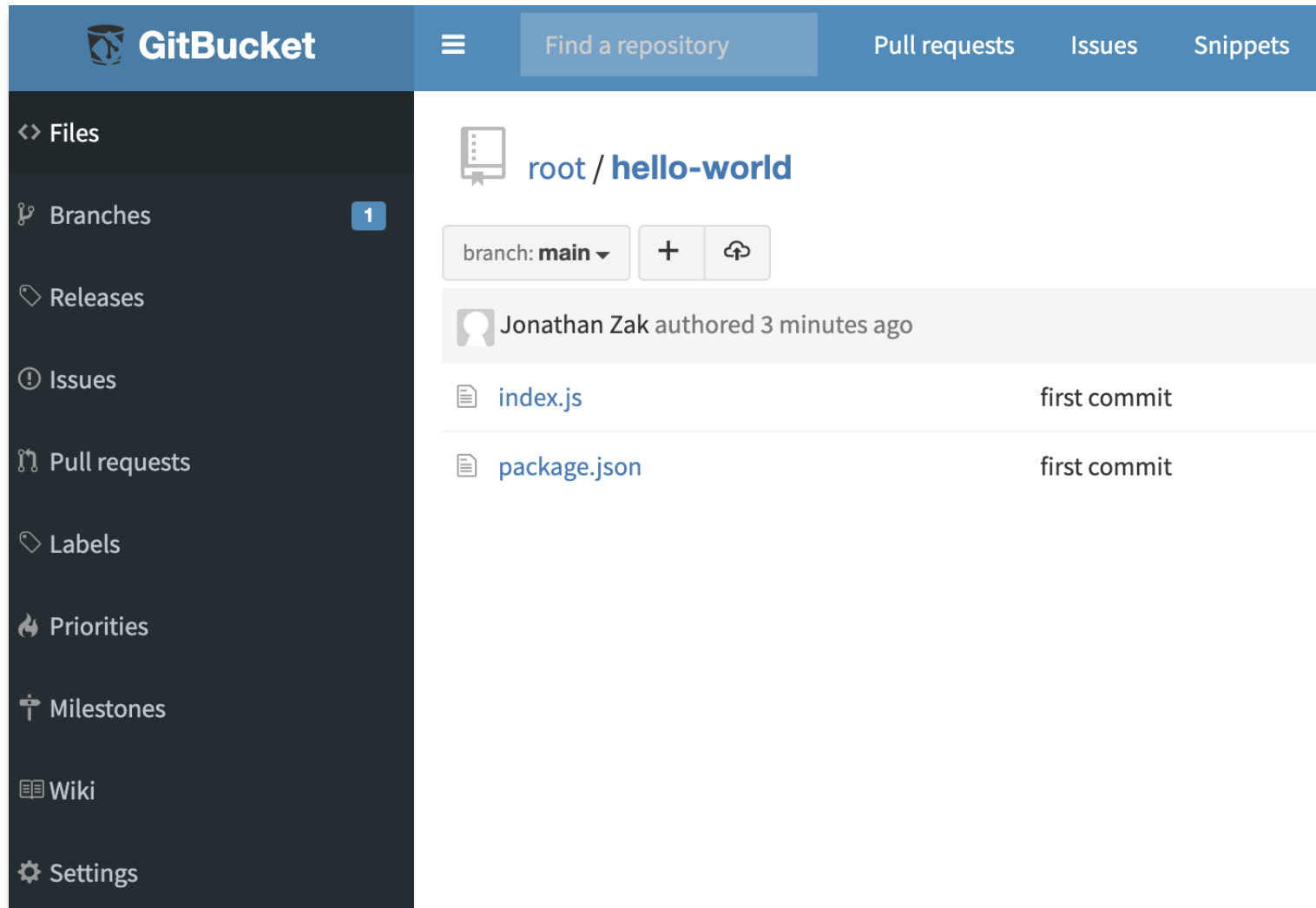
Create a new repository from the command line

```
touch README.md
git init
git add README.md
git commit -m "first commit"
git remote add origin http://p9adt02.rch.stglabs.ibm.com:8080/git/root/hello-world.git
git push -u origin main
```

Push an existing repository from the command line

```
git remote add origin http://p9adt02.rch.stglabs.ibm.com:8080/git/root/hello-world.git
git push -u origin main
```

All setup now



The screenshot displays the GitBucket web interface. The top navigation bar includes the GitBucket logo, a search bar with the text "Find a repository", and links for "Pull requests", "Issues", and "Snippets". The left sidebar contains navigation options: "Files", "Branches" (with a notification badge "1"), "Releases", "Issues", "Pull requests", "Labels", "Priorities", "Milestones", "Wiki", and "Settings". The main content area shows the repository path "root / hello-world" and a "branch: main" dropdown. Below this, a commit message reads "Jonathan Zak authored 3 minutes ago". A list of files is shown with their commit status:

File	Commit Status
index.js	first commit
package.json	first commit

Add a collaborator

- From the repository settings page, add individual collaborators or groups
- Click “Add”, set the access level, then “Apply changes”

The screenshot displays the GitHub repository settings interface for a repository named 'root / hello-world'. On the left is a dark sidebar with navigation links: Files, Branches (with a notification badge '1'), Releases, Issues, Pull requests, Labels, Priorities, Milestones, Wiki, and Settings. The main content area has a header with 'Watching' and 'Fork: 0' buttons. Below the header are tabs for 'Options', 'Collaborators' (selected), 'Branches', 'Issues', 'Service Hooks', and 'Deploy Keys'. There are also links for 'Danger Zone' and 'Pages'. The 'Collaborators' section shows a list of collaborators with roles: Admin, Developer, Guest, and 'jonathan'. A '(remove)' link is next to 'jonathan'. Below the list is an input field and an 'Add' button. The 'Groups' section below it also has an input field and an 'Add' button. At the bottom right, there is a prominent green 'Apply changes' button.

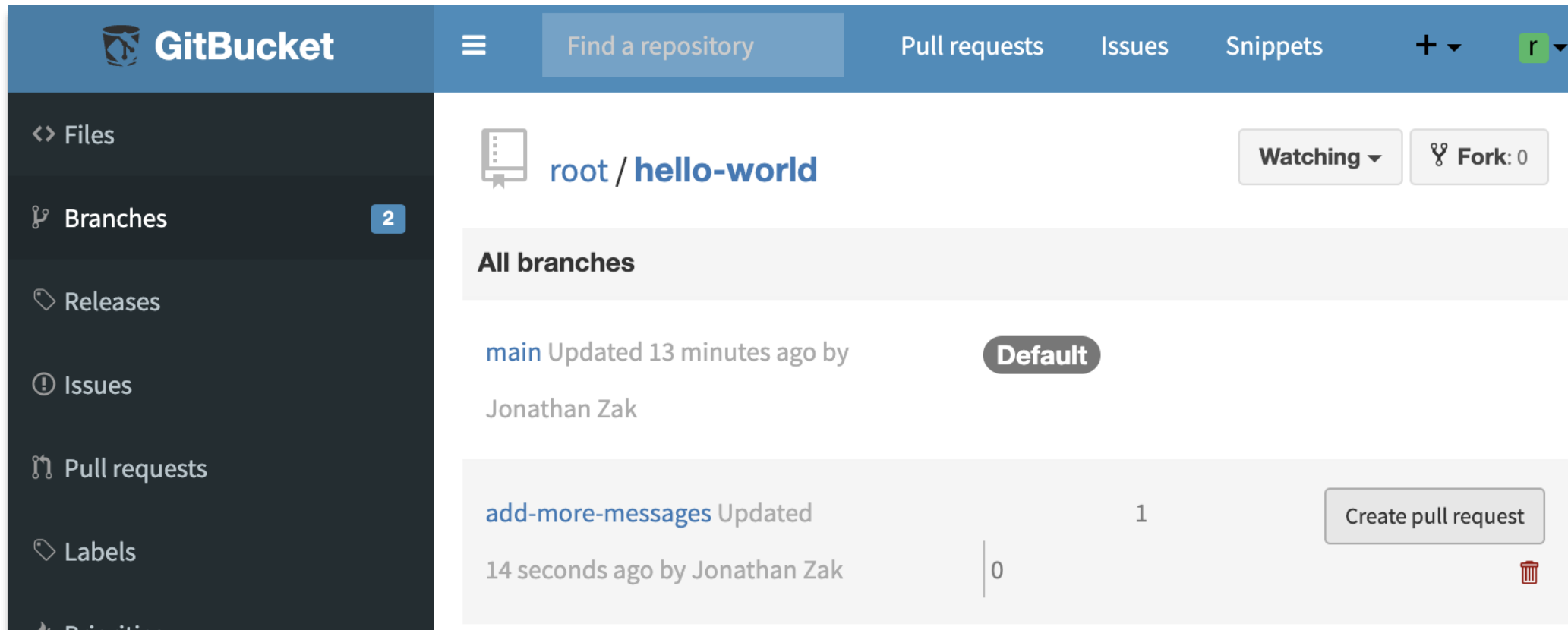
Add a group collaborator

- Everyone in the hello-world-members group will be able to contribute to the hello-world repo

The screenshot shows the GitHub repository settings for 'root / hello-world'. The 'Collaborators' tab is selected, and the 'Groups' section is active. The 'Groups' section shows a search input with 'hello-world-membe' and an 'Add' button. A dropdown menu is open, showing the suggestion '@hello-world-members hello-world-members'. Below this, there is a green 'Apply changes' button. The 'Collaborators' section shows a list of collaborators with roles: Admin, Developer, Guest, and Jonathan. Below this, there is an 'Add' button. The 'Groups' section shows a list of groups with roles: Admin, Developer, Guest, and hello-world-members. Below this, there is an 'Add' button. A second green 'Apply changes' button is visible at the bottom right of the 'Groups' section.

Creating a pull request

- From the branches tab, click “Create pull request” on the branch for which you would like to create a pull request



The screenshot shows the GitBucket web interface for a repository named 'root / hello-world'. The left sidebar contains navigation links for Files, Branches (with a '2' badge), Releases, Issues, Pull requests, and Labels. The main content area displays the repository name and a 'Watching' button. Below this, a section titled 'All branches' lists the following branches:

Branch Name	Updated	Author	Default	Count	Action
main	Updated 13 minutes ago by	Jonathan Zak	Default		
add-more-messages	Updated 14 seconds ago by	Jonathan Zak		1	Create pull request

Creating a pull request

- Add a description, and hit “Create pull request”

The screenshot shows the GitHub web interface for creating a pull request. The repository is 'root/hello-world'. The base branch is 'main' and the head branch is 'add-more-messages'. A green checkmark indicates the pull request is 'Able to merge'. The description field contains the text: '- Print "Goodbye world!" after "Hello World!"'. The 'Create pull request' button is visible at the bottom right.

Add comments

- From the Files Changed tab, add comments next to a particular line

The screenshot shows a GitHub pull request interface for a repository named 'root / hello-world'. The pull request title is 'add more messages #1'. It shows a merge by Jonathan 13 minutes ago. The 'Files Changed' tab is active, showing a diff for 'index.js'. The diff shows two lines of code: '1 console.log("Hello world!");' and '2 console.log("Goodbye world!");'. The second line is highlighted in green. Below the diff is a comment box with a 'Write' tab selected and a 'Preview' tab. The comment text is 'Nice change'. There are 'Cancel' and 'Comment' buttons at the bottom right of the comment box.

root / [hello-world](#) Watching Fork: 0

[add more messages #1](#) Edit New pull request

Merged Jonathan merged 1 commit into [root:main](#) from [root:add-more-messages](#) 13 minutes ago

[Conversation](#) **1** [Commits](#) **1** [Files Changed](#) **1**

Showing 1 changed file Patch Unified Split

1 Ignore Space Show notes View

1 console.log("Hello world!");
2 console.log("Goodbye world!");

Write Preview

Nice change

Attach images or documents by dragging & dropping, or selecting them.

Cancel Comment

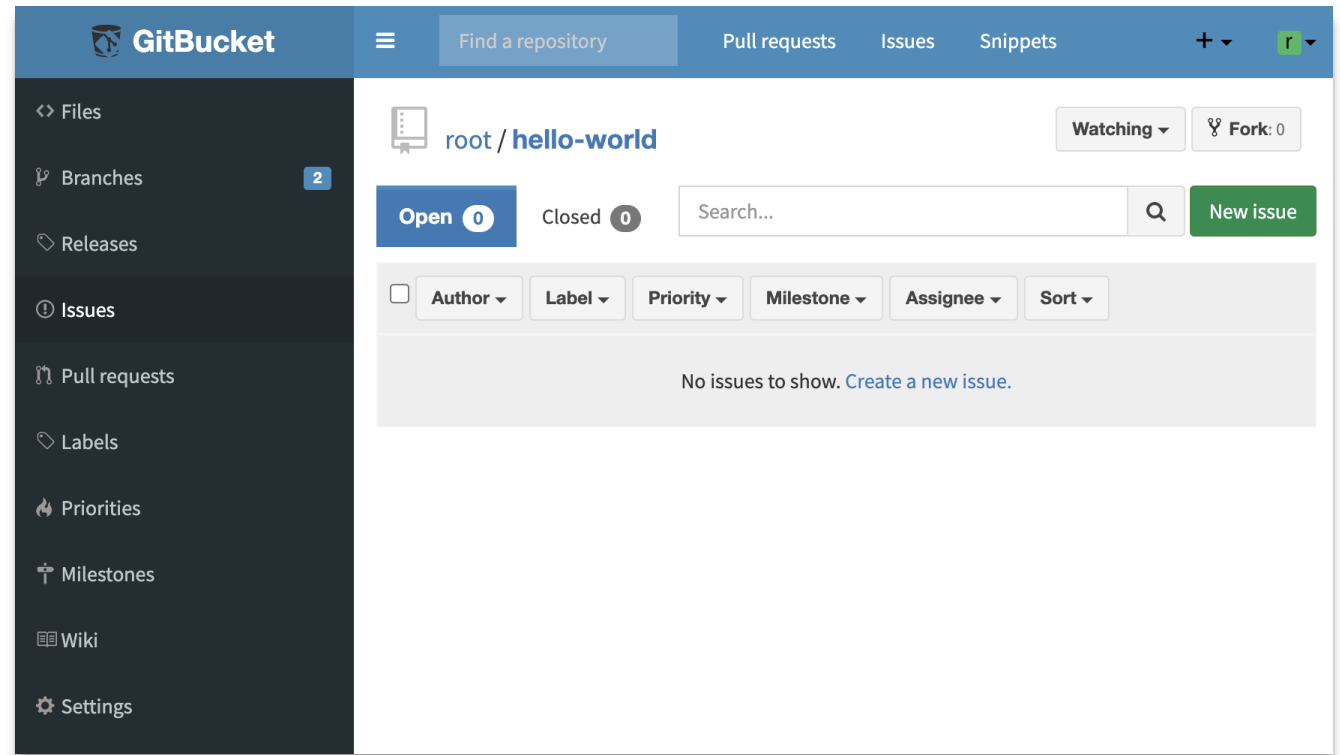
Merge the PR

- Another user with review authority, is allowed to perform merges

The screenshot shows a GitHub pull request for the repository 'root / hello-world'. The title is 'add more messages #1'. The pull request is open, showing that 'root' wants to merge 1 commit into 'root:main' from 'root:add-more-messages'. The interface includes tabs for 'Conversation' (0), 'Commits' (1), and 'Files Changed' (1). A comment from 'root' 17 minutes ago states: 'Print "Goodbye world!" after "Hello World!"'. Below this, 'root' assigned 'Jonathan' 9 minutes ago, and 'Jonathan' unassigned 'Jonathan' 16 seconds ago. A green checkmark indicates 'Merging can be performed automatically.' with a button to 'Create a merge commit'. The right sidebar shows settings for Labels (None yet), Priority (default), Milestone (No milestone), Assignee (No one assigned), and Notifications (Unsubscribe). At the bottom, a comment box contains 'LGTM!' and a 'Comment' button.

Create a new issue

- Click the "New issue" button to create a new issue



Create a new issue

- Fill out the template, and submit the issue

The screenshot shows the GitHub interface for creating a new issue in the repository 'root/hello-world'. At the top right, there are buttons for 'Watching' and 'Fork: 0'. The issue title field contains the text 'Create a web server for the messages'. Below the title, there are 'Write' and 'Preview' tabs. The main content area contains the text '- The messages should be served over the web via http, rather than printed in the console'. Below this is a dashed line indicating where to attach images or documents. At the bottom right of the form is a green 'Submit new issue' button. Below the form, there are sections for 'Labels', 'Priority', 'Milestone', and 'Assignee', each with an 'Edit' button. The 'Labels' section shows 'enhancement' selected. The 'Priority' section shows 'default' selected. The 'Milestone' section shows 'No milestone'. The 'Assignee' section shows 'Jonathan' assigned.

root / **hello-world** Watching Fork: 0

Create a web server for the messages

Write [Preview](#)

- The messages should be served over the web via http, rather than printed in the console

Attach images or documents by dragging & dropping, or selecting them.

Submit new issue

Labels Edit

enhancement

Priority Edit

default

Milestone Edit

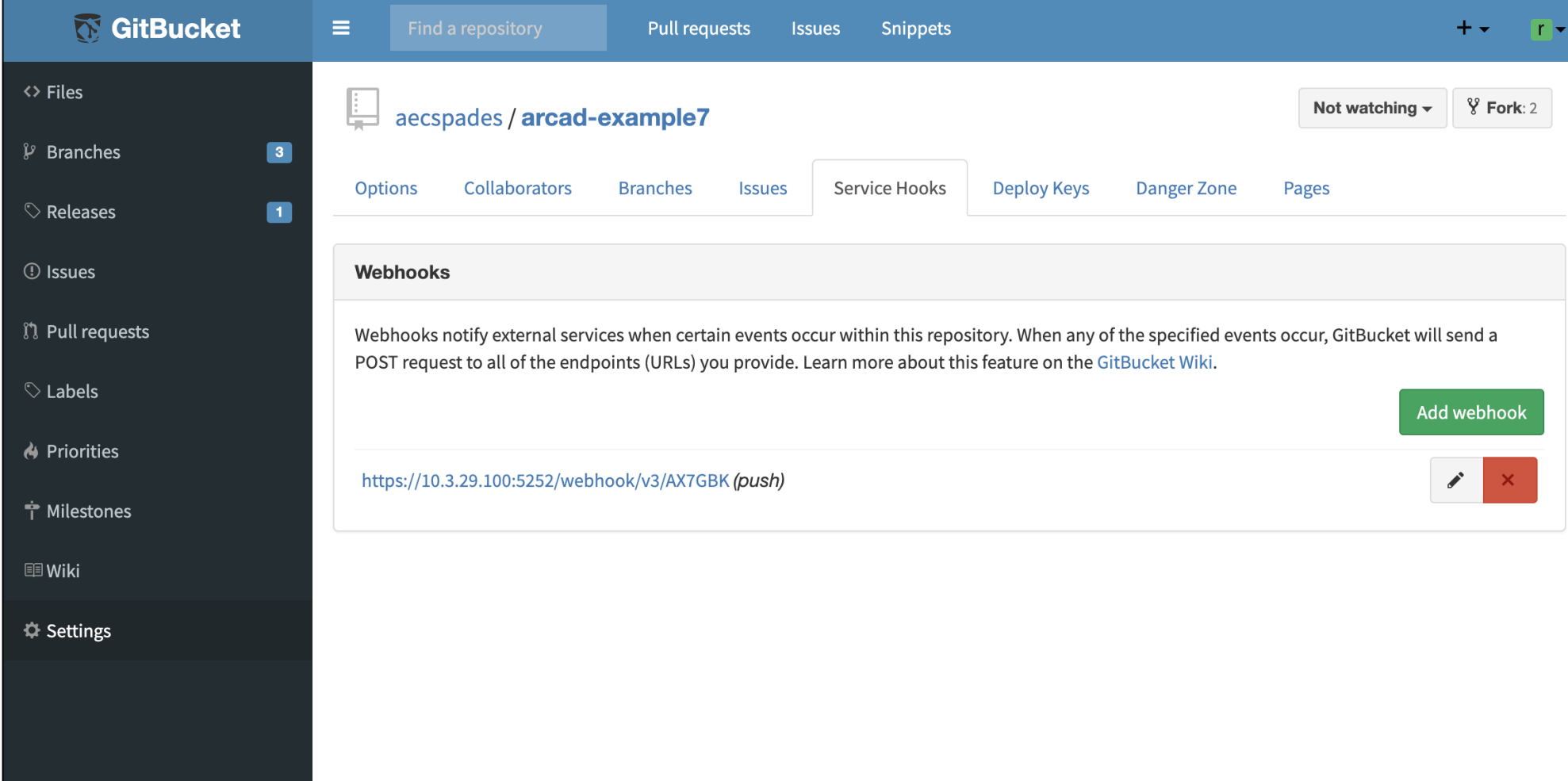
No milestone

Assignee Edit

J Jonathan

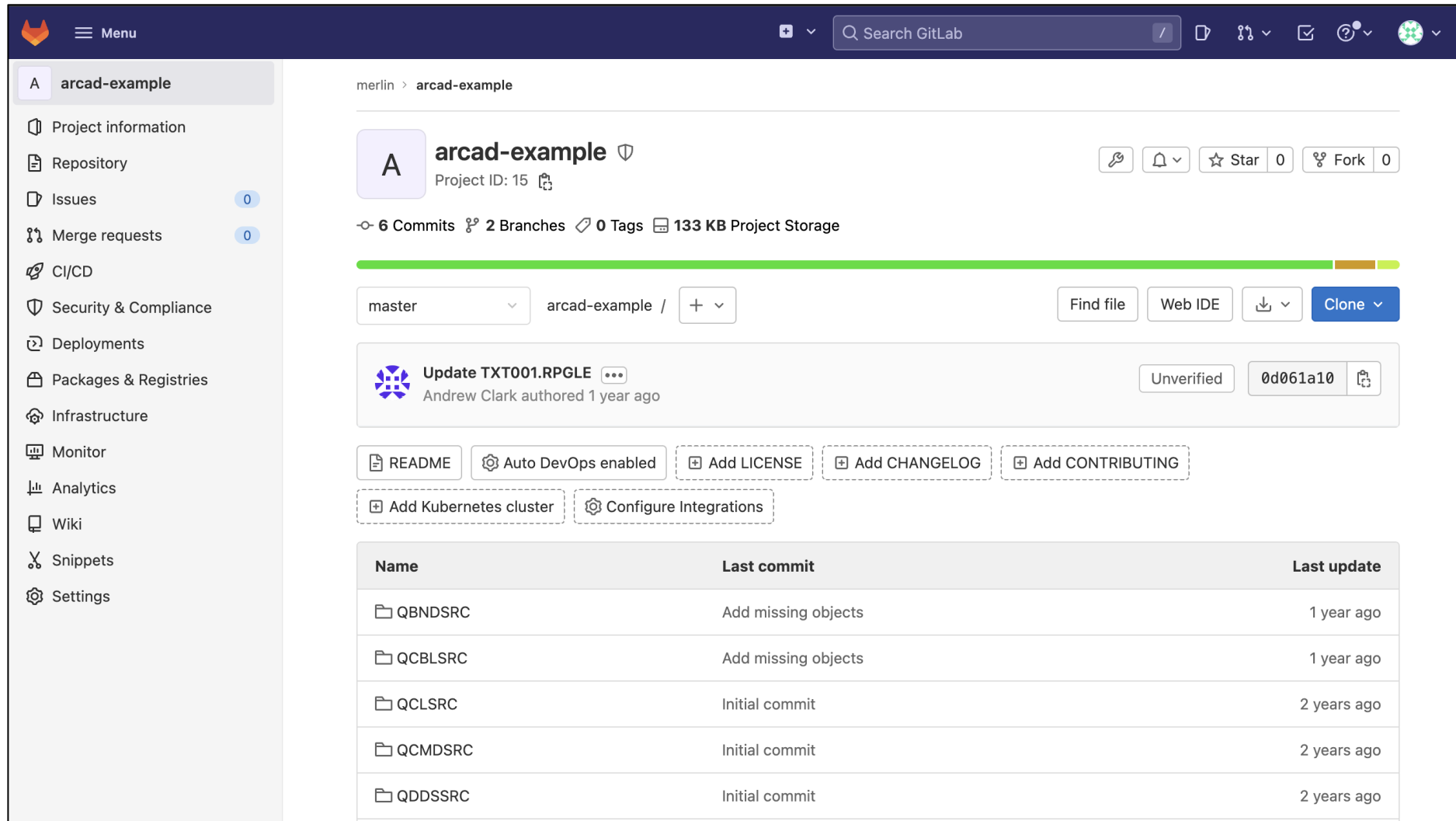
Git integrations

Leverage ARCAD builder with Webhook



The screenshot shows the GitBucket interface for a repository named 'aecspades / arcad-example7'. The top navigation bar includes 'Find a repository', 'Pull requests', 'Issues', and 'Snippets'. The left sidebar contains navigation options: Files, Branches (3), Releases (1), Issues, Pull requests, Labels, Priorities, Milestones, Wiki, and Settings. The main content area is titled 'Webhooks' and contains the following text: 'Webhooks notify external services when certain events occur within this repository. When any of the specified events occur, GitBucket will send a POST request to all of the endpoints (URLs) you provide. Learn more about this feature on the [GitBucket Wiki](#).' Below this text is a green 'Add webhook' button. A single webhook is listed with the URL 'https://10.3.29.100:5252/webhook/v3/AX7GBK (push)' and edit/delete icons.

Gitlab on IBM Power



The screenshot shows the GitLab web interface for a project named 'arcad-example'. The left sidebar contains navigation options: Project information, Repository, Issues (0), Merge requests (0), CI/CD, Security & Compliance, Deployments, Packages & Registries, Infrastructure, Monitor, Analytics, Wiki, Snippets, and Settings. The main content area shows the project details for 'arcad-example' (Project ID: 15), including 6 commits, 2 branches, 0 tags, and 133 KB of project storage. A commit titled 'Update TXT001.RPGLE' by Andrew Clark is highlighted, with a commit hash of 0d061a10. Below the commit, there are buttons for 'README', 'Auto DevOps enabled', 'Add LICENSE', 'Add CHANGELOG', and 'Add CONTRIBUTING'. At the bottom, a table lists the project's files and their commit history.

Name	Last commit	Last update
QBNDSRC	Add missing objects	1 year ago
QCBLSRC	Add missing objects	1 year ago
QCLSRC	Initial commit	2 years ago
QCMDSRC	Initial commit	2 years ago
QDDSSRC	Initial commit	2 years ago

VSCoDe

- Has several IBM i modules for language knowledge
- Comes with Git Lens built in
- Accessing source on IBM i
 - "Code for IBM i" extension allows you to access IBM i stream files directly
 - Use with "Git for IBM i" extension
 - Map a drive and open folder directly in VSCoDe
 - Git Lens works seamlessly
 - Requires FAST connectivity to work well
 - Several VSCoDe extensions can keep a local folder in sync with a remote (IBM i) directory
 - Git Lens works on local dir (fast and smooth)
 - Several other tools for synchronizing directories (e.g. WinSCP) ← Jesse's preference
 - Git Lens works on local dir (fast and smooth)

SOURCE CONTROL

Message (Ctrl+Enter to commit on 'master')

Changes 0

COMMITTS 01 11 • master
Changes to push to origin on GitHub: 1 commit

- uno You, 4 minutes ago
- (origin) test Jesse Gorzinski, 6 hours ago
 - payrollff.rpgle qrpglesrc M
 - test You, 6 hours ago

FILE HISTORY payrollff.rpgle

- uno You, 4 minutes ago M
- (origin) test Jesse Gorzinski, 6 hours ago M
- test You, 6 hours ago M
- initial migration Jesse Gorzinski, 7 hours ago A

BRANCHES (1)

- master 01 11 ↔ origin/master • 4 minutes ago ✓ ▲

REOTES

STASHES

TAGS

SEARCH & COMPARE

```
C: > rselab > qrpglesrc > payrollff.rpgle
1 // *****
2 // PROGRAM NAME - Payroll
3 // DESCRIPTION - Time reporting master file maintenance using
4 // externally described workstation processing
5 // *****
6 // INDICATORS USED
7 // 50 - No record found on CHAIN operation
8 // 60 - General error condition
9 // 90 - Protect display on delete request
10 // KC - End of job requested
11 // KD - Return to application selection
12 // KE - Return to employee selection
13 // KF - Return to project selection
14 // KG - Return to reason code selection!
15- // LR - Last record!!!!
16 // *****
17 // SUBROUTINES USED
18 // EDITSL - Edit application selection display (SELECT)
19 // ACDESR - Edit action code for all maintenance requests
20 // *****
21 // This program uses all externally described files. Files
22 // used are - MSTDSP - maintenance display file
23 // - EMPMST - employee master file
24 // - PRJMST - project master file
25 // - RSNMST - reason code master file
26 // *****
27 Dcl-F MSTDSP WORKSTN;
28 Dcl-F EMPMST Usage(*Update:*Delete:*Output) Keyed;
29 Dcl-F PRJMST Usage(*Update:*Delete:*Output) Keyed;
30 Dcl-F RSNMST Usage(*Update:*Delete:*Output) Keyed;
31 //
32 // Compile time array containing error descriptions.
33 Dcl-S ERR Char(50) DIM(10) CTDATA PERRCD(1);
34 Dcl-s i int(10);
35 Dcl-S EMESS Char(50);
36 //
37 // *****
38 // MAINLINE CALCULATIONS
39 // *****
```

```
1 // *****
2 // PROGRAM NAME - Payroll
3 // DESCRIPTION - Time reporting master file maintenance using
4 // externally described workstation processing
5 // *****
6 // INDICATORS USED
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13 // KF - Return to project selection
14 // KG - Return to reason code selection!
15+ // LR - Last record!!!!!!! Jesse Gorzinski, 6 hours ago
16 // *****
17 // SUBROUTINES USED
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35 Dcl-S EMESS Char(50);
36 //
37 // *****
38 // MAINLINE CALCULATIONS
39 // *****
```

SOURCE CONTROL

Message (Ctrl+Enter to commit on 'master')

Changes 1

- payrollff.rpgle qrpglesrc

COMMITTS 01 11 + master

- uno You, 13 hours ago
- test Jesse Gorzinski, 19 hours ago
 - payrollff.rpgle qrpglesrc
 - test You, 19 hours ago

FILE HISTORY payrollff.rpgle

- Uncommitted changes You, seconds ago M
- uno You, 13 hours ago M
- test Jesse Gorzinski, 19 hours ago M
- test You, 19 hours ago M
- initial migration Jesse Gorzinski, 20 hours ago A

BRANCHES (1)

- master 01 11 origin/master 13 hours ago ✓ ▲

REOTES

STASHES

TAGS

SEARCH & COMPARE

```

1 // *****
2 // PROGRAM NAME - Payroll
3 // DESCRIPTION - Time reporting master file maintenance using
4 // externally described workstation processing
5 // *****
6 // INDICATORS USED
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36 //
37 // *****
38 // MAINLINE CALCULATIONS
39 // *****

```

```

1 // *****
2 // PROGRAM NAME - PayrollFF You, seconds ago • Uncommi
3 // DESCRIPTION - Time reporting master file maintenance usi
4 // externally described workstation processing
5 // *****
6 // INDICATORS USED
7 // 50 - No record found on CHAIN operation
8 // 60 - General error condition
9 // 90 - Protect display on delete request
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35 Dcl-S EMESS Char(50);
36 //
37 // *****
38 // MAINLINE CALCULATIONS
39 // *****

```

SOURCE CONTROL

Message (Ctrl+Enter to commit on 'master')

Staged Changes 1

payrollff.rpgle qrpglesrc M

Changes 0

COMMITTS 01 11 + master

Changes to push to origin on GitHub 1 commit

uno You, 13 hours ago

test Jesse Gorzinski, 19 hours ago

payrollff.rpgle qrpglesrc M

test You, 19 hours ago

FILE HISTORY payrollff.rpgle

Staged changes You, seconds ago M

uno You, 13 hours ago M

test Jesse Gorzinski, 19 hours ago M

test You, 19 hours ago M

initial migration Jesse Gorzinski, 20 hours ago A

BRANCHES (1)

master 01 11 origin/master 13 hours ago ✓ ▲

REOTES

STASHES

TAGS

SEARCH & COMPARE

```
C: > rselab > qrpglesrc > payrollff.rpgle
1 // *****
2- // PROGRAM NAME - Payroll
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4 // externally described workstation processing
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27 Dcl-F MSTDSP WORKSTN;
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35 Dcl-S EMESS Char(50);
36 //
37 // *****
38 // MAINLINE CALCULATIONS
39 // *****
```

```
1 // *****
2+ // PROGRAM NAME - PayrollFF You, seconds ago • Uncommi
3 // DESCRIPTION - Time reporting master file maintenance usi
4 // externally described workstation processing
5 // *****
6 // INDICATORS USED
7 // 50 - No record found on CHAIN operation
8 // 60 - General error condition
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36 //
37 // *****
38 // MAINLINE CALCULATIONS
39 // *****
```

Collaborative coding examples

Example: Node.js (<https://github.com/nodejs/node>)

nodejs / node Watch 2,978 Unstar 57,172 Fork 12,652

Code Issues 539 Pull requests 213 Projects 9 Insights

Node.js JavaScript runtime  <https://nodejs.org>

nodejs javascript node js runtime mit linux macos windows

25,339 commits 136 branches 529 releases 2,392 contributors View license

Branch: master New pull request Create new file Upload files Find file Clone or download

t niessen test: improve test coverage of native crypto code ...		Latest commit 7710235 4 days ago
folder .github	doc: add multiple issue templates for GitHub	5 months ago
folder benchmark	doc: update benchmark doc	3 days ago
folder deps	deps: cherry-pick 56f6a76 from upstream V8	2 days ago
folder doc	doc: fix deprecations metadata	22 hours ago
folder lib	util: remove eslint comments and rename variables	10 hours ago
folder src	process: move C++ process events into node_process_events.cc	5 hours ago

Example: Node.js (<https://github.com/nodejs/node>)

nodejs / node

Watch 2,978 Unstar 57,172 Fork 12,652

Code Issues 539 Pull requests 213 Projects 9 Insights

Node.js JavaScript runtime <https://nodejs.org>

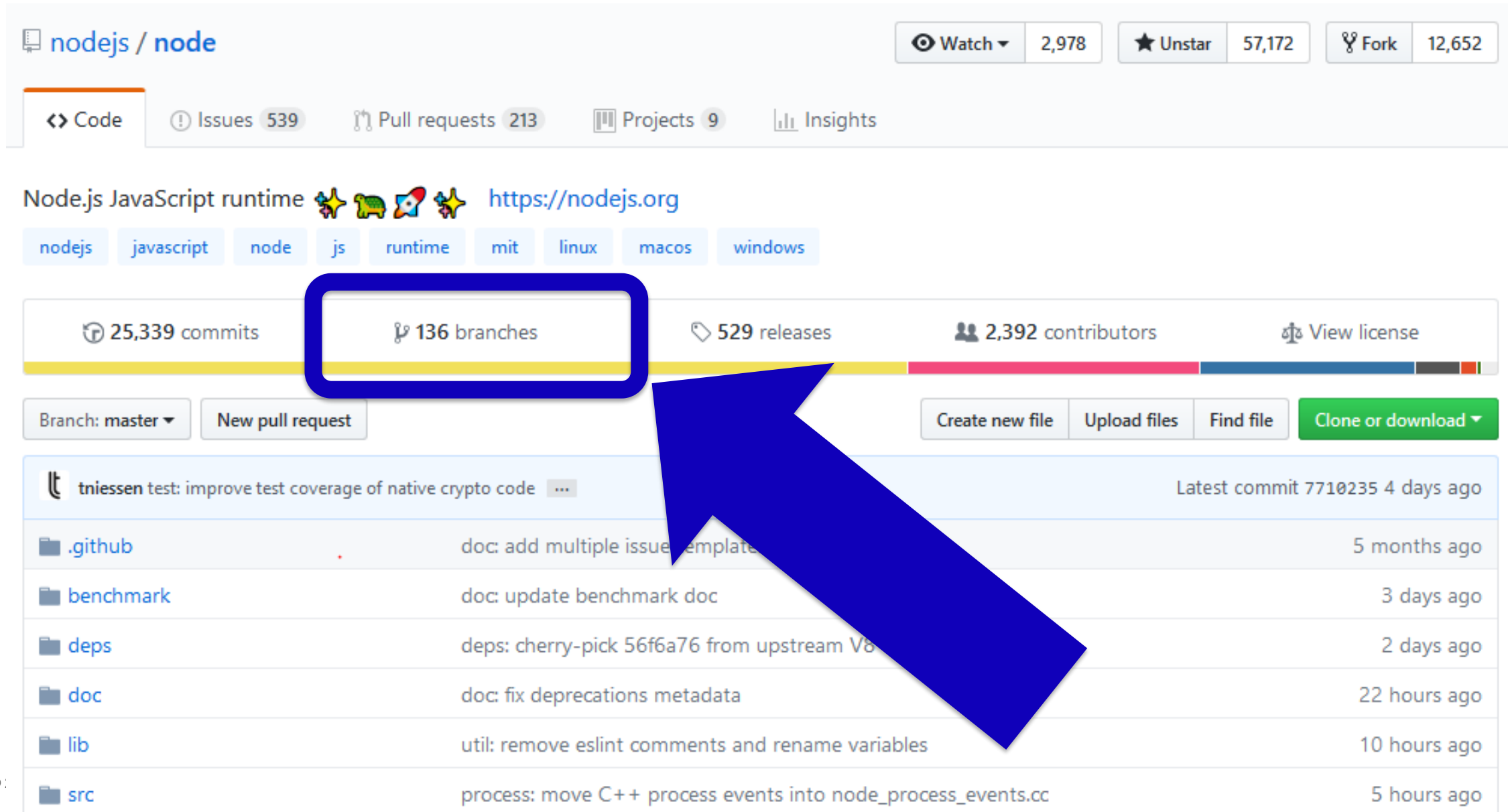
nodejs javascript node js runtime mit linux macos windows

25,339 commits 136 branches 29 releases **2,392 contributors** View license

Branch: master New pull request Create new file Upload files Find file Clone or download

tniessen	test: improve test coverage of native crypto co	Latest commit 7710235 4 days ago
.github	templates for GitHub	5 months ago
benchmark	benchmark doc	3 days ago
deps	cherry-pick 56f6a76 from upstream V8	2 days ago
doc	doc: fix deprecations metadata	22 hours ago
lib	util: remove eslint comments and rename variables	10 hours ago
src	process: move C++ process events into node_process_events.cc	5 hours ago

Example: Node.js (<https://github.com/nodejs/node>)



nodejs / node

Watch 2,978 Unstar 57,172 Fork 12,652

Code Issues 539 Pull requests 213 Projects 9 Insights

Node.js JavaScript runtime <https://nodejs.org>

nodejs javascript node js runtime mit linux macos windows

25,339 commits **136 branches** 529 releases 2,392 contributors View license

Branch: master New pull request Create new file Upload files Find file Clone or download

Commit	Message	Time
tniessen	test: improve test coverage of native crypto code	Latest commit 7710235 4 days ago
	doc: add multiple issue templates	5 months ago
	doc: update benchmark doc	3 days ago
	deps: cherry-pick 56f6a76 from upstream V8	2 days ago
	doc: fix deprecations metadata	22 hours ago
	util: remove eslint comments and rename variables	10 hours ago
	process: move C++ process events into node_process_events.cc	5 hours ago

Example: Node.js (<https://github.com/nodejs/node>)

nodejs / node Watch 2,978 Unstar 57,172 Fork 12,652

Code Issues 539 Pull requests 213 Projects 9 Insights

Overview **Active** Stale All branches

Active branches

<code>v11.x-staging</code>	Updated 8 months ago by addaleax	✓	1473 1326	Compare
<code>canary-base</code>	Updated 2 days ago by ryzokuken	✗	40 18	Compare
<code>v10.15.1-proposal</code>	Updated 4 days ago by codebytere	✗	3499 2454	#25346 Open
<code>Trott-patch-1</code>	Updated 5 days ago by Trott	✓	73 1	#25371 Closed
<code>v6.x-staging</code>	Updated 16 days ago by addaleax		11727 4077	Compare

Node.js active branches

v12.x }
v14.x } Long-Term Support (LTS) releases
v16.x }

v17.x } Feature Release

v12.x-staging }
v14.x-staging } Staging areas for each release
v16.x-staging }
v17.x-staging }

v12.16.0-proposal }
v14.15.0-proposal } Proposal branches for LTS releases (heavily verified before landing in LTS release)
v16.15.1-proposal }

Collaboration Example 1: Cross-project dependency

- Two development teams (A & B)
 - Team A needs a small change in Team B's code
- What happens?
 - Non-collaborative:
 - Team A files a requirement against Team B
 - Team B establishes priority based on Team B's needs
 - Team A waits for Team B to implement
 - Collaborative:
 - Team A creates a branch in Team B's repository
 - ... Or their own clone of the repository
 - Team A commits a fix to the new branch
 - Team A continues on, using the new branch
 - Team B asked to review the changes and eventually merges

Collaboration Example 2: Concurrent development

Two developers, working on two separate enhancements



Dev 1

File_01

File_02

File_03

File_04

File_05

File_06

File_07

File_08

File_09



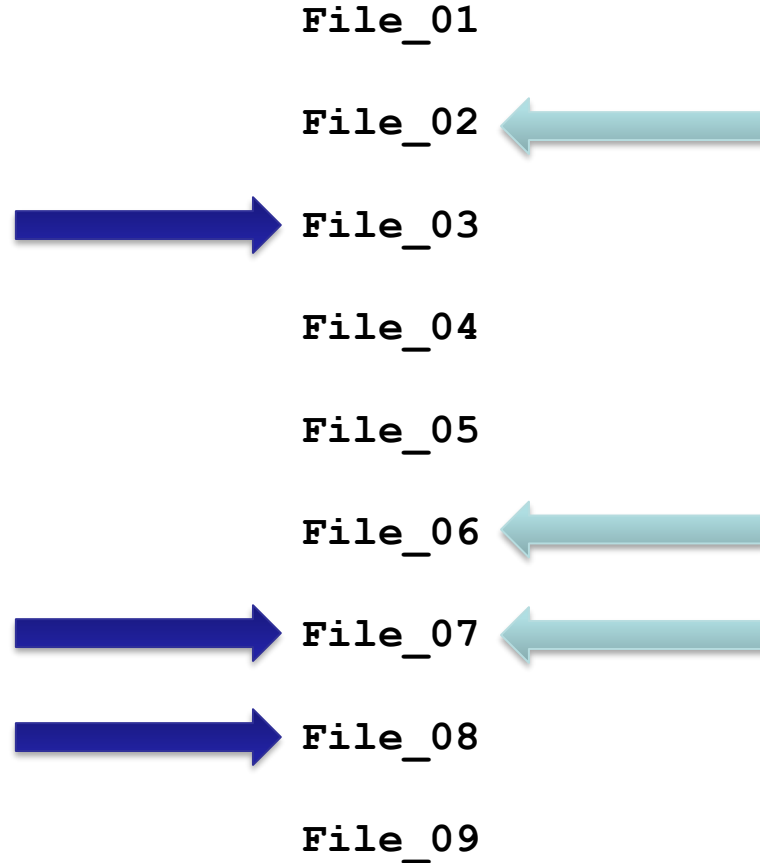
Dev 2

Collaboration Example 2: Concurrent development

Each needs to change multiple files



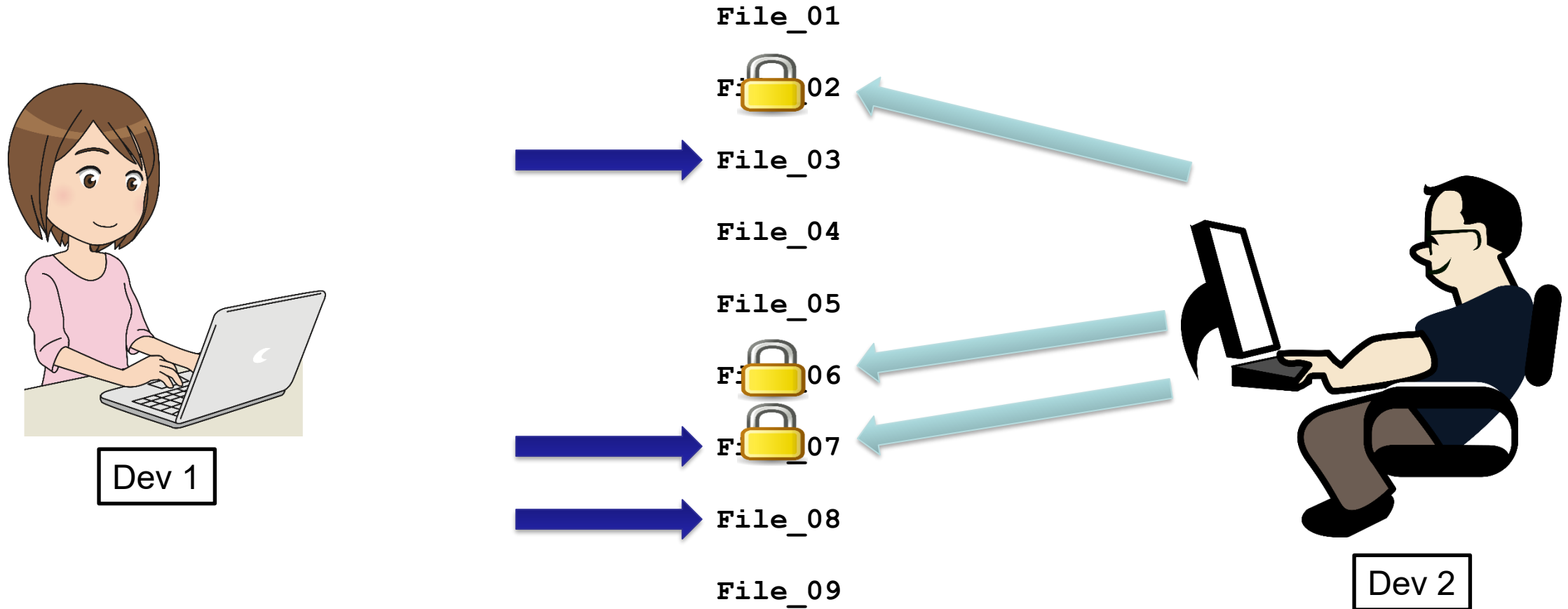
Dev 1



Dev 2

Collaboration Example 2: Concurrent development

Some traditional change control systems lock files (Dev 2 does just that)

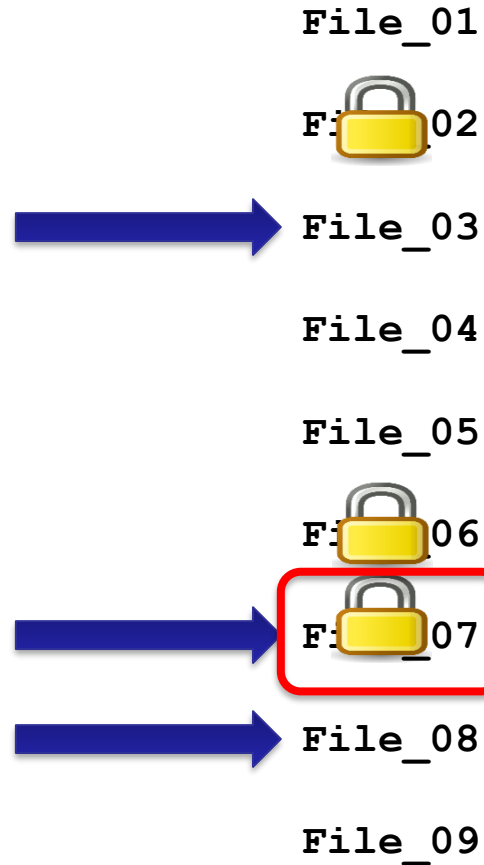


Collaboration Example 2: Concurrent development

Dev 1 can't lock the file also! Now What?



Dev 1



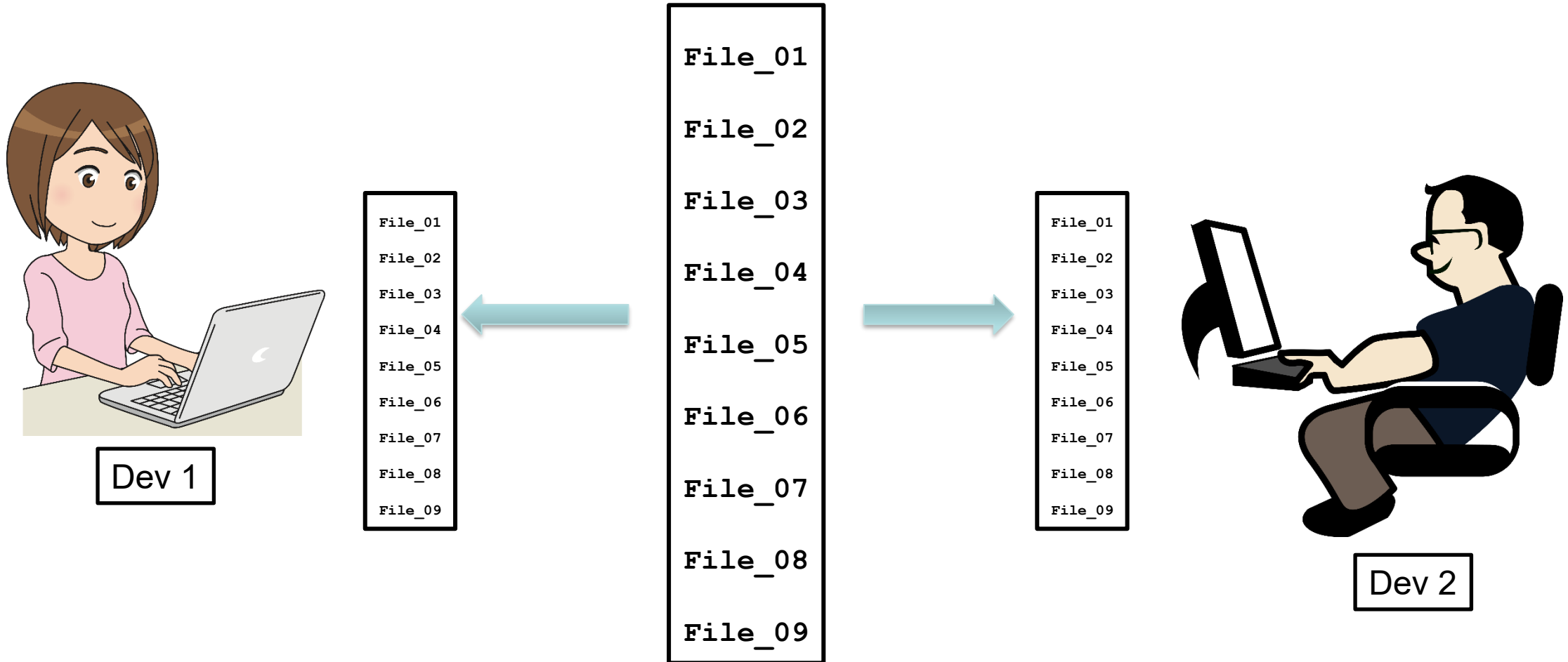
Dev 2

Locking-based change control: conflict resolution

1. Developer waits for teammates to be done with the part
2. Developer takes a copy of the source part, proceeds to make changes, then later manually merges in changes (ERROR PRONE!!)

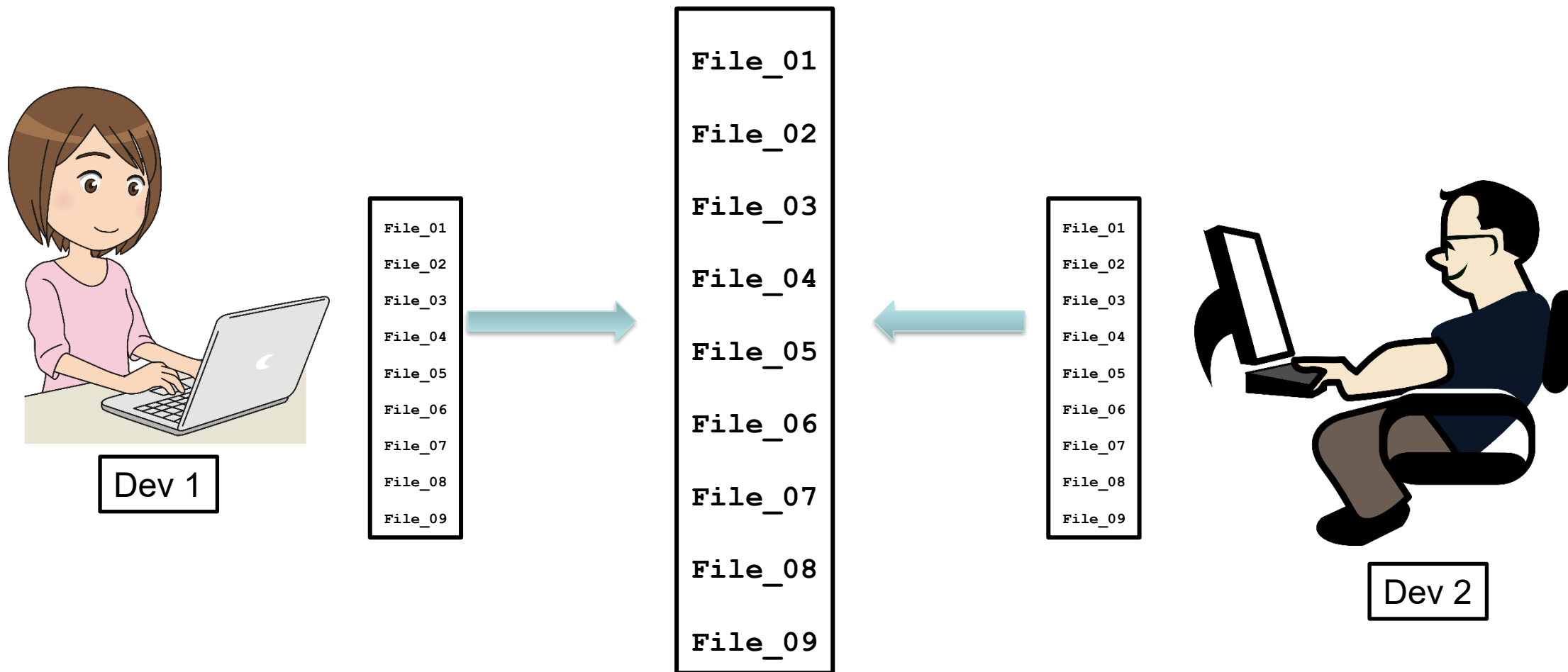
Collaboration Example 2: Concurrent development

With Git, each Dev clones the repository (and maybe create different branches)



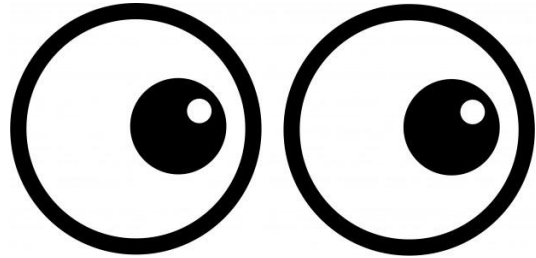
Collaboration Example 2: Concurrent development

When complete, changes get pushed back into central repository



Git: conflict resolution

- Human eyes are required when multiple devs change the same lines of code (in reality, this is rare)



- Concurrent development is easy because:
 - Everyone works on own copy
 - Branching strategy further avoids conflicts



Summary

We learned


- How git works (distributed client/server architecture)
- How to install and configure git
- Basic git commands
- Migrate files from QSYS to IFS to be used with Git
- Adding code to a git repo
- How to setup a private git server
- Git webhook integrations

Next Steps

- Read Git articles online to enhance your knowledge <https://www.atlassian.com/git>
- Learn how to use Git with Vscode <https://code.visualstudio.com/docs/sourcecontrol/overview>
- Explore useful Vscode extensions like GitLens, GitHub Pull Requests, and GitHub actions
- Explore modern IBM I development tools like Merlin, Code for IBM i, and IBM i Project Explorer

Questions?

For More Information:

Links You Need	Twitter	#Hashtags
<p>IBM i Home Page: https://www.ibm.com/it-infrastructure/power/os/ibm-i (find link to Forrester Study and updated IBM i Strategy Whitepaper)</p> <p>IBM Strategy Whitepaper: https://www.ibm.com/it-infrastructure/us-en/resources/power/i-strategy-roadmap/</p> <p>IBM Client Success: https://www.ibm.com/it-infrastructure/us-en/resources/power/ibm-i-customer-stories/</p> <p>Support Life Cycle: https://www.ibm.com/support/lifecycle/</p> <p>License Topics: https://www-01.ibm.com/support/docview.wss?uid=nas8N1022087</p> <p>HelpSystems 2021 Marketplace Survey https://www.helpsystems.com/resources/guides/ibm-i-marketplace-survey-results</p>	 @IBMSystems @COMMONug @IBMChampions @IBMSystemsISVs @IBMiMag @ITJungleNews @SAPonIBMi @SiDforIBMi	<p>#PowerSystems #IBMi #IBMAIX #POWER9 #LinuxonPower #OpenPOWER #HANAonPower #ITInfrastructure #OpenSource #HybridCloud #BigData</p>