PRFAQ

Announcing the Clemson Makerspace Maintenance Manager

A new system to simplify the way the Clemson Makerspace's maintenance team tracks work.
December 4th, 2020. Clemson University, Clemson, SC.

Today, with the launch of the Clemson's Makerspace Maintenance Manager, scheduling recurring maintenance is easier than ever before. The Maintenance Manager keeps track of required maintenance tasks and automatically reminds maintenance employees to complete their assigned tasks. If the maintenance employee does not complete the task within a specified time period the Clemson Makerspace Maintenance Manager will automatically escalate the issue to make sure the work gets completed.

A valuable asset to over 800 Clemson students every semester, the Clemson Makerspace is a student-run organization that fosters innovation and creativity by providing high-tech equipment such as 3D printers and laser cutters for Clemson students to use for their school or personal projects. The Clemson Makerspace currently manages more than 30 machines across 3 locations, and as Makerspace usage grows, so does the difficulty of maintaining the equipment. In previous semesters, maintenance failures have contributed to a 23% failure rate for prints across the Makerspace fleet.

The most common maintenance tasks need to be completed on a set chronological schedule: clean the laser lens every day; grease a bearing every month; check the status of the air filters on the laser cutter, or clean debris out from the laser cutter's vector grid or from behind the 3D printers once per week. The Makerspace has historically had the staff fill out paper spreadsheets in a maintenance manual to provide an audit log of maintenance work, but this paper system has no way to alarm / alert if someone forgets to do the work. The Maintenance Manager removes human error from the paper tracking process and solves the problem of forgotten work with notifications for scheduled work and a system for escalating work that isn't done on time.

"Our partnership with AWS on this project has allowed our students to build a novel system for tracking maintenance work in less than 15 weeks. This product optimizes the operations of the Clemson Makerspace, and has given our students valuable professional experience." said Dr. Alex Herzog, Director of the Senior Design/Capstone program in Computer Science.

Makerspace employees will spend 5 minutes registering with the Maintenance Manager during their onboarding process, and then they will get text messages, emails, or slack messages to automatically alert them whenever a maintenance task has been assigned to them. Employees are also able to submit maintenance tickets which will allow the system to triage and assign the work to someone on the maintenance team.

"The Clemson Makerspace provides Clemson students access to over $300,000 worth of equipment, and the Maintenance Manager has helped us reduce downtime by 25%!" said Meg Nuttall, Maintenance Lead for the Clemson Makerspace.

Makerspace employees can simply go to https://mm.cuMaker.space to access the Maintenance Manager and view all of the upcoming maintenance tasks.

External FAQ
1. Is the Maintenance Manager open source?
   a. Yes, the source code for the Maintenance Manager is available under the GPLv3 license at https://github.com/clemsonMakerspace/.
2. Can I deploy the Maintenance Manager for my own makerspace?
   a. Sure! Simply visit https://github.com/clemsonMakerspace/ to get the source code and find instructions on how to deploy it to your own AWS account.
3. Why should I use the Maintenance Manager instead of paper spreadsheets?
   a. Maintenance Manager assigns all work to an individual, which increases ownership among Makerspace employees. Maintenance Manager also allows the Makerspace to gather metrics on maintenance tasks without processing paper spreadsheets by hand.
4. Why was this project funded?
   a. AWS believes that the cloud is the future and wants to give students the experience of solving real world issues for local non-profits.
5. What is the operational cost of the Maintenance Manager?
   a. The architecture for Makerspace Maintenance Manager was chosen for its low downtime and minimal operational support needs. The Maintenance Manager can be operated by an undergraduate with minimal cloud DevOps experience.

Makerspace FAQ
1. How much will the Maintenance Manager cost to run?
   a. The Maintenance Manager uses AWS's free tier and Serverless offerings to keep costs for static hosting and backend each under $10 a month.
2. What kind of maintenance tasks are supported?
   a. Currently we only support chronological tasks. In the future we would like to allow staff members to submit maintenance requests, or allow for machines to automatically submit maintenance requests (e.g. the laser cutter air filter could request to be changed once it senses

restricted air flow, or a 3D printer could request to have its filament changed once it detects it ran out).
3. How do I add a new user?
    a. Regular users can use Clemson SSO to access the console, and administrators can add other administrators to the console.

Dev Team FAQ
1. Where should our source code be stored?
    a. The source code for the Maintenance Manager should be stored in a public repo in https://github.com/clemsonMakerspace/ with a GPLv3 license.
2. How will the cloud infrastructure be managed?
    a. The Maintenance Manager's infrastructure must be built with AWS Cloud Development Kit (AWS CDK), and should have unit-tests.
3. How long should this project take to build?
    a. Development began on Aug 19th, 2020 and ran for approximately 15 1/2 weeks until we launched on Dec 4th, 2020.