MLFM | Machine Learning Flow Manager

User Manual

MLFM Version 3.0

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Overview

This document is meant to be the essential documentation as a user manual for MLFM installer v3.0, it provides useful information about the bundle, health check commands, debugging commands, and a step by step guide to install the MLFM platform. Also, it provides a scope about the version.

1. MLFM Installation

1.1. Install A New Version

Shared artifacts

1. A `.run` file **(shared via SecuFEx)** is a self extracting Unix script including all the batteries needed to power and manage an MLFM installation.
2. `DEPLOY_KEY_USERNAME` and `DEPLOY_KEY_PASSWORD` **(shared via Mail or SecuFEx)** are the access credentials used to pull secured MLFM resources.

Prerequisites

To run MLFM smoothly, you need to have the following

Minimum Requirements:

- Memory: 6 GBvm
- Storage: 80 GB
- CPU: 2 cores
- Virtualbox 6.1 (Incase virtualization is used instead of bare metal)

Recommended Requirements:

- Memory: 8 GB
- Storage: 100 GB
- CPU: 4 cores
- Virtualbox 6.1 (Incase virtualization is used instead of bare metal)

Virtual machine provisioning steps

1. Download and install Virtualbox 6.1
2. Download Ubuntu 18.04 or Ubuntu 20.04 iso image (other distros could be tried as well)
3. Create a new Linux 64bit VM from Virtualbox
4. Change resources allocated to the VM (memory, cpu, storage) as per requirements mentioned above
5. Start installing Linux distro (Ubuntu) by inserting downloaded iso from step 2
6. On Ubuntu once installation is complete, we'd need to install Guest additions
7. Setup a shared folder between host and guest VM (this is where MLFM .run **(Will be shared via SecuFEx)** shall be placed)

Step by step guide

To run the installer, follow the following steps, and make sure you satisfy the prerequisites.

Installation could typically take up to 45 mins, but it varies depending on hardware specs and internet bandwidth. The reason behind the long installation time is that the bundle typically orchestrates 32 k8s pods, which takes a while to create and orchestrate.

1. Download MLFM .run file **(Will be shared via SecuFEx)** and place it in the shared folder on your host machine
2. Open a terminal window in the guest VM using the GUI, or using the following shortcut: CTRL + ALT + T
3. cd into the shared folder where MLFM .run file resides
4. Make sure the .run file is executable by running `chmod +x ./MLFM_Installer_<version>.run"`
5. Run in the terminal to start the installation process
    1. `export DEPLOY_KEY_USERNAME={Paste the DELPOY_KEY_USERNAME that is shared via SecuFEx or Mail}`
    2. `export DEPLOY_KEY_PASSWORD={Paste the DELPOY_KEY_PASSWORD that is shared via SecuFEx or Mail}`
    3. `export VERBOSE=1`
    4. `./MLFM_Installer_<version>.run`
6. During the installation prompt for root password might be required

Start MLFM

- Just open your browser and Enter http://mlfm.siemens.local in the url box

MLFM built-in users

- admin user
    - email : csp-r8_dadmin@mentor.com
    - password : Test12345
- workflow creator user (this user has 2 roles workflow creator and plugin manager)
    - email : creator@siemens.com
    - password : Test12345
- operator user
    - email : basic@siemens.com
    - password : Test12345
- documenter user
    - email : documenter@siemens.com
    - password : Test12345

Expected outcomes of the installation

If the installation finishes successfully, there are expected outcomes (logs).

You can check the readiness of the pods using the following command

- `mlfman kubectl get pods -A`

In case you found some pods are running, and others have problems initializing (for ex : ImagePullBackOff), you can do the following steps to help installation continue successfully

- You can try to restart the virtual machine, sometimes this helps refresh kubernetes resource orchestration and restarts the pod initialization .

Note that the previous tips are optional, typically if you just wait long enough, all the pods eventually will be initialized, because kubernetes retries to initialize all the failed containers periodically, but restarting proved to be accelerating that process in this situation.

In case you reboot the vm, please run the following command after 15 mins of the reboot : `mlfman kubectl get pods -A` make sure that the all the pods status now are in "Running" state, if not, please wait for other 15 mins, then re-run the command.

1.2. Useful commands

MLFM is a very resource exhaustive set of applications, running in a K8s cluster, so you are expected to face high CPU utilization sometimes, this is only normal, specially while an experiment takes place.

Sometimes you would need the following commands while running the platform on your host or your virtual machine, each command will be described with an example if possible.

1.3. K8s resource monitoring

- Check online pods and all existing resource status- `mlfman kubectl get pods -A`
- Get service cluster ip (example, get the ip of pipelines ui)- `mlfman kubectl get svc -A`

You can also specify kubeflow namespace using `-n kubeflow` instead of `-A` if your cluster has many existing namespaces

1.4. Uninstall MLFM

Run the following command `mlfman uninstall`

1.5. Update MLFM

Currently the update process is to uninstall the older version of MLFM and install the new one.
Seek 1.4. Uninstall MLFM for uninstall steps and Step by step guide for installation steps

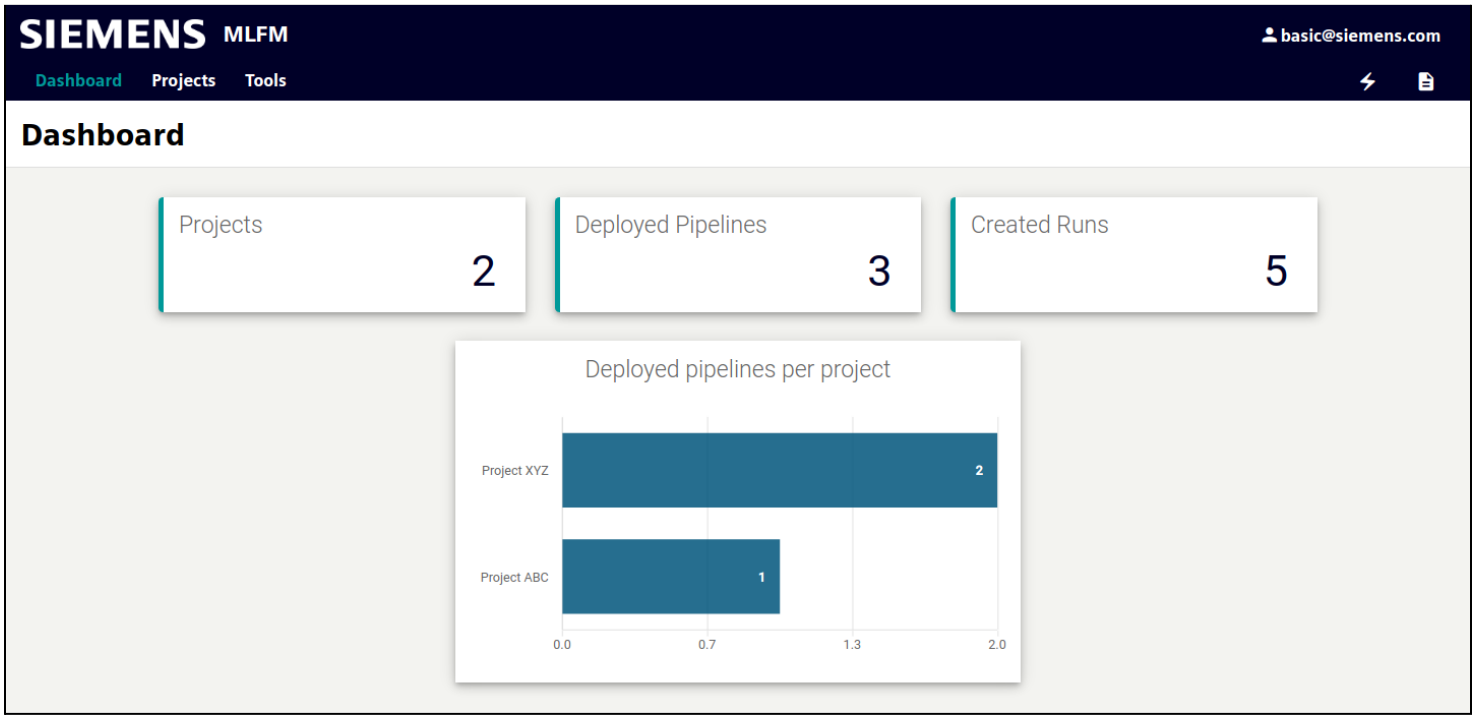
2. User Stories

2.1. Basic User

2.1.1. Dashboard Page

The dashboard is the entry point for the MLFM portal. It has a navigation bar for quick routing for other pages (Projects, Tools and Documentation)

The dashboard contains some statistics about the user activities (created projects, deployed pipelines, and runs). It gives an overview for the user about the system in general.

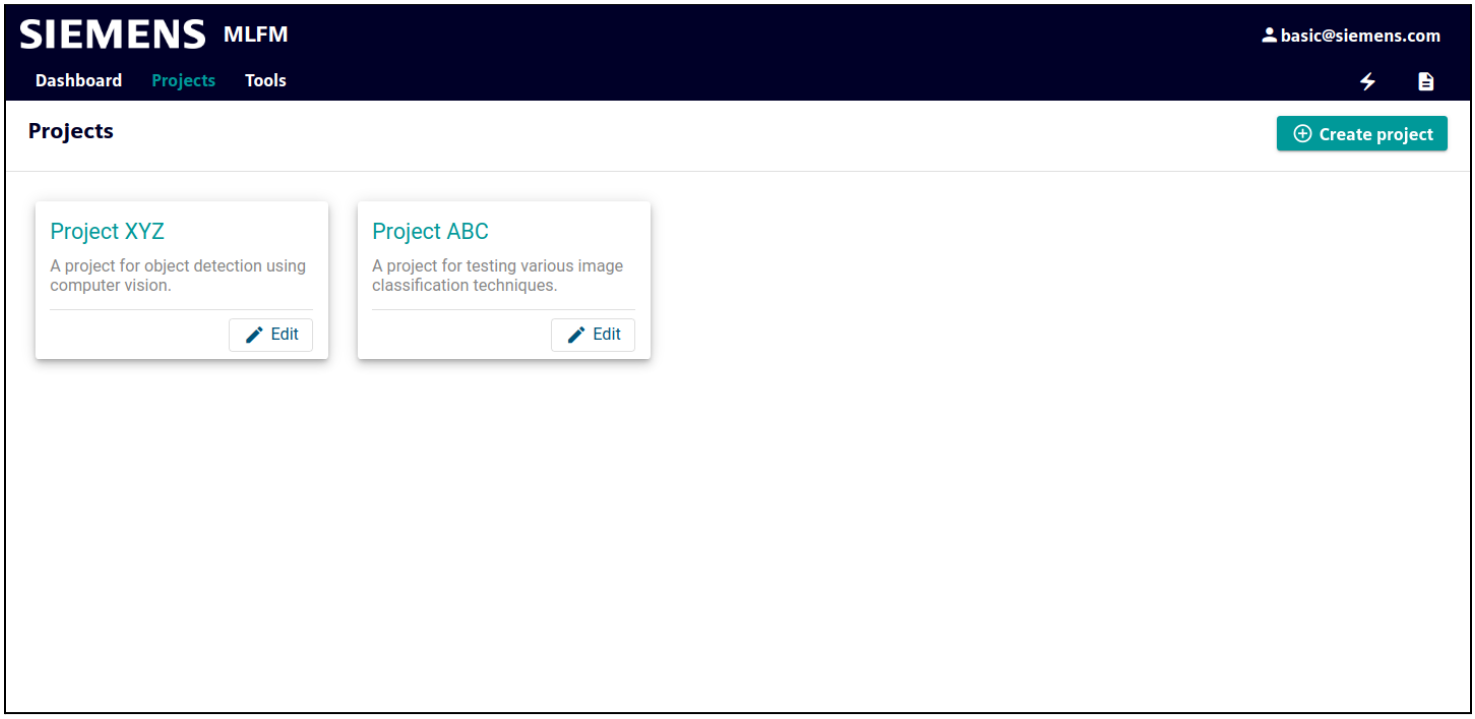


2.1.2. Projects Page

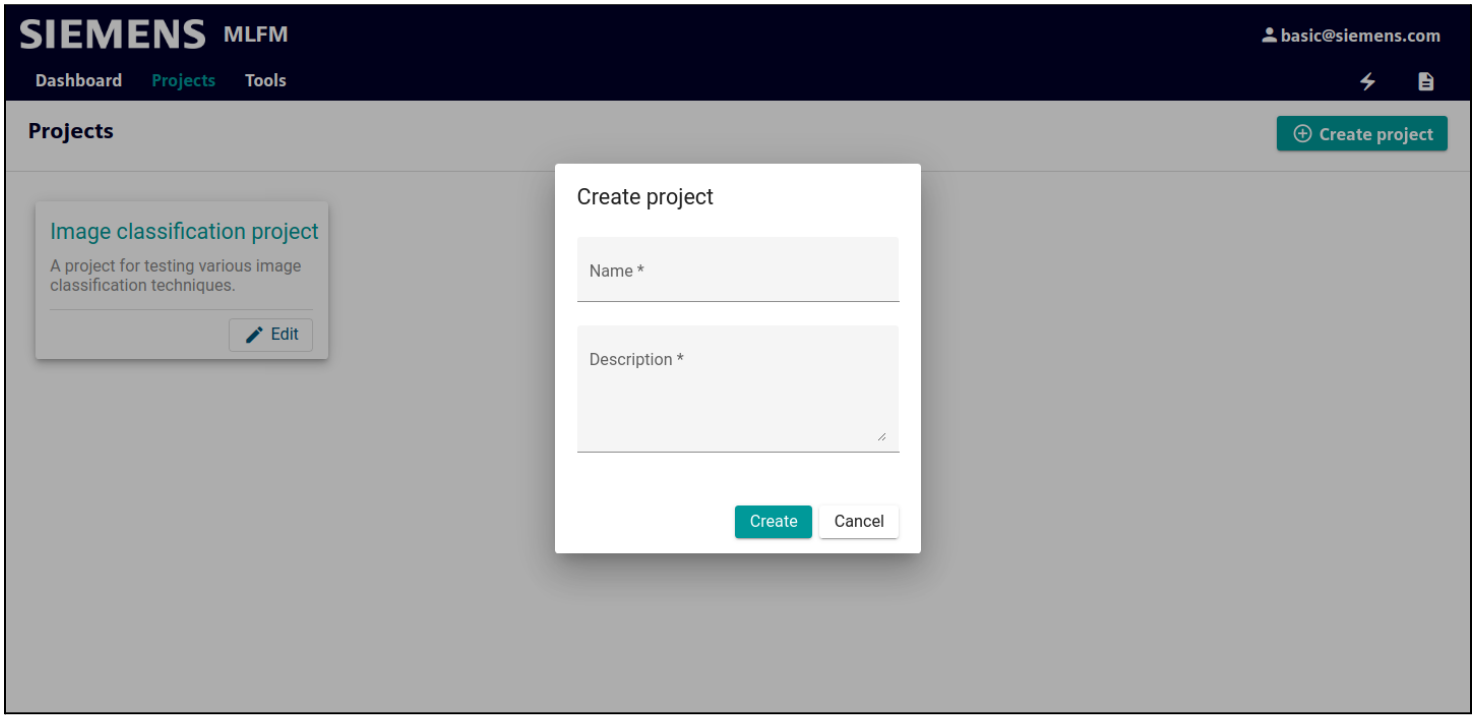
A project in MLFM is the key for pipelines and “runs”. Every pipeline must be linked with a project. So project creation is the first step for cloning and running pipelines.

2.1.2.1. Create project

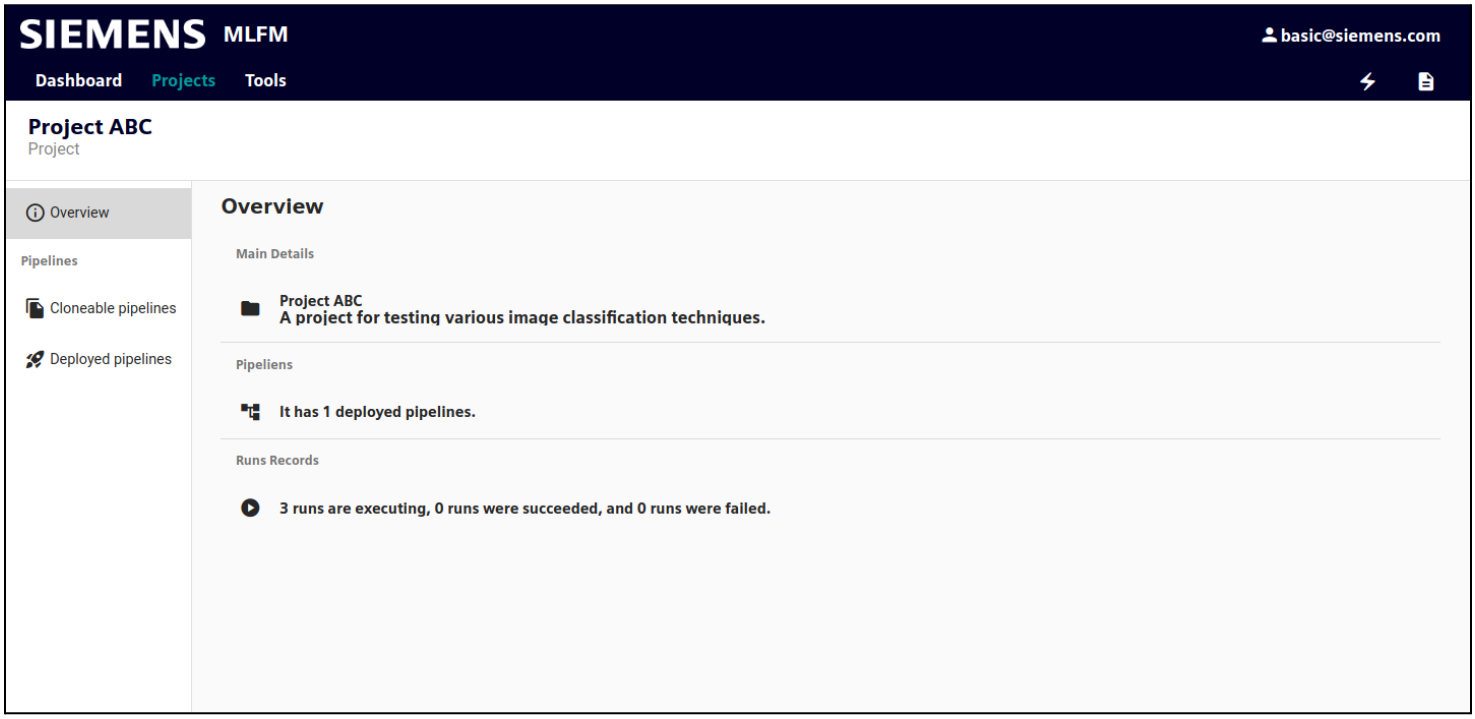
In the projects page, we can see a top-right button for project creation.



The create new project button will pop-up a form that requires project details (name and description).



After project creation, the project will be added to the projects board and can be accessed by the user to see project details and clone pipelines.

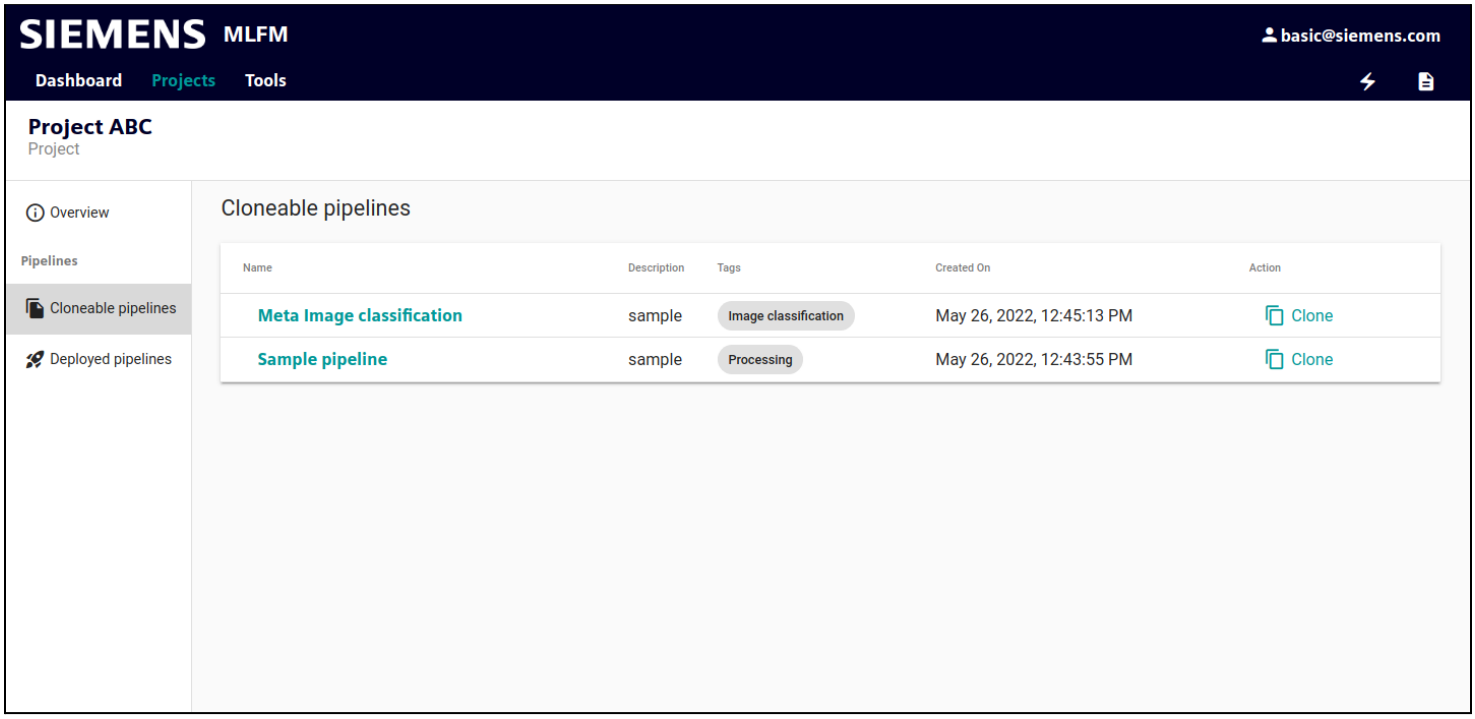


In the project details page, you can find:

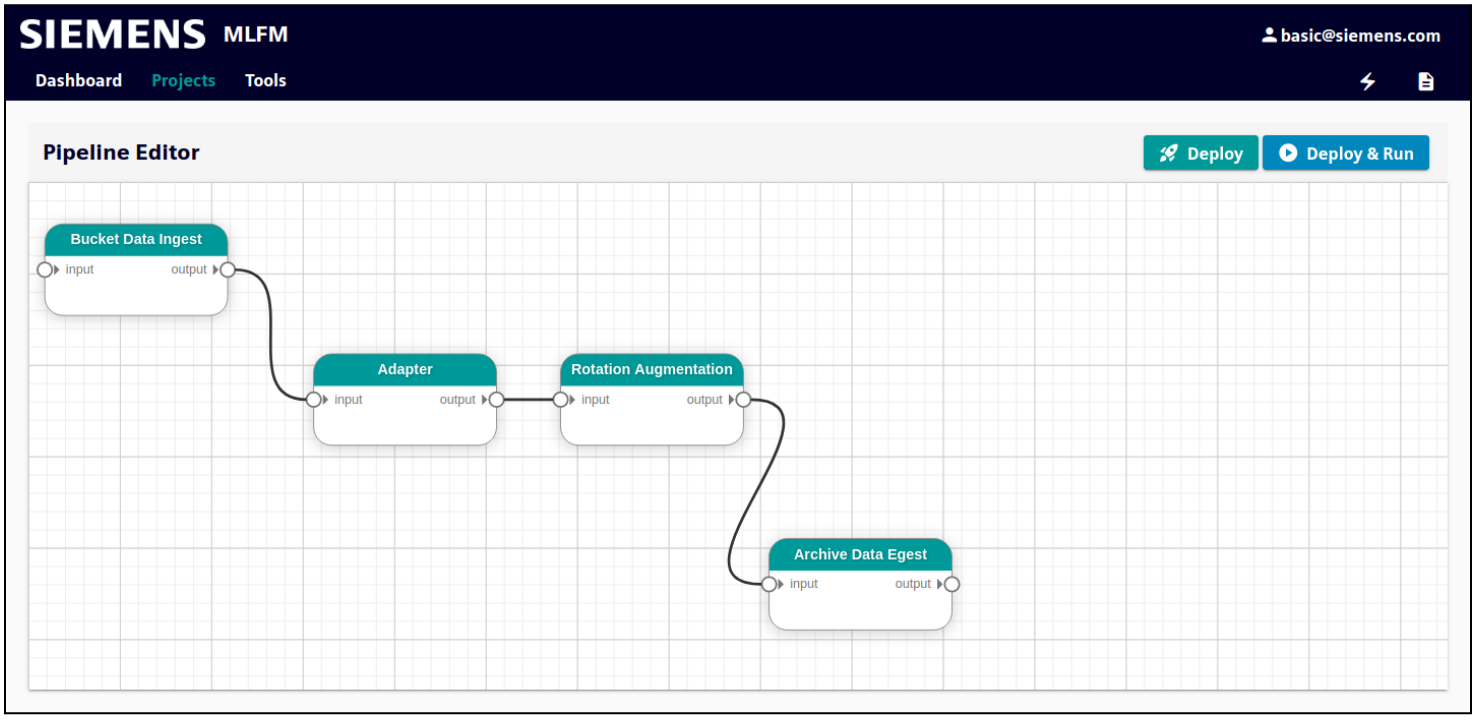
1. Overview: an overview of the project, like the number of deployed pipelines, and some statistics about the “runs” in this project.
2. Cloneable pipelines: a list of the pipelines that can be cloned and deployed.
3. Deployed pipelines: a list of the deployed pipelines in this project.

2.1.2.2. Clone pipeline

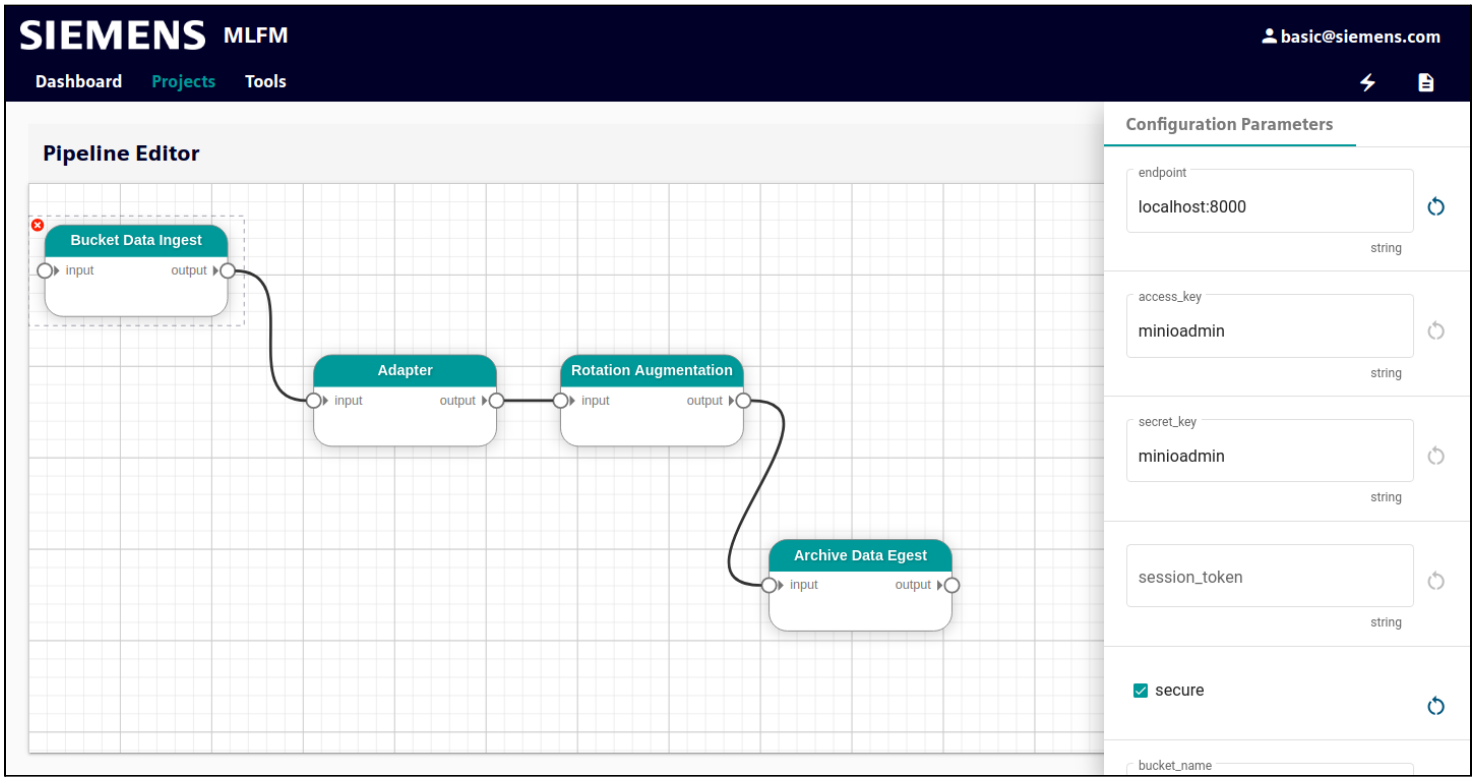
From the project details page, click on “Cloneable pipelines”. You will find a list of the pipelines that can be cloned.



Click on “Clone”.

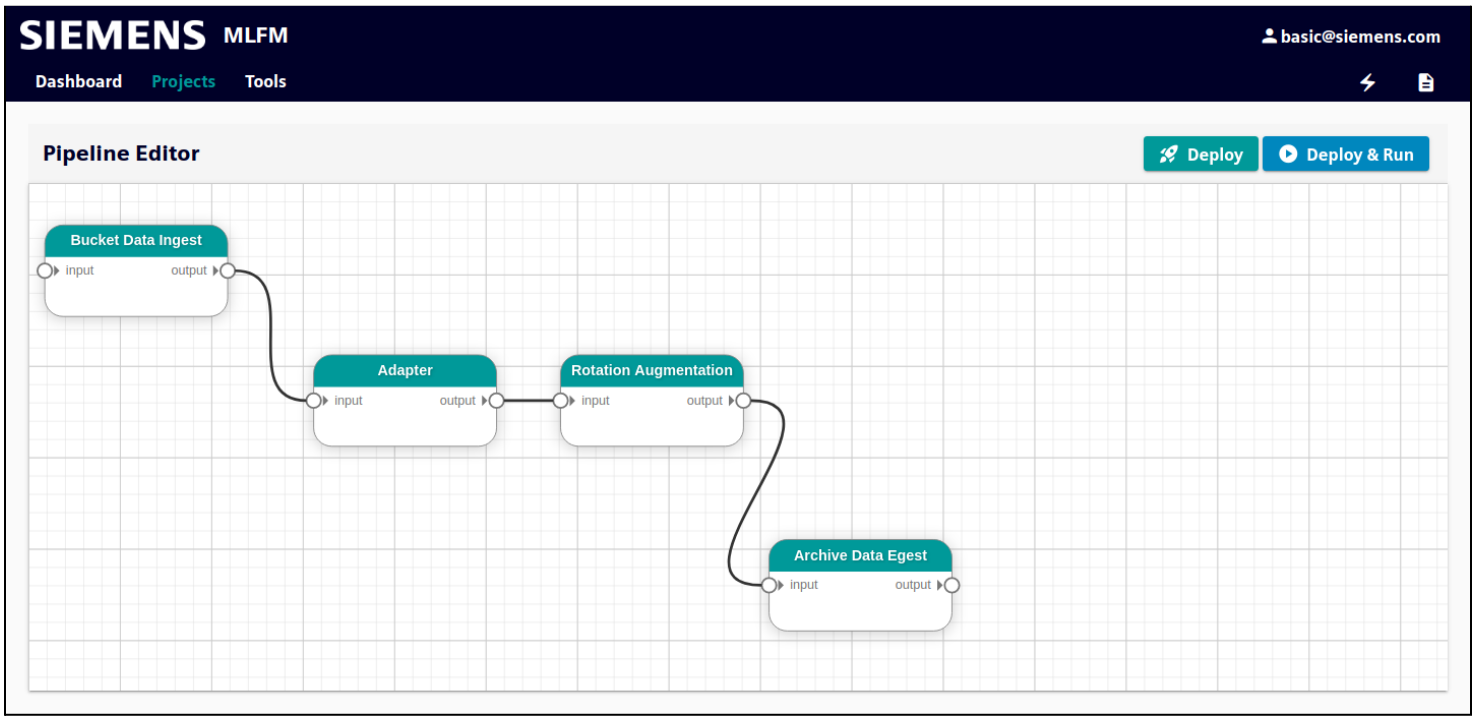


Left-click on a plugin to edit its configuration.

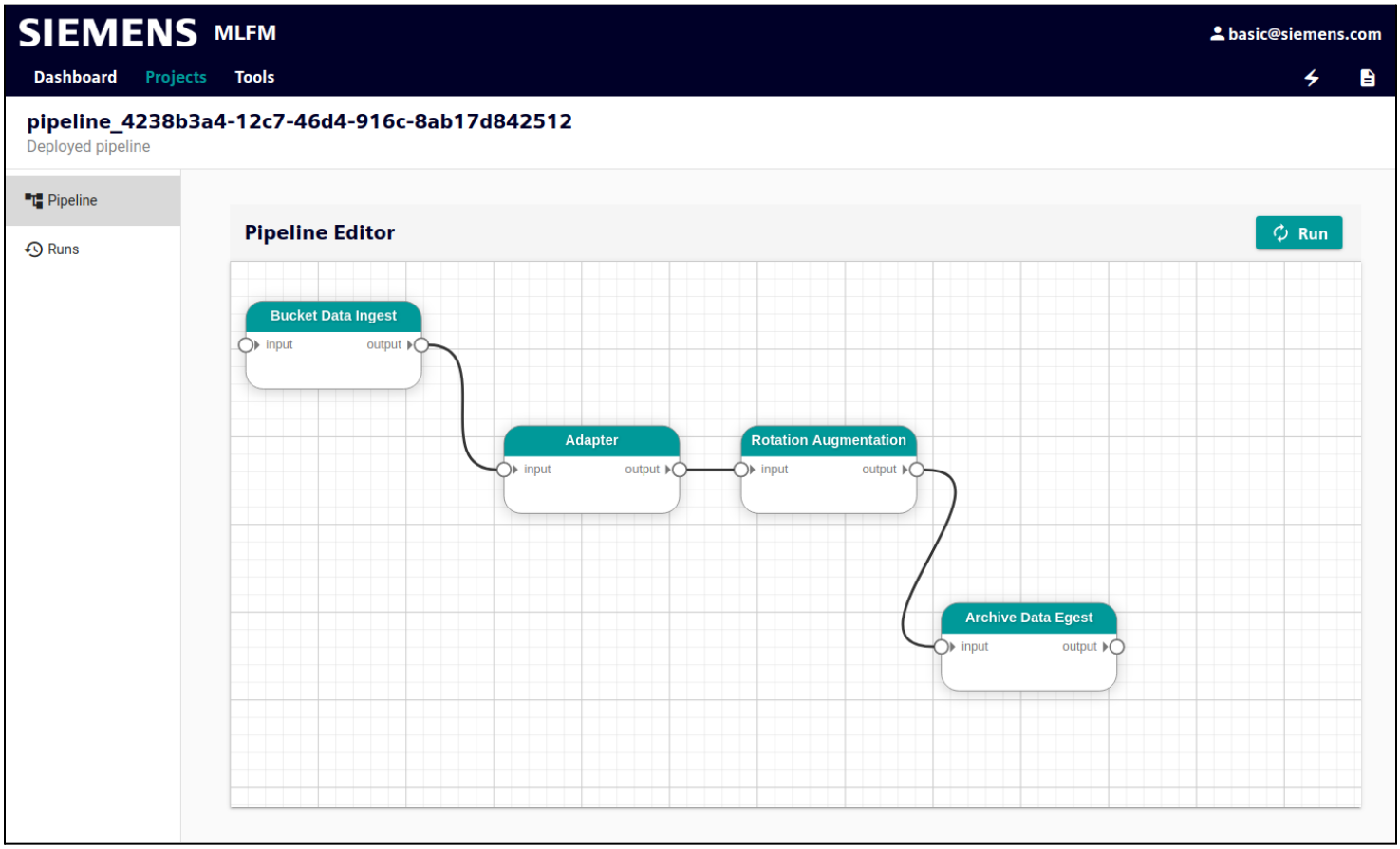


Left-click on a free area on the grid to close the configuration form.

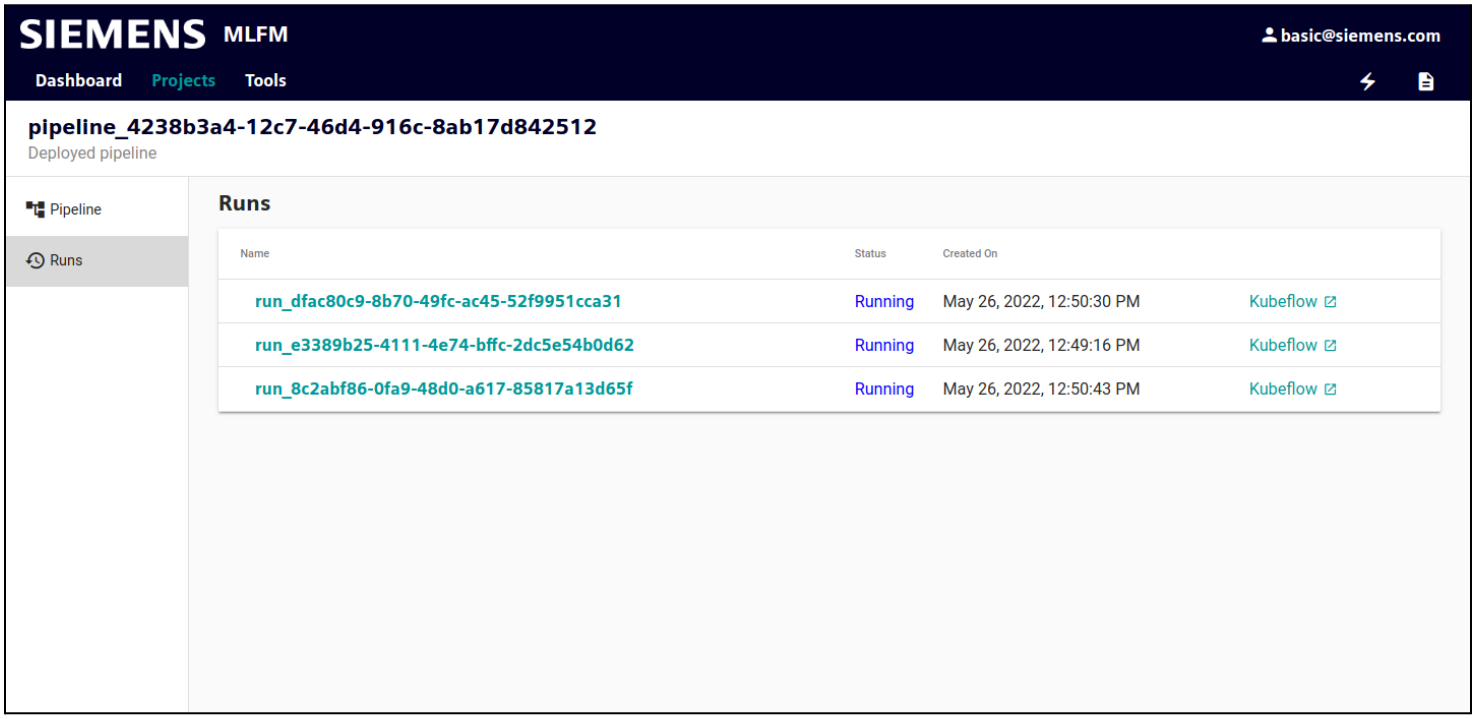
When done, you can deploy, or deploy and run the pipeline, using the buttons on the top-right corner.



When you click “Deploy”, the pipeline will be deployed, and you will be taken to the deployed pipeline page.

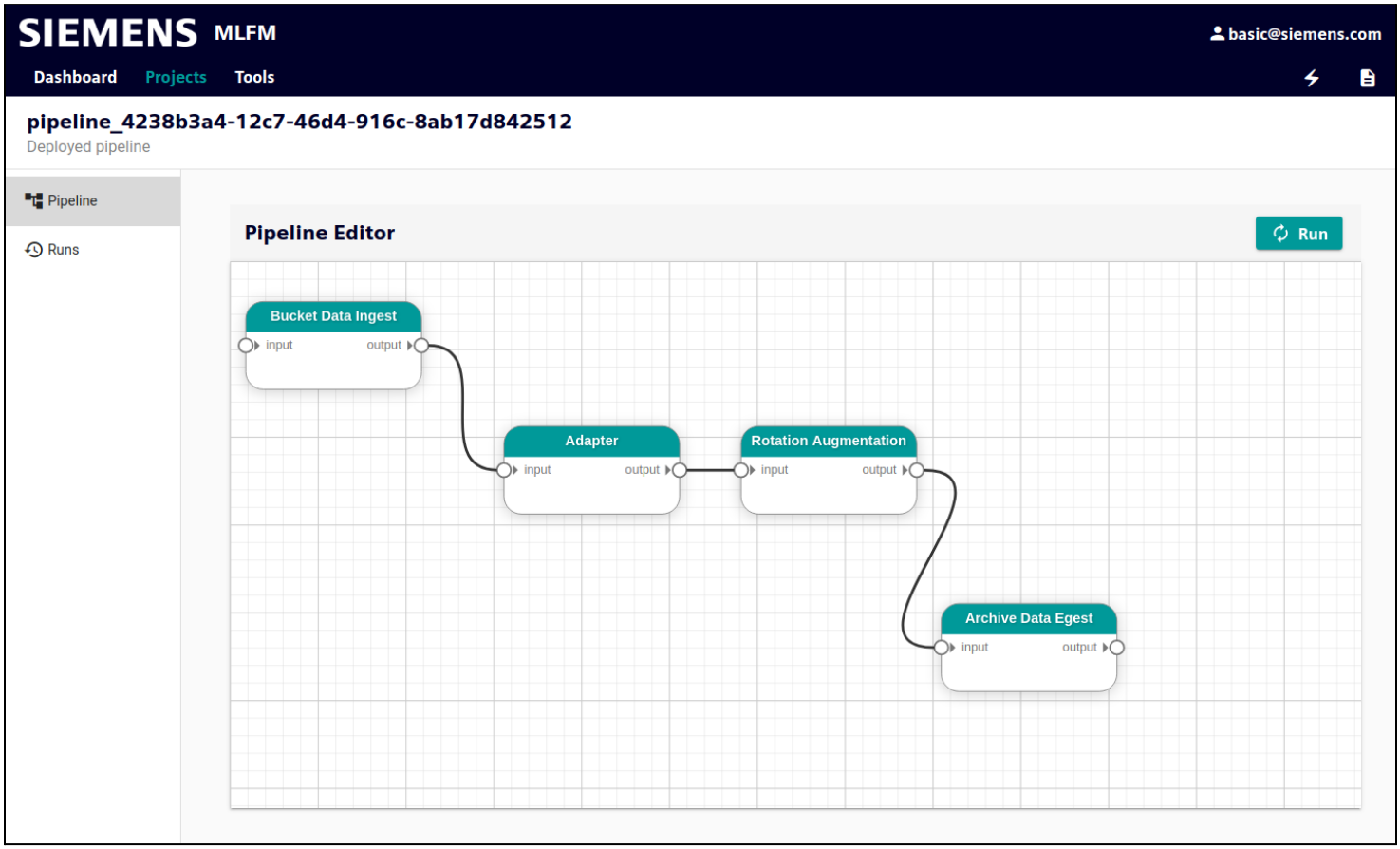


Click on “Runs” on the left side to view the list of “runs” of this deployed pipeline. Here you can see the status of each run, and you can view the run on “Kubeflow”

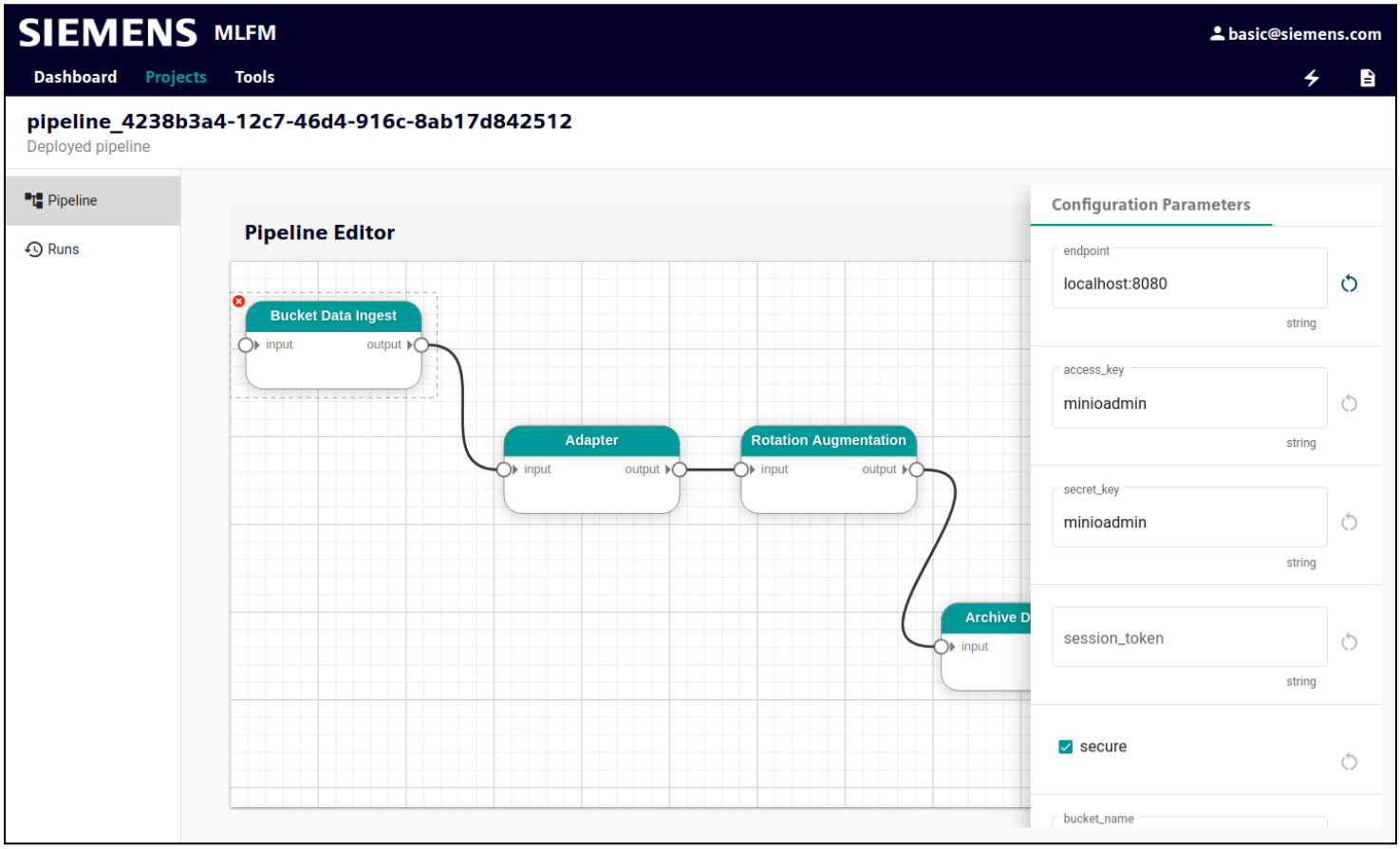


2.1.2.3. Run pipeline

You can create a new “run” for a deployed pipeline, from the deployed pipeline’s page.



Configure the pipeline. Left-click on the plugin you want to edit its configuration. When done, left-click on a free area of the grid to close the configuration form.



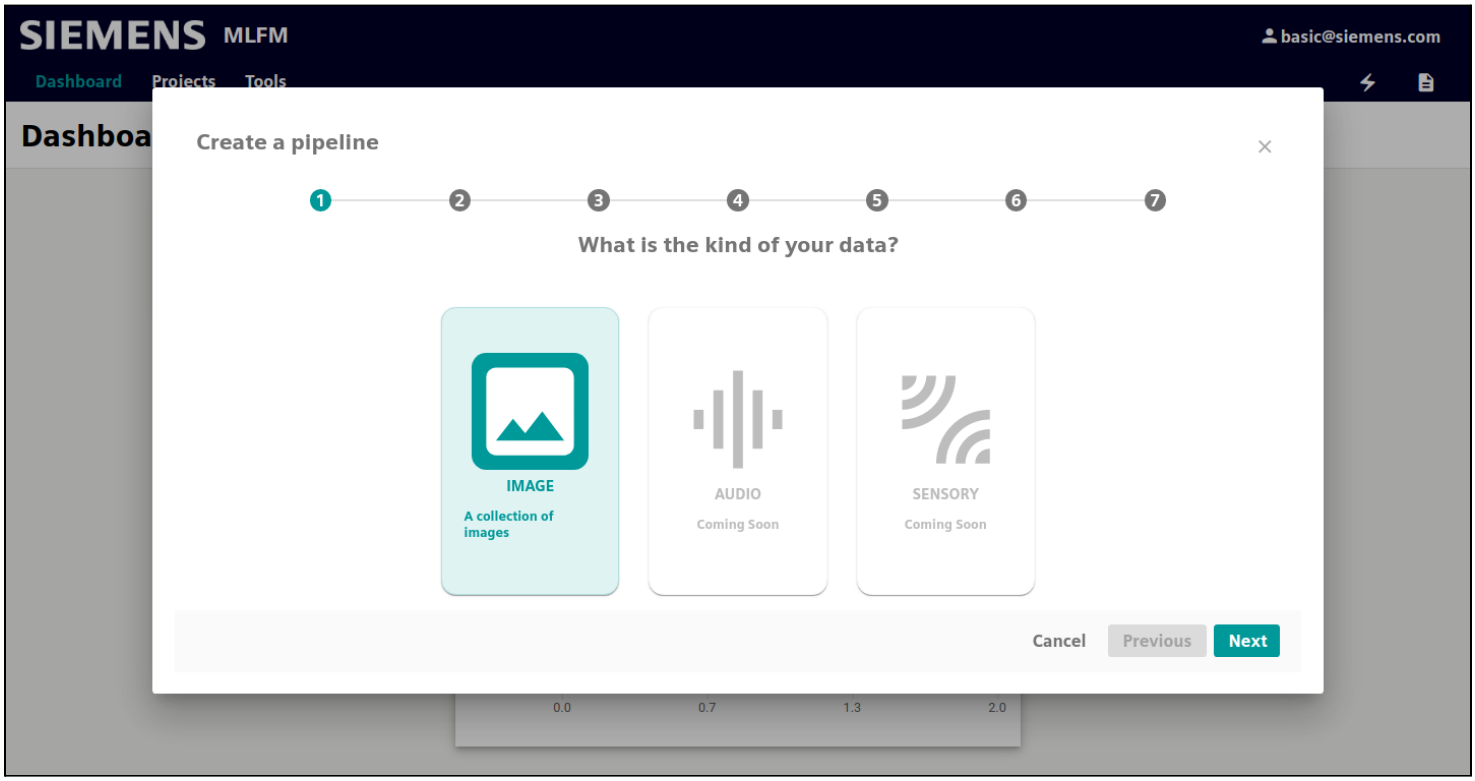
When you finish configuring the pipeline, click on “Run” on the top-right corner to create a new run with the new configuration.

2.1.3. Tools Page

Contains the shipped tools with MLFM. MLFM is open for integration with other tools that can be used in ML activities. For now it is integrated only with the Computer Vision Annotation Tool (CVAT).

2.1.4. Quick start

Quick start button allows you to create a pipeline in a simple and quick way by answering some questions about the problem that you want to solve using ML.



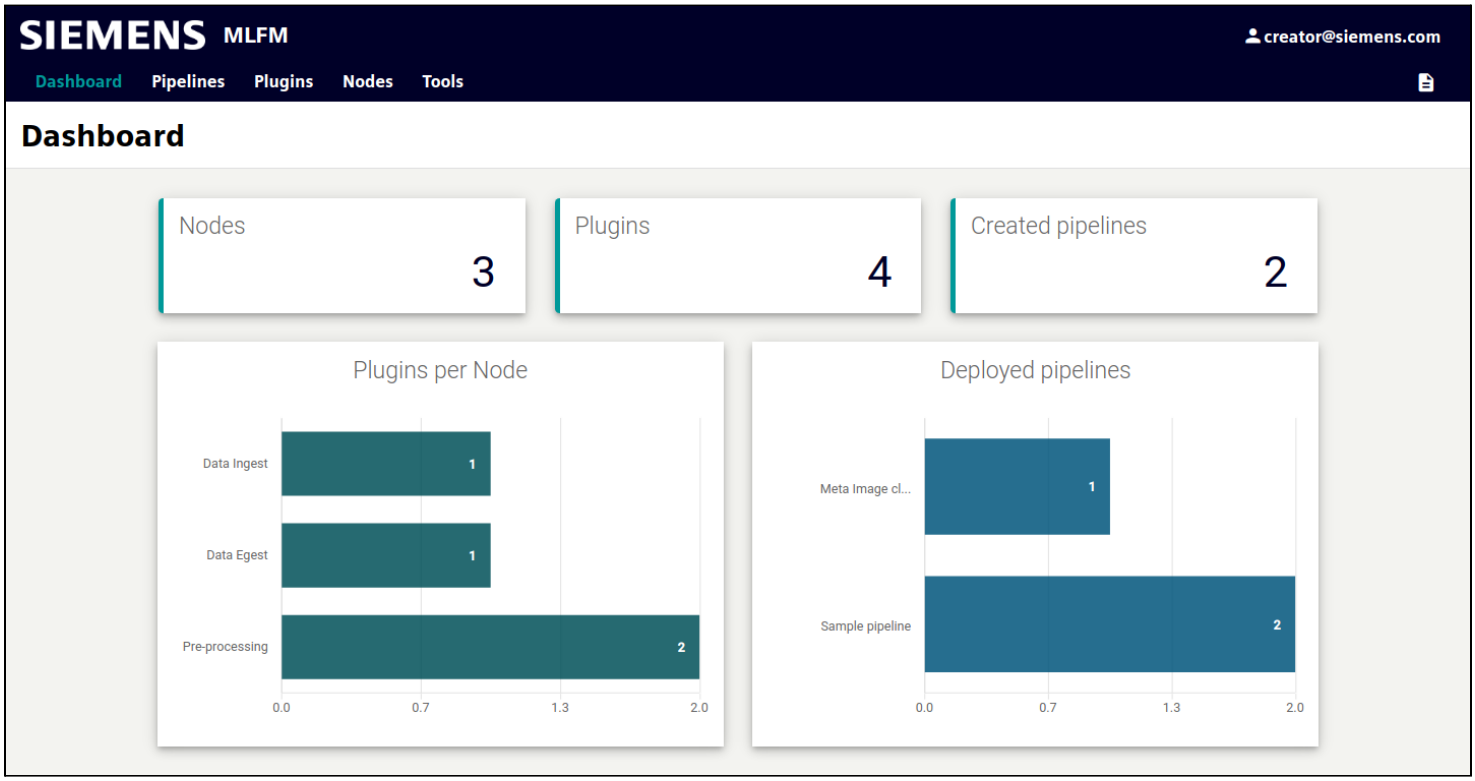
2.1.5. Documentation Page

The last page that can be accessed by the basic user is the ‘Documentation’ page, and it contains documentation about MLFM and functionalities that the user can use for guidance or to check steps for a specific task.

2.2. Workflow Creator User

2.2.1. Dashboard Page

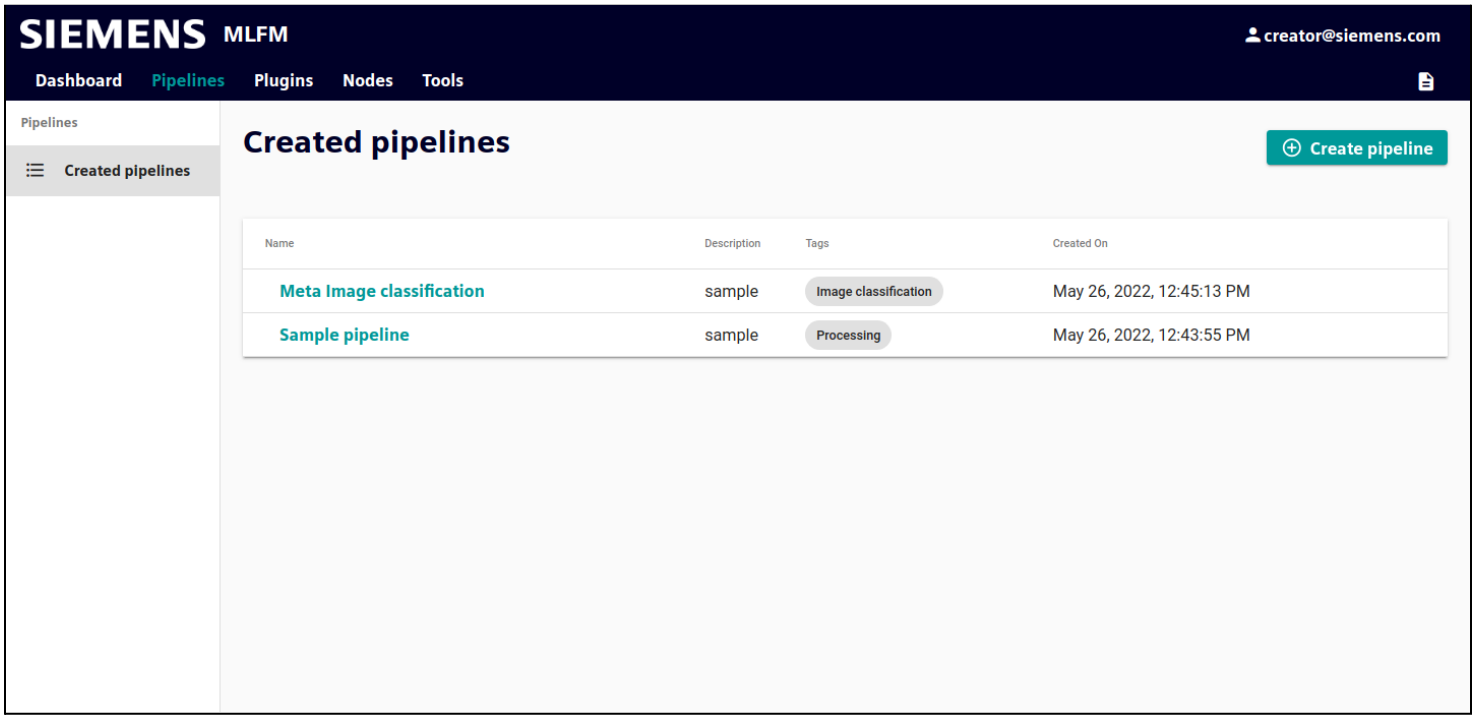
Contains different charts to show some statistics about the user activities (created pipelines, nodes and plugins). It gives an overview for the user about the system in general.



2.2.2. Pipelines Page

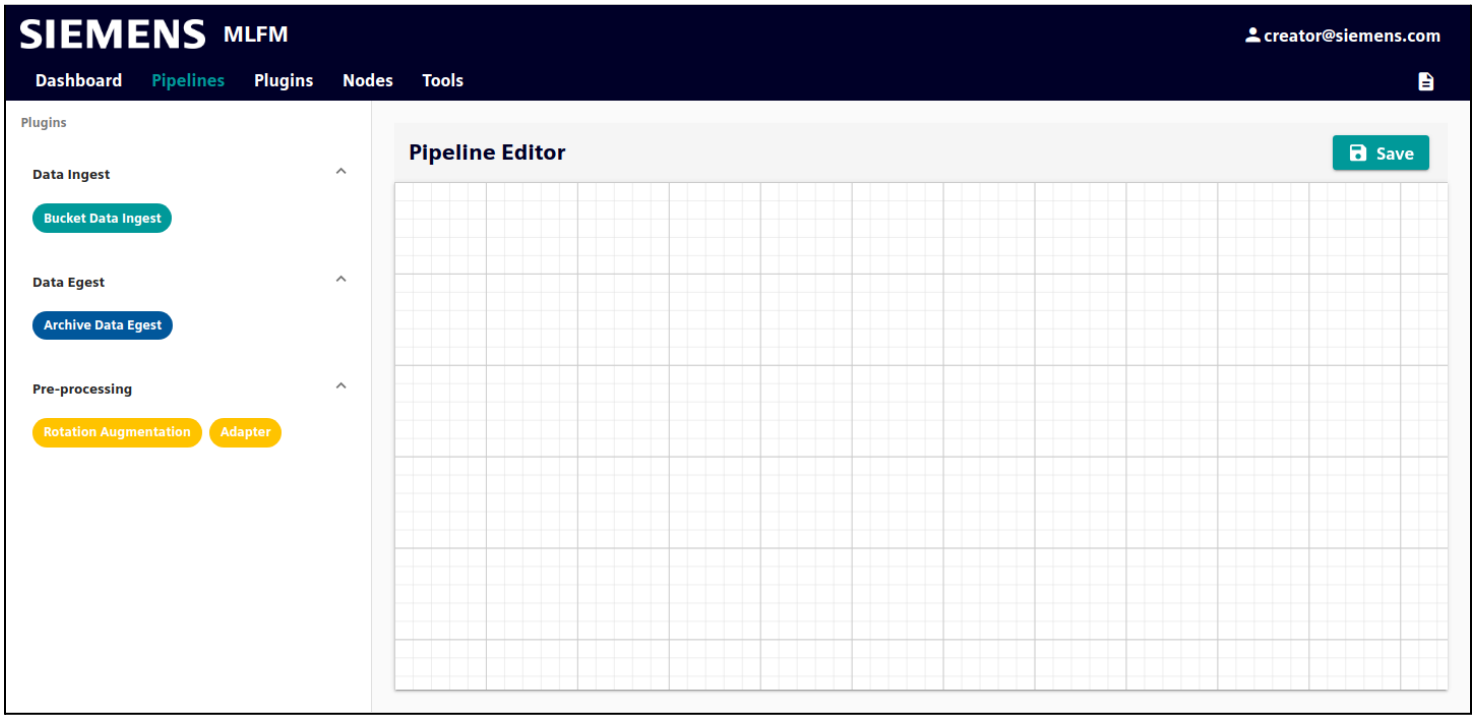
2.2.2.1. Pipelines List

Contains the list of created pipelines. Clicking on a pipeline will open the pipeline details.

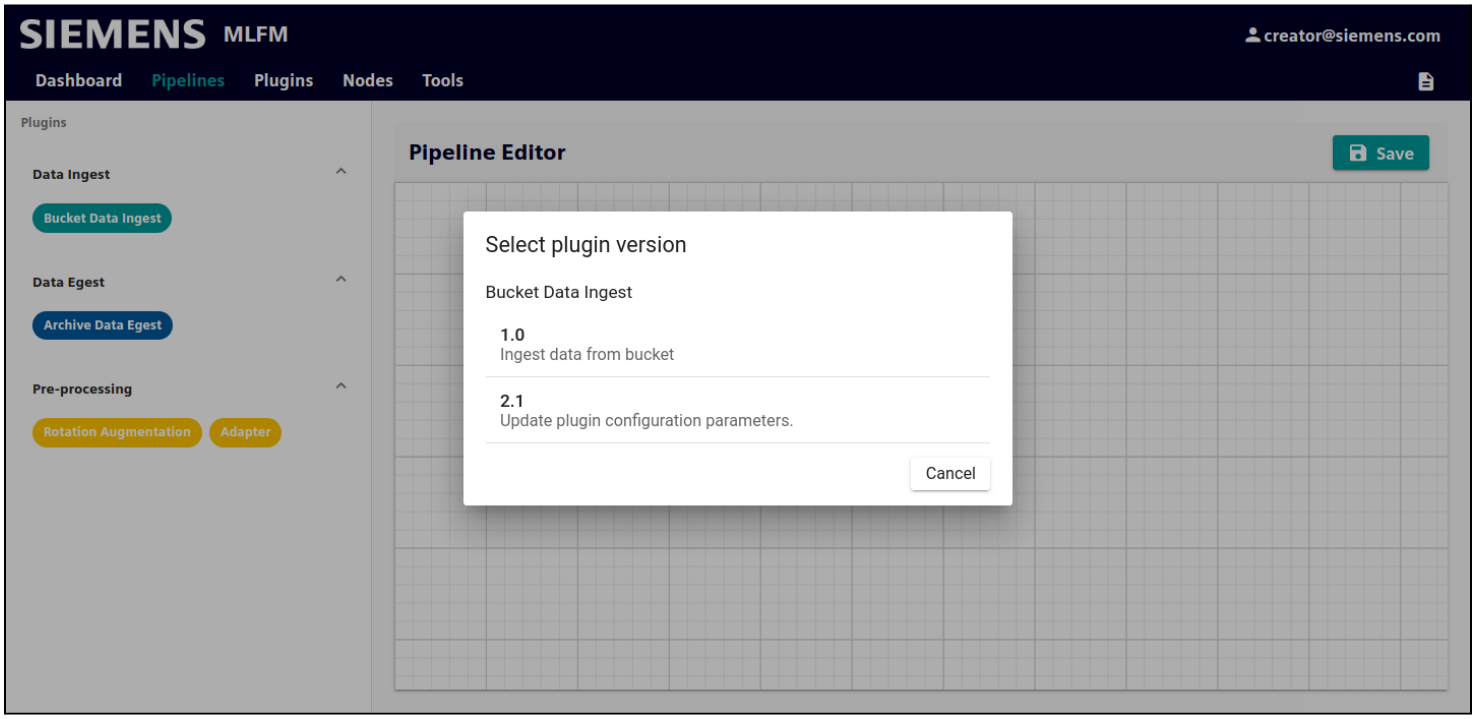


2.2.2.2. Create new pipeline

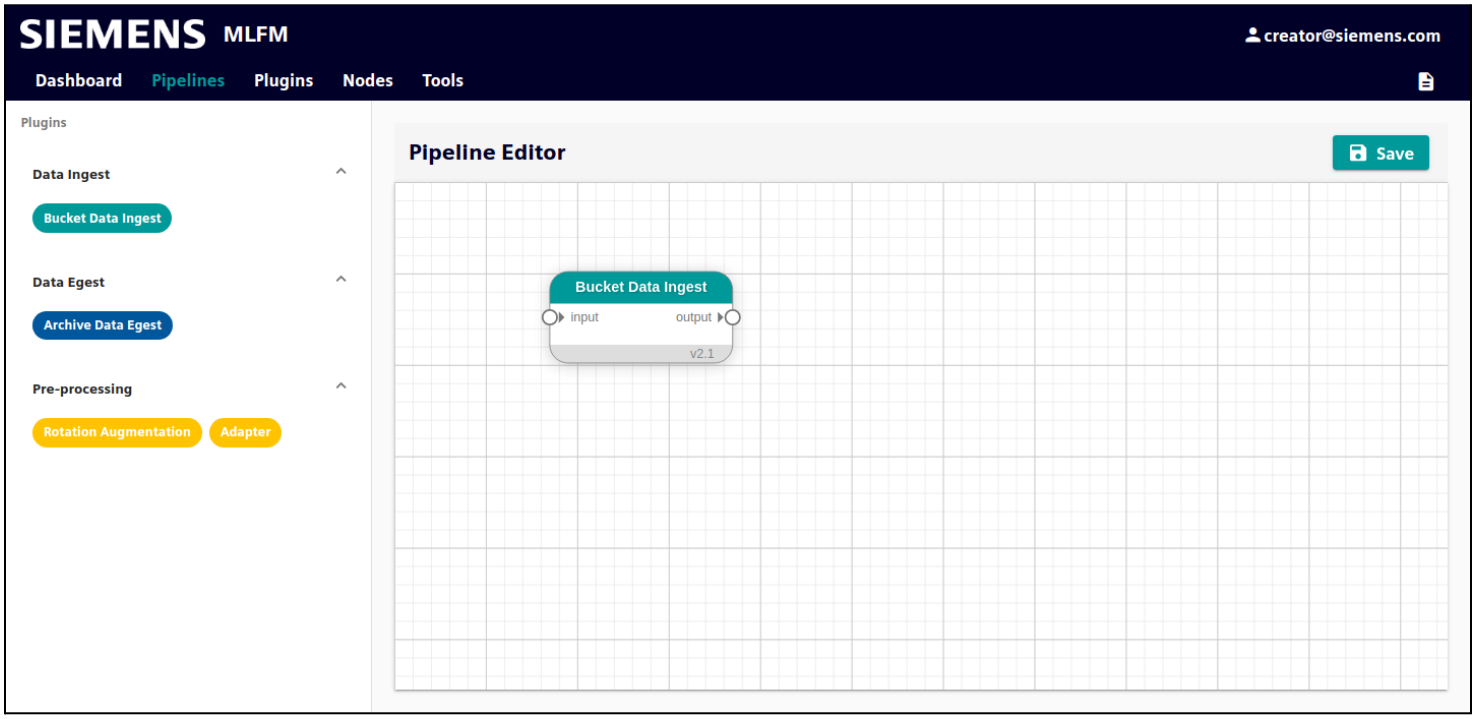
When the user clicks on create new pipeline, a new page will be rendered containing a board for pipeline creation and the creator will be able to see available plugins to use from the left side menu.



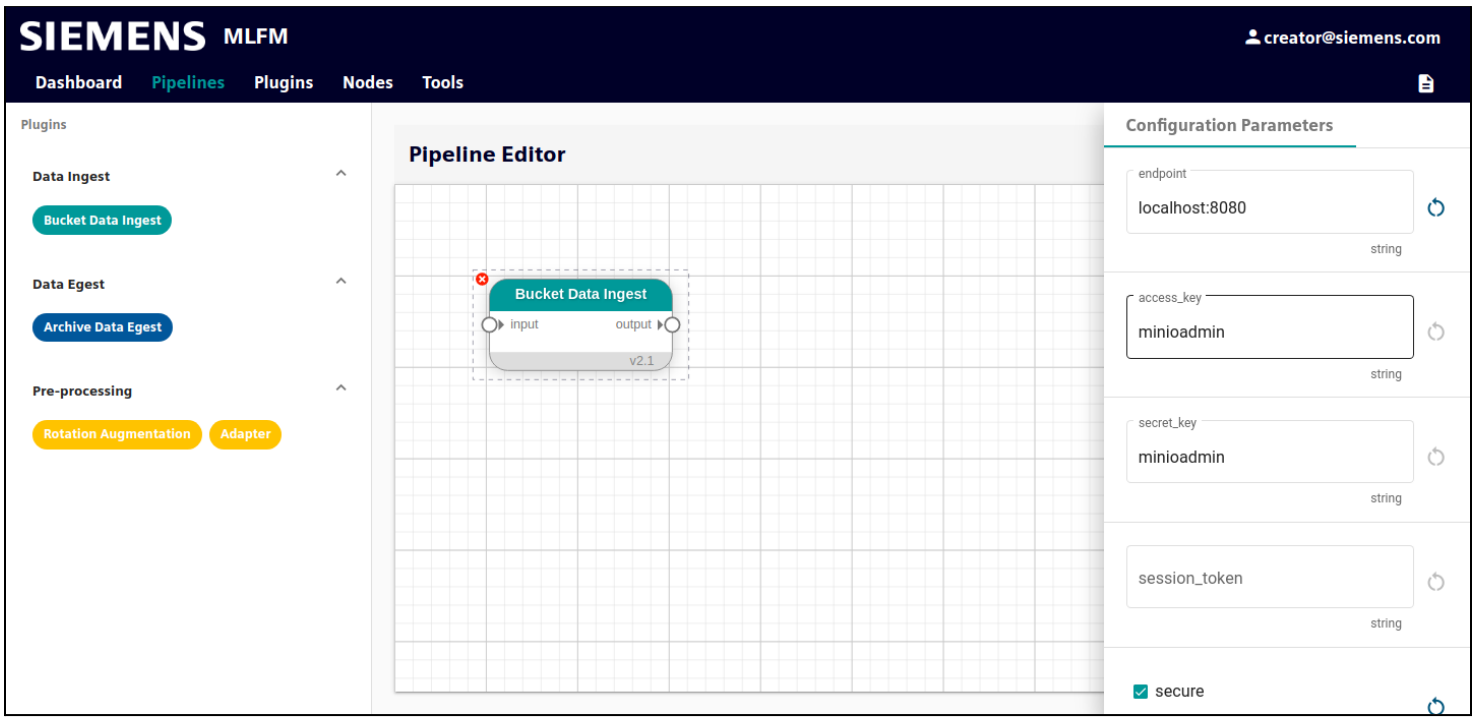
To add a plugin to the pipeline, drag the plugin you want from the left side and drop it on the grid.
A dialog that contains the list of versions of that plugin will appear.



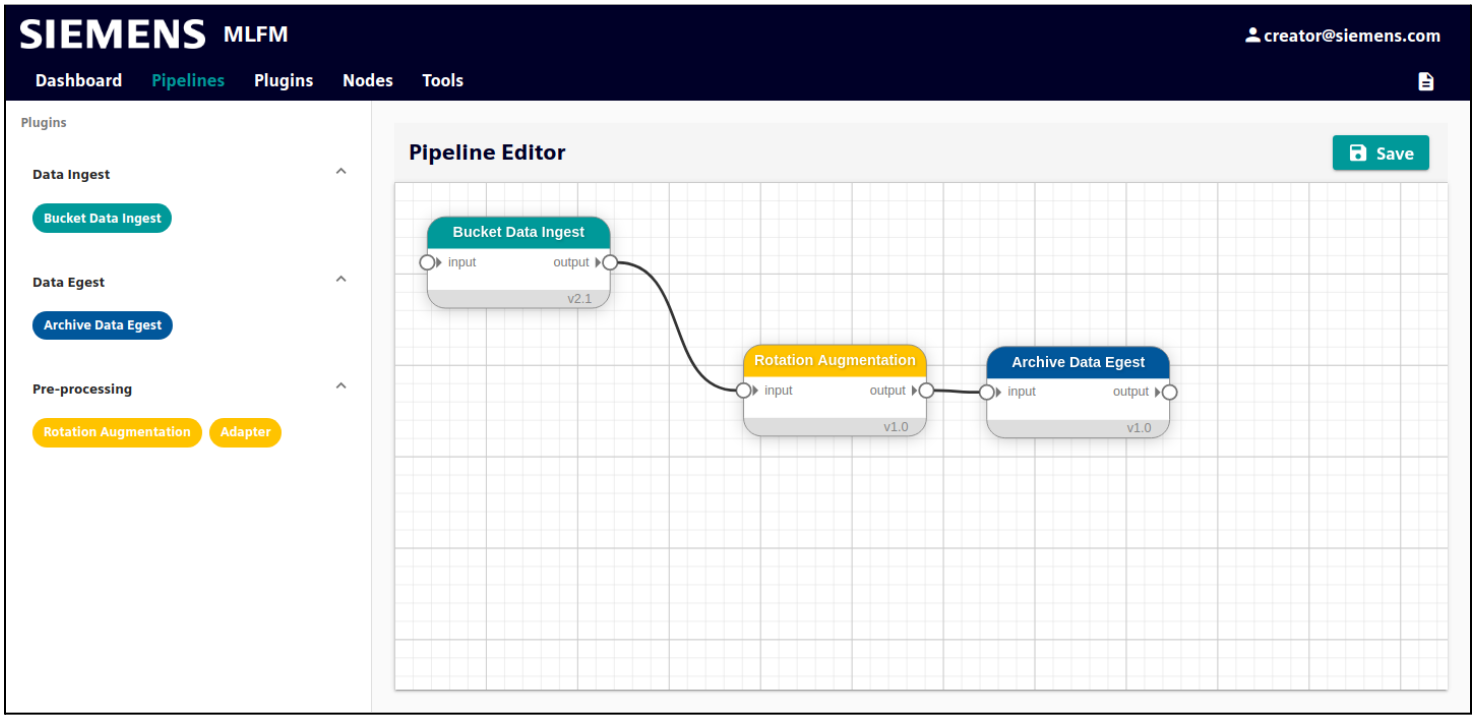
Select the version you want to add, and it will be added to the pipeline.



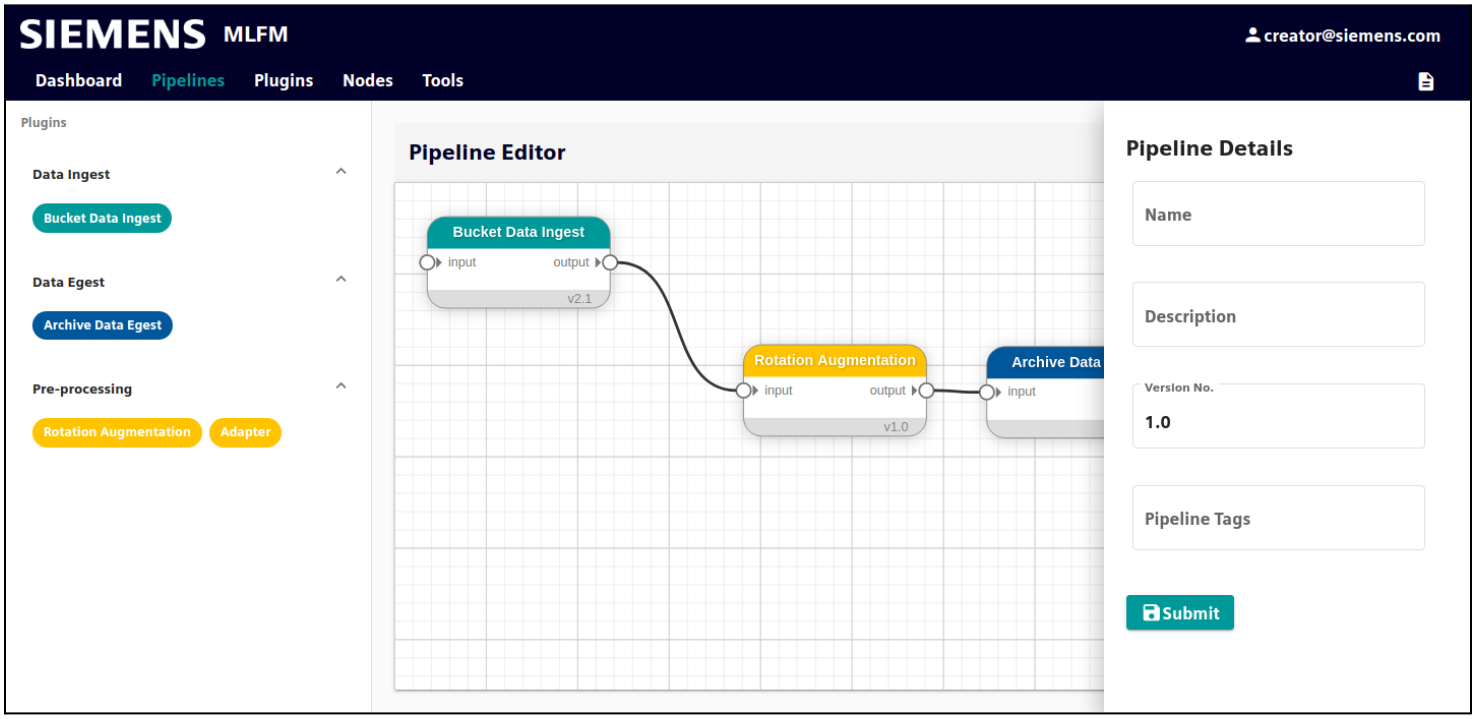
To configure the plugin, left-click on the plugin to select it, and the configuration will appear on the right side.
Left-click on any free area on the grid to deselect the plugin, and hide the configuration form.



After adding all the plugins and connecting them, click on “Save”.



A form will appear on the right side, enter the pipeline details (like name and description), then click “Submit” to save the pipeline.



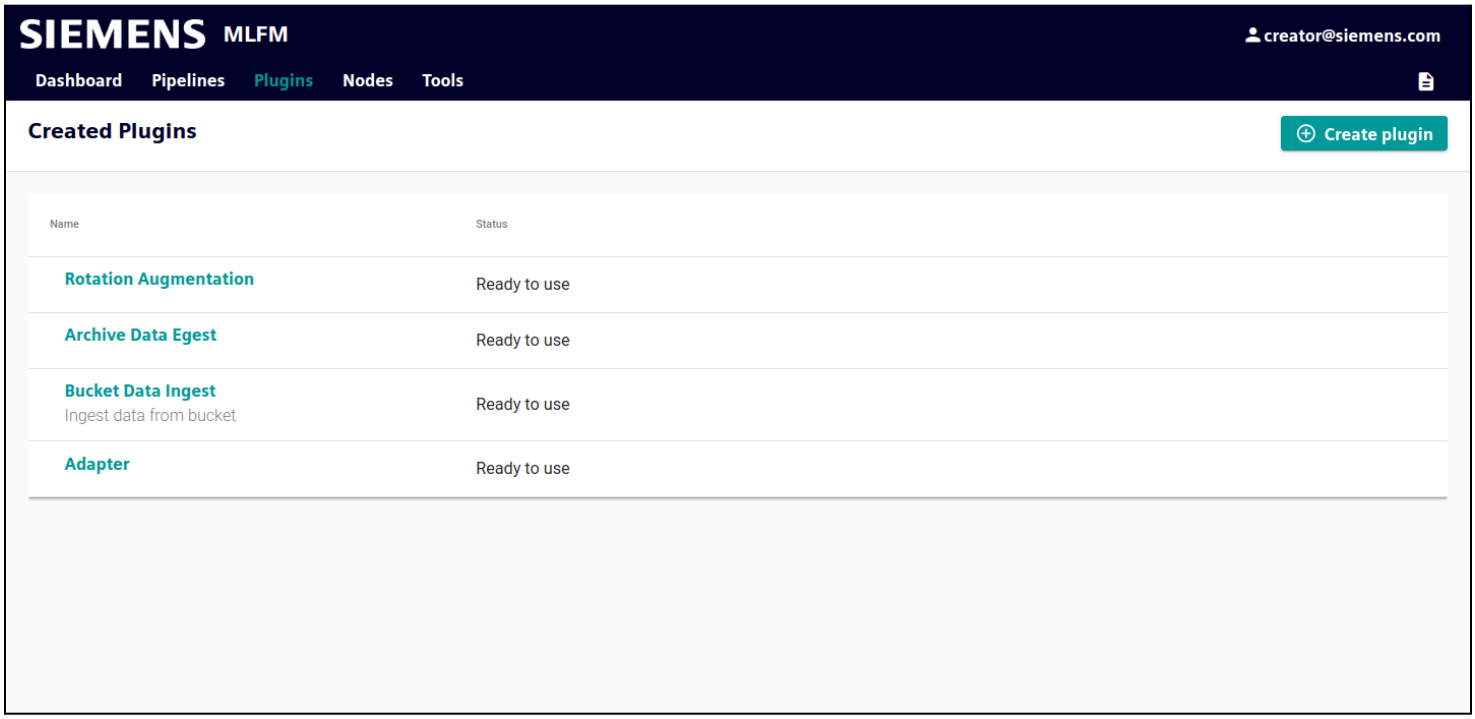
You can see the created pipeline in the pipelines list.

2.2.3. Plugins Page

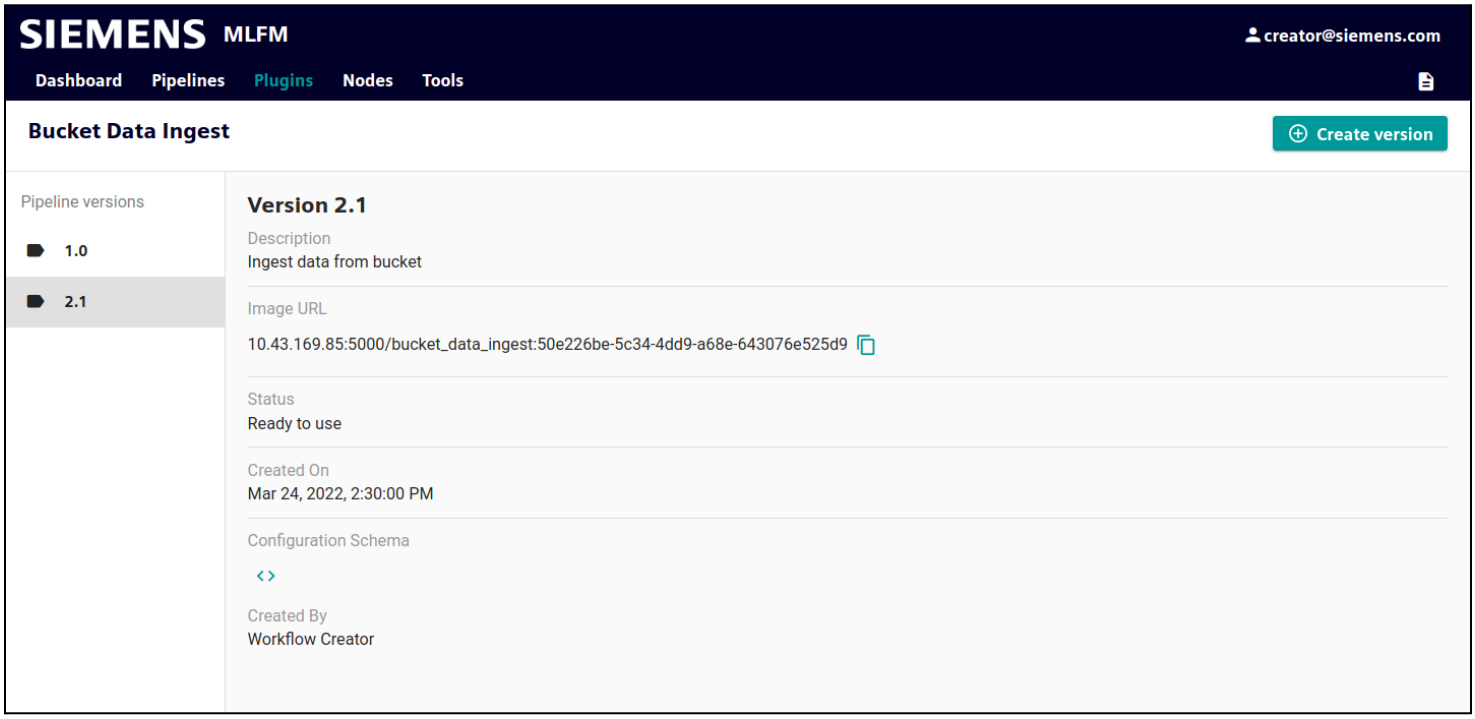
The plugin in MLFM is an entity for workflow, so workflow consists of some plugins connected with links. So to create a pipeline (workflow), you have to have plugins for that.

2.2.3.1. Plugins list

Plugins list contains all created/imported plugins. This is also where you can import a new plugin.



Click on a plugin to view the plugin versions, and the details of each version. Here you can also create a new version of that plugin.



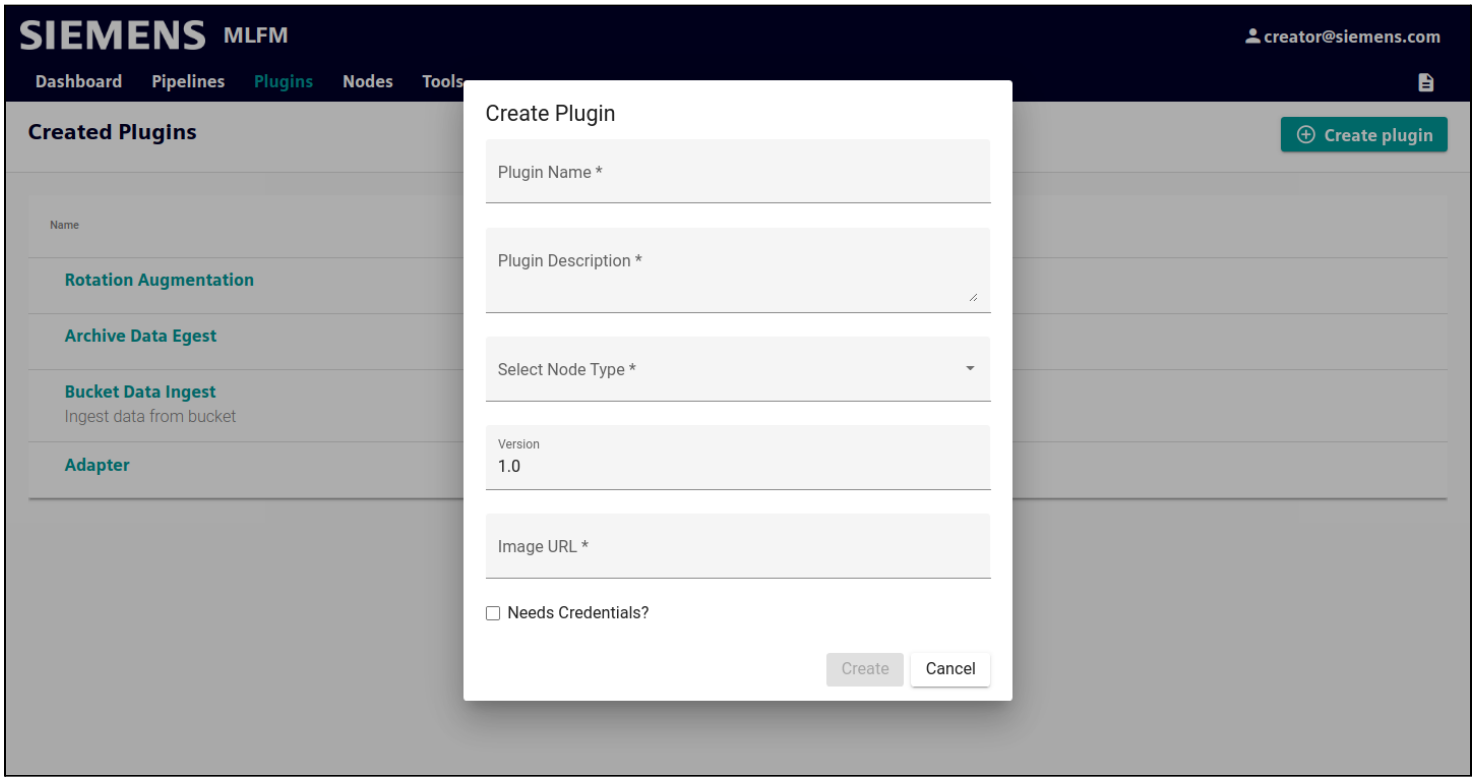
2.2.3.2. Create new plugin

To import a plugin into MLFM, you must have the URL of the plugin's container image.

Note: to build the plugin's container image, you need to use "MLFM SDK" and "MLFM CLI".

When you have the URL of the plugin's container image, go to the "Plugins" page.
Click on the "Create plugin" button in the top-right corner, and a dialog will appear.

Enter the plugin's details, like name, description, and image URL, then click "Create".



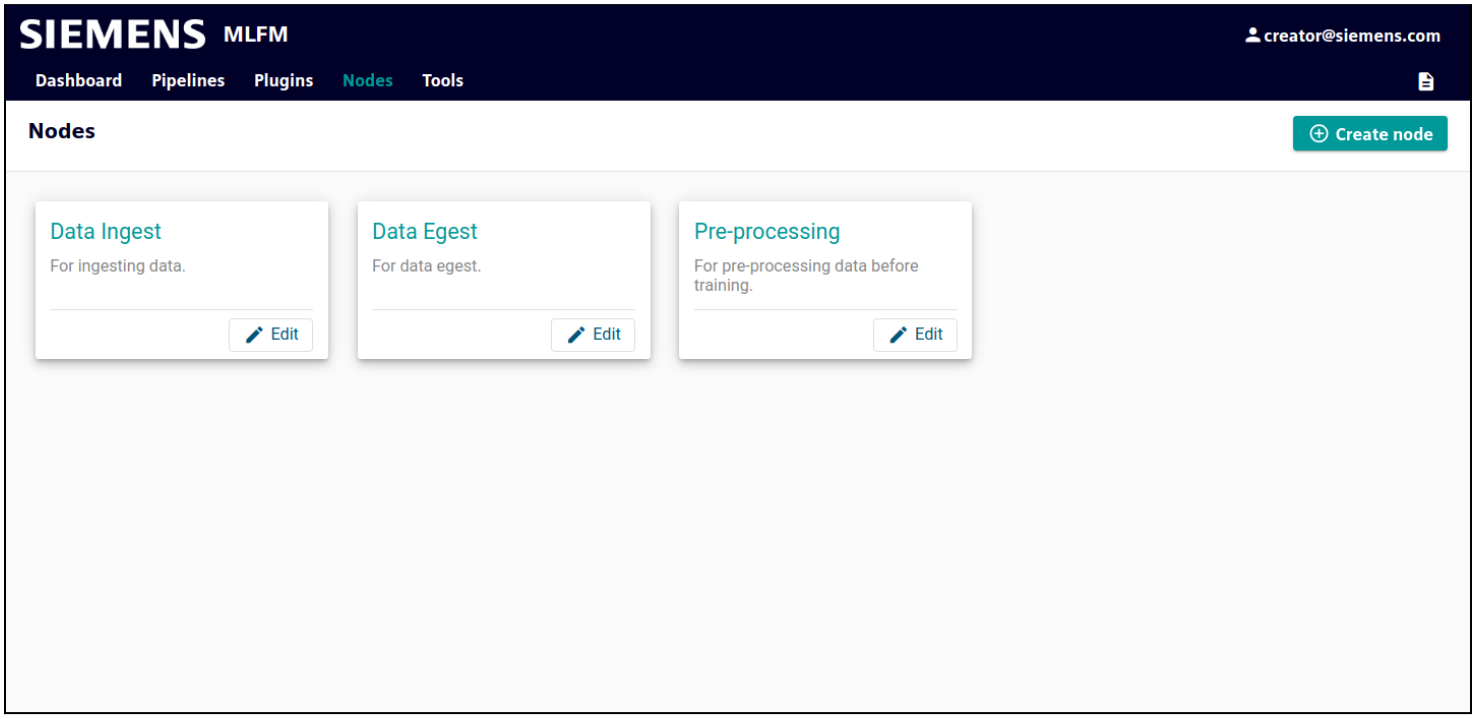
The plugin will be imported into MLFM, and once it's ready, it can be used when creating a new pipeline.

2.2.4. Nodes Page

The node in MLFM means a plugin type, so each plugin must have a node.

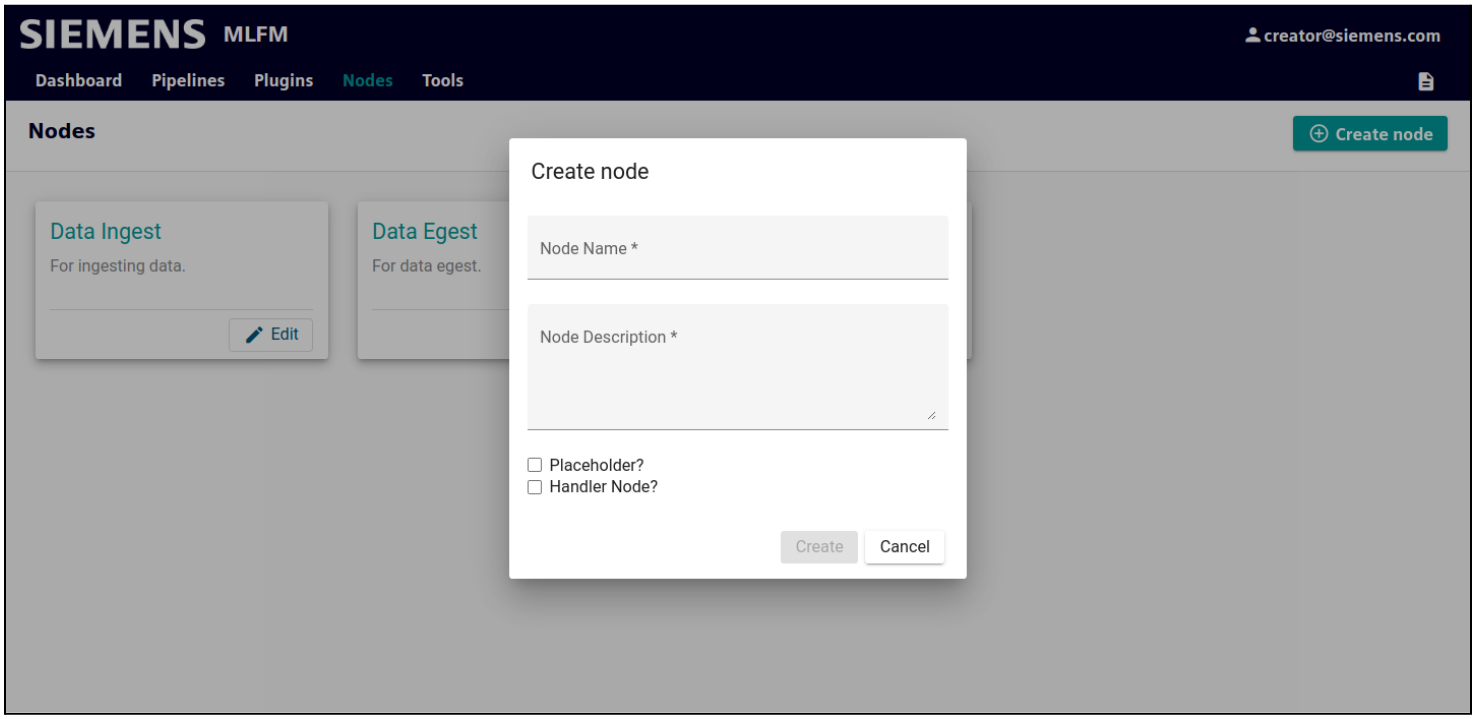
2.2.4.1. Nodes dashboard

Nodes dashboard contains all created plugin types (nodes) with the ability to edit them, and add new nodes.



2.2.4.2. Create new node

To create a new node you have to provide node details to the details form which will appear by clicking on the “Create node” button.



Once created, you can create plugins under this node.

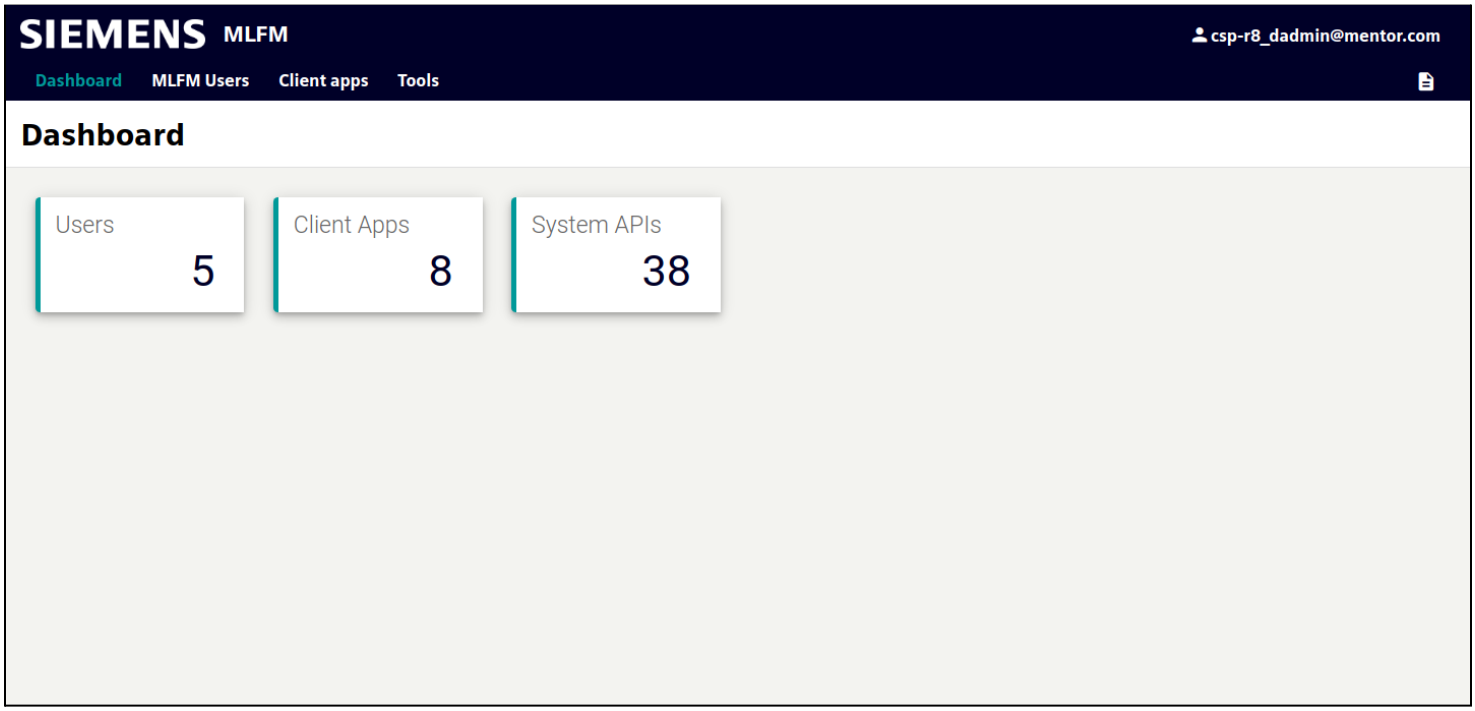
2.2.5. Documentation Page

The last page is the ‘Documentation’ page, and it contains documentation about MLFM and functionalities that the workflow creator can use for guidance or to check steps for a specific task.

2.3. Admin User

2.3.1. Dashboard Page

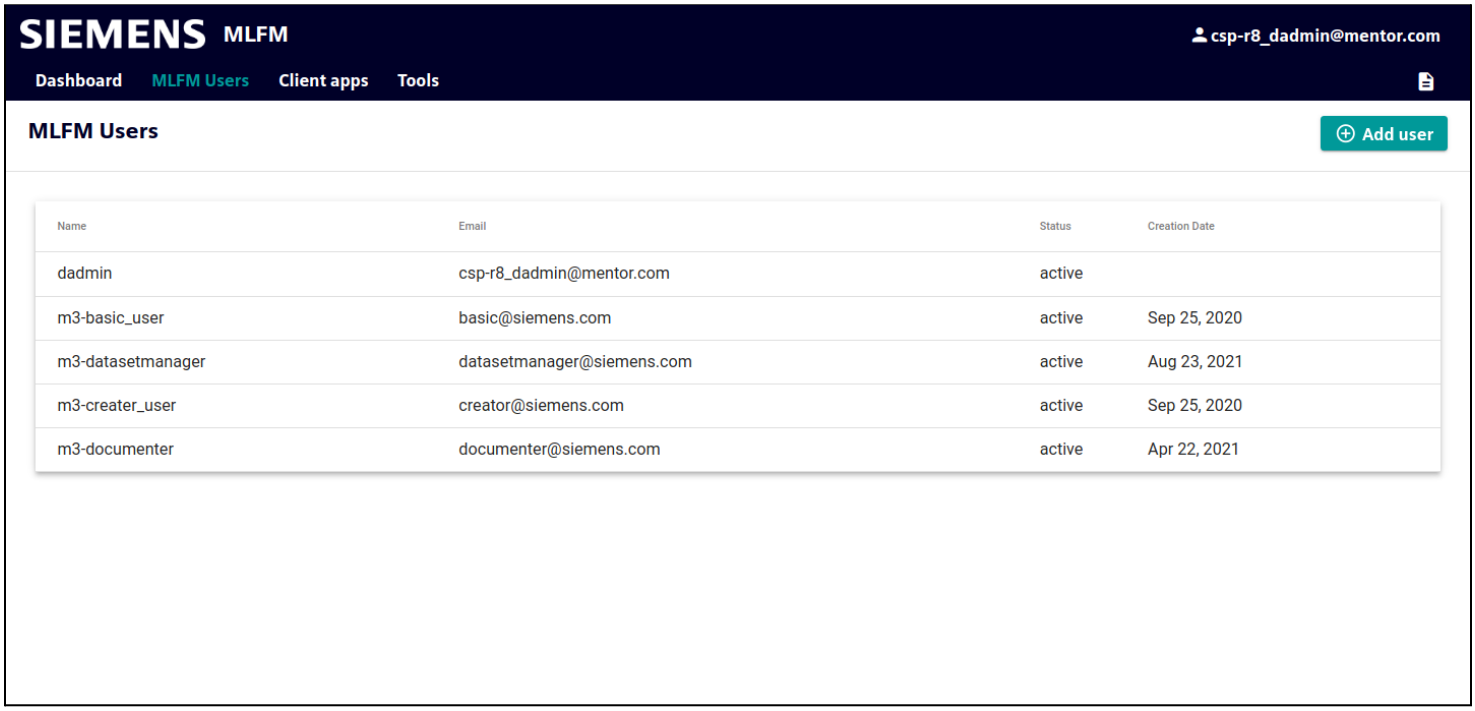
Contains different widgets to show some statistics about system users, APIs and client apps. Also a navigation bar to navigate to the user management page, client apps page, and documentation page.



2.3.2. User Management Page

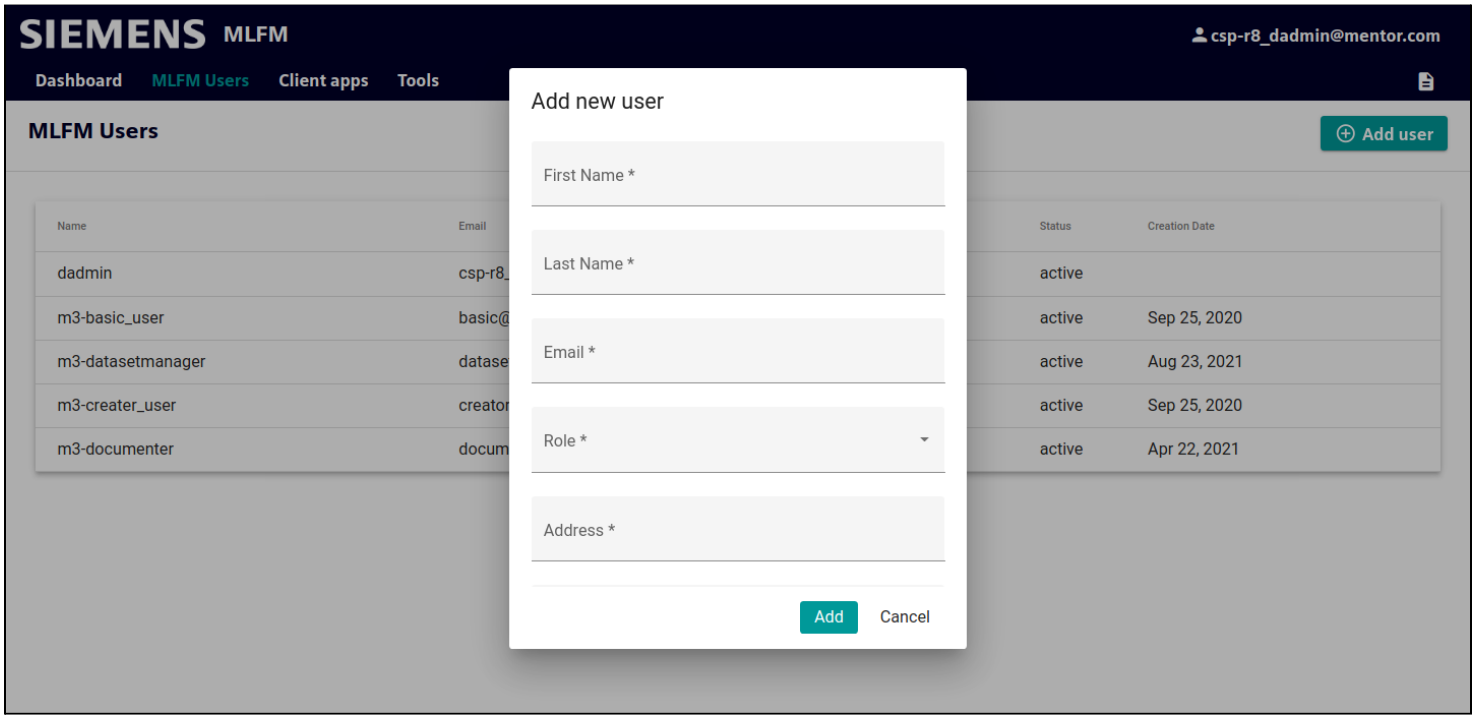
2.3.2.1 User Management Board

The user details table shows the created users, their emails and status. Also the admin user is able to add new users to the system by clicking on the create new user button.



2.3.2.2 Create new user

On clicking on the “Add user” button, there is a pop-up to enter user’s details (name, role, email, address and phone)

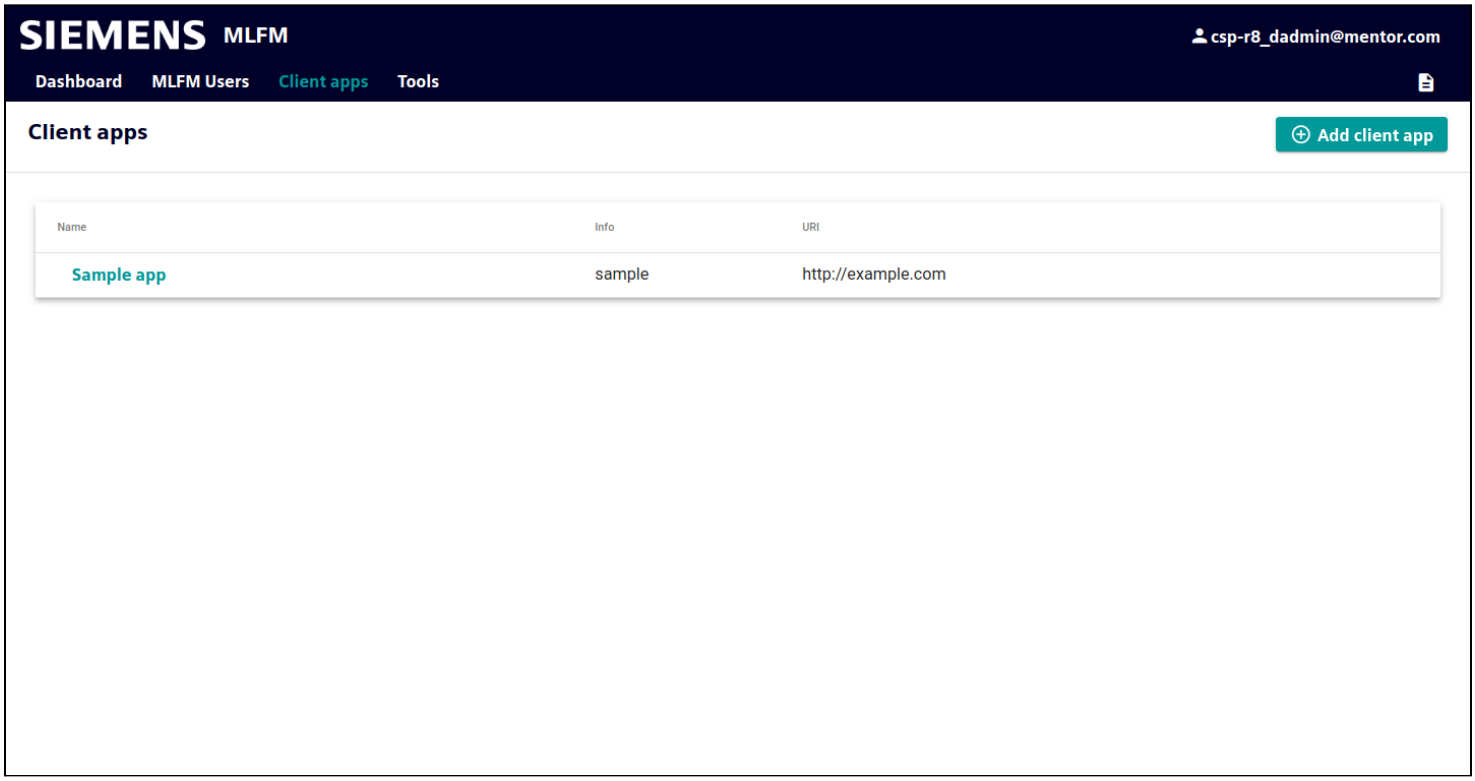


By filling the form and clicking on the “Add” button, a new user will be created and added to the users table.

2.3.3. Client Apps Page

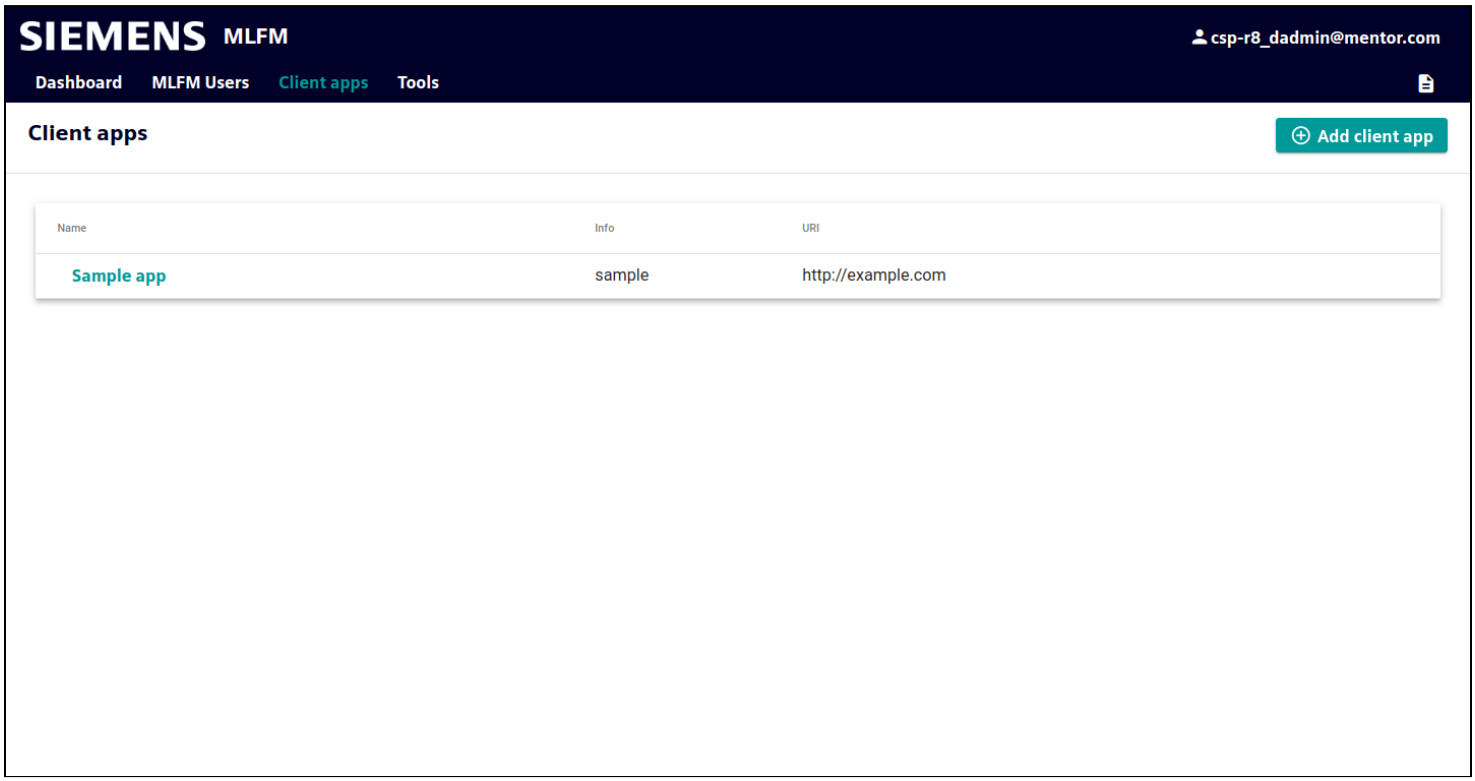
2.3.3.1 Client Apps Board

The client apps details table shows the created client apps, their info and URI. Also the admin user is able to add/create new client apps by clicking on the “Add client app” button.



2.3.3.2 Create new client app

On clicking on the “Add client app” button, there is a pop-up to enter the client app’s details (name, info and uri)

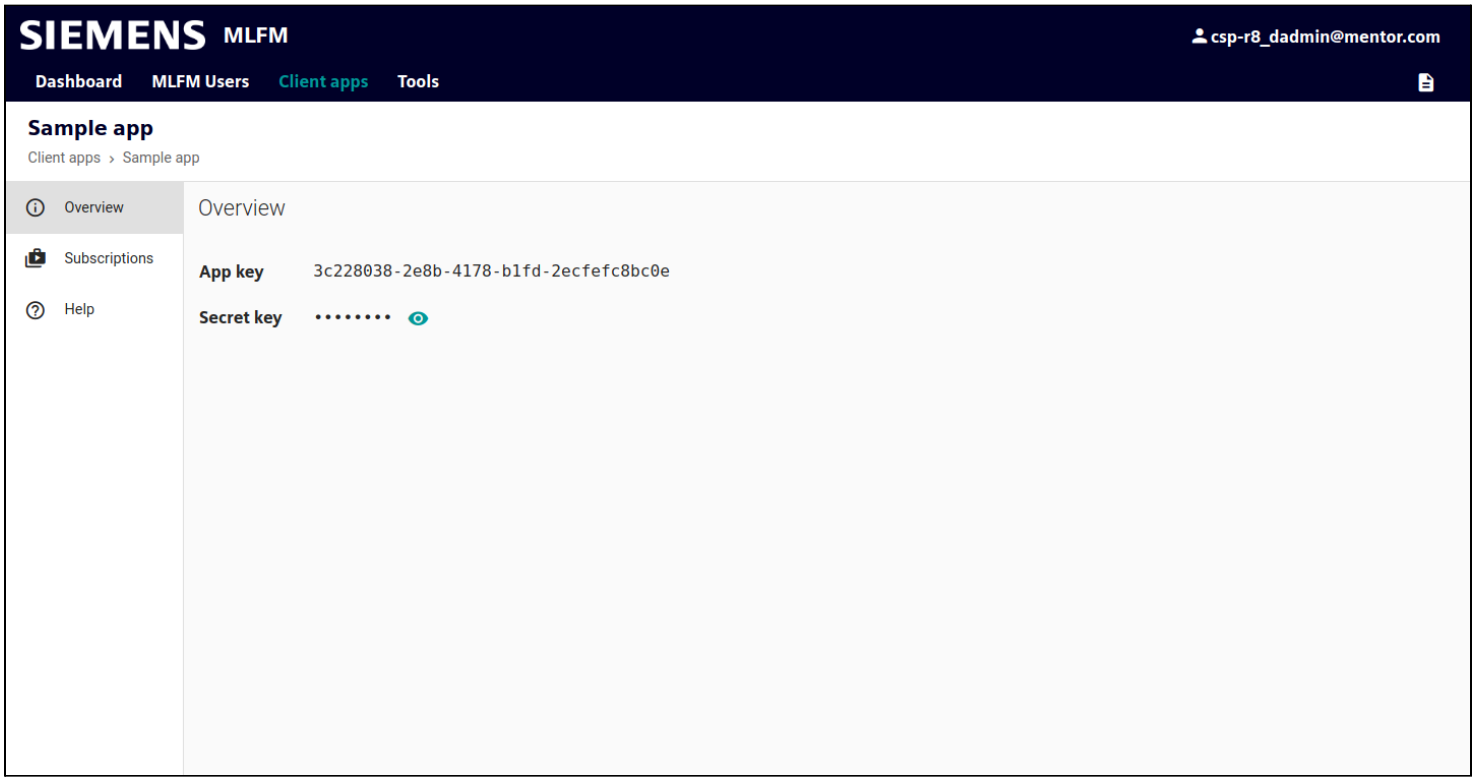


By filling the form and clicking on the save button, a new client app will be created and added to the client apps table.

2.3.3.3 Client app details

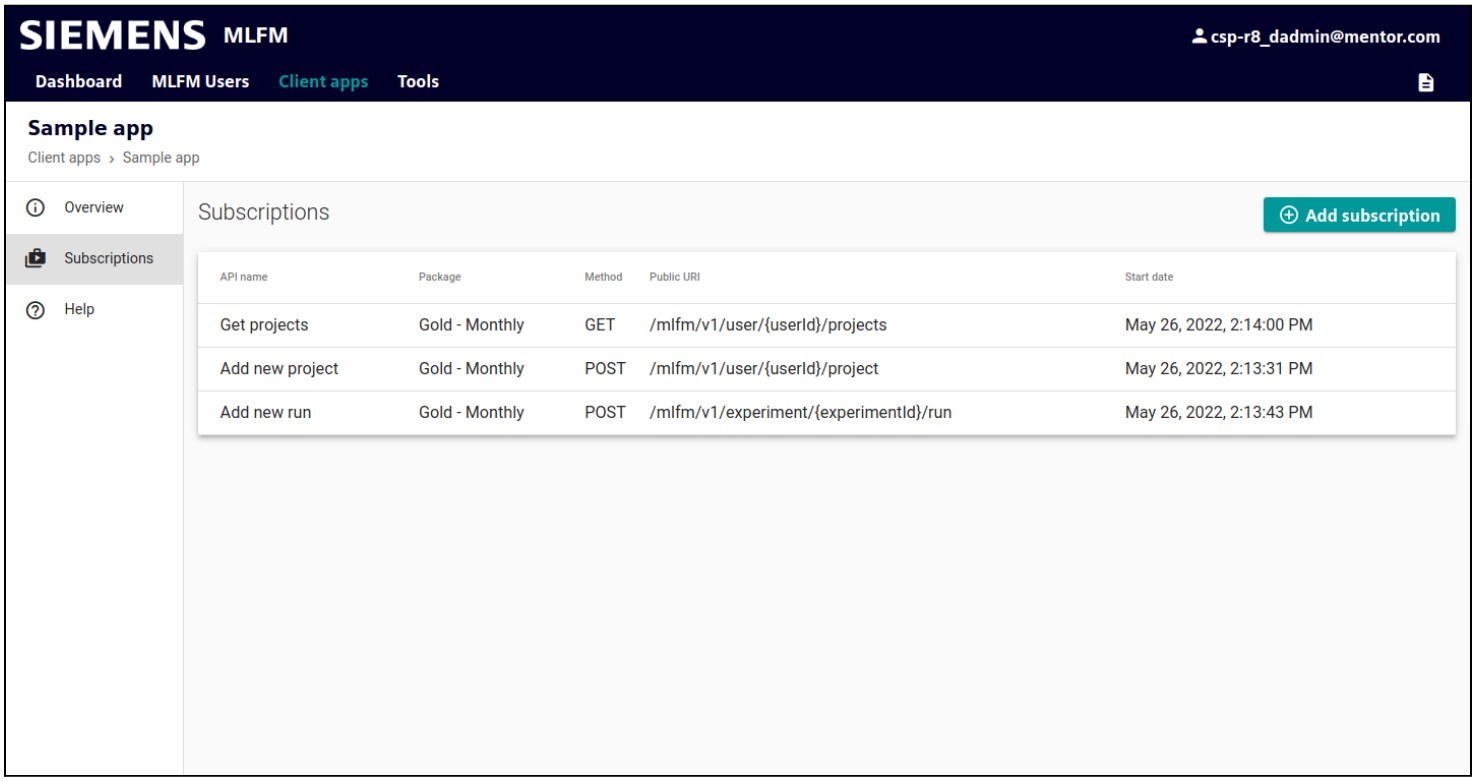
It is a page that is shown when the user clicks on a client app from the table. It contains a tab for general information about the created client app and its app and secret keys, and another tab for subscribed APIs and another tab for instructions on

how to use the created keys to integrate with MLFM.



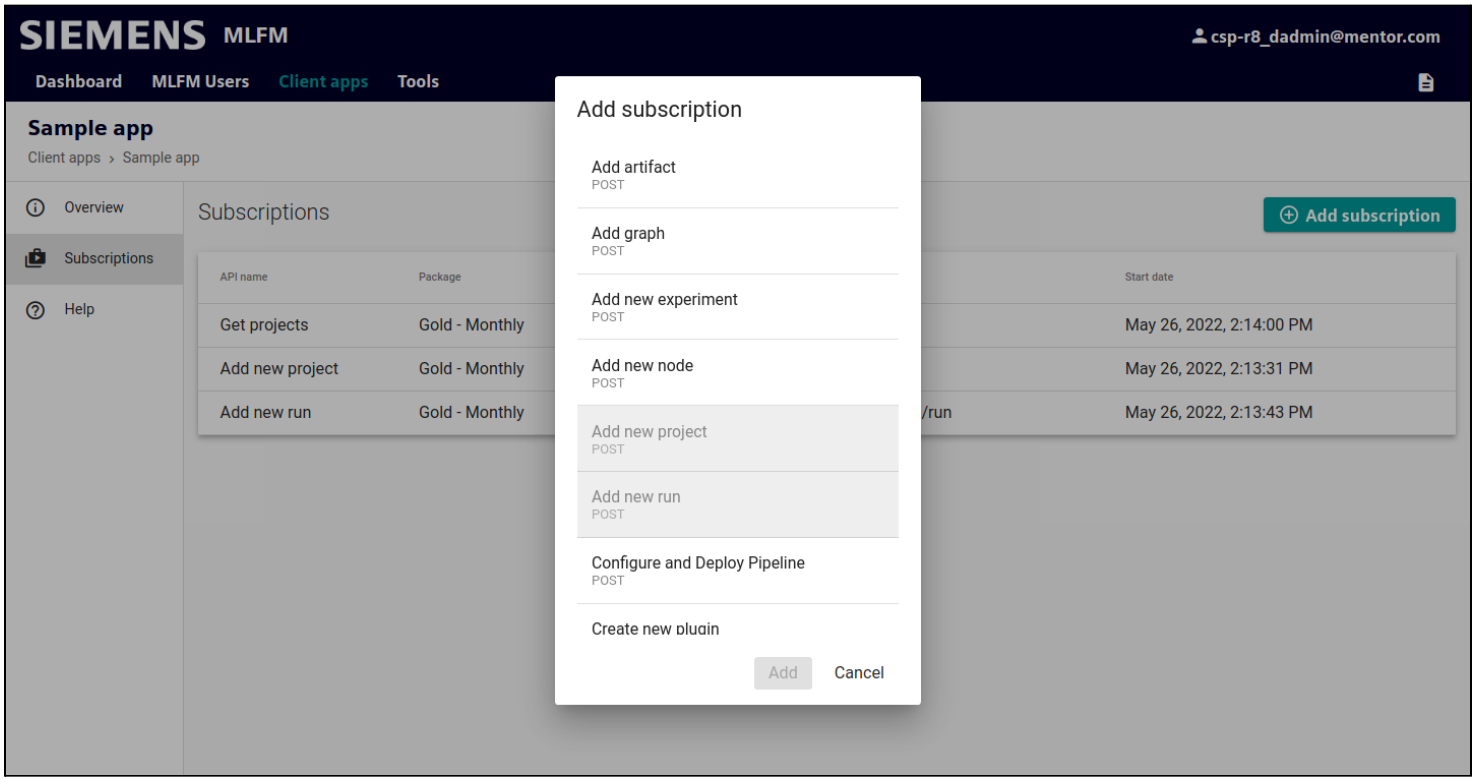
2.3.3.4 APIs Subscription

To add an API subscription to a client app, click on “Subscriptions” on the left side, then click on the “Add subscription” button in the top-right corner.



By clicking on that button a pop-up will appear with the available APIs that the user can subscribe to. The user will be able

to choose the required API and click on the save button.



2.4. Documenter User

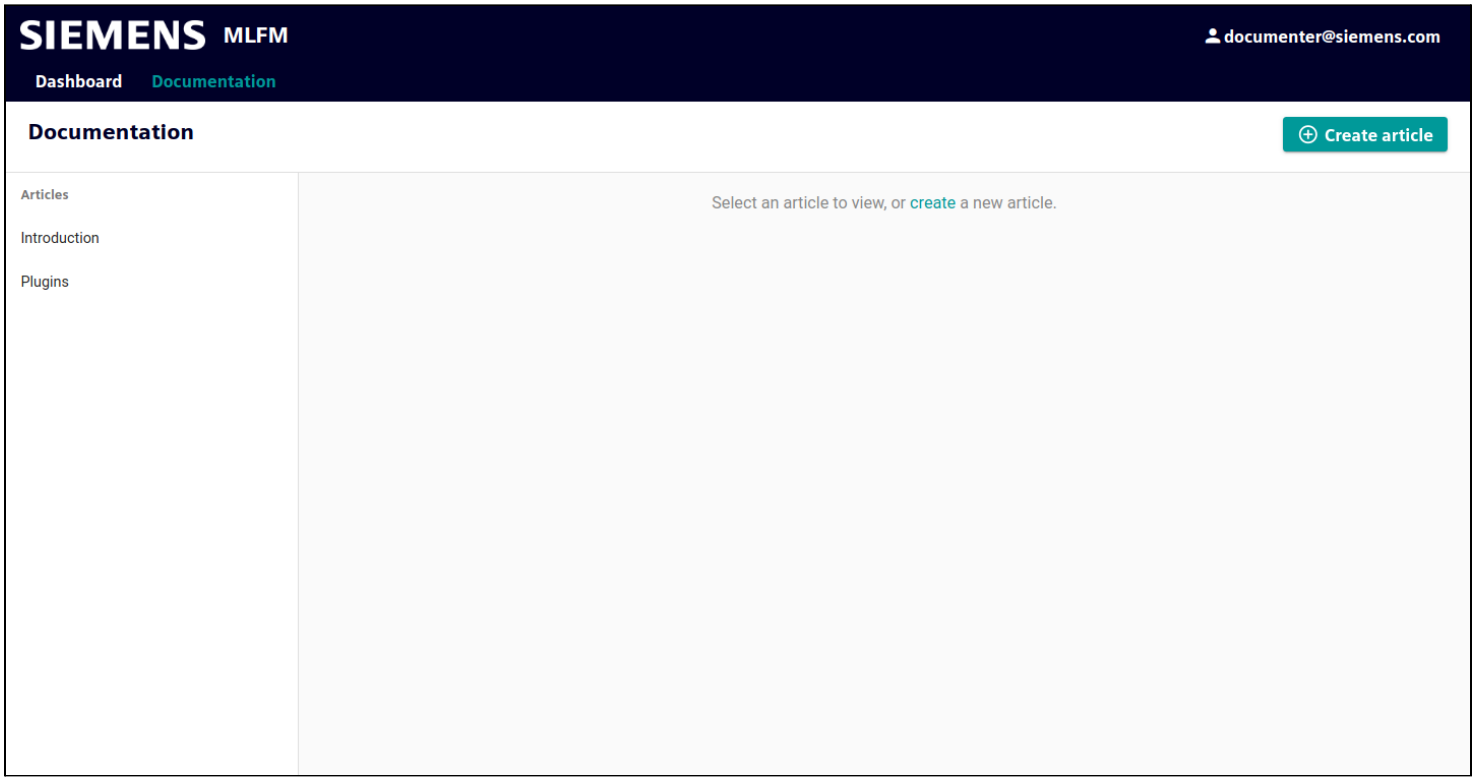
2.4.1. Dashboard Page

Contains a widget that shows some statistics about system documentation. Also a navigation bar to navigate to the user documentation page.

2.4.2. Documentation Page

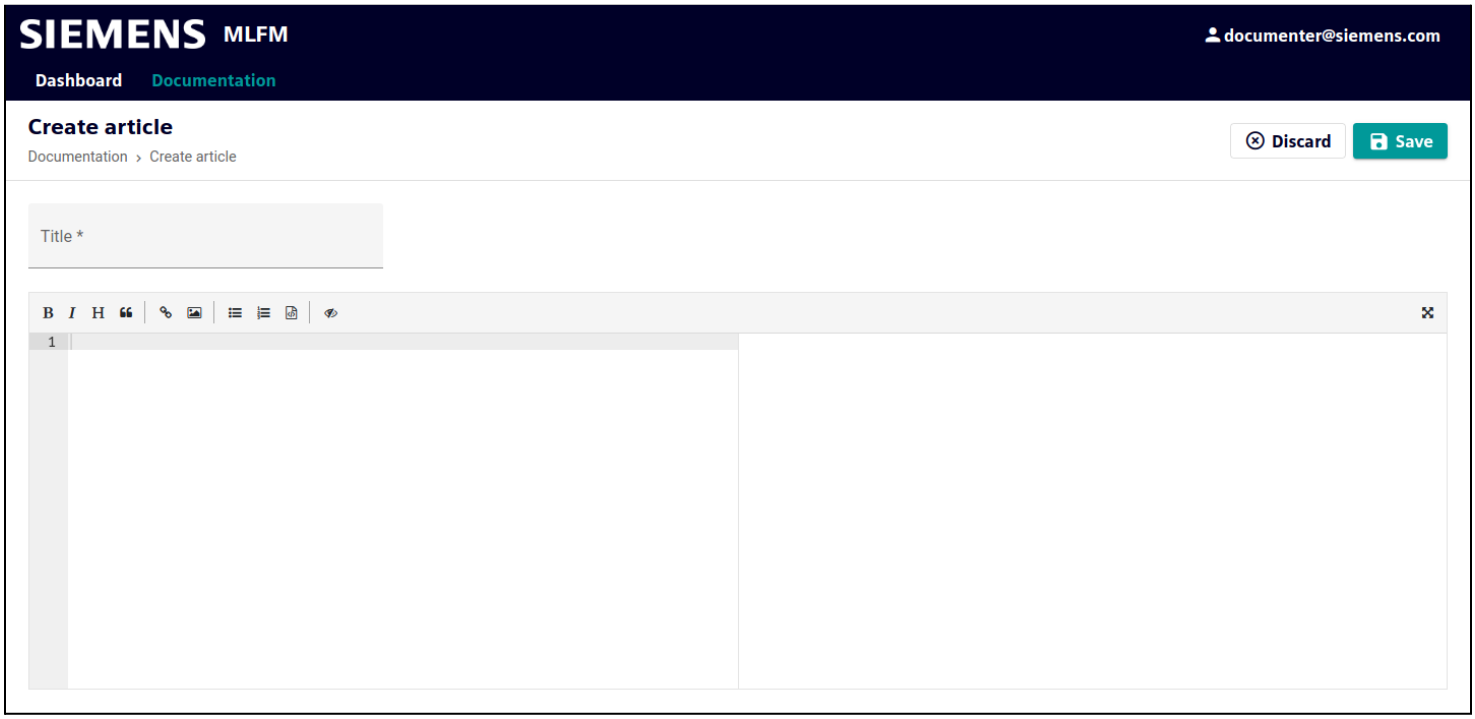
2.4.2.1 Documentations List

It contains all system documentation. The user will be able to view the documentation and also has the ability to edit and create new documentation as well.



2.4.2.2 Add new documentation

On clicking the “Create article” button, there is another page to enter the article’s title and content.
The content can be written in the “markdown” editor on the left side, and a live-preview is visible on the right side.



When done, click “Save” to save the new article.