

White Paper

Saving Lives with 3D Printing: Processes Currently Being Used to Manage 3D Printing of Medical Supplies in Andalucía, Spain.

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There are a huge number of 3D Printer owners around the world starting to mobilize and help with the Covid-19 crisis. This is primarily related to the 3D Printing of potentially life-saving Face Shield parts, and in some cases ventilator parts. As time goes on, we will assuredly find more parts/components that are in short supply and can be 3D Printed.

One huge issue happening, however, is that not many people have developed a PROCESS around the production and distribution of these parts. More and more people are trying to help, however they are running into extreme issues around logistics, quality control, etc.

Our team in Spain is working closely with 3D Printing groups that are printing for medical facilities in the Andalucía region. This has given us insight into the very specific challenges they have faced, and the processes developed to overcome those challenges.

The purpose of this paper is to let others know how 3D Printing is currently being done in regards to Covid 19 relief efforts in the area. It is our hope this will help others as they create their local groups/hubs/clusters for 3D Printing medical supplies.

NOTE: Soon, AstroPrint will be launching a software tool (cloud based) that helps manage many of the issues around scaling this process. This tool is being built in coordination with the 3D Printing groups and Medical Facilities referenced in this document, and is being built to streamline their existing 3DP processes. **This should allow for a much more scalable 3D Printing solution during the C19 crisis.** This tool will be free, of course, and will be made available to everyone around the globe that wishes to create their own 'cluster' of 3D printers serving local medical facilities. If you wish to be informed when it is available, you can sign up here: <https://www.astroprint.com/covid-3d-cluster-app>

Some things that surprised me (and might surprise you):

- **Part Distribution & Logistics is the biggest issue!**
 - It is VERY complicated for a regional coordinator to track: Which 3D Printer Owners have enough parts to get picked up, getting them picked up, creating a paper trail for quality control, then distributing the parts to the local medical facilities. This is the primary barrier to scaling the solution to 100's of 3D printers in a region.
 - TLDR: Finding 3D Printer owners that want to print parts is easy. The hard part is coordination and tracking of the entire process.
- **Quality Control matters**
 - Even in this crisis, some hospitals are requiring the 3D printed parts to have basic quality control.
- **Trackability of Printed Parts matters**
 - Many, but not all, of the hospitals prefer serial numbers for each 3D Printed part. Assumably to track in-field failures or contaminations (if they occur).

The process being used with our partners in the Andalucía region of Spain:



Key Takeaways from the Process:

- **User Types:** There are two types of 'users' involved with the project.
 - Regional Coordinators
 - At the moment, Regional Coordinators are using Google Spreadsheets and other cloud based generic tools to track everything from: Serial numbers for parts, number of parts completed, when pickups/deliveries need to occur, quality control checks, etc.
 - 3D Printer Owners
- **Creating Connections with Medical Facilities:**
 - Regional Coordinators should be able to create (or already have) connections with medical facilities and verify these facilities can and will use the 3D Printed parts. This often involves calling hospitals, nursing homes, etc and tracking their needs. (We have also identified Grocery Stores as organizations that need PPEs.)
- **Approval of a design:**
 - Regional Coordinators have the medical facilities verify that the printed design works for their needs. This may require several printed prototypes. For face shield parts, a standard design from Thingiverse, Prusa, etc will typically suffice.
- **Finding 3D Printer owners:**
 - This is currently arduous and haphazard, being done through social media and word of mouth. AstroPrint will put out a tool soon to help streamline this process. A number of other organizations are also working to help make these connections for people.
- **Printing Parts:**
 - Each 3D Printer owner in the 'cluster' of printers prints their parts individually. After each part is complete, they mark a Google Spreadsheet, showing one more part is complete.
- **Serial Numbers:**
 - If Serial Numbers are required by local medical facilities, the Regional Coordinator then gives the Printer Owner a Serial Number to be written on the part.
- **Pick Up of Parts:**

How pick-up is performed is very individualized by locality.

 - A) Pick-up after XX prints are complete:
 - From the Google Spreadsheet, the Regional Coordinator can track how many parts a Printer Owner has completed since their last pickup. Once the Printer Owner has XX parts ready for pickup (typically 20+ parts), the Regional Coordinator contacts them and arranges a pick up time.
 - One of the groups we are working with now is able to utilize the local Fire Department to manage pick up / delivery.
 - B) Delivery, with no minimum - Printer Owners are given a delivery location and they drop off the parts whenever they can. This requires the Printer Owners to leave the house (and break quarantine) but is still the best way for many localities to manage logistics.

- C) Mailing/Shipping - Printer Owners shipping the parts to medical facilities in other regions. This is less ideal. In the US, if a major shipping company donates shipping costs, this could become more viable and could mobilize more 3D Printer Owners that are in remote regions. Ex: If FedEx were to offer free shipping for relief supplies, this could work well.
- **Quality Control Check**
 - Regional Coordinator does a visual quality control check of each part. If a part is rejected for some reason, it would be discarded.
- **Delivery to medical facilities**
 - For all parts that pass Quality Control, the Regional Coordinator arranges for delivery to the appropriate medical facilities.

The groups involved in this project are no doubt saving lives in Spain. We believe this process can be duplicated in other areas, and hopefully save lives there as well.

At the same time, these groups are experiencing many challenges in regards to scaling their current solution. This is preventing them from helping even more people in their region. Nearly all of these challenges are around coordination, tracking, and logistics of the process.

As mentioned previously, AstroPrint is developing a solution to streamline this arduous part of the process. This tool will be available for free, for anyone involved in Covid 19 relief efforts. Our entire development team is working on this project, and we expect it to launch by April 1, 2020. We will roll it out via the groups mentioned above in Spain, then will make it available to everyone else in the world shortly thereafter. If you have interest in coming on board as a Regional Coordinator, or as a Printer Owner, please sign up here: <https://www.astroprint.com/covid-3d-cluster-app>

Stay safe, wash your hands, and call your friends and family more often!