

OpenHDS manual

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Revision history:

Version	Date	Modified by	Changes
1.0	01.10.2014	STPH	Initial version of OpenHDS manual
1.1	19.11.2014	MTR	Added sections on how to create MySQL user and Mobile application installation and set-up. Other small changes.
1.2	23.11.2014	MTR	Extended section on how to deploy the Amazon EC2 OpenHDS Evaluation platform
1.3	23.11.2014	NMA	Added section on data flows and error resolution

Introduction

OpenHDS is a multi-component data platform for Health and Demographic Surveillance, based on client-server architecture and using tablet computers for point-of-capture digitization of data. This document provides an overview of the system. It covers the setup and administration of the server and tablet components of the platform. It contains guides for field workers, field supervisors, and data managers. Finally, it describes the setup and use of a virtualized OpenHDS system for testing and evaluation purposes.

Administrator manual

This section contains the instructions on how to set-up the server and additional software which will result in a fully functional OpenHDS-Server platform with ODKAggregate and MirthConnect installed. OpenHDS will connect to a local MySQL database and run inside the Tomcat servlet container. We assume that you make an installation to a local domain "local", and the hostname "data-management" for the server, and that you can reach the server under this domain name. Adjust these settings to your local environment.

We will also cover how to install and set-up the mobile apps used for mobile data collection, in particular OpenHDS Mobile and ODKCollet.

It is highly recommended to change the logins used in this guide for your production setup!

Installing Minimal Ubuntu server

- Download the **Ubuntu Mini** ISO from
<https://help.ubuntu.com/community/Installation/MinimalCD>
(32-bit PC (x86) Ubuntu 14.04 "Trusty Tahr" LTS Minimal CD, Size is around 31MB)
- Install the operating-system with no localization options and don't install any packages.
- During installation, set the hostname of the machine to '**data-management.local**'. If you missed to change this during setup, you can change the hostname afterwards by editing the file 'etc/hostname'.

Installing Java 7

- Currently the only supported Version is Java 7. Different auxiliary software packages required to run a full-blown OpenHDS server have different Java requirements, version 7 is the consensus.
- Install Java with the command 'sudo apt-get install openjdk-7-jre-headless' from a terminal.
- **Optional:** Set the environment variable *JAVA_HOME* to the Java installation folder (you might need to reboot of the system for the variable to be available).

Installing MySQL Server

- Install the MySQL server with 'sudo apt-get install --no-install-recommends mysql-server'.
- Follow the set-up instructions during installation and set the password of the root user during installation to '**data**', leave the rest to its default.

Installing Apache2, PHP and PHPMyAdmin

This step is only required if you want to administer the MySQL database with a graphical user interface. If you are familiar with the mysql Command Line Interface (CLI) and the MySQL syntax, you don't need to insert all the statements from the command line.

- Run the command 'sudo apt-get install phpmyadmin' in a terminal
- This command will install the phpmyadmin package. This package depends on other packages to be installed (e.g. apache2 and php), and it will also install all the missing packages if they are not available on the system (which is the case if you followed this guide).
- During the installation choose MySQL as the database and say yes to set-up the config through dbconfig-common.
- Set the root password to 'test'
- Set up a password for the PhpMyAdmin-application (e.g. 'test')
- PhpMyAdmin is now accessible under <http://data-management.local/phpmyadmin>

Set up MySQL-users

Add user and grant access rights in MySQL cli:

Open a Terminal:

- 'mysql -uroot -p test' this will open the MySQL CLI, login in as user root with password test
- The MySQL command prompt should appear
- 'CREATE USER 'data'@'%' IDENTIFIED BY 'data';' this command will create a new MySQL user data with the password data.
- 'GRANT ALL ON *.* TO 'data'@'%';' this command will grant the user data access to all databases with all access rights (**YOU MAY WANT TO CHANGE THIS FOR A PRODUCTION SERVER ENVIRONMENT!**)

Add user and grant access rights in PhpMyAdmin:

Open the PhpMyAdmin site <http://data-management.local/phpmyadmin>

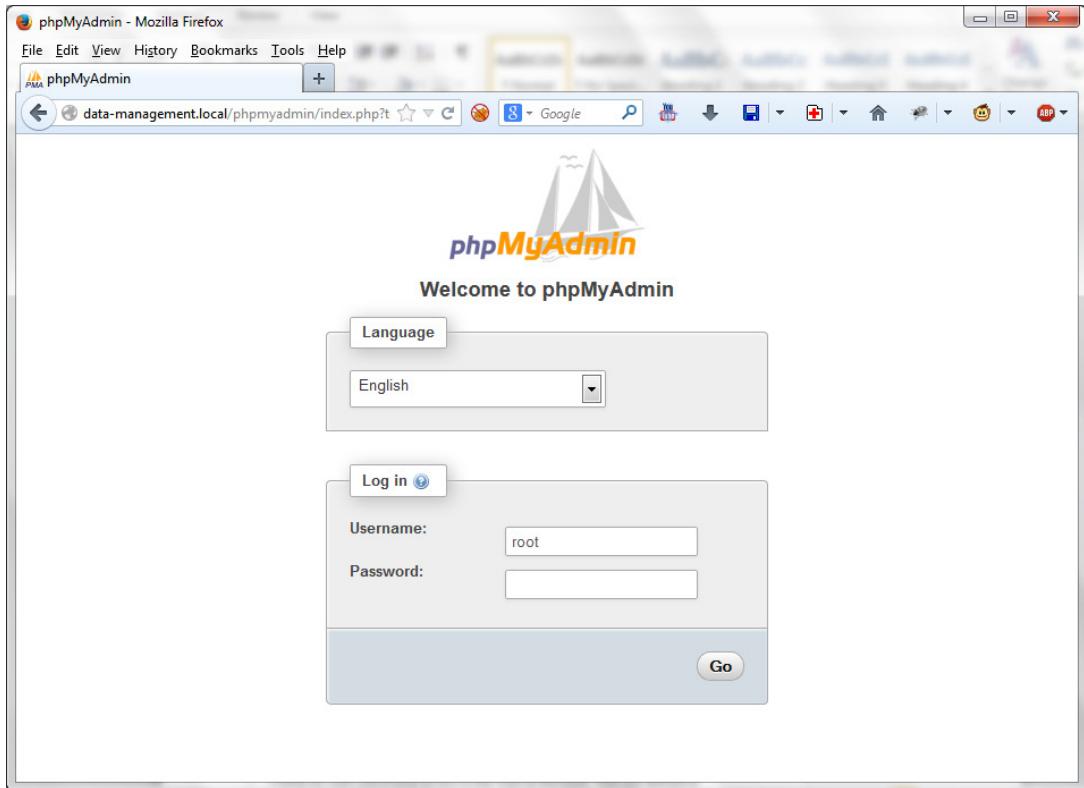


Figure 1

Log in as user 'root' with password 'test'.
From the main menu, switch to the User section

User	Host	Password	Global privileges	Grant	Action
data	%	Yes	ALL PRIVILEGES	Yes	Edit Privileges Export
datamanager	%	Yes	USAGE	No	Edit Privileges Export
debian-sys-maint	localhost	Yes	ALL PRIVILEGES	Yes	Edit Privileges Export
mirthuser	%	Yes	USAGE	No	Edit Privileges Export
mirthuser	localhost	Yes	USAGE	No	Edit Privileges Export
odk_user	localhost	Yes	USAGE	No	Edit Privileges Export
root	127.0.0.1	Yes	ALL PRIVILEGES	Yes	Edit Privileges Export
root	::1	Yes	ALL PRIVILEGES	Yes	Edit Privileges Export
root	data-management	Yes	ALL PRIVILEGES	Yes	Edit Privileges Export
root	localhost	Yes	ALL PRIVILEGES	Yes	Edit Privileges Export

Figure 2

From there, click on 'Add user'.

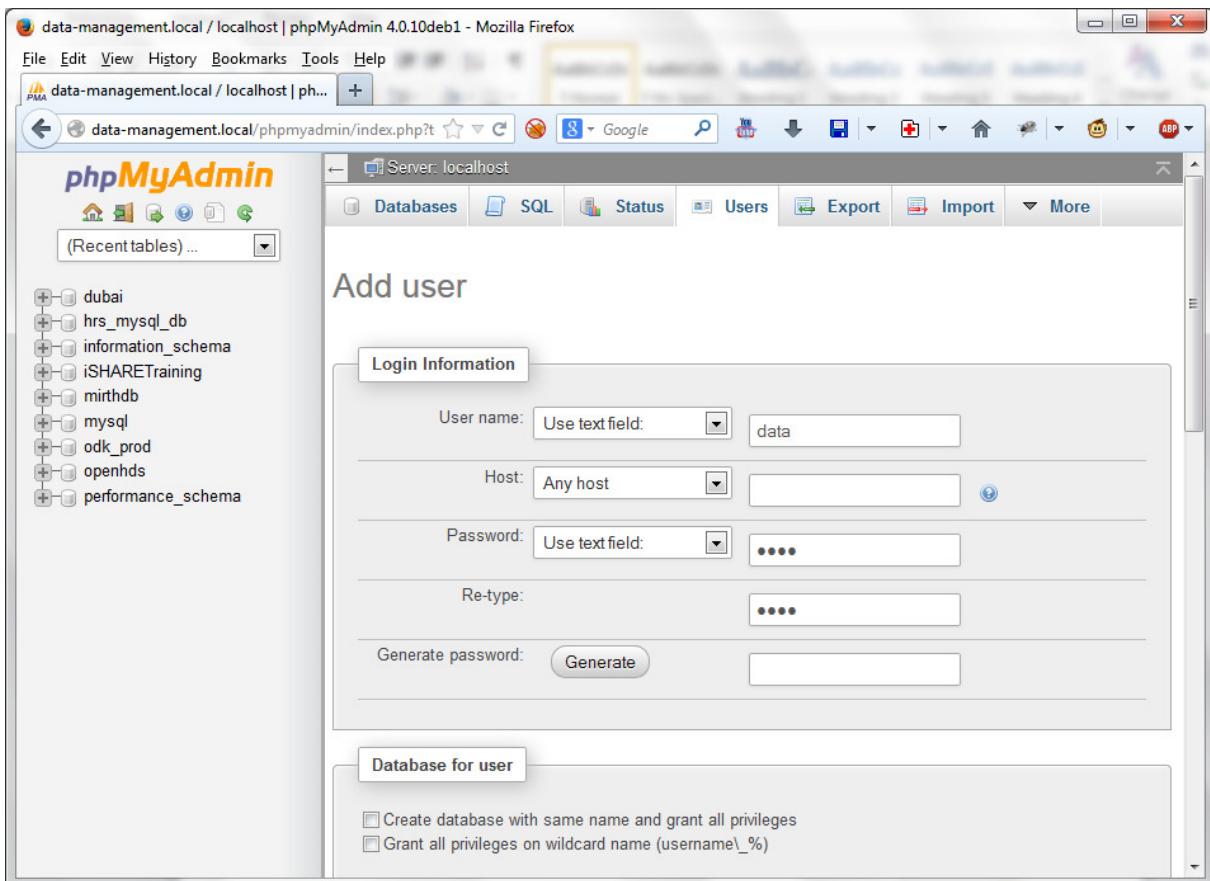


Figure 3

Set the ‘User name’ to ‘data’ and the password fields to ‘data’. Under Global privileges click on ‘Check All’.

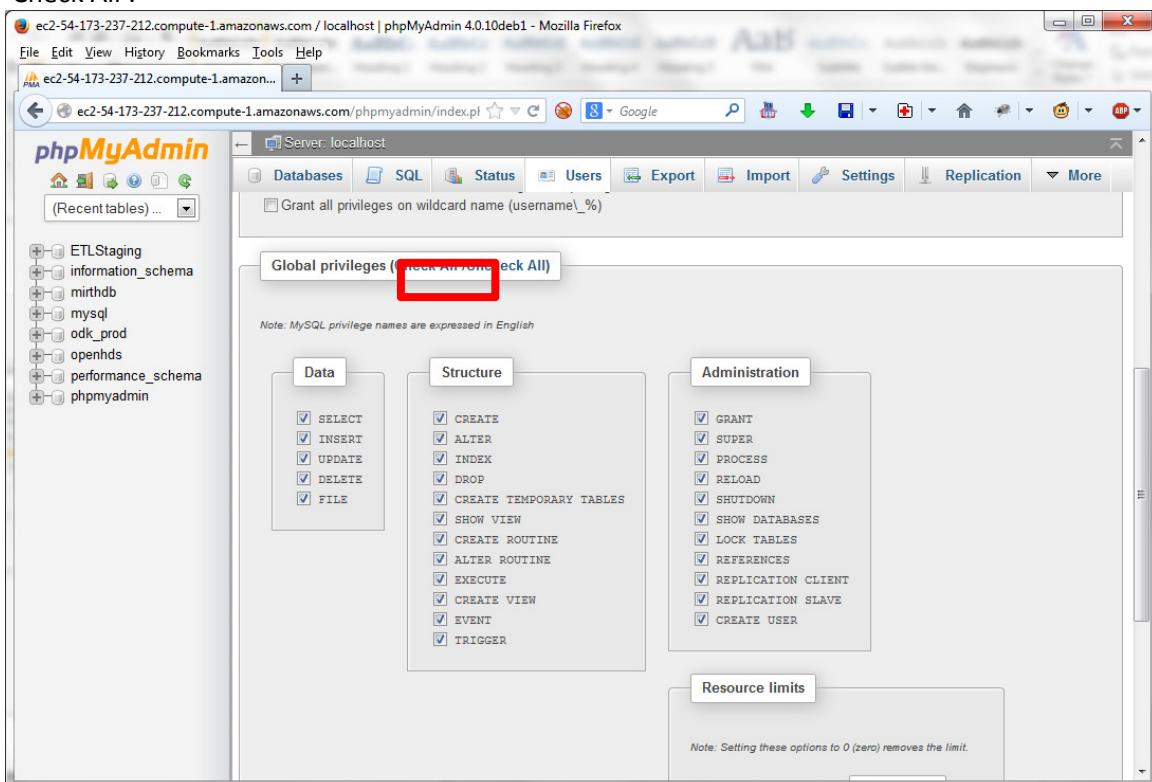


Figure 4

Create the new user and permissions by clicking on 'Go'.

Optional: Grant outside access to MySQL

This step is optional. You can use this to access the MySQL Server instance from outside the server (non-localhost), so e.g. you can use Fat Clients like the MySQL Workbench Application to administer the MySQL database instead of PhpMyAdmin.

- Edit /etc/mysql/my.cnf and either remove or comment out line starting with *Bind-Address* with a '#'
- Restart the MySQL-service with 'sudo service mysql restart'

Installing Tomcat

- Install Tomcat (check available versions for distro on <https://launchpad.net/ubuntu/+source/tomcat6>) with 'sudo apt-get install tomcat6' .
- Check if Tomcat is running with 'sudo service tomcat6 status' You can start the Tomcat service with 'sudo service tomcat6 start' if it is not already running.
- If the service is erroring out with a message about *JAVA_HOME* not set, open **/etc/default/tomcat6** with 'sudo vi /etc/default/tomcat6/' , uncomment the line '*JAVA_HOME=...*' and set it to folder of Java installation.
- Install *tomcat6-admin* with 'sudo apt-get install tomcat6-admin'.
- Configure users which have access to the Tomcat Manager. They are defined in **/etc/tomcat6/tomcat-users.xml** (open the file e.g. with sudo vi tomcat-users.xml).
- Add a new role *html-gui* and a user in this role to above mentioned file in the <tomcat-users> section:

```
<role rolename="manager-gui" />
<user username="tomcat" password="tomcat" roles="manager-gui" />
```
- reload the Tomcat-service ('sudo service tomcat6 restart')
- You should now be able to log in into the tomcat manager under:
http://serverip:tomcat_port/manager
- The Tomcat log-files are stored under **/var/log/tomcat6/** (if needed)

Recommended:

Increase Tomcat Memory allocation.

When encountering huge amounts of data (e.g. Individuals data), Tomcat runs out of heap memory (Since it defaults to use only 128MB). It is thus advised to increase the amount of memory that Tomcat can use.

To do this, edit the configuration in 'etc/default/tomcat6'. Find the line starting with '*JAVA_OPTS=*', and add the values '*-Xmx1024M -Xms1024M*'. After saving the file, restart the Tomcat server with 'sudo service tomcat6 restart' to apply the change.

Installing MySQL-J Connector

MySQL Connector/J is the official JDBC driver for MySQL. It is required for Tomcat in order to communicate with a MySQL server instance.

- Go to <http://dev.mysql.com/downloads/connector/j/> and download the mysql-connector*.tar.gz to your Ubuntu home (e.g. with wget)

- extract the file (in Ubuntu: 'tar -xvzf mysql*.tar.gz')
- and chmod the mysql*.jar file to 777 or just executable

OR AS AN ALTERNATIVE TO DOWNLOADING FROM MYSQL.COM (UNDER UBUNTU):

Install the mysql lib package with 'sudo apt-get install libmysql-java' which will put the MySQL connector into '/usr/share/java'.

THEN:

- cd to **/usr/share/tomcat6/lib**
- Create a symbolic link 'sudo ln -s mysql-connector-xyz.jar .', resp. cd /usr/share/tomcat6/lib
- > sudo ln -s ../../java/mysql.jar mysql.jar
- Restart the Tomcat-service with 'sudo service tomcat6 restart' .

Installing SSH-Server

The SSH server installation is a good way to remotely access the server.

- Install ssh-server with: 'sudo apt-get install -y --no-install-recommends openssh-server'
- Service option: sudo service ssh status | start | stop | restart
- Now you will be able to remotely connect to your server over SSH for example with Putty which can be downloaded from <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>

Installing OpenHDS

A .war file is a Web Application Archive. This is the format that OpenHDS comes packaged in when you download our binary distribution. It is ready to be deployed to the Tomcat Servlet Application Server. Ways to obtain the OpenHDS Web Application are:

- You can build and the OpenHDS server manually from Source code available under <https://github.com/SwissTPH/openhds-server> (Maven build) OR
- Download a precompiled OpenHDS.war-file from <https://github.com/SwissTPH/openhds>
- Deploy the war file through the Tomcat html manager <http://data-management.local:8080/manager>

Deploying OpenHDS in Tomcat

Open the Tomcat manager under <http://data-management.local:8080/manager> and log in as tomcat/tomcat.

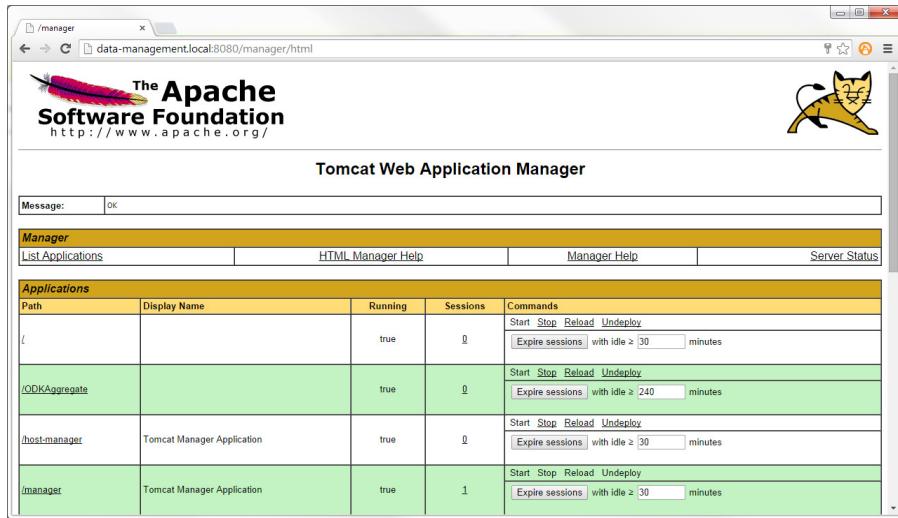


Figure 5

Upload and submit *openhds.war* file.

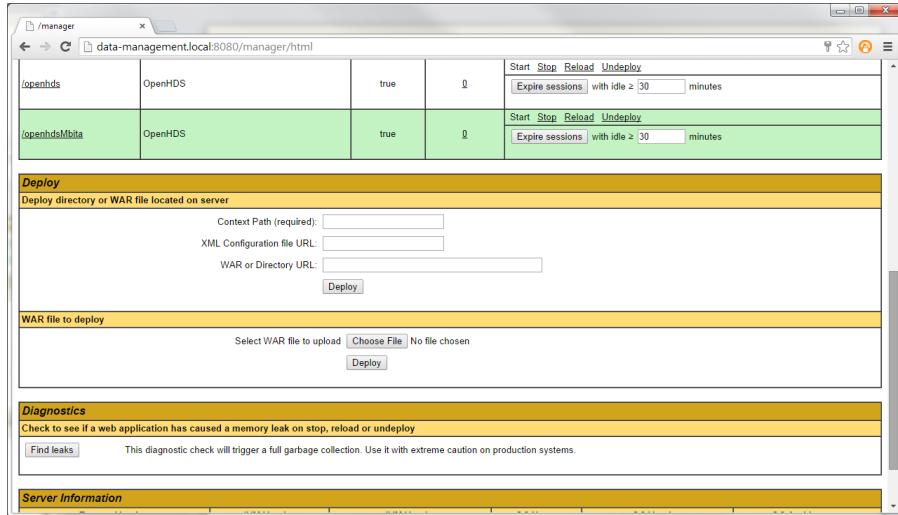


Figure 6

Check if the application package was successfully deployed and is running.

Set up OpenHDS required data

After you have deployed the OpenHDS Application you will need to run one additional SQL script, that will insert some required data into the openhds-database, including a default administrator login (**admin/test**).

Find the SQL-script ‘openhds-required-data.sql’ which can be found in the openhds.war-file (open with 7zip, WinRar or equivalent) under WEB-INF\classes\.

If you are using PhpMyadmin, log in as user data. Then select the openhds database and select the SQL section. Copy/paste the contents of the SQL file into the ‘Run SQL queries’ window and submit with ‘Go’.

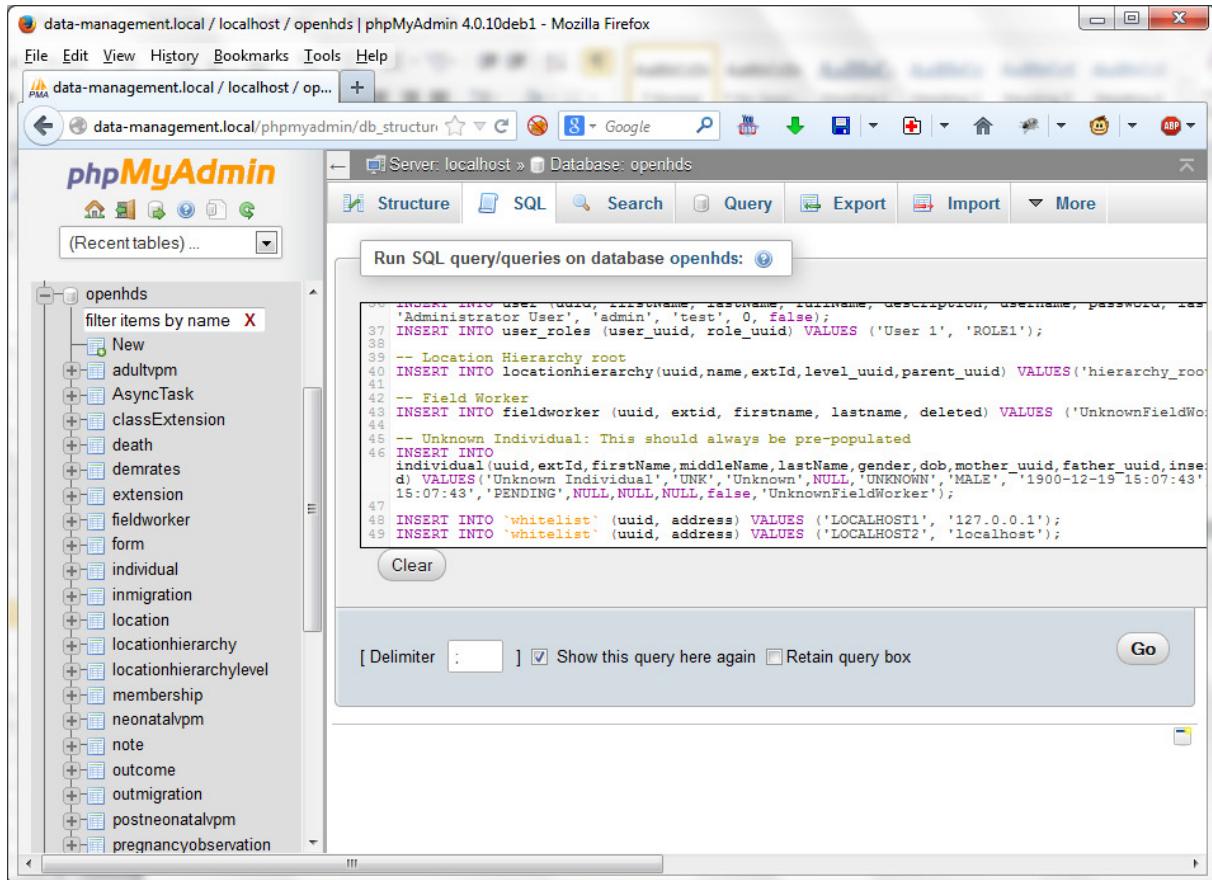


Figure 7

Under the Ubuntu terminal you can extract the war file with ‘unzip openhds.war’. Then issue a ‘mysql –udata –pdata openhds < /path/to/sql/file/openhds-required-data.sql’ to run the SQL script.

Installing Mirth

MirthConnect is used to transfer data into OpenHDS by making web service calls. This is used for submitting data during the baseline and update rounds, but also for ingesting legacy data from a system like HRS2. Make sure you have an updated Java with Java Web Start to run the Mirth Connect Administrator Application.

- Download the Linux installer from <http://www.mirthcorp.com/community/downloads> (~116MB).
- Issue a ‘chmod a+x mirth...sh’ to mark the installer as executable.
- Run the installer with ‘sudo ./mirth...sh’ .
- Read through the agreements, scroll with enter and set-up as follows:

Installation steps

- Default install to **/usr/local/mirthconnect**
- Symlinks go to **/usr/local/bin**
- Set port number, e.g. port 8082 (since port 8080 is in use by tomcat).
- Set apps and log directory (/usr/local/mirthconnect/apps and /logs resp.)
- After installation, check if connection to <http://data-management.local:8082> is okay.
- Launch the *Mirth Connect Administrator* from above site

- Log in with admin/admin
- Create an admin account (admin/test) - no need to register.
- You can start/stop/etc the Mirth Connect service by running 'sudo service mcservice start|stop|status' (service is located in **/usr/local/mirthconnect**).

Set-up Mirth Connect to use the MySQL database

By default, Mirth will use the Derby database. We will need to change this to MySQL. First create a Mirth database user in PHPMyAdmin, e.g. with following script:

```
CREATE DATABASE mirthdb DEFAULT CHARACTER SET utf8;
GRANT ALL ON mirthdb.* TO data@'%' IDENTIFIED BY 'data' WITH GRANT OPTION;
```

Now open the file 'mirth.properties' in /opt/mirthconnect/conf for editing. Change the line starting with 'database' to 'mysql', change 'database.url' to 'jdbc:mysql://localhost:3306/mirthdb' (or your database name), and set the values for 'database.username' and 'database.password'.

Relevant lines to change

```
# options: derby, mysql, postgres, oracle, sqlserver

database = mysql

# examples:
# Derby      jdbc:derby:${dir.appdata}/mirthdb;create=true
# PostgreSQL  jdbc:postgresql://localhost:5432/mirthdb
# MySQL       jdbc:mysql://localhost:3306/mirthdb
# Oracle      jdbc:oracle:thin:@localhost:1521:DB
# SQLServer   jdbc:jtds:sqlserver://localhost:1433/mirthdb

database.url = jdbc:mysql://localhost:3306/mirthdb

# if using a custom driver, specify it here
#database.driver =

# maximum number of connections allowed for the connection pool
database.max-connections = 10

# database credentials
database.username = data
database.password = data
```

- Afterwards restart the mirth connect service (sudo service mcservice restart)
- After the restart, the new database schema will be created and you can log in to the Mirth Connect Administrator with **data/data**

Importing MirthConnect channels

Download the latest release of the channel definitions, code templates, global scripts, and alerts from the OpenHDS source repository: <https://github.com/SwissTPH/openhds>. Using the

MirthConnect Administrator application, import these resources into your MirthConnect environment.

Installing ODKAggregate

ODKAggregate is the server component that acts as a repository for electronic forms used in the data collection (which can be synchronized to tablets), and as the recipient and storage for completed forms which are submitted from tablets.

ODKAggregate provides an installer that will create the war-file with settings preconfigured according to your settings during the installation steps. The installer is available for Windows, Linux 32 or 64 and also Mac OS. This guide will assume that you download and run the Linux installer.

See also <http://opendatakit.org/use/aggregate/tomcat-install/>

- Download the appropriate (32 or 64 bit, depending on your system) Linux installer from <http://opendatakit.org/downloads/> (~260MB). If you're under Ubuntu, you can issue a 'wget <http://url.to.file/filename.sth>' to download the file
- Change the installer permissions with 'chmod 777 ODK[...].run'. This will set the permissions for the installer such that it is allowed to be executed.
- Run the installer with './ODK[...].run'

Run the installer

The ODKAggregate installer will ask for user input to set up the database connection and other configuration options.

- Put the installer into e.g.: ~/ (the tilde stands for the user home, e.g. /home/data)
- Set the output folder to ~/ODK
- The port you can leave at 8080
- The database server is hosted at 127.0.0.1
- When asked for the public internet address, insert 'data-management.local'
- When asked for the SQL user, use: *data / data* (not recommended for production)
- Db name: *odk_prod*
- ODKAggregate instance name: *odk_prod*
- Configuration

Installation

The installer ran in the previous step will create a new folder called 'ODKAggregate' in the install folder that you supplied in the first step. You will find the ODKAggregate.war file there and an SQL script *create_db_and_user.sql*.

- Open PhpMyAdmin and run theSQL script to generate the odk database.
- Deploy the *ODKAggregate.war* with the Tomcat manager.
- Start the ODKAggregate application in Tomcat manager if it is not already started.
- Navigate to '<http://data-management.local:8080/ODKAggregate/>' in a web-browser to browse to ODKAggregate
- You should now be able to log in by using 'Aggregate Password' with the username you supplied in the installer and the password 'aggregate'. You can later change the password by going to the 'Site Admin' section.

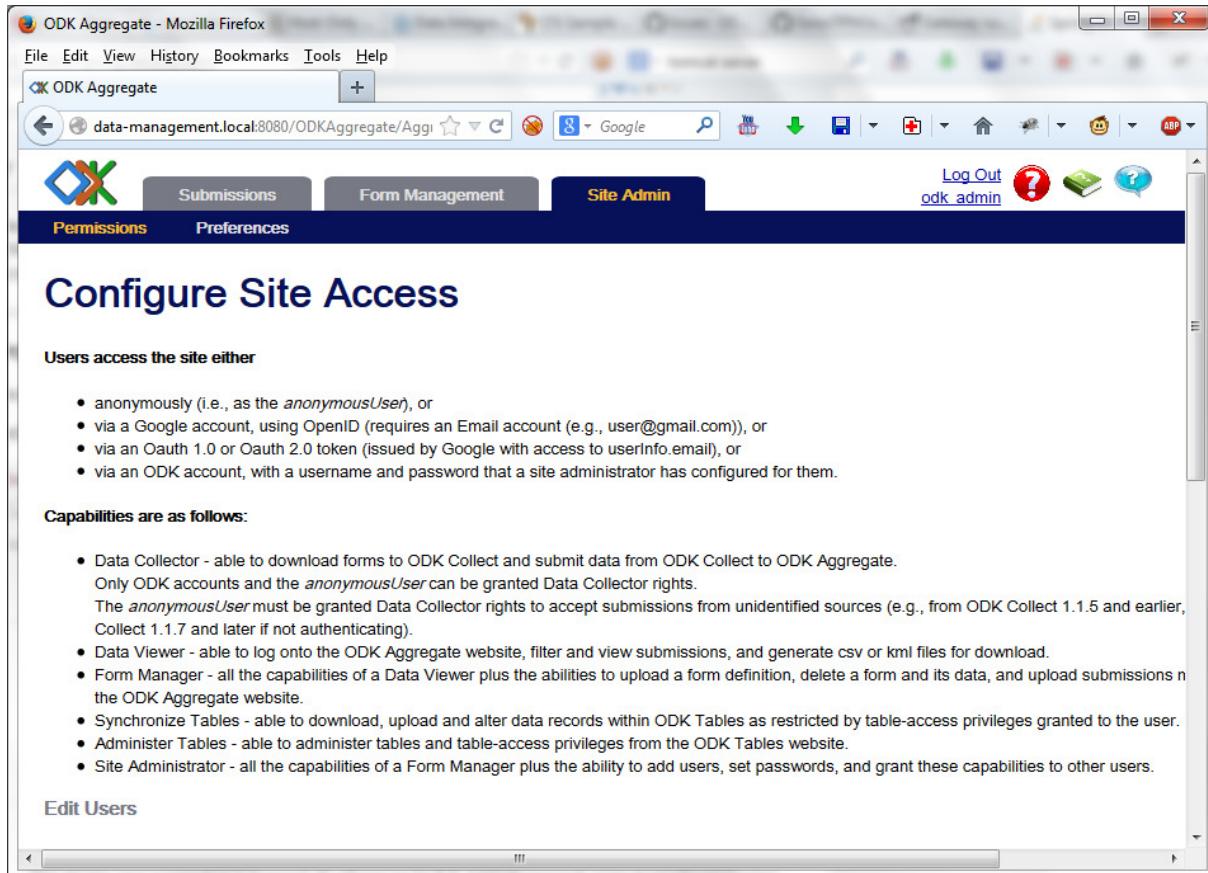


Figure 8 ODKAggregate 'Site Admin' section

Note: If the installer quits the installation with the error: "Installer payload initialization failed. This is likely due to an incomplete or corrupt downloaded file." then try re-downloading the file again with `wget`. (`wget` for windows available at http://www.alexloamas.com/blog/2005/08/64_bit_wget_for_windows/)

Deploy ODKAggregate with a local superuser account

Skip the following section unless you are required to use an old version of ODKAggregate (from ODKAggregate v1.4.4. on and upwards, the installer will ask for a ODKAggregate username for the super-user. The default password is aggregate. The following steps are thus not required anymore.)

ODKAggregate v.1.4.3 and lower by default require a Google e-mail account to set-up the installation. The steps provided here will create a local super-user so that no google mail account is required. This is especially helpful if you don't have/want a google account for the initial login or don't have an internet connection available:

- Open/extract the `ODKAggregate.war` that was created after executing the installer with e.g. 7zip.
- Navigate to the `WEB-INF\lib` folder
- Open '`ODKAggregate-settings.jar`' (also with a zip program)
- Open the file **security-properties** in a text editor
- Add admin username next to 'security.server.superUserUsername=' (e.g. `odk_admin / aggregate`)
- The default password is *aggregate*

- Repackage (zip up and put to according location) and redeploy the war file.
- Login over <http://data-management.local:8080/ODKAggregate/>

Upload DSS Core XLSForms

This section covers the steps to obtain and upload the OpenHDS core forms, which the OpenHDS application needs for its core functionality.

Download the OpenHDS Core Forms from <https://github.com/SwissTPH/openhds>. They already come converted into the XForms format and are ready for upload into ODKAggregate.

Open up <http://data-management.local:8080/ODKAggregate/> in your Web browser.

You can log in with the local ODK account if required, but you shouldn't need it to upload Forms, since by default it should be allowed for anonymous users.

The screenshot shows a web browser window with the URL data-management.local:8080/ODKAggregate/Aggregate.html#submissions/filter///. The page title is "Submissions". The main content area displays a table of "Baseline registration" submissions. The table has columns: start, end, deviceld, migrationType, locationId, visitId, fieldWorkerId, individualInfo_individualId, individualInfo_motherId, individualInfo_fatherId, and individualInfo_fatherId. There are 20 rows of data, each with a red 'X' icon in the first column. The rows represent various dates and device IDs, such as 2014-08-27 17:17:35.0, 2014-08-27 17:16:22.0, etc. The last row is dated 2011-05-27 2011-05-27 10:47:38.0.

	start	end	deviceld	migrationType	locationId	visitId	fieldWorkerId	individualInfo_individualId	individualInfo_motherId	individualInfo_fatherId	individualInfo_fatherId
X	2014-08-27 17:17:35.0	14:F4:2A:87:12:30	BASELINE	IFA000008	IFA000008001	data	IFA000008001	UNK	UNK	UNK	
X	2014-08-27 17:16:22.0	14:F4:2A:87:12:30	BASELINE	IFA000007	IFA000007001	data	IFA000007003	UNK	UNK	UNK	
X	2014-09-03 18:14:17.0	14:F4:2A:87:12:30	BASELINE	IFA000001	IFA000001001	data	IFA000001001	UNK	UNK	UNK	
X	2014-09-03 18:16:23.0	14:F4:2A:87:12:30	BASELINE	IFA000001	IFA000001001	data	IFA000001002	UNK	UNK	UNK	
X	2014-09-17 11:46:50.0	14:F4:2A:87:12:30	BASELINE	IFA000001	IFA000001001	data	IFA000001001	UNK	UNK	UNK	
X	2014-09-17 12:00:06.0	14:F4:2A:87:12:30	BASELINE	IFA000001	IFA000001001	data	IFA000001002	UNK	UNK	UNK	
X	2011-06-06 2011-06-06 05:48:58.0	06:47:13.0	8c:77:12:5b:c1:3c	BASELINE	KIU000001	KIU000001000	FWDG5	KIU000001001	UNK	UNK	
X	2011-06-06 2011-06-06 07:43:40.0	08:18:56.0	8c:77:12:5b:c1:3c	BASELINE	KIU000001	KIU000001000	FWDG5	KIU000001002	UNK	UNK	
X	2011-06-06 2011-06-06 05:40:43.0	06:30:26.0	8c:77:12:5b:c1:3c	BASELINE	KIU000001	KIU000001000	FWDG5	KIU000001003	UNK	UNK	
X	2011-06-06 2011-06-06 05:43:44.0	05:56:40.0	8c:77:12:5b:c1:3c	BASELINE	KIU000001	KIU000001000	FWDG5	KIU000001004	UNK	UNK	A
X	2011-05-27 2011-05-27 07:52:06.0	08:00:37.0	8c:77:12:5b:c1:3c	BASELINE	IFA000002	IFA000002000	FWNF4	IFA000002001	UNK	UNK	S
X	2011-05-27 2011-05-27 10:47:38.0	11:46:55.0	8c:77:12:5b:c1:3c	BASELINE	IFA000002	IFA000002000	FWNF4	IFA000002002	UNK	UNK	F

Figure 9

Switch to the 'Form Management' tab.

Title	Form Id	Media files	User	Downloadable	Accept Submissions	Publish	Export	Delete
Baseline registration	baseline	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Connect Adult	connect_adult	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Death registration	death_registration	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Death to Head of household	DEATHTOHOH	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
In migration registration	in_migration	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Location registration	location_registration	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Membership registration	membership	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Out migration registration	out_migration_registration	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Pregnancy Outcome	pregnancy_outcome	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Pregnancy observation registration	pregnancy_observation	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Relationship registration	relationship	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Social Group Registration	social_group_registration	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Visit Registration	visit_registration	0	anonymousUser	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			

Figure 10

Click on add new form.

Xform Upload

Upload one form into ODK Aggregate

Form definition (xml file): No file selected.

Optional Media file(s): No files selected.

Media files for the form's logo, images, audio clips and video clips (if any) should be in a single directory without subdirectories.

NOTE: If the form definition contains string answers the string data will be truncated to 255 characters. See ODK Aggregate 1.0 documentation for how to increase (or decrease) this size.

On ODK Collect 1.1.7 and higher, the file named "form_logo.png", if present in the media folder, will be displayed as the form's logo.

Figure 11

Click browse and select the XForm (.xml).

Click on 'Upload Form' to submit the form.

After a successful upload, the new form will appear in the 'Forms List'.

Upload the other forms, one by one.

Create Database and Views for Data Management

This section provides SQL statements that will provide the Data Manager with a simplified database view of errors that occurred while sending data to OpenHDS. This allows for a fast and uncomplicated determination of cause of problematic data. These entries can then be corrected and resubmitted for a successful insertion into OpenHDS.

After logging in as user **root** select the **odk_prod** database and execute following SQL script:

Error table and views

```
CREATE TABLE `errors` (
  `id` int(11) NOT NULL AUTO_INCREMENT,
  `CHANNEL` varchar(30) DEFAULT NULL,
  `DATA` varchar(500) DEFAULT NULL,
  `ERROR` varchar(280) DEFAULT NULL,
  `exported` int(1) DEFAULT '0',
  PRIMARY KEY (`id`)
) ENGINE=InnoDB AUTO_INCREMENT=51322 DEFAULT CHARSET=latin1;

#UPDATE ROUND VIEWS
create view IN_MIGRATION_VIEW as select * from IN_MIGRATION_CORE where
PROCESSED_BY_MIRTH=2;
create view LOCATION_VIEW as select * from LOCATION_REGISTRATION_CORE where
PROCESSED_BY_MIRTH=2;create view DEATH_VIEW as select * from
DEATH_REGISTRATION_CORE where PROCESSED_BY_MIRTH=2;
create view MEMBERSHIP_VIEW as select * from MEMBERSHIP_CORE where
PROCESSED_BY_MIRTH=2;
create view OUT_MIGRATION_VIEW as select * from
OUT_MIGRATION_REGISTRATION_CORE where PROCESSED_BY_MIRTH=2;
create view PREGNANCY_OBSERVATION_VIEW as select * from
PREGNANCY_OBSERVATION_CORE where PROCESSED_BY_MIRTH=2;
create view PREGNANCY_OUTCOME_VIEW as select * from PREGNANCY_OUTCOME_CORE
where PROCESSED_BY_MIRTH=2;
create view RELATIONSHIP_VIEW as select * from RELATIONSHIP_CORE where
PROCESSED_BY_MIRTH=2;
create view SOCIALGROUP_VIEW as select * FROM SOCIAL_GROUP_REGISTRATION_CORE
where PROCESSED_BY_MIRTH=2;
# BASELINE ROUND VIEW
create view BASELINE_VIEW as select * from BASELINE_CORE where
PROCESSED_BY_MIRTH=2;
CREATE USER 'datamanager'@'%' IDENTIFIED BY 'dataODKmanager';

GRANT SELECT, UPDATE ON DEATH_VIEW TO 'datamanager'@'%';
GRANT SELECT, UPDATE ON IN_MIGRATION_VIEW TO 'datamanager'@'%';
GRANT SELECT, UPDATE ON LOCATION_VIEW TO 'datamanager'@'%';
GRANT SELECT, UPDATE ON MEMBERSHIP_VIEW TO 'datamanager'@'%';
GRANT SELECT, UPDATE ON OUT_MIGRATION_VIEW TO 'datamanager'@'%';
GRANT SELECT, UPDATE ON PREGNANCY_OBSERVATION_VIEW TO 'datamanager'@'%';
GRANT SELECT, UPDATE ON PREGNANCY_OUTCOME_VIEW TO 'datamanager'@'%';
```

```

GRANT SELECT, UPDATE ON RELATIONSHIP_VIEW TO 'datamanager'@'%';
GRANT SELECT, UPDATE ON SOCIALGROUP_VIEW TO 'datamanager'@'%';
# BASELINE ROUND PERMISSIONS
GRANT SELECT, UPDATE ON BASELINE_VIEW TO 'datamanager'@'%';

```

Datamanager SQL User

The above script will also create a MySQL user ‘datamanager’ with the password ‘dataODKmanager’. This special user only has access to these error views. With these he can modify and reset the erroneous data. Refer to section ‘Error handling’ in the Data Management section below for more details.

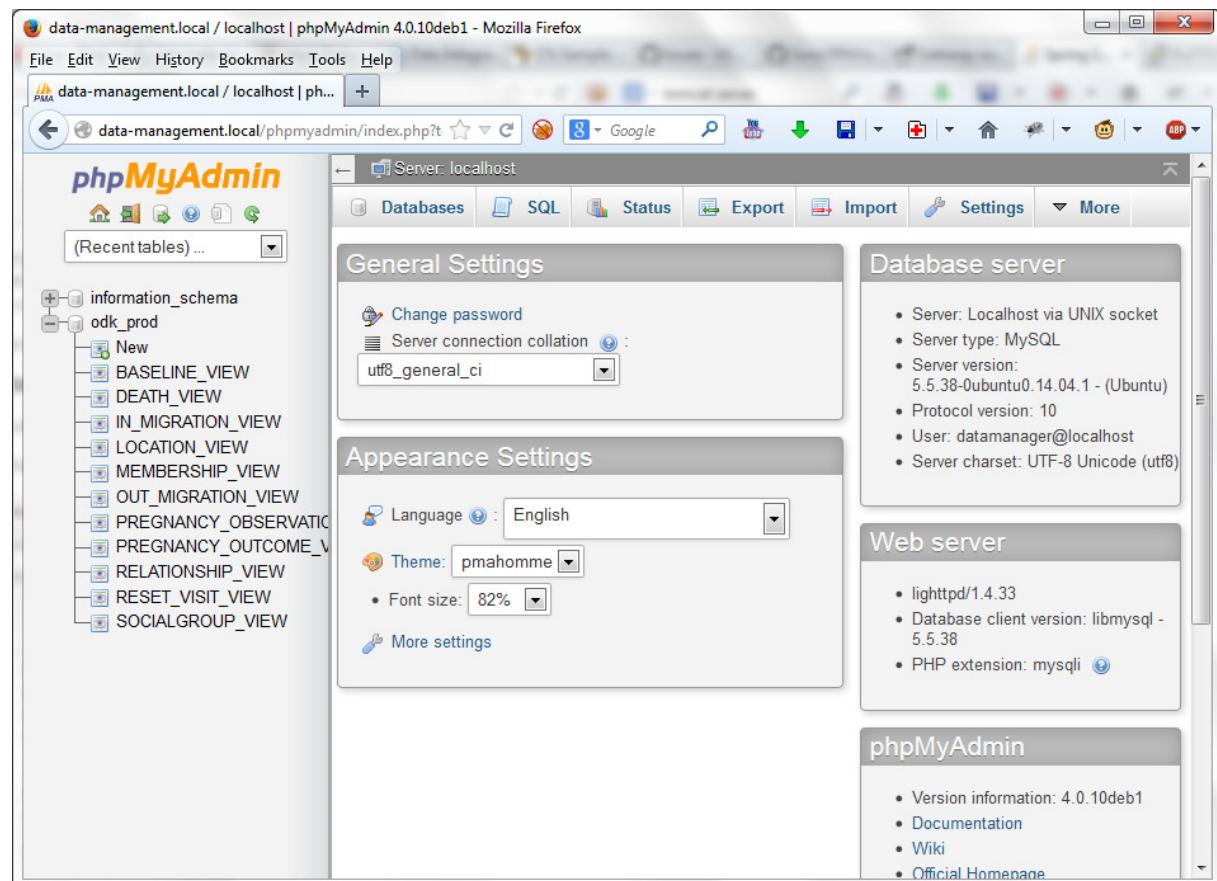


Figure 12 The datamanager MySQL user only has access to the error views

Custom Location hierarchy

By default OpenHDS has a location hierarchy that starts at the country level, goes down to region, District, Village and finally Subvillage. It is possible to modify these labels to have a custom location hierarchy where this is needed.

To customize the location hierarchy, open the OpenHDS web-application and log in. Then navigate to 'Configuration' and finally to 'Location Levels'.

The screenshot shows the 'Configure Location Levels' page of the OpenHDS web application. The left sidebar is dark green with white text, showing navigation links like HOME, GETTING STARTED, BASELINE, UPDATE, AMENDMENTS, REPORTS, UTILITY ROUTINES, and CONFIGURATION. Under CONFIGURATION, there are sub-links: Codes and Parameters, Database, Location Levels (which is highlighted in blue), Role Management, User Management, and Whitelist Management. The main content area has a light green background. At the top, it says 'Configuration > Location Levels' and 'Configure Location Levels'. Below that is a note: 'Modifying the Location Hierarchy levels after data has been entered may result in unexpected errors. These should only be configured once when the application is deployed. Keep the unused level fields empty.' There are nine input fields labeled 'Level 1' through 'Level 9'. The first four fields contain the values: 'Country' (Level 1), 'Region' (Level 2), 'District' (Level 3), and 'Village' (Level 4). The other five fields ('Level 5' through 'Level 9') are empty. At the bottom of the page is a 'Create' button. At the very bottom, there is a footer bar with the text: 'Open Health and Demographic Surveillance System (OpenHDS) - Open Source License - Build 1.0-M5-SNAPSHOT' and 'This project is supported by the generous contributions of the IDRC | License | Code Repository'.

Figure 13

At the moment, the OpenHDS system is fixed to a 5-level location hierarchy.

To change the labels edit the Level entries and then save with the button 'Create'.

You will need to stop and start the openhds-webapp in Tomcat for the changes to register.

IMPORTANT:

Once you have changed the location Levels, you'll also need to update the openHDS mobile application to handle these changes.

Open the strings.xml and find the entry 'STARTHIERARCHYLEVELNAME'. Change the value of the entry accordingly, e.g. from *Region* to *State* and save the file.

Tablet setup

- Download the OpenHDS apk from <https://github.com/SwissTPH/openhds> . If you should into installation troubles, make sure that Installation from untrusted sources is enabled in the settings under security.
- Download ODKCollet (from the Google Play Store or from <https://opendatakit.org/downloads/download-info/odk-collect-apk/>).
- Install OpenHDS mobile and ODKCollet

Set-up OpenHDS Mobile

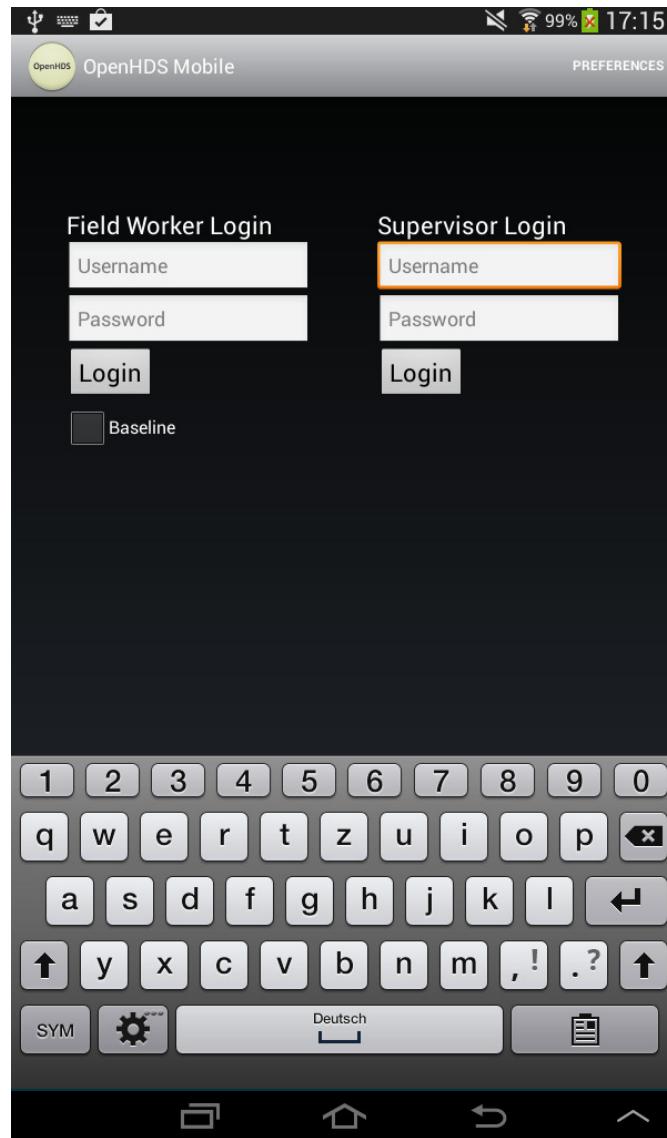


Figure 14

Tap the «*Preferences*» button at the upper right hand corner



Figure 15

Click on the URL to start editing the entry

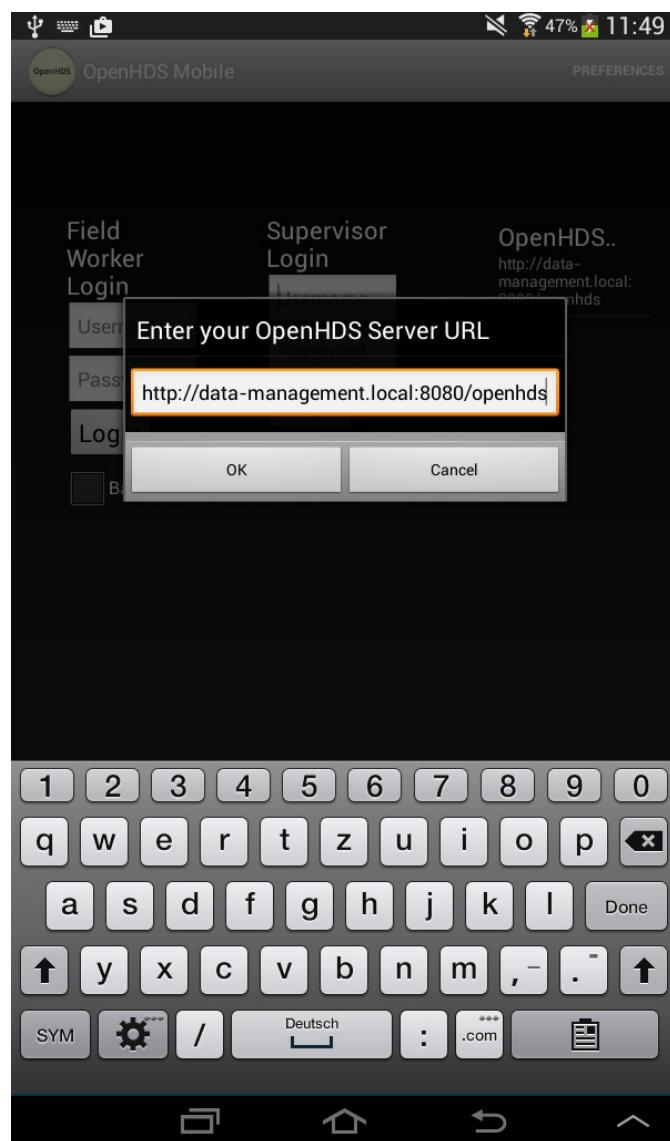


Figure 16

Enter the URL to the OpenHDS server and confirm your input with a click on «OK»

Set-up ODKCollect

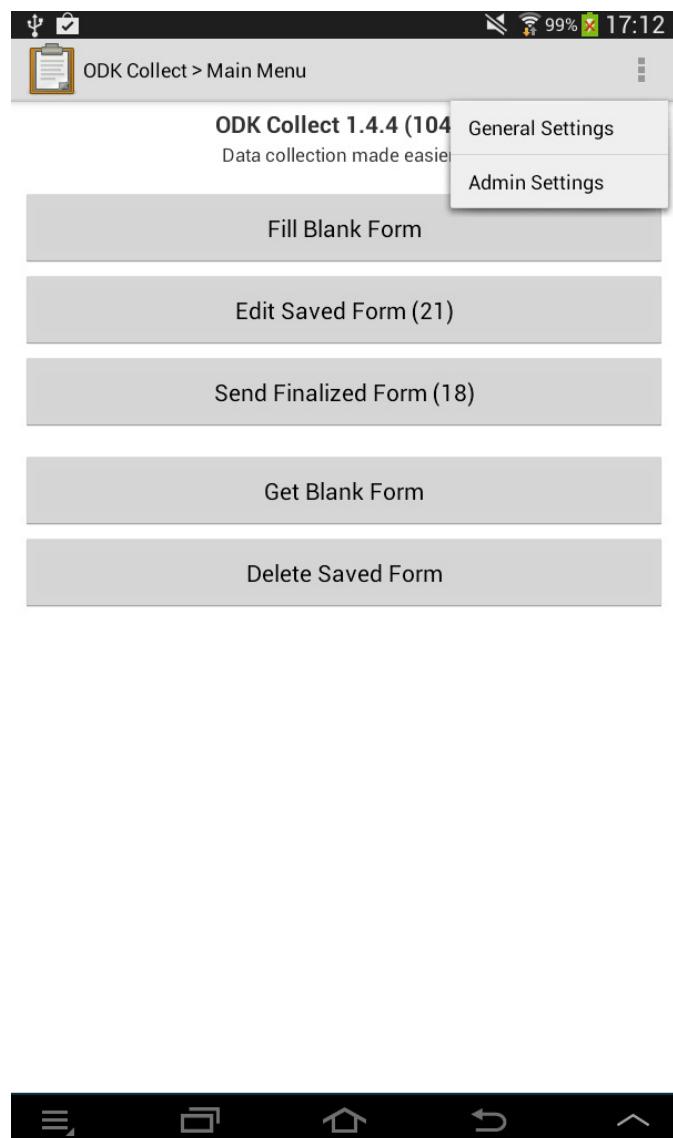


Figure 17

Open the Menu at the upper right hand corner (or tap the hardware menu button on your device respectively) and select «*General Settings*»

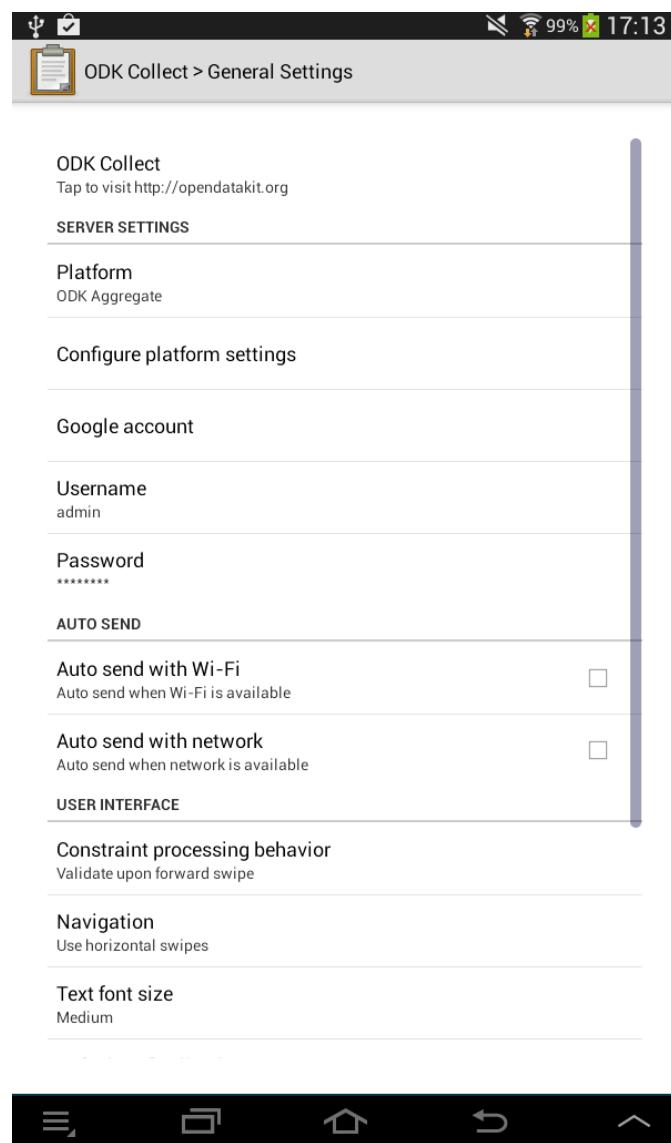


Figure 18

Select the option «*Configure platform settings*»

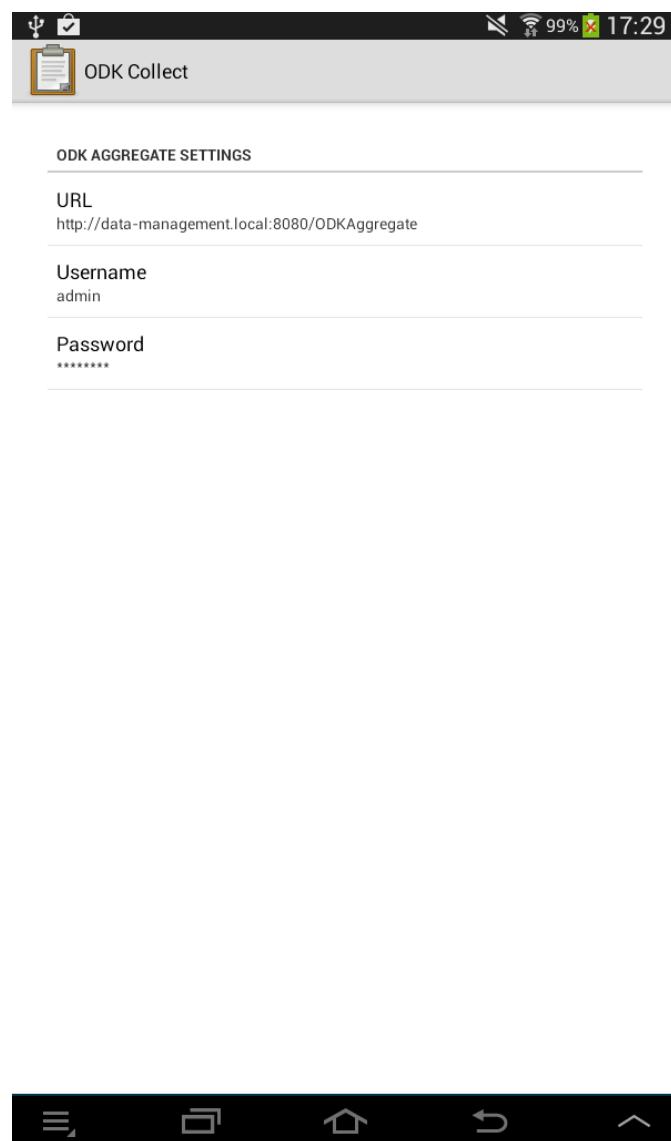


Figure 19

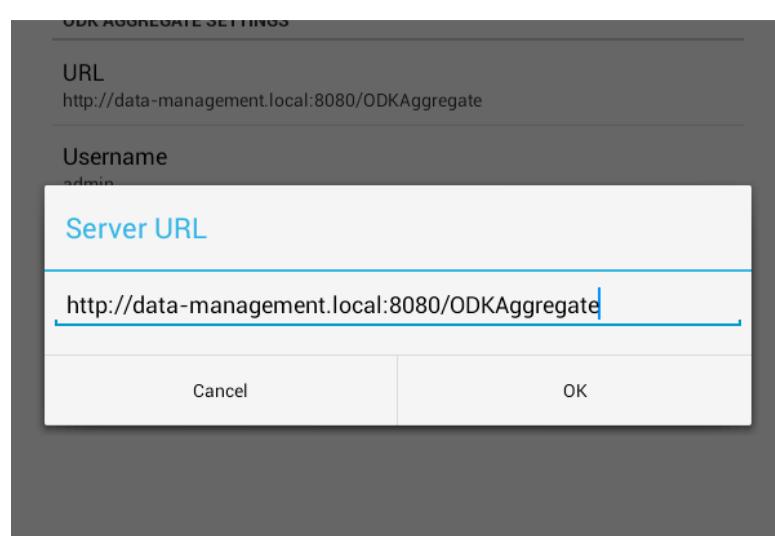


Figure 20

Enter the URL to the ODKAggregate server and also provide a valid ODKAggregate Username/Password combination.

Synchronizing OpenHDS Mobile

NOTE:

Before you can start the synchronization with OpenHDS Mobile, make sure you have set-up OpenHDS as described in the section “Set up OpenHDS”.

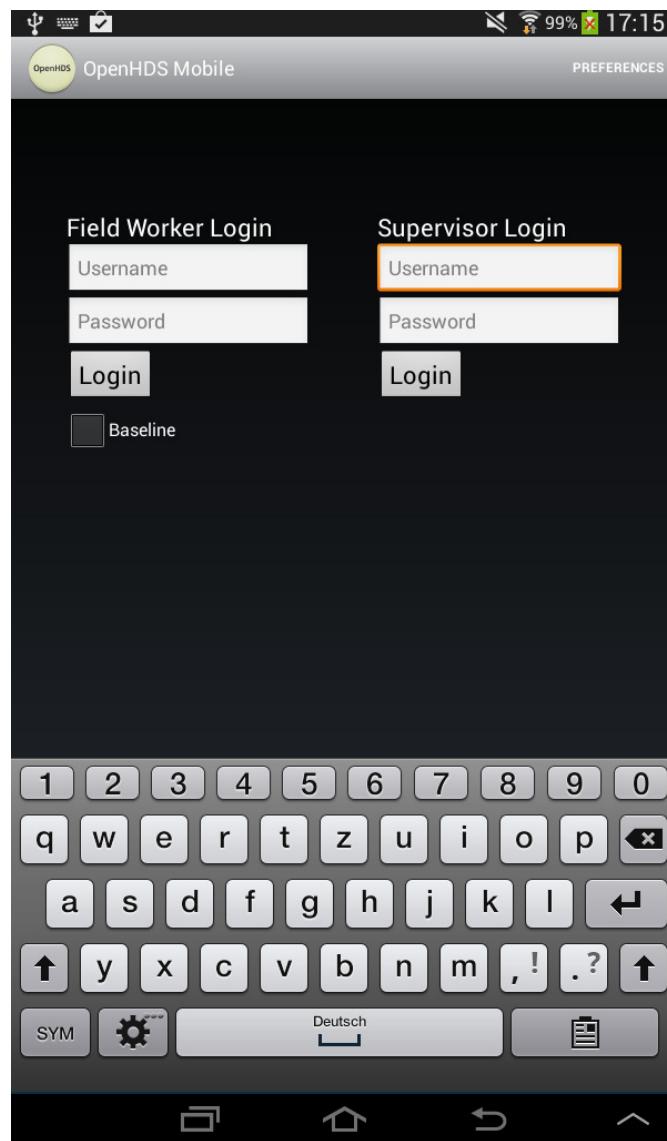


Figure 21

In the «*Supervisor Login*» section, provide the user credentials and click on «*Login*»

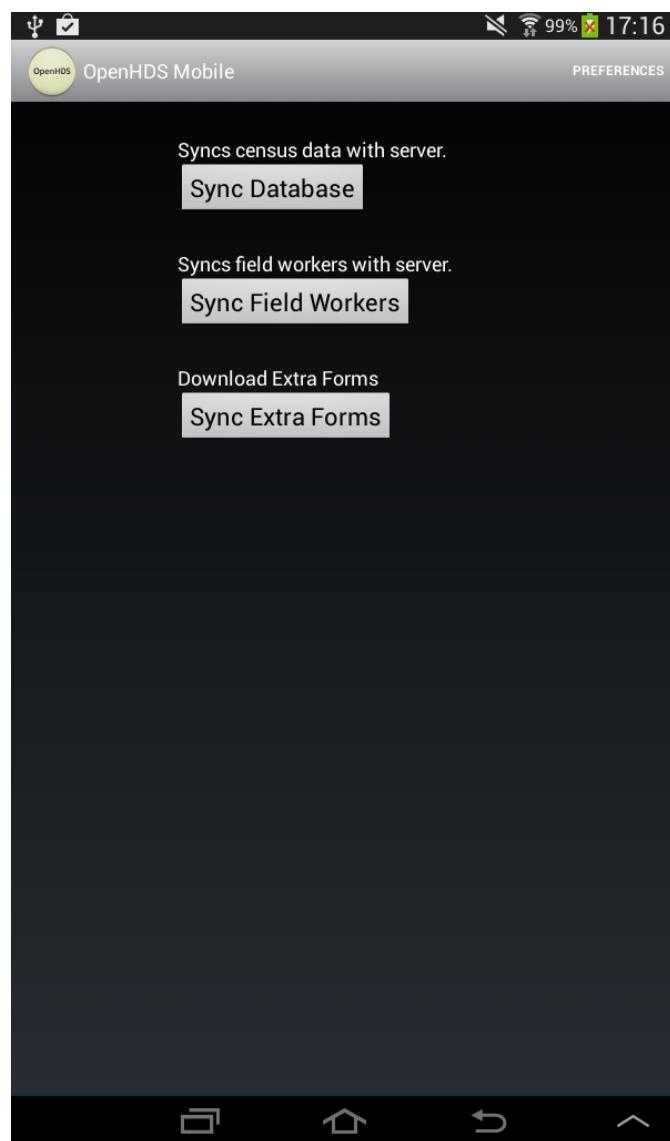


Figure 22

Select «*Sync Database*» to download the OpenHDS Entities onto the tablet

Select «*Sync Field Workers*» to download the OpenHDS Field Workers onto the tablet

Select «*Sync Extra Forms*» to download the Extra Form definitions onto the tablet

Synchronizing ODKCollect

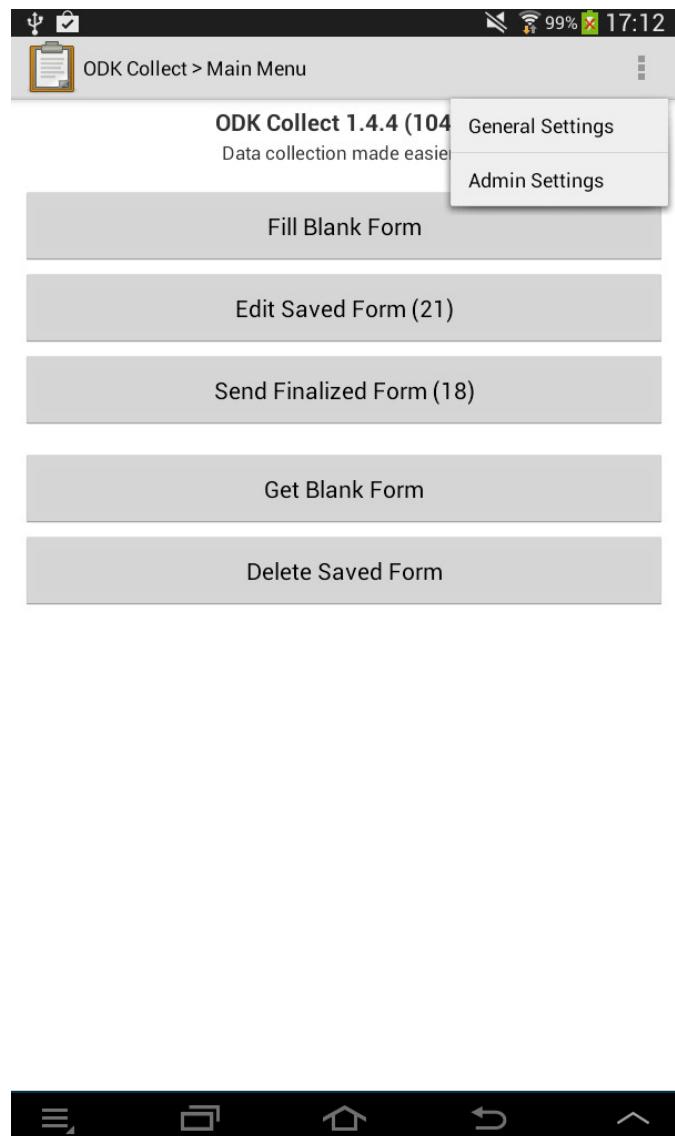


Figure 23

Select «*Get Blank Form*»

ODKCollect will now query for all available Forms directly on the server and display them in an overview

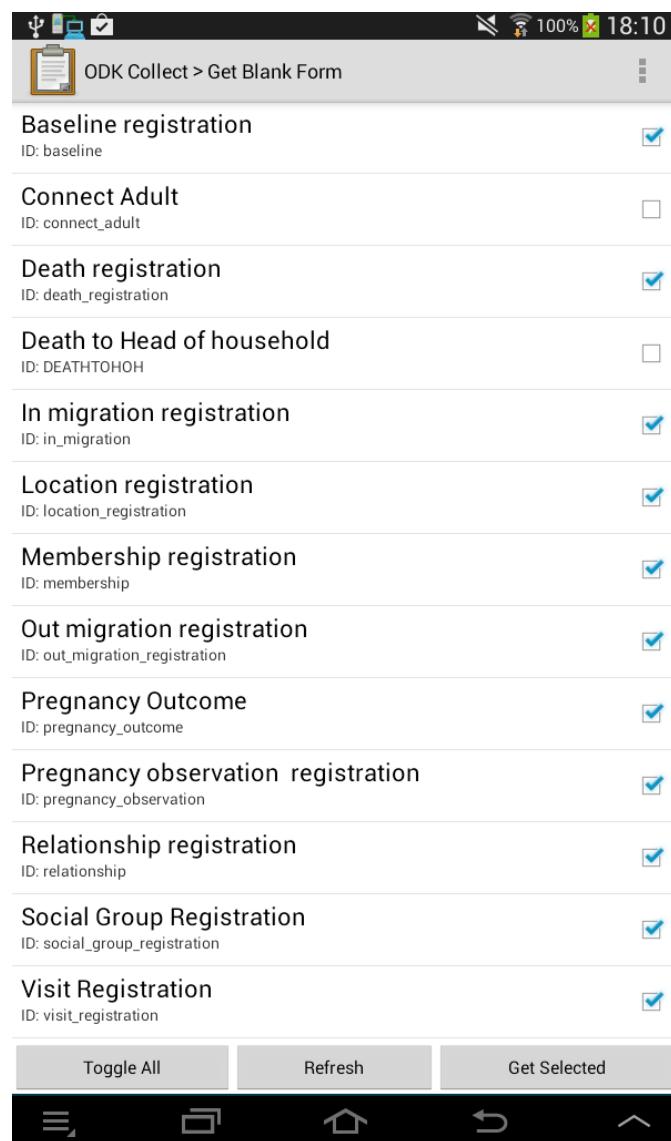


Figure 24

Select the Forms you want to synchronize with the tablet from the list

Click on «*Get Selected*» to start the import process

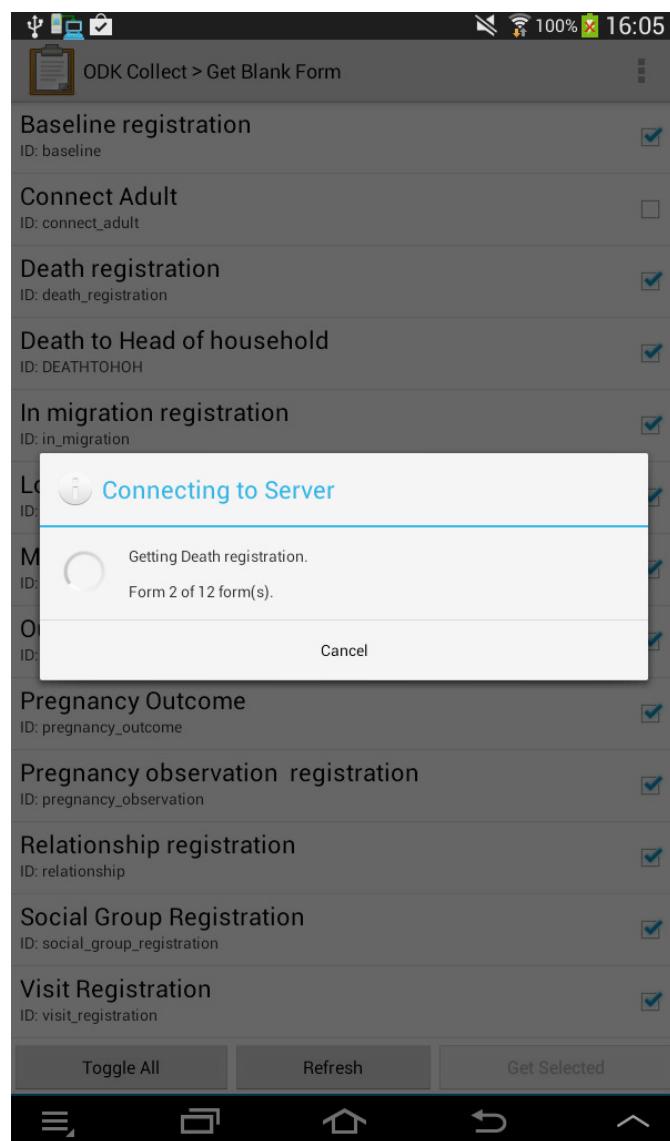


Figure 25

The selected forms are transferred and imported one by one into ODKCollect

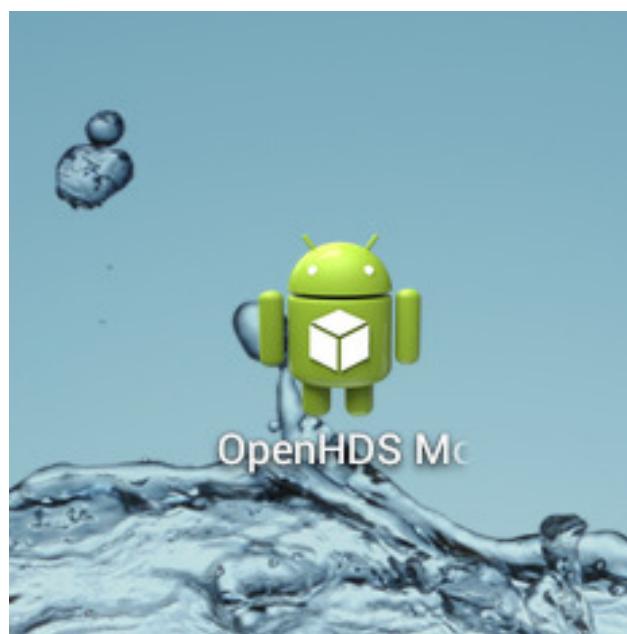
The imported forms are displayed. Make sure there were no errors.

User manual

Field worker manual

This section gives detailed descriptions on how a Field Worker will work with OpenHDS mobile application in the field.

Below are the procedures for OpenHDS mobile data collection using Android Tablet computers.



Field Worker Login

Figure 27 is the login page when pressing “**Log in as Worker**”. For the first time using the device a Field worker should register their user name and password prior to log in. Therefore first s/he should enter Username and Password then tick the Register Field worker on device, and then once they successfully registered (Network is required for this procedure), thereafter they will need to login this time they will have to uncheck the Register Field worker on device.

Getting Started

To get into the application you have to find and tap the icon which looks like **Error! Reference source not found.6**.

First for security purpose, Field worker will need to have login credentials to be able to access the application. Hence they will be encountered with the following page as shown in Figure 2 below:

A Field worker will always use the top button “**Log in as Field Worker**”.

Figure 26

Field

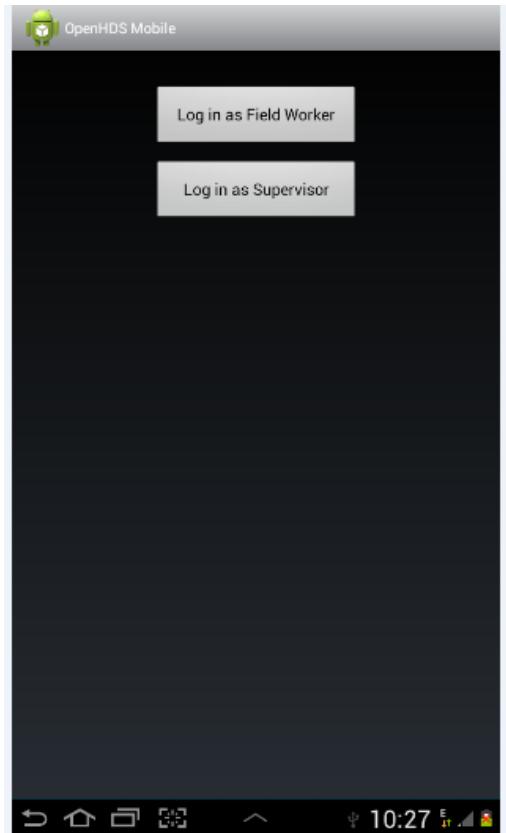


Figure 27

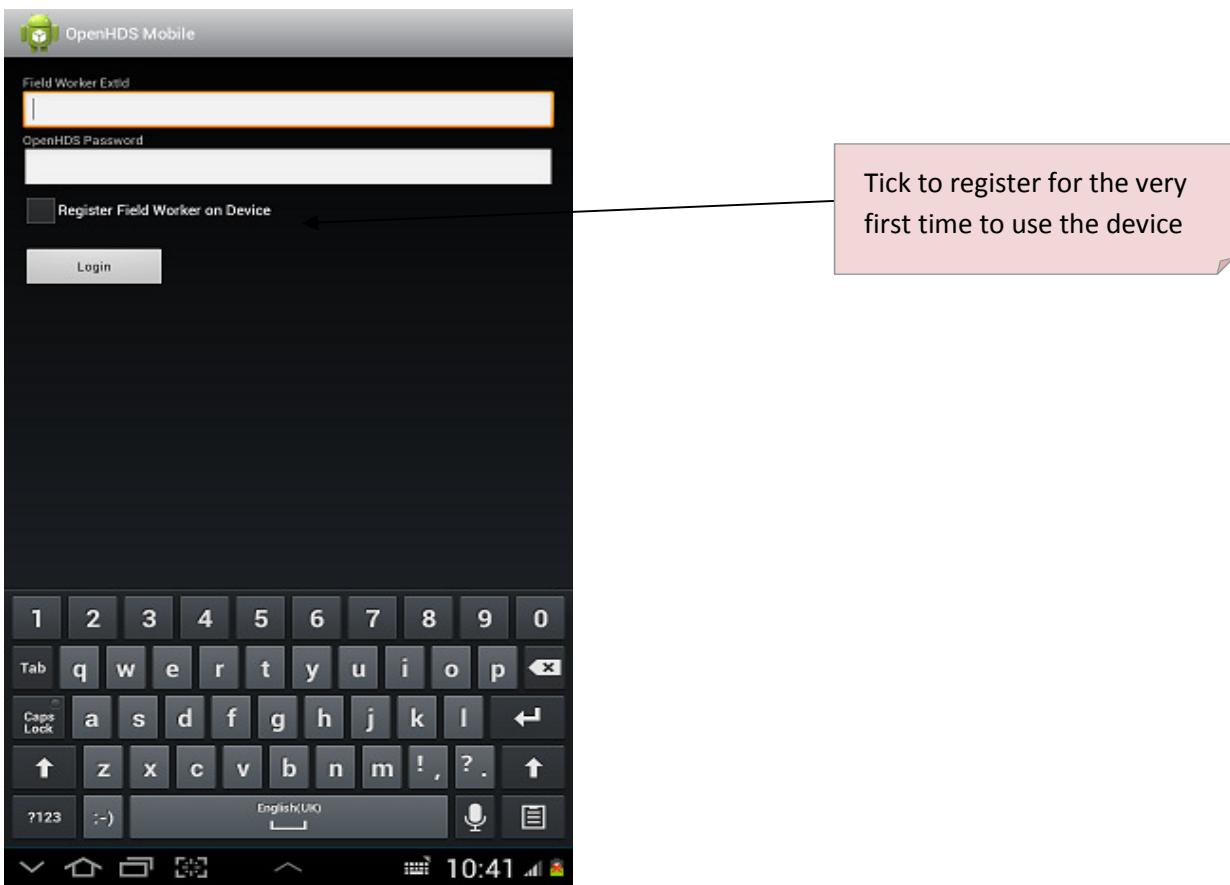


Figure 28

Figure 29 shows the **main menu** display, on the left column is the information about location and individuals while on the right column is event information. Note that most of the buttons are always disabled until it is right time for usage, for instance the “**Select Individual**” button cannot be active if the location information has not been select etc.

On the top right corner you will see the name of the Field worker logged in the device. Only two buttons are active at the main menu page. That means Field worker can only select the location for visiting, beginning with Region as the top level and/or Find the location Geo point of that particular location

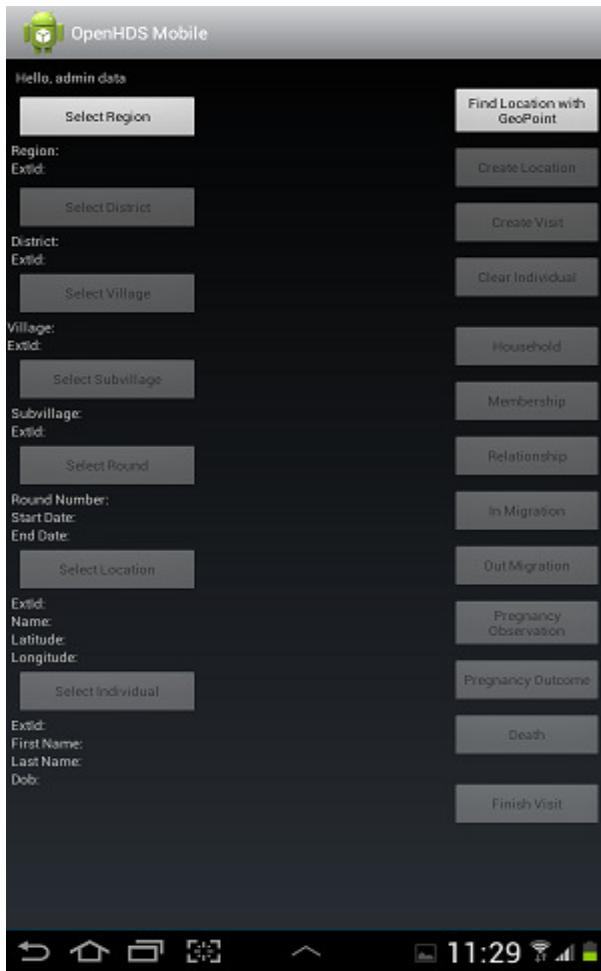


Figure 29

Creating New Location

When Field worker is visiting a new household s/he will have to create a new location, to create a new location select round after select round tap “**Create Location**” button then fill in Name of location, type of location and tap **Record Location** to record GPS reading.

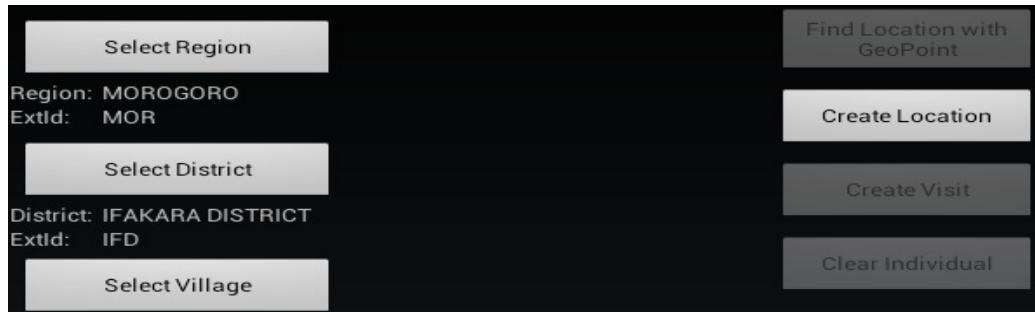


Figure 30

Once Field worker taps the “**Create Location**” button s/he will see the location page as depicted on Figure 31 below;

Figure 31

Most of the fields are pre-filled by the tablet, only two fields need to be filled in, these are Location Name, Location Type Geo point.

The device might take a bit longer to register the GPS coordinates accuracy depends on the number of available satellites but most of the time the best accuracy is when the reading is less than 6 meters accuracy, there you can press record location as per Figure 32. Please note the lower the numbers the better the accuracy.



Figure 32

Please note that to get the best reading is recommended tablet users to be outside the building:

Language Selection

Field workers have an option to choose the language they are comfortable to work with, therefore once they have open the form ready for data entry, they can select the language by tapping the **Menu** button as shown in Figure 33 below;

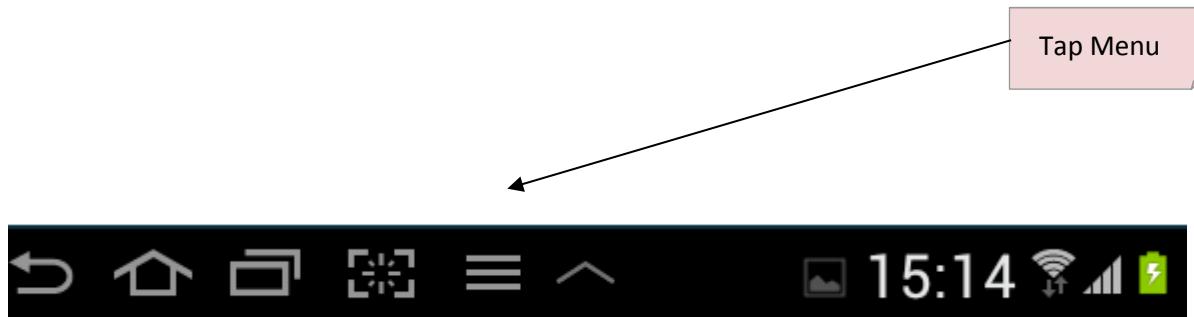


Figure 33

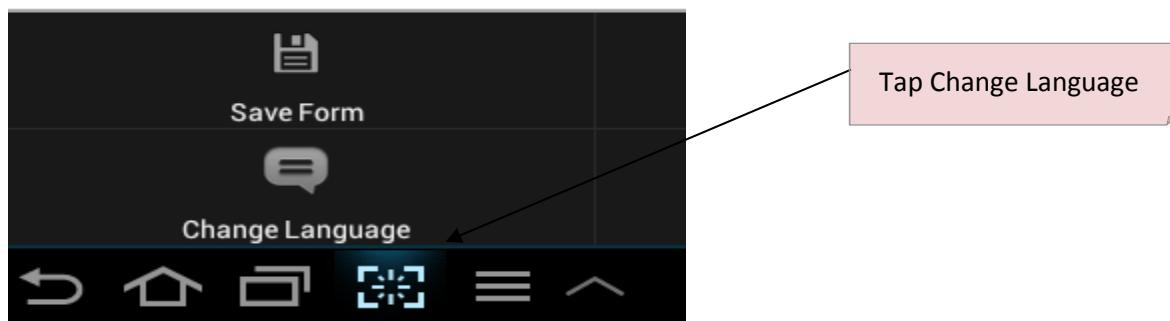


Figure 34

The tap change language to go to the Language selection menu as per Figure 10 below;

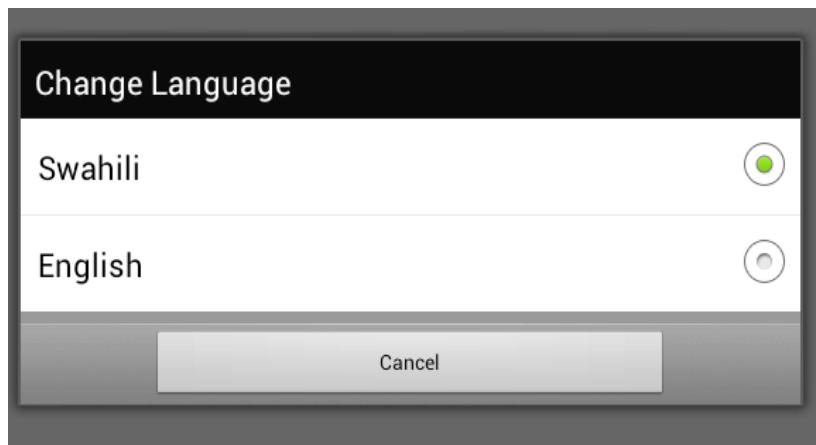


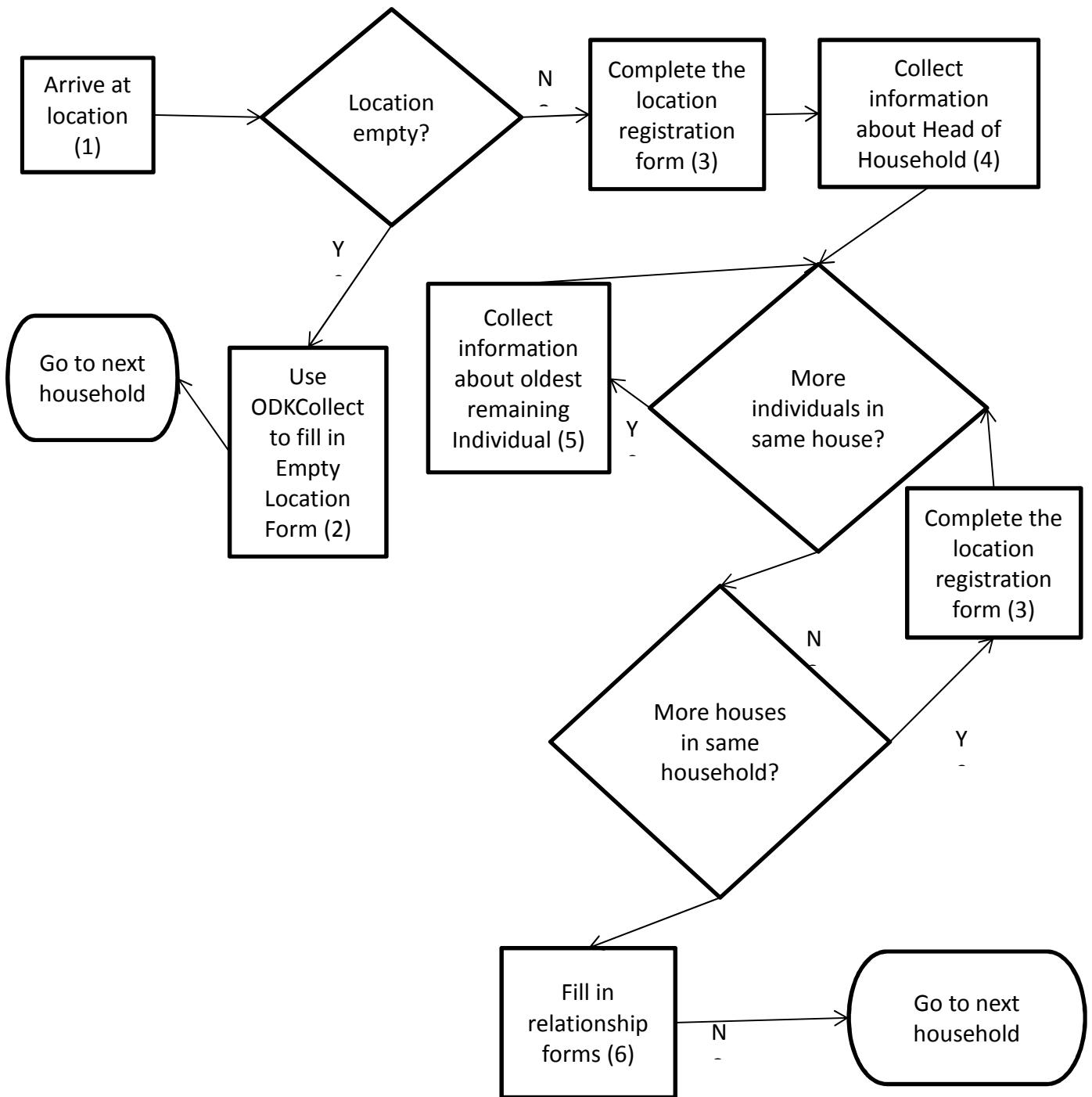
Figure 35

Tablet workflows

This section gives detailed descriptions on how the fieldworker has to handle each specific visit round and the included duties.

Baseline Visit

Following flowchart shows the basic workflow of a baseline visit:



(1) On arrival at the household, find the head of the household. If no one is in the location, an empty location form is completed to keep track of houses that need to be revisited. TODO: we need the head of household (not a different respondent) because of the consent, correct?

(2) The empty location form, unlike all other forms, needs to be filled in by starting ODKCollect, choosing fill blank form, and completing the questionnaire

(3) First collect the information about the location (house) in which the head of household lives. If this is the first house in the household, log in to openHDS, and find the village by going down the location hierarchy. Select “Create location” and complete the questionnaire. For further houses, come back to this step after completing (4) and (5) as shown in the flowchart.

(4) Record information about the head of household by first filling in the baseline form (select “Baseline” to start the form). Select “no” in response to the prompts if mother and father are known. After completing the form chose “Membership”. Choose “Create” when asked whether to search for or create a household. Fill in the household information, use the last name of the head of household as household name. Finish by selecting “Clear individual”.

(5) If there are more individuals living in the same house, register them in decreasing order of age. First fill in the Baseline form. If the parents are in the same household, respond yes to the prompt whether they are registered in the system, and search for the correct individual. After completing the Baseline form complete the Membership form.

(6) Fill in the relationship form for married individuals in the same household

Follow-up Visit

Find Existing Location

A Field worker should be able to explore the location for enumeration starting at Region level down to Household they wish to visit,

Region: MOROGORO
ExtId: MOR

Select District

District: IFAKARA DISTRICT
ExtId: IFD

Select Village

Village: IFAKARA VILLAGE
ExtId: IFV

Create Location

Create Visit

Clear Individual

Household

Figure 37

Filter Existing Location

Sometimes a Field Worker may encounter a very long list of locations. To quickly and accurately enable them select the desired location, they will use location filtering by tapping “**Filter Location**” button and the Figure 38 below shows the search location page for user to search the actual location they need to visit.

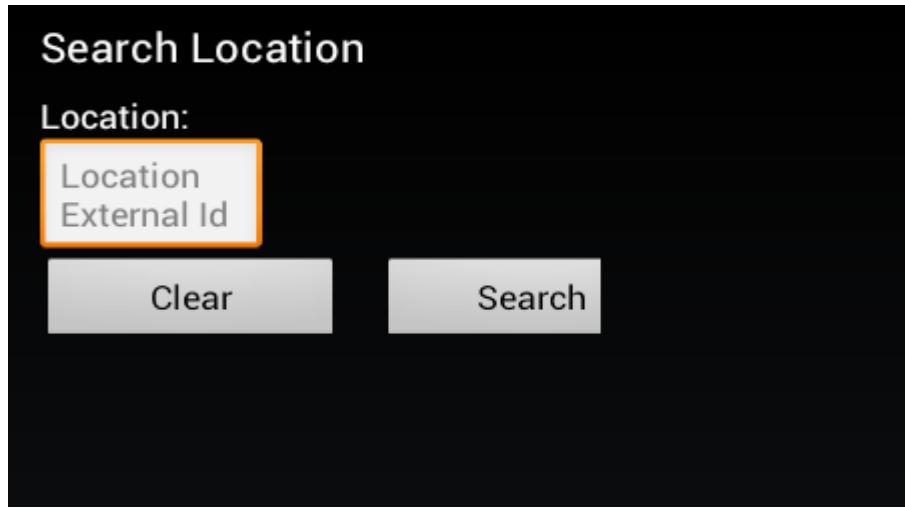


Figure 38

Create Visit

Every time a Field worker visits the household s/he will have to create a visit by tapping the "**Create Visit**" button. This can only be done once the location has been selected. So after tapping the visit the **Search for an Individual page** displays as per Figure 39 below. There a Field worker can tap Search individual after selecting location information and individual names, or just tap the search button without filing in any data for results. A successful search will populate the list of household members in that location ready for the Field worker to pick the individual who shall be interviewed.

Please note: if you are in the household page and unable to view household members, tap "**Select Individual**" button and all members will be displayed.

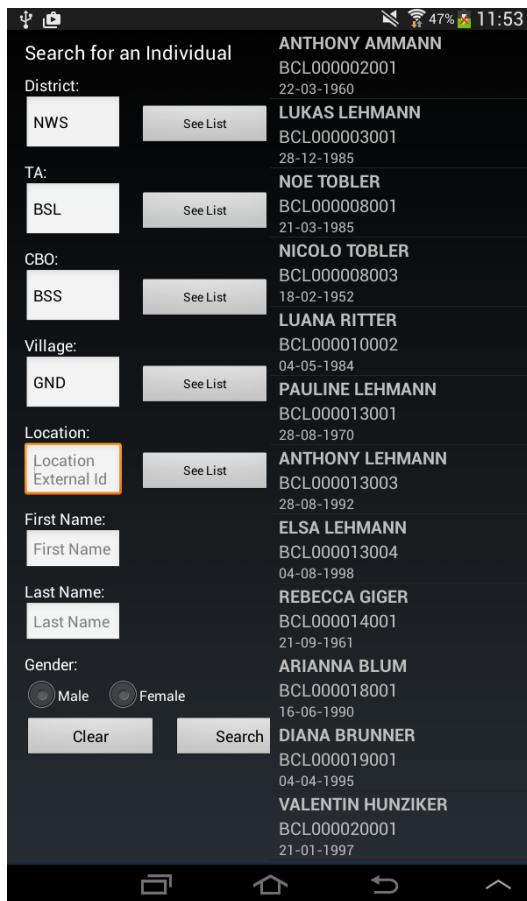


Figure 39

In Migration

In Migration can be in two forms. External from outside HDSS area or Internal from HDSS area:

External in Migration:

To In migrate an individual from outside the HDSS area, tap **In Migration** button. This button can only be active when the Field worker has created a visit. Once they tap that button the pop up message window will show up asking if it was **Internal** or **External**, the Field worker selects the external as per figure 9 below;

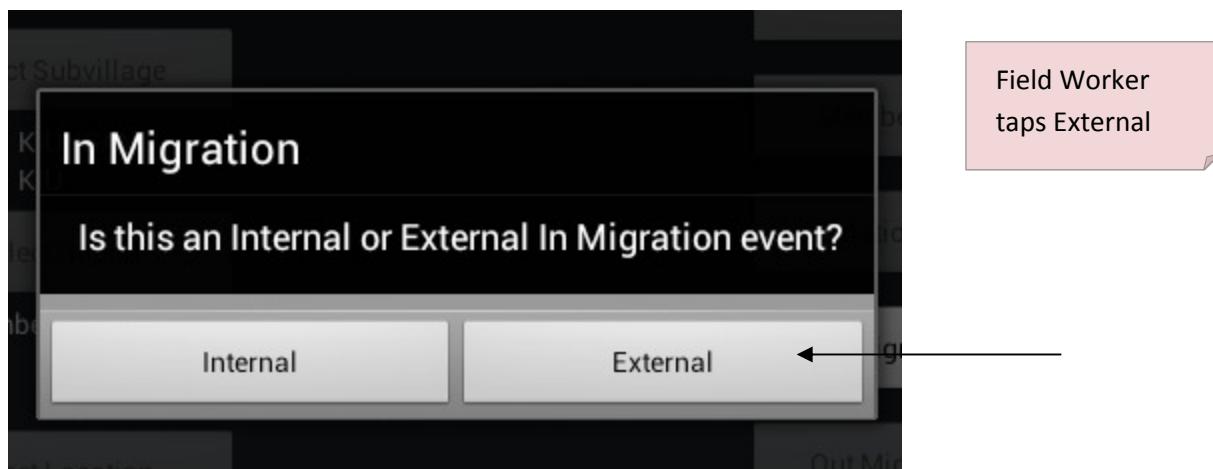


Figure 40

The tablet will try to link mother and father information of the in migrating individual to the existing individual, therefore it will ask if the mother and father of the in migrating individual are known and registered in the system as per Figure 41 and Figure 42 below.

There he should search for the individual to in migrate from the tablet.

IMPORTANT: Please note that at some point when an individual is asked whether s/he has ever registered with the HDSS, s/he might say **NO** which at some point it might not be the truth. To avoid duplicate individual registration to HDSS system, Field worker **MUST** search for the individual's information to verify their existence in the tablet before attempting to add as new individual.

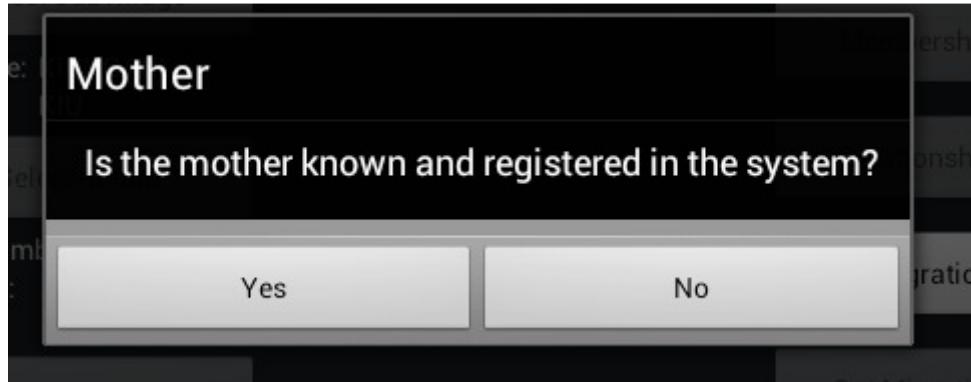


Figure 41

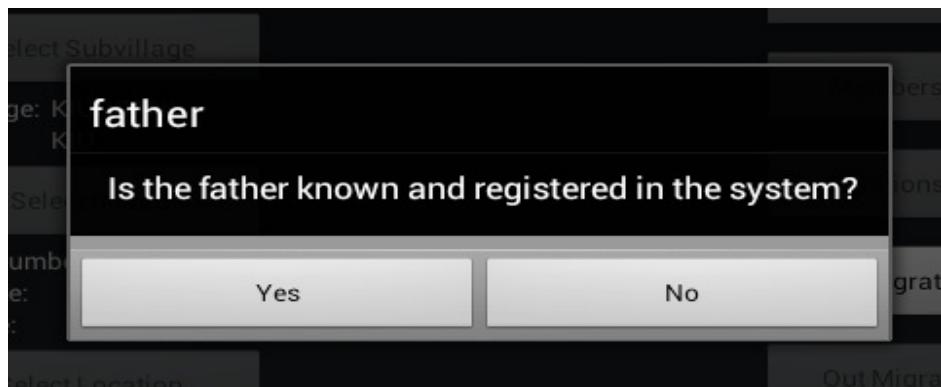


Figure 42

If either mother and/or father of the in migrating individual are known then the tablet will open the search for individual page ready for Field worker to search for the mother and father of the in migrating individual starting with mother and then mother to create the membership as per Figure 43 below:

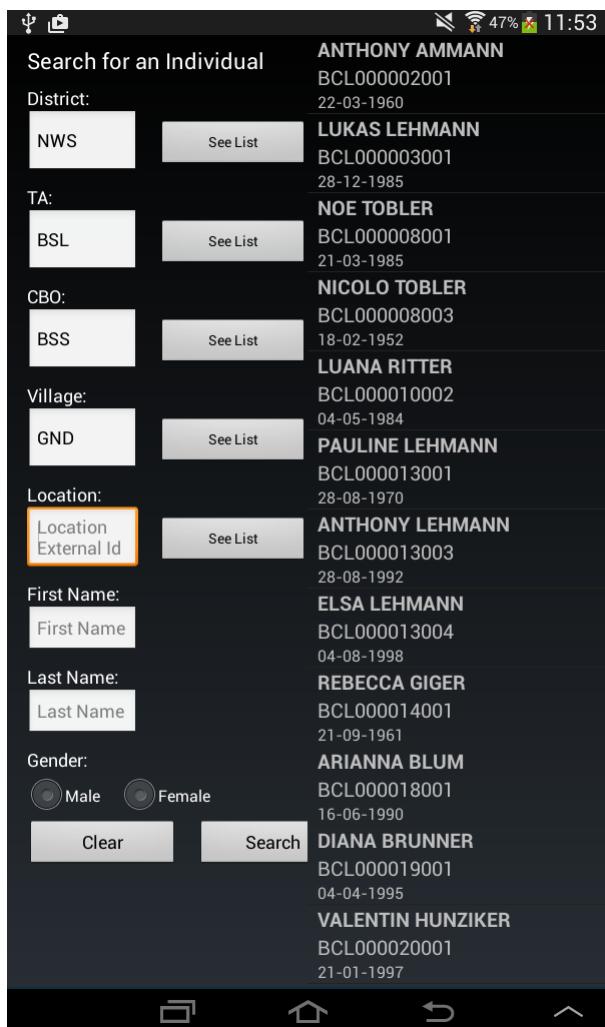


Figure 43

Please bear in mind that the searching functionality will allow Field worker to search from different location hierarchy that is to say they can search on region level to get more results or search on village level to get fewer results. Therefore if Field worker leaves blank in **Village** text box then the search will display all individuals for that district in the **Region**.

Once Field worker finds the matching mother or father the tablet will assign them to that individual and take Field worker on the page for registering the in migrating individual information as depicted in Figure 44 below;

ODK Collect > In Migration

Location Id	IFA000002
Visit Id	IFA000002018
Field Worker Id	FWAD1
Individual Id	IFA000002003
Mother Id	IFA000002002
Father Id	UNK
First Name	
Middle Name	
Last Name	
Gender	
Date of Birth	
Partial Date	
Date of In Migration	
Origin	
Reason	

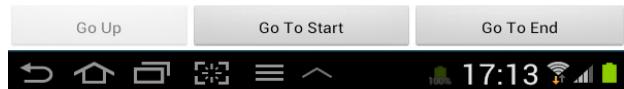


Figure 44

If both mother and father are unknown then the tablet will instead directly open the In Migration form with some pre-filled information ready for the Field worker to continue with filling in the names and other information of the individual as per Figure 44 above.

After external in-migration the Field worker has to create a membership. The pop up window will show up prompting the Field worker to create membership of the individual. Field Worker **MUST** create the membership. Below Figure 45 is the window asking Field worker to create membership. Also please follow the procedures for adding individual membership on the **membership** section;

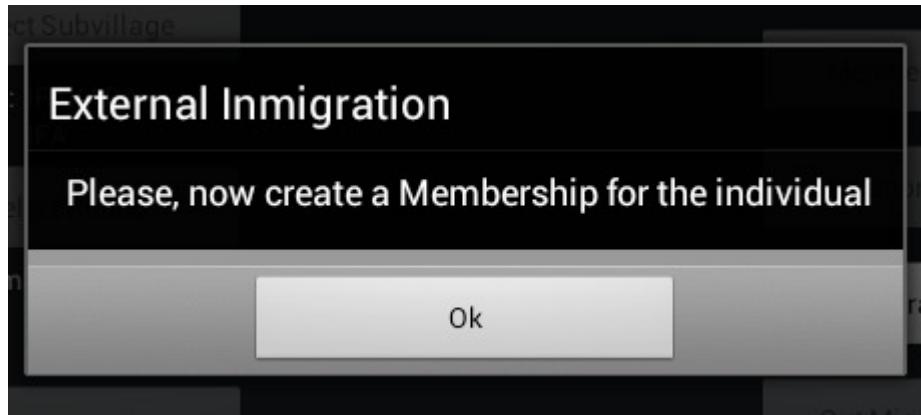


Figure 45

If we are migrating a social group in a new household first the field worker should migrate the head of the household.

Then select the head of the head of the household and create Household (button Household).

Then create the membership for him (indicating him as the head), then membership for all others individuals.

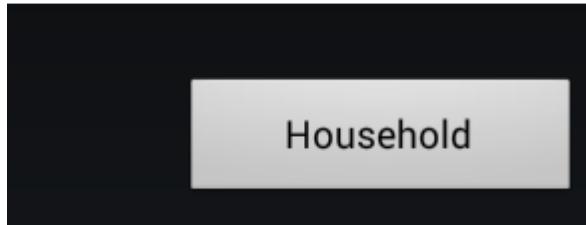


Figure 46

Internal In Migration:

If the individual has migrated from internal the HDSS, once a pop up message shows up tap Internal to in migrate the individual as depicted in Figure 47 below;

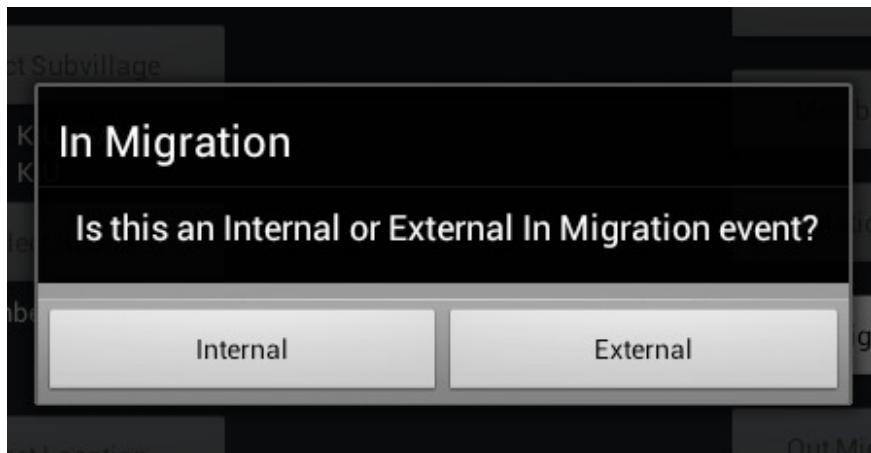


Figure 47

For the internal In Migration the individual to in migrate shall already be available in the tablet, therefore Field worker will be required to search for the individual to in migrate when the “**Search for an Individual**” page opens as shown in Figure 48 below. Every button next to the text box field will populate the list of available location information for Field worker to pick the necessary information for Field worker to search for the individual to in migrate

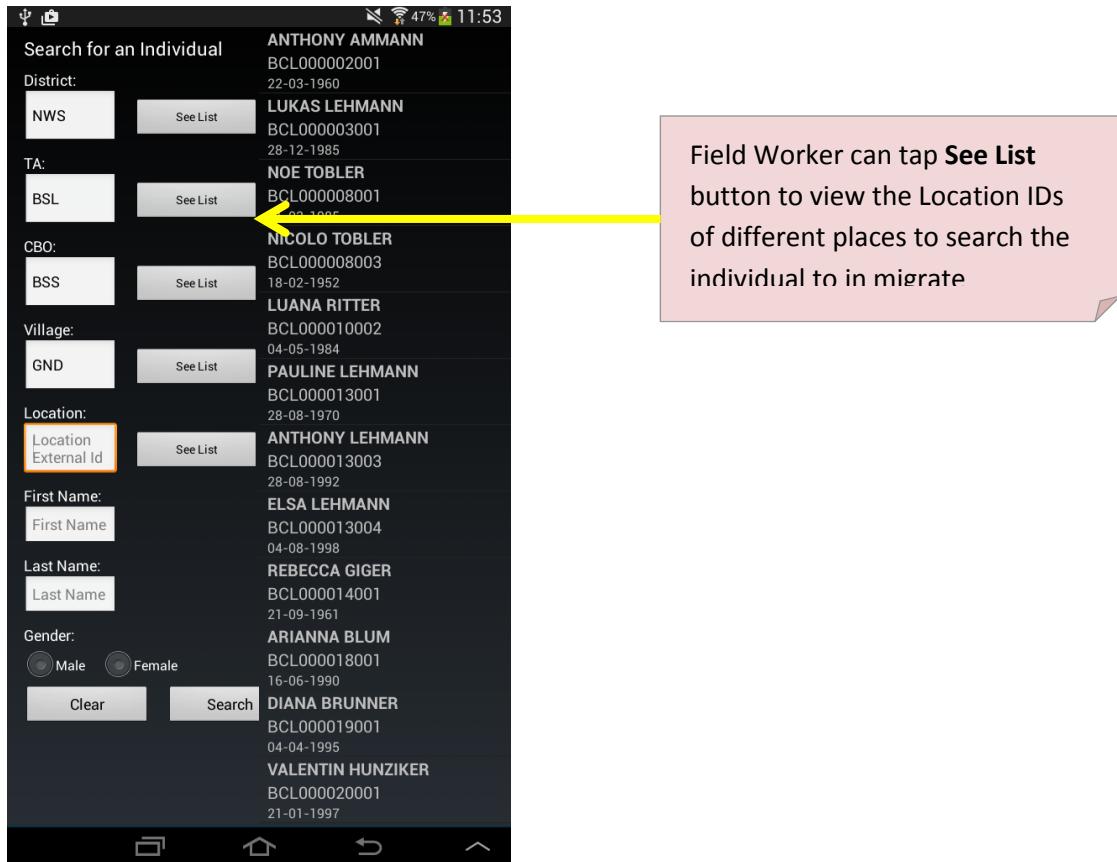


Figure 48

Figure 49

Once a Field worker finds the individual they wish to in migrate s/he will tap to proceed to the next page for finalizing the in migration process as displayed in Figure 49 above. Field worker should fill in and save the form and exit.

Out Migration

ODK Collect > Out Migration Registration

Individual Id
KAT0002001

Field Worker Id
FWAD1

Visit Id
VKAC01491

Date of Migration

Name of Destination

Reason for Out Migration

Go Up Go To Start Go To End

Figure 50

Most of the fields will be pre-filled except for Date of Out Migration, Name of destination and Reason for Out migration.

Membership

Membership **MUST** be created soon after the individual has been migrated in the household otherwise the tablet will not allow Field worker to perform other events of that individual. To create membership Field worker should tap “**Create Membership**” button then tap location ID to select the household to in migrate the individual as per Figure 51 below depicting

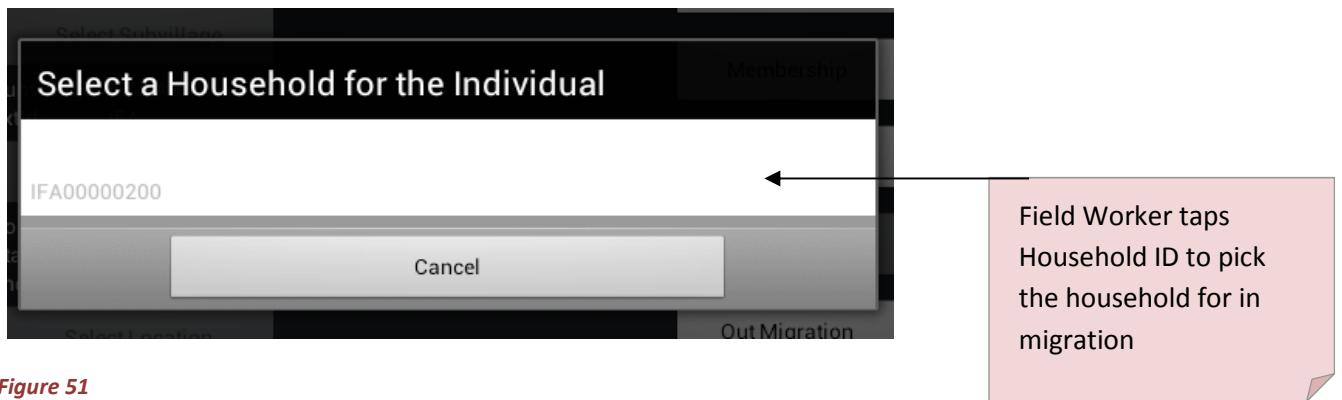


Figure 51

Field worker should start filling the blank fields as depicted in Figure 52 below, once finished should save the form and exit at the end of the form;

ODK Collect > Membership

Individual Id
KAT0002001

Social Group Id
KAT000200

Field Worker Id
FWA01

Relationship to Group Head

Start Date

Go Up Go To Start Go To End

09:24

Figure 52

Relationship

To create the relationship tap “**Select Individual**” button and the list of all individual will be listed, and the Field worker will pick the household member they wish to add the relationship by tapping that member and next the Field worker will tap the “**Relationship**”, then the Field worker will search for the individual to add the relationship with. The Field worker should press “**Search**” button to list individual and pick the one s/he is going to add the relationship and the Relationship page will come up for the Field worker for finalize the relationship by filling in *Relationship type* and *Start Date* as shown in Figure 53 below:

ODK Collect > Relationship

Individual A
IFA000668002

Individual B
IFA000668003

Field Worker Id
FWAD1

Relationship Type

Start Date

Figure 53

Pregnancy Observation

To create pregnancy observation in the household, tap the household member then tap the “**Pregnancy Observation**” button to update her pregnancy observation as per Figure 54 below;

The screenshot shows a mobile application interface for 'Pregnancy observation registration' using ODK Collect. At the top, there are standard Android status icons (signal, battery, time). Below this, the title 'ODK Collect > Pregnancy observation registration' is displayed next to a clipboard icon.

The form consists of several text input fields:

- Number of months pregnant
- Does the expectant mother have:
 - Have you been to an ANC clinic?
 - Have you attended any other Health Facility?
 - Have you received any medicine for the pregnancy?
 - Have you received TT injection?
- Specify if other medicine
- Total number of pregnancies to date
- PERM Id
- Field Worker Id
- Visit Id
- expectedDeliveryDate
- Recorded Date

At the bottom, there is a navigation bar with three buttons: 'Go Up', 'Go To Start', and 'Go To End'. Below this is a dark bar containing standard Android navigation icons: back, home, recent apps, and a menu icon.

Figure 54

Clear Individual

Please note that if you have finished to add events of any individual in the household you can clear the individual for the purpose of select another individual by tapping the "**Clear Individual**" button as shown in Figure 55 below.

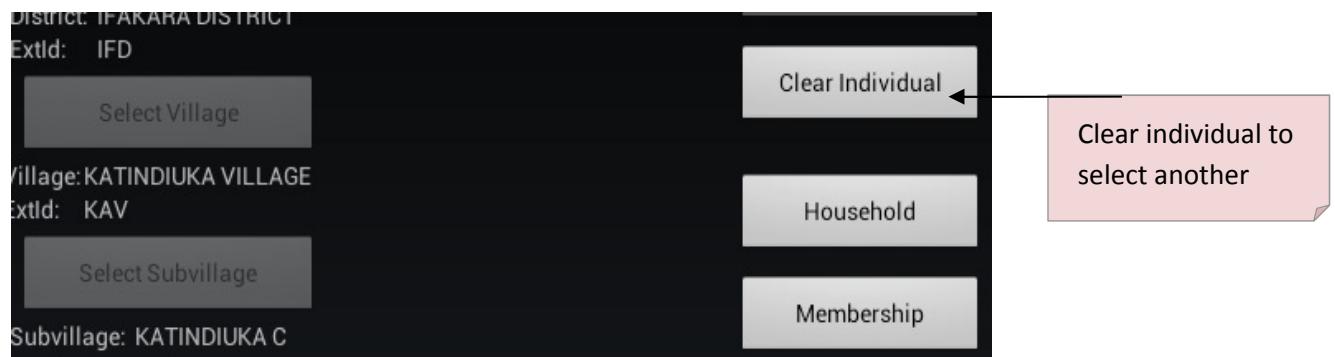


Figure 55

Pregnancy Outcome

To record a pregnancy outcome Field worker should tap the “**pregnancy Outcome**” button after selected the mother and this following window will display option to select the number of live births, tap the number of births as shown in Figure 56 below:



Figure 56

Tap the father in the **Choose father**, window to link the new born with their father as depicted in Figure 57below if that is the father of the new born (if the mother has a relationship with an individual, the individual will be suggested as first choice):

Village: MLABANI VILLAGE
ctId: MLV

Choose Father

Thomas Mann (BAS001001)

Search HDSS

Father not within HDSS

xtId: MLA000557

Household

Pregnancy

Figure 57

Please note, if there was more than one child born the process for fill the form will repeat according to the number of those births, fill in the pregnancy outcome accordingly, save form and exit.

Death

To register the death of individual once the Field worker is in select the deceased household member will click the death button and the form will open for the Field worker to fill in Date of Death, Place of Death and Cause of Death as per Figure 58.

Figure 58

There's a particular case when the deceased person is the head of the household.

In this case the Death for Head of household form will automatically will be opened and there the Field worker has to indicate also the new Head of the household and the membership changes for all the members of the household as shown in the below picture.

The screenshot shows the ODK Collect application running on a mobile device. The top status bar indicates the time as 11:14. The main screen displays a form titled "deathToHOHform". The form contains the following fields:

- Interview Date
- Household ID
- Field Worker
- Visit ID
- Deceased Head of House ID
- Number of Resident Household Members
2
- New Head of House ID
- First Name of New Head of House
- Last name of New Head of House
- Date of Birth of the New Head of House
- Date of Death
16/04/14
- Death Cause diagnosed by health authority?
- Place of Death
- remaining
1
- members

At the bottom of the screen, there is a navigation bar with the following buttons:

- Go Up
- Go To Start
- Go To End
- Back arrow
- Home icon
- File icon
- More options menu

Figure 59

Finish Visit

To finish visit can only be made when the Field worker has completely recorded all the events of the household and ready to leave the premises, otherwise Field Worker are not allow to tap the **Finish Visit** button. When Field worker finishes the visit the application will take them to the main menu, ready for them to visit the next household. To finish visit tap the “**Finish Visit**” as shown in Figure 60 below

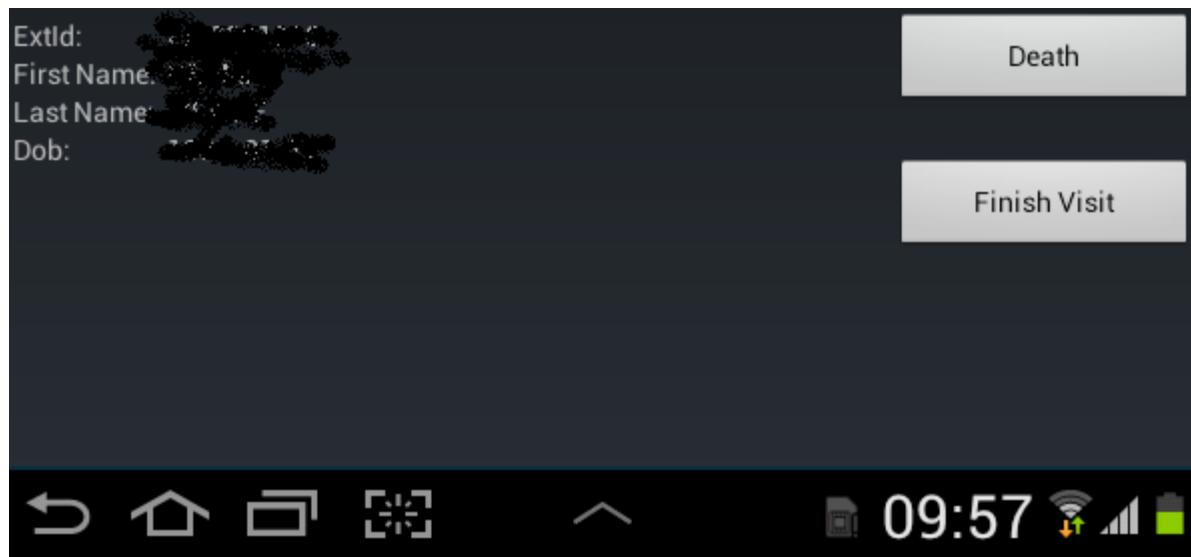


Figure 60

For the purpose of checking that the Field worker has not accidentally tapped the “Finish Visit” button, the pop up message will come up asking Field worker to confirm if they have finished capturing all the events for that particular household and they wish to finish the visit as per Figure 61 below displaying: Tap **Yes** to finish the visit, otherwise tap **cancel** to proceed with the visit

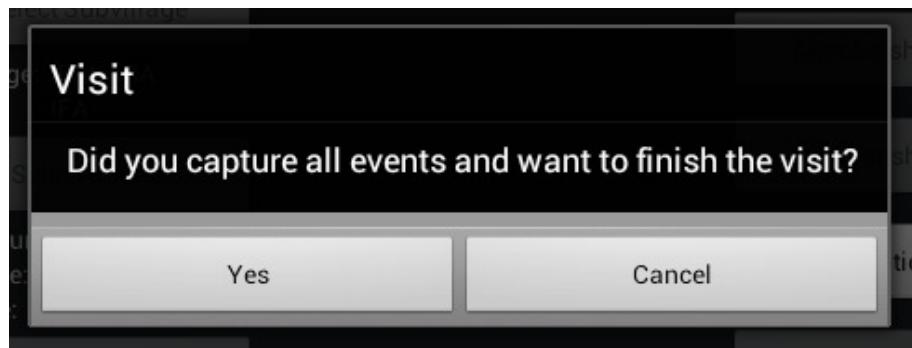


Figure 61

Data manager manual

Extra forms

The tablet component of openHDS can be extended to allow for data collection beyond the core HDSS events and entities, while making use of the demographic database stored on the tablet. Additional (ODK-) questionnaires can be added using the “Extra forms” functionality as follows:

On the server side select “ODK Forms” from the “Utility routines” menu, and define any extra forms required for the current round of enumeration. All forms have the following attributes:

- Name: (corresponds to formId of the ODK uploaded file, and has to be unique)
- Active: you can define when a form is active or not (you can decide to deactivate during a certain period, and re-activate at a later stage)
- Gender: this is a filter, and allows specifying if the form is just for Males or Females or applying to all.

On the tablet side log in as Supervisor, where you will have the option to download the extra form list (this downloads only the form definition stubs. The real forms should be as usual downloaded from using ODKCollect)

When a Field worker starts the survey, once he get at Individual level he'll see on the top right of the screen a new Menu: "Extra forms". There he can search for all or search by name. Upon selection the corresponding form will appear already prefilled with all the IDs previously selected.

If the form is not physically present on the tablet the Field worker will get a warning message.

Every time a property of an extra form is changed (e.g. hidden or unhidden, or via a change of the filter rule), or if a new form is added, form definition stubs on the tablet have to be updated by repeating the download step described above.

Data flows in OpenHDS

The data flow from the tablet to the OpenHDS server is illustrated in Figure 62. On submission to ODKAggregate, the records are flagged by a column in the corresponding database table as unprocessed by Mirth: each table has a column processed_by_mirth, which is set to zero at this stage. MirthConnect attempts to transfer these record to OpenHDS, and set the flag processed_by_mirth=1 on success. A record which fails to pass because of a violation of one of the imposed constraints has the flag processed_by_mirth set to two. These records have to be addressed by a data manager as detailed in the following section.

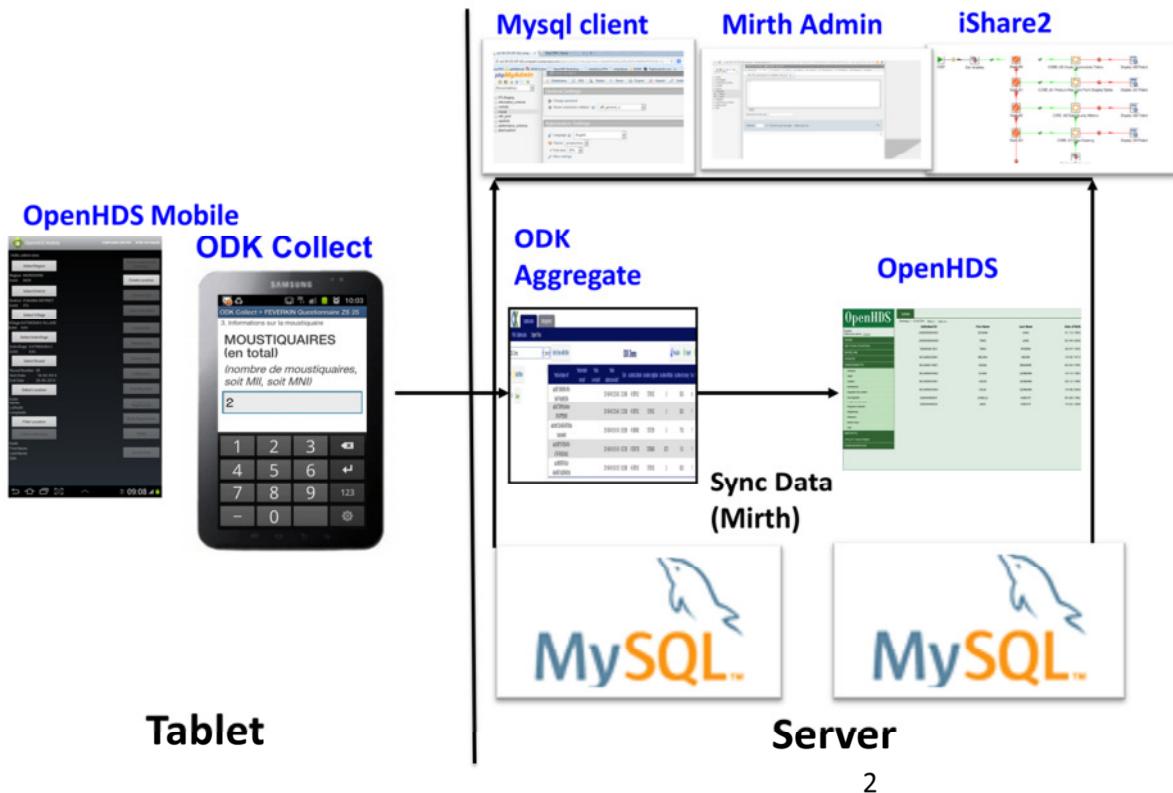


Figure 62 Data flows and monitoring

Error Handling

Error handling and data cleaning should be done on a continuous basis. Monitoring of the data submission first happens at the stage of transferring data from ODKAggregate to OpenHDS through MirthConnect. By default, the Mirth channel will poll the ODKAggregate database every night. Mirthconnect reports error messages as created by the OpenHDS web services, and allows the data manager to browse and filter errors (Figure 62). Faulty records are also visible in the dedicated views using the role of datamanager in an MySQL client. A data manager is required to fix records which failed successful transfer to OpenHDS (i.e. are flagged processed_by_mirth=2), if necessary in consultation with the field team. After error resolution, the processed_by_mirth flag should be reset to zero to make the record eligible for reprocessing by Mirth. Records which are fixed and reset in this way will be picked up the following night when the Mirth channel polls the ODKAggregate database again.

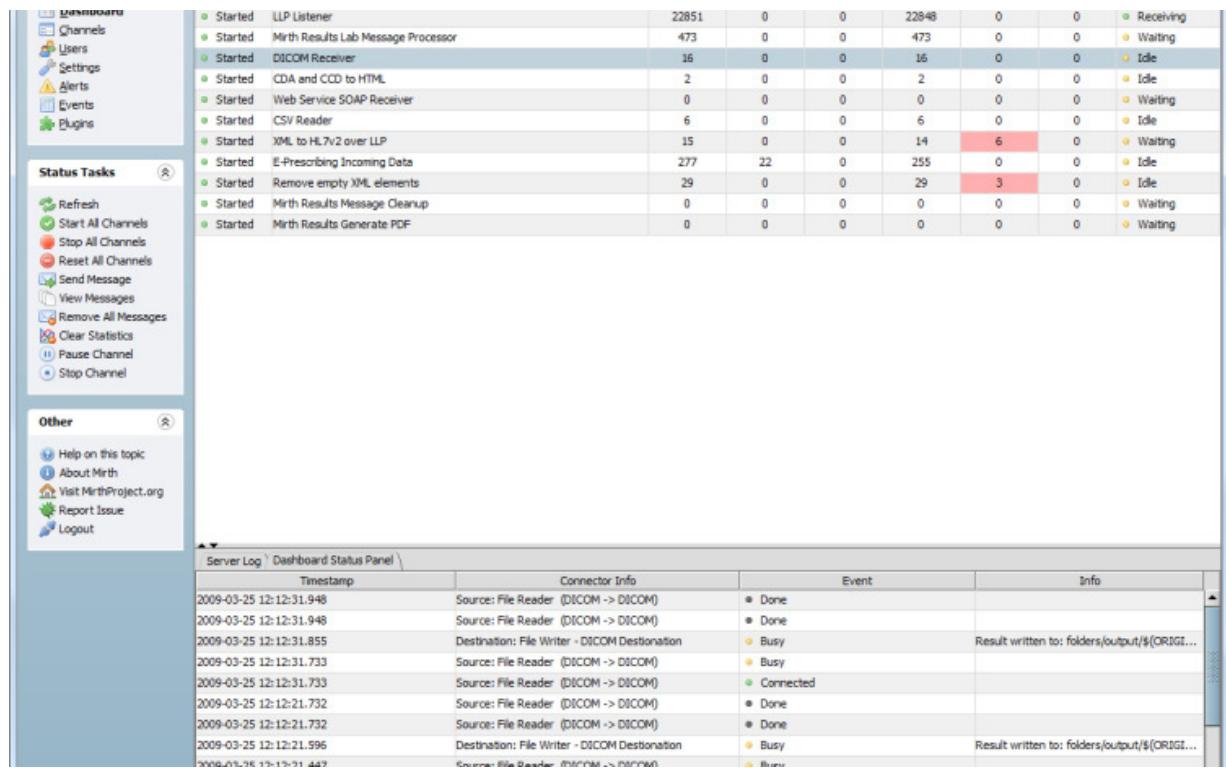


Figure 63 Error reports in MirthConnect

Migration of legacy data to openHDS

This section explains the necessary steps to migrate from the HRS2 platform to its successor OpenHDS. Figure 63 shows the principle of using a MirthConnect channel for moving data from HRS2 via a staging database to OpenHDS. This approach allows re-use of much of the OpenHDS error checking functionality that was developed for Baseline and Update rounds.

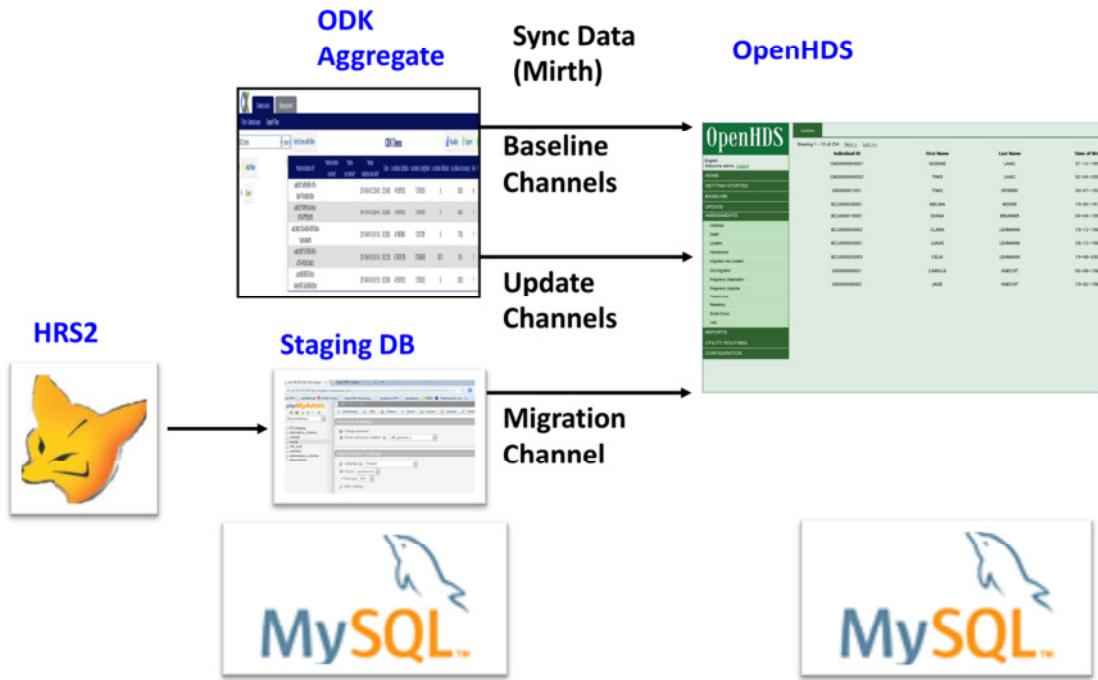


Figure 64: Migration of legacy data from HRS2 to OpenHDS

HRS2 was developed using Microsoft FoxPro. As such it also uses its underlying database structure. The database files are saved locally as separate DBF files for each table, which can be easily copied for data migration.

Attention!

To maintain the highest level of data quality, it is highly recommended that the data migration is only to be done in close collaboration with the Data-Manager (DM) of the migrating site, to avoid ambiguity.

We recommend to dry-run this process first by following the tutorial using the scripts and synthetic data found here: <https://github.com/SwissTPH/openhds-from-hrs2>. The scripts starting with numbers referred to below (e.g. 01_create_hrs_mysql_db.sql) refer to files which are part of the data migration tutorial. We assume that you use the same directory layout as in the github repository. Adjust your paths in the scripts if this is not the case.

Requirements

Before you start with this guide, please make sure you have all the required files and applications:

- HRS2 Database Dump (DBF-Files)
- OpenHDS (version 1.2 or later) with MySQL as database system

File Conversion and staging HDSS database

In a first step all dbf files corresponding to the tables listed as required below need to be imported into a database staging database, we here use hrs_mysql_db to name this. There are various ways of achieving this (e.g. via export to csv files and import to mysql), here we demonstrate how to use R for this purpose. For this:

All DBF-Files should be in one directory.

Create a database named hrs_mysql_db (01_create_hrs_mysql_db.sql). This database is only needed temporary and will be used to clean the data.

Run script 02_a_dbf_mysql.R to convert the dbf to mysql, making sure that the working directory matches the location of the dbf files. The script will first create the empty staging tables needed, and then populate them. The run 02_b_alter_fields.py to change all database columns to datatype varchar (the default of importing from R is datatype text, which has drawbacks).

Required tables for migration

After the creation of the staging HDSS database in MySQL, the following tables should be in the database (same name).

birth

death

individual

indvstatus

inmigration

location

membership

observation

outmigration

pregoutcome

relationship

residency

round

socialgroup

If a table is not there please check the reason.

If a table is there with a different name, please run the following alter table to change the name.

```
ALTER TABLE WRONGTABLENAME RENAME CORRECTTABLENAME;
```

Adding required attributes

All tables which are now populated from the HRS2 records in the dbf files need some modifications in order for the migration to OpenHDS to work. Some steps to all tables, table-specific alterations are described below.

Common steps for all tables

These steps occur in steps 03-17 in the tutorial.

Add new column: **FIELDWORKER** VARCHAR(6)

Add new column: **processed_by_mirth** CHAR(1) DEFAULT '0'

Add new column: **id** INT NOT NULL AUTO_INCREMENT PRIMARY KEY(id)

Using the following script (change TABLE_NAME to the real table name)

```
ALTER TABLE TABLE_NAME
```

```
ADD FIELDWORKER VARCHAR(6) DEFAULT 'FWAD1',
```

```
ADD processed_by_mirth VARCHAR(1) DEFAULT '0',
```

```
ADD id INT AUTO_INCREMENT NOT NULL,
```

```
ADD PRIMARY KEY (id);
```

For each table check that the requirements for IDs defined in openHDS are respected:

Location Id 9 digits (e.g. KWM000087)

Visit ID 12 digits (e.g. KWM000087005 = Location ID + round 3 digit))

SocialGroup/Household ID 11 digits (e.g. KWM00008700 = Location ID + 00)

Individual ID 12 digits (e.g. KWM000087001 + Location ID + individual cardinality 001,002...)

In case it doesn't respect the requirement please pad with 0 (zero) to get the required length.

Steps for each table

Round

Run common SQL-queries.

If all worked ok then the following query should work correctly and all the columns should have a value.

```
select id, ROUND_NUM, str_to_date(START_DATE,'%Y-%m-%d') START_DATE,  
str_to_date(END_DATE,'%Y-%m-%d') END_DATE, REMARKS FROM round where  
processed_by_mirth=0
```

(03_alter_rounds.sql)

Location

Run common SQL-queries.

Extra Scripts:

Add new column: **altitude** CHAR(1)
Add new column: **latitude** CHAR(1)
Add new column: **longitude** CHAR(1)
Add new column: **accuracy** CHAR(1)
Add new column: **subvillageId** CHAR(3)

ALTER TABLE location

```
ADD altitude CHAR(1) default '0',  
ADD latitude CHAR(1) default '0',  
ADD longitude CHAR(1) default '0',  
ADD accuracy CHAR(1) default '0',  
ADD subvillageId VARCHAR(3);
```

Clean eventual duplications on the Location table.

```
select count(LOCATIONID),LOCATIONID from LOCATION group by LOCATIONID order by 1 desc;
```

ALTER TABLE location

```
ADD UNIQUE INDEX idx_locid (LOCATIONID);
```

- Before migrating the Locations, please collaborate with the DM to recreate the Location-Hierarchy!
- SubvillageID on the location table must have the correct value. Please update it with the values provided from the data managers.

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, subvillageId , LOCATIONID, FIELDWORKER, 'RUR' LOCATION_TYPE, ACCURACY, ALTITUDE, LONGITUDE, LATITUDE FROM location WHERE processed_by_mirth =0;
```

Please check that Location ID has the right format.

Location Id 9 digits (e.g. KWM000087)

In case not update it:

e.g. if Location ID is IFA0301 instead of IFA000301.

```
UPDATE LOCATION set LOCATIONID=CONCAT(LEFT(LOCATIONID,3),'00',RIGHT(LOCATIONID,4))  
(04_alter_location.sql)
```

Observation (maps to Visit)

Run common SQL-queries.

Then:

```
ALTER TABLE observation
```

```
ADD INDEX idx_observeid (OBSERVEID);
```

```
ALTER TABLE observation
```

```
ADD INDEX idx_obslocation (LOCATIONID);
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, str_to_date(DATE,'%Y-%m-%d') DATE, OBSERVEID, LOCATIONID, FIELDWORKER, ROUND  
FROM observation WHERE processed_by_mirth=0;
```

Check that there are no records with OBSERVEID null.

If yes, having the Location ID and the Round number update the records accordingly

e.g. update observation set OBSERVEID=concat((LOCATIONID), LPAD(ROUND, 3, '0')) where OBSERVEID is null;

Please check that Location ID and OBSERVEID (VISITID) have the right format.

Location Id 9 digits (e.g. KWM000087)

Visit ID 12 digits (e.g. KWM000087005 = Location ID + round 3 digit))

e.g. if Location ID is IFA0301 instead of IFA000301.

```
UPDATE OBSERVATION set LOCATIONID=CONCAT(LEFT(LOCATIONID,3),'00',RIGHT(LOCATIONID,4));
```

e.g. if OBSERVEID ID is IFA024200 instead of IFA000024200.

```
UPDATE OBSERVATION set OBSERVEID=CONCAT(LEFT(OBSERVEID,3),'000',RIGHT(OBSERVEID,6));
```

Verify and find/fix if there are LOCATIONS in the observation table that are not existing in the location table:

```
select LOCATIONID FROM observation where LOCATIONID not in (select LOCATIONID FROM location);
(05_alter_observation.sql)
```

Individual

Run common SQL-queries.

Add new column: **approximate** INT DEFAULT 1 (maps to dobAspect)

Add new column: **FIRSTNAME** VARCHAR(50)

Add new column: **MIDDLENAME** VARCHAR(50)

Add new column: **LASTNAME** VARCHAR(50)

ALTER TABLE individual

```
ADD FIRSTNAME VARCHAR(50),
ADD MIDDLENAME VARCHAR(50) ,
ADD LASTNAME VARCHAR(50) ,
ADD approximate INT(1) DEFAULT 1;
```

- Since the name of an Individual in HRS2 is not separated into a First-, Middle- and Lastname as in OpenHDS, we have to split up this entry.
For this step, please execute the following SQL query. This will also put an entry of UNKNOWN into the LASTNAME-column, in case the Lastname is still not set.

update individual SET

```
FIRSTNAME = SUBSTRING_INDEX(name, ' ', 1)
,MIDDLENAME = case when locate(" ",Ltrim(SUBSTRING(name, length(SUBSTRING_INDEX(name,'
', 1))+1)))=0
then "
else SUBSTRING_INDEX(Ltrim(SUBSTRING(name, length(SUBSTRING_INDEX(name,'
', 1))+1)), ' ', 1)
end
,LASTNAME = case when locate(" ",Ltrim(SUBSTRING(name, length(SUBSTRING_INDEX(name,'
', 1))+1)))=0
then Ltrim(SUBSTRING(name, length(SUBSTRING_INDEX(name,'
', 1))+1))
else SUBSTRING_INDEX(Ltrim(SUBSTRING(name, length(SUBSTRING_INDEX(name,'
', 1))+1)), ' ', -
1) end;
```

update individual set LASTNAME='UNKNOWN' where length(LASTNAME) =0;

- Replace a Father- and MotherID of 'Q' with 'UNK'.

```
UPDATE individual SET MotherID='UNK' where MotherID='Q';
UPDATE individual SET FatherID='UNK' where FatherID ='Q';
```

```
UPDATE individual SET MotherID='UNK' where MotherID is null;
UPDATE individual SET FatherID ='UNK' where FatherID is null;
```

Add index on INDIVIDID

```
ALTER TABLE individual
    ADD INDEX idx_individual (INDIVIDID);
```

Check that the individual IDs are unique:

```
select count(INDIVIDID), INDIVIDID from individual group by INDIVIDID order by 1 desc;
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, str_to_date(BIRTH_DATE,'%Y-%m-%d') BIRTH_DATE, FIRSTNAME,MIDDLENAME,
MOTHERID, INDIVIDID, GENDER, FIELDWORKER, LASTNAME, approximate, FATHERID FROM
individual WHERE processed_by_mirth=0 order by BIRTH_DATE ASC;
```

Please check that Individual ID is 12 digits (e.g.KWM000087001)

e.g. if is VIS2287005 instead of VIS002287005

```
UPDATE INDIVIDUAL set INDIVIDID=CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7)) ;
```

Same thing for MOTHER and FATHER ID:

```
UPDATE INDIVIDUAL set MOTHERID=CONCAT(LEFT(MOTHERID,3),'00',RIGHT(MOTHERID,7))
where length(MOTHERID)>6;
```

```
UPDATE INDIVIDUAL set FATHERID=CONCAT(LEFT(FATHERID,3),'00',RIGHT(FATHERID,7)) where
length(FATHERID)>6;
```

(06_alter_individual.sql)

Socialgroup

Run common SQL-queries.

Create indexes

```
ALTER TABLE socialgroup
    ADD INDEX idx_sgid (SOCIALGPID);
```

```
ALTER TABLE socialgroup
    ADD INDEX idx_headid (HEADID);
```

Please check that head ID is 12 digits (e.g.KWM000087001)

```
UPDATE socialgroup set HEADID=CONCAT(LEFT(HEADID,3),'00',RIGHT(HEADID,7)) ;
```

Please check that SocialGroups ID is 11 digits (e.g.KWM00008700)

```
UPDATE socialgroup set SOCIALGPID=CONCAT(LEFT(SOCIALGPID,3),'00',RIGHT(SOCIALGPID,6)) ;
```

Be sure that all SocialGroups have a head known in individual table. Fix the one that result from the query below.

```
select * from socialgroup where HEADID not in (select INDIVIDID FROM individual);
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
select id, str_to_date(DE_DATE,'%Y-%m-%d') DE_DATE , SOCIALGPID , FIELDWORKER , NAME, TYPE ,  
HEADID FROM socialgroup WHERE processed_by_mirth=0;  
(07_alter_socialgroup.sql)
```

Relationship

Run common SQL-queries.

create indexes:

```
ALTER TABLE relationship
```

```
ADD INDEX IDX_RELIND (INDIVIDID);
```

```
ALTER TABLE relationship
```

```
ADD INDEX IDX_RELIND2 (INDIVIDID2);
```

Update the column Relationship Type (TYPE) to accepted valid values:

1 - Never Married

2 - Married

3 - Separated/Divorced

4 - Widowed

5 - Living Together

```
UPDATE relationship set TYPE='2' WHERE TYPE='MRT';
```

Update the column EVENTTYPE to accepted/valid values:

DTH - Death

OMG – Out Migration

DHH – Death of Head Household

NA – None

```
UPDATE relationship set EEVENTTYPE ='NA' WHERE EEVENTTYPE is null;
```

```
UPDATE relationship set EEVENTTYPE ='DTH' WHERE EEVENTTYPE ='WID';
```

Check that Individual ID is 12 digits (e.g.KWM000087001)

```
UPDATE relationship set INDIVIDID=CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7)) ;
```

```
UPDATE relationship set INDIVIDID2=CONCAT(LEFT(INDIVIDID2,3),'00',RIGHT(INDIVIDID2,7)) ;
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, str_to_date(DE_DATE,'%Y-%m-%d') DE_DATE, str_to_date(SDATE,'%Y-%m-%d') SDATE,  
INDIVIDID2, FIELDWORKER, INDIVIDID, TYPE FROM relationship WHERE processed_by_mirth =0;
```

(08_alter_relationship.sql)

Membership

Run common SQL-queries.

create indexes:

```
ALTER TABLE membership
```

```
ADD INDEX IDX_MEMIND (INDIVIDID);
```

```
ALTER TABLE membership
```

```
ADD INDEX IDX_RELSPG (SOCIALGPID);
```

Update the column Relation to Head (RLTN_HEAD) to accepted/valid values:

1 - Head

2 - Spouse

3 - Son/Daughter

4 - Brother/Sister

5 - Parent

6 - Grandchild

7 - Not Related

8 - Other Relative

9 - Don't Know

```
UPDATE membership set RLTN_HEAD='1' WHERE RLTN_HEAD='ONE';
UPDATE membership set RLTN_HEAD='2' WHERE RLTN_HEAD='WIF';
UPDATE membership set RLTN_HEAD='3' WHERE RLTN_HEAD='CHD';
UPDATE membership set RLTN_HEAD='4' WHERE RLTN_HEAD IN ('BRO','SIS');
UPDATE membership set RLTN_HEAD='5' WHERE RLTN_HEAD='PAR';
UPDATE membership set RLTN_HEAD='7' WHERE RLTN_HEAD='OTH';
UPDATE membership set RLTN_HEAD='7' WHERE RLTN_HEAD='OTH';
UPDATE membership set RLTN_HEAD='8' WHERE RLTN_HEAD='OT';
UPDATE membership set RLTN_HEAD='9' WHERE RLTN_HEAD='UNK';
```

Update the column EEVENTTYPE to accepted/valid values:

DTH - Death

OMG – Out Migration

DHH – Death of Head Household

NA – None

```
UPDATE membership set EEVENTTYPE='OMG' WHERE EEVENTTYPE ='EXT';
```

```
UPDATE membership set EEVENTTYPE='NA' WHERE EEVENTTYPE IS NULL;
```

Update the column SEVENTTYPE to accepted/valid values:

BIR - Birth

IMG – IN Migration

MAR - Marriage

ENU - Enumeration

```
UPDATE membership set SEVENTTYPE='IMG' WHERE SEVENTTYPE ='ENT';
```

Please check that INDIVIDUAL ID is 12 digits (e.g.KWM000087001)

```
UPDATE membership set INDIVIDID =CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7));
```

Please check that SocialGroups ID is 11 digits (e.g.KWM00008700)

```
UPDATE membership set SOCIALGPID=CONCAT(LEFT(SOCIALGPID,3),'00',RIGHT(SOCIALGPID,6));
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, str_to_date(DE_DATE,'%Y-%m-%d') DE_DATE, str_to_date(SDATE,'%Y-%m-%d') SDATE,
FIELDWORKER, SOCIALGPID, RLTN_HEAD,
INDIVIDID, SEVENTTYPE, EVENTTYPE, str_to_date(EDATE,'%Y-%m-%d') EDATE FROM membership
WHERE processed_by_mirth =0 order by SDATE asc;
```

(09_alter_membership.sql)

Pregnancy observation (indvstatus)

Run common SQL-queries.

create indexes:

```
ALTER TABLE indvstatus
```

```
ADD INDEX IDX_POBIND (INDIVIDID);
```

Please check that INDIVIDUAL ID is 12 digits (e.g.KWM000087001)

```
UPDATE indvstatus set INDIVIDID =CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7));
```

Please check that Visit ID 12 digits (e.g. KWM000087005 = Location ID + round 3 digit))

```
UPDATE indvstatus set OBSERVEID=CONCAT(LEFT(OBSERVEID,3),'000',RIGHT(OBSERVEID,6));
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, OBSERVEID, DATE_ADD(str_to_date(DATE,'%Y-%m-%d'), INTERVAL 9-
CAST(PREG_MONTH AS SIGNED) MONTH) EXPECTED_DELIVERY_DATE,
FIELDWORKER, str_to_date(DATE,'%Y-%m-%d') DATE, INDIVIDID FROM indvstatus WHERE
processed_by_mirth =0
```

(10_alter_indvstatus.sql)

Pregnancy outcome (pregoutcome)

Run common SQL-queries.

create indexes:

```
ALTER TABLE pregoutcome
```

```
ADD INDEX idx_proind (INDIVIDID);
```

```
ALTER TABLE pregoutcome
```

```
ADD INDEX idx_prov (OBSERVEID);
```

Update FATHERID to UNK if equals to 'Q':

```
UPDATE pregoutcome set FATHERID='UNK' where FATHERID='Q';
```

Please check that INDIVIDUAL ID/FATHERID is 12 digits (e.g.KWM000087001)

```
UPDATE pregoutcome set INDIVIDID =CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7));
```

```
UPDATE pregoutcome set FATHERID =CONCAT(LEFT(FATHERID,3),'00',RIGHT(FATHERID,7)) where LENGTH(FATHERID)>6;
```

Please check that Visit ID 12 digits (e.g. KWM000087005 = Location ID + round 3 digit))

```
UPDATE pregoutcome set OBSERVEID=CONCAT(LEFT(OBSERVEID,3),'000',RIGHT(OBSERVEID,6)) ;
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, OBSERVEID, INDIVIDID, 1 PARTIAL_DATE, FIELDWORKER, str_to_date(DATE, '%Y-%m-%d') DATE, FATHERID FROM pregoutcome WHERE processed_by_mirth =0
```

(11_alter_pregoutcome.sql)

Birth

Run common SQL-queries.

Please check that INDIVIDUAL ID is 12 digits (e.g.KWM000087001)

```
UPDATE birth set INDIVIDID =CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7));
```

Please check that SocialGroups ID is 11 digits (e.g.KWM00008700)

```
UPDATE birth set SOCIALGPID=CONCAT(LEFT(SOCIALGPID,3),'00',RIGHT(SOCIALGPID,6)) ;
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT FIRSTNAME, TYPE, SOCIALGPID , GENDER, 9 RELATIONSHIP_TO_GROUP_HEAD, a.INDIVIDID  
INDIVIDID, LASTNAME FROM birth a, individual b where a.INDIVIDID = b.INDIVIDID
```

(12_alter_birth.sql)

Residency

Run common SQL-queries.

Create indexes:

```
ALTER TABLE residency
```

```
ADD INDEX idx_resind (INDIVIDID);
```

```
ALTER TABLE residency
```

```
ADD INDEX idx_resloc (LOCATIONID);
```

Please check that Individual ID is 12 digits (e.g.KWM000087001)

e.g. if is VIS2287005 instead of VIS002287005

```
UPDATE residency set INDIVIDID=CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7));
```

Please check that Location Id 9 digits (e.g. KWM000087)

```
UPDATE residency set LOCATIONID=CONCAT(LEFT(LOCATIONID,3),'00',RIGHT(LOCATIONID,4));
```

Check if data entries are clean. If entries are found that are not consistent, please show them to the DM so that they are fixed! (endDate<startDate, endDate or startdate in the future or before the start of DSS, etc etc)

Update the column EEVENTTYPE to accepted/valid values:

DTH - Death

OMG – Out Migration

NA – None

```
UPDATE residency set EEVENTTYPE='NA' where EEVENTTYPE is null;
```

```
UPDATE residency set EEVENTTYPE='OMG' where EEVENTTYPE ='EXT' ;
```

Update the column SEVENTTYPE to accepted/valid values:

BIR - Birth

IMG – IN Migration

ENU - Enumeration

```
UPDATE residency set SEVENTTYPE='IMG' where SEVENTTYPE ='ENT';
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, str_to_date(DE_DATE,'%Y-%m-%d') DE_DATE, str_to_date(SDATE,'%Y-%m-%d') SDATE,  
FIELDWORKER, LOCATIONID, INDIVIDID,SEVENTTYPE,EEVENTTYPE,str_to_date(EDATE,'%Y-%m-%d')  
EDATE FROM residency WHERE processed_by_mirth =0 order by SDATE asc;
```

(13_alter_residency.sql)

Death

Run common SQL-queries.

When updating the Death locations, please collaborate with the DM to make sure numbers and locations correspond accordingly!

Common SQL-Scripts.

Reason and **Place** should be 2 columns of the death table.

If not rename the columns correspondent to these one.

e.g.

```
ALTER TABLE death  
  
CHANGE DTHPLACE PLACE VARCHAR(99),  
  
CHANGE DTHCAUSE REASON VARCHAR(99);
```

Then

```
update death set PLACE='UNK' where PLACE is null;  
  
update death set REASON='UNK' where REASON is null;
```

Please check that INDIVIDUAL ID is 12 digits (e.g.KWM000087001)

```
UPDATE death set INDIVIDID =CONCAT(LEFT(INDIVIDID,3),'00',RIGHT(INDIVIDID,7));
```

Please check that Visit ID 12 digits (e.g. KWM000087005 = Location ID + round 3 digit))

```
UPDATE death set OBSERVEID=CONCAT(LEFT(OBSERVEID,3),'000',RIGHT(OBSERVEID,6)) ;
```

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, OBSERVEID, REASON, FIELDWORKER, str_to_date(DATE,'%Y-%m-%d') DATE, PLACE,  
INDIVIDID FROM death where processed_by_mirth =0;
```

(14_alter_death.sql)

Outmigration

Run common SQL-queries.

create indexes:

```
ALTER TABLE outmigration
```

```
ADD INDEX idx_omgind (INDIVIDID);
```

```
ALTER TABLE outmigration
```

```
ADD INDEX idx_omgvis (OBSERVEID);
```

REASON should be a column of the outmigration table. If has another name please change it to **REASON**.

E.G. ALTER TABLE outmigration

```
CHANGE OUTMGRREASO REASON VARCHAR(99);
```

Usually this column has a numeric value, please update to the correspondent String value.

E.G. update outmigration set REASON='OTHER' where REASON='6';

Please check that INDIVIDUAL ID is 12 digits (e.g.KWM000087001)

UPDATE outmigration set INDIVIDID =CONCAT(LEFT(INDIVIDID,**3**),'00',RIGHT(INDIVIDID,**7**));

Please check that Visit ID 12 digits (e.g. KWM000087005 = Location ID + round 3 digit))

UPDATE outmigration set OBSERVEID=CONCAT(LEFT(OBSERVEID,**3**),'000',RIGHT(OBSERVEID,**6**)) ;

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, OBSERVEID, REGION_NAM, FIELDWORKER, str_to_date(DATE,'%Y-%m-%d') DATE,  
REASON, INDIVIDID FROM outmigration WHERE processed_by_mirth =0;
```

(15_alter_outmigration.sql)

Immigration

Run common SQL-queries.

create indexes:

ALTER TABLE inmigration

ADD INDEX idx_imgind (INDIVIDID);

ALTER TABLE inmigration

ADD INDEX idx_imgvis (OBSERVEID);

REASON should be a column of the inmigration table. If has another name please change it to REASON.

E.G. ALTER TABLE inmigration

CHANGE IMGREASON REASON VARCHAR(99);

Usually this column has a numeric value, please update to the correspondent String value.

E.G. update inmigration set REASON='OTHER' where REASON='6';

Please check that INDIVIDUAL ID is 12 digits (e.g.KWM000087001)

UPDATE inmigration set INDIVIDID =CONCAT(LEFT(INDIVIDID,**3**),'00',RIGHT(INDIVIDID,**7**));

Please check that Visit ID 12 digits (e.g. KWM000087005 = Location ID + round 3 digit))

UPDATE inmigration set OBSERVEID=CONCAT(LEFT(OBSERVEID,**3**),'000',RIGHT(OBSERVEID,**6**)) ;

If all worked ok then the following query should work correctly and all the columns should have a value.

```
SELECT id, REASON, str_to_date(DATE,'%Y-%m-%d') DATE, INDIVIDID, REGION_NAM MOVED_FROM ,  
OBSERVEID, INTERNAL, LOCATIONID, FIELDWORKER FROM immigration where  
processed_by_mirth=0;
```

(16_alter_inmigration.sql)

Error table

The Mirth error reporting channel will write all problems to an error database. We can create table errors on the HRS database, for the tutorial we will create it in the odk_prod database so we don't need to reconfigure the channel (17_create_error_table.sql).

```
CREATE TABLE `errors` (  
  `id` int(11) NOT NULL AUTO_INCREMENT,  
  `CHANNEL` varchar(30) DEFAULT NULL,  
  `DATA` varchar(500) DEFAULT NULL,  
  `ERROR` varchar(250) DEFAULT NULL,  
  PRIMARY KEY (`id`)  
) ENGINE=InnoDB AUTO_INCREMENT=119 DEFAULT CHARSET=latin1;
```

Data import into OpenHDS

A few prerequisites for the OpenHDS database before transferring the data from the staging database (18_prepare_openhds_db.sql):

Create Fieldworker FWAD1 (Admin Data) in openhds database;

```
insert into  
`fieldworker`(`uuid`,`deleted`,`insertDate`,`voidDate`,`voidReason`,`extId`,`firstName`,`lastName`,`ins  
ertBy_uuid`,`voidBy_uuid`) values ('0318a3bd496578ed014965a075dc001b',0,'2014-10-31  
00:00:00',null,null,'FWAD1','Admin','Data','User 1',null);
```

A location hierarchy corresponding to the entities in the staging database should be defined and present on OpenHDS (18_prepare_openhds_db.sql takes care of this).

Transformation using MirthConnect

Open Mirth Connect Administrator.

Status	Data Type	Name	Id	Description	Rev Δ	Last Deployed
Enabled	XML	Baseline	814bcc47-89b9-47af-882c-265ed71afddb	This channel will a...	0	2014-09-04 09:37
Enabled	XML	Baseline1	95bbf706-26dc-4af7-84ff-aed09a2607e8	This channel will a...	0	2014-09-04 09:37

Connected to: https://data-management.local:8443 | CEST (UTC +2)

Figure 65

Import the appropriate Mirth Channel (Migration Channel) that handles the migration process and the ‘database error writer’ channel.

Configure the connection to openhds DB and application, the HRS db connection in the global script.

Import the code template.

Run the channels.

After the records are processed you can export the error list by table just running the following query;

E:G: select CHANNEL tableName, DATA, ERROR FROM errors where CHANNEL='Visit';

Here you can see the error ant fix them on the HRS table if possible.

All the record not processed will have the flag processed_by_mirth=2 (errored).

If you fix the error and reset the flag to 0 (unprocessed) and re-run the channel, Mirth will try to re-process the record and if the correction was done correctly the record will go to openhds and the flag will be updated to 1 (transferred).

After you export the data and fix it **DON'T forget to delete the data from the error table. Otherwise on next export your list of errors will show them again even if processed.**

So after fixing run on the HRS DB:

E.G. delete from errors where CHANNEL='Visit';

OpenHDS evaluation platforms

In order to lower the entry barrier for parties interested in the evaluation of the software platform, we have compiled an all-in-one package based on virtualization technology, which removes the need for a full-blown IT infrastructure to test the basic features. The following sections describe the setup of this system on a regular PC or Laptop computer, as well as launching a virtual server in the Amazon EC2 infrastructure. The latter has the advantage that an internet-visible network interface is readily available, which makes testing to the tablet application straightforward.

OpenHDS in VirtualBox

Download and install Virtualbox (<https://www.virtualbox.org/wiki/Downloads>). Download the openhds_server.ova (<https://www.wuala.com/swisstph-phc/openhds/>) and import this into your local Virtualbox host. This is an Ubuntu 12.4 system, with all necessary components of openHDS installed (openDHS server, ODKAggregate, MirthConnect, openHDS mobile), and initialized as a functional openHDS server.

Make sure the network settings of the virtual machine enable you to connect from your computer. You may need to adapt the network settings in the virtual machine manager, and/or the network configuration of the Ubuntu system (which is set to the static IP address 192.168.56.102). The configuration of the test data generator (below) assumes that the server is accessible under the name data-management.local. Either change the configuration of the test data generator, or map this name to the IP of the virtual server. On a Windows 7 host system, this can be done by adding the following line to the file "c:\Windows\System32\drivers\etc\hosts"

192.168.56.102 data-management.local

All services on the server are running after booting the image. The openHDS database comes pre-populated with a synthetic test data set.

URLS:

- Tomcat is available under <http://data-management.local:8080/>
- openHds : <http://data-management.local:8080/openhds/>
- ODKAggregate : <http://data-management.local:8080/ODKAggregate/>

The mirth connect administrator tool can be reached from the host system via: <https://data-management.local:8443> / (create exception)

From there you can start the java webstart app. It will fail due to insufficient permissions, so we'll need to add this url to a whitelist. Control Pane -> Java -> Security -> Edit Sitelist -> Add -> Insert <https://data-management.local:8443> -> Ok -> Ok.

Most necessary users (Linux, mysql, mirthConnect Admin) are called data, with password data. The openHDS administrative user is called admin, with password test. This image is intended purely for

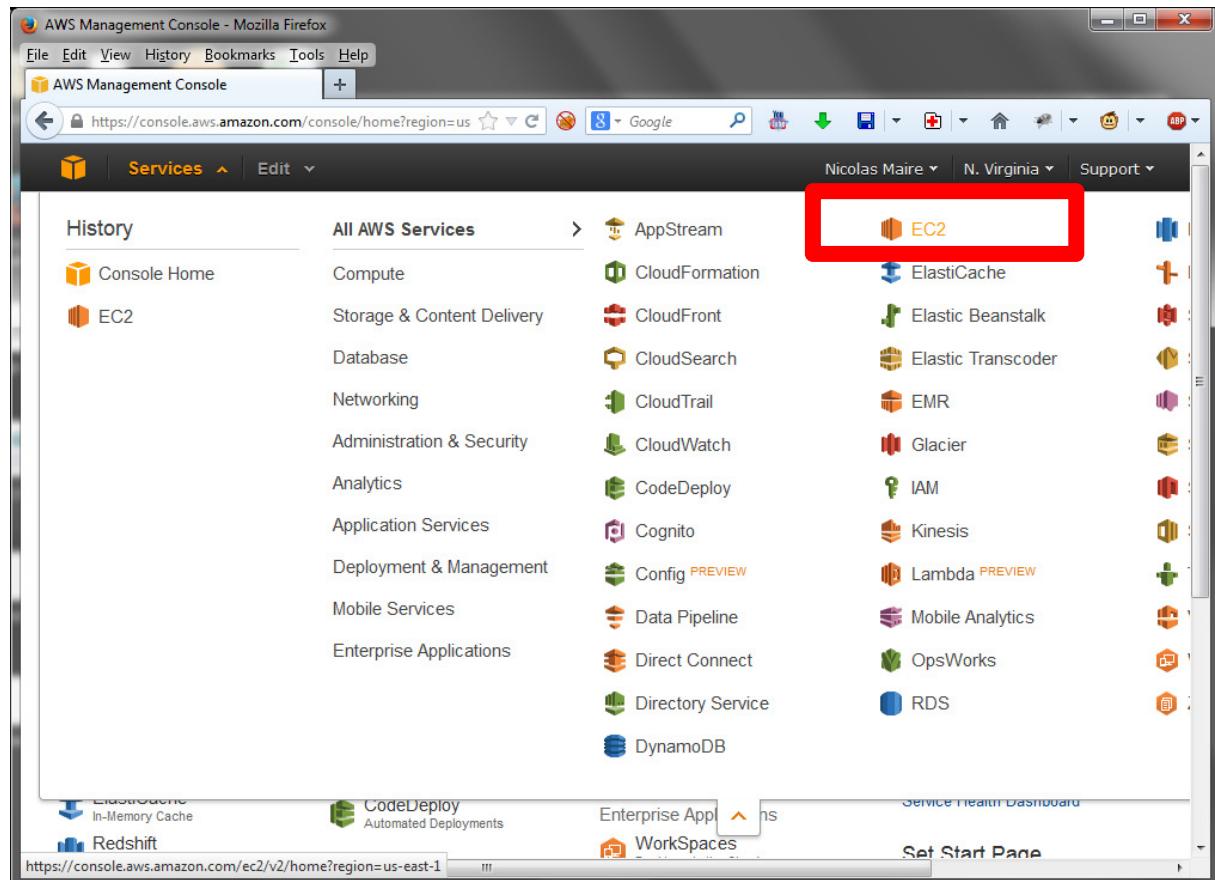
development and testing, THE VIRTUAL MACHINE SHOULD NOT BE ACCESSIBLE ON A SHARED NETWORK INTERFACE AT ANY TIME.

OpenHDS on EC2

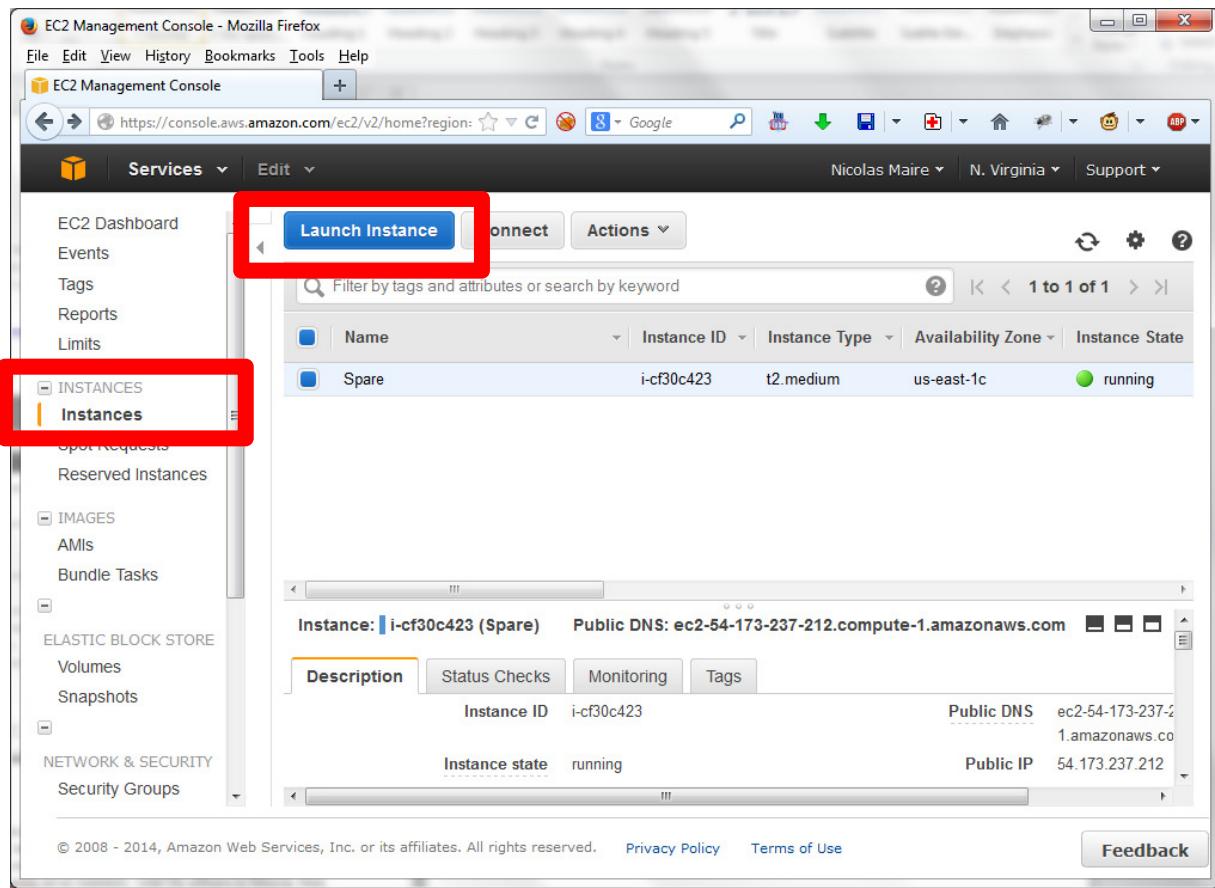
This OpenHDS evaluation package is running as an Amazon EC2 (Elastic Cloud Computing) instance which is part of Amazon's Web Services (AWS). This system also comes in the form of a virtualized image just like the virtual box image described in the previous section. The difference is that the system is running in the cloud and could thus be reached from anywhere with an internet access and a Web-Browser. This Evaluation Package was first created for the OpenHDS Workshop 2014 in Dubai. It will be continually be updated and extended to provide more functionality.

Create an account for AWS at <http://aws.amazon.com/>. Sign in into the AWS console from <https://console.aws.amazon.com>.

From the Services menu, choose EC2:



Go into Instances section and click on Instances:



Click on “Launch instance”.

Click on “Community AMIs” (AMI stands for ‘Amazon Machine Image’) and search for OpenHDS.

EC2 Management Console - Mozilla Firefox

File Edit View History Bookmarks Tools Help

EC2 Management Console

Services Edit

Nicolas Maire N. Virginia Support

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

Step 1: Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Quick Start My AMIs AWS Marketplace

Community AMIs

Operating system

- Amazon Linux
- Cent OS
- Debian
- Fedora
- Gentoo

OpenHDS 1.2.1 - ami-44cb592c

OpenHDS Evaluation platform

Root device type: ebs Virtualization type: hvm

Select 64-bit

Cancel and Exit

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The OpenHDS evaluation platform should be displayed under the found AMIs.

EC2 Management Console - Mozilla Firefox

File Edit View History Bookmarks Tools Help

EC2 Management Console

Services Edit

Nicolas Maire N. Virginia Support

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

Step 1: Choose an Amazon Machine Image (AMI)

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OpenHDS 1.2.1 - ami-44cb592c

OpenHDS Evaluation platform

Root device type: ebs Virtualization type: hvm

Select 64-bit

Cancel and Exit

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Click on Select to start creating an EC2 instance with this AMI as a basis.

From the next menu you can select an Instance type. Depending on the type you choose, this will influence the number of virtual CPUs and the main memory available. The OpenHDS evaluation platform is optimized to run on a ‘t2.medium’ instance. It might be possible to run it on a lower tier, but this was never tested, since they come only with 1 GB of RAM and we don’t recommend it. The pricing for this instance type can be looked up on <http://aws.amazon.com/ec2/pricing/> but in general is very affordable and at the time of writing this documentation on hour of usage of the ‘t2.medium’ tier cost only \$0.052 per Hour.

The screenshot shows the AWS EC2 Management Console interface. The title bar reads "EC2 Management Console - Mozilla Firefox". The main navigation bar includes "File", "Edit", "View", "History", "Bookmarks", "Tools", and "Help". Below the navigation bar, there's a toolbar with icons for search, refresh, and other browser functions. The top menu bar has "Services" and "Edit" dropdowns, along with user information "Nicolas Maire", "N. Virginia", and "Support". A progress bar at the top indicates steps 1 through 7. Step 2, "Choose Instance Type", is currently active. The page content starts with "Step 2: Choose an Instance Type" and a brief description of instance types. A table lists instance types by family, type, vCPUs, memory, storage, EBS-optimized availability, and network performance. The "t2.medium" row is highlighted with a red box. At the bottom of the table are buttons for "Cancel", "Previous", "Review and Launch", and "Next: Configure Instance Details". The footer contains copyright information for Amazon Web Services and links for "Privacy Policy" and "Terms of Use".

Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
General purpose	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate
General purpose	t2.small	1	2	EBS only	-	Low to Moderate
General purpose	t2.medium	2	4	EBS only	-	Low to Moderate

After choosing the t2.medium type, click on ‘Next: Configure Instance Details’.

Here you don't need to change any settings:

EC2 Management Console - Mozilla Firefox

File Edit View History Bookmarks Tools Help

EC2 Management Console

Services Edit Nicolas Maire N. Virginia Support

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot Instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances: 1

Purchasing option: Request Spot Instances

Network: vpc-1b65dc7e (172.31.0.0/16) (default) Create new VPC

Subnet: No preference (default subnet in any Availability Zone) Create new subnet

Auto-assign Public IP: Use subnet setting (Enable)

IAM role: None

Shutdown behavior: Stop

Enable termination protection: Protect against accidental termination

Cancel Previous Review and Launch Next: Add Storage

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Click on 'Next: Add Storage'

EC2 Management Console - Mozilla Firefox

File Edit View History Bookmarks Tools Help

EC2 Management Console

Services Edit Nicolas Maire N. Virginia Support

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. [Learn more](#) about storage options in Amazon EC2.

Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Delete on Termination	Encrypted
Root	/dev/sda1	snap-d6e47067	20	General Purpose (S)	60 / 3000	<input checked="" type="checkbox"/>	Not Encrypted

Add New Volume

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. [Learn more](#) about free usage tier eligibility and usage restrictions.

Cancel Previous Review and Launch Next: Tag Instance

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Create a 'General Purpose' volume of 20GB in size and click on 'Next: Tag Instance'.

From the next step you can create a name for this instance and also add other tags:

The screenshot shows the EC2 Management Console in Mozilla Firefox. The URL is https://console.aws.amazon.com/ec2/v2/home?region=us-east-1. The navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, and a search bar with Google. The main menu has Services and a user account. Below the menu, a progress bar shows steps 1 through 7: Choose AMI, Choose Instance Type, Configure Instance, Add Storage, Tag Instance (underlined in blue), Configure Security Group, and Review. Step 5, 'Tag Instance', is currently active. It displays a key-value pair: Key 'Name' and Value 'OpenHDS Evaluation Platform'. A red box highlights this pair. Below it is a 'Create Tag' button. At the bottom are 'Cancel', 'Previous', 'Review and Launch' (highlighted in blue), and 'Next: Configure Security Group'.

Click on 'Next: Configure Security Group'.

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: Create a new security group Select an existing security group

Security group name: launch-wizard-2

Description: launch-wizard-2 created 2014-11-23T08:10:34.705+01:00

Type	Protocol	Port Range	Source
SSH	TCP	22	Anywhere 0.0.0.0/0

Add Rule

Warning
Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow

[Cancel](#) [Previous](#) [Review and Launch](#)

This next step is crucial in restricting access to your EC2 instance. If you don't do that anybody from anywhere is able to access your EC2 instance and might gain unauthorized access.

We recommend restricting the EC2 access to your IP. The recommended settings are shown in the table below:

Type	Protocol	Port Range
MYSQL	TCP	3306
Custom TCP Rule	TCP	8080
SSH	TCP	22
HTTP	TCP	80
Custom TCP Rule	TCP	8443
Custom TCP Rule	TCP	8082

To input your current IP, open the drop-down menu under Source for the entry and select my IP. From here It is also possible to define a whole IP range.

Next, click on 'Review and Launch'.

On the next screen you get a final overview screen. Make sure your settings are correct or modify accordingly with the Edit functionality.

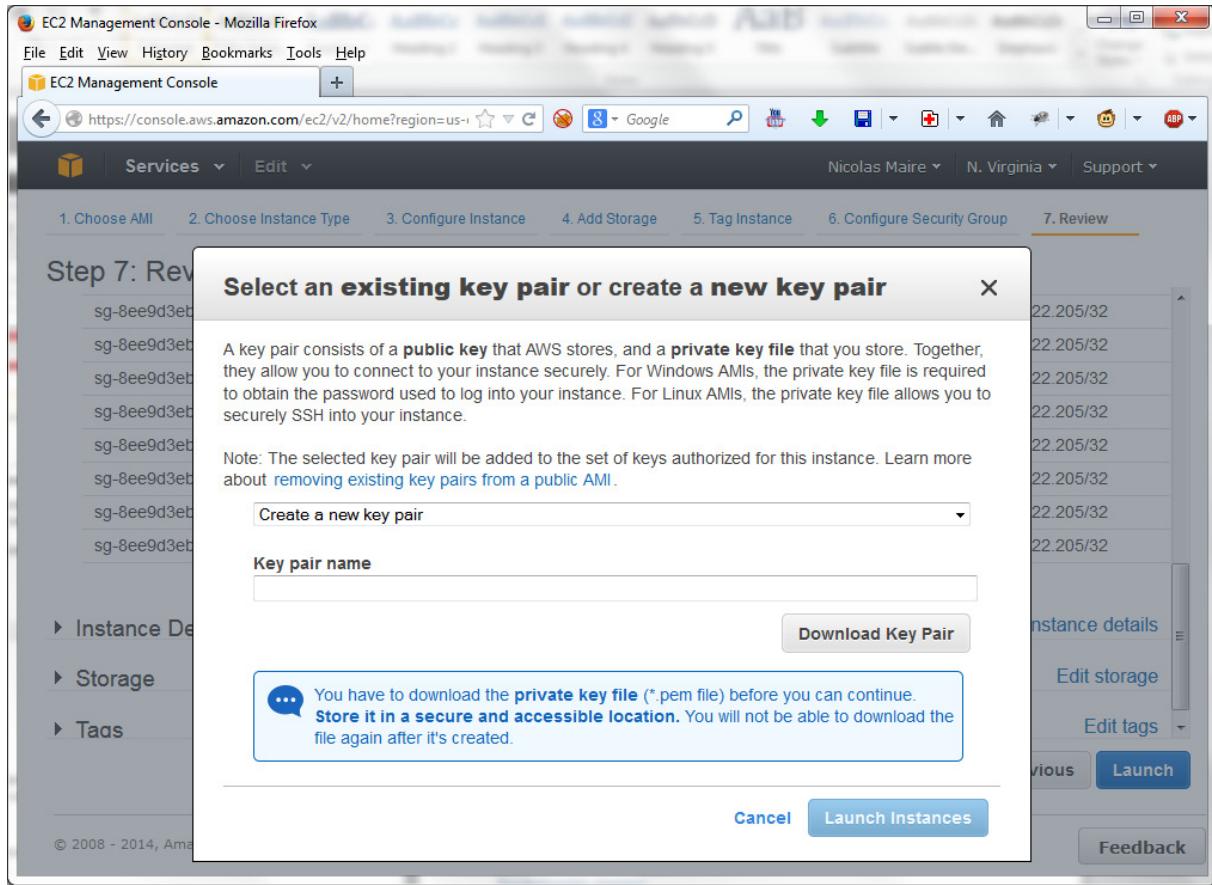
The screenshot shows the EC2 Management Console in Mozilla Firefox. The URL is https://console.aws.amazon.com/ec2/v2/home?region=us-east-1. The top navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, and the EC2 Management Console logo. The main menu has Services selected. On the right, there are user details (Nicolas Maire, N. Virginia) and Support links. A progress bar at the top indicates steps 1 through 7, with Step 7: Review Instance Launch currently active. The main content area displays the following information:

- AMI Details:** OpenHDS 1.2.1 - ami-44cb592c (OpenHDS Evaluation platform). Root Device Type: ebs, Virtualization type: hvm.
- Instance Type:** A table showing t2.medium settings: ECUs (Variable), vCPUs (2), Memory (GiB) (4), Instance Storage (GB) (EBS only), EBS-Optimized Available (-), and Network Performance (Low to Moderate).
- Security Groups:** A table header for Security Group ID, Name, and Description. Buttons for Cancel, Previous, Launch, and Feedback are visible.

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You can now launch your EC2 instance by clicking on Launch.

You will now be asked for providing a Public/Private Key pair for accessing your EC2 instance securely over SSH. Generate a new one by inputting a name and downloading it. Then select it from the list, check the “Acknowledge” checkbox and click on ‘Launch instances’ to continue.



Your EC2 instance is now launching. Click the instance id to see the current status:

Your instance is now launching

The following instance launch has been initiated: i-f0bbd211 [View launch log](#)

Get notified of estimated charges

Create billing alerts to get an email notification when estimated charges on your AWS bill exceed an amount you define (for example, if you exceed the free usage tier).

How to connect to your instance

Your instance is launching, and it may take a few minutes until it is in the **running** state, when it will be ready for you to use. Usage hours on your new instance will start immediately and continue to accrue until you stop or terminate your instance.

Click [View Instances](#) to monitor your instance's status. Once your instance is in the **running** state, you can **connect** to it from the Instances screen. [Find out](#) how to connect to your instance.

Here are some helpful resources to get you started

- [How to connect to your Linux instance](#)
- [Learn about AWS Free Usage Tier](#)
- [Amazon EC2: User Guide](#)
- [Amazon EC2: Discussion Forum](#)

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After the instance is started, click on the entry:

EC2 Dashboard

Events

Tags

Reports

Limits

INSTANCES

Instances

Spot Requests

Reserved Instances

IMAGES

AMIs

Bundle Tasks

ELASTIC BLOCK STORE

Volumes

Snapshots

NETWORK & SECURITY

Security Groups

Launch Instance Connect Actions

Filter by tags and attributes or search by keyword

1 to 2 of 2

Instance Name	Instance ID	Type	Region	Status	Action
OpenHDS Evaluation Platform	i-f0bbd211	t2.medium	us-east-1a	running	Initiate

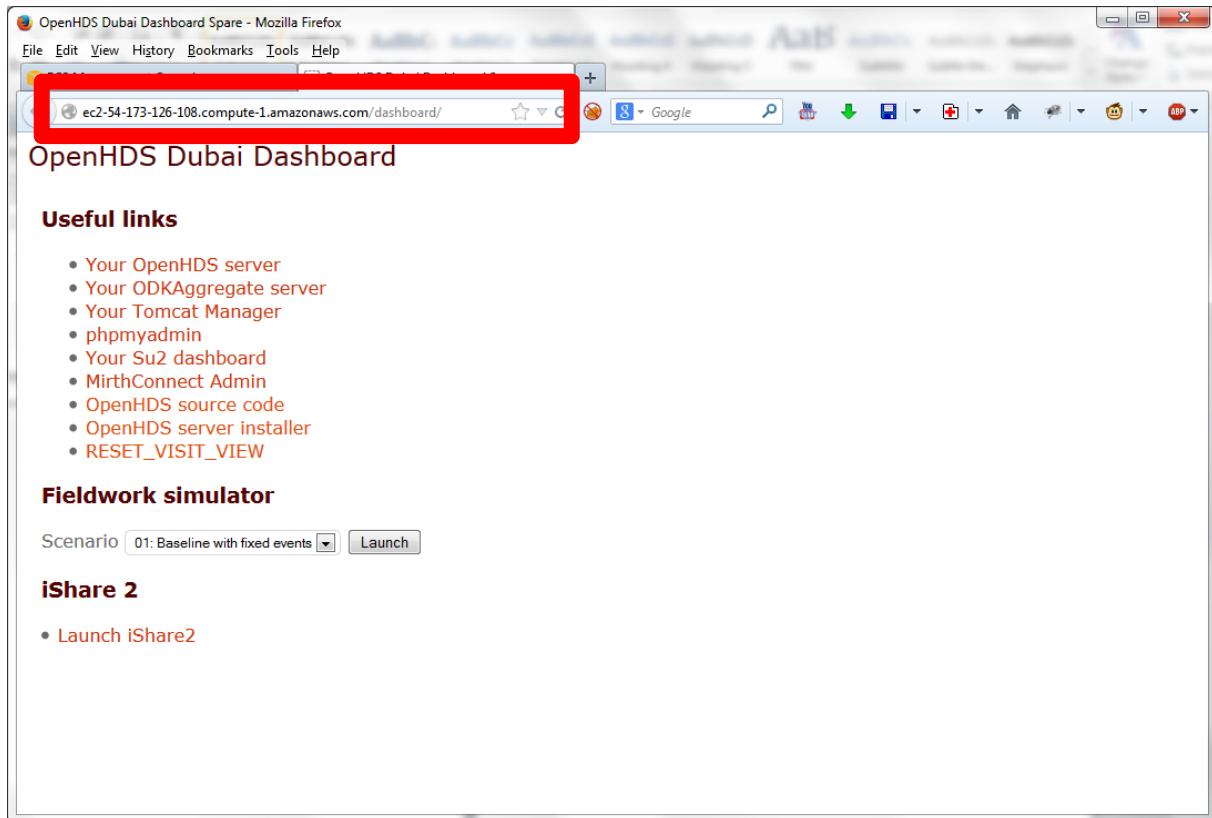
Instance: i-f0bbd211 (OpenHDS Evaluation Platform) Public DNS: ec2-54-173-126-108.compute-1.amazonaws.com

Description Status Checks Monitoring Tags

Instance ID: i-f0bbd211 Public DNS: ec2-54-173-126-108.compute-1.amazonaws.com

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On the bottom window you can now see the public DNS. Copy paste this into your browser and append /dashboard (so the final URL will read something like <http://ec2-54-173-126-108.compute-1.amazonaws.com/dashboard>). You can now access the Dashboard for the OpenHDS Evaluation Platform.



If you can't connect to the Dashboard, go into the Security Group Settings in the AWS Console and make sure your current IP still matches the security settings.

Test data generation

<https://github.com/SwissTPH/openhds-sim/> is a Python program that emulates a tablet computer with ODKCollect installed, and which can be used to generate test data sets in openHDS. The Python program is also pre-installed on the virtual image. Note that you can also use the openhds-sim software to test-drive your local OpenHDS server installation. Install the software by following these setup instructions.

Setup

- Download latest Fieldworker-Simulator from <https://github.com/SwissTPH/openhds-sim>
e.g. 'wget https://github.com/SwissTPH/openhds-sim/archive/master.zip'
- 'sudo apt-get update'
- Download zip-program 'sudo apt-get install zip'
- Extract zip file with 'zip master.zip'

Installing dependencies

- install 'sudo apt-get install --no-install-dependencies python-mysqldb'

- install 'sudo apt-get install --no-install-dependencies python-numpy'
- install 'sudo apt-get install --no-install-dependencies python-matplotlib'
- install 'sudo apt-get install --no-install-dependencies python-lxml '

Run fieldworker-simulator

- Change folder 'cd openhds-sim-master'
- python fieldwork_simulator.py -s SCENARIO
where scenario is one of the *.json files in the conf directory (omit the .json file extension when passing as a parameter).

The software comes with configuration files which allow the simulation of a baseline round, and 2 update rounds, and therefore can be used to generate a small test data set. At this stage, the events reported are not necessarily meaningful, but they are meant to be compatible with the consistency checks imposed by openHDS.

Start the main program fieldwork_simulator.py: Optionally edit the configuration file which is stored under /home/data/ openhds-sim/conf/site.json, and start the script by double-clicking on the shortcut “fieldwork_simulator” on the

Events submitted for the baseline round are now transferred from ODKCollect to openHDS. Once this process finishes, the data generator will submit events for the subsequent rounds (and pause again once this is over), until all events have been transferred.

The test data set can then be viewed in openHDS.