Pay-per-use concept for 3D printers

Section 1. Interaction Flow for using Pay-per-use concept

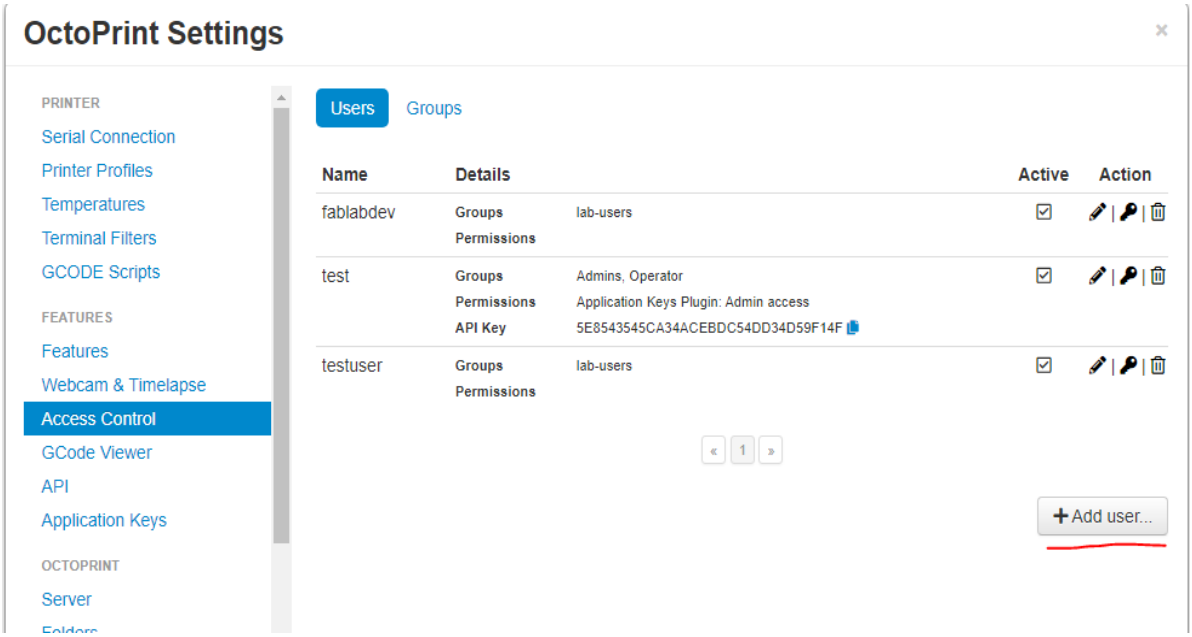
Customer: Visits lab to take a 3D print.

Operator: Ask the customer to slice the model using PrusaSlicer.

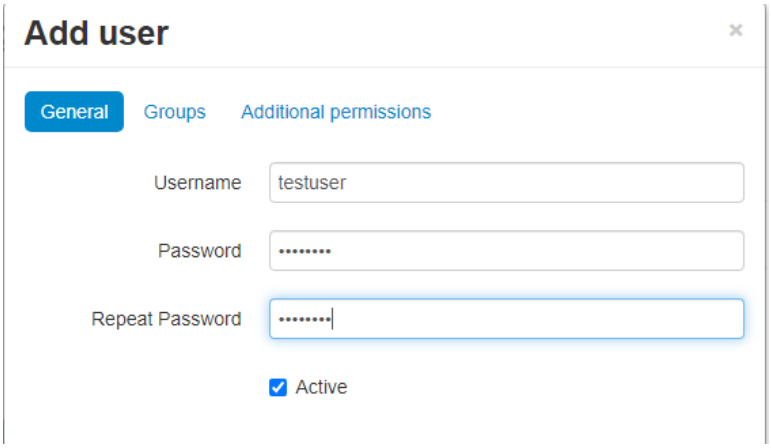
Customer: Slice the model in PrusaSlicer.

Link to download: https://www.prusa3d.com/prusaslicer/

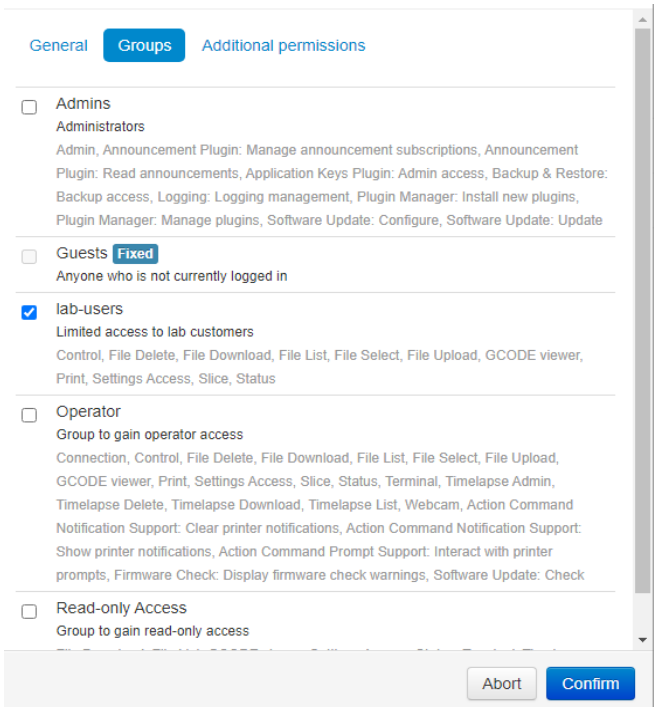
Operator: Once slicing is done by the customer, Create a user account for the customer in the OctoPrint. Click on OctoPrint settings-> Access control -> Add user.



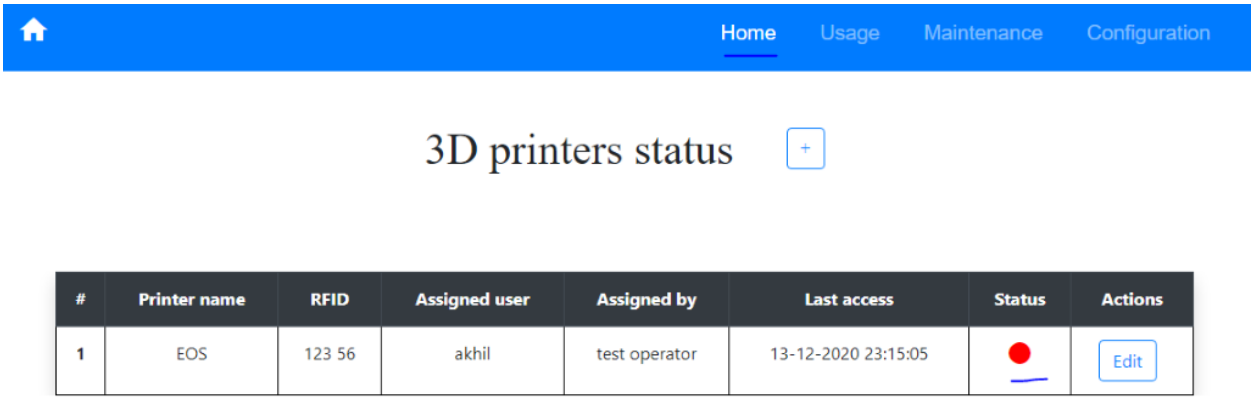
Operator: Provide customers with a username, password. (Note: Username should not contain spaces)



Operator: For the user, under groups, assign the new user a group named ‘lab-users’, this group provides the user with necessary access to the printer. (How to create the group ‘lab-users’ is mentioned in the Section 4 of this document). OctoPrint user setup is done, provide the user with credentials.

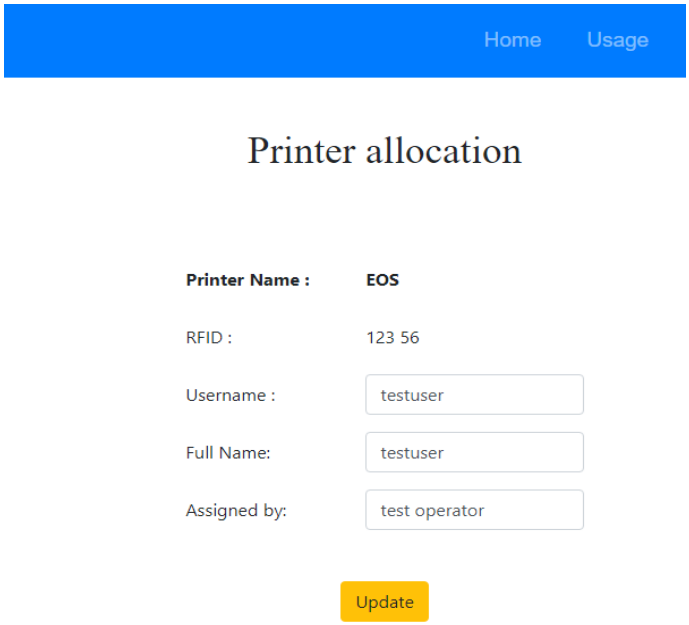


Operator: Each printer has a unique RFID card, assign the user with the available printer by checking the status of printers in the web application (Red: Inactive, Green: Active which means printer is printing). Provide the corresponding RFID card of the printer to the customer.

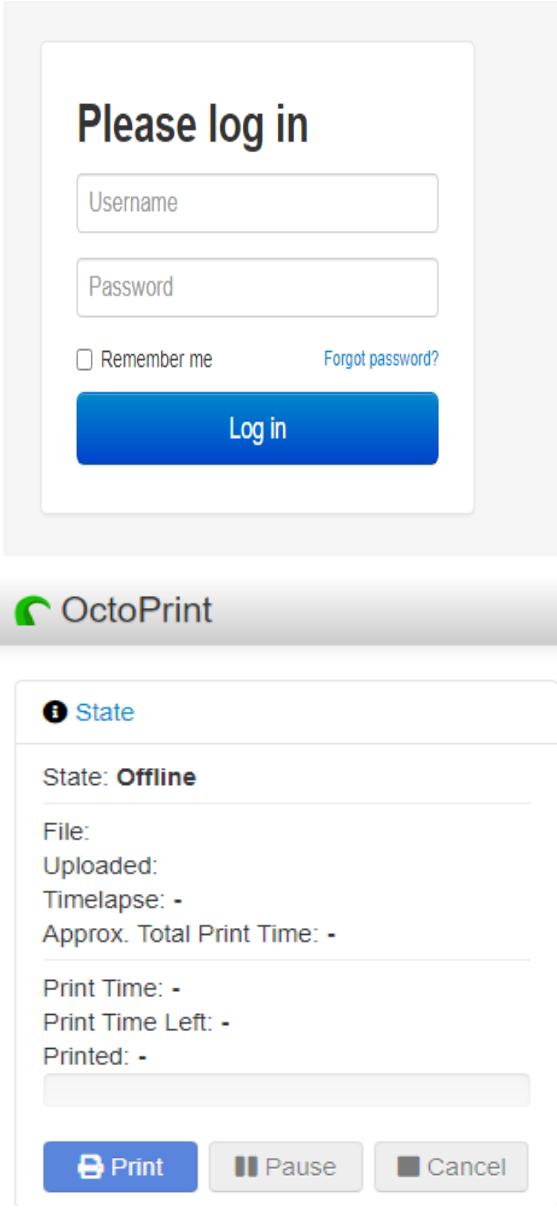


Operator: Click on edit and assign the printer as shown below by filling the username, full name and assigned by operator details.

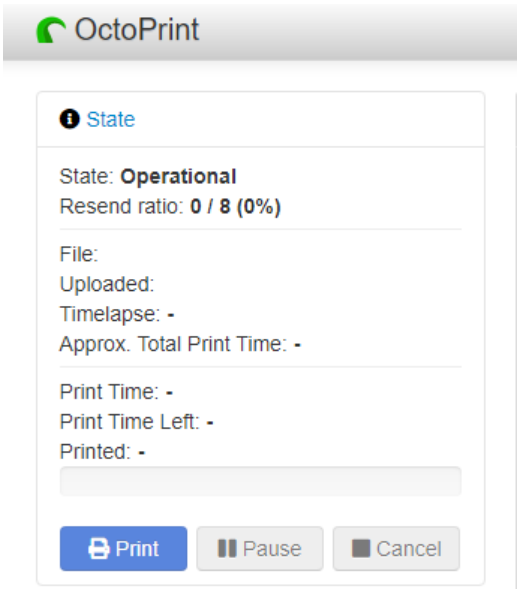
(Note: Here the username should match the OctoPrint username created)



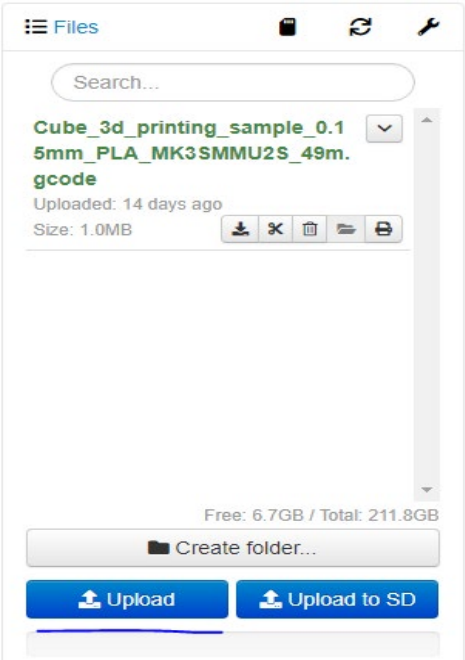
Customer: Now customer has RFID card and OctoPrint credentials. Open OctoPrint in the browser with credentials provided. The state is 'Offline' in the OctoPrint.

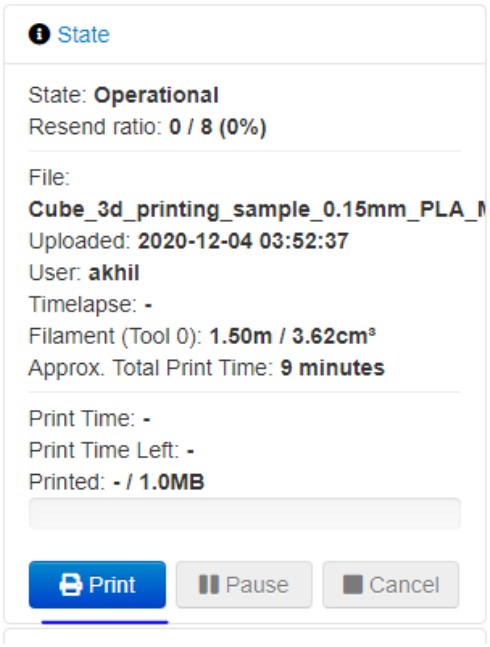


Customer: Touch the RFID card provided by the operator to the microcontroller at the printer, this will connect the OctoPrint to the printer. Now in the OctoPrint, the state changes to 'Operational'.

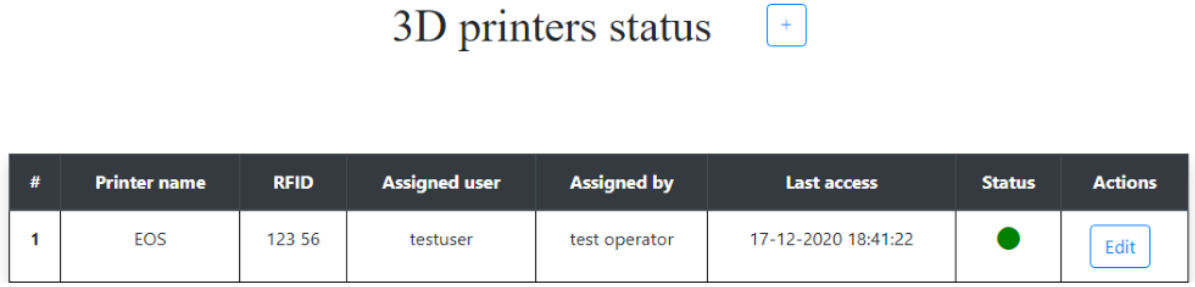


Customer: Load the .gcode file to be printed in the OctoPrint, start printing.

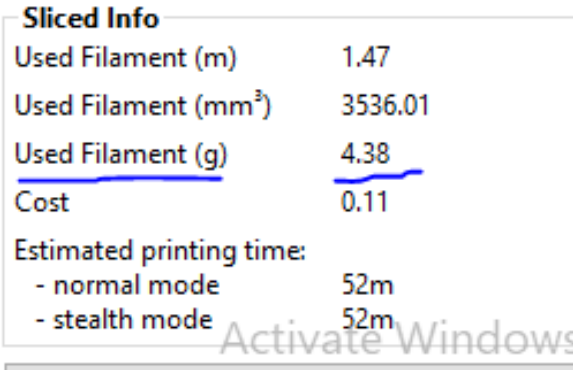




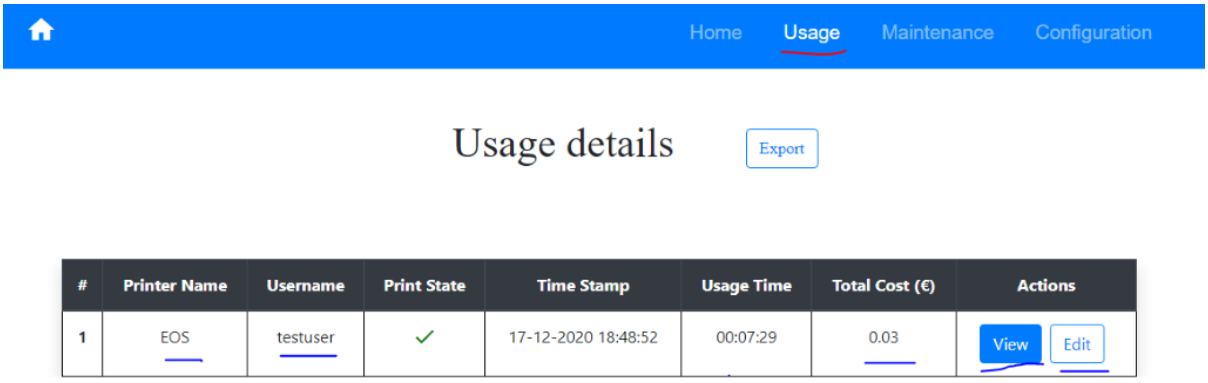
Operator: When the user start's printing in OctoPrint the Status in the web app turns green, showing that the printer is Active.



Customer: Once print is done, go to the operator, provide the details of filament used (in grams) from PrusaSlicer. You can know the filament used from PrusaSlicer at the bottom right as below.



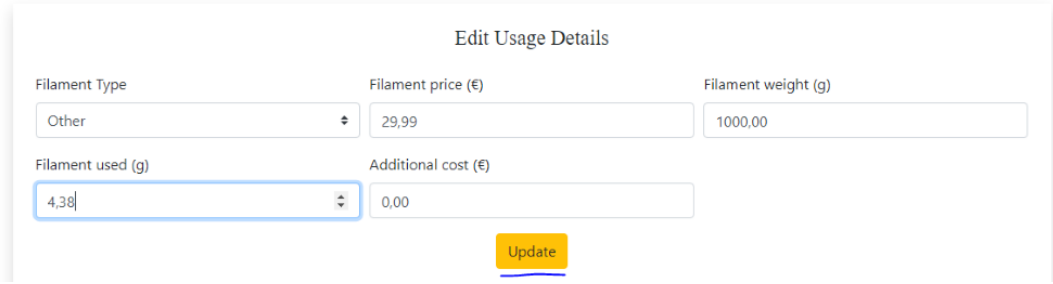
Operator: Once print is done by the user, In the web application under usage details, the print details are available along with the cost details under 'Usage' page. Here Printer name is the printer which the operator has assigned to the user before step. Click on the 'View' option to just view the usage or 'Edit' option the usage detail to edit the usage.



Operator: By default, filament usage is not added to the print. It has to be manually filled by the operator. So, ask the user for the filament used or any additional usage. If present, add them to the usage as below by clicking on 'Edit' option the corresponding usage detail. Operators can select different filament types, edit the filament details and update them to the usage.

Overview

User:	testuser
File Name:	Cube_3d_printing_sample_0.15mm_PLA_MK3SMMU2S_49m.gcode
Print time (HH:MM:SS):	00:07:29
Time Stamp:	17-12-2020 18:48:52
Print Status:	PrintDone
Print Name:	EOS
Filament Cost (€):	**0.13**
Operating Cost (€):	**0.01**
Printer Cost (€):	**0.02**
Additional Cost (€):	**0.00**
Total Cost (€):	**0.16**



Operator: Update the edited usage detail to see the total cost of the print.

Operator: View page for the usage, contains all details of the print and its corresponding cost.

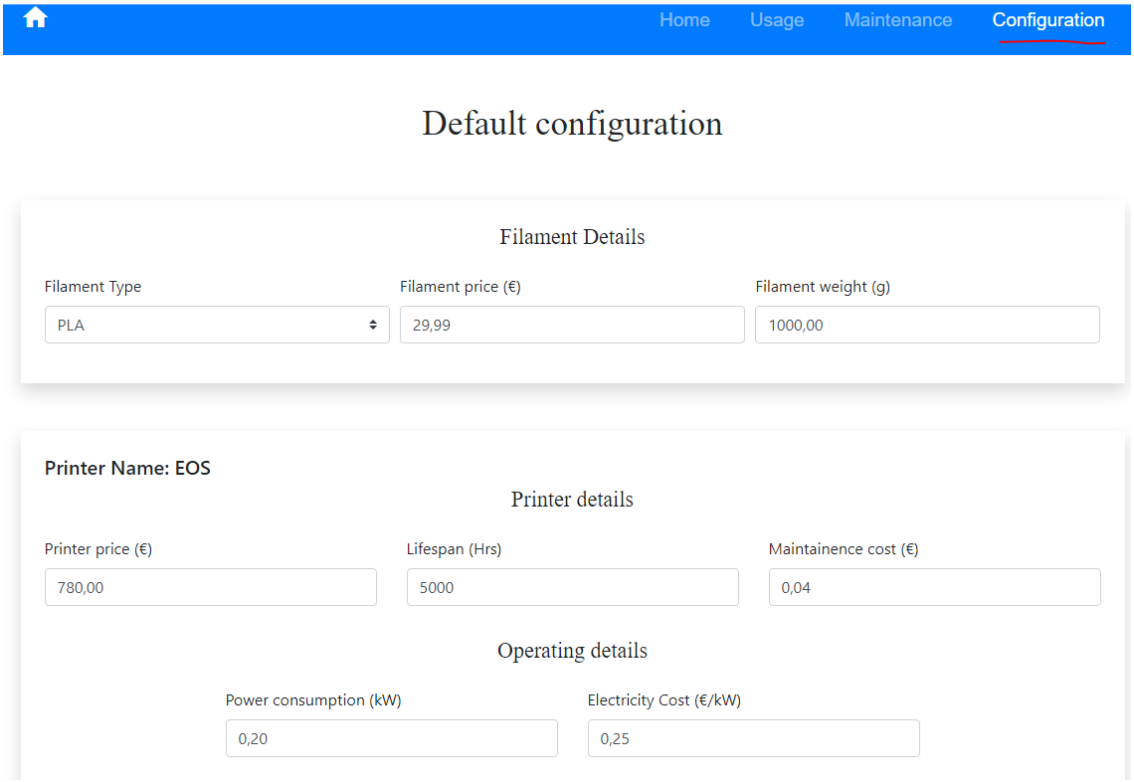
Overview

User:	testuser
File Name:	Cube_3d_printing_sample_0.15mm_PLA_MK3SMMU2S_49m.gcode
Print time (HH:MM:SS):	00:07:29
Time Stamp:	17-12-2020 18:48:52
Print Status:	PrintDone
Print Name:	EOS
Filament Name:	Other
Filament Price (€):	29.99
Filament Used (g):	4.38
Filament Weight (g):	1000.00
Filament Cost (€):	**0.13**
Operating Cost (€):	**0.01**
Printer Cost (€):	**0.02**
Additional Cost (€):	**0.00**
Total Cost (€):	**0.16**

Operator: Provide the user with the total cost (Euro) for the print.

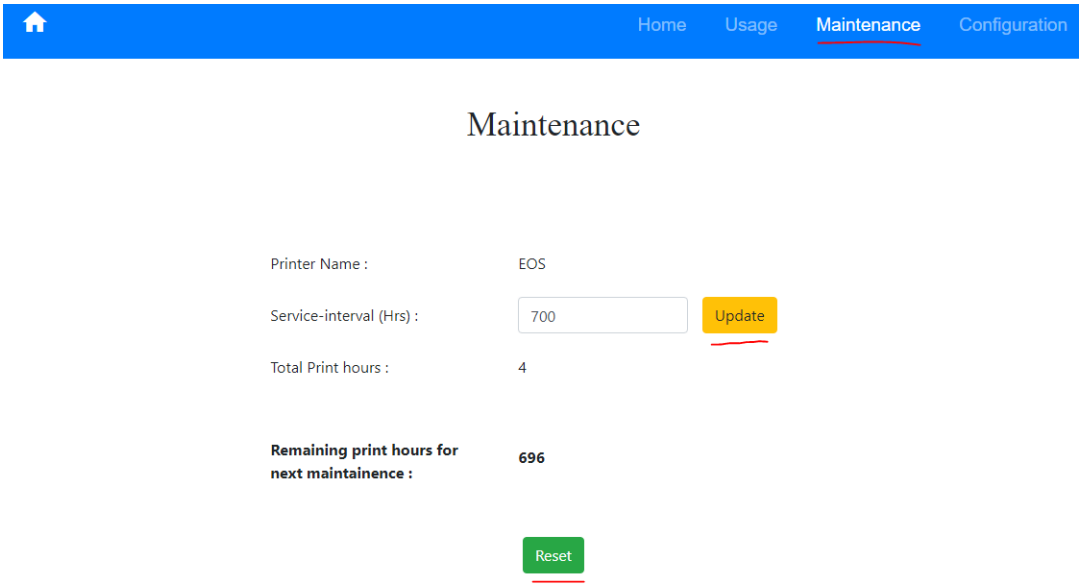
Section 2. Default configuration setup

- Under the ‘Configuration’ page, the default values can be set for the printer and filaments. These details can be modified and updated. (Please be careful with the decimal values)
- For your information, the total usage cost of the print is based on these details.



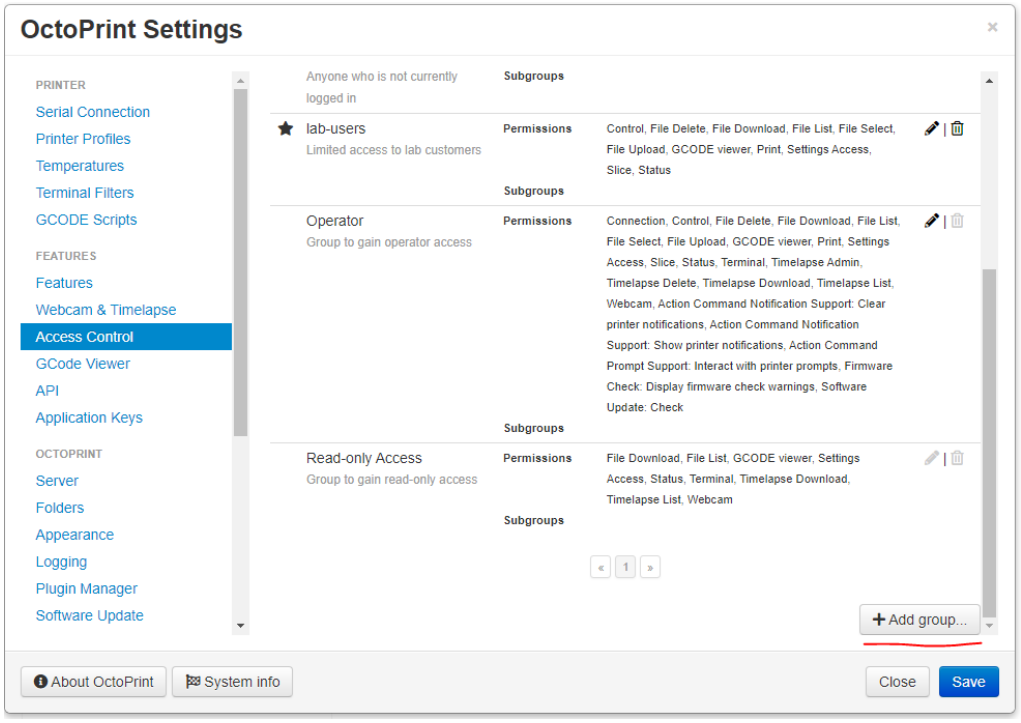
Section 3. Maintenance details

- Under the maintenance page, you can see the remaining print hours for next maintenance. If the remaining hours are 0 which means that the printer needs to be serviced right away.
- Once the printer is serviced, then click on ‘Reset’ option to update that the maintenance is done. This will make the total printed hours to 0.
- If you want to change the service-interval, you can use the ‘Update’ option accordingly on this page.
- Note: The remaining print hours for next maintenance is difference of service-interval and total print hours printed by the printer).

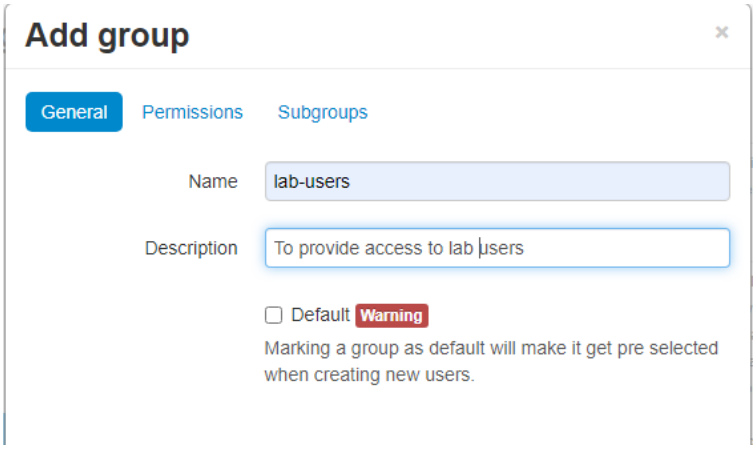


Section 4. Creating user group in OctoPrint

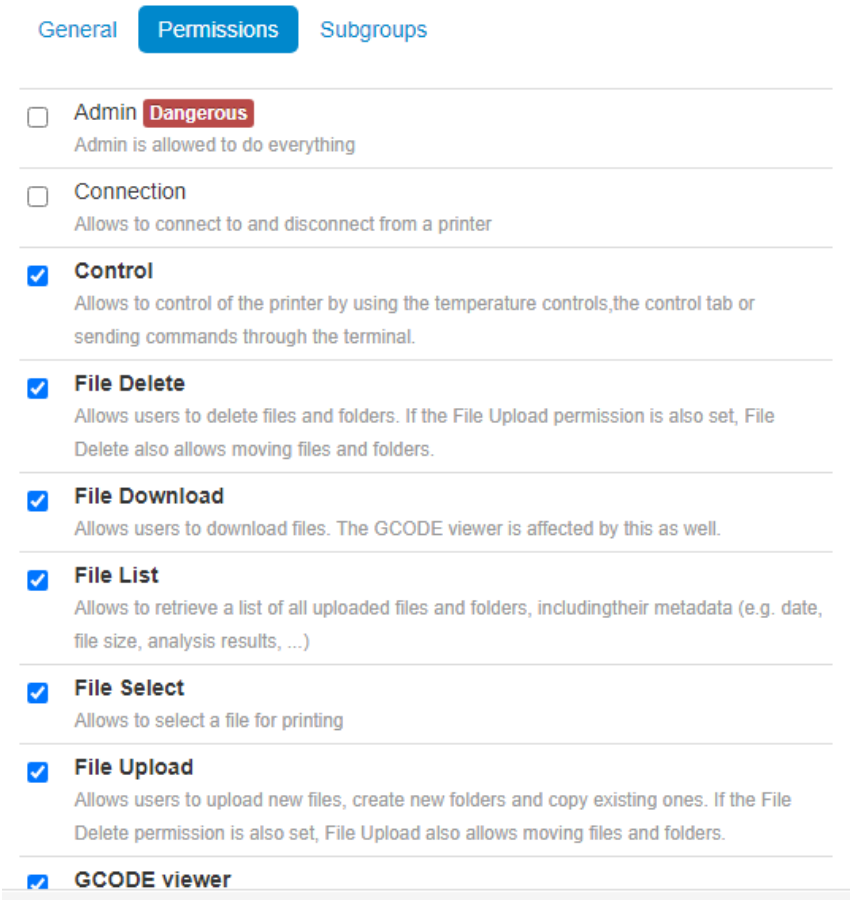
- Open in OctoPrint, Under settings -> Access Control -> Groups -> Add group.

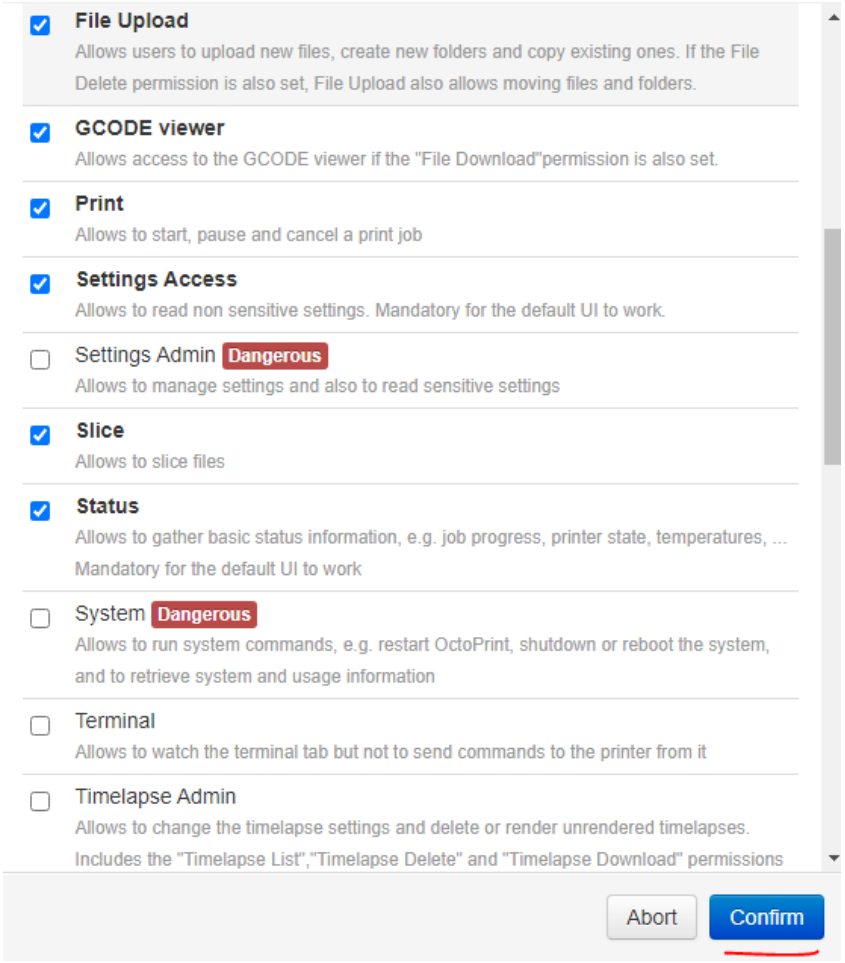


- Give a name, description for the group as follow.



- Provide the following permissions to the group and click on confirm then save to create the group.




File Upload
Allows users to upload new files, create new folders and copy existing ones. If the File Delete permission is also set, File Upload also allows moving files and folders.
GCODE viewer
Allows access to the GCODE viewer if the "File Download"permission is also set.
Print
Allows to start, pause and cancel a print job
Settings Access
Allows to read non sensitive settings. Mandatory for the default UI to work.
Settings Admin Dangerous
Allows to manage settings and also to read sensitive settings
Slice
Allows to slice files
Status
Allows to gather basic status information, e.g. job progress, printer state, temperatures, ... Mandatory for the default UI to work
System Dangerous
Allows to run system commands, e.g. restart OctoPrint, shutdown or reboot the system, and to retrieve system and usage information
Terminal
Allows to watch the terminal tab but not to send commands to the printer from it
Timelapse Admin
Allows to change the timelapse settings and delete or render unrendered timelapses. Includes the "Timelapse List","Timelapse Delete" and "Timelapse Download" permissions
Abort
Confirm

END