Continental
The Future in Motion

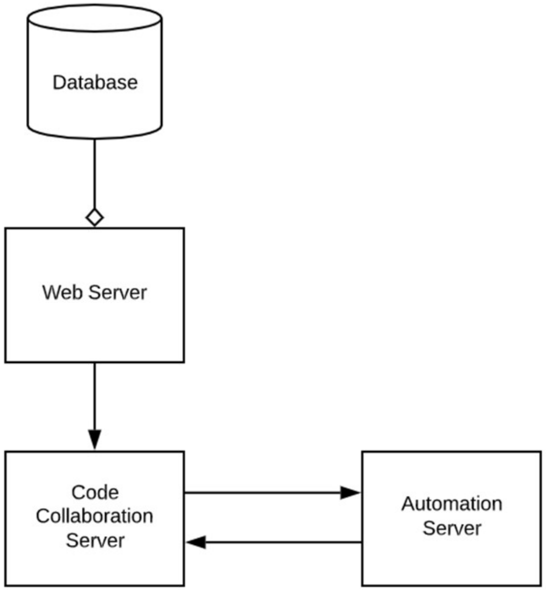
Continuous Integration / Continuous Testing

Seminary Part

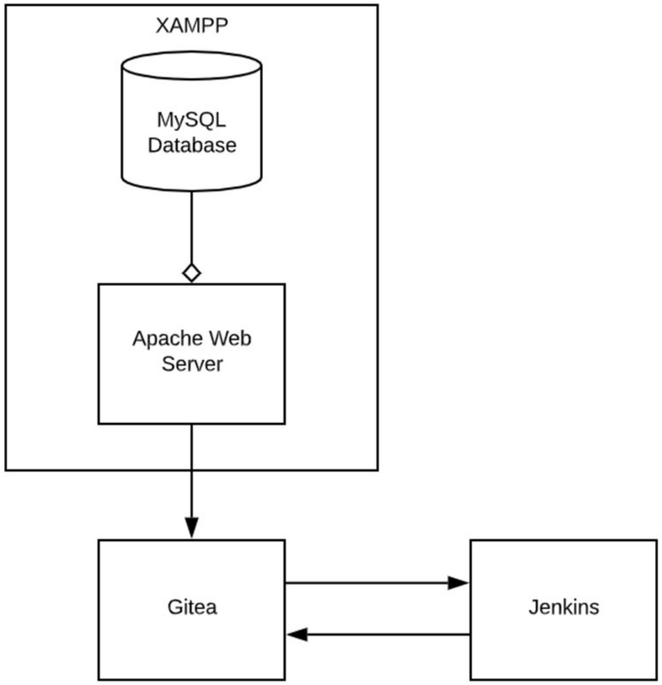
Concept

- You are going to act as a true Software Engineer in a DevOps environment ("DevOps Engineer" – in marketing terms)
- Based on a given architecture you are going to juggle between all the DevOps main functional areas (System Administration, Infrastructure, Platform and Site Reliability Engineering) and set-up from scratch the necessary tools and a Continuous Delivery System on top.

Arch – Infrastructure



Arch – Infra – Toolchain



1st Part: System Administration Ops (SysOps)

- **Purpose**: install and set-up the necessary tools
- **Points**: 1 / 5

Resources

Python 3.x installed

- https://www.python.org/downloads/

Git installed

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

Gitea: https://github.com/go-gitea/gitea/

- Windows: https://github.com/go-gitea/gitea/releases/download/v1.9.4/gitea-1.9.4-windows-4.0-386.exe
- Linux: https://github.com/go-gitea/gitea/releases/download/v1.9.4/gitea-1.9.4-linux-386

XAMPP: https://www.apachefriends.org/

- Windows: https://www.apachefriends.org/xampp-files/7.3.10/xampp-windows-x64-7.3.10-0-VC15-installer.exe
- Linux: https://www.apachefriends.org/xampp-files/7.3.10/xampp-linux-x64-7.3.10-0-installer.run

Jenkins: https://jenkins.io/

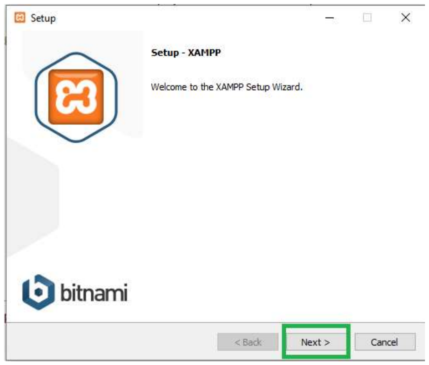
- Windows: https://jenkins.io/download/thank-you-downloading-windows-installer-stable
- Linux: https://pkg.jenkins.io/debian-stable

File System Layout

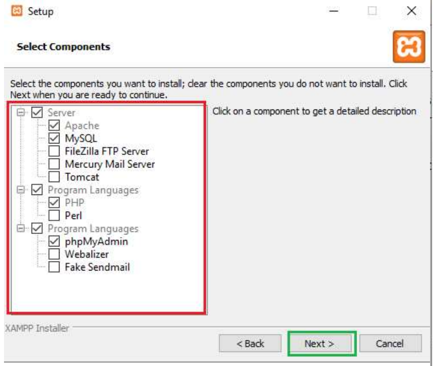
- Create the following directory structure either in your main Drive on Windows or in your user home space on Linux
  - D:\cd-seminary
  - ├───code
  - └───infra
  -     ├───gitea
  -     ├───jenkins
  -     └───xampp

XAMPP Installation

Please follow the same steps to avoid issues!
Install only selected applications like in the print screen!


Setup - XAMPP

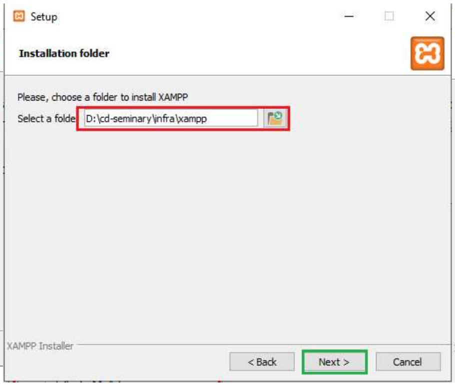
Welcome to the XAMPP Setup Wizard.


Select Components

Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.

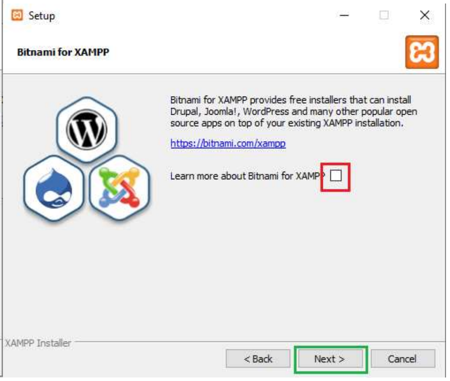
- ☑ Server
  - ☑ Apache
  - ☑ MySQL
  - □ FileZilla FTP Server
  - □ Mercury Mail Server
  - □ Tomcat
- ☑ Program Languages
  - ☑ PHP
  - □ Perl
- ☑ Program Languages
  - ☑ phpMyAdmin
  - □ Webalizer
  - □ Fake Sendmail

Click on a component to get a detailed description


Installation folder

Please, choose a folder to install XAMPP

Select a folde D:\cd-seminary\infra\xampp


Bitnami for XAMPP

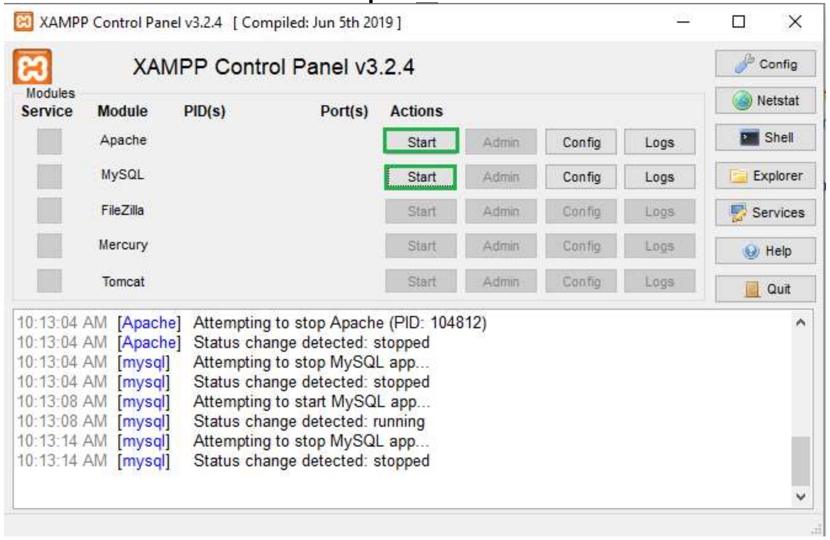
Bitnami for XAMPP provides free installers that can install Drupal, Joomla!, WordPress and many other popular open source apps on top of your existing XAMPP installation.

https://bitnami.com/xampp

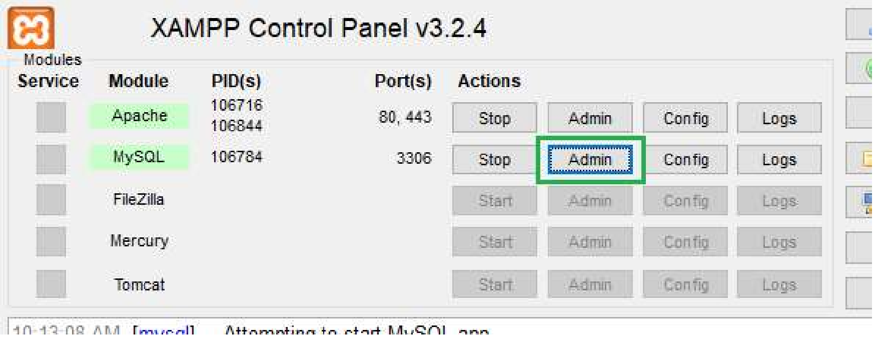
Learn more about Bitnami for XAMPP □

XAMPP Bring-up

- Start the Apache Web Server & MySQL Database
- Now access MySQL via the phpMyAdmin interface
- A new tab into your default browser should be open on http://localhost/phpmyadmin/
- Hint: Do not change the port -> if it is used, identify the PID (Go to Xampp -> Netstat) and kill with:
  - taskkill /PID <pid_id> /F



```
10:13:04 AM  [Apache]   Attempting to stop Apache (PID: 104812)
10:13:04 AM  [Apache]   Status change detected: stopped
10:13:04 AM  [mysql]    Attempting to stop MySQL app...
10:13:04 AM  [mysql]    Status change detected: stopped
10:13:08 AM  [mysql]    Attempting to start MySQL app...
10:13:08 AM  [mysql]    Status change detected: running
10:13:14 AM  [mysql]    Attempting to stop MySQL app...
10:13:14 AM  [mysql]    Status change detected: stopped
```

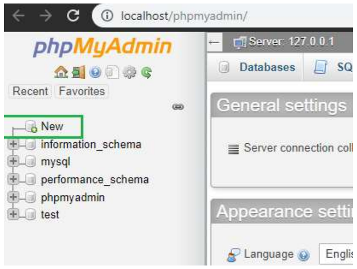


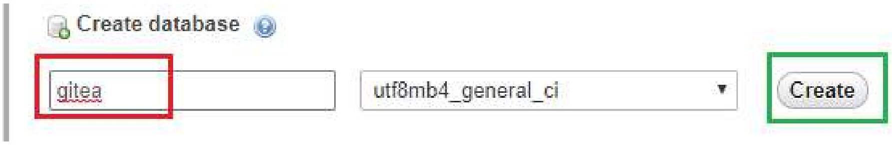
Module	PID(s)	Port(s)
Apache	106716 106844	80, 443
MySQL	106784	3306
FileZilla		
Mercury		
Tomcat		

```
10:13:08 AM  [mysql]   Attempting to start MySQL app
```

MySQL set-up

› A new database has to be created in order to be populated with tables by the Gitea server.

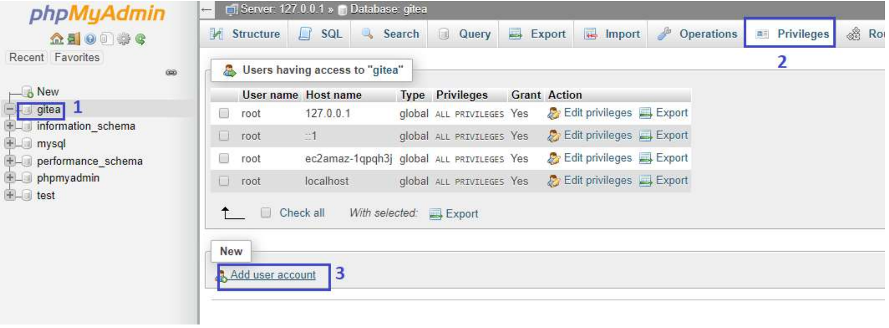



Create database

gitea

utf8mb4_general_ci

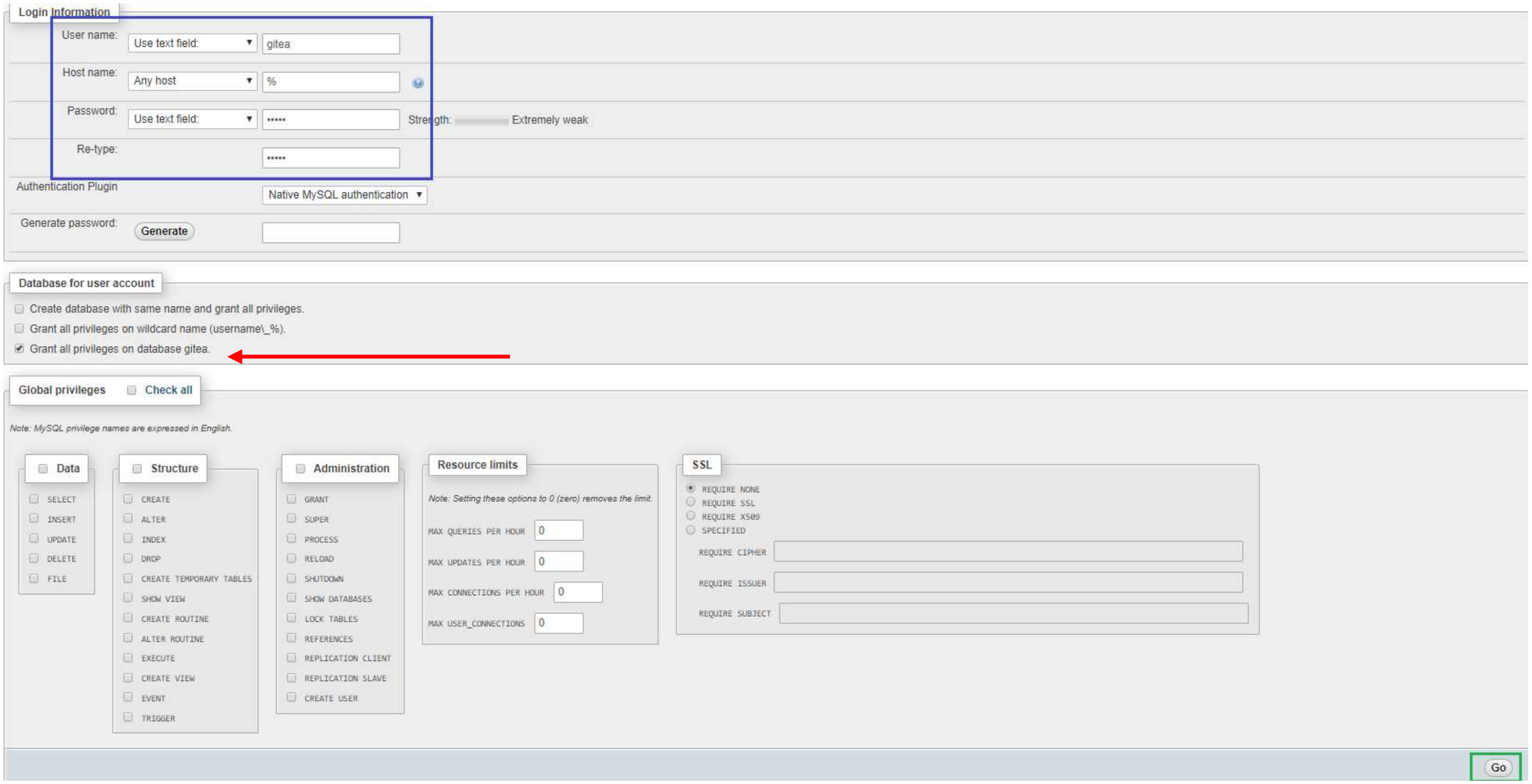
› A separate user has to be created to be used by the Gitea server



Users having access to "gitea"

	User name	Host name	Type	Privileges	Grant	Action
□	root	127.0.0.1	global	ALL PRIVILEGES	Yes	Edit privileges Export
□	root	::1	global	ALL PRIVILEGES	Yes	Edit privileges Export
□	root	ec2amaz-1qpqh3j	global	ALL PRIVILEGES	Yes	Edit privileges Export
□	root	localhost	global	ALL PRIVILEGES	Yes	Edit privileges Export

- username: gitea | password: gitea



Login Information

User name:	Use text field: ▾	gitea
Host name:	Any host ▾	%
Password:	Use text field: ▾	••••• Strength: Extremely weak
Re-type:		•••••
Authentication Plugin		Native MySQL authentication ▾
Generate password:	Generate	

Database for user account

- □ Create database with same name and grant all privileges.
- □ Grant all privileges on wildcard name (username_%).
- ☑ Grant all privileges on database gitea.

Global privileges □ Check all

Note: MySQL privilege names are expressed in English.

□ **Data**

- □ SELECT
- □ INSERT
- □ UPDATE
- □ DELETE
- □ FILE

□ **Structure**

- □ CREATE
- □ ALTER
- □ INDEX
- □ DROP
- □ CREATE TEMPORARY TABLES
- □ SHOW VIEW
- □ CREATE ROUTINE
- □ ALTER ROUTINE
- □ EXECUTE
- □ CREATE VIEW
- □ EVENT
- □ TRIGGER

□ **Administration**

- □ GRANT
- □ SUPER
- □ PROCESS
- □ RELOAD
- □ SHUTDOWN
- □ SHOW DATABASES
- □ LOCK TABLES
- □ REFERENCES
- □ REPLICATION CLIENT
- □ REPLICATION SLAVE
- □ CREATE USER

Resource limits

Note: Setting these options to 0 (zero) removes the limit.

MAX QUERIES PER HOUR	0
MAX UPDATES PER HOUR	0
MAX CONNECTIONS PER HOUR	0
MAX USER_CONNECTIONS	0

SSL

- ● REQUIRE NONE
- ○ REQUIRE SSL
- ○ REQUIRE X509
- ○ SPECIFIED

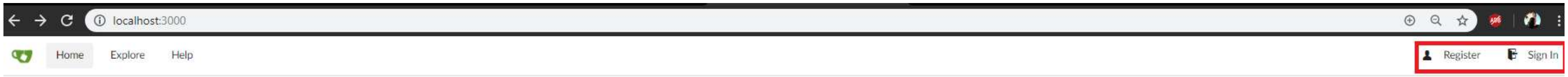
REQUIRE CIPHER

REQUIRE ISSUER

REQUIRE SUBJECT

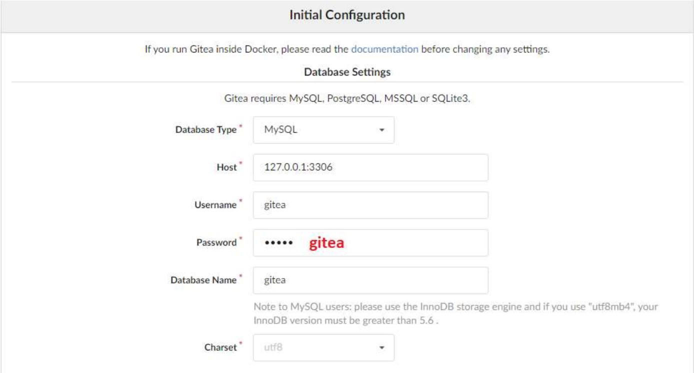
Gitea Bring-up

- Copy the Gitea binary (.exe) into cd-seminary/infra/gitea and run it.
- After the initialization, Gitea should be up on localhost:3000, open the page in a browser.
- Click on either one of the Register or Sign In buttons for the Initial Configuration



- Proceed by filling the fields as shown in the next pages

Part 1 / 3



Initial Configuration

If you run Gitea inside Docker, please read the documentation before changing any settings.

Database Settings

Gitea requires MySQL, PostgreSQL, MSSQL or SQLite3.

Database Type * MySQL

Host * 127.0.0.1:3306

Username * gitea

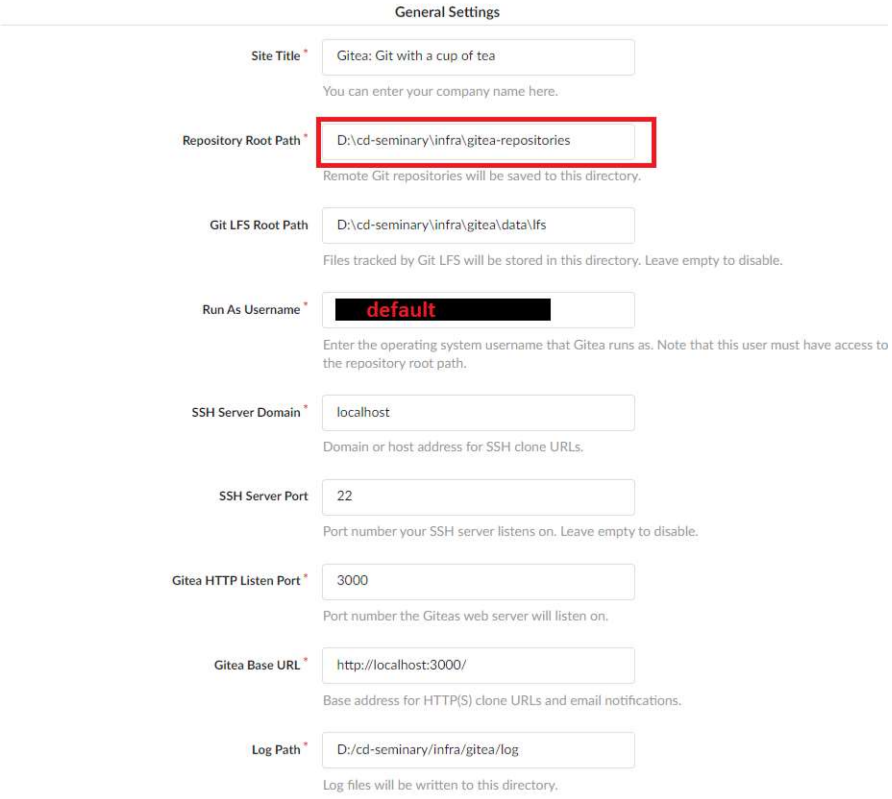
Password * ••••• gitea

Database Name * gitea

Note to MySQL users: please use the InnoDB storage engine and if you use "utf8mb4", your InnoDB version must be greater than 5.6 .

Charset * utf8

Part 2 / 3



General Settings

Site Title * Gitea: Git with a cup of tea

You can enter your company name here.

Repository Root Path * D:\cd-seminary\infra\gitea-repositories

Remote Git repositories will be saved to this directory.

Git LFS Root Path D:\cd-seminary\infra\gitea\data\lfs

Files tracked by Git LFS will be stored in this directory. Leave empty to disable.

Run As Username * [redacted] default

Enter the operating system username that Gitea runs as. Note that this user must have access to the repository root path.

SSH Server Domain * localhost

Domain or host address for SSH clone URLs.

SSH Server Port 22

Port number your SSH server listens on. Leave empty to disable.

Gitea HTTP Listen Port * 3000

Port number the Giteas web server will listen on.

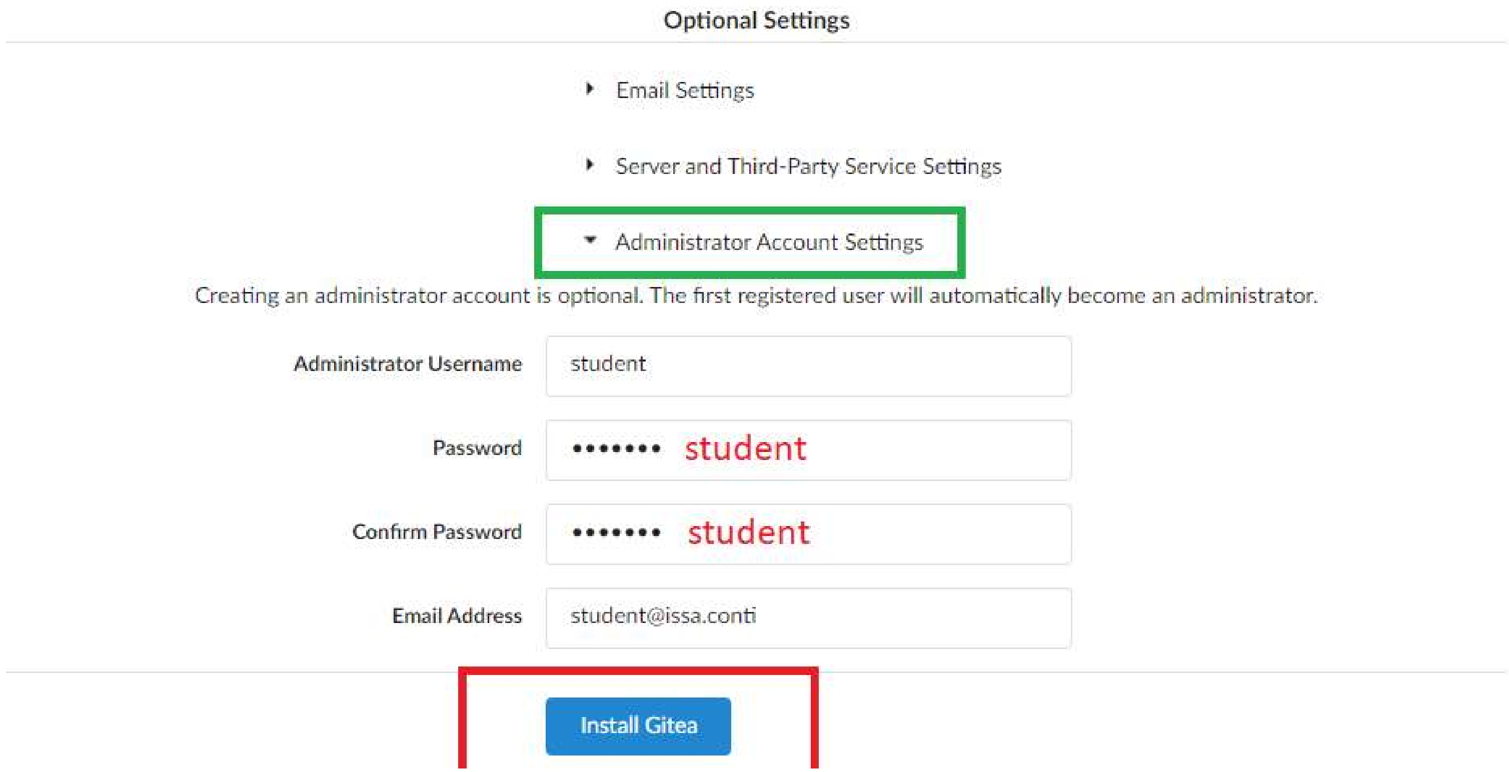
Gitea Base URL * http://localhost:3000/

Base address for HTTP(S) clone URLs and email notifications.

Log Path * D:/cd-seminary/infra/gitea/log

Log files will be written to this directory.

Part 3 / 3



Optional Settings

▸ Email Settings
▸ Server and Third-Party Service Settings
▾ Administrator Account Settings

Creating an administrator account is optional. The first registered user will automatically become an administrator.

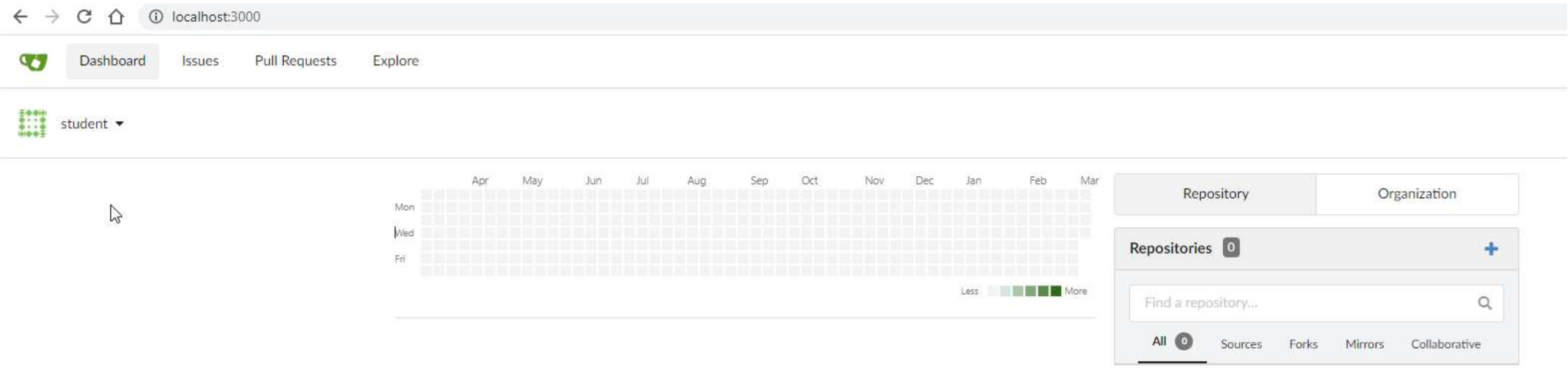
Administrator Username: student

Password: ••••••• student

Confirm Password: ••••••• student

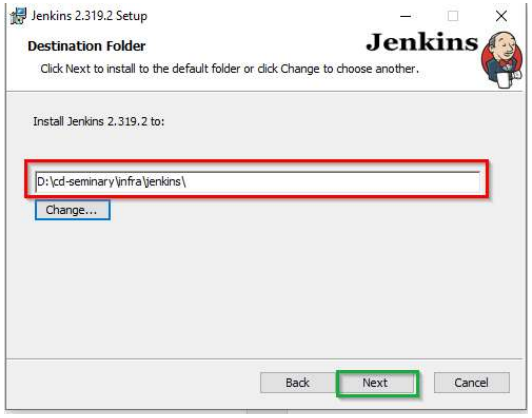
Email Address: student@issa.conti

Hint: in case of error, try to run gitea.exe as admin or delete the folders beside exe file and run it again


localhost:3000
Dashboard
Issues
Pull Requests
Explore
student
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Mon
Wed
Fri
Less
More
Repository
Organization
Repositories 0
Find a repository...
All 0
Sources
Forks
Mirrors
Collaborative

Jenkins Bring-up

- Run the Jenkins binary and proceed to install it as shown in the next images.
- **During Jenkins installation, you can test the port. If it is already used, please deactivate that application from services.msc or see the hint from slide 10**



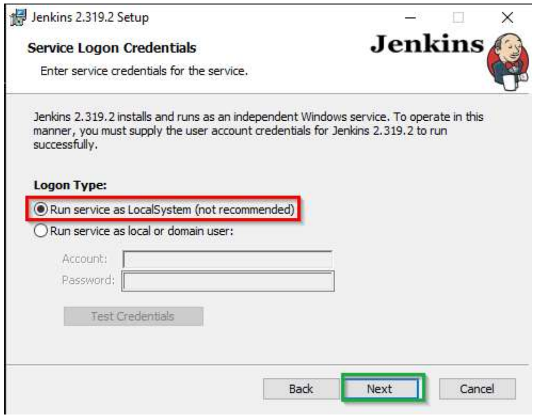
Jenkins 2.319.2 Setup

Destination Folder

Click Next to install to the default folder or click Change to choose another.

Install Jenkins 2.319.2 to:

D:\cd-seminary\infra\jenkins\



Jenkins 2.319.2 Setup

Service Logon Credentials

Enter service credentials for the service.

Jenkins 2.319.2 installs and runs as an independent Windows service. To operate in this manner, you must supply the user account credentials for Jenkins 2.319.2 to run successfully.

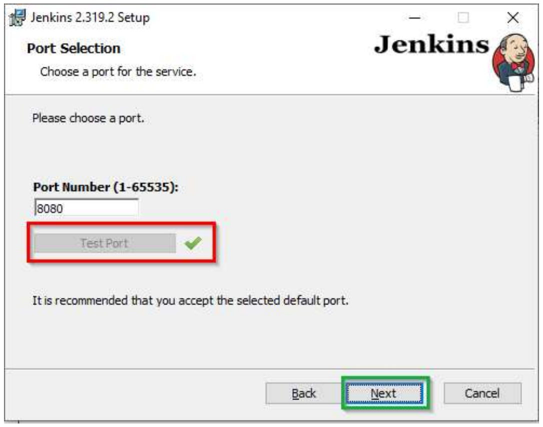
Logon Type:

● Run service as LocalSystem (not recommended)

○ Run service as local or domain user:

Account:

Password:



Jenkins 2.319.2 Setup

Port Selection

Choose a port for the service.

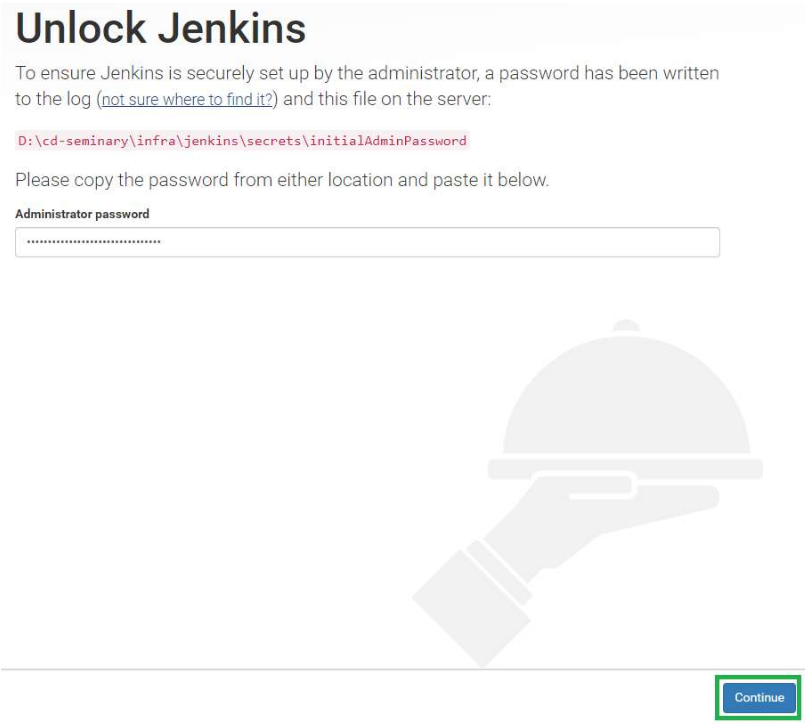
Please choose a port.

Port Number (1-65535): 8080

Test Port ✓

It is recommended that you accept the selected default port.

- After the installation ends. Jenkins will be available at **localhost:8080**



Unlock Jenkins

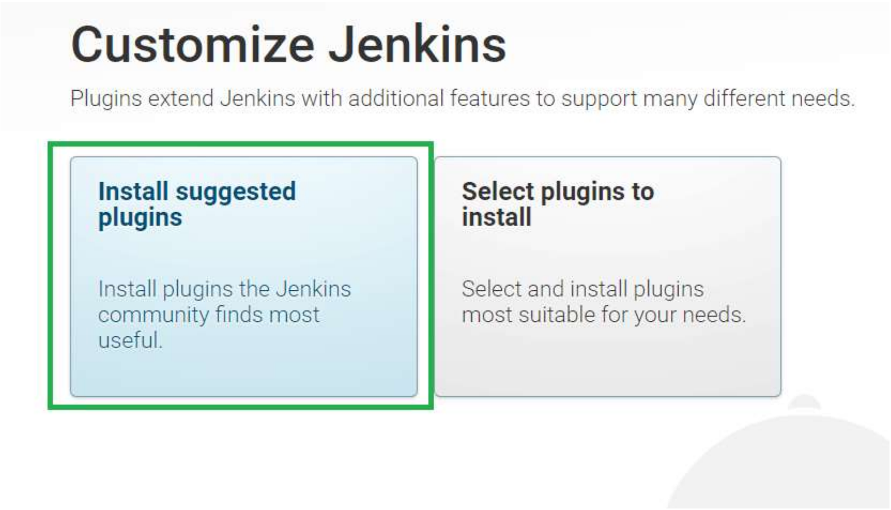
To ensure Jenkins is securely set up by the administrator, a password has been written to the log (not sure where to find it?) and this file on the server:

```
D:\cd-seminary\infra\jenkins\secrets\initialAdminPassword
```

Please copy the password from either location and paste it below.

Administrator password

································



Customize Jenkins

Plugins extend Jenkins with additional features to support many different needs.

Install suggested plugins

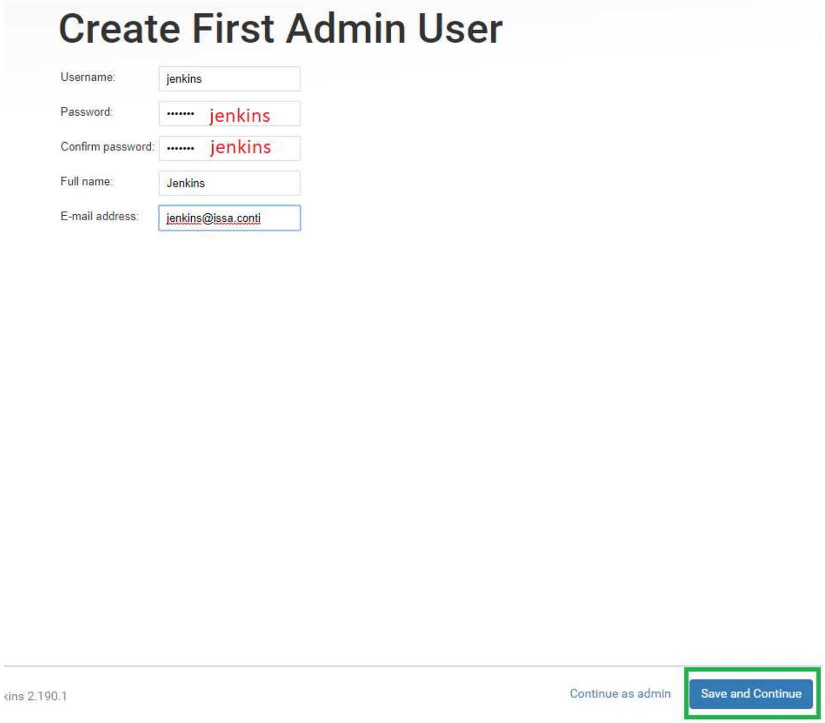
Install plugins the Jenkins community finds most useful.

Select plugins to install

Select and install plugins most suitable for your needs.

If you encounter an error installing plugins, see links below:

- https://www.phpflow.com/misc/devops/how-to-manually-install-jenkins-plugin/
- https://www.jenkins.io/doc/book/installing/offline/



Create First Admin User

Username: jenkins

Password: ••••••• jenkins

Confirm password: ••••••• jenkins

Full name: Jenkins

E-mail address: jenkins@issa.conti

kins 2.190.1

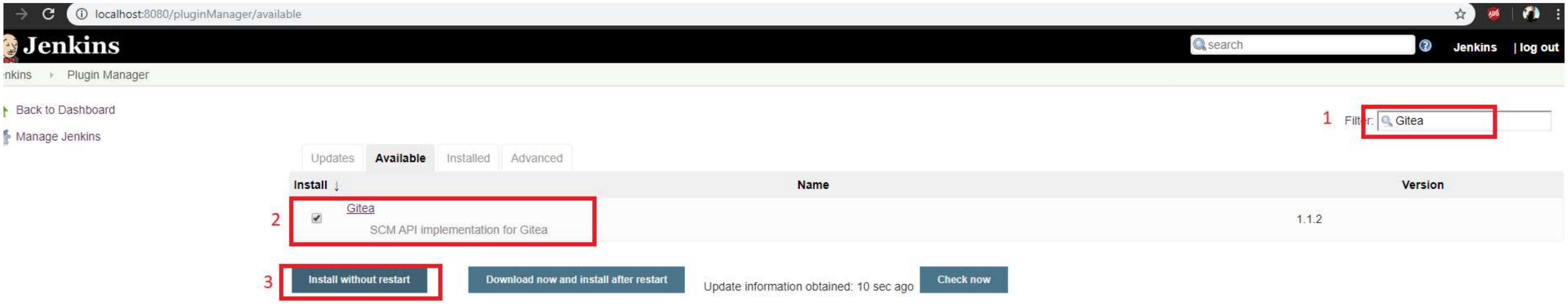
- Keep the defaults on the next step
- Save & Finish
- Jenkins should be up and you should be logged in with the 'jenkins' account

2nd Part: Infrastructure Ops (InfraOps)

- **Purpose**: Set-up the needed configurations that link the tools in between.
- **Points**: 1 / 5

Install Gitea Jenkins plug-in

- Access Jenkins pluginManager service and check for Gitea and install it. http://localhost:8080/pluginManager/available



Install ↓	Name	Version
☑	Gitea SCM API implementation for Gitea	1.1.2

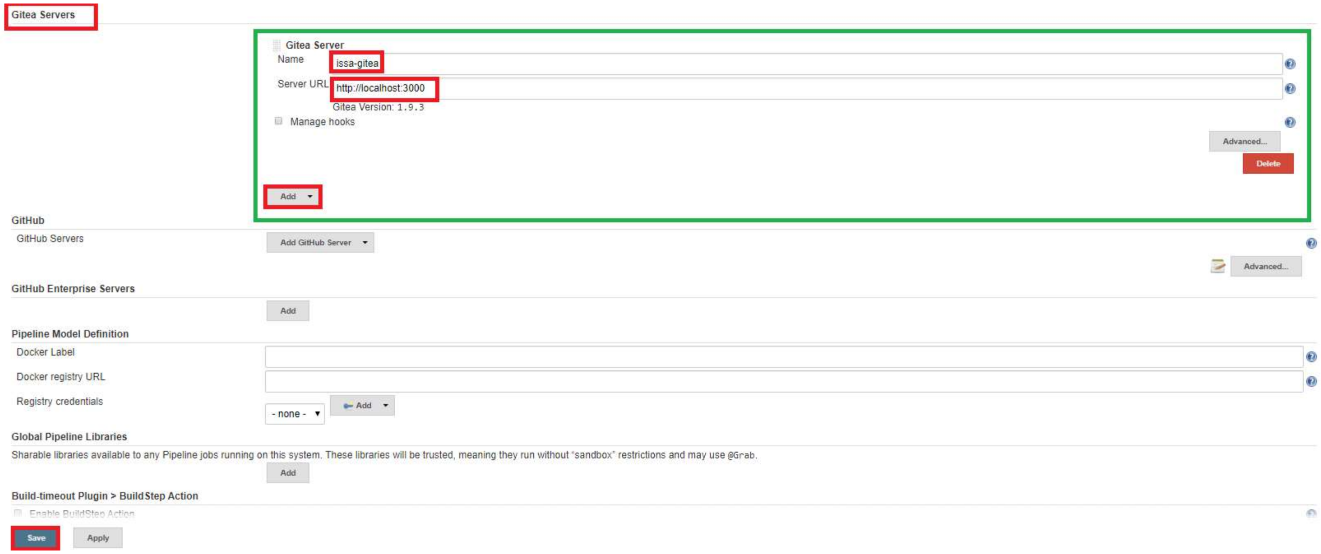
Update information obtained: 10 sec ago

Perform a Jenkins Safe Restart

- Access http://localhost:8080/safeRestart
- Click on **Yes**
- Wait for the restart
- Log in again (user: jenkins, password: jenkins)

Add Gitea server in Jenkins global scope

- This is done in the system configuration page http://localhost:8080/configure
- Scroll down to the **Gitea Server section** and **Add** a new one and then click on **Save**
- If Jenkins can access the server, it should display the Gitea Version



Gitea Servers

Gitea Server

Name: issa-gitea

Server URL: http://localhost:3000

Gitea Version: 1.9.3

□ Manage hooks

GitHub

GitHub Servers

GitHub Enterprise Servers

Pipeline Model Definition

Docker Label

Docker registry URL

Registry credentials: - none -

Global Pipeline Libraries

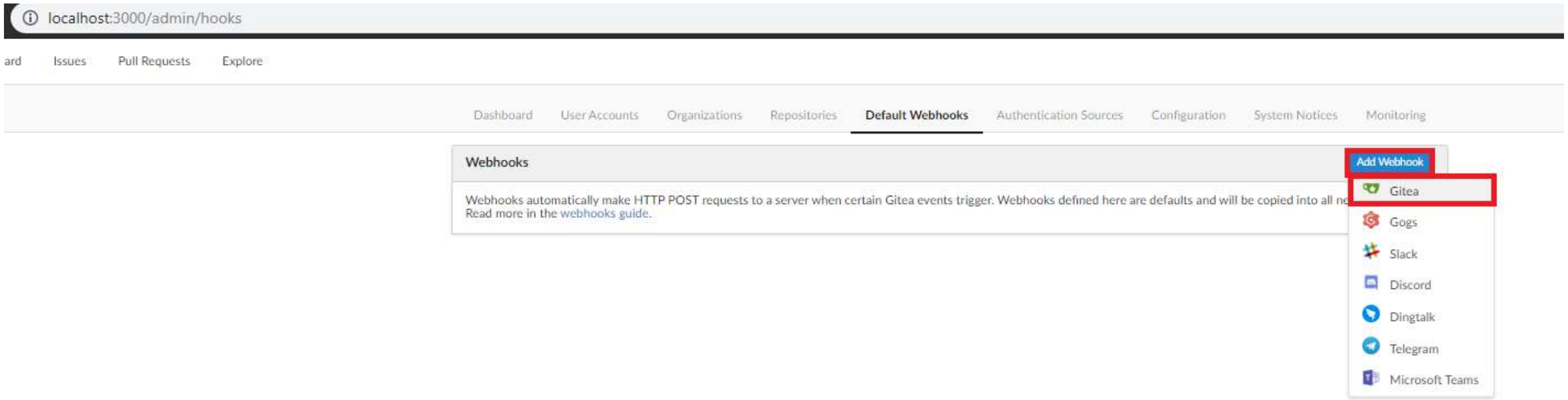
Sharable libraries available to any Pipeline jobs running on this system. These libraries will be trusted, meaning they run without “sandbox” restrictions and may use @Grab.

Build-timeout Plugin > BuildStep Action

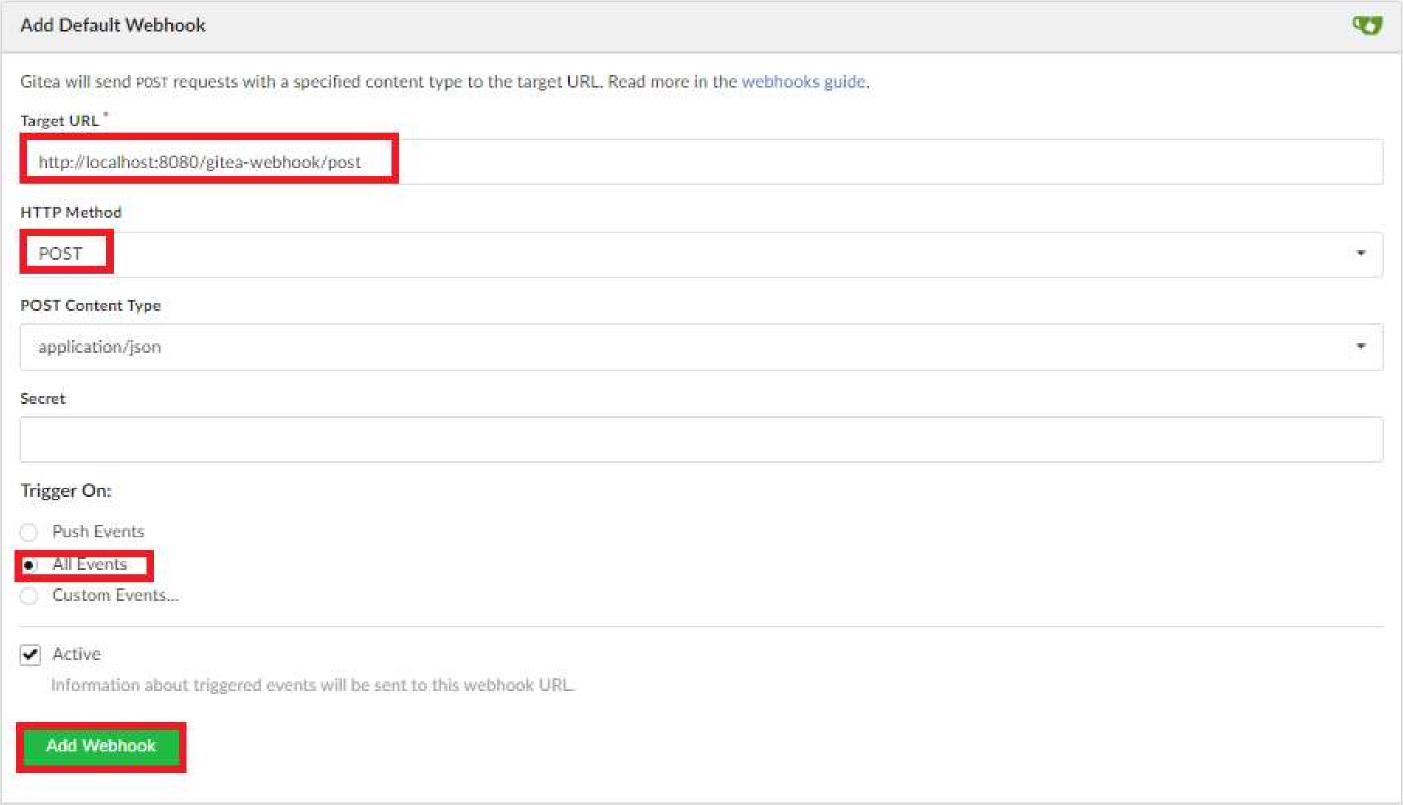
□ Enable BuildStep Action

Set-up the Gitea to Jenkins webhook

- We are going to set-up a webhook were Gitea will perform HTTP POST requests each time a new event happens globally.
- This is done on the Gitea side, in site admins settings, in the Webhooks tab. Here is the direct link to it http://localhost:3000/admin/hooks



Webhooks automatically make HTTP POST requests to a server when certain Gitea events trigger. Webhooks defined here are defaults and will be copied into all ne
Read more in the webhooks guide.



Add Default Webhook

Gitea will send POST requests with a specified content type to the target URL. Read more in the webhooks guide.

Target URL *

http://localhost:8080/gitea-webhook/post

HTTP Method

POST

POST Content Type

application/json

Secret

Trigger On:

○ Push Events

● All Events

○ Custom Events...

☑ Active

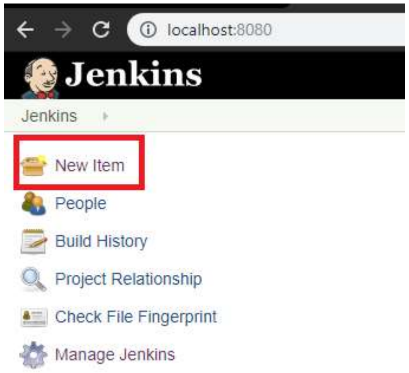
Information about triggered events will be sent to this webhook URL.

3rd Part: Platform Ops

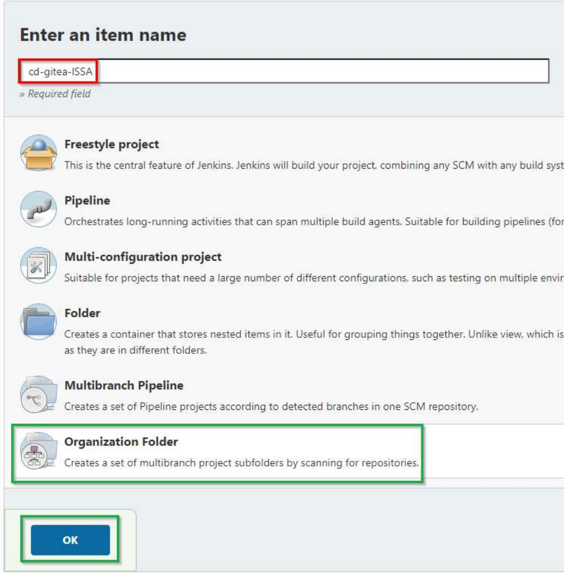
- **Purpose**: set-up the Continuous Delivery environment in Jenkins
- **Points**: 1 / 5

Create the Gitea organization folder using the plugin

- In the Jenkins home page, click on **New Item**
- Then proceed to create a Gitea Organization folder



1 / 6



Enter an item name

cd-gitea-ISSA

» Required field

Freestyle project
This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build syst

Pipeline
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (for

Multi-configuration project
Suitable for projects that need a large number of different configurations, such as testing on multiple envir

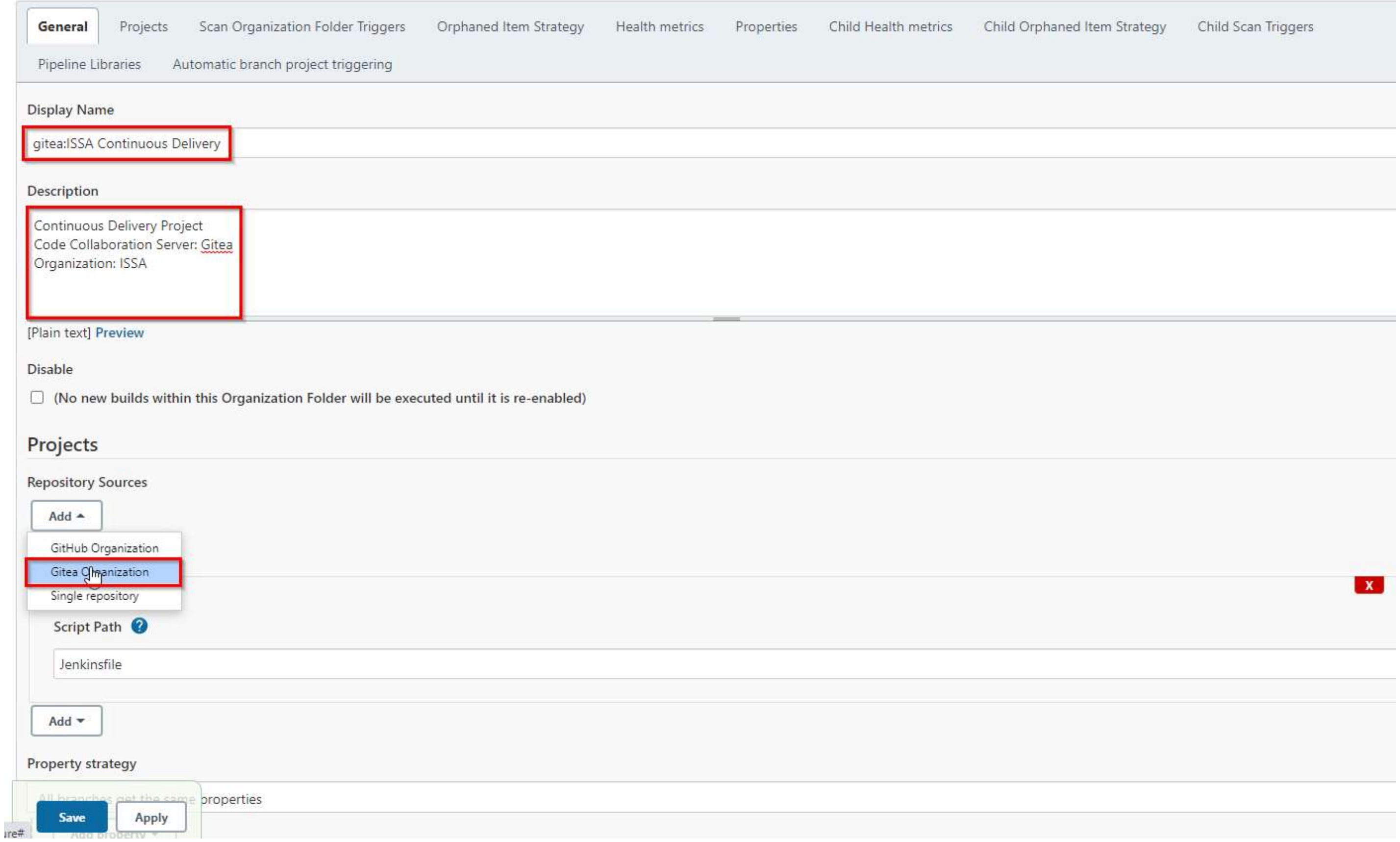
Folder
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is as they are in different folders.

Multibranch Pipeline
Creates a set of Pipeline projects according to detected branches in one SCM repository.

Organization Folder
Creates a set of multibranch project subfolders by scanning for repositories.

2 / 6

- You will be prompted to the Job configuration Page, don’t save yet.



Display Name

gitea:ISSA Continuous Delivery

Description

Continuous Delivery Project
Code Collaboration Server: Gitea
Organization: ISSA

[Plain text] Preview

Disable

□ (No new builds within this Organization Folder will be executed until it is re-enabled)

Projects

Repository Sources

Script Path

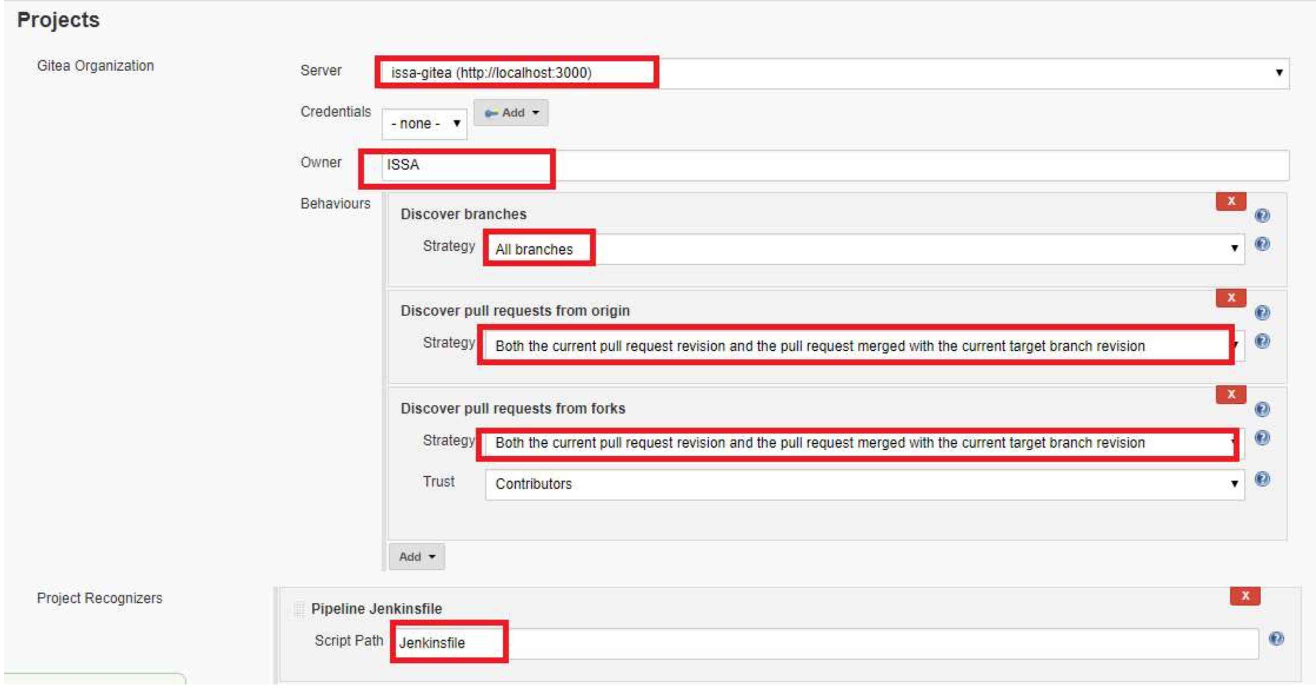
Jenkinsfile

Property strategy

All branches get the same properties

3 / 6

- You will be prompted to the Job configuration Page, don’t save yet.



Projects

Gitea Organization

Server: issa-gitea (http://localhost:3000)

Credentials: - none -

Owner: ISSA

Behaviours

Discover branches

Strategy: All branches

Discover pull requests from origin

Strategy: Both the current pull request revision and the pull request merged with the current target branch revision

Discover pull requests from forks

Strategy: Both the current pull request revision and the pull request merged with the current target branch revision

Trust: Contributors

Project Recognizers

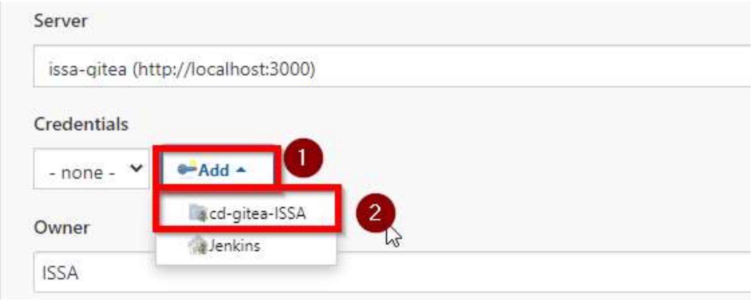
Pipeline Jenkinsfile

Script Path: Jenkinsfile

4 / 6

- Also you have to add the credentials that have access to the specified organization (Owner)
- These credentials are going to be available only for **cd-gitea-ISSA**

5 / 6



Server

issa-gitea (http://localhost:3000)

Credentials

- none -

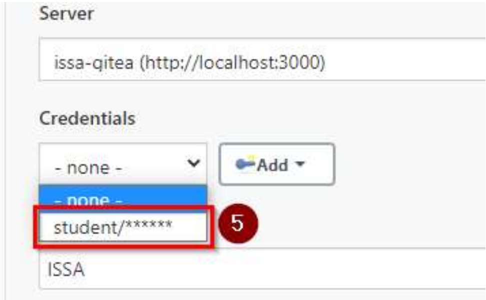
Add 1

cd-gitea-ISSA 2

Jenkins

Owner

ISSA



Server

issa-gitea (http://localhost:3000)

Credentials

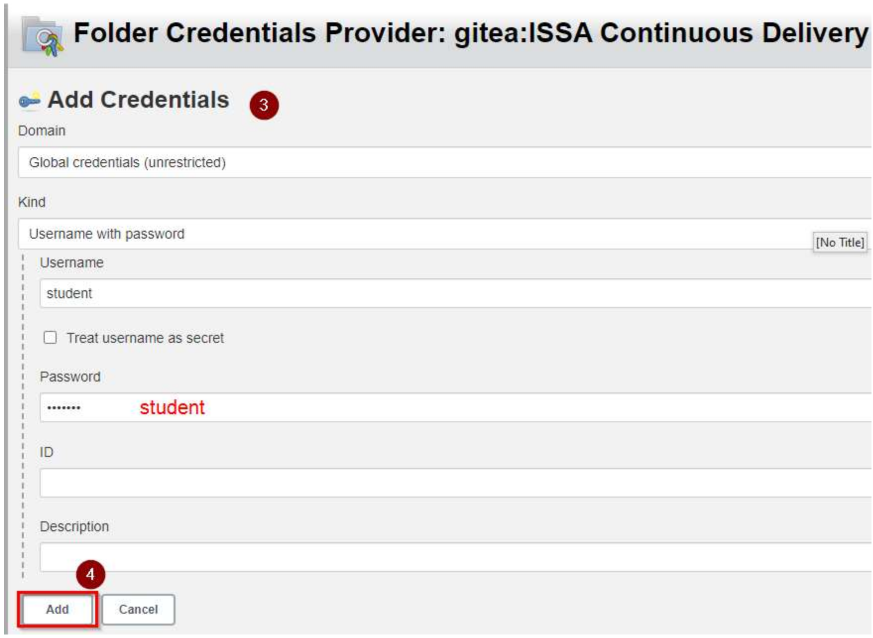
- none -

Add

- none -

student/****** 5

ISSA



Folder Credentials Provider: gitea:ISSA Continuous Delivery

Add Credentials 3

Domain: Global credentials (unrestricted)

Kind: Username with password [No Title]

Username: student

☐ Treat username as secret

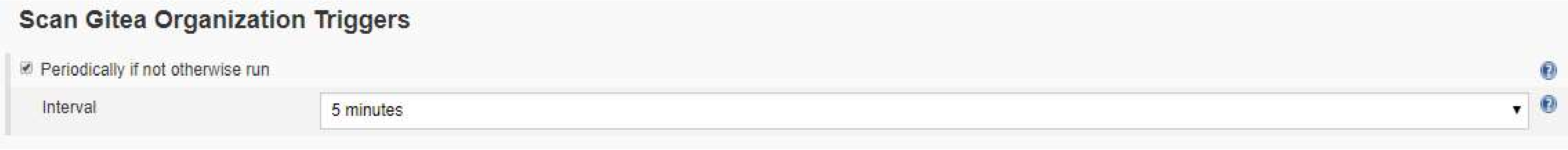
Password: ••••••• student

ID:

Description:

4 Add Cancel

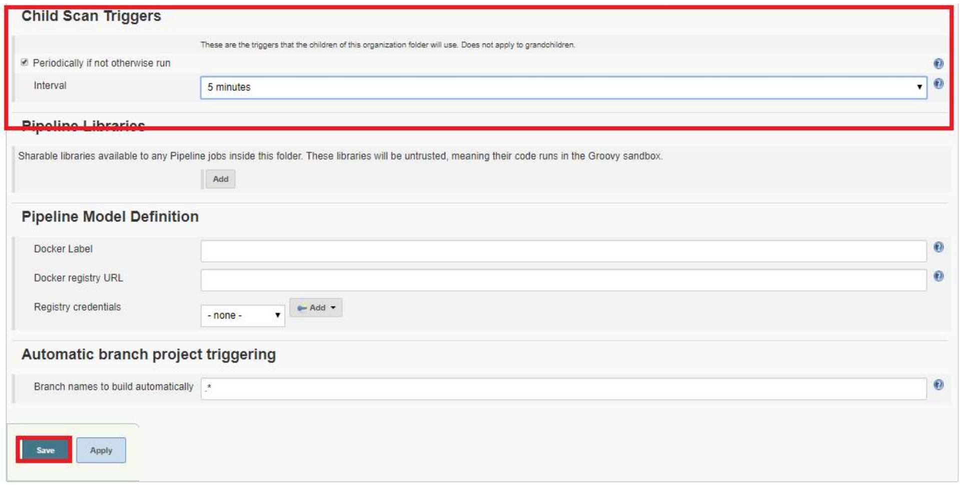
- Go down into the job configuration page and update the following configurations and **Save**



Scan Gitea Organization Triggers

☑ Periodically if not otherwise run

Interval: 5 minutes



Child Scan Triggers

These are the triggers that the children of this organization folder will use. Does not apply to grandchildren.

☑ Periodically if not otherwise run

Interval: 5 minutes

Pipeline Libraries

Sharable libraries available to any Pipeline jobs inside this folder. These libraries will be untrusted, meaning their code runs in the Groovy sandbox.

Pipeline Model Definition

Docker Label:

Docker registry URL:

Registry credentials: - none -

Automatic branch project triggering

Branch names to build automatically: .*

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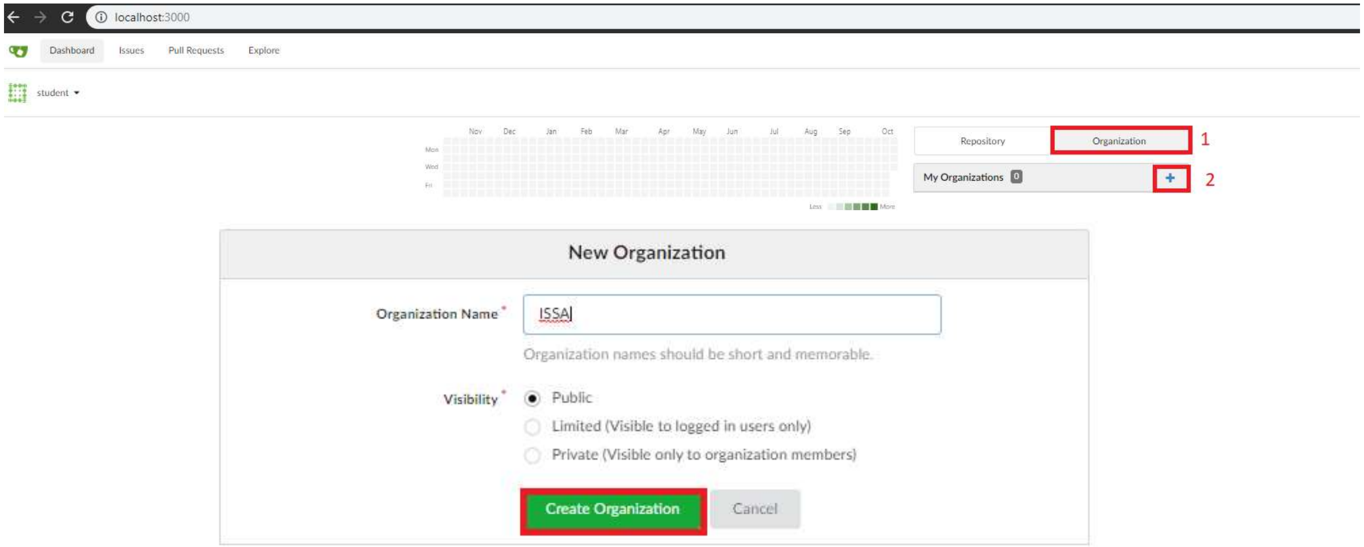
4th Part: Site Reliability Engineering Ops (SREOps)

- **Purpose**: set-up the production environment, software development environment and the required configuration management particularities
- **Points**: 1 / 5

Create a new Gitea organization

› Access Gitea homepage http://localhost:3000/ and proceed creating your ISSA organization



New Organization

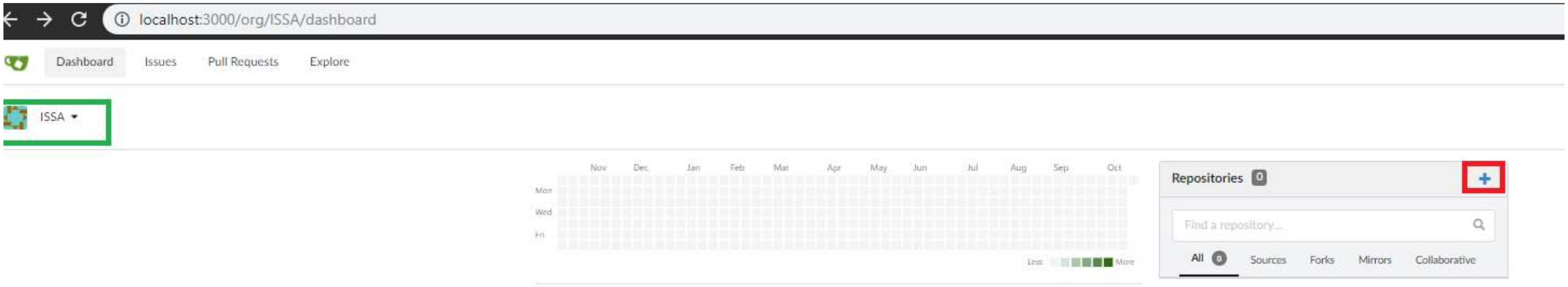
Organization Name * ISSA

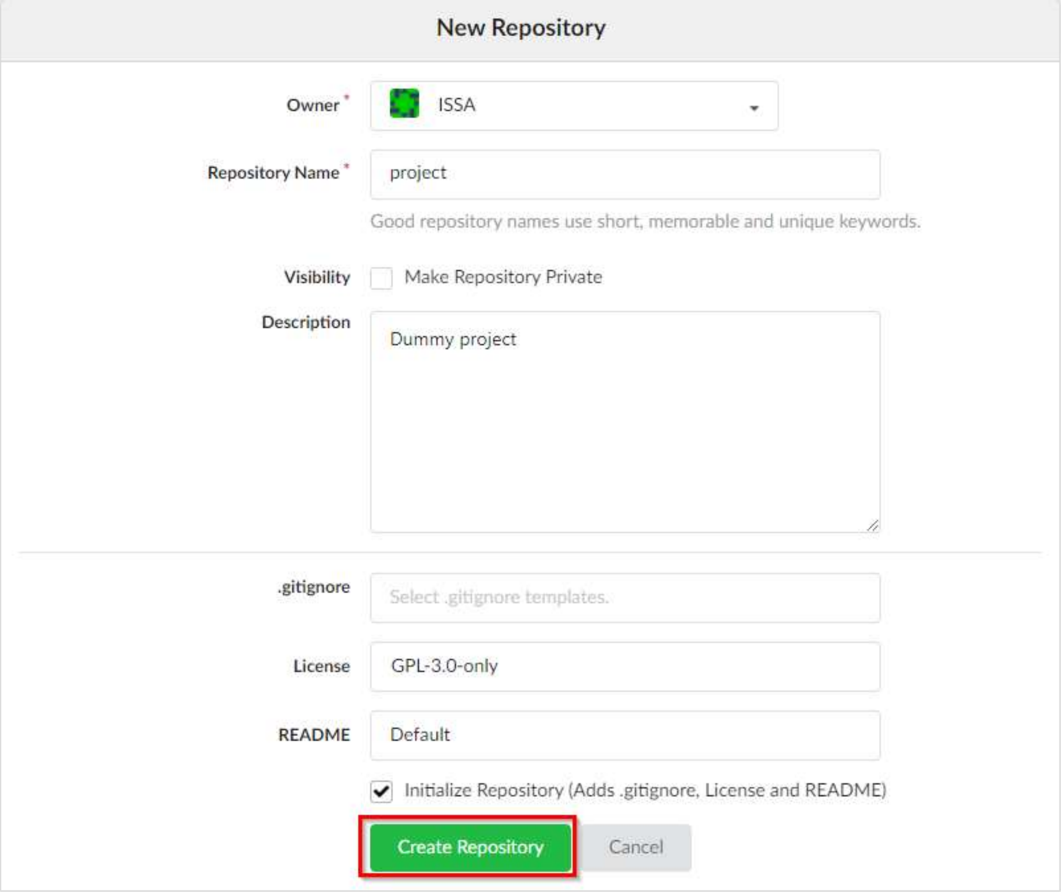
Organization names should be short and memorable.

Visibility *
● Public
○ Limited (Visible to logged in users only)
○ Private (Visible only to organization members)

Create your project Git repository

- From your ISSA's organization dashboard page http://localhost:3000/org/ISSA/dashboard, proceed creating your project's Git repository





New Repository

Owner * ISSA

Repository Name * project

Good repository names use short, memorable and unique keywords.

Visibility □ Make Repository Private

Description: Dummy project

.gitignore: Select .gitignore templates.

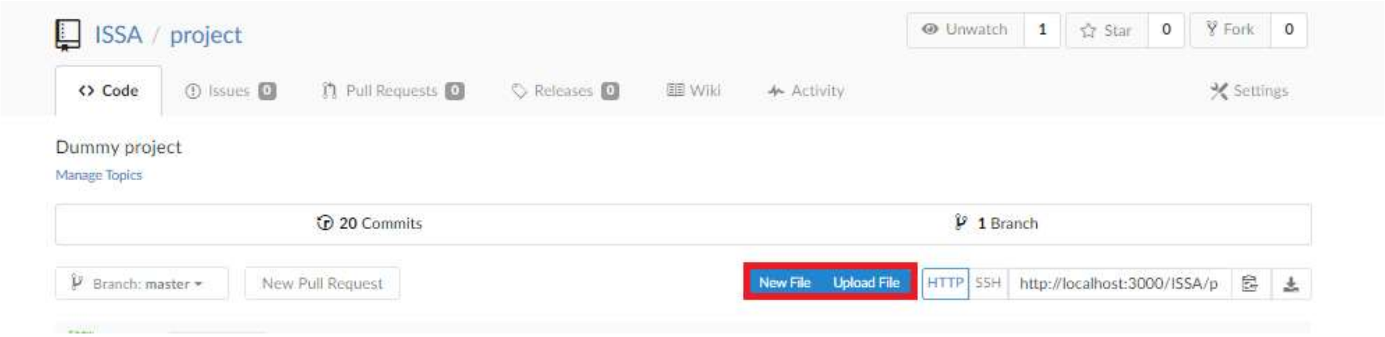
License: GPL-3.0-only

README: Default

☑ Initialize Repository (Adds .gitignore, License and README)

How to commit a new file(s)

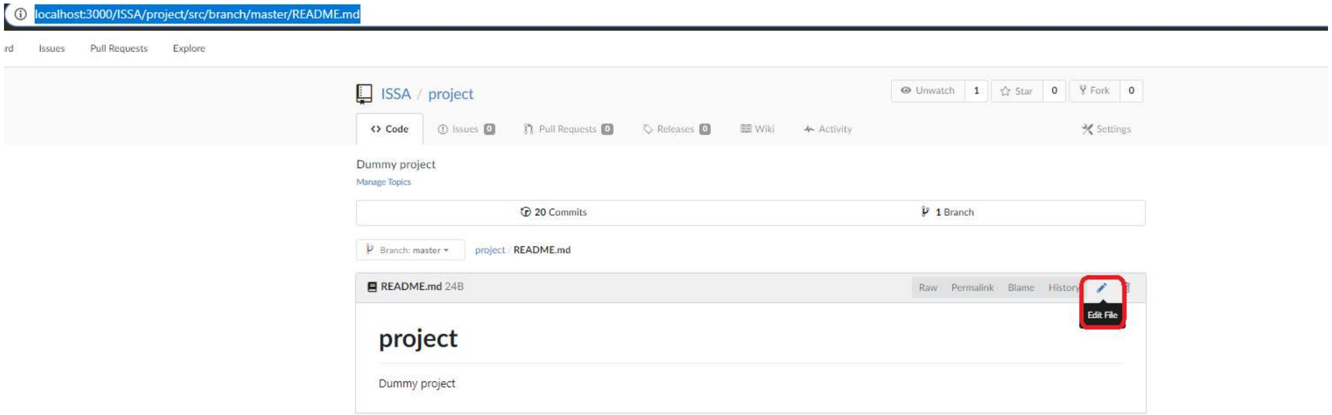
- From your repository page http://localhost:3000/ISSA/project. Via the New File or Upload File



- The New File will prompt your to a page where you can specify the file name (or relative path) and edit it on the spot.
- The Upload File will prompt your to a page where you can drag and drop files to be committed

How to edit a committed file

- From your repository page http://localhost:3000/ISSA/project. Navigate to the desired file to be edited. README.md for example http://localhost:3000/ISSA/project/src/branch/master/README.md and click on the edit button.



localhost:3000/ISSA/project/src/branch/master/README.md

Initial Jenkinsfile

- Commit a new file called **Jenkinsfile**
- It should have only one line
  - **sleep 10**
- After that go to http://localhost:8080/job/cd-issa-gitea/, the Gitea Jenkins Project that you created at the 3rd Step.
- From the menu of the left, click on **Scan Gitea Organization Now.**
- Now the ISSA/project repository should have it's own **project** folder with it's own Jenkins job for the **master** branch that only sleeps 10 seconds at each new change / commit.

Add your project source code

- Go to https://github.com/whymex/issa-cd-fii and port the following files, keeping the directory structure in your Gitea repository
  - **dev-requirements.txt**
  - **requirements.txt**
  - **project/__init__.py**
  - **project/project.py**
- **Commit each file individually.** 4 Jenkins builds (that still do nothing) should get triggered.

Jenkinsfile code

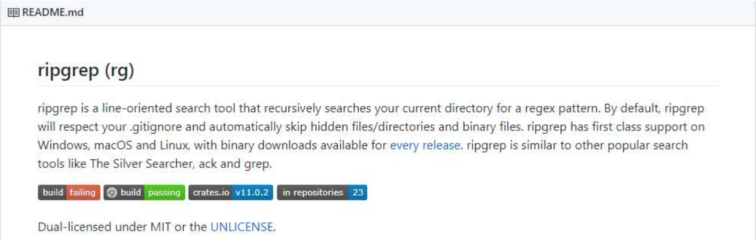
- Edit the Jenkinsfile from your Gitea repository and copy paste the code from https://github.com/whymex/issa-cd-fii/blob/master/Jenkinsfile
- Observe what's happening in Jenkins and check the Console Output
  - Hint: In case of error, check **system** environment variable for python and pip.
  - After the changes will be done, restart the Jenkins service from services.msc
- Observe what happened in Gitea after the pipeline execution

Fix the code style and make the pipeline succeed

- Fix the variables naming from **project/project.py** by replacing x and y with first_number and second_number
- Commit the changes and analyze the Jenkins pipeline execution

Exercise: Add a build badge to README.md

- **Points**: 1 / 5
- The majority of the opensource project have inside their README.md a badge like icon that displays the build / pipeline execution status.
- Example: https://github.com/BurntSushi/ripgrep



README.md

ripgrep (rg)

ripgrep is a line-oriented search tool that recursively searches your current directory for a regex pattern. By default, ripgrep will respect your .gitignore and automatically skip hidden files/directories and binary files. ripgrep has first class support on Windows, macOS and Linux, with binary downloads available for every release. ripgrep is similar to other popular search tools like The Silver Searcher, ack and grep.

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- Hints:
  - Use the following plug-in and check it's documentation how to set it up and add the necessary links to your README.md https://github.com/jenkinsci/embeddable-build-status-plugin
  - Allow anonymous users read access at Jenkins.