



## DATA COLLECTION TOOLS FOR SHELTER TAGGING & ITEMS DISTRIBUTION

### *Collector for ArcGIS & Survey123 for ArcGIS vs. OpenMapKit & ODK*

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## I. Introduction

The aim of this study is to present and compare two sets of proprietary and open source data collection tools:

	Map-centric	Form-centric
Proprietary	Collector for ArcGIS	Survey123 for ArcGIS
Open source	OpenMapKits	ODK

In order to better understand how they work together and how they could be used in the field, the tools have been tested against a specific scenario.

### UNHCR's data collection for Rohingya refugees' camps in Bangladesh:

UNHCR has deployed a site planner for the Rohingya refugees' camps in Bangladesh. Two of the data collection activities conducted in the field are:

1. Shelter tagging: the enumerators go to the camps, they take the location point of the shelter and they list all the families that live in that shelter (FCN and RCN)<sup>1</sup>
2. Items distribution: the enumerators go to the camps, they select an existing location point of the shelter and for each family they assess if any NFI's<sup>2</sup> have been distributed as part of the General Distribution or Replenishment Distribution.

The tools used for the data collection should allow adding new data but also to update the existing one (existing geometries; submitted forms).

The data collected could be exported in various formats and could feed various data visualization tools.

For each tool there is a general presentation of the functionalities and the updates of the latest release. Then there is a general description of the interaction between the tools and the required set-up. The full workflow is then tested for *the given scenario* in order to reveal the Pro's and Con's for each tool. And at last, the study presents the interaction of these group of tools with two database systems: ArcGIS – currently in use by UNHCR, and OSM.

The main idea of the study is that in addition to the general presentation of the tools, the user gains a better understanding of these tools by seeing them tested against a given scenario, with their pro's and con's, and also a review of how the data collected in the field could be integrated with existing database systems.

**Most mobile data collection solutions evolve fast, new versions are often released several times a year. This report is based on tests conducted in the last quarter of 2018. It includes instructions and some analysis that can be considered as a good basis for potential users to start testing these tools in their own specific field context. However, this report mainly serves to give a general overview and a comparison based on a snapshot in time, and readers are strongly advised to verify features and functions of newer releases when interested in a particular tool.**

<sup>1</sup> FCN = Family Counting Number; RCN = Ration Card Number

<sup>2</sup> Nonfood items

## II. Mobile Data Collection tools

### II.1. Key aspects of Collector for ArcGIS used with Survey123 for ArcGIS

#### II.1.A. General presentation

#### Collector for ArcGIS

Version	Collector for ArcGIS – Version: 18.0.3
Platform	Android, Windows, iOS
Website & Forum	Main site: <a href="https://www.esri.com/en-us/arcgis/products/collector-for-arcgis/overview">https://www.esri.com/en-us/arcgis/products/collector-for-arcgis/overview</a>  Forum: <a href="https://community.esri.com/community/gis/applications/collector-for-arcgis">https://community.esri.com/community/gis/applications/collector-for-arcgis</a>
Provider / Developer	ESRI
Requirements	<u>Device:</u> <b>Android</b> <ul style="list-style-type: none"> <li>Android 4.2 (Jelly Bean) or later</li> <li>Processor: ARMv7 or later, or x86</li> <li>OpenGL ES 2.0 support</li> <li>Precise location (GPS and network-based) support</li> </ul> <b>iOS</b> <ul style="list-style-type: none"> <li>iOS 8 or later</li> <li>iPhone, iPad, iPod touch</li> </ul> <b>Windows 10 (tablet and PC)</b> <ul style="list-style-type: none"> <li>Version 1511 or later</li> <li>Long-Term Servicing Branch (LTSB) version 1607 or later</li> </ul> <u>ArcGIS account requirements:</u> <ul style="list-style-type: none"> <li>ArcGIS organizational account (ArcGIS Online OR ArcGIS Enterprise) – level 2 member</li> <li>Portal 10.3.1 and 10.4.1 are also supported</li> </ul>
Pricing	No additional charge for the app but for the ArcGIS organizational account (Field Worker user type)
Components	- Mobile App + ArcGIS Online OR - Mobile App + ArcGIS Enterprise
Main strengths	- Update of existing data - Adding points, polygons, lines - Automatic sync with DB
Main weakness	- No complex form logic/ XLSForm - Pricing > if using one account per enumerator
Standard Use Case	Collecting and updating geographic data and attribute table information using a mobile device

**Table 01.** Overview of Collector for ArcGIS key aspects

#### Main characteristics:

- Map-centric data collection app
- Works with web maps
- Possibility to use custom base maps
- Enables disconnected workflows
- Supports high-accuracy GPS
- Possibility to use new geometries and edit the existing ones

- Geometries: point, line, polygon
- Data export formats: .csv, .xls, .shp, .gdb, .kml, geoJSON, Feature Collection

Storage: Data collected is stored in a feature layer

- ArcGIS Online: Hosted feature layer OR from an Enterprise geodatabase
- ArcGIS Enterprise: Portal for ArcGIS feature layer (Hosted data in ArcGIS Data Store) OR ArcGIS Server feature service (from an enterprise geodatabase)

Getting started:

- Create feature layers to collect data (ArcGIS Online and/or ArcGIS Enterprise)
- Add to a webmap
- Access in Collector for ArcGIS



## Survey123 for ArcGIS

Version	Survey123 for ArcGIS – Version: 3.1.159
Platform	Android, Windows, iOS
Website & Forum	Main site: <a href="https://www.esri.com/en-us/arcgis/products/survey123/resources">https://www.esri.com/en-us/arcgis/products/survey123/resources</a>  Forum: <a href="https://community.esri.com/groups/survey123/blog">https://community.esri.com/groups/survey123/blog</a>
Provider / Developer	ESRI
Requirements	<p><u>Device:</u></p> <p><b>Android</b></p> <ul style="list-style-type: none"> <li>4.4 (Kitkat) or later</li> </ul> <p><b>Ios</b></p> <ul style="list-style-type: none"> <li>10 or later (64 bit)</li> </ul> <p><b>Windows</b></p> <ul style="list-style-type: none"> <li>Windows 10 Pro and Windows 10 Enterprise (32 bit and 64 bit [EM64T])</li> <li>Windows 8.1, Windows 8.1 Pro, and Windows 8.1 Enterprise (32 bit and 64 bit [EM64T])</li> <li>Windows 7 Ultimate, Enterprise, Professional, and Home Premium (32 bit and 64 bit [EM64T]) SP1</li> <li>Windows Server 2012 Standard and Datacenter (64 bit [EM64T])</li> </ul> <p><u>ArcGIS account requirements:</u></p> <ul style="list-style-type: none"> <li>ArcGIS organizational account (ArcGIS Online OR ArcGIS Enterprise) – level 2 member</li> <li>ArcGIS Online and ArcGIS Enterprise 10.5 and later are supported</li> <li>Portal 10.4 is also supported</li> </ul>
Pricing	No additional charge for the app but for the ArcGIS organizational account (Field Worker user type)
Components	- Mobile App + ArcGIS Online OR - Mobile App + ArcGIS Enterprise
Main strengths	- Based on .xls form - Automatic sync with DB
Main weakness	- No Polygons/Lines or path tracking - Pricing > if using one account per enumerator
Standard Use Case	Creating a survey with complex logic that can be integrated into and managed through an existing ArcGIS architecture

**Table 02.** Overview of Survey123 for ArcGIS key aspects

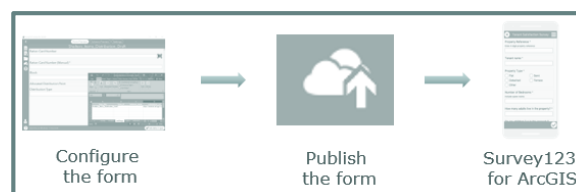
### Main characteristics:


- Form-centric data collection app: skip logic, cascade choices
- Based on the standard .xls form
- Enables disconnected workflows
- Create new forms and edit the existing ones
- Retrieve forms collected by other users
- Search among the forms by a specific value
- Geometry: point
- Data export formats: .csv, .shp, .gdb
- Desktop interface for configuring the forms
- Web interface to visualize the results

Storage: Data collected is stored in a hosted feature layer in ArcGIS Online or Portal for ArcGIS.

### Getting started:

- Configure the form in Survey123 Connect for ArcGIS Desktop app
- Publish the form
- Access in Survey123 for ArcGIS



 For additional information about the latest release and potential upgrades for both of these tools, see appendix [V.3 Latest release of tools](#).

## II.1.B. Implementing and testing the tools: what were the conclusions?

### *a. Interaction between Collector for ArcGIS and Survey123 for ArcGIS*

Collector for ArcGIS works with its own feature service: a Survey123 feature service cannot be added in a Collector Map and then be able to download the map for using it offline.

However, Survey123 can be used against a feature layer from Collector

It is possible to launch Survey123 from Collector and indicate what form should be opened, and even passing parameters to the app to prepopulate fields

Collector for ArcGIS can be used to collect features and Survey123 to add new information about these features through forms. The Survey123 form becomes a related table for the features in Collector. The Feature ID in Collector is sent to the form as a unique key between features and forms.

### *b. How to use the tools?*

The workflows of both tools have been tested on some of UNHCRs' data collection activities conducted in the Rohingya refugees' camps in Bangladesh. You will find in the appendix, information on how to set up your devices in order to use these tools (see appendix [V.4.A Required set-up for Collector and Survey123 for ArcGIS](#)) and instructions on how to use the tools in the particular context of UNHCR's activities (see appendix [V.4.B How to use ArcGIS and Survey123 for ArcGIS](#)).

### *c. Pro's and Con's*



The main advantage of using Collector and Survey123 is that they are **integrated into the ArcGIS Platform**:

- The data can reside in a centralized database / stored in the cloud
- The same data can be accessed in the desktop app (ArcGIS Pro), on the mobile devices (Collector & Survey123) and on the web browser (ArcGIS Online / Portal for ArcGIS) – in order to interact with it and configure data visualization tools (webapps, dashboards, etc.)
- Once the device is synced, the updates are available in the three environments: desktop, mobile & web.



Another advantage is that **the two apps are complementary** and they can be used with the same feature service: Collector can collect all types of geometries (points, lines, polygons) and Survey123 can assess the attributes of these geometries on a form-logic basis, acting as a related table for the features in Collector.

- Both apps **can be used in a disconnected environment**.
- Both apps have the following **edit options**: add, delete, update.
- Both apps **export in various formats**, so that data can also be used outside the ArcGIS environment: Collector (.csv, .xls, .shp, .gdb, .kml, geoJSON, Feature Collection); Survey123 (.csv, .shp, .gdb).
- If in maintenance, **the bugs or sync issues can be sent to the ESRI Technical Support service**.



**The configuration of the two apps to be used against the same feature service is not really straight forward**; however, the whole process is well documented online.



**Both apps are proprietary solutions**, so in order to configure the apps and benefit from different sharing capabilities within an organization, an ArcGIS Organization subscription is required. However, a Survey123 form made publically available doesn't need an account to be filled in.



There are a **series of best practices specific to the usage of both apps in order to avoid sync issues**. Without appropriate capacity building, the configuration of the apps and their usage might seem difficult for the end user.

## II.2. Key aspects of OpenMapKit used with ODK Collect

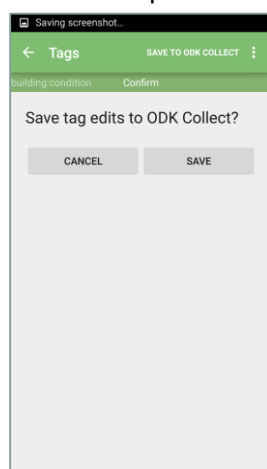
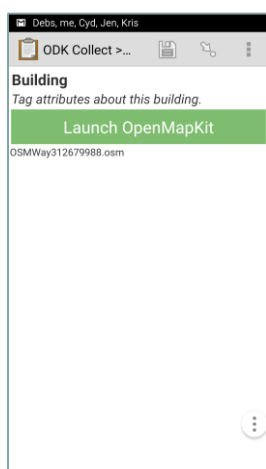
### II.2.A. General presentation

#### OpenMapKit presentation

Version	Open Map Kit – Version: 1.2
Platform	Android
Website & Forum	Main site for OMK: <a href="http://openmapkit.org/">http://openmapkit.org/</a> Main site for POSM: <a href="http://posm.io/">http://posm.io/</a>
Provider / Developer	American Red Cross
Requirements	ODK Collect on phone and a POSM server instance (cloud or local)
Pricing	App for free but cost of a POSM server instance (either fully offline or set up on a cloud instance)
Components	App + Server
Main strengths	<ul style="list-style-type: none"> <li>- Update of existing geo-data</li> <li>- Automatic sync with POSM server</li> <li>- Very easy integration with OSM</li> </ul>
Main weakness	<ul style="list-style-type: none"> <li>- No polygon/line drawing</li> <li>- Little documentation on server setup, maintenance, debugging</li> <li>- Not intended for collection of Non-OSM geo-data</li> </ul>
Standard Use Case	Filling in an ODK survey in the field, including questions which will update and add information to be made available in OSM

**Table 03.** Overview of OpenMapKit key aspects

- Open Map Kit (OMK) is an extension of Open Data Kit (ODK) and was developed by the American Red Cross
- OMK is designed to allow the humanitarian actors to collect field survey information while seamlessly contributing to Open Street Map by selecting OSM features and creating and/or editing tags within the survey collection workflow.
- Geometries: point
- Supports the use of an offline base map on the phone, providing the user with the available OSM vector data and base map for the area of interest, using the POSM Export Tool.



OMK is not a stand-alone mobile data application, but an extension launched automatically from within ODK Collect when an OSM question type is included in a standard survey (fig. 13).

Once the OSM tag questions have been answered, the tags are saved to ODK Collect and the user will automatically return to ODK Collect to answer the remaining questions of the survey (fig. 14).

**Fig 13 (left).** OpenMapKit automatic launch from within ODK Collect for an OSM question-type

**Fig 14 (right).** Automatic save of OSM tags to ODK Collect



## ODK Collect presentation

Version	ODK Collect – Version: 1.18.2
Platform	Android
Website & Forum	<a href="https://docs.opendatakit.org/collect-intro/">https://docs.opendatakit.org/collect-intro/</a>
Provider / Developer	Open development
Requirements	ODK, KoBo or similar server
Pricing	Free
Components	App + backend server
Main strengths	<ul style="list-style-type: none"> <li>- Complex form logic</li> <li>- Tracking available</li> </ul>
Main weakness	<ul style="list-style-type: none"> <li>- No editing of features once sent to the server</li> </ul>
Standard Use Case	Filling in an ODK survey including geoshape and geotrace questions

**Table 04.** Overview of ODK Collect key aspects

- ODK Collect is an open source Android app for survey-based data collection
- Supports a wide range of question and answer types and complex form logic
- Support offline data collection
- Can collect location, audio, images, video, barcodes, signatures, multiple-choice, free text, and numeric answers
- Can accept answers from other apps, such as OpenMapKit with OSM question types as described above
- Geometries: geopoint, geoshape and geotrace
- Use of a base map (offline MBTiles files can be stored directly on the device to be used as an offline base map layer for location questions)
- Answers are stored as text in the survey with latitude, longitude and elevation coordinates

💡 For additional information about the latest release and potential upgrades for both of these tools, see appendix [V.5 Latest release of tools](#).

### II.2.B. Implementing and testing the tools: what were the conclusions?

#### *a. Interaction between ODK Collect and OpenMapKit*

The enumerator would usually begin the data collection in the field using ODK Collect and only for the geographic features he/she will, move to OpenMapKit launching it from within ODK Collect.

To allow for the collection of OSM features, the standard survey form created for ODK Collect has to be *slightly adapted in order to incorporate the OSM tagging scheme* (see appendix [V.6 XLSForm for OpenMapKit](#) for more details).

#### *b. Testing the workflow*

The workflows of both tools have been tested on some of UNHCRs' data collection activities conducted in the Rohingya refugees' camps in Bangladesh. You will find in the appendix, information on how to set up your devices in order to use these tools (see appendix [V.5.A Required set-up for ODK Collect and OpenMapKit](#)) and instructions on how to use the tools in the particular context of UNHCR's activities (see appendix [V.5.B How to use ODK Collect and OpenMapKit](#)).

### c. Pro's and Con's



OMK has the great advantage of allowing users:

- to **easily collect OSM data in the field in low** (to no) **connectivity environments**, and
- to **seamlessly integrate this data to OpenStreetMap** while collecting private survey data that won't be pushed to OSM.



However, throughout the tested data collection workflow, we **experienced many bugs and limitations** that makes the app hardly recommendable (for the moment) for this specific scenario.



We encountered **many difficulties with the POSM server from the set-up to the maintenance and little documentation is available for troubleshooting**. In addition, most of the available documentation focuses on the hardware set-up while we would also be interested to learn how to manage the cloud server that we used for the testing.



For instance, there is **no easy option for the users to delete old deployments or forms from the POSM server**, while it is recommended by the American Red Cross to keep it "clean" by deleting old deployments no longer needed, as multiple deployments can generate bugs. Moreover, the option to submit local OSM data to OpenStreetMap – the main (and only) added-value of OMK – wasn't available on our POSM instance. We also encountered **difficulties with FieldPaper atlas and deployments** for which the link didn't work on POSM and made the app OMK crash every time we tried to visualize the deployment. Also, **the server doesn't allow for visualizing and managing the results** unlike Kobotoolbox for instance. Data has to be downloaded and opened in QGIS (or another GIS software) for analysis and visualization.



Having **two separate datasets with ODK-survey data in a CSV file and OMK-OSM data in an OSM file represents a strong limitation**. We would expect having an integrated dataset at the end, as the standard workflow for which OMK was designed for, is to be used from within an existing survey done on ODK Collect. For this specific scenario where we would need to have the shelter points data integrated together with the item distribution data, the geopoint question type in ODK Collect seems to be more appropriate than the OSM question type. The geographic coordinates of each shelter would be stored directly in the CSV file and an offline MBTiles file for the AOI could be loaded on ODK Collect to provide visualization. However, with a geopoint question, **OSM tags or attributes for the shelters wouldn't be collected and pushed to OpenStreetMap unlike using OMK**.



Another aspect to consider is how long it takes for OSM edits to be made available online to anyone. For instance, it would be useful to see which shelter points have been created and surveyed to follow up on the data collection advancement. If edits validation takes several weeks or more to be approved and made available online, then it can be a strong limitation to the use of OMK. For this benchmarking, **we couldn't find an indication regarding how long the validation time process can take**.



Despite all these limitations, OMK still has the advantage of:

- being **easy to use**,
- to provide the option to **go entirely offline** in the field with a portable POSM and
- to **easily contribute to OSM**.
- **For a simple data collection workflow focused only on editing OSM tags, OMK would be a recommendable tool to deploy in the field.**

### III. Integration with DB systems

#### III.1. With ArcGIS

##### *a. Collector for ArcGIS and Survey123 for ArcGIS*

Both apps are fully integrated with the ArcGIS Platform, being able to update a central database or a feature layer hosted in the cloud.

No additional steps are required: once the devices have access to an internet connection and the sync process is launched, the data is synced back to the original data source, and the updates are applied based on the edits that have done on the devices: new records can be added, and the existing ones can be deleted or updated.

The same data source can be used in a desktop app (like ArcGIS Pro) to create and print maps, or in a web app (like those configured with Web App Builder, or Operations Dashboard) to configure and visualize different infographics.

##### *b. ODK and OpenMapKit*

There is no possible seamless integration of ODK/OMK data into ArcGIS. This would require developing ETL processes which could be investigated in another project but falls outside the scope of the current benchmarking.

#### III.2. With OSM

##### *a. Collector for ArcGIS and Survey123 for ArcGIS*

It is not possible to use Collector or Survey123 for data collection and then directly sync it to OSM. Both apps are configured to work with Esri data storage formats. Manual import following the OSM import process can however be done, and various organizations are currently investigating the possibilities to partially automatize this process with ETL tools.

##### *b. ODK and OpenMapKit*

As a final stage, edits completed on the local OSM (see section IV.3.D) must be pushed to the online OpenStreetMap. Prior to this, the local OSM file has to go through a conflict detection process in order to reconcile the data with potential modifications made by online users during the offline data collection on the AOI. To handle this process, the American Red Cross developed a tool called "POSM replay tool" (this workflow hasn't been tested during our benchmarking).

The POSM replay tool requires some command line knowledge and familiarity with GitHub. Complete instruction can be found here: <https://github.com/posm/posm-replay-tool>

##### Main steps of the replay process:

- a. Obtain an AOI extract (PBF or XML) corresponding to the point where the local OSM API branched from. It corresponds to the PBF file created through the AOI export and used to set up the POSM deployment.
- b. Gather local change sets.
- c. Initialize a git repository containing locally-modified entities present in the AOI extract.
- d. Obtain an AOI extract containing current data from your upstream. Use the POSM Export Tool and follow the same steps as for the POSM deployment in the first place, but using the current data.
- e. Extract and apply changes to locally-modified entities from the current AOI extract.
- f. Create a branch representing the local history by applying all local changesets to a branch containing the starting AOI extract.

- g. Apply each local changeset to the branch containing the current AOI extract.
- h. Manually resolve merge conflicts between local and upstream edits.
- i. Submit resolved changesets to your upstream API, renumbering references to locally-created entities as necessary.

OSM has developed a guideline available online on the OpenStreetMap Wiki to help users importing data into the OpenStreetMap database<sup>3</sup>. It contains all the steps of the workflow as well as key considerations to bear in mind.

**!** The POSM cloud instance used for this benchmarking didn't have the option to submit local OSM data to the OSM API as it should be (fig. 54 & 55). This is one among several bugs that we experienced with POSM during this project.

OpenMapKit Server							
Colombia Buildings (68)							
<a href="#">ODK DATA</a> <a href="#">OSM DATA</a> <a href="#">SUBMIT TO OSM</a>							
start	end	today	deviceid	fieldpaper_id	osm_building/originalFilename	form	
2016-02-16T14:34:32.413-05	2016-02-16T16:09:17.462-05	2016-02-16	352651073274320	E2	<a href="#">54994b8a1db295bdf2aee4141314825a9f49b240.osm</a>	2016-02-16T16:09	
2016-02-16T14:33:28.876-05	2016-02-16T16:15:40.886-05	2016-02-16	359535052501154	E4	<a href="#">8a0f712df4505d9f938769c873cb859e6c9b93.osm</a>	2016-02-16T16:15	
2016-02-16T15:29:06.687-05	2016-02-16T15:30:35.697-05	2016-02-16	352651073274932	B2	<a href="#">6f7dd1bd93bcfa1443e7d34947dddc48c609653c.osm</a>	2016-02-16T15:30	
2016-02-16T14:34:11.332-05	2016-02-16T15:19:36.914-05	2016-02-16	355167056141425	C3	<a href="#">910829a31d320914aba8d96268dbaa118002f5ba.osm</a>	2016-02-16T15:19	

**Fig 54.** Example of a POSM server with the option to submit OSM data to the OSM API

## Shelter tagging OMK\_v16

Total submissions: 4

[ODK Data](#)
[OSM Data](#)

**From**

**To**

**Device ID**

**Page Size**

**Page**

**Fig 55.** Our POSM server instance with the missing option to submit OSM data for the shelter tagging form

<sup>3</sup> OSM Import guideline: [https://wiki.openstreetmap.org/wiki/Import/Guidelines#See\\_also](https://wiki.openstreetmap.org/wiki/Import/Guidelines#See_also)  
[info@cartong.org](mailto:info@cartong.org) | [www.cartong.org](http://www.cartong.org)

## IV. Conclusion

Proprietary tools		Collector and Survey123 for ArcGIS
Survey123 for ArcGIS		Survey123 for ArcGIS is Esri’s form-centric data collection app.  It is based on standard .xls form, enables disconnected workflows, collects points geometries and allows adding new forms and edit the existing ones.  The latest release includes improvements for user interface and form logic as well as various bug fixes.
	Collector for ArcGIS	Collector for ArcGIS is Esri’s map-centric data collection app.  It is based on web maps, enables disconnected workflows, collects all types of geometries and allows adding new features and edit the existing ones.  The Aurora Project will replace the actual version of Collector with a new improved one (2019).
	Interaction between both tools	Collector can be used together with Survey123: <ul style="list-style-type: none"><li>• with Collector, new features are collected, and</li><li>• with Survey123 new information about these features is added through forms.</li></ul> The Survey123 form becomes a related table for the features in Collector.  The Feature ID in Collector is sent to the form as a unique key between features and forms.
Main advantages		<ul style="list-style-type: none"><li>• The main advantage of using Collector and Survey123 is that they are integrated into the ArcGIS Platform.</li><li>• Also, the two apps are complementary, they can be used against the same feature service.</li></ul>
Main weaknesses		<ul style="list-style-type: none"><li>• The configuration process might not seem straight forward at the first sight.</li><li>• The two apps are proprietary solutions, which means an ArcGIS Organization subscription is required.</li><li>• Neither Collector or Survey123 can sync directly to OSM: an additional ETL tool is needed.</li></ul>

Open source tools	OpenMapKit and ODK
<b>ODK</b>	<p>ODK Collect is an open source form-centric data collection app.</p> <p>It works on Android platforms, enables disconnected workflows and collects all types of geometries.</p> <p>The latest release includes improvements for user interface and form logic as well as various bug fixes.</p>
<b>OpenMapKit</b>	<p>OpenMapKit is an extension of ODK and was developed by American Red Cross.</p> <p>It enables disconnected workflows, collects point geometries and the data collected can be directly sync to OSM Db, by selecting OSM features and creating/editing tags.</p> <p>The latest release includes a constraint functionality for OSM tag questions.</p>
<b>Interaction between both tools</b>	<p>ODK Collect can be used together with OpenMapKit:</p> <ul style="list-style-type: none"> <li>the data collection starts with ODK Collect, and</li> <li>only for the geographic features the enumerator moves to OpenMapKit launching it from within ODK Collect.</li> </ul> <p>To allow for the collection of OSM features, the standard survey form created for ODK Collect has to be slightly adapted in order to incorporate the OSM tagging scheme.</p>
<b>Main advantages</b>	<ul style="list-style-type: none"> <li>The main advantage of OMK is that allows users to easily collect OSM data in the field in low/no connectivity environments, and to integrate this data to OSM while collecting private survey data that won't be pushed to OSM.</li> <li>Also, it is an open source app.</li> </ul>
<b>Main weaknesses</b>	<ul style="list-style-type: none"> <li>However, for this specific scenario, we experienced many bugs and limitations that makes the app hardly recommendable (for the moment):             <ul style="list-style-type: none"> <li>the set-up of the POSM server,</li> <li>no easy options for the users to delete old deployments or forms from the POSM server,</li> <li>the server doesn't allow for visualizing and managing the results, having two separate datasets with ODK-survey data in a .CSV file and OMK-OSM data in an .osm.</li> </ul> </li> <li>There is no possible seamless integration of ODK/OMK data into ArcGIS: an additional ETL is needed.</li> </ul>

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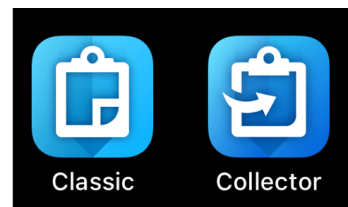
### V.3. Latest releases of tools

#### V.3.A. Latest release: Collector for ArcGIS

Launched in the Apple App Store and Google Play in January 2013, followed by the Windows Store in December 2015. Since its initial release Collector has evolved considerably and its capabilities have grown over the time.

In autumn 2018, Esri has announced a major new development with Collector, called the **Aurora Project**. It has been released on the iOS platform, and planned to be released in 2019 for Android (beta in Q1 2019) and Windows 10 platform (beta in Q4 2019).

The Collector app currently in use on the device will rename itself to *Classic* and in the store will be called "*Collector Classic*". At the same time Esri will release the Aurora Project as a new listing in the store and call it "*Collector for ArcGIS*". When download onto the device, the app will be named *Collector*.



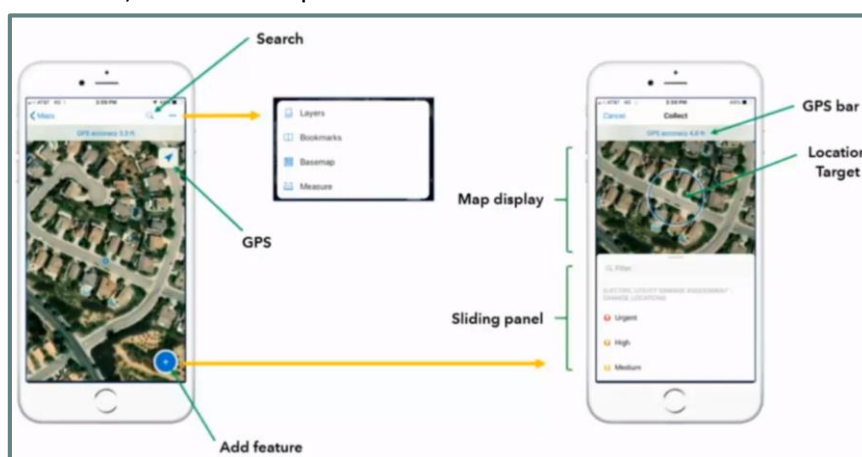
The improvements of Collector through the Aurora project are:

#### → Better maps

- Labels and advanced symbology
  - Arcade expressions
  - Symbol effects and symbol properties (heat maps)
- Vector basemaps
  - Enhanced in comparison to the old ones

#### → Improved user experience

- Focused on usability
- More intuitive UX
- New sliding panel (you can keep the map view besides)
- Tablets
  - Portrait mode, feels like clipboard



**Fig 01.** New UI in Collector for ArcGIS

#### → Enhanced Collect experience

- Feature placed at Location Target
- Reduced taps to capture photos + other attachments (gallery, audio, video)
- Stream collection by distance OR time
- Forms: required fields > the users won't be able to pass to the next field unless they fill in a required field



### → Several new capabilities

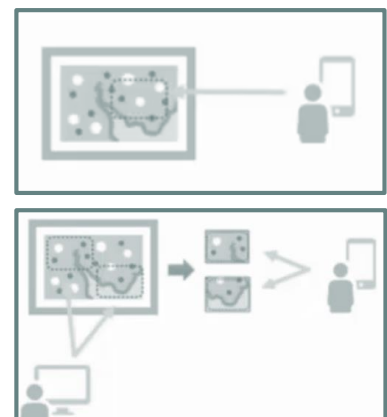
- Barcode scanner
  - Scan barcodes to auto-populate fields
- Input additional metadata
- Compass tool
  - Shows direction north
- Legend
  - Switch between layer/legend view to identify what you see on the map
- Layers
  - Share layers' load errors
- App settings
  - Collection properties
    - Accuracy
    - GPS Averaging
    - Streaming
    - Photo size
  - Location
    - Configure provider
  - General
    - Units and direction
    - Offline properties

### → Data collection with high accuracy

- Use Collector with GPS/GNSS device
- Set a location provider
- Define a location profile
- Attach accuracy info to your data
- Receive alerts and notifications
- GPS averaging
- Support for z-values
  - Store orthometric heights

### → Offline field collection

- Field workers can take their maps offline
  - View and interact with map
  - Measure distances and areas
  - View pop-ups and media
  - Search for features
  - Collect and update features
  - Synchronize changes between field and office
- Two-approaches
  - On-demand workflow
    - Map author enables and configures maps for offline use
    - Fieldworker defines the area and level of detail
    - Server processes data for download
  - Pre-planned workflow (NEW)
    - Map author defines the map areas for offline use
    - Fieldworker selects the area to work offline
    - Server processes data once



➤ Data synchronization

- More options: Sync in Map, Auto-Sync
- Sync panel shows pending edits, sync failures
- App profile settings:
  - General > Download & Sync

V.3.B. Latest release: Survey123 for ArcGIS

- ➔ The **Settings** page has been redesigned
- ➔ The app's font can be changed in the **Settings** page
- ➔ The app will alert the user when it fails to capture a location
- ➔ The **Settings** page contains a **Location** tab, providing options to change when the app attempts to capture a location or to configure the alert when location capture fails
- ➔ Improved handling of repeat counts when editing existing surveys with repeats
- ➔ The Survey123 URL scheme supports altitude in geopoint questions
- ➔ Geosearch can search all available geocoders
- ➔ Text questions display a character count
- ➔ A confirmation message displays when emptying the **Sent** box
- ➔ Calculations within repeats will no longer create related records by themselves
- ➔ A default value applied to a cascading select will apply the appropriate choice filter to later questions
- ➔ A time field with a calculation applied will not cause other time fields to ignore defaults
- ➔ Selecting an image from an Android device can search subfolders within the DCIM folder
- ➔ Predictive text is disabled by default for text input questions on Android
- ➔ Various bug fixes

V.3.C. Latest release: OpenMapKit

With OpenMapKit Android v1.1, a new feature was developed focused on constraint functionality for OSM tag questions. Via JSON configuration files, the user now has the possibility to add special functionality to the tagging of OSM data. The following constraint functionalities are available<sup>4</sup>:

- ➔ Multiple Values Per Key
- ➔ Required Tags Force User To Answer
- ➔ Implicit Tag Recorded Without UI
- ➔ Default Value for a Tag
- ➔ Typeahead Based off of Tag Index
- ➔ Skip Logic
- ➔ Numeric Input
- ➔ Enable / Disable Custom Value Input
- ➔ Constraints JSON

V.3.D. Latest release: ODK Collect

ODK Collect is updated on a regular basis and each release is well documented on Github<sup>5</sup> and on the forum<sup>6</sup>. Since version 1.18.0, the following features and bug fixes have been implemented:

- ➔ Targets API 26 to benefit from new Android features and continue publishing in Play Store
- ➔ Adds Bikram Sambat (Nepali) date widget with appearance bikram-sambat

<sup>4</sup> More details available on Github: <https://github.com/posm/OpenMapKitAndroid/releases/tag/v1.1>

<sup>5</sup> Github: ODK Collect v 1.18.0: <https://github.com/opendatakit/collect/releases/tag/v1.18.0>

<sup>6</sup> ODK Collect forum: <https://forum.opendatakit.org/t/odk-collect-v1-18/15982>

- Improves auto send and auto form updates
- Improves zooming on Open Street Map
- Hides buttons if a question is readonly
- Fixes current() used in choice filters to provide support for cascading selects in repeats
- Fixes reported issue with form styling
- Fixes issues with randomizing selects and rank widget

## V.4. Collector and Survey123 for ArcGIS: Step-by-step instructions

### V.4.A. Required set-up for Collector and Survey123

**!** An ArcGIS organizational account level 2 is required in order to configure Survey123 & Collector

1. **Download and install the Survey123 for ArcGIS Connect desktop app:**  
<https://www.esri.com/en-us/arcgis/products/survey123/resources>
2. **Open Survey123 for ArcGIS Connect and log in with the ArcGIS Online user account**
3. **Create a new Survey123 project in Survey123 Connect;** add the key field that will link the feature in Collector to the form in Survey123 ( → in the given scenario the *key field is the Shelter ID {hh\_progres\_id}*)

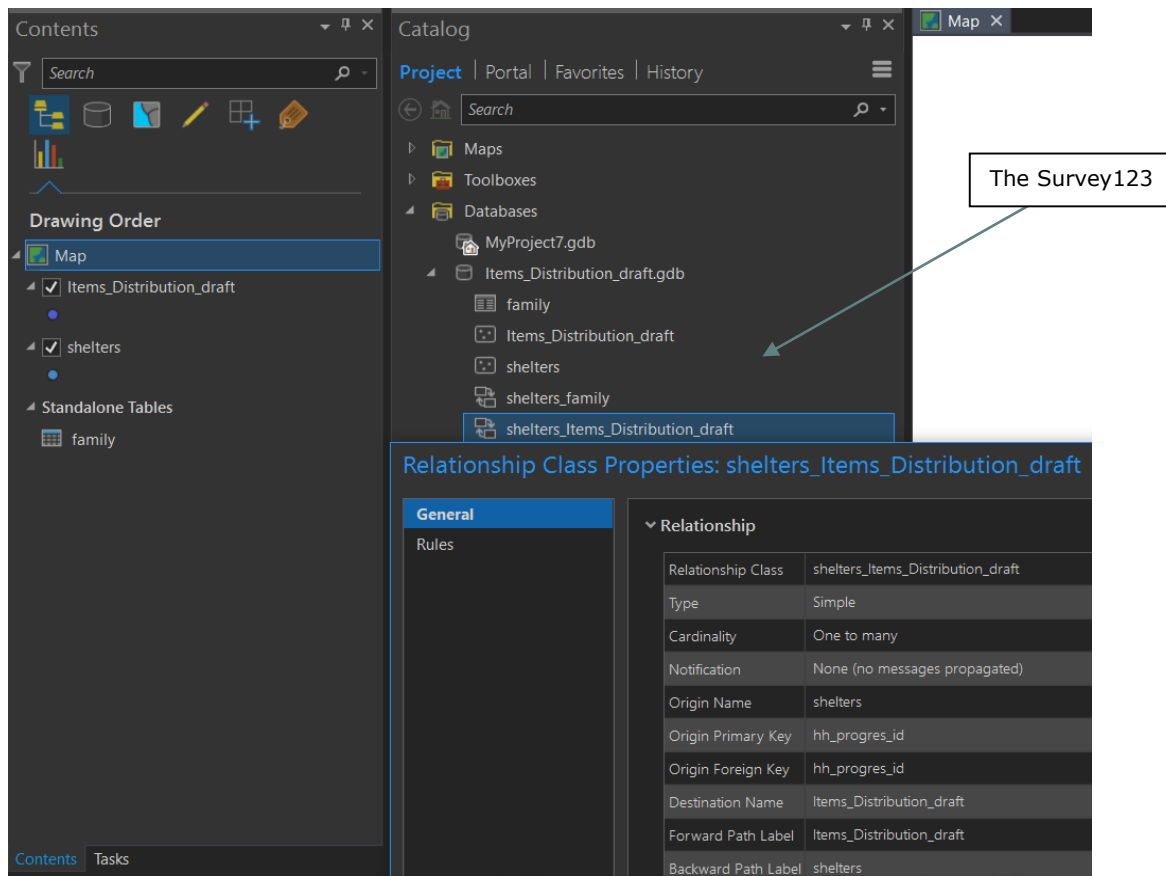
type	name	label
hidden	hh_progres_id	Household Progres ID
barcode	Ration_Card_Number_A	Ration Card Number
text	Ration_Card_Number_Manual_A	Ration Card Number (Manual)
select_one blocks	Camp_block	Block
select_one_external allocated_distribution_point	Allocated_distribution_point	Allocated Distribution Point
select_one distrib_type	Distribution_Type	Distribution Type

**Fig 02.** Configuring the key field in the Survey123 form

4. **Publish the survey to ArcGIS Online**
5. **Download the feature service** that was created at step 4 **to a file geodatabase**

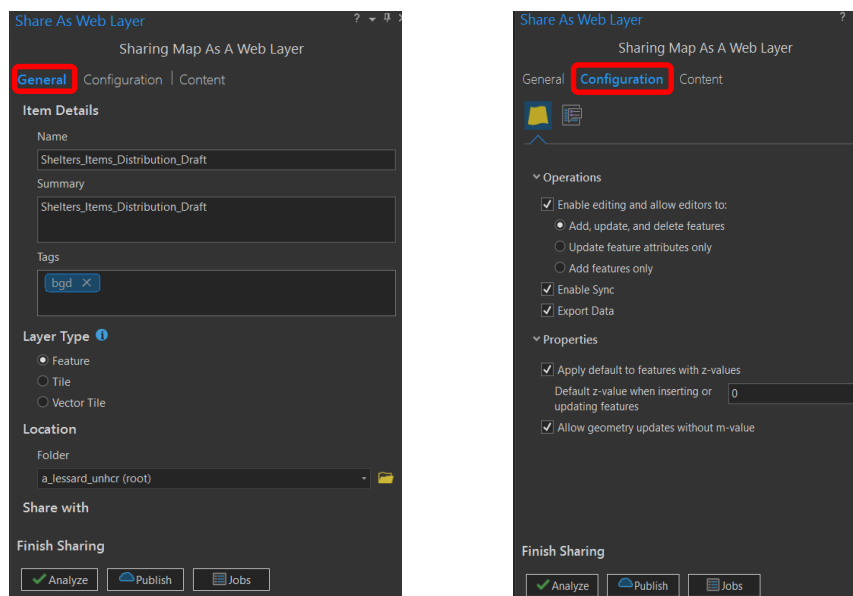
**!** Very important not to choose another format, because choice lists will be lost if you choose another format

6. In the file geodatabase that was downloaded, **create your primary feature class** ( → in the given scenario the *shelters* feature class). Ensure it has a common ID with the Survey123 feature class ( → in the given scenario the *key field is the Shelter ID {hh\_progres\_id}*)
7. **Create a geodatabase relationship** between the primary feature class (Shelters) and the Survey123 feature class using the common ID
8. In ArcGIS Pro, **add both layers with the Survey123 feature as the first item in the table of contents**



**Fig 03.** ArcGIS Pro – Preparing the layers for publishing

- Publish as a new feature service in ArcGIS Online** (The Survey123 feature class should be ~/FeatureServer/0)

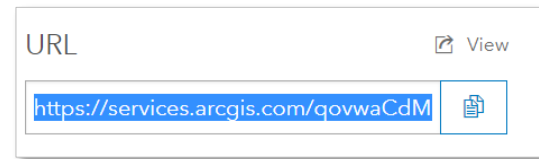


**Fig 04.** ArcGIS Pro – publishing the feature layer

10. In the Survey123 Connect app, **open the spreadsheet and switch to the settings tab**

11. **Update the submission\_url parameter** to match the feature service for the ArcGIS Online Feature Service

- Taken from the Item Details page:



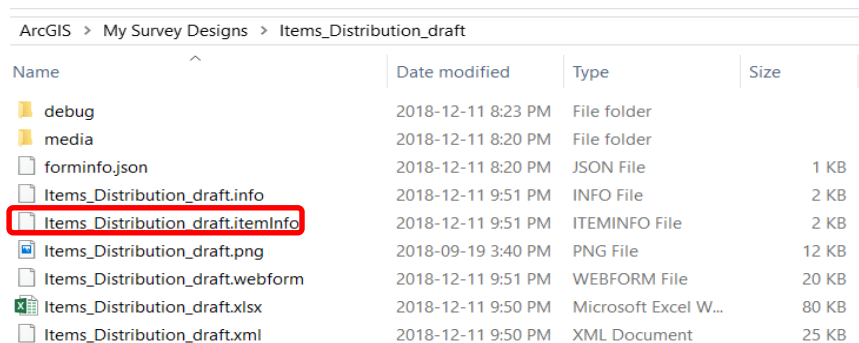
**Fig 05.** Copying the URL of the feature service published at Step 9

- Also update the "form\_title" column to contain the name of the survey layer that you just published

form_title	form_id	instance_name	submission_url	default_language	version	style
Shelters_Items_Distribution_Draft			https://services.arcgis.com/qowwaCdM/EzUUFzS/arcgis/rest/services/Shelters_Items_Distribution_Draft/FeatureServer			

**Fig 06.** Configuring the "Settings" sheet in the .xls form

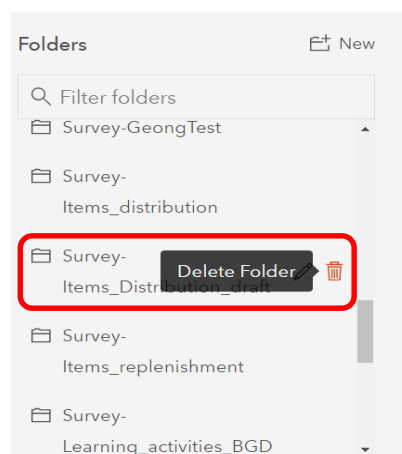
12. In the Survey123 project folder **delete the .iteminfo file**



ArcGIS > My Survey Designs > Items_Distribution_draft				
Name	Date modified	Type	Size	
debug	2018-12-11 8:23 PM	File folder		
media	2018-12-11 8:20 PM	File folder		
forminfo.json	2018-12-11 8:20 PM	JSON File	1 KB	
Items_Distribution_draft.info	2018-12-11 9:51 PM	INFO File	2 KB	
<b>Items_Distribution_draft.iteminfo</b>	2018-12-11 9:51 PM	ITEMINFO File	2 KB	
Items_Distribution_draft.png	2018-09-19 3:40 PM	PNG File	12 KB	
Items_Distribution_draft.webform	2018-12-11 9:51 PM	WEBFORM File	20 KB	
Items_Distribution_draft.xlsx	2018-12-11 9:50 PM	Microsoft Excel W...	80 KB	
Items_Distribution_draft.xml	2018-12-11 9:50 PM	XML Document	25 KB	

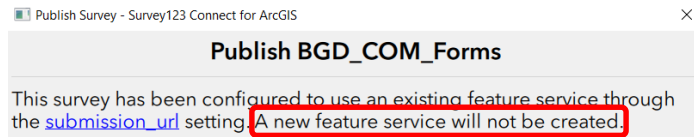
**Fig 07.** Accessing the Survey123 project folder

13. In ArcGIS Online **delete the original associated Survey123 folder**



**Fig 08.** Deleting the Survey123 folder in ArcGIS Online

14. **Republish the Survey123 project** and it should associate with the specified feature service

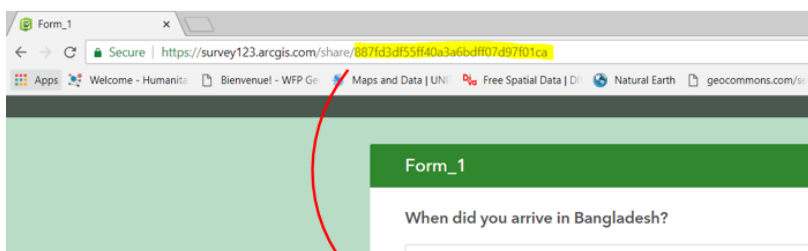


**Fig 09.** Republishing the form

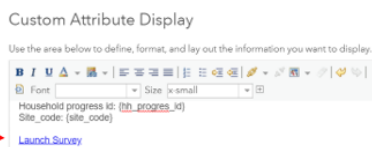
15. In AGOL **create a new map for Collector**

16. In the pop-up window of the Shelter layer, **configure the URL to launch Survey**

17. Within the URL **call the feature ID from Collector** so that the same field in Survey gets pre-populated




**arcgis-survey123://?itemID=887fd3df55ff40a3a6bdf07d97f01ca&field:hh\_progres\_id={hh\_progres\_id}**

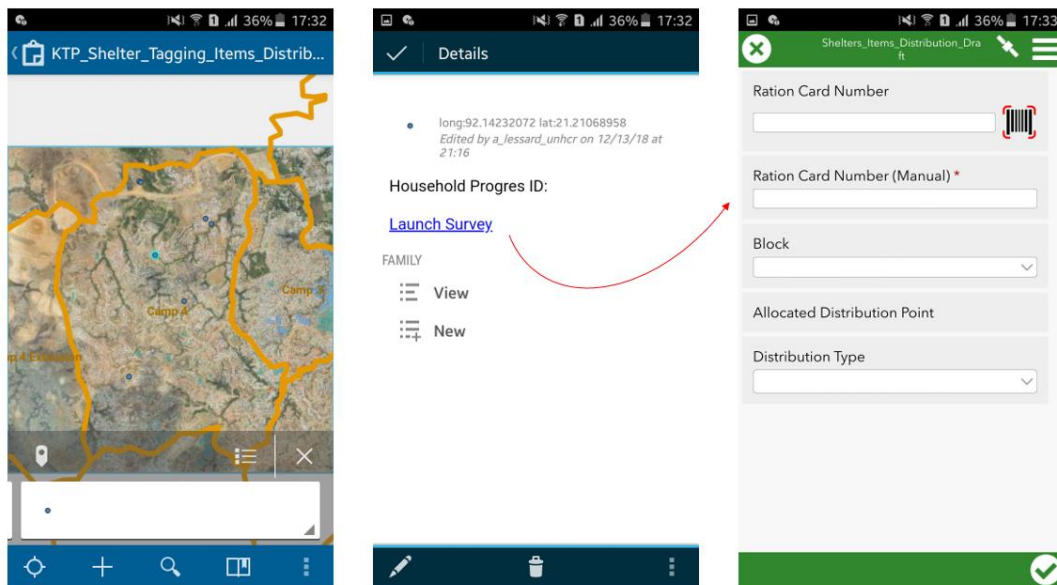


hh\_progres\_id = The name of the field in Survey123 that will be populated with the values from the {hh\_progres\_id} field in Collector

**Fig 10.** Configure the URL for launching the Survey123 app from within Collector

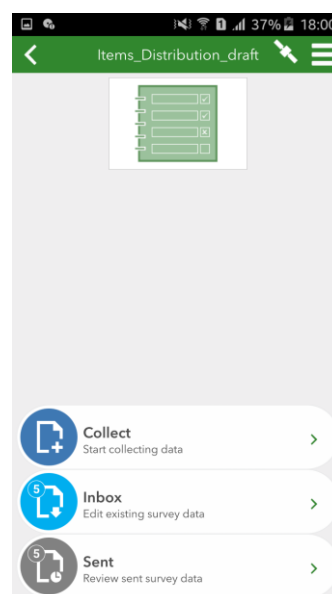
#### V.4.B. How to use Collector and Survey123 for ArcGIS

1. **Install Collector for ArcGIS & Survey123 for ArcGIS on the device**
2. **Download the survey form on the device**
3. **In Collector, add a new feature**
4. **In the “Details” window click on “Launch Survey”** – the Survey123 app opens with the “Items Distribution” form
5. **Fill the information in the form and then submit the form by clicking on the** 



**Fig 11.** Combined usage of Collector and Survey123

6. **Once in Survey123 app you have the possibility to search among all the surveys available** (the “Inbox” option) if there it access to an internet connection, **or to search among the survey submitted from the device** (the “Sent” option)



**Fig 12.** Survey123 form options



## V.5. OpenMapKit and ODK: Step-by-step instructions

### V.5.A. Required set-up for OpenMapKit and ODK

#### I) Setting-up the OpenStreetMap server - POSM

It can be set-up as:

- a hardware device loaded with offline version of the software (supports full offline autonomy in the field for the data collection)
- run directly in the cloud (more adapted to a semi-connected environment)

Full documentation for POSM installation can be found on the POSM website:

- Hardware set-up: <http://posm.io/getting-a-posm/>
- Cloud set-up: <http://posm.io/cloud/>

For this project, the benchmarking of OpenMapKit was conducted on a cloud POSM instance.



Although some documentation is available, it does require a little bit of “Do it yourself” skills to set up the POSM hardware and some IT skills for the cloud instance since it requires command line and Linux environment knowledge.

#### II) Adapting the existing UNHCR form to include OSM tags

Starting from the XLSForm designed for Survey123, the item distribution form has to be adapted in order to include OSM tags for the shelters:

1. **Include an OSM question type in the *survey* tab for the buildings (fig. 20) to match with UNHCR current data model**

type	name	label	hint
osm building_tags	osm_building	Building	Tag attributes about this shelter
barcode	Ration_Card_Number_A	Ration Card Number	
text	Ration_Card_Number_Manual_A	Ration Card Number (Manual)	

→ Single field to answer in ODK for the OSM question on buildings

list name	name	label
building_tags	building	building
building	yes	yes

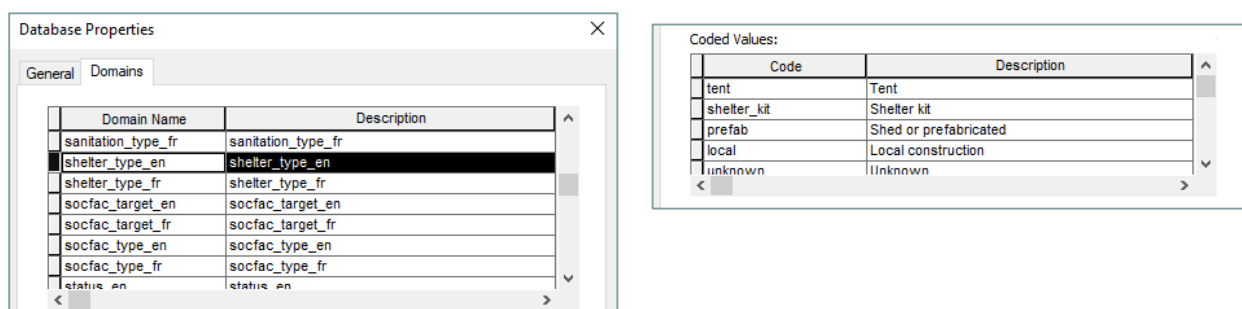
→ Single pre-populated choice for building tag key

**Fig 20.** OSM question type for *building\_tags* as defined in the *survey* (top figure) and *osm* (bottom figure) tab of the ODK/OMK form.



Currently there are no available OSM tags for shelter types as used in the current UNHCR domain *shelter\_types\_en* (fig. 21).

For the purpose of this benchmarking, the only OSM tag key used for the shelter is *building* = yes. Once OSM tags for shelters are developed and validated by the OSM community, they can be included in the ODK/OMK form in the *osm* tab.



**Fig 21.** Snapshot of UNHCR Camp Mapping database properties for *shelter\_types\_en*

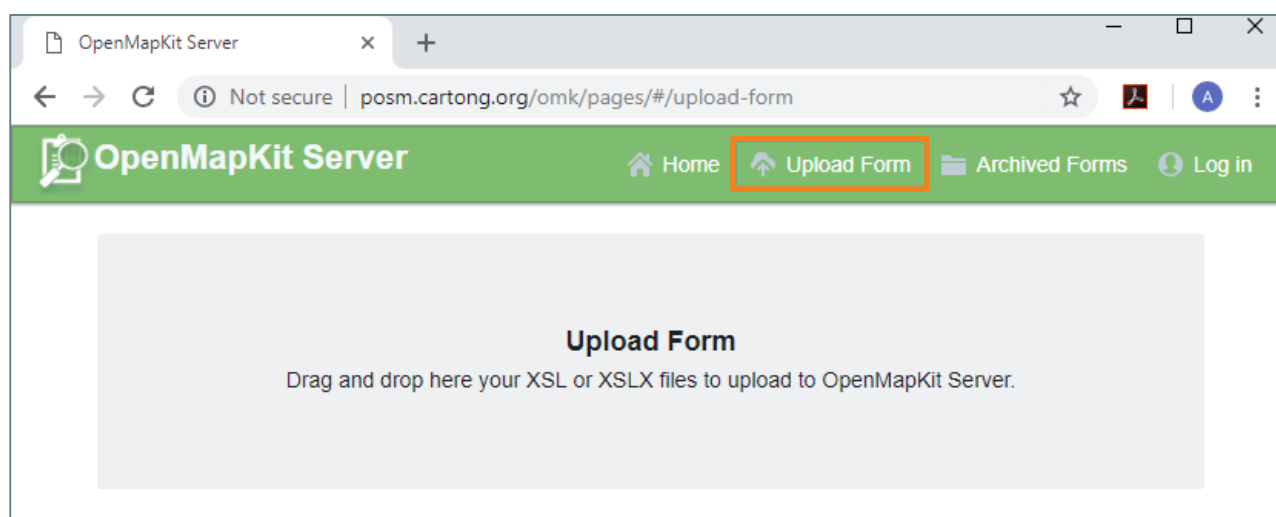
2. **Remove all Esri's custom columns from the *survey* tab.** These columns provide additional functionalities for Survey123 users only.
3. **Adapt the cascade select for the allocated distribution point list** (as subsequent choice from camp block) to XLSForm standards. This implies to delete the *external\_choices* tab and to copy-paste the cascade select within the *choices* tab.
4. **Add metadata question types** (fig. 22) at the beginning of the *survey* tab.

type	name	label
start	start	
end	end	
today	today	
deviceid	deviceid	
note	title	Shelter tagging with OMK

**Fig 22.** Metadata questions types in the *survey* tab

**⚠** While testing, we found out that without these metadata question types in the form, the submitted form could not be visualized on POSM. The "view submission" page would freeze and not open.

Once ready, the XLSForm can be uploaded on the POSM server (fig. 23), to be then deployed on the mobile device used for the data collection and filled-in with ODK Collect and OMK.



**Fig 23.** Upload form functionality of the OpenMapKit server

**⚠** During the upload, a message error will pop-up if the form doesn't respect XLSForm standards, but it won't specify where the errors come from. Therefore, we would recommend to regularly test your form every time you implement some modifications, in order to easily identify where the bugs (if any) come from.

### III) Creating an AOI deployment

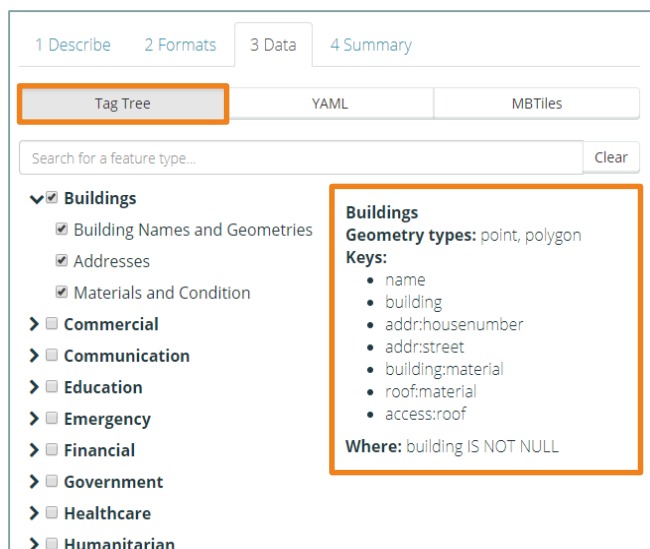
While in a connected environment, a “deployment” must be created > downloading all available OSM related-data for the area of interest (AOI)

#### 1. **Extract OSM-related data for the AOI using the POSM Export Tool**<sup>7</sup>

Extracted data is used to produce offline maps for Field Papers and OpenMapKit.

Steps to follow on the POSM Export Tool:

- a. **Log in** with your OpenStreetMap credentials or register a new account
- b. **Define your AOI** for the extract using one of the four options available (Search bar, Bounding box, Draw polygon, Current view, or Upload)
- ! **The export is limited to a maximum of 10,000,000 OSM nodes. For larger exports, they can be executed with alternative resources such as Geofabrik or Mapzen.**
- c. **Name and describe your export**
- d. **Choose the export format.** For OMK, the only requirement is OSM.pbf – the core OSM data package.
- e. **Choose map features** using either the Tag Tree or the YAML tool to select some parts of OSM data of interest for your project (fig. 24). You must select:
  - **A Tag Filter:** a subset of OSM features of interest for the data collection.  
For our scenario, we can limit the export to the relation tagged *building = true*.
  - **A Key Selection:** a subset of OSM keys of interest for the data collection.  
For our scenario, we can limit the export to OSM keys *name* and *building*. For this benchmarking, all OSM keys related to Building features have been downloaded.



→ The infobox displays the detailed information about the tags and filters specified (when hovering the checkbox).

**Fig 24.** Selection of map features using the Tag Tree from the HOT Export Tool

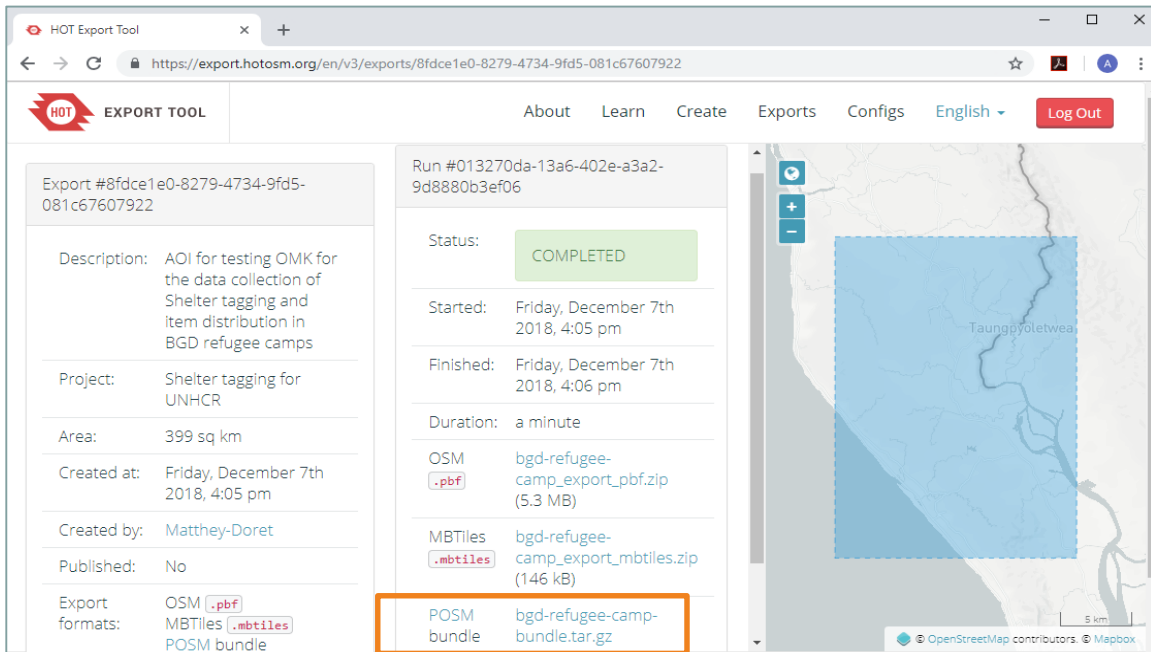
- ! **To learn how to define YAML to create an export or to save YAML as a configuration for future exports, the documentation is available here:**  
[https://export.hotosm.org/en/v3/learn/feature\\_selections](https://export.hotosm.org/en/v3/learn/feature_selections)

<sup>7</sup> POSM Export Tool: <https://export.hotosm.org/en/v3/exports/new/describe>

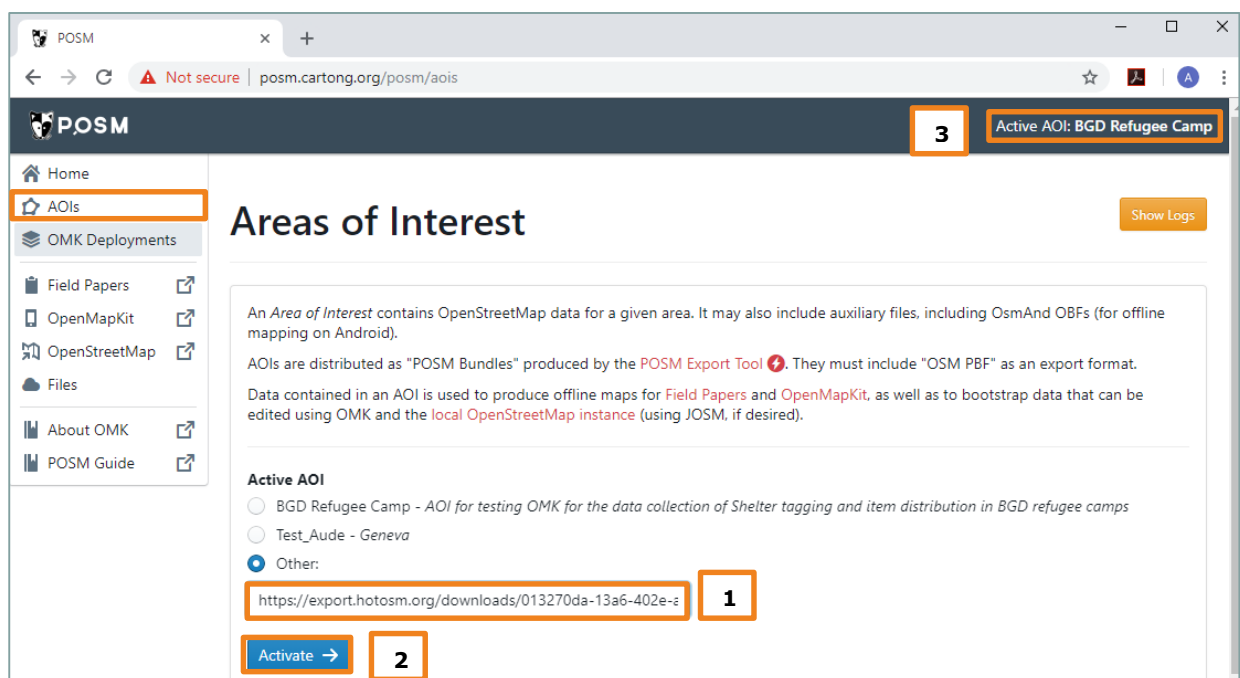
- f. **Download your files.** You can download each file format individually or the whole bundle at once. The easiest way to upload the export onto POSM in the next step, is to download your files as "Bundle for POSM". Once your export is ready you will receive a notification email (at your email address registered in your OSM account).

## 2. Import your AOI onto POSM

In order to upload your AOI onto your POSM server, you have to copy paste the link of your POSM Bundle export (.tar.gz) (fig. 25) and pasting it in the Active AOI box of your POSM (fig. 26). This steps allows POSM to download the OSM data and setting it up for use. This step can take some time.



**Fig 25.** Final page of HOT Export Tool with the POSM bundle file .tar.gz



**Fig 26.** POSM AOIs tab: Paste the POSM Bundle link (1), Run the link (2), Activate AOI (3)

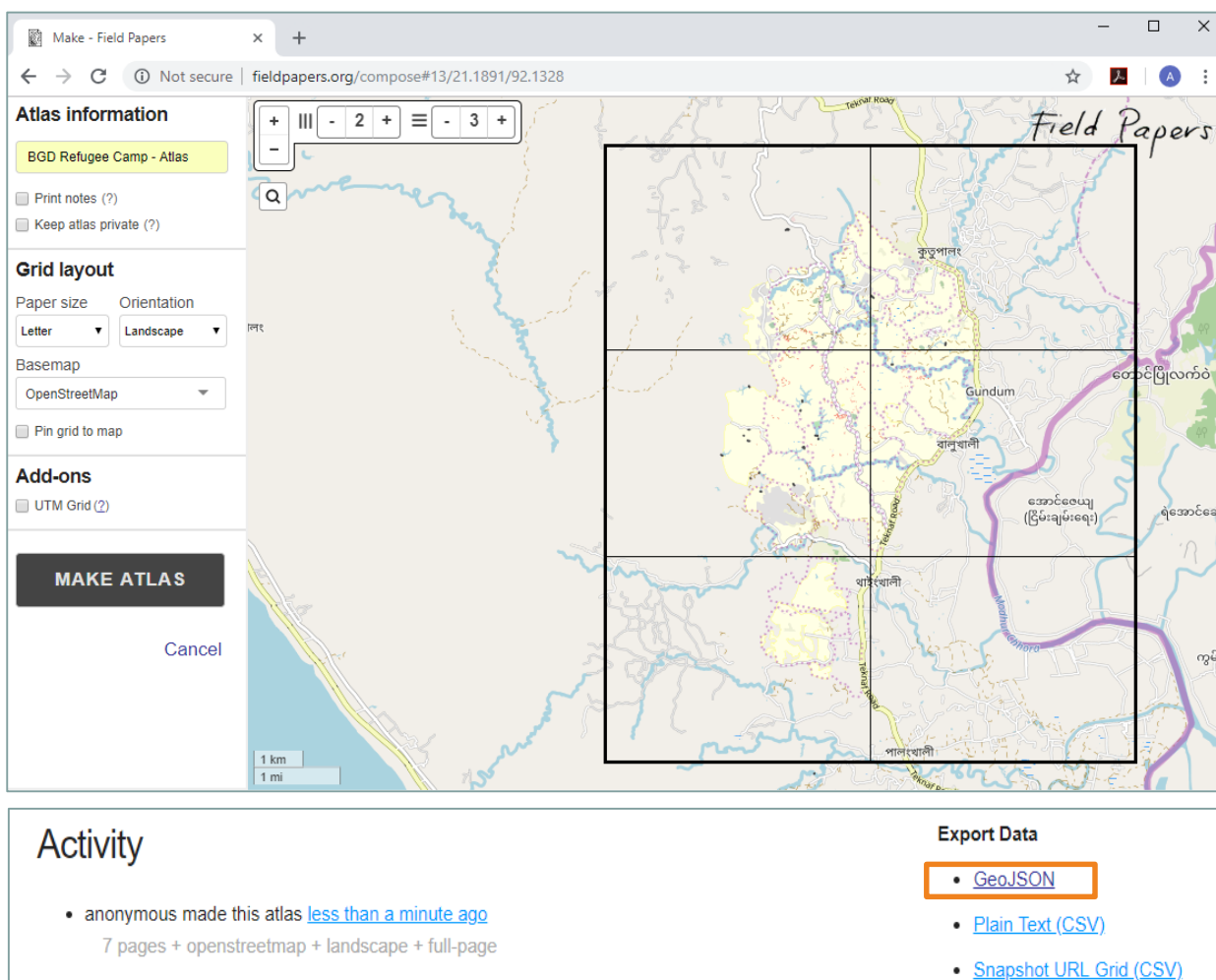
⚠ With a hardware POSM set-up, you'll have to plug the POSM into an ethernet connection and power it up. POSM will broadcast a local wifi network named "POSM". The password is "Awesomeposm". The workflow to upload your AOI is similar to the above description.

### 3. Create a FieldPapers atlas for your AOI

The final step to set up your POSM is to generate a FieldPaper atlas (MB tiles) for your surveyed area. FieldPapers are zoomable map tiles in the background of OpenMapKit. The OSM data (OSM.pbf) will sit on top of the tiles as interactive buildings, roads, etc. (in our case buildings). This step can take some times, but it can run in the background as long as POSM is plugged in and powered up (for the hardware set-up).

💡 This step is necessary even if you have downloaded MBTiles for your AOI in the previous step.

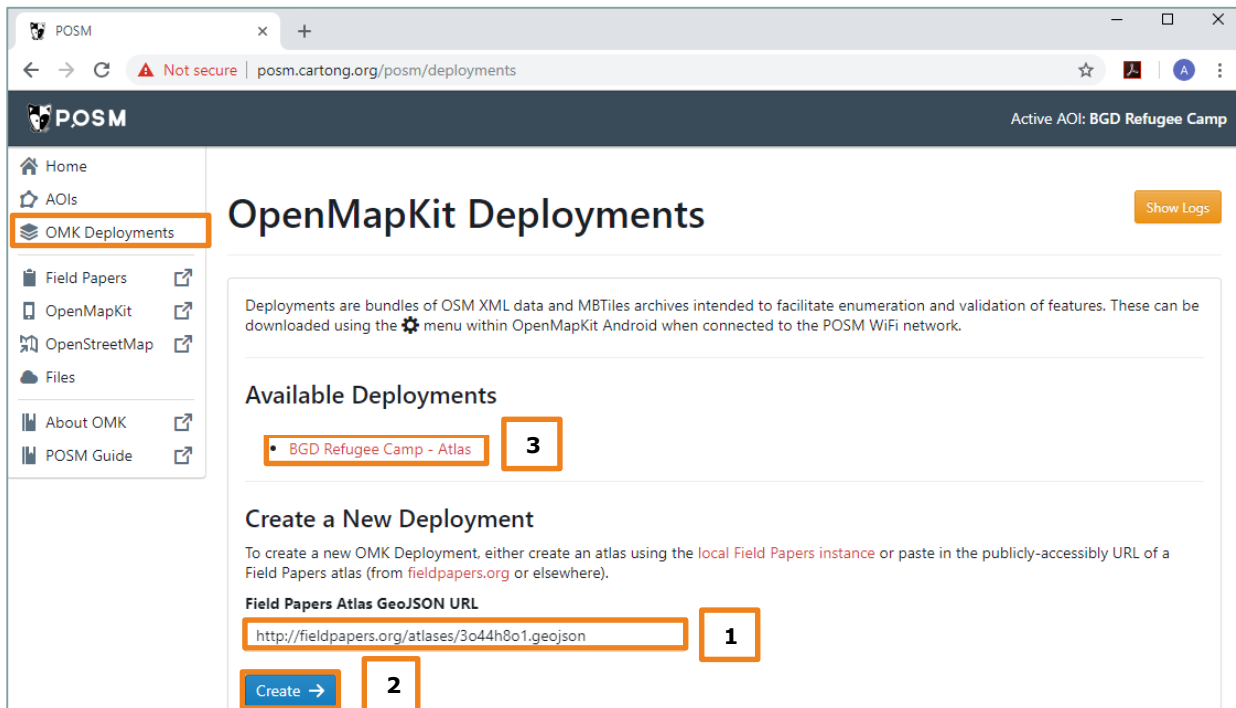
To generate your atlas, click on the FieldPapers link of you POSM home page and generate your atlas (fig. 27). Then copy-paste the FieldPapers atlas GeoJSON URL in the OMK Deployments tab of your POSM (fig. 28).



**Fig 27.** Generated FieldPapers atlas with GeoJSON export data

⚠ With the cloud POSM instance used for this benchmarking we encountered some bugs with the field papers. The link from the POSM homepage (i.e., the local field paper instance) never worked. We found a way around it by generating field papers from the public field paper web site: <http://fieldpapers.org/> but the OMK deployment generated from the GeoJSON link

doesn't work properly. It makes OMK crash every time the deployment is selected as the basemap and the deployment link from POSM OMK Deployments tab doesn't work neither.



**Fig 28.** POSM OMK Deployments tab: Paste the GeoJSON link (1), Run the link (2), Available Deployments (3)

💡 If you are doing a monitoring (editing of OSM data) in a constantly changing environment, it would be wise to re-run your FieldPapers atlas regularly prior to each monitoring campaign in order to create updated MB tiles for your area. Thus your monitoring will build off previous changes.

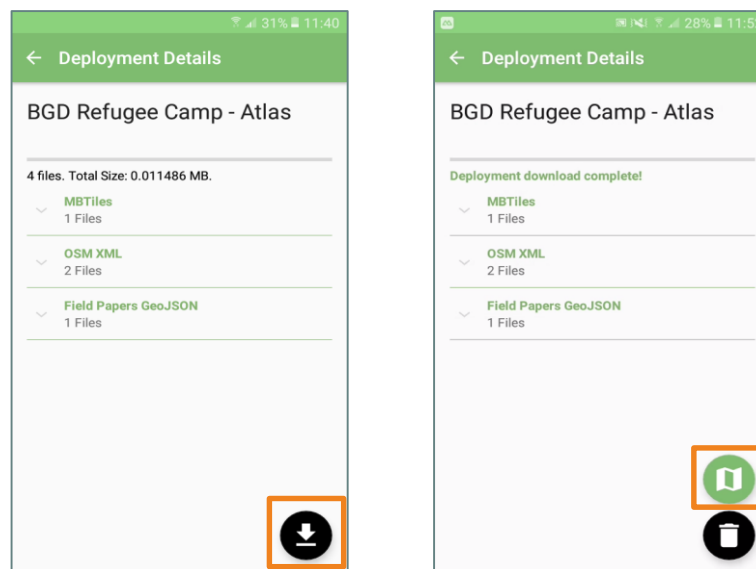
#### 4. Deploy your AOI on the phone

The final step consists of deploying your AOI (i.e., MBTiles and OSM.PBF) on the phone by connecting OMK to POSM. For this step, you will have to launch OMK and enter the POSM server URL in the deployments tab of the top-right gear menu. You can also scan the QR code of your FieldPapers atlas and it will automatically point to your POSM server.

⚠️ For a POSM hardware instance, you'll have to connect the phone to the POSM Wi-Fi network, by clicking on the top-right icon of the deployments tab.

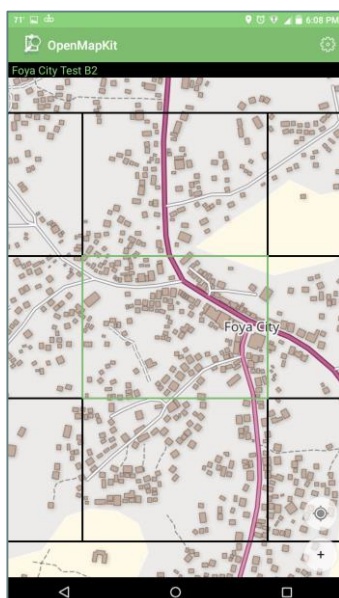
To load your FieldPapers atlas as the basemap for OMK, you'll have to tap on the specific deployment file, then on the download button on the bottom-right to install all the files in it (i.e., MBTiles and OSM.PBF) (fig. 29). Once your download is completed, there will be a new button in the bottom left to visualize your deployment. This will turn on the POSM Carto MBTiles and OSM XML data on the map (fig. 30).





**Fig 29 (left).** FieldPapers atlas details with all the files in it ready for download

**Fig 30 (right).** Downloaded deployment with the check-in button



OMK should display the footprint of your FieldPapers atlas as shown on the figure (fig. 31). However, during our testing, due to the bugs with the FieldPaper link (as mentioned above), we couldn't visualize the deployment on OMK. It would crash the app every time we tried to open it after being downloaded. For the testing, we used the Online Humanitarian OpenStreetMap as an alternative basemap instead, but it requires an internet connection unlike MBTiles.



Although MBTiles didn't work during the tests, OSM XML files from the AOI deployment could sometimes be downloaded onto OMK (but with frequent errors) using the "OSM XML Downloaded" tab of the gear menu. Downloaded OSM data could then be used for taking or editing OSM features.

**Fig 31.** FieldPaper atlas as it should be displayed in OMK

If everything were to run without bugs, with the AOI deployment downloaded on OMK, the collection and edition of OSM data can be run in a completely offline environment (once ODK Collect is linked to POSM server as described below). Only for the sync at the end of the data collection would an internet connection be necessary. If POSM is run on a hardware instance, then the phone will have to be connected to the POSM Wi-Fi network for the sync.

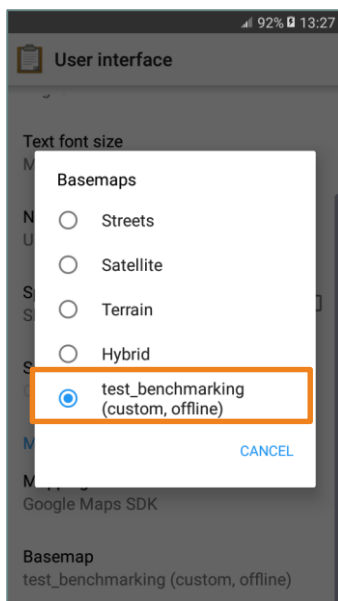
## 5. Offline MBTiles

In order to bypass the issue with the download of MBTiles on OMK, offline MBTiles can be used directly on ODK Collect as a base map for questions requiring a map display (i.e., location widget), such as OMK questions.

For this, a MBTiles file have to be created with a compatible application such as Open Map Tiles, TileMill or QGIS<sup>8</sup> and manually transferred to the device in a subfolder (not at the root) in */phone/odk/layers*. In addition, Mapping SDK settings (in the user interface setting of ODK Collect) has to be switched to "Google Maps SDK". Once done, the offline custom basemap can be activated in the user interface (fig. 32).

**⚠ While we could load and activate an offline custom basemap on ODK Collect, we haven't managed to display it for the OSM question type on OMK. It might be due to the bugs happening with the AOI deployment that makes OMK crash.**

However, the offline custom basemap did work on ODK Collect for a geopoint question type. It would display on top of the default google basemap completely offline within the defined zoom limit of the MBTiles file (fig. 33 & 34).



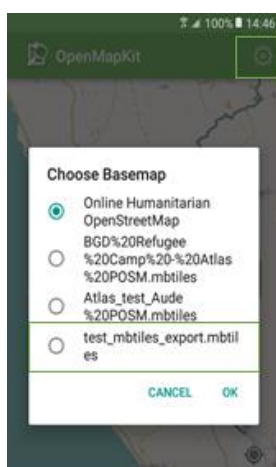
**Fig 32 (left).** Selection of the offline basemap in the user interface settings



**Fig 33 (middle).** Geopoint question with a Google basemap background over part of the AOI



**Fig 34 (right).** Geopoint question with the custom basemap background over the same part of the AOI



**Fig 35.** Selection of basemaps in the Basemap tab of the gear menu

Another option is to manually transfer the same MBTiles file in the device at the root of the openmapkit mbtiles folder in */Phone/openmapkit/mbtiles* (similar process to ODK Collect offline basemap). The custom basemap can then be selected and displayed offline in OMK within the defined zoom limit (fig. 34). However, this manipulation doesn't solve the regular bugs that we experienced with the download of OSM XML data.

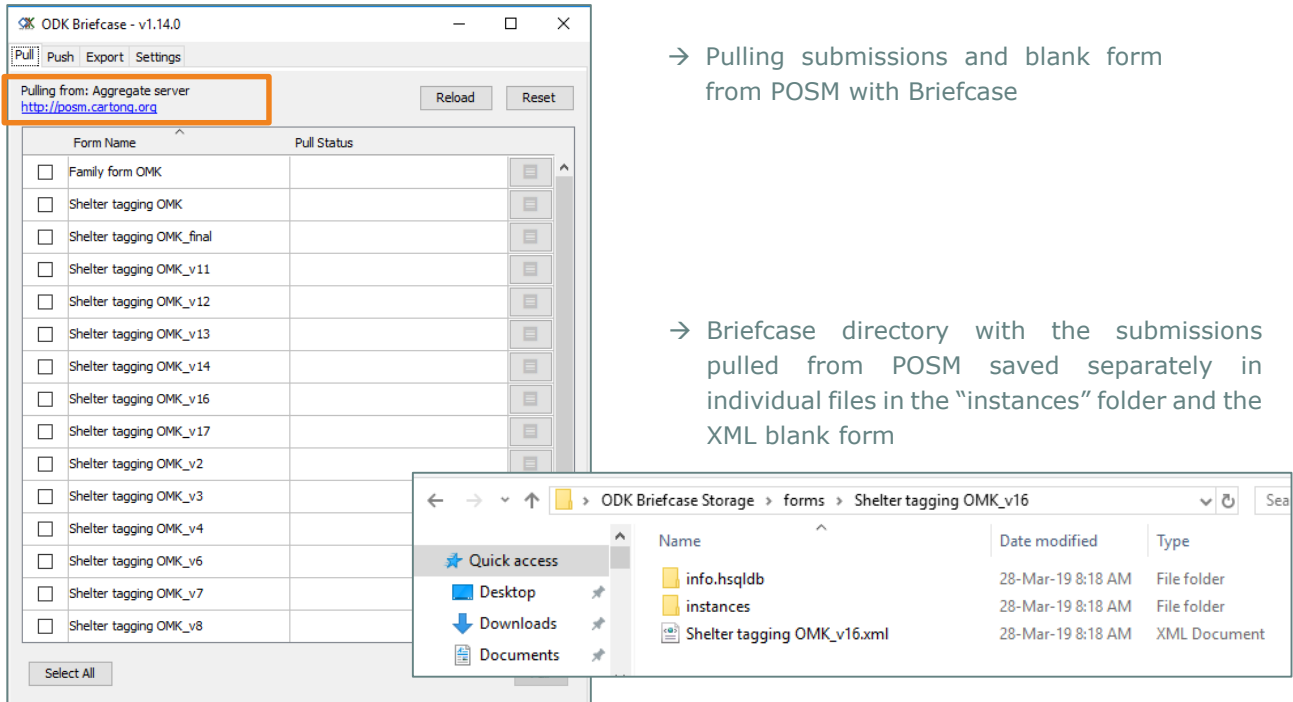
<sup>8</sup> For the testing, we created a MBTiles with POSM Export Tool



## 6. Testing OMK with another server than POSM

OpenMapKit was designed to work with POSM as the server offers the possibility to directly contribute to the OpenStreetMap database by submitting OSM tags collected in the field through the OSM API.

However, OMK XLSForms are also supported by other servers such as Aggregate and ONA, which offers the possibility to first submit collected data on POSM (to benefit from the OSM API) and then resubmit the same collected data either with Briefcase (fig. 36-37) or directly from ODK Collect on the phone (from the menu tab "Send finalized forms") to the Aggregate or ONA server (assuming that the blank form is already uploaded there).

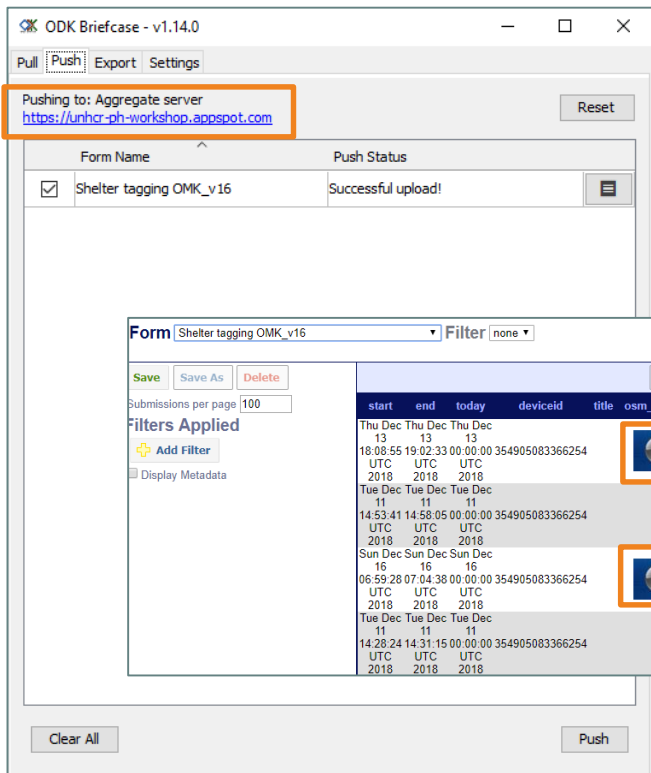


→ Pulling submissions and blank form from POSM with Briefcase

→ Briefcase directory with the submissions pulled from POSM saved separately in individual files in the "instances" folder and the XML blank form

Name	Date modified	Type
info.hsqldb	28-Mar-19 8:18 AM	File folder
instances	28-Mar-19 8:18 AM	File folder
Shelter tagging OMK_v16.xml	28-Mar-19 8:18 AM	XML Document

**Fig 36.** Pulling data from the POSM server with Briefcase



Pushing to: Aggregate server  
<https://unhcr-ph-workshop.appspot.com>

Form Name: Shelter tagging OMK\_v16 | Push Status: Successful upload!

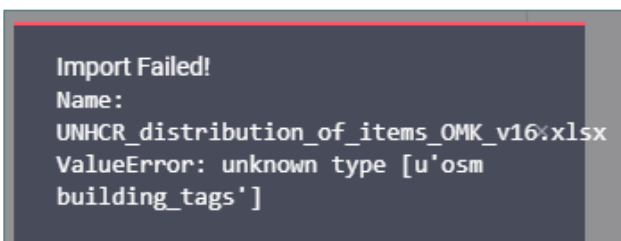
start	end	today	deviceid	title	osm_building	Ration_Card_Number_A	Ration_Card_Number_Manual_A	Camp_block	Allocated_distribution_point	dis
Thu Dec 13 18:08:55 UTC 2018	Thu Dec 13 19:02:33 UTC 2018	00:00:00	354905083366254					C03_A	Camp_4_DP	
Tue Dec 11 14:53:41 UTC 2018	Tue Dec 11 14:58:05 UTC 2018	00:00:00	354905083366254					C04_D	Camp_4_DP	
Sun Dec 16 06:59:28 UTC 2018	Sun Dec 16 07:04:38 UTC 2018	00:00:00	354905083366254					C05_E	Camp_17_DP	
Tue Dec 11 14:28:24 UTC 2018	Tue Dec 11 14:31:15 UTC 2018	00:00:00	354905083366254					C03_A	Camp_4_DP	

→ Pushing submissions to Aggregate with Briefcase

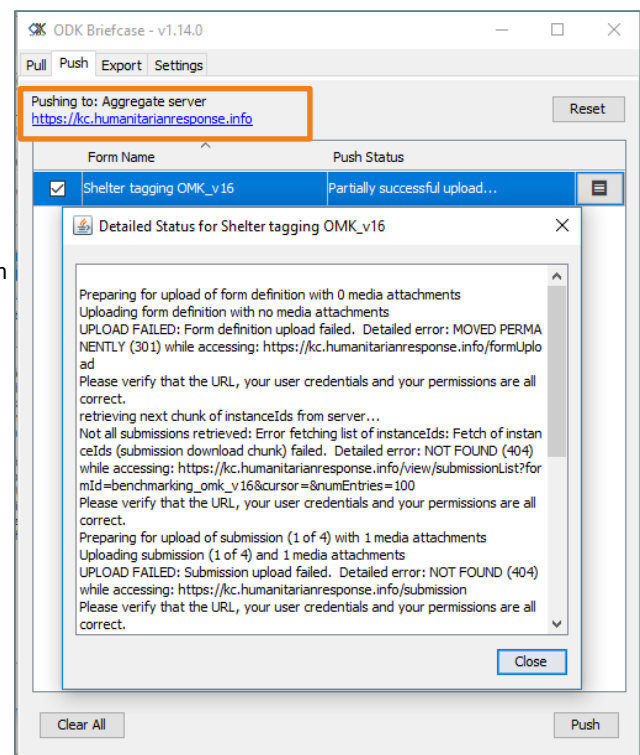
→ Submitted data in Aggregate. OSM data "osm\_building" question is saved in a binaryData file

**Fig 37.** Pushing data from the local Briefcase directory to UNHCR Aggregate server

However, the Kobotoolbox server doesn't support the osm tag values and therefore it is not possible to push submissions to Kobotoolbox with Briefcase (fig. 39) as the blank form cannot be uploaded onto the platform (fig. 38).



**Fig 38.** Error message in Kobo for the upload of an XLSForm



Pushing to: Aggregate server  
<https://kc.humanitarianresponse.info>

Form Name: Shelter tagging OMK\_v16 | Push Status: Partially successful upload...

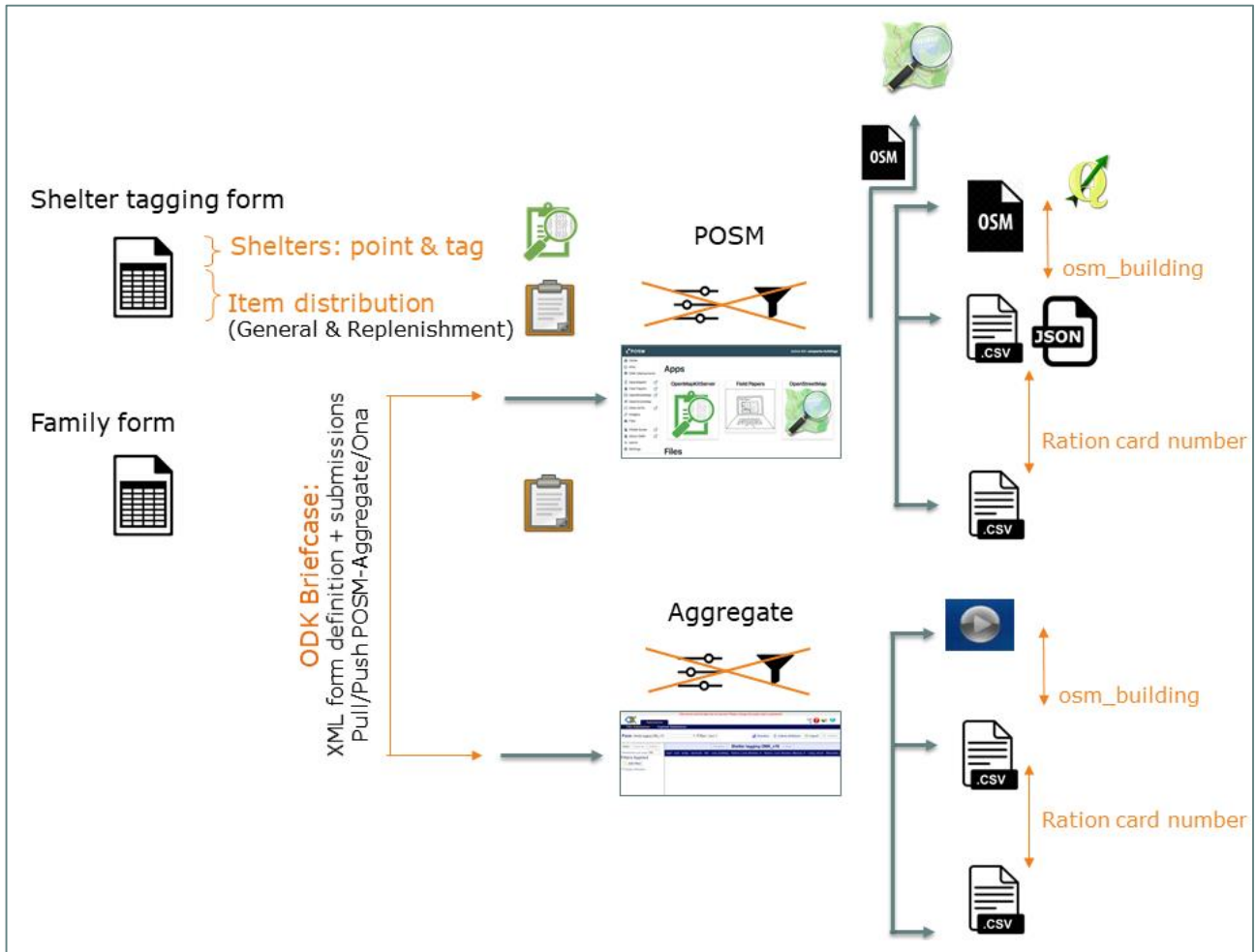
Detailed Status for Shelter tagging OMK\_v16

```

Preparing for upload of form definition with 0 media attachments
Uploading form definition with no media attachments
UPLOAD FAILED: Form definition upload failed. Detailed error: MOVED PERMANENTLY (301) while accessing: https://kc.humanitarianresponse.info/formUpload
Please verify that the URL, your user credentials and your permissions are all correct.
retrieving next chunk of instanceIds from server...
Not all submissions retrieved: Error fetching list of instanceIds: Fetch of instanceIds (submission download chunk) failed. Detailed error: NOT FOUND (404) while accessing: https://kc.humanitarianresponse.info/view/submissionList?for mid=benchmarking_omk_v16&cursor=&numEntries=100
Please verify that the URL, your user credentials and your permissions are all correct.
Preparing for upload of submission (1 of 4) with 1 media attachments
Uploading submission (1 of 4) and 1 media attachments
UPLOAD FAILED: Submission upload failed. Detailed error: NOT FOUND (404) while accessing: https://kc.humanitarianresponse.info/submission
Please verify that the URL, your user credentials and your permissions are all correct.
  
```

**Fig 39.** Error message in Briefcase for pushing submissions to the Kobotoolbox server

Illustration of the workflow between POSM and Aggregate server:

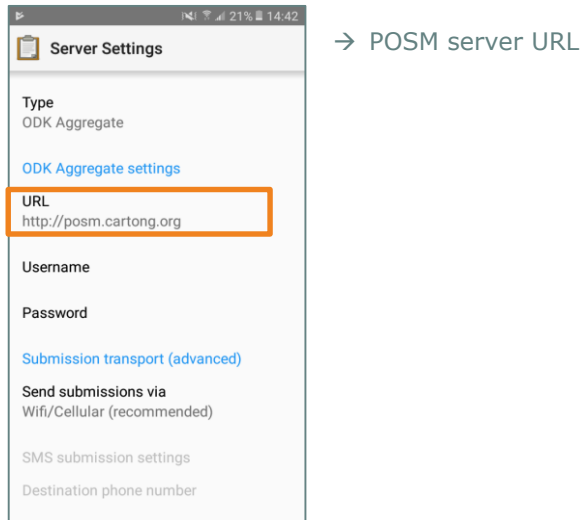


**Fig 40.** Possible workflow from the data collection on ODK Collect/OpenMapKit and the data submissions to the POSM and Aggregate server

## V.5.B. How to use OpenMapKit and ODK

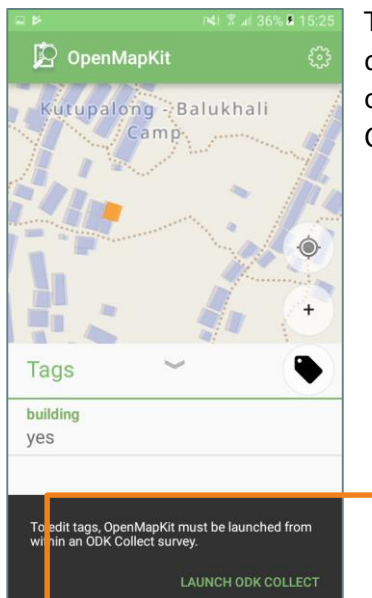
### 1. Connect ODK to POSM server

Prior to disconnecting your phone completely from the internet, you'll have to link ODK Collect to your POSM by entering the POSM URL into the app server settings. This step will allow you to download the ODK/OMK form from the server (fig. 41).



**Fig 41.** Server settings in ODK Collect under the General settings menu

### 2. Open and fill the form



The data collection start from within ODK Collect, even if the first question relates to OSM features. If you still start from OMK to take or edit a geographic feature, the app will ask you to launch ODK Collect to fill in the survey (fig. 42).

→ Blocking message asking you to switch to ODK Collector to edit OSM tags

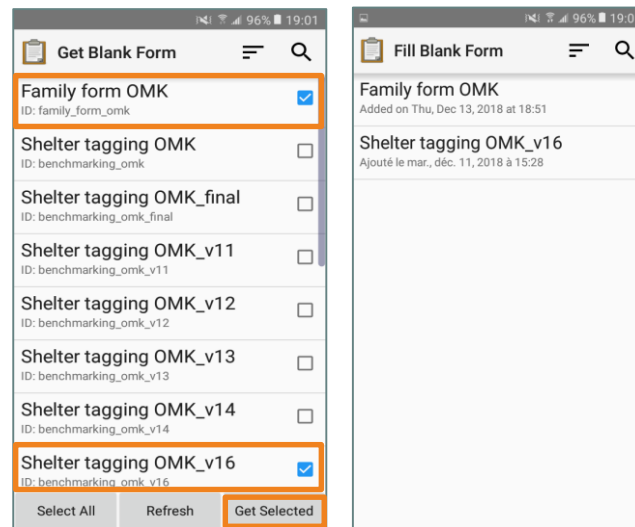
**Fig 42.** Automatic message to launch OMK from within ODK Collect when edits are done outside of an ODK survey

To start the shelter tagging (including item distribution) or family survey with ODK Collect, you have to select the corresponding forms (you can select several forms at once) in the tab "Get Blank Form" on the ODK Collect home page (fig. 43).



Once this is done, everything else can run offline from now on until finalized forms have to be sent to the server

To start filling in the form, go to “Fill Blank Form” and select the survey you need (shelter tagging form or family form) and start answering the survey (fig. 44).

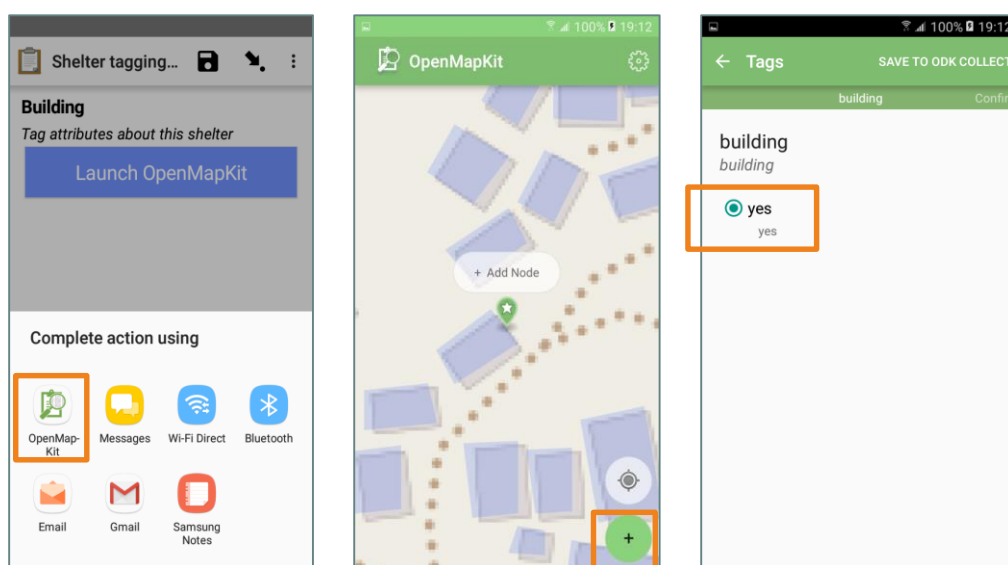


**Fig 43 (left).** List of available forms from POSM to choose from

**Fig 44 (right).** Selected blank forms ready to be filled in

Filling in a survey with ODK Collect is rather straight forward, the questions appear in the order of the survey form and with the defined constraint. The only difference from a standard ODK form is the OSM question type (included only in the shelter tagging form) that launches OMK from within ODK Collect allowing the data collector to collect a new OSM feature (point feature) or to edit existing OSM data (see the general workflow in section IV.1.B).

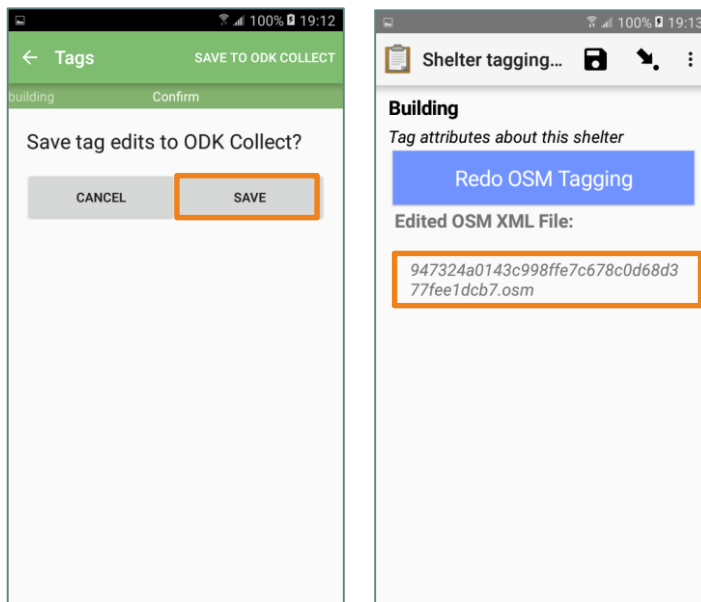
For the OSM building question, ODK will ask the data collector to launch OMK (1), once in OMK, new OSM data (node) can be taken (or existing one selected) (2) and tags can be filled in (or edited) for this feature (3) and saved to ODK Collect (4). The OSM data will be stored in a separate .osm file (5) and the .osm file name will be saved in the ODK form (same as a media question type). For this last step, OMK will ask your OpenStreetMap user name (only for the first time). Then, the remaining questions of the survey can be answered in ODK Collect in a standard way.



**Fig 45 (left).** Launching OMK for the tagging the shelters (1)

**Fig 46 (middle).** Collecting a new node with OMK (2)

**Fig 47 (right).** Confirming the only pre-populated choice for tag key building = yes (3)



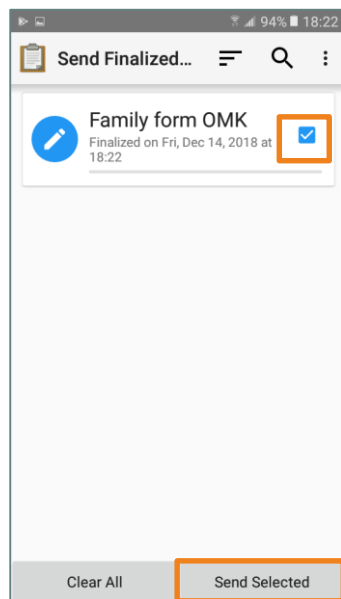
→ the *.osm* file name will be stored in the ODK survey in a separate column named after the osm question type name (here *osm\_building*).

**Fig 48 (left).** Saving OMK tags to ODK Collect (4)

**Fig 49 (right).** Summary window with the name of the *.osm* file in which OSM tags for the selected feature are stored (5)

### 3. Save and submit the form

Finalized forms can be submitted from the "Send finalized form" tab of ODK Collect<sup>9</sup>.



For this last step, you will need to have an internet connection or to connect your phone to the POSM wifi network (for the POSM hardware instance).

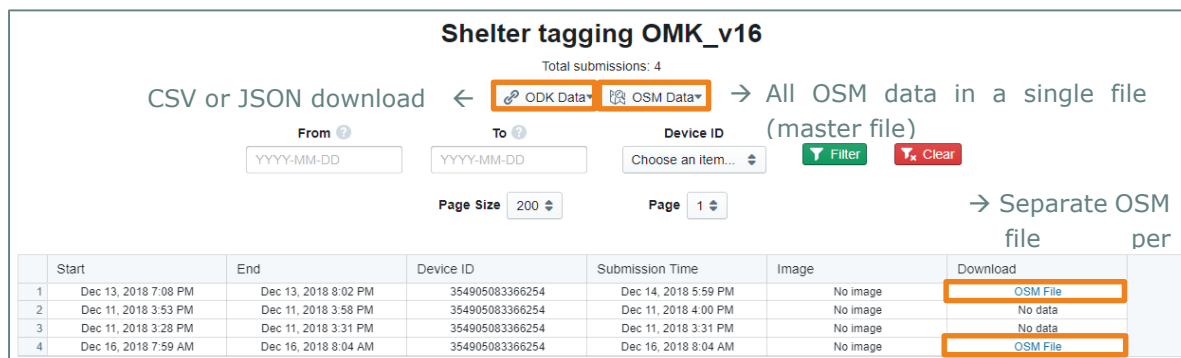
**Fig 50.** Selected form to submit to POSM

Submitted data is stored in the dataset of the corresponding form on POSM. OSM data is stored in separate *.osm* files (one file per feature) and the name of the file is recorded in the ODK dataset in a separate column (named after the name of the OSM question type defined in the form).

<sup>9</sup> Finalized form can be submitted automatically if the settings in "General settings" > "Form management" allows for Auto send with wifi and/or cellular

⚠ Therefore, data submitted for the shelter tagging form is stored in two datasets: a csv file with the survey questions related to item distribution and an osm file with the tags of the shelter points. These two datasets can be joined based on the name of each osm file.

ODK data can be downloaded as csv or json file while OSM data can be downloaded into one .osm file compiling all features or into separate .osm file (fig. 51).



**Shelter tagging OMK\_v16**

Total submissions: 4

CSV or JSON download ← **ODK Data** **OSM Data** → All OSM data in a single file (master file)

From: YYYY-MM-DD To: YYYY-MM-DD Device ID: Choose an item... Filter Clear

Page Size: 200 Page: 1

→ Separate OSM file per

	Start	End	Device ID	Submission Time	Image	Download
1	Dec 13, 2018 7:08 PM	Dec 13, 2018 8:02 PM	354905083366254	Dec 14, 2018 5:59 PM	No image	<b>OSM File</b>
2	Dec 11, 2018 3:53 PM	Dec 11, 2018 3:58 PM	354905083366254	Dec 11, 2018 4:00 PM	No image	No data
3	Dec 11, 2018 3:28 PM	Dec 11, 2018 3:31 PM	354905083366254	Dec 11, 2018 3:31 PM	No image	No data
4	Dec 16, 2018 7:59 AM	Dec 16, 2018 8:04 AM	354905083366254	Dec 16, 2018 8:04 AM	No image	<b>OSM File</b>

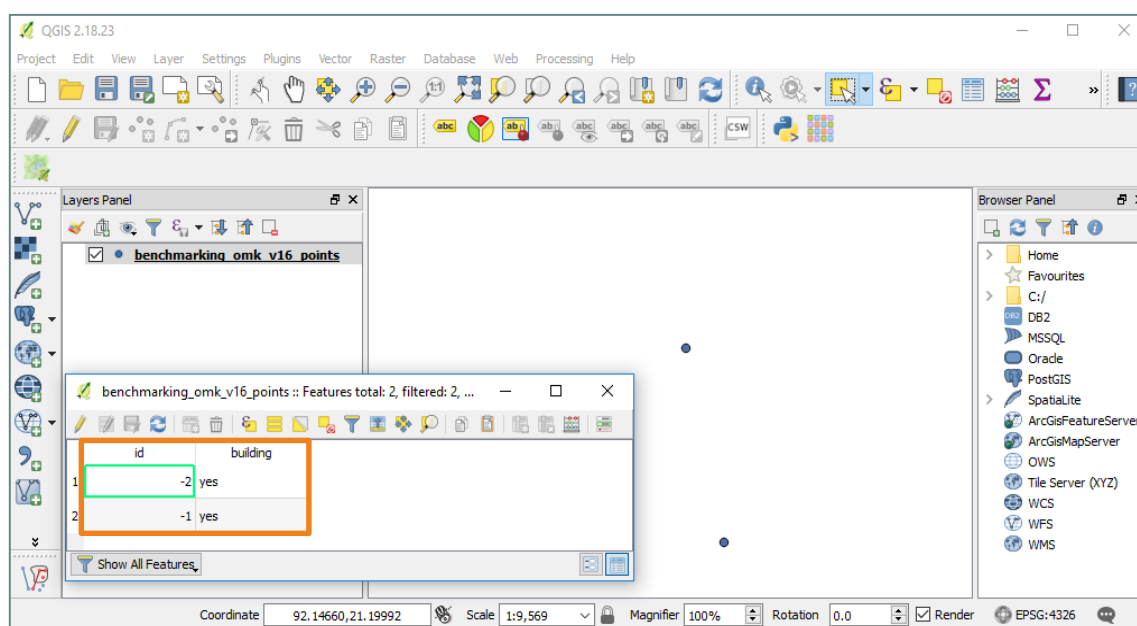
**Fig 51.** Data submission view of the shelter tagging form on POSM

⚠ A major limitation to using OMK for collecting OSM tags within a survey is that submitted data aren't integrated together in a common dataset. In this scenario, we would need to have the shelter points' coordinates and tags for each item distribution survey integrated together. To do this, you'll have to open each osm file separately in QGIS, add xy coordinates, add a new text field to encode the name of the corresponding osm file (for the join) and finally export the attribute table as CSV.

Each exported CSV file can then be joined to the shelter tagging form based on the osm file name column, here *osm\_building* (fix.52). This is time consuming as the osm file name of each feature isn't stored as attribute in the master OSM file. The only way to retrieve this information is to open each single osm file individually and encode its name in the attribute table, taking the risk for errors (considering the length of the osm file.name).

Metadata questions					Item distribution survey questions	
start	end	today	deviceid	osm_building	Camp_block	Allocated_dist
2018-12-13T19	2018-12-13T20	13-12-18	3.54905E+14	947324a0143c998ffe7c678c0d68d377fee1dcb7.osm	C03_A	Camp_4_DP
2018-12-16T07	2018-12-16T08	16-12-18	3.54905E+14	d5cfa0783b499bf4a47f329f361c4d761057dad2.osm	C05_E	Camp_17_DP

**Fig 52.** CSV export file of ODK data, i.e., Shelter tagging form data with osm file name from OMK



**Fig 53.** Master OSM file with two osm features opened in QGIS: osm tags stored in the attribute table

#### 4. Check and submit OSM data

The added value of OMK is the easy data integration to OpenStreetMap. In order to submit as clean OSM data as possible, the American Red Cross documented a data cleaning workflow useful when dealing with large amounts of data (this workflow hasn't been tested during our benchmarking). The full documentation based on one of their project in West Africa can be found here:

[https://github.com/AmericanRedCross/workflows/blob/master/west-africa\\_data-cleaning.md](https://github.com/AmericanRedCross/workflows/blob/master/west-africa_data-cleaning.md)

Major steps to follow:

- i. Retrieve the osm file from OMK server and open it in JOSM. Enable the *ToDoList* and *OpenData* plug-ins for JOSM.
- ii. Purge non-relevant features (features that don't need to be cleaned or features outside of the AOI) using CTRL+Shift+P.
- iii. Save the points and polygons as separate files.
- iv. For point data: Clean any free-form text inputs. When entering data for features like hospital names, town names, etc, enumerators sometimes use different spellings or include a typo. Use *Open Refine* to clean these columns individually. Open Refine looks for responses that are close but not exactly the same, and allows you to group these and change them to a consistent spelling.
- v. Once done, export the data as a CSV file and re-open it in JOSM (File > Open, accept the coordinate system as WGS84). Make sure the points appear to be in the correct place.
- vi. Add a source tag to all your new features and push the changes to the local OSM (POSM).
- vii. Save the .osm file for future reference.

These steps will push the modifications to the OSM data saved locally on your POSM. This data can be reused to generate new Field Papers which will incorporate these modifications for future rounds of mapping.



At this stage, the local OSM copy is still separate from OpenStreetMap online version. It has to be reconciled and synched once connected to the internet to contribute to OpenStreetMap (see [section VI.2](#)).

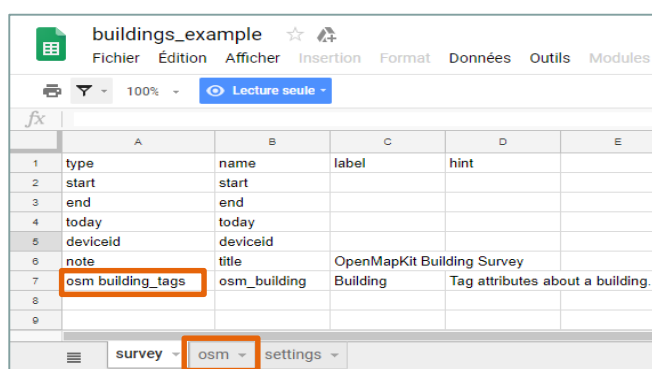
## V.6. XLSForm<sup>10</sup> for OpenMapKit

The main change to a standard XLSForm (as it would be used in ODK Collect alone) is the *introduction of OSM question types*. Instead of taking a geographic GPS point or shape directly in the form, the OSM question refers to an OSM file (.osm) that gets created in OpenMapKit.

This modification is justified by two reasons:

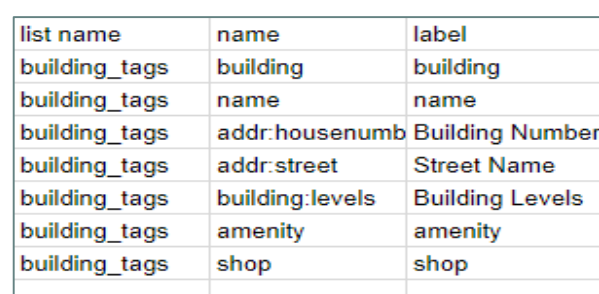
- A survey about a specific, identifiable feature on a map is more useful than a GPS point.
- The survey can directly enrich OpenStreetMap by adding tags to OSM features. Thus, the user can easily create accessible public information for OpenStreetMap, while collecting its own private specific ODK survey data (that won't be pushed into OSM).

To define the tagging parameters that will be pushed to OSM for each OSM question, the XLSForm needs to have an extra *osm* tab (fig. 15) that contains three columns: *list name*, *name*, and *label* (fig. 16).



The screenshot shows a spreadsheet with columns A through E. Row 7 is highlighted, showing the 'osm\_building\_tags' question. The 'osm' tab is selected in the bottom navigation bar.

	A	B	C	D	E
1	type	name	label	hint	
2	start	start			
3	end	end			
4	today	today			
5	deviceid	deviceid			
6	note	title	OpenMapKit Building Survey		
7	osm_building_tags	osm_building	Building	Tag attributes about a building.	
8					
9					



list name	name	label
building_tags	building	building
building_tags	name	name
building_tags	addr:housenumb	Building Number
building_tags	addr:street	Street Name
building_tags	building:levels	Building Levels
building_tags	amenity	amenity
building_tags	shop	shop

**Fig 15 (left).** Example of the *osm* tab for the *osm building\_tags* question as defined in survey

**Fig 16 (right).** Example of an OMK form with the *osm* tab

- **list name**: defines the set of OSM tags the user will have to answer in OMK for a specific OSM question.

Optional: *list name* can also define the set of tag values selectable for a given OSM tag (a set of pre-populated choices) (fig. 17). If the set of tag values is not provided, the user will have to manually type in a value for a given question in OMK (fig. 18).

- **name**: tag keys that are recognized in OSM
- **label**: labels that will appear in OpenMapKit to the user

<sup>10</sup> XLSForm is a “popular open form standard, that allows you to author a form with complex functionality like skip logic in a consistent way across a number of web and mobile data collection platforms” (XLSForm.org, <http://xlsform.org/en/#what-is-an-xlsform>)

Tags SAVE TO ODK COLLECT

addr.postcode building amenity

Building  
building

☐ Residential  
residential

☐ Commercial  
commercial

☐ Industrial  
industrial

☒ Other  
yes

11	building	residential	Residential
12	building	commercial	Commercial
13	building	industrial	Industrial
14	building	yes	Other

Tags SAVE TO ODK COLLECT

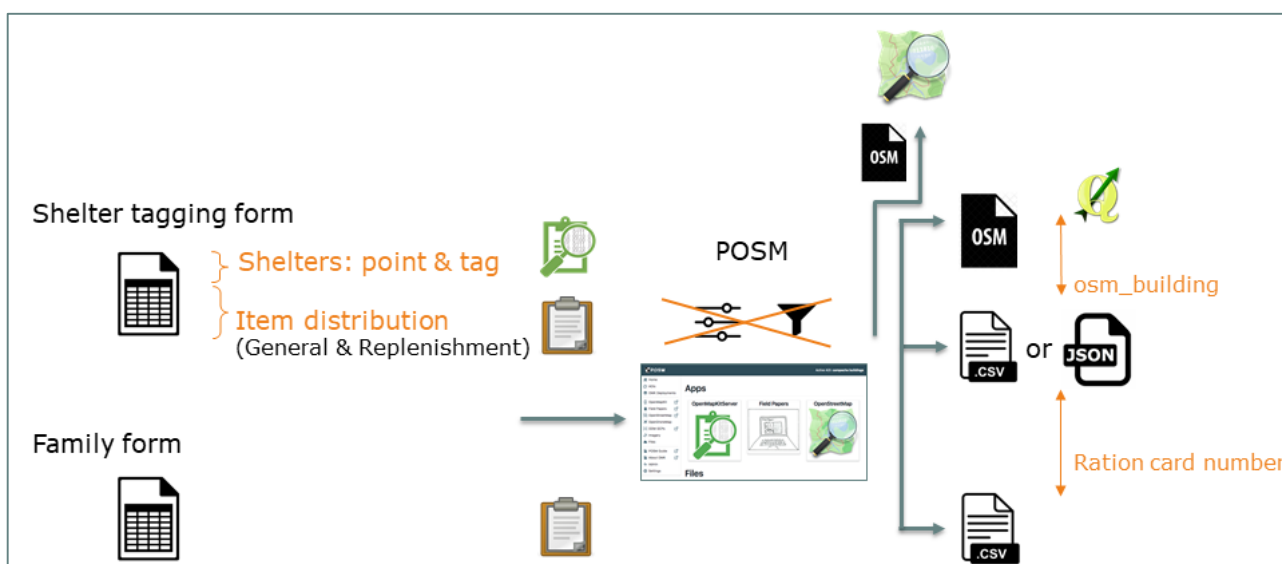
addr.street addr.city addr.postcode

City  
addr.city

Seattle

**Fig 17 (left).** Multiple choice OpenMapKit tag question with the corresponding XLSForm for *name = building* defined in the *osm* tab

**Fig 18 (right).** Manual string value OpenMapKit tag question for which no pre-populated choices were defined in the XLSForm



**Fig 19.** Data collection workflow using ODK Collect and OMK

Two XLSForm were designed to test the data collection workflow for shelter tagging and item distribution for UNHCR in the context of Bangladesh refugee camps. These forms were adapted to be used with ODK Collect and OpenMapKit and are uploaded on a POSM server. The two forms have a common question – Ration Card Number (RCN) – to allow for joining the two datasets at the end.

The forms for this workflow are:

#### → Shelter tagging form:

This form includes an OSM question type for tagging shelters and questions on item distribution (general & replenishment distribution). Questions on item distribution come from the existing UNHCR item distribution form used with Kobo. The osm question type name will be used for joining the osm file to the CSV table.



For consistency with the Collector workflow, the data collector should take a new node (or edit an existing one) on OMK for the shelters instead of editing the “building” polygons of the OSM XML data (from the AOI deployment, see section IV.3.C). This will allow to have point features for shelters with both Collector and OMK at the end.

→ **Family form:**

This form only includes questions on the Family Count Number (FCN) and the Ration Card Number (RCN), the latter is used as common field to join with the shelter tagging dataset. This form doesn’t include osm question type and therefore can run entirely with ODK Collect alone, even if the form is uploaded on a POSM server.

## V.6.A. Survey123 form

type	name	label	constraint	constraint_message	required	appearance	relevant	choice_filter
hidden	hh_progres_id	Household Progres ID						
barcode	Ration_Card_Number_A	Ration Card Number	regex(., '[A-Z][0-9]{1,7}\$')	Check Ration card number	FALSE			
text	Ration_Card_Number_Manual_A	Ration Card Number (Manual)	regex(., '[A-Z][0-9]{1,7}\$')	Check Ration card number	TRUE		\${Ration_Card_Number_A} = "	
select_one blocks	Camp_block	Block				autocomplete		
select_one_external	Allocated_distribution_point	Allocated Distribution Point						block_name=\${Camp_block}
allocated_distribution_point								
select_one distrib_type	Distribution_Type	Distribution Type			FALSE	minimal		
begin_group	GEN_DIST	GENERAL DISTRIBUTION					\${Distribution_Type} = 'Gen_Dist'	
date	Distribution_Date	Distribution Date						
select_one distrib_site	Distribution_Site	Distribution Site			TRUE	minimal		
select_multiple gen_distrib_item	Item	General Distribution Item			TRUE	minimal		
integer	Number_of_Hygiene_Kits	Number of Hygiene Kits			TRUE		selected(\${Item}, 'HYG_FEMALE')	
integer	Number_of_CRH	Number of CRH			TRUE		selected(\${Item}, 'CRHSEP2018') or selected(\${Item}, 'CRH_Oct2018')	
select_multiple distributed_by	Distributed_by_gen_dist	Distributed by				minimal		
text	Agency_gen_distrib	Please input the name of agency distributing					\${Distributed_by_gen_dist} = 'Other'	
end_group								
begin_group	REP_DIST	REPLENISHMENT DISTRIBUTION					\${Distribution_Type} = 'Rep_Dist'	
date	Replenishment_Date	Replenishment Date						
select_one distrib_site	Distribution_Site_A	Distribution Site				minimal		
select_multiple repl_distrib_item	Item_A	Item				minimal		
integer	Number_of_Hygiene_Kits_A	Number of Hygiene Kits						
integer	Number_of_CRH_a	Number of CRH						
select_multiple repl_reason	Reason_for_Replenishment	Reason for Replenishment				minimal		
text	Mention_other_reason	Mention other reason					\${Reason_for_Replenishment} = 'Other'	
select_multiple distributed_by	Distributed_by_rep_dist	Distributed by				minimal		
text	Agency_rep_distrib	Please input the name of agency distributing					\${Distributed_by_rep_dist} = 'Other'	
end_group								

## V.6.B. ODK-OMK form

type	name	label	hint	constraint	constraint_message	appearance	relevant	choice_filter
start	start							
end	end							
today	today							
deviceid	deviceid							
note	title	Shelter tagging with OMK						
osm building_tags	osm_building	Building	Tag attributes about this shelter					
barcode	Ration_Card_Number_A	Ration Card Number		regex(.,'^[A-Z][0-9]{1,7}\$')	Check Ration card number			
text	Ration_Card_Number_Manual_A	Ration Card Number (Manual)		regex(.,'^[A-Z][0-9]{1,7}\$')	Check Ration card number		\${Ration_Card_Number_A} = "	
select_one blocks	Camp_block	Block				autocomplete		
select_one allocated_distribution_point	Allocated_distribution_point	Allocated Distribution Point						block_name=\${Camp_block}
begin_repeat	distribution	Distribution Records						
select_one distrib_type	Distribution_Type	Distribution Type				minimal		
begin_group	GEN_DIST	GENERAL DISTRIBUTION					\${Distribution_Type} = 'Gen_Dist'	
date	Distribution_Date	Distribution Date						
select_one distrib_site	Distribution_Site	Distribution Site				minimal		
select_multiple gen_distrib_item	Item	General Distribution Item				minimal		
integer	Number_of_Hygiene_Kits	Number of Hygiene Kits					selected(\${Item}, 'HYG_FEMALE')	
integer	Number_of_CRH	Number of CRH					selected(\${Item}, 'CRHSEP2018') or selected(\${Item}, 'CRH_Oct2018')	
select_multiple distributed_by	Distributed_by_gen_dist	Distributed by				minimal		
text	Agency_gen_distrib	Please input the name of agency distributing					\${Distributed_by_gen_dist} = 'Other'	
end_group								
begin_group	REP_DIST	REPLENISHMENT DISTRIBUTION					\${Distribution_Type} = 'Rep_Dist'	
date	Replenishment_Date	Replenishment Date						
select_one distrib_site	Distribution_Site_A	Distribution Site				minimal		
select_multiple repl_distrib_item	Item_A	Item				minimal		
integer	Number_of_Hygiene_Kits_A	Number of Hygiene Kits						
integer	Number_of_CRH_a	Number of CRH						
select_multiple repl_reason	Reason_for_Replenishment	Reason for Replenishment				minimal		
text	Mention_other_reason	Mention other reason					\${Reason_for_Replenishment} = 'Other'	
select_multiple distributed_by	Distributed_by_rep_dist	Distributed by				minimal		
text	Agency_rep_distrib	Please input the name of agency distributing					\${Distributed_by_rep_dist} = 'Other'	
end_group								
end_repeat								