

Mapping Regions of DRC to help WHO's Global Polio Eradication Initiative

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Project Overview

In late May 2017, the World Health Organization (WHO) approached GISCorps about conducting a short-term time-sensitive crowdsourcing project for the Global Polio Eradication Initiative. The Initiative is a public-private partnership led by national governments with five partners – Rotary International, the US Centers for Disease Control and Prevention (CDC), the United Nations Children's Fund (UNICEF) and the Bill & Melinda Gates Foundation. Its goal is to eradicate polio worldwide. Two separate outbreaks of circulating vaccine derived poliovirus type 2 were affecting two provinces in the Democratic Republic of Congo, Haut Lomami and Maniema. Assistance was needed to map all structures in the region in an effort to better manage and direct a wide-scale vaccination campaign.

WHO was interested in working with skilled GISCorps volunteers after having very successful interactions with our volunteers during the Ebola Crisis. GISCorps in partnership with Esri's Disaster Response and Non-Profit staff were tasked with creating a multi-user crowdsourcing app using WebAppBuilder. CDC/ATSDR, Geospatial Research Analysis and Services Program in Atlanta selected and processed high resolution image scenes generously donated by DigitalGlobe. Along with the app creation and image processing, a parallel process got underway to recruit as many GISCorps volunteers as possible in less than one week's time.

Volunteer Recruitment and Statistics

Volunteer recruitment was done in two phases. The initial recruitment focused on volunteers who listed experience using ArcGIS Online in their GISCorps volunteer profile. Because we knew there would be unforeseen technical challenges working with an untested application developed on a short timeline, we needed volunteers skilled with ArcGIS Online to help work out the application bugs. The initial recruitment was sent to 170 volunteers on May 27, six days after the first call with WHO.

Of the 170 volunteers who received the announcement, 105 signed up via the Google Spreadsheet to participate in the early days of the project. Early participants were extremely patient, helped troubleshoot, aided the development of more efficient workflows, and helped refine the documentation.

Once the application and technical performance issues were stabilized, a second recruitment was conducted on June 1 and expanded to all the volunteers and friends of GISCorps. Announcements were also posted to Esri staff, CDC partners, YouthMappers, and several university and state listservs outside the GISCorps organization.

Due to the high numbers of volunteers across the world, the Mission Coordinators and ArcGIS Online Committee needed additional help monitoring the Slack channels, troubleshooting with technical issues and assisting with development. An additional recruitment of project volunteers occurred on June 15 and sixteen people were chosen across multiple time zones to assist.

By the end of the project on July 2, 274 unique volunteers from 20 countries placed 760,019 structure points contributing 5,458 volunteer hours. Far and away, the largest GISCorps project to date!

110 of the GISCorps DRC Global Polio Eradication volunteers and the "End Polio Now" bear (center of collage)
You can download the photo above in full size from [here](#).

of Volunteers
Structure points

Phase I - Haut Lomami
235
400,495

Phase II - Maniema
114
188,302

Total:
274 unique vols
588,797

Management and Communication

Early on in the project, the management team communicated via Skype and utilized Google documents for collaboration. In an effort to minimize emails to the entire volunteer group, it was deemed necessary to have a more robust chat room setting for volunteers to communicate with the management team and each other. GISCorps created a Slack platform specifically for this project.

In general, the Slack channels performed well for answering questions; however, only 70% of volunteers signed up for Slack which made updates to the entire team more challenging. Several volunteers indicated that it was difficult to sift through the numerous Slack messages after being away for a time. It was also difficult to know which ArcGIS Online accounts corresponded to Slack handles.

To reach as many participants as possible, other methods for announcing important developments were also utilized: a dedicated #announce Slack channel was created, the WebApp Splashscreen was updated regularly, and developments were posted at the top of the sign-up sheet and project instructions. With so many volunteers coming into the project at different times, it proved a challenge to efficiently keep everyone informed on daily updates and scheduling, while conveying new instructions in the documentation.

Given the rapid development of the project, we were generally satisfied with the setup of Slack and the use of Google Documents, but there are areas for improvement in the future, particularly providing support across more time zones.

Technical Methods

Two separate apps were created using Esri's WebAppBuilder via ArcGIS Online: the main feature collection app and the validation app. The goal was to keep both apps as simple as possible so the user experience would be self-explanatory. Digitizers could only drop points and delete points of their own creation. The validators could drop points and move and delete points created by other users. Validators were assigned a special ArcGIS Online role to allow these additional edit capabilities. A very small selection of volunteers also added points via Desktop ArcGIS (both ArcMap and ArcGIS Pro) allowing for more rapid digitizing.

Screen capture of structure digitizing application

Screen capture of WebAppBuilder and an early version of the structure validation application

As a restriction on the imagery, DigitalGlobe required that a user login be required. As new users registered to participate, GISCorps AGO administrators created blocks of new accounts several times a day. Over the course of the project, GISCorps created over 400 new AGO user accounts. Esri generously increased the number of GISCorps AGO users as the project rapidly expanded.

Immediately after the project started, several bottlenecks popped up in the initial deployment relating to workflows, app limitations, and server responsiveness. Initially, there was not a good way to focus volunteer efforts on populated areas. It was cumbersome to pan around the imagery and find areas that had not been digitized. The bookmark widget was initially used to keep volunteers focused on populated areas, but keeping the bookmarks updated was a very time-intensive task. As a solution for Phase 1, a Google spreadsheet with settlement Lat/Longs was dynamically linked to the app and reflected the current status of specific villages. While it was a good first solution, it still required managers to

manually update the status of the villages in the spreadsheet as volunteers reported them completed in the Slack digitizer channel. When there was a break between Phase I and II, the data was restructured and incorporated directly into the app. When volunteers checked their 'blue star' tile as completed, the tile was automatically pushed to the validator app and the blue star was removed from the digitizer application dataset.

Another common observation was that continuous digitizing was not possible in the app. Digitizers were forced to click on the structure template before dropping every point. This was a limitation of WebAppBuilder. Once it was brought to Esri's attention, their developers immediately began working on a fix. On the last day of Phase II, Esri rolled out the Smart Editor widget, which allows continuous editing functionality for WebAppBuilder and is now available to all.

Screen capture of the continuous digitizing tool developed by Esri in response to this project

As mentioned, imagery was donated by DigitalGlobe and obtained through the CDC/ATSDR, Geospatial Research Analysis and Services Program. Esri then unpacked the imagery to their servers and created an image service for use in the apps. Due to the short turnaround between project inception to rollout, Phase I was started with only partial imagery for Haut Lomami. This proved to add unnecessary confusion to the process, so it was determined to delay Phase II until all of the imagery for Maniema Province was available. With the other improvements in workflow, Phase II went much more smoothly for both digitizers and management.

One other fun technical aspect was the use of Operational Dashboards to monitor user contributions and project progress. It was determined early in Phase I that the Dashboard was not updating properly, so current stats were not accurate. By the end of the project, the Dashboard was working smoothly and allowed for better cheerleading of volunteers and tracking accomplishments.

Screen capture of the Operations Dashboard and the final results of the Phase II Maniema Province effort

Results

After the dust settled on the amazing work done during the digitizing and validating phases, the work in the field was just beginning. Every one of the 588,797 structure points was plotted on a mapbook page and eventually routed to the appropriate settlements for the vaccination campaign. Your contributions were invaluable to the effort!

Sample mapbook page can be seen here:

<https://drive.google.com/file/d/0B32t9jSZ6lFddkZ4V1dTcWozVXc/view?usp=sharing>

Your hard work in action in DRC:

Photo credits to WHO

On the other side of the planet, your work was graciously highlighted by Jack Dangermond during the Esri Plenary and in the Map Gallery

An animated clip of digitizing progress for phase one

<https://drive.google.com/open?id=0BwX-iGCGGTjLM09ibDN6dG8wR1U>

Thank you to all who participated and extra special thanks to the high volume contributors, validators, moderators, and technical specialists that went above and beyond the original project vision:

Jeff Pires (developer extraordinaire);

Top 5 Digitizers: Venkatesh Balaji (50,570 pts), Suchern Og (30,588 pts), Alexis Handleman (27,722 pts), Dave Litke (23,664 pts), Katherine Barton (23,380 pts)

Technical Specialists: Troy Wirth, Amanda Miner, Suchern Ong, Mikias Wondimu Hundie, Naiara Fernandez, Gary White, Tamas Balazas

Moderators: Carrie Davis, Venkatesh Balaji, Dedjo Yao Simon, Kenneth Leon, Ponnuvel Krishnamoorthy, Olabisi Abe, Samaraweera Jayawardhana, Abidemi Elesho, Luisa Teixeira, Ighodalo Ijabone

Dozens of Validators!

Management Team: WHO: Ravi Shankar

CDC: Brian Kaplan and Amy Lang

Esri: Jeff Baranyi, Jon Pedder, Kevin Armstrong, Carmelle Terborgh

GISCorps: German Whitley, Leslie Zolman, Jeff Pires, Dave Litke, Shoreh Elhami

Part of the management group at the ESRI UC: Front: Ravi Shankar (WHO), German Whitley, Jeff Baranyi (Esri); Back row: Brian Kaplan (CDC), Leslie Zolman, Shoreh Elhami, Jon Pedder (Esri), Dave Litke

Project Timeline:

21-May-2017: GISCorps Kickoff call with WHO and GISCorps

27-May-2017: First recruitment sent out (AGO vols only)

27-May-2017: First AGO account created. Digitizing begins on Haut Lomami

31-May-2017: Sent out 1st update

01-June-2017: Second recruitment (all vols and FOGs)

10-June-2017: Start 3-day mapathon (additional areas south of Haut Lomami)

12-June-2017: End Mapathon. 1+ week break

15-June-2017: Recruit for Moderators/Specialists

23-June-2017: Phase 2 Maniema Mapathon Start

28-June-2017: End Phase 2 digitizing

01-July-2017: End Phase 2 validation

Volunteers' quotes are found in here.