DHIS2 MALARIA WORKSHOP

DHIS2 standard malaria modules toolkit

For malaria programme managers

WORKING DOCUMENT, AUGUST 2022

World Health Organization

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Contents

Introduction

DIGITAL SOLUTIONS FOR MALARIA SURVEILLANCE

Surveillance is a core malaria intervention. Data standards, tools and curricula materials have been developed to support countries to strengthen and monitor national routine surveillance systems and to support use of data for decision-making in all transmission settings. These standards have been developed into malaria modules by the Digital Health Information System (DHIS2) and the World Health Organization (WHO) for countries using this platform. These tools comprise:

- modules for burden reduction and elimination settings
    - aggregate module
    - case-based module
- modules for entomological surveillance and vector control interventions

The DHIS2 modules provide a set of data elements and indicators as well as validation rules and standard charts and tables presented in a set of dashboards.

The modules are accompanied by a guidance document and a curriculum to help programmes and participants understand and implement the content. The modules can be used either separately or in conjunction with one another depending on the type of public health responses being implemented.

The modules comprise a standard set of data elements and indicators, validation rules and dashboards for visualization of core epidemiological and data quality indicators, as charts, tables and maps. Routine reports and data exports can be easily generated for rapid dissemination of information to decision-makers. The modules, which are configurable and can be used either separately or in conjunction with one another, are accompanied by a guidance document and a curriculum for facility-level data analysis, to help programmes to understand the content and how the data can be used in practice.

Aggregated malaria module

In settings in which transmission remains relatively high and where the aim of national programmes is to reduce the burdens of morbidity and mortality, data are aggregated to provide an overall picture of where and when malaria occurs and who is most affected. Surveillance data in high transmission settings permits monitoring of trends over time in terms of the number of cases and deaths, the distribution of cases and deaths geographically, the characteristics of people infected or dying from malaria, and the seasonality of transmission.

In high transmission settings, surveillance data can be used to stratify geographic units by their malaria prevalence or annual parasite incidence to permit better targeting of interventions. Surveillance data can be used to plan for the number of test kits, antimalarial drugs and supplies needed for different health facilities.

The malaria module is based on the guidance provided in the Malaria surveillance, monitoring & evaluation: a reference manual and the Framework for malaria elimination.

Country implementation

WHO is supporting Member states to implement these modules at national level. The modules give Member States the possibility to bring key malaria-related data into a single place, facilitating interpretation and the dynamic use of data for decision-making.

National malaria data repositories

WHO has been working in coordination with national health management information systems (HMIS) departments of ministries of health, in particular the "High burden to high impact" (HBHI) countries, to establish structured dynamic databases that support NMPs subnationally to implement targeted malaria activities informed by clear stratification, to monitor disease trends, to effectively respond to epidemics, to evaluate programme performance and to develop national strategic plans.

These national data repositories are developed either as part of WHO-supported national health observatories or as a direct service provided by the HMIS to disease programmes. GMP has developed an easily adaptable repository structure in DHIS2 with guidance on relevant data elements and indicators, their definitions and computation to cover key thematic areas. So far, work to develop these databases has started in Gambia, Ghana, Mozambique, Nigeria, Uganda and the United Republic of Tanzania.

DHIS2-BASED ENTOMOLOGY AND VECTOR CONTROL DATA COLLECTION AND COLLATION TOOLS

What are the DHIS2 modules for entomology and vector control?

The DHIS2 standard modules for entomology and vector control have been developed to support countries to improve the collection and use of entomological and vector control interventions data and its use to inform programmatic decisions.

They are the results of the collaboration between WHO, its collaborating partners and Members States.

The modules contain a set of standard data collection forms, automatically calculated indicators, data visualizations and thematic dashboards that allow to collect, visualize and interpret data from the following activities in line with WHO recommendations:

- insecticide treated nets (ITNs) mass distribution campaigns and bioefficacy monitoring;
- indoor residual spraying (IRS) campaigns and residual efficacy monitoring,
- insecticide resistance monitoring;
- adult mosquito surveillance and identification, including the collection of individual mosquito data; and
- larval source monitoring and management.

With these modules, countries can:

- collect data from the field, insectaries or laboratories, using mobile phones, tables or computers, online and offline, and geolocated;
- integrate entomological and vector control data with epidemiological data and other types of relevant data (e.g. climatological data, stock data);
- calculate standard entomological indicators automatically; and
- develop custom visualizations (tables, graphs and maps) and dashboard to inform specific needs.

The modules are constantly improved to better meet country-specific needs and expanded to include new procedures and methods for entomological surveillance and the monitoring of vector control interventions.

WHO DHIS2 standard modules for entomology and vector control

Implementation support tools

WHO is working in collaboration with partners to support to countries implement the modules. To facilitate implementation, WHO has developed multiple tools:

- to customize the modules to country needs (D2-docker);
- to facilitate installation of the modules (MetaData Sync App);
- to help countries build capacity for the use of the modules (Training App);
- to facilitate collation, sharing and reporting of data (MetaData Sync); and
- to facilitate import of data from excel sheets (Bulk Load).

Partner contributions

The following institutions have contributed to the development of the DHIS2 modules and of their implementation support tools:

- **Population Services International (PSI)** has contributed metadata to support countries to collect data during ITN mass distribution campaigns at both aggregate and household levels and is supporting countries to implement the ITN campaign tools.
- **The US President's Malaria Initiative VectorLink Project** has contributed metadata to support countries to collect data during IRS campaigns and is collaborating on refinements to the entomology module building on their PMO VectorLink project DHIS2 database.
- **The Clinton Health Initiative (CHAI)** is supporting countries to implement the DHIS2 standard modules and contributing to improvement in module structure and implementation support tools.

WHO seeks further collaboration from other institutions and welcomes their contributions with a view to further evolve these modules, strengthen implementation support provided to WHO Member States and harmonize existing data collection tools. Interested institutions should write an email to vectorsurveillance@who.int

This working document takes you through the different tools available on DHIS2 that assist with malaria data management.

This document is a supplementary resource to the available online learning platform as well as providing detailed steps for installing a package into DHIS2, the Pivot table, Bulk Load and Metadata synchronization applications.

Chapter 1: Installing a package

DHIS2 and WHO have developed malaria modules that those working in malaria control and elimination can download and use to improve their data collection process. There are three ways these packages can be installed.

WHO configuration packages for DHIS2
The WHO configuration packages consist of DHIS2 metadata that provide standard configurations of DHIS2 to support the collection of health data following WHO recommendations.

ENTOMOLOGY AND VECTOR CONTROL

Generic DHIS2 modules have been developed to strengthen the collection, reporting and use of malaria entomology and vector control data to inform decision-making. All the modules have been designed in line with existing WHO recommendations, standard protocols and guidance. These modules complement already existing modules for malaria epidemiology.

The modules consist of event programs and dashboards to support the collection of data from the following activities:

- insecticide-treated nets (ITN) mass distribution campaigns
- ITN bio-efficacy monitoring
- indoor residual spraying (IRS) campaigns
- IRS residual efficacy monitoring
- insecticide resistance monitoring
- adult mosquito surveillance and identification, including individual mosquito laboratory results
- monitoring of mosquito larval habitats.

Watch the introductory video to understand what these modules can offer to you.

A demo of the modules is available in French and English. More information on the modules and the tools designed to facilitate their implementation can be found on this page.

Links to the latest version of the metadata packages that are compatible with different DHIS2 versions are included in the tables below. If you have questions or difficulties implementing these modules, please contact fernandezl@who.int.

EXPLAINING DEFINITIONS

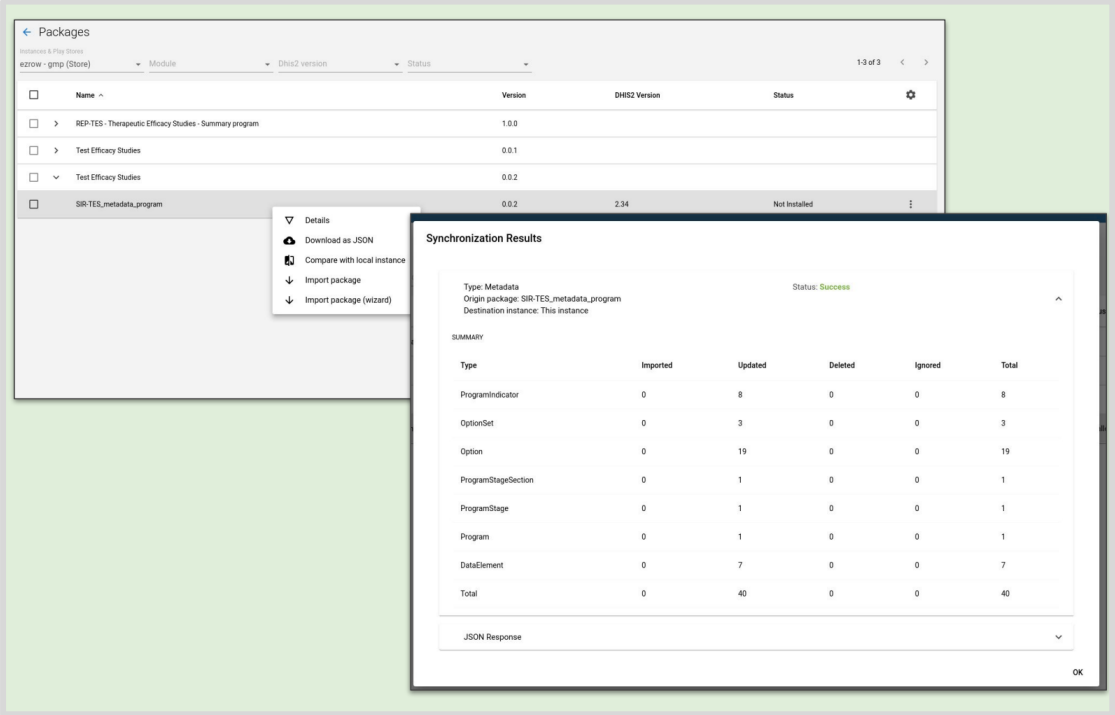
A **module** is something dynamic. Just a pointer to the current status of the metadata.

A **package** is a picture of that metadata in a precise moment. Packages are versioned.

From a module we can extract a package representing the status of that module metadata at the time it was generated.

Direct import

1. Connect from another instance to the same repository
2. Import a package



Within the list of packages of an instance or repository, the user can import a package at any time. The repository is grouped into modules. Within modules are packages in which are indicated version numbers and which version of DHIS2 they are compatible with.

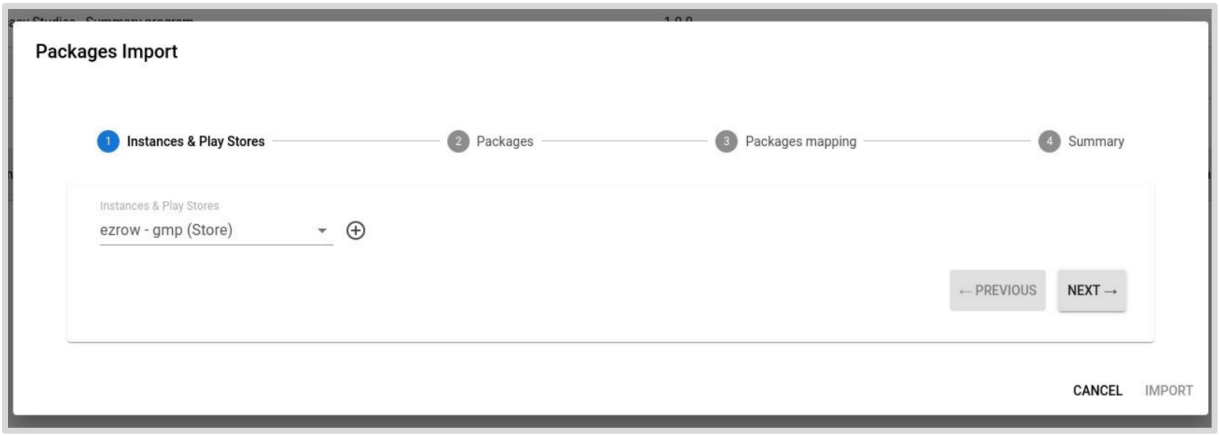
You can filter in accordance with the packages that are adapted to your version.

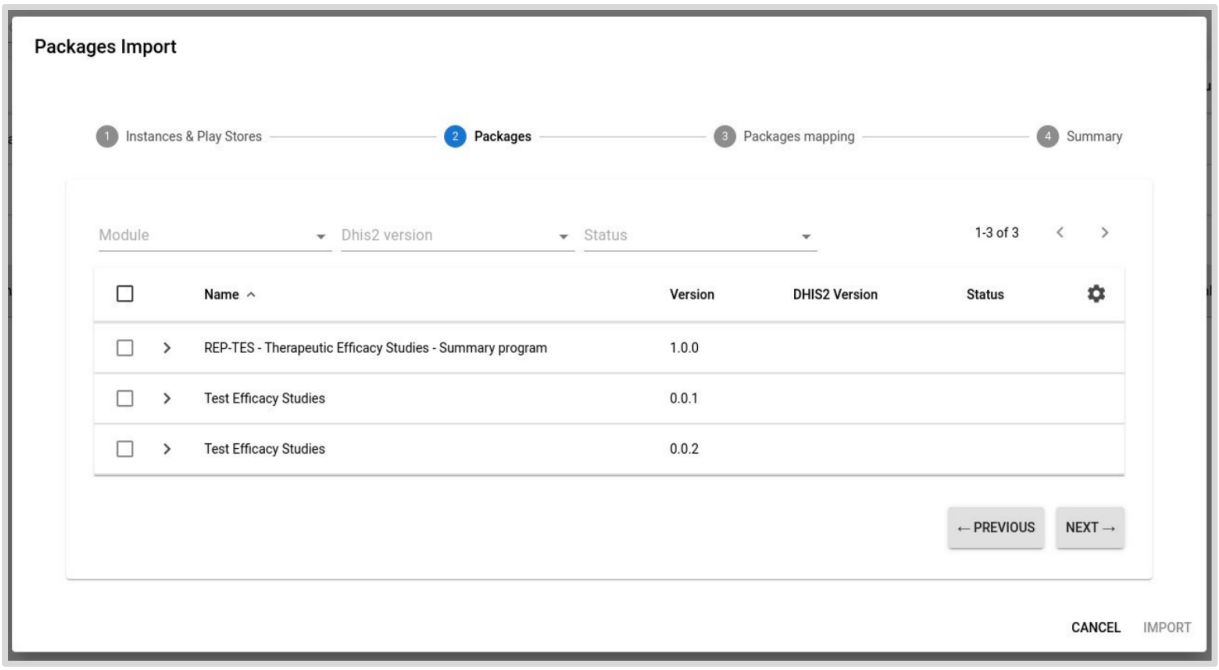
Wizard import

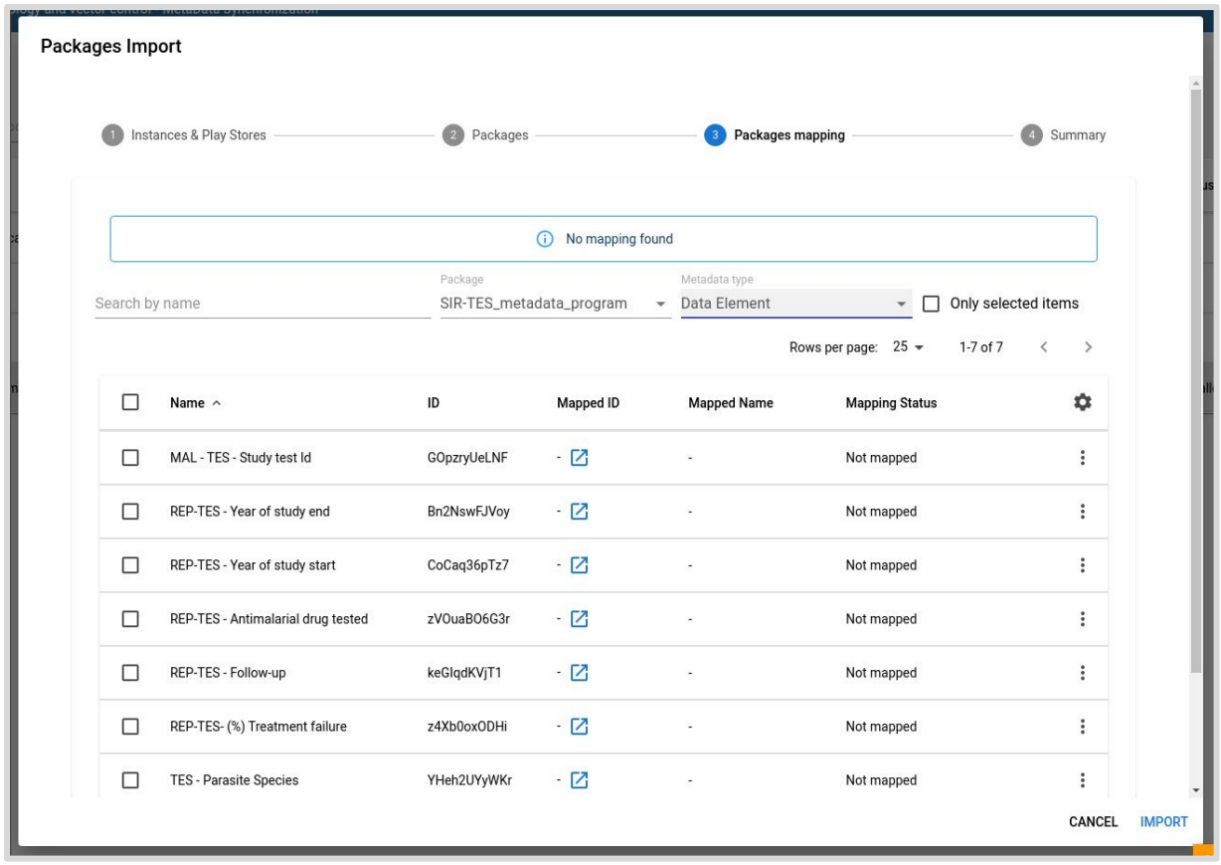
1. Connect from another instance to the same repository
2. Import a package using wizard

A wizard is available to assist the user by:

- Creating stores
- Selecting packages from that store to install
- Mapping the remote metadata to actual metadata inside the instance
- Importing the package, once mapped.

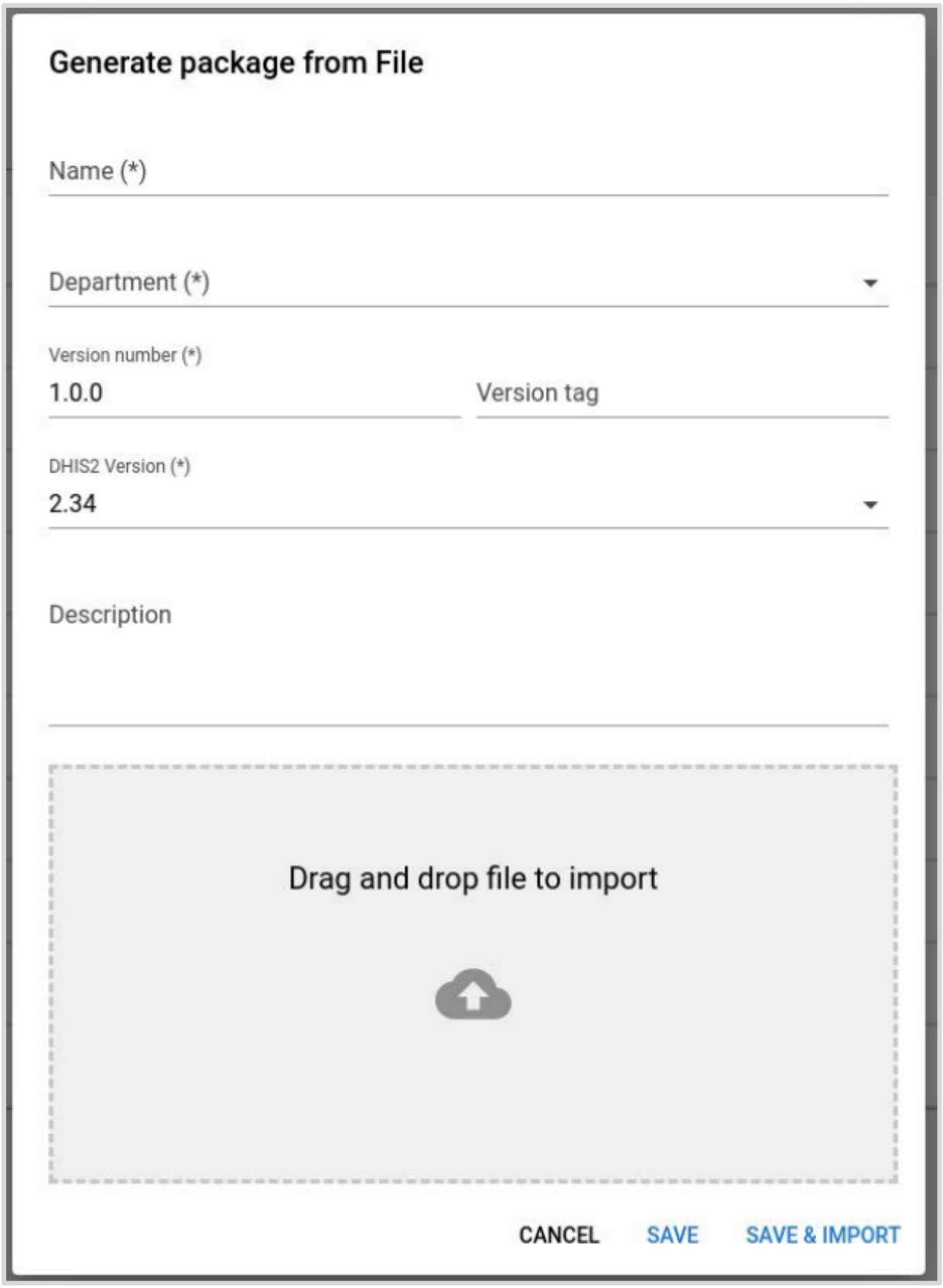






Import from a file

In some cases, the user has a JSON file (a package) that's generated using other methods from any DHIS2 instance. These can also be imported into the Metadata Synchronization app (MD Sync), labelling them so they can also be exported, published and used in other operations in MD Sync.


Generate package from File
Name (*)
Department (*)
Version number (*)
1.0.0
Version tag
DHIS2 Version (*)
2.34
Description
Drag and drop file to import
CANCEL
SAVE
SAVE & IMPORT

Chapter 2: pivot tables

ABOUT THE APP

With the Pivot Table app, you can create pivot tables based on all available data dimensions in DHIS2. A pivot table is a dynamic tool for data analysis which lets you summarize and arrange data according to its dimensions. Examples of data dimensions in DHIS2 are:

- data dimensions themselves (for example data elements, indicators and events);
- periods (representing the time period for the data); and
- organization hierarchies (representing the geographical location of the data).

From these dimensions you can freely select dimension items to include in the pivot table. You can create additional dimensions in DHIS2 with the group set functionality. This allows for different aggregation pathways, such as aggregation by "partner" or facility type.

A pivot table can arrange data dimensions on columns, rows, and as filters. When you place a data dimension on columns, the pivot table will display one column per dimension item. If you place multiple data dimensions on columns, the pivot table displays one column for all combinations of the items in the selected dimensions. When you place a data dimension on rows, the pivot table displays one row per dimension item in a similar fashion. The dimensions you select as filters will not be included in the pivot table but will aggregate and filter the table data based on the selected filter items.

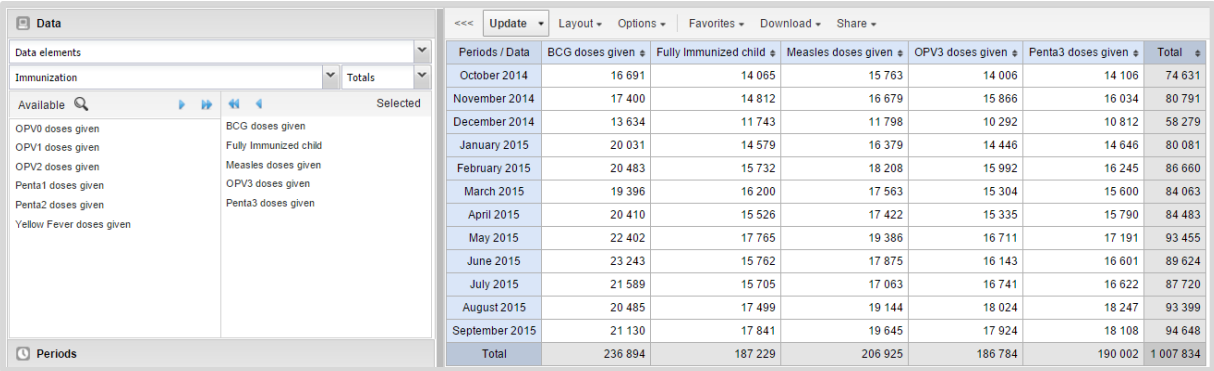
Tips:

- *You must select at least one dimension on columns or rows.*
- *You must include at least one period.*
- *Data element group sets and reporting rates can't appear in the same pivot table.*
- *A pivot table can't contain more than the maximum number of analytic records which have been specified in the system settings. The maximum number of records could also be constrained by the maximum random-access memory (RAM) which is available to your browser. You will be prompted with a warning if your requested table exceeds a particular size. From this prompt, you can either cancel the request or continue building the table. Consider making smaller tables instead of one table which will display all of your data elements and indicators together.*
- *The Pivot Table app supports drill down and drill up for periods and organization units. This means that you can for example drill down from yearly periods to quarters, months and weeks inside a pivot table. You can also drill down from the global organization unit to countries, provinces and facilities.*

CREATE A PIVOT TABLE

1. Open the Pivot Table app.
2. In the menu to the left, select the dimension items you want to analyse, for example data elements or indicators.
3. Click Layout and arrange the data dimensions as columns, rows and filters. You can keep the default selection if you want.
4. Click Update.

In this example, indicators are listed as columns and periods as rows.



Periods / Data	BCG doses given	Fully Immunized child	Measles doses given	OPV3 doses given	Penta3 doses given	Total
October 2014	16 691	14 065	15 763	14 006	14 106	74 631
November 2014	17 400	14 812	16 679	15 866	16 034	80 791
December 2014	13 634	11 743	11 798	10 292	10 812	58 279
January 2015	20 031	14 579	16 379	14 446	14 646	80 081
February 2015	20 483	15 732	18 208	15 992	16 245	86 660
March 2015	19 396	16 200	17 563	15 304	15 600	84 063
April 2015	20 410	15 526	17 422	15 335	15 790	84 483
May 2015	22 402	17 765	19 386	16 711	17 191	93 455
June 2015	23 243	15 762	17 875	16 143	16 601	89 624
July 2015	21 589	15 705	17 063	16 741	16 622	87 720
August 2015	20 485	17 499	19 144	18 024	18 247	93 399
September 2015	21 130	17 841	19 645	17 924	18 108	94 648
Total	236 894	187 229	206 925	186 784	190 002	1 007 834

Select dimension items

The left menu lists sections for all available data dimensions. From each section you can select any number of dimension items. As an example, you can open the section for data elements and select any number of data elements from the available list. You can select an item by marking it and clicking on the arrow in the section header or simply double-clicking on the item. Before you can use a data dimension in your pivot table you must at least select one-dimension item. If you arrange a dimension as columns or rows but do not select any dimension items, the dimension is ignored.

You must choose at least one data dimension type to create a pivot table. The available types are described in this table:

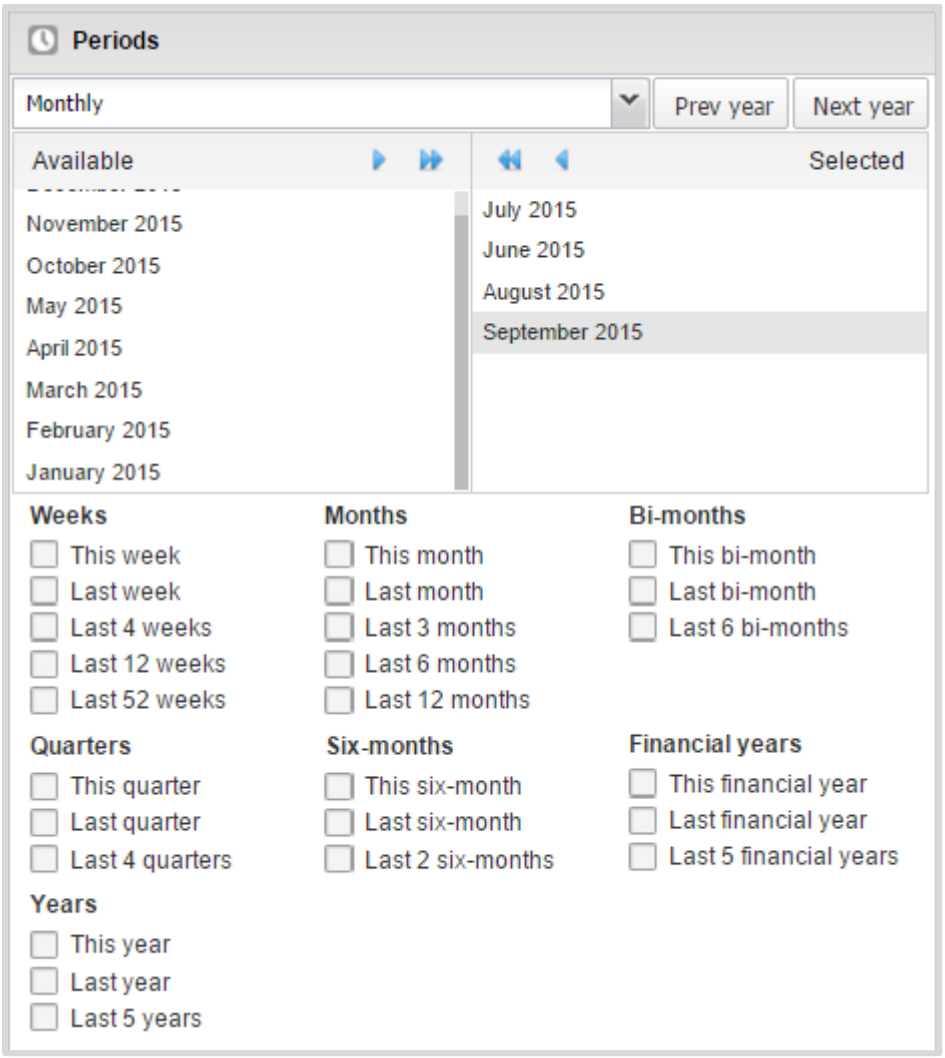
Data dimension type	Definition	Examples
Indicators	An indicator is a calculated formula based on data elements.	Coverage of immunization across a specific district.
Data elements	Represents the phenomenon for which data has been captured.	Number of malaria cases; number of tuberculosis vaccine (BCG) doses given.
Data sets	A collection of data elements grouped for data collection. You can select: ● **Reporting rates**: the percentage of actual reports compared to the expected number of reports ● **Reporting rates on time**: the reporting rates based on timely form submissions. A timely submission must happen within a number of days after the reporting period. ● **Actual reports**: the actual number of reports ● **Actual reports on time**: the actual number of reports based on timely form submissions. A timely submission must happen within a number of days after the reporting period. ● **Expected reports**: the number of expected reports based on organization units where the data set and the reporting frequency has been assigned.	Reporting rates for immunization and morbidity forms.
Event data items	A data element that is part of a program representing events that have been captured.	Average weight and height for children in a nutrition program.
Program indicators	A calculated formula based on data elements in a program representing events.	Average body mass index (BMI) score for children in a nutrition program.

You can combine these dimensions to display for example aggregate data with reporting rates, or event data items together with program indicators, all in the same pivot tables. For the Data element data dimension, you are also able to select Totals and Details, which will allow you to view different category combination options together on the same pivot table.

For the period dimension you can choose between using fixed periods or relative periods. An example of a fixed period is "January 2012". To select a fixed period, start by selecting a period type from the period type list. You can then select periods from the list of available periods.

Relative periods are periods relative to the current date. Examples of relative periods are "Last month", "Last 12 months", "Last 5 years". Relative periods can be selected by ticking the checkboxes next to each period. The main advantage of using relative periods is that when you save a pivot table favourite, it will stay updated with the latest data as time goes by without the need to constantly update it.

You can select any number of organization unit dimensions from the hierarchy. To select all organization units below a specific parent organization unit, right click and click Select all children. To manually select multiple organization units, click and hold the Ctrl key while clicking on the organization units. You can tick User org unit, User sub-units or User sub-x2-units in order to dynamically insert the organization unit or units associated with your user account. This is useful when you save a pivot table favourite and want to share it with other users, as the organization units linked with the other user's account will be used when viewing the favourite.



Dynamic dimensions can consist of organization unit group sets, data element group sets, or category option group sets which have been configured with the type of disaggregation. Once the group sets have been configured, they will become available in the pivot tables, and can be used as

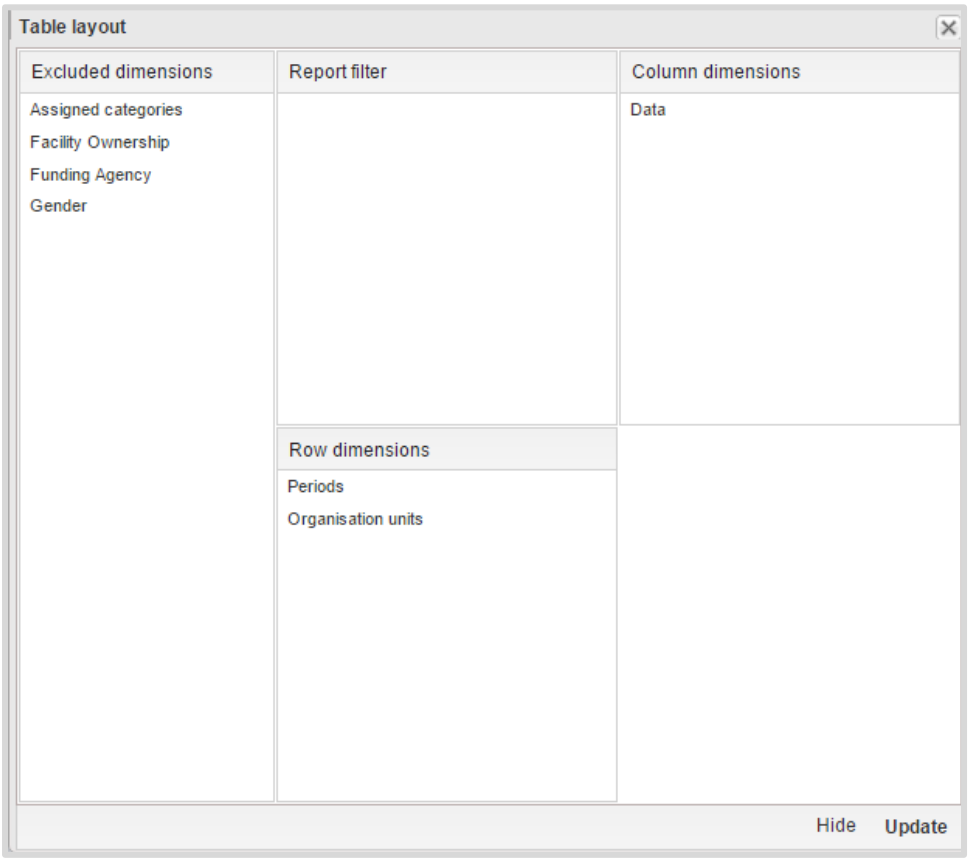
additional analysis dimensions, for instance to analyse aggregate data by Type of organization unit or Implementing partner. Dynamic dimensions work the same as fixed dimensions.

Tip:

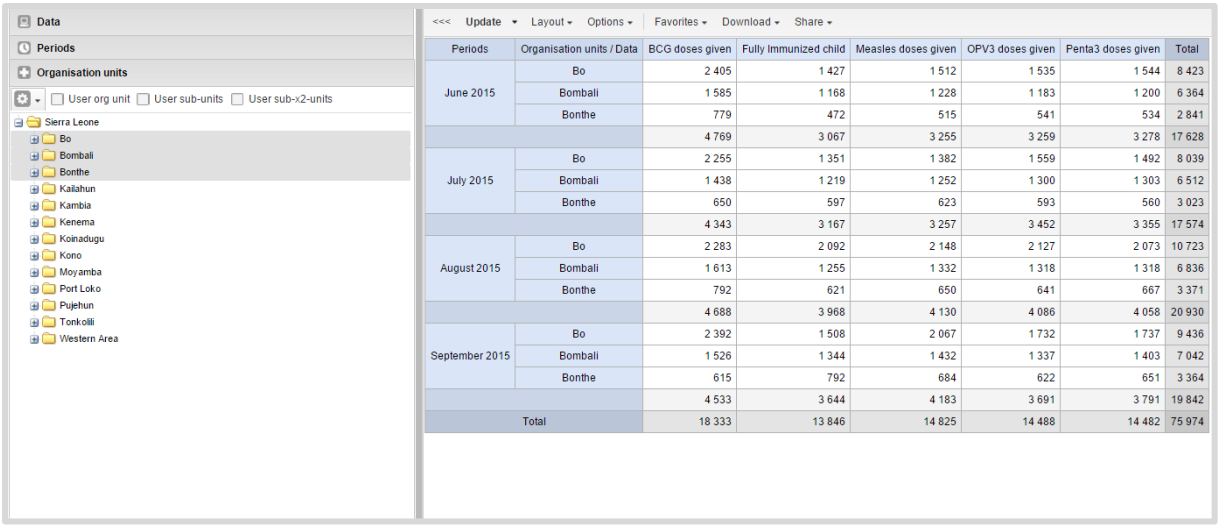
Some dynamic dimensions may contain many items. This can cause issues with certain browsers due to the length of the URL when many dimension members are selected. A special All check box is available for dynamic dimensions, which allows you to include all available dimensions implicitly in your pivot table, without specifying every dimension member.

Modify pivot table layout

After selecting data dimensions, it is time to arrange your pivot table. Click Layout in the top menu to open the layout screen. In this screen you can position your data dimensions as table columns, rows or filters by clicking and dragging the dimensions from the dimensions list to the respective column, row and filter lists. You can set any number of dimensions in any of the lists. For instance, you can click on Organization units and drag it to the row list in order to position the organization unit dimension as table rows. Note that indicators, data elements and data set reporting rates are part of the common Data dimension and will be displayed together in the pivot table. For instance, after selecting indicators and data elements in the left menu, you can drag Organization Unit from the available dimensions list to the row dimension list in order to arrange them as rows in the pivot table.



After you have set up your pivot table you can click Update to render your pivot table or click Hide to hide the layout screen without any changes taking effect. Since, in our example, we have selected both the period and organization unit dimension as rows, the pivot table will generate every combination of the items in these dimensions and produce a table such as this:



Periods	Organisation units / Data	BCG doses given	Fully Immunized child	Measles doses given	OPV3 doses given	Penta3 doses given	Total
June 2015	Bo	2 405	1 427	1 512	1 535	1 544	8 423
	Bombali	1 585	1 168	1 228	1 183	1 200	6 364
	Bonthe	779	472	515	541	534	2 841
		4 769	3 067	3 255	3 259	3 278	17 628
July 2015	Bo	2 255	1 351	1 382	1 559	1 492	8 039
	Bombali	1 438	1 219	1 252	1 300	1 303	6 512
	Bonthe	650	597	623	593	560	3 023
		4 343	3 167	3 257	3 452	3 355	17 574
August 2015	Bo	2 283	2 092	2 148	2 127	2 073	10 723
	Bombali	1 613	1 255	1 332	1 318	1 318	6 836
	Bonthe	792	621	650	641	667	3 371
		4 688	3 968	4 130	4 086	4 058	20 930
September 2015	Bo	2 392	1 508	2 067	1 732	1 737	9 436
	Bombali	1 526	1 344	1 432	1 337	1 403	7 042
	Bonthe	615	792	684	622	651	3 364
		4 533	3 644	4 183	3 691	3 791	19 842
Total		18 333	13 846	14 825	14 488	14 482	75 974

CHANGE THE DISPLAY OF YOUR PIVOT TABLE

1. Open the Pivot Table app
2. Create a new pivot table or open a favourite
3. Click Options
4. Set the options as required
5. Click Update.

	Option	Description
Data	Show column totals Show row totals	Displays total values in the table for each row and column, as well as a total for all values in the table.
	Show column subtotals Show row subtotals	Displays subtotals in the table for each dimension. If you only select one dimension, subtotals will be hidden for those columns or rows. This is because the values will be equal to the subtotals.
	Show dimension labels	Shows the dimension names as part of the pivot tables.
	Hide empty rows	Hides empty rows from the table. This is useful when you look at large tables where many of the dimension items don't have data in order to keep the table more readable.
	Hide empty columns	Hides empty columns from the table. This is useful when looking at large tables where many of the dimension items don't have data in order to keep the table more readable.
	Skip rounding	Skips the rounding of data values, offering the full precision of data values. Can be useful for finance data where the full dollar amount is required.
	Aggregation type	The default aggregation operator can be overridden here, by selecting a different aggregation operator. Some of the aggregation types are Count, Min and Max.
	Number type	Sets the type of value you want to display in the pivot table: Value, Percentage of row or Percentage of column. The options Percentage of row and Percentage of column mean that you'll display values as percentages of row total or percentage of column total instead of the aggregated value. This is useful when you want to see the contribution of data elements, categories or organization units to the total value.
	Measure criteria	Allows for the data to be filtered on the server side. You can instruct the system to return only records where the aggregated data value is equal, greater than, greater or equal, less than or less or equal to certain values. If both parts of the filter are used, it's possible to filter out a range of data records.
Events	Include only completed events	Includes only completed events in the aggregation process. This is useful for example to exclude partial events in indicator calculations.
Organization units	Show hierarchy	Shows the name of all ancestors for organization units, for example "Sierra Leone / Bombali / Tamabaka / Sanya CHP" for Sanya CHP. The organization units are then sorted alphabetically which will order the organization units according to the hierarchy. When you download a pivot table with organization units as rows and you've selected Show hierarchy, each organization unit level is rendered as a separate column. This is useful for

	Option	Description
		example when you create Excel pivot tables on a local computer.
Legend	Apply legend	Applies a legend to the values. This means that you can apply a colour to the values. Select by data item to colour the table cells individually according to each data element or indicator. You can configure legends in the Maintenance app.
	Style	Colours the text or background of cells in pivot tables based on the selected legend. You can use this option for scorecards to identify high and low values at a glance.
Style	Display density	Controls the size of the cells in the table. You can set it to Comfortable, Normal or Compact. Compact is useful when you want to fit large tables into the browser screen.
	Font size	Controls the size of the table text font. You can set it to Large, Normal or Small.
	Digit group separator	Controls which character to separate groups of digits or thousands. You can set it to Comma, Space or None.
General	Table title	A title may be inserted here to display it above the table.
Parameters (for standard reports only)	*Note:* You can create standard reports in the Reports app. You can set which parameters the system should prompt the user to input in the Pivot Table app.	
	Reporting period	Controls whether to ask the user to enter a report period.
	Organization unit	Controls whether to ask the user to enter an organization unit.
	Parent organization unit	Controls whether to ask the user to enter a parent organization unit.
	Include regression	Includes a column with regression values to the pivot table.
	Include cumulative	Includes a column with cumulative values to the pivot table.
	Sort order	Controls the sort order of the values.
	Top limit	Controls the maximum number of rows to include in the pivot table.

MANAGE FAVOURITES

Saving your charts or pivot tables as favourites makes it easy to find them later. You can also choose to share them with other users as an interpretation or to display them on the dashboard.

You can view the details and interpretations of your favourites in the Pivot Table, Data Visualizer, Event Visualizer and Event Reports apps. Use the Favourites menu to manage your favourites.

Open

1. Click Favourites > Open.
2. Enter the name of a favourite in the search field or click Prev and Next to display favourites.
3. Click the name of the favourite you want to open.

Save

1. Click Favourites > Save as.
2. Enter a name and a description for your favourite. The description field supports rich text format, see the interpretations section for more details.
3. Click Save.

Rename

1. Click Favourites > Rename.
2. Enter the new name for your favourite.
3. Click Update.

Write an interpretation for a favourite

An interpretation is a link to a resource with a description of the data at a given period. This information is visible in the Dashboard app. To create an interpretation, you first need to create a favourite. If you've shared your favourite with other people, the interpretation you write is visible to those people.

1. Click Favourites > Write interpretation.
2. In the text field, type a comment, question or interpretation. You can also mention other users with '@username'. Start by typing ”@” plus the first letters of the username or real name and a mentioning bar will display the available users. Mentioned users will receive an

internal DHIS2 message with the interpretation or comment. You can see the interpretation in the Dashboard app.

It is possible to format the text with bold, italic by using the markdown style markers * and _ for bold and italic respectively. Keyboard shortcuts are also available: Ctrl/Cmd + B and Ctrl/Cmd + I. A limited set of smilies is supported and can be used by typing one of the following character combinations: :), :-), :(:-(, :+1 and :-1. URLs are automatically detected and converted into a clickable link.

3. Search for a user group that you want to share your favourite with, then click the + icon.
4. Change sharing settings for the user groups you want to modify:
   - Can edit and view: Everyone can view and edit the object;
   - Can view only: Everyone can view the object; or
   - None: The public won't have access to the object. This setting is only applicable to public access.
5. Click Share.

Subscribe

When you are subscribed to a favourite, you will receive internal messages whenever another user likes, creates or updates an interpretation or creates or updates an interpretation comment of this favourite.

1. Open a favourite.
2. Click >>> in the top right of the workspace.
3. Click on the upper-right bell icon to subscribe to this favourite.

Create a link

1. Click Favourites > Get link.
2. Select one of the following:
   - Open in this app: You will get a URL for the favourite which you can share with other users by email or chat.
   - Open in web API: You get a URL of the API resource. By default this is an HTML resource, but you can change the file extension to “.json" or ".csv".

Delete

1. Click Favourites > Delete.
2. Click OK.

View interpretations based on relative periods

To view interpretations for relative periods, such as a year ago:

1. Open a favourite with interpretations.
2. Click >>> in the top right of the workspace.
3. Click an interpretation. Your chart displays the data and the date based on when the interpretation was created. To view other interpretations, click on them.

DOWNLOAD DATA FROM A PIVOT TABLE

Download table layout data format

To download the data in the current pivot table:

1. Click Download.
2. Under Table layout, click the format you want to download: Microsoft Excel, CSV or HTML.

   The data table will have one column per dimension and contains names of the dimension items.

Tip:

When you download a pivot table with organization units as rows and you've selected Show hierarchy in Table options, each organization unit level is rendered as a separate column. This is useful for example when you create Excel pivot tables on a local computer.

Tip:

You can create a pivot table in Microsoft Excel from the downloaded Excel file.

Download plain data source format

You can download data in the current pivot table in JSON, XML, Excel, and CSV as plain data formats with different identification schemes (ID, code, and name). The data document uses identifiers of

the dimension items and opens in a new browser window to display the URL of the request to the Web API in the address bar. This is useful for developers of apps and other client modules based on the DHIS2 Web API or for those who require a plain data source, for instance for import into statistical packages.

To download plain data source formats:

1. Click Download.
2. Under Plain data source, click the format you want to download.

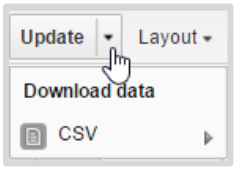
Format	Action	Description
JSON	Click JSON	Downloads JSON format based on ID property. You can also download JSON format based on code or name property.
XML	Click XML	Downloads XML format based on ID property. You can also download XML format based on code or name property.
Microsoft Excel	Click Microsoft Excel	Downloads XML format based on ID property. You can also download Microsoft Excel format based on code or name property.
CSV	Click CSV	Downloads CSV format based on ID property. You can also download CSV format based on code or name property.
JRXML	Put the cursor on Advanced and click JRXML	Produces a template of a Jasper report which can be further customized based on your exact needs and used as the basis for a standard report in DHIS2.
Raw data SQL	Put the cursor on Advanced and click Raw data SQL	Provides the actual SQL statement used to generate the pivot table. You can use it as a data source in a Jasper report, or as the basis for an SQL view.

Downloading in CSV format without rendering data in the web browser

You can download data in CSV format directly without rendering the data in the web browser. This helps to reduce any constraints in the system settings that have been set with regards to the maximum number of analytic records. This lets you download much larger batches of data that you can use for later offline analysis.

To download data in CSV format without first rendering data in the web browser:

1. Click the arrow beside Update.



2. Click CSV to download the format based on ID property.
   The file downloads to your computer.

Tip:

You can also download in CSV format based on code or name property.

EMBED A PIVOT TABLE IN AN EXTERNAL WEB PAGE

Certain analysis-related resources in DHIS2, such as pivot tables, charts and maps, can be embedded in any web page by using a plug-in. You will find more information about the plug-ins in the Web API chapter in the DHIS2 developer manual.

To generate a HTML fragment to display the pivot table in an external web page:

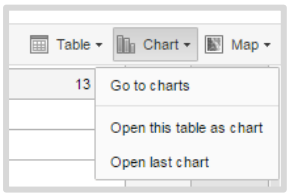
1. Click Embed.
2. Click Select to highlight the HTML fragment.

VISUALIZE PIVOT TABLE DATA AS A CHART OR A MAP

When you have created a pivot table you can switch between pivot table, chart and map visualization of your data.

Open a pivot table as a chart

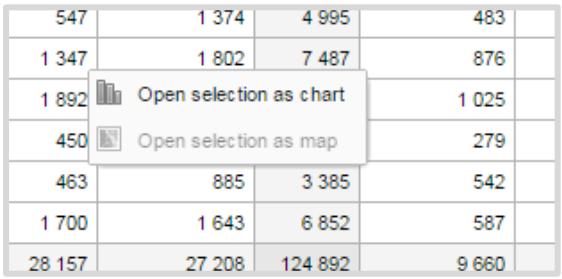
1. Click Chart > Open this table as a chart.
   Your current pivot table opens as a chart.



Open a pivot table selection as a chart

If you want to visualize a small part of your pivot table as a chart you can click directly on a value in the table instead of opening the whole table.

1. In the pivot table, click a value.



2. To verify the selection, hold the cursor over Open selection as a chart. The highlighted dimension headers in the table indicate what data will be visualized as a chart.
3. Click Open selection as a chart.

Open a pivot table as a map

1. Click Chart > Open this table as map
   Your current pivot table opens as a map.

Open a pivot table selection as a map

1. In the pivot table, click a value.
   A menu will be displayed.
2. Click Open selection as map.
   Your selection opens as a map.

Chapter 3: Bulk Load

INTRODUCTION

Bulk Load is a DHIS2 application for the interconnection of DHIS2 and Excel files. It is a DHIS2 web application to generate templates (Excel sheets) for datasets and programs and import multiple data values into DHIS2 instances.

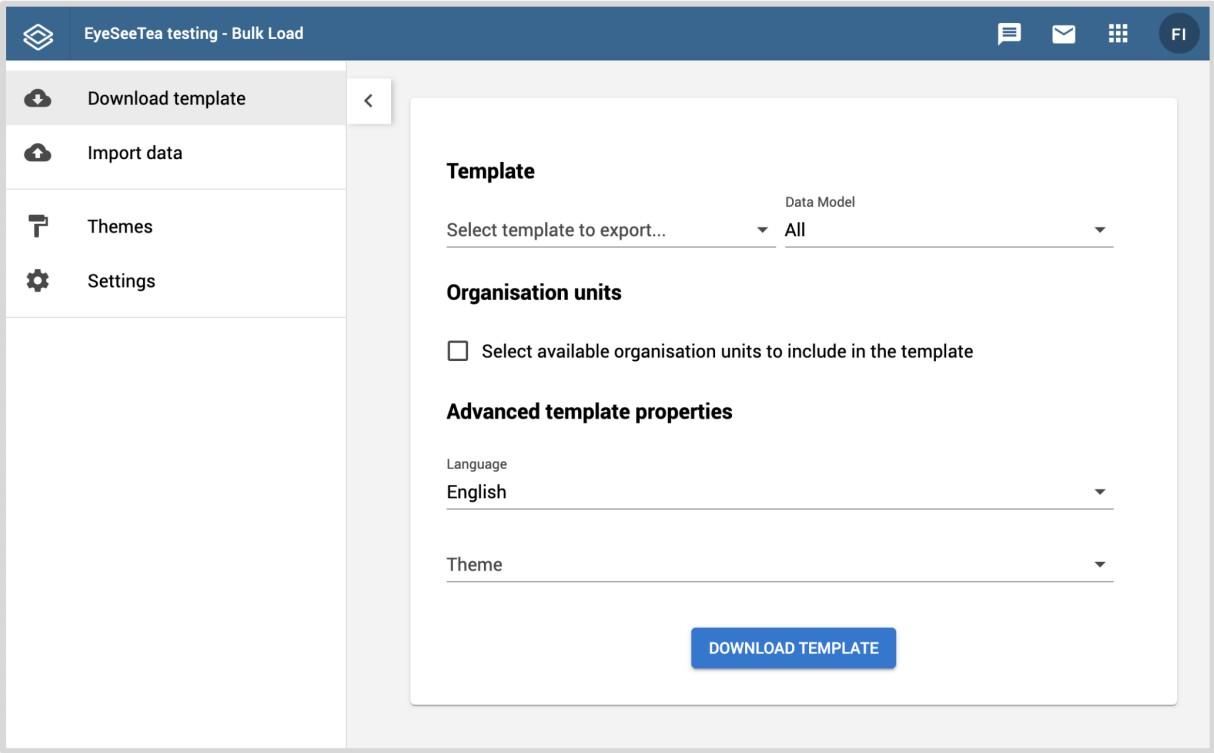
Bulk Load can:

- Generate a quick Excel template reading the metadata from a program or dataset;
- Populate the template with the data stored in the server as required by the user; and
- Load at once all the data in the templates detecting overrides and duplicates.

Innovations

- **Auto-generated excel:** It doesn't require manual mapping between the DHIS2 data and excel file columns.
- **Validation:** Cells in the resulting Excel file include validation according to the type of data: numbers, options sets, strings, dates, etc
- **Themes:** You can customize the colour and appearance of resulting excels, including custom headers.
- **Advanced:** If you need custom templates, you can build them with minimal development work.

Interface



Bulk load sections

The Bulk Load interface offers an easy to navigate outlay consisting of four main sections:

1. **Download template:** This creates an excel file with the fields for a program or dataset and downloads it to a computer. This feature also allows users to select individual organization units to be included in the template generated. Users can also select a language or theme for this template.
2. **Import data:** Loads data from an Excel file into the repository of the DHIS2
3. **Themes**: Designs a custom visual appearance for the Excel file, usually in correlation to the user's wishes or organization's brand colours. This feature is available with administrative permissions only.
4. **Settings:** Bulk Load template options can be configured and defined in settings. The settings function is available with administrative permissions only.

USE CASES

There are a number of situations where you might need to use Bulk Load:

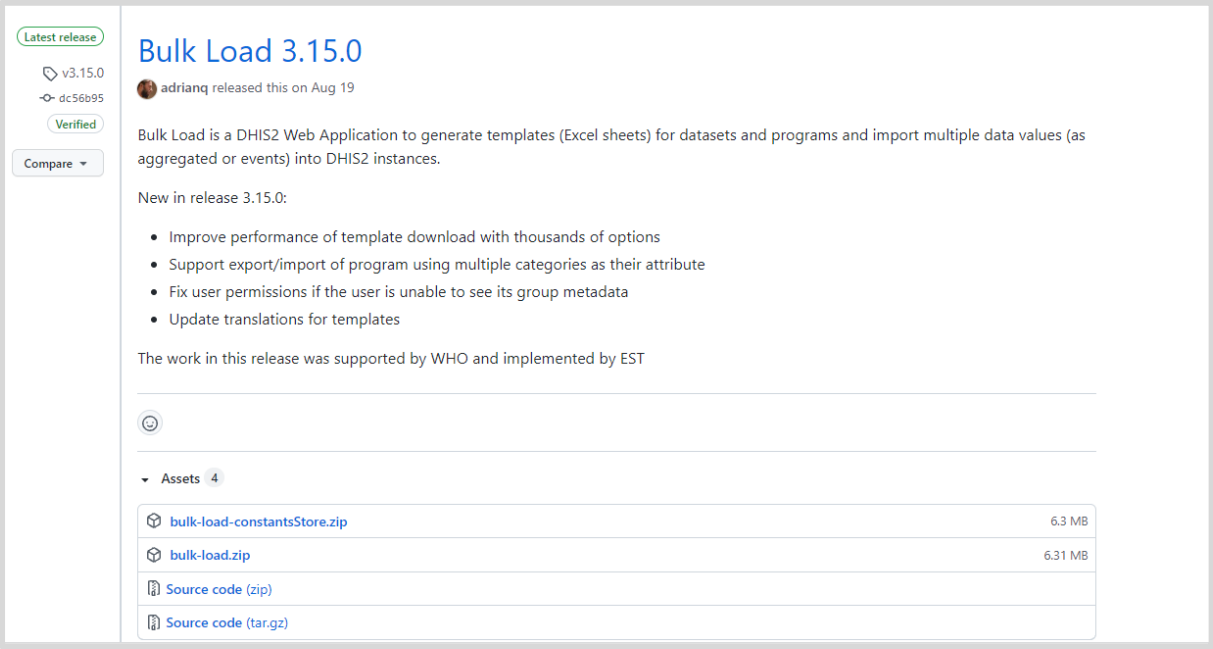
- If those in charge of recording events or inputting information in the datasets are unfamiliar with DHIS2 but are familiar with Excel spreadsheets. The downloaded templates can be presented in the Excel spreadsheet formats in alignment with the DHIS2 data style.
- If there is no easy way to access the DHIS2 instance, such as a lack of infrastructure or connectivity. In this case, spreadsheets offer a standard solution almost as efficient as entering the data directly in DHIS2.
- If you want a single form to enter data for multiple organizational units at a time.
- If you don't wish to provide access to the existing data in the DHIS2 instance for security or privacy reasons, but you need to input data gathered by a user.

INSTALLATION

Bulk Load can be installed on any existing DHIS2 instance of version 2.30 and above. It is installed using the built-in app manager. The latest release of the application can be found in zip format at the link below:

https://github.com/EyeSeeTea/Bulk-Load-blessed/releases

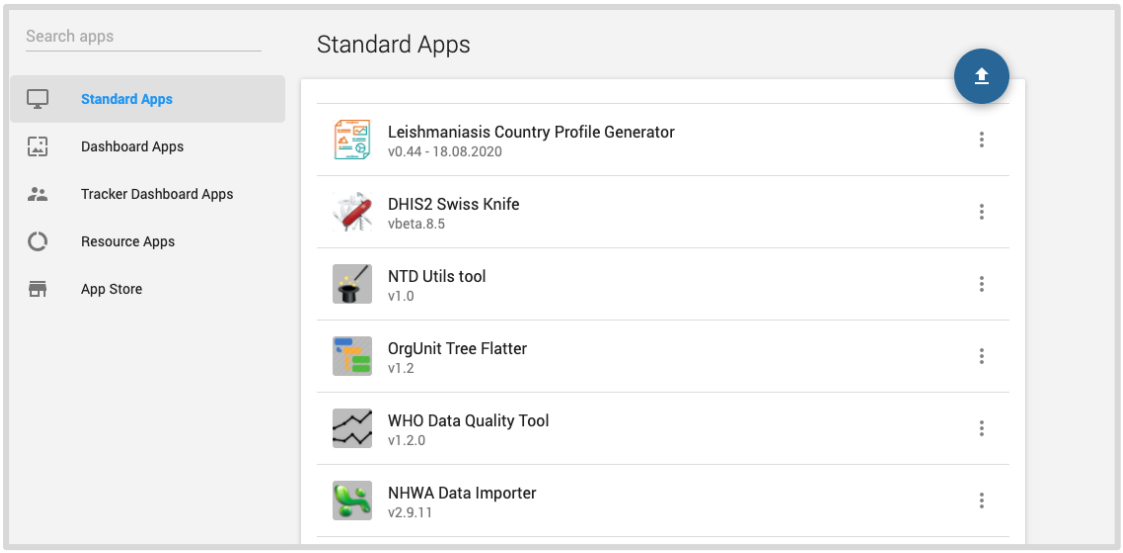
The link will open the GitHub releases page as displayed in the image below.



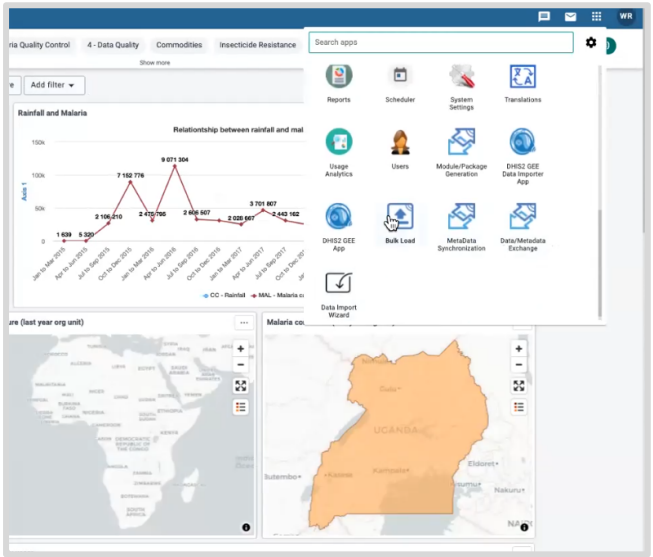
Follow the next steps to install and upload Bulk Load into your DHIS2 instance.

1. In the linked GitHub repository, you will find every release of Bulk Load, make sure to grab the latest release in Zip format. To download the zip file for a given version, click on "bulk-load.zip" under the relevant Assets section.

2. The Zip file will then be downloaded to your computer. Once you have the zip file on your computer, please visit the App Management app on your DHIS2 instance and upload the file that has just been downloaded.



3. Once the upload is finished, you will be able to access the Bulk Load app from the applications menu, which can be found in the search bar.

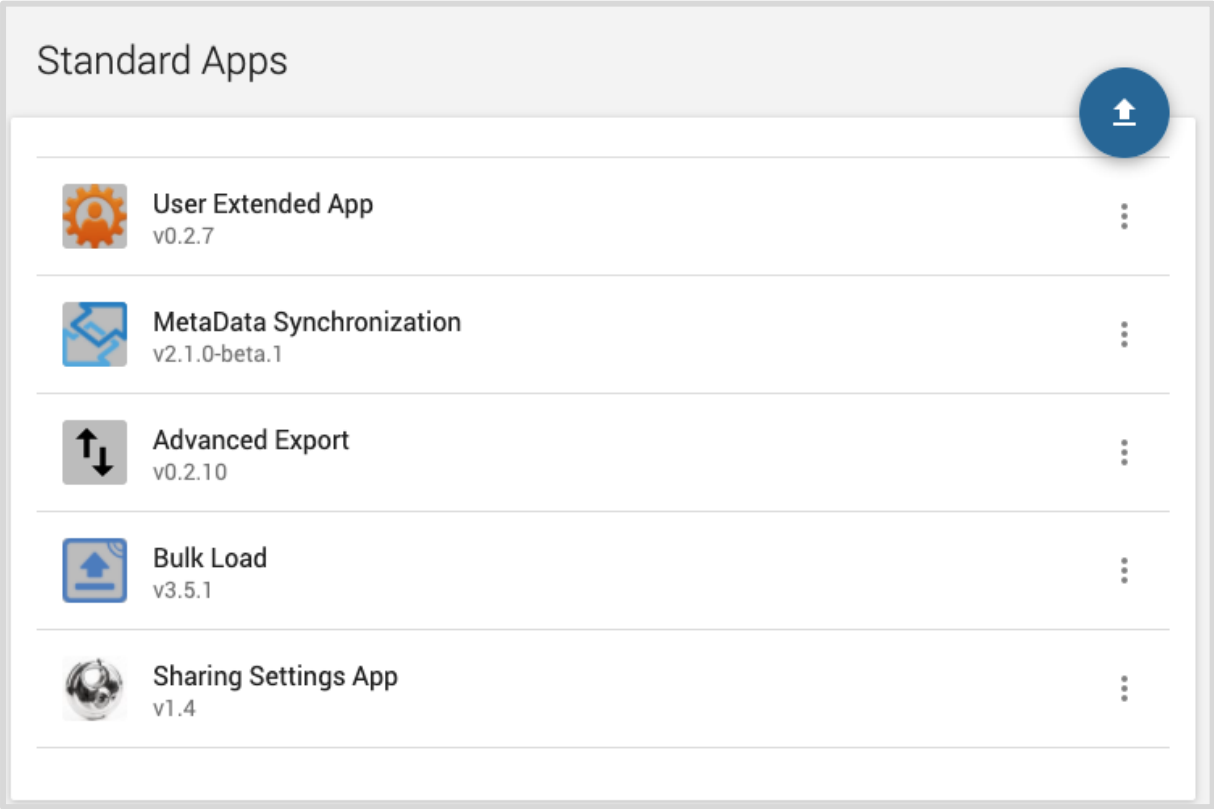


UPDATING AN EXISTING BULK LOAD APPLICATION

Installing updates

To update Bulk Load, please visit the App Management app on your DHIS2 instance and upload the latest file from the releases page on GitHub.

Please refer to the Images shown below:



You can check if the application you have installed on your instance is up to date by comparing the version number, which is incremental following a major, minor and patch semantic versioning. For example, 3.3.1 is newer than 3.0.0, and 3.1.0 is newer than 2.0.1. As of October 2021, the latest version is 3.15.0

CONFIGURATION

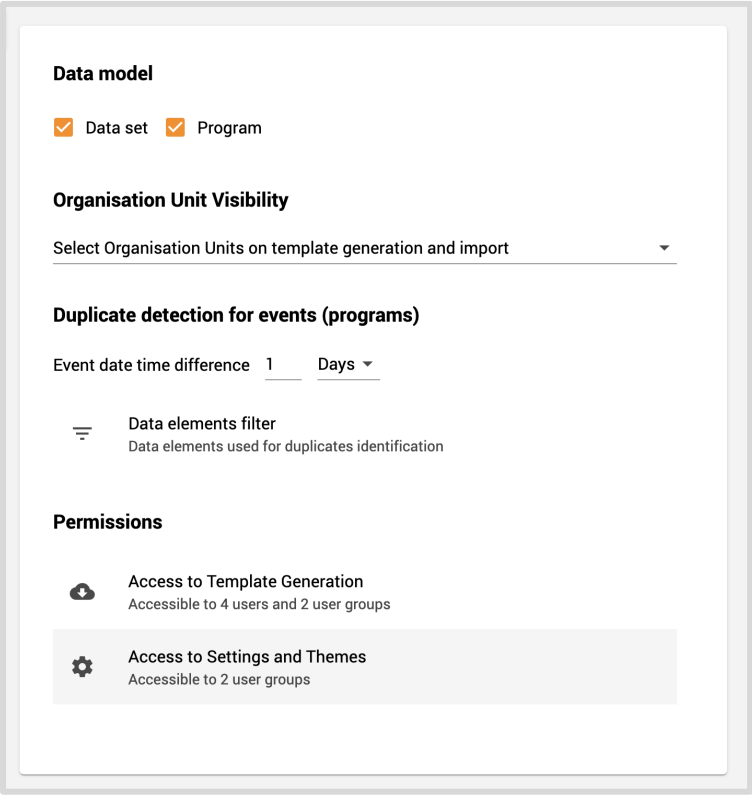
Administrator and User Permissions: A DHIS2 user with access to Bulk Load will always have access to the Import data section.

Beyond that minimum access, there are two additional roles:

- Users and groups with access to Template Generation: The Bulk Load users.
- Users and groups with access to Settings and Themes: The Bulk Load admins who set the path for the Bulk Load users.

Note: These permissions are only relative to the sections defined within the Bulk Load App. Beyond having access to the Bulk Load import or template generation, users must have the right permissions to access or edit a program or dataset.

This is the Bulk Load configuration page.



Data model

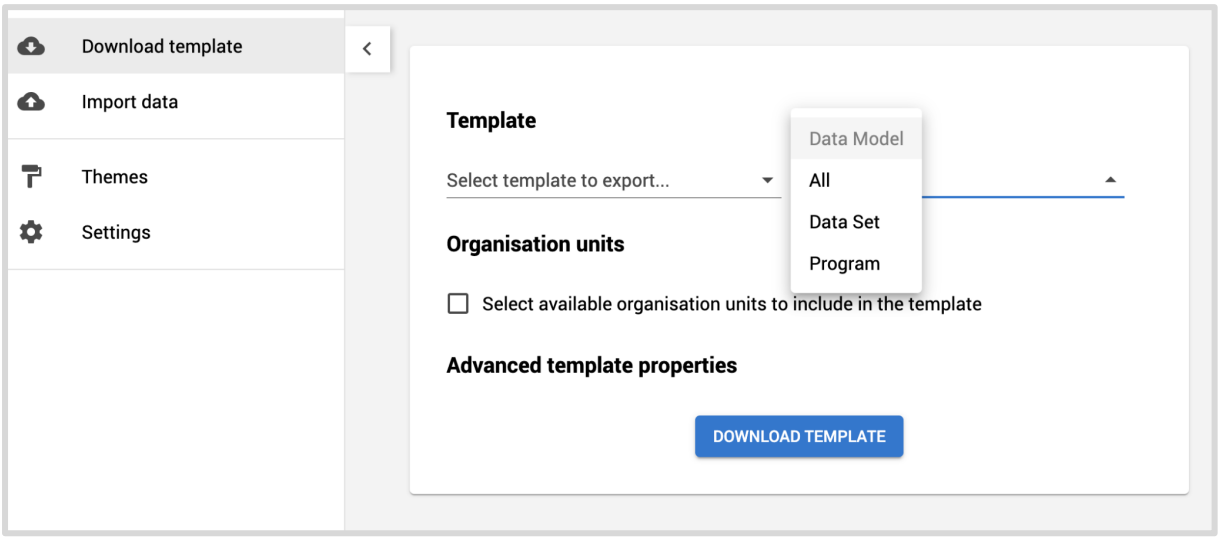
Users with access to the administrator settings panel can configure what it is available when creating a template.

The Bulk Load admin can select between allowing users to explore multiple data models or just one. For example, your organization might decide that excel files are only a valid method to gather

aggregated data but not events (program) because, for example, there is an android app or another interface available. In this case, the Bulk Load admin would disable the Program option.

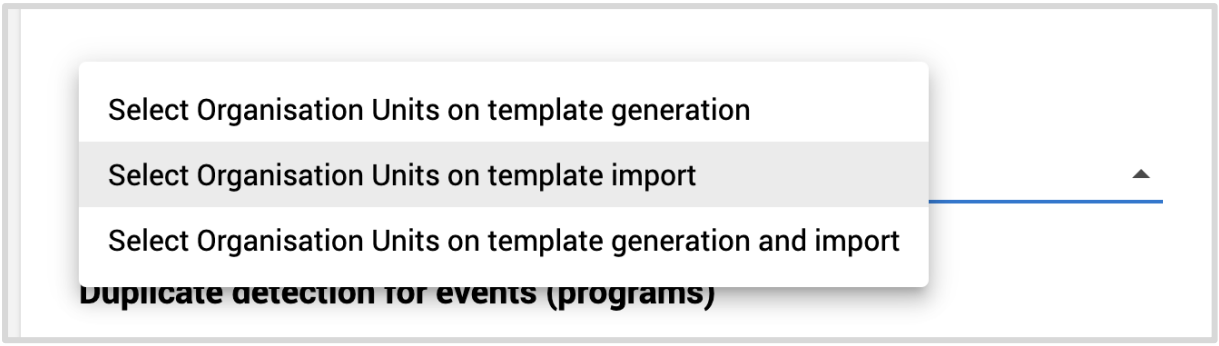
Note: *Events are also referred to as Program*

If more than one model is available users can filter using the Download template tab, while If only one model is available this selection box disappears.



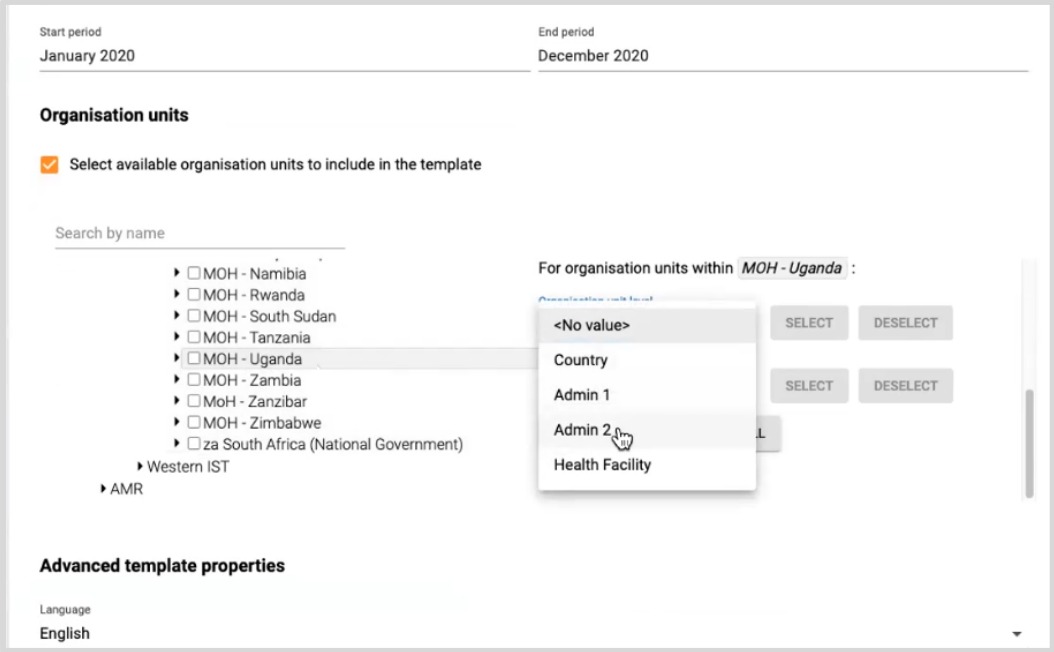
Organization unit visibility

When creating a template, the admin can define three different ways to associate the data in the excel file to individual organization units.



Select organization units on template generation

This is the ideal option if the organization units for the data collection are known when generating the template. For this option, users must know the country and organization unit level required for the needed data.



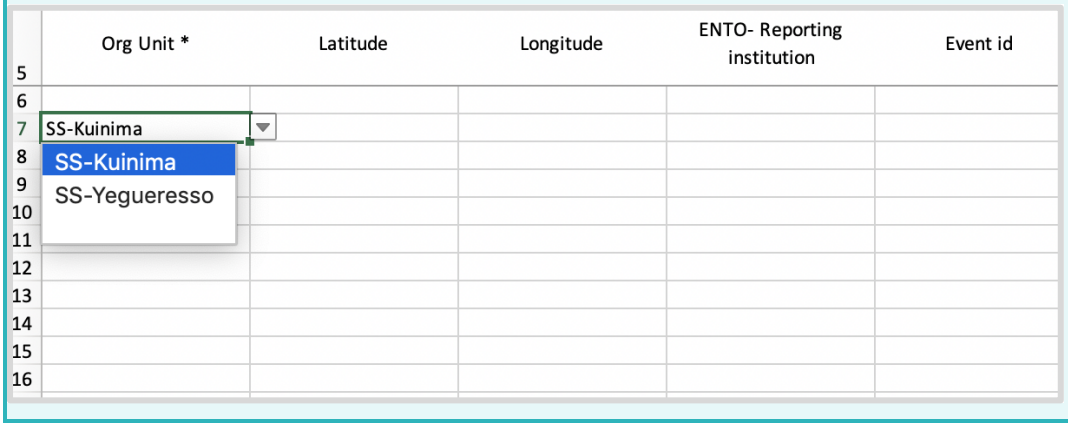
If this option is selected, users can select Organization Units on template generation.

CASE STUDY

In this example, we have chosen the Africa Region (AFR) from the global region (left) as our organizational unit, then selected the East Southern Inter-country Support Team (IST) and selected Ministry of Health Uganda (MOH – Uganda).

From the right, we have selected administrative level 2 (Admin 2) which corresponds to the districts in Uganda and will show all the districts selected and reflected in the template upon being downloaded. Admin 1 refers to the region and will show all the regions in the selected MOH.

In the excel file the organization unit (Org Unit) appears in a select box and the organization unit can be selected from among the options in the select box for each row.

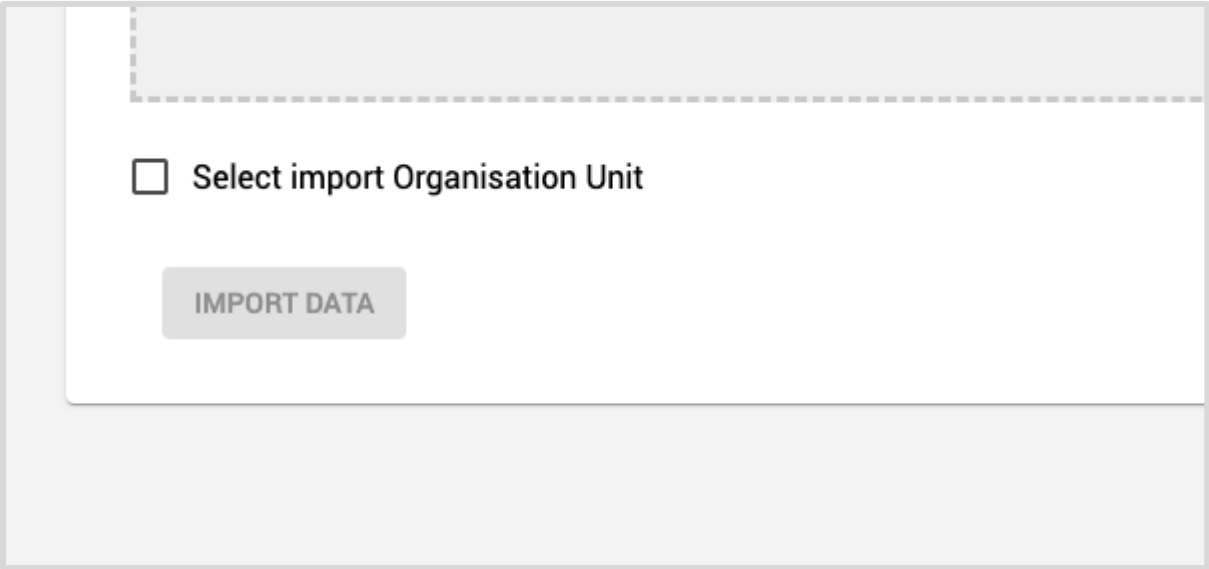


Select organization units on template import

It might happen that you don't know the organization unit when generating the template or the organization unit is not in the system yet.

In this case, the decision can be postponed until the template is imported with the data.

When this option is selected, a checkbox appears in the import window and the user importing the data can choose the Select import Organization Unit, with a maximum of one per file.



Note: *Remember when selecting the organization unit on a template, all data in the template file will be imported into a single organization unit.*

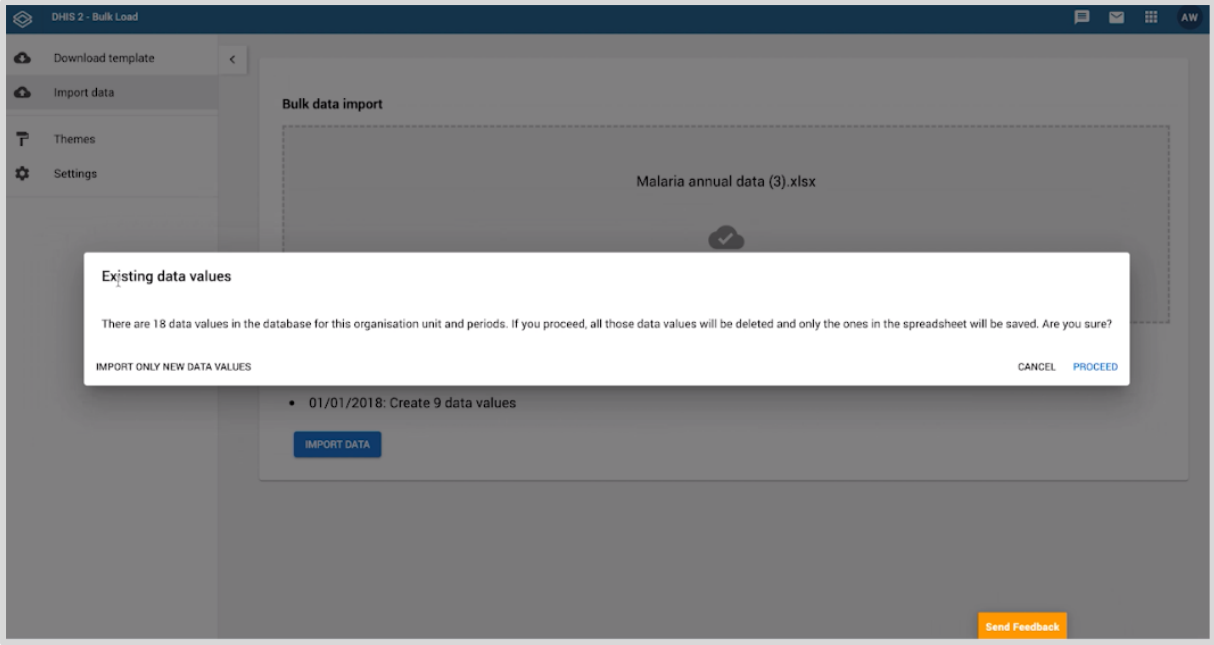
Select organization units on template generation and import

This option lets users decide what to do when creating templates or importing data.

- Users can select the organization unit when generating the template and the organization unit will appear in the excel file.
- However, it is also possible to overwrite the information on the template by selecting a different organization unit on import. Doing so will mean that all the data in the template file is assigned to a single organization unit.

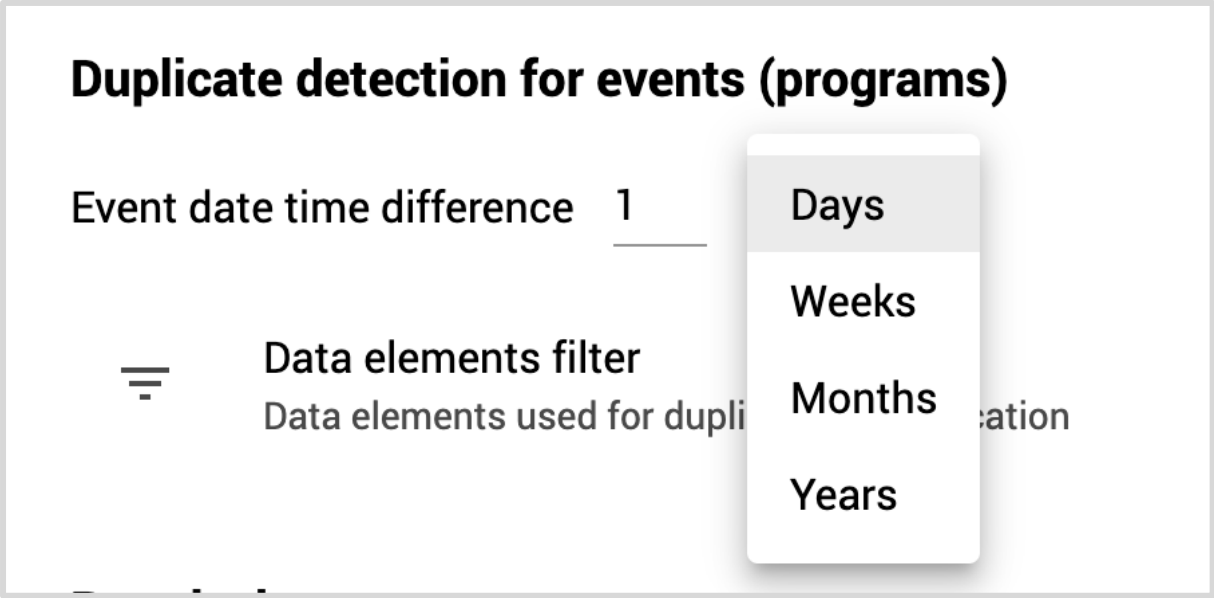
Duplicate detection for events (programs)

Duplicate events are a relatively common problem. Sometimes the same data is loaded several times using different methods. Bulk Load runs an algorithm for each event to detect whether the event may already be in the system. Then we ask the user what to do with the suspect event.

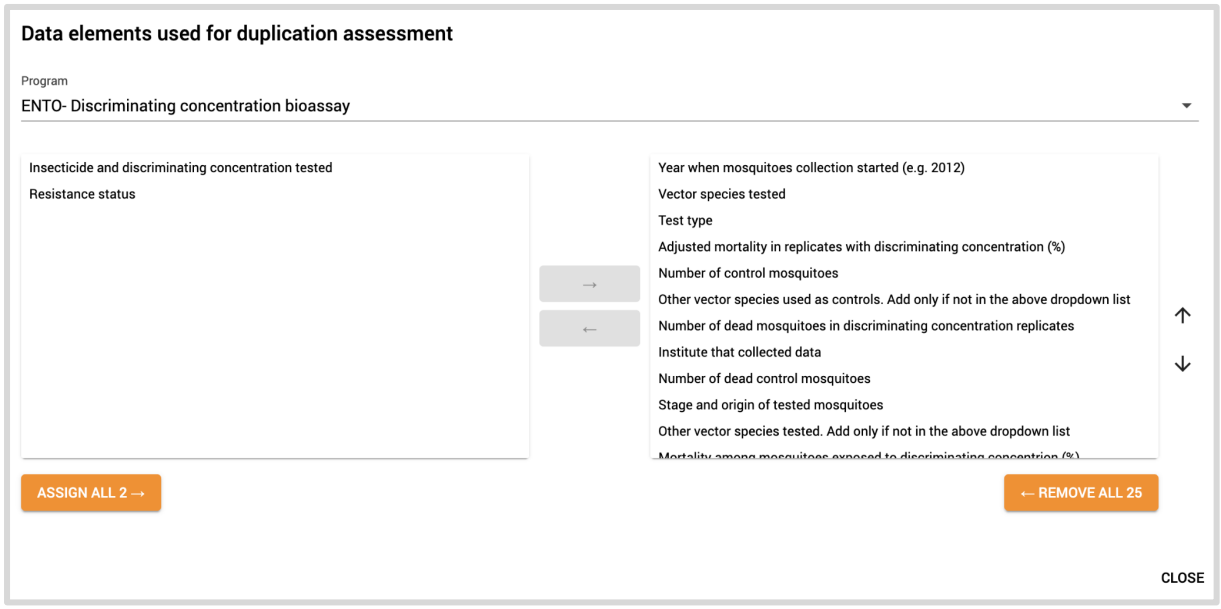


If the event in the system and the event being imported share the same ID, the event is assumed to be the same, and Bulk Load will attempt to update it. But in other cases, the algorithm will compare time difference and data elements to find duplicate events:

Time difference



Selecting data elements for the program



This window appears when Data elements filter is selected. For each program, you can select which data elements are taken into consideration when comparing two events. By default, all elements are compared.

Move elements to the left side to exclude them from the comparison.

CREATING AND DOWNLOADING TEMPLATES

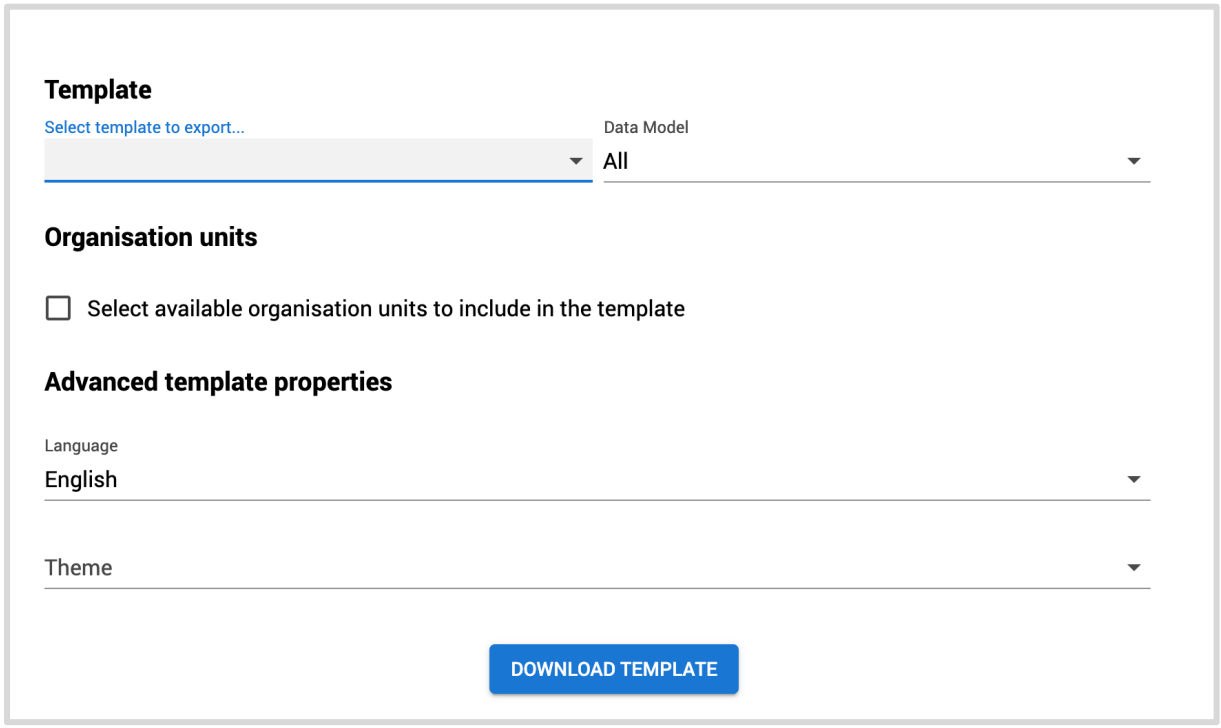
Creating an Excel template is a straightforward process. No mapping is required.

1. Select the program or dataset
2. Choose the organization unit (optional)
3. Choose the language and theme

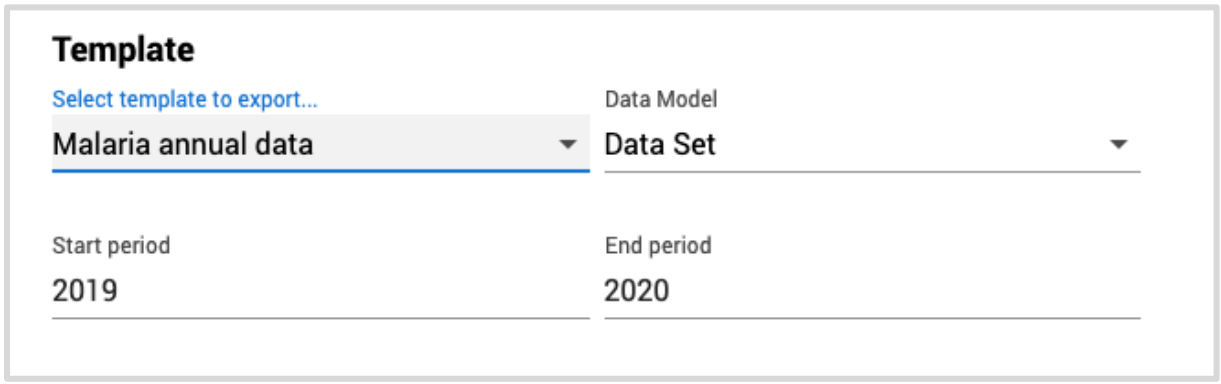
These three simple steps generate an Excel file which can then be reimported fully populated with data.

Template

The template list displays the programs or datasets that you have access to.



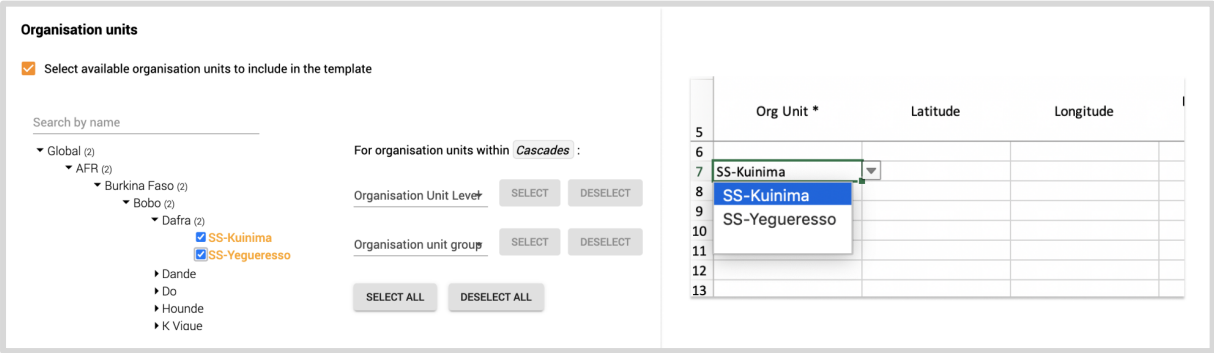
For datasets, you must also select the time period into which you will allow the template to insert data.



Organization units

This option is only available if Select organization units on template generation is enabled in settings.

You can choose as many organization units as required and they will be available for selection in the excel file.



Language

You can choose any language in this selector, but the program or dataset must have an available translation to this language. If there is no translation available for the metadata it will use the information in the Display name field.

Theme

In this section, you can choose one of the available themes for your system. A theme includes choosing colours to differentiate fields and a specific header design with a title, subtitle and image.

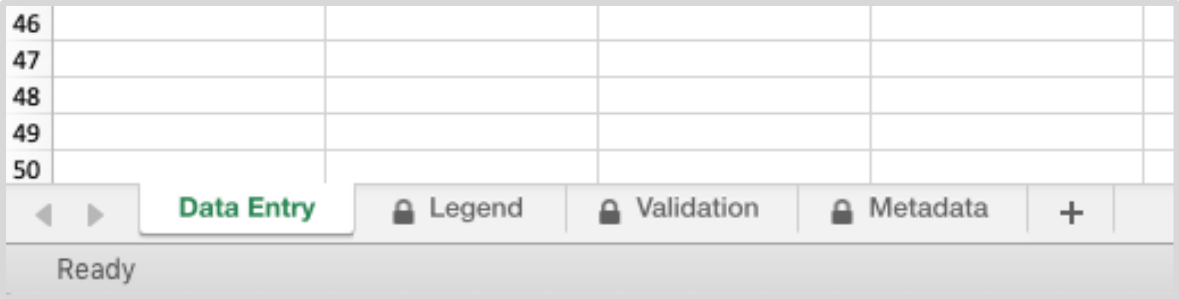
Populating the template with data

By default, templates contain no data, only row headers. By enabling this option, the template comes pre-populated with instance data for the selected time period. There are a few contexts where populating with data can be useful:

- You require previous data as a reference.
- You wish to ensure that there is no existing data.

THE TEMPLATE FILE

The template file is an Excel file that contains the mapping information required to correlate the columns in the spreadsheet with the metadata in the DHIS2 system.



The "Data Entry" page contains columns that don't depend on the data model or the columns representing the data model.

Note: *The file has many pages; however, only the Data Entry page should be edited. The other pages contain internal information for Bulk Load.*

Case study

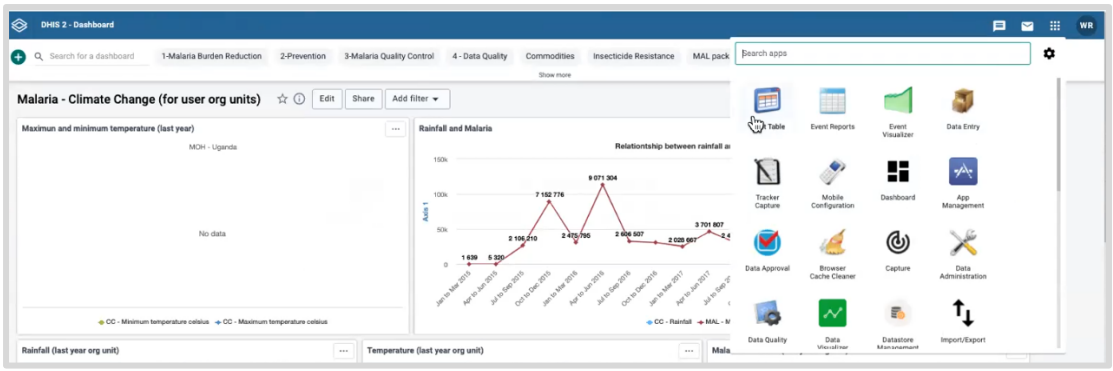
Importing data into the template using a pivot table

By default, the template contains no data when it is downloaded from the Bulk Load app. You can populate the template (an Excel table) with data by exporting from the local health management information system (HMIS) through the pivot table and loading it into the DHIS2 repository. This will help to transfer data from one system to another without any direct linkages.

This example shows how to achieve this:

1. Find out what the different variables in the mapped HMIS data corresponds to that in the AFRO instance, then link the variables to the pivot table:

    a. Open the DHIS2 dashboard and locate the pivot table in the list of applications. The pivot table is used for report creation.



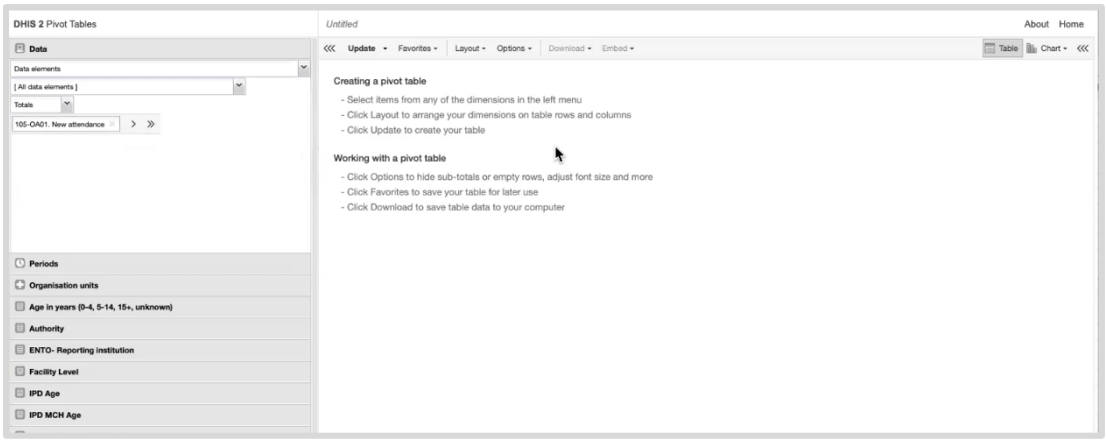
2. Open the pivot table to start creating the report based on the data that is required in the downloaded template.

Note: *In this example, we match the HMIS variables with the variables on the AFRO repository (2.1.) and then find the corresponding HMIS variables on the pivot table (2.2).*

2.1.

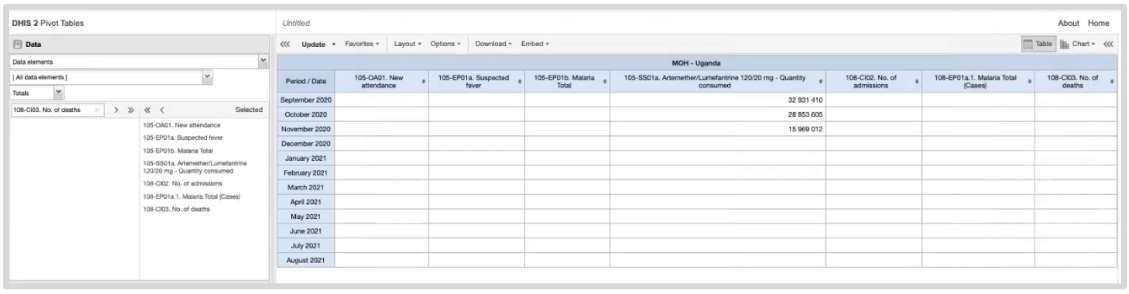
	Montly Variables (AFRO repository)	Local equivalent (HMIS-DHIS2)
1		
2	**Montly Variables (AFRO repository)**	**Local equivalent (HMIS-DHIS2)**
3	All-cause outpatient	105-OA01. New attendance
4	Suspected cases	105-EP01a. Suspected fever
5	Outpatient malaria cases (confirmed + presumed)	105-EP01b. Malaria Total
6	Number 1st-line treatment courses received (inlc. ACTs)	105-SS01a. Artemether/Lumefantrine 120/20 mg - Qui
7	All-cause admissions	108-CI02. No. of admissions
8	Malaria admissions	108-EP01a.1. Malaria Total (Cases)
9	All-cause deaths	108-CI03. No. of deaths
10	Malaria deaths	108-EP01a.2. Malaria Total (Deaths)
11	Tested (micr)	105-PS01a. Malaria Microscopy - Done
12	Positive (micr)	105-PS01b. Malaria Microscopy
13	P. falciparum (micr)	
14	P. vivax (micr)	
15	Mixed (micr)	
16	Other species (micr)	
17	Tested (RDT)	105-PS02a. Malaria RDTs - Done
18	Positive (RDT)	Positive + 105-PS02b. Malaria RDTs - Positive
19	P. falciparum (RDT)	
20	P. vivax (RDT)	
21	Mixed (RDT)	
22	Number of health facilities expected to report	HTM - 105 OPD Monthly Report Expected reports
23	Number of health facilities reporting	HTM - 105 OPD Monthly Report Actual reports
24		

2.2. To look for the HMIS data on the pivot table, select **data**, select **all data elements** in the dropdown list then paste the HMIS variable into the search box on the pivot table. When this is done, the corresponding data in the DHIS2 repository will move from the left to the right on the pivot table.



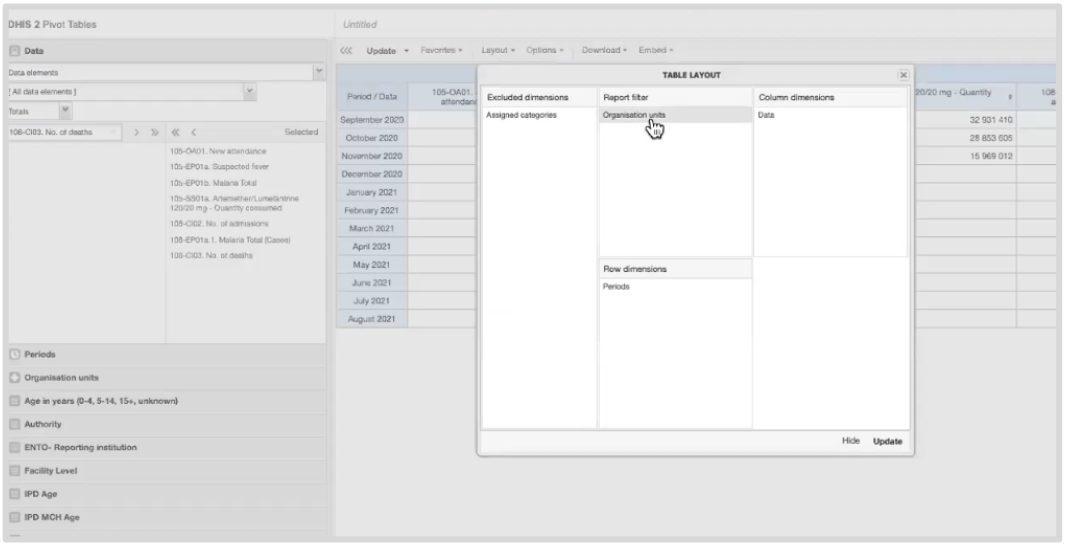
All the variables in the HMIS data required in the template will be uploaded into the pivot table in the same manner until all required variables have been matched with the corresponding DHIS2 variables through the pivot table.

3. Click Update to view the report and confirm that it corresponds to the DHIS2 template generated.

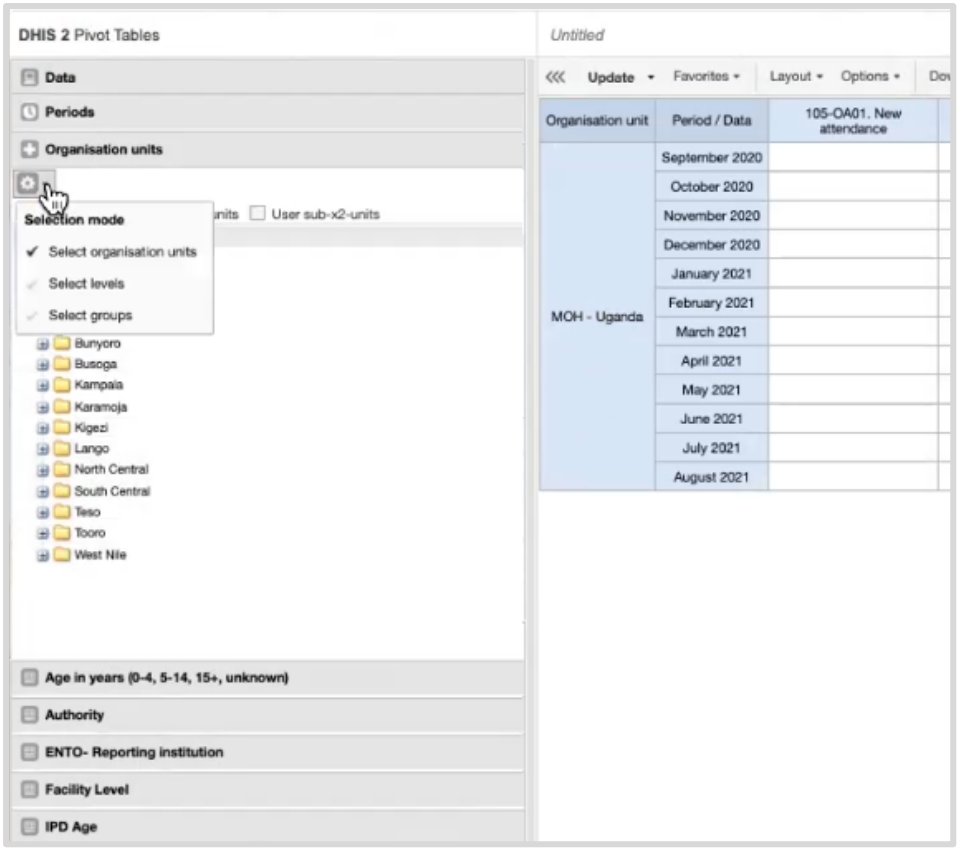


4. Click Layout to insert desired sections into the report as required by the template.

Note: In this example, we inserted the organizational unit into the report by clicking the Layout button and dragging the organizational unit into the desired row. Click Update to put the new arrangement into effect.

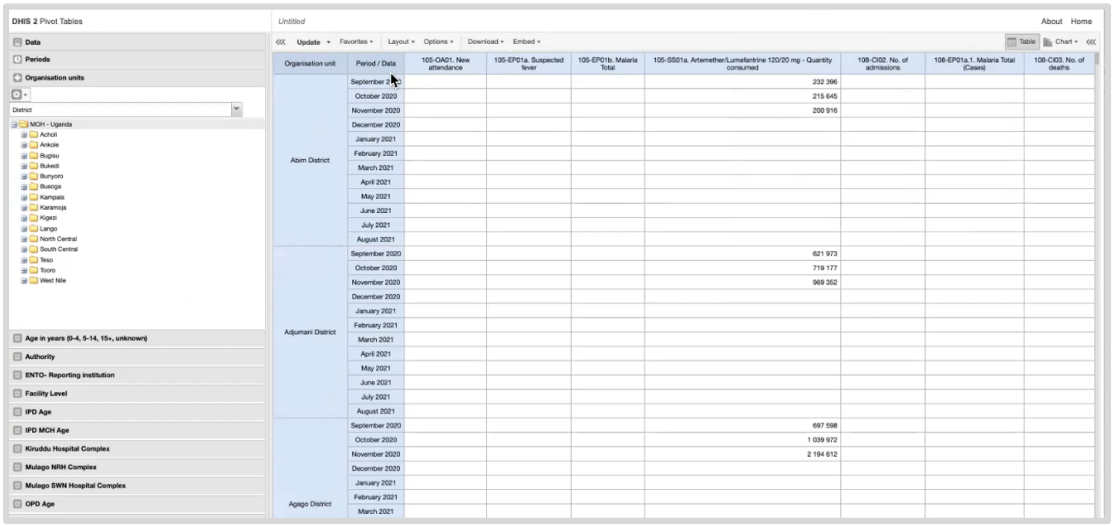


5. To view the report as districts instead of national level information, navigate to the menu list on the left hand of the DHIS2 and select Organization units. Then, click on the Selection mode and Select levels and then select the districts corresponding to your desired result.

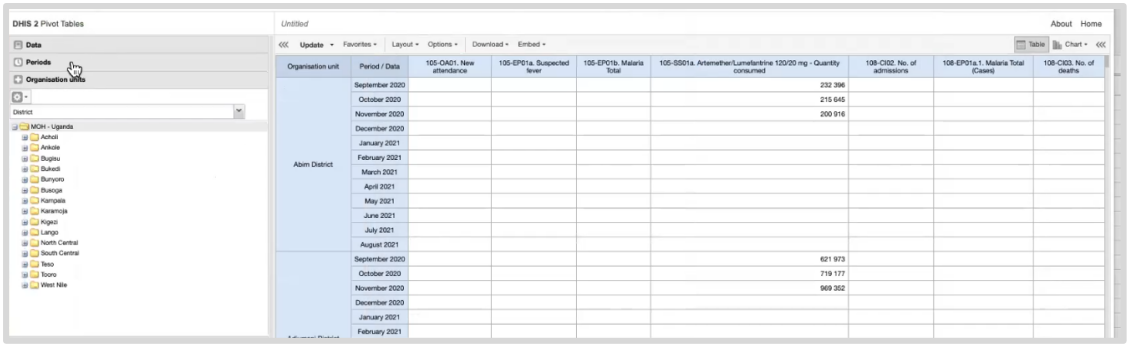


6. Click update to view the new report data sheet.

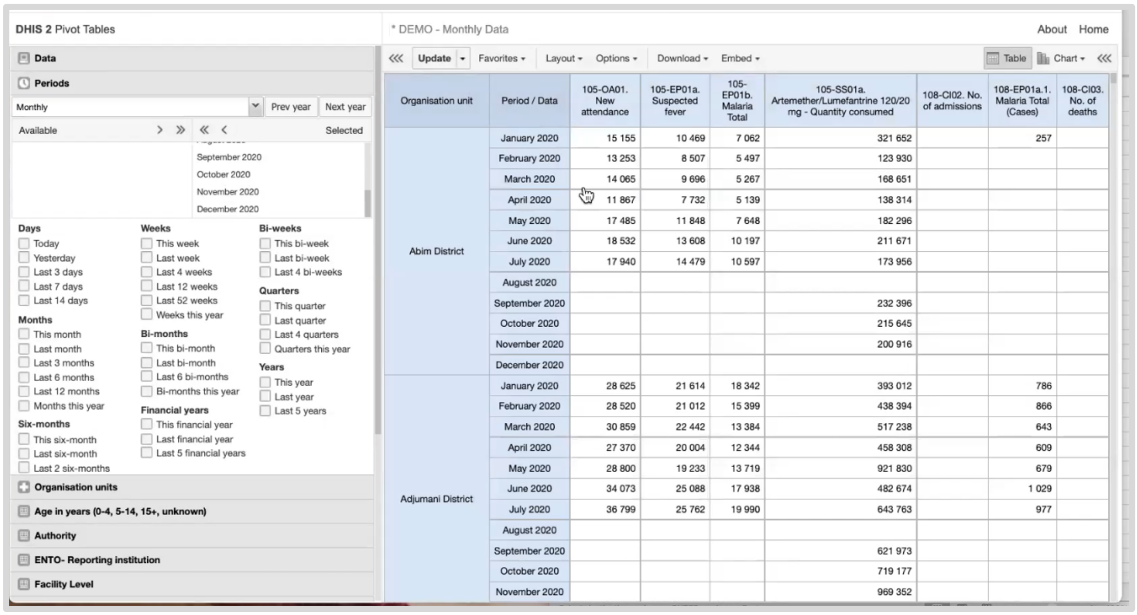
Note: *In the example below, we have selected the districts within MOH Uganda under the organization unit.*



7. To view the report for a particular period of time, select Period from the menu on the left hand and navigate to select the desired period for which you require a report.



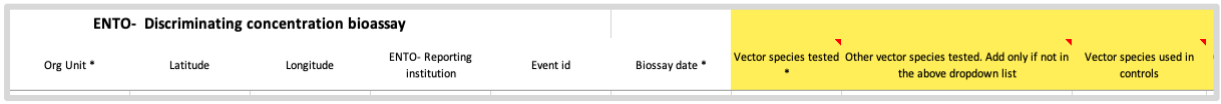
Note: *In this example, we selected January 2020 to December 2020 and categorized the data by districts using Organization unit.*



8. To download the report in excel format, click Download and select the CSV format in the table layout option. Upon downloading, delete columns that are irrelevant to the DHIS2 template and copy the report into the DHIS2 template by using the Insert values option.

   The DHIS2 template and the data can then be uploaded into the repository using the Bulk Load app on the DHIS2 webpage. The upload page also allows users to import data specific to selected districts by clicking the Select import organization unit button.

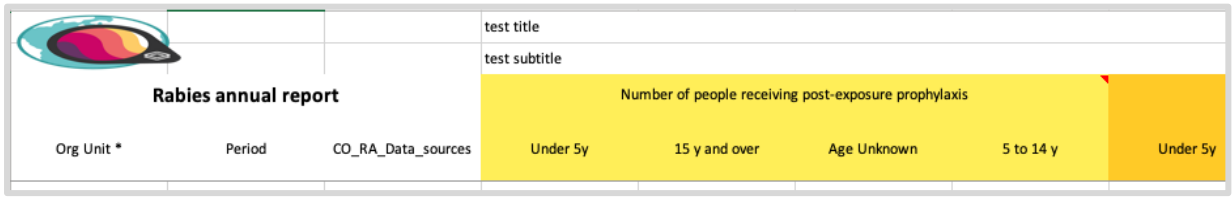
Common columns for events



- Organization unit: Select one of the existing organization units or enter a new one. Excel will warn you if you add a new one.
- Latitude-Longitude: Useful to add extra information about the organization units particularly when it is not in the system.
- Reporting institution: Complete if the data comes from an institution.
- Event ID: Usually this field is empty: DHIS2 will assign the Event ID to the event during importation. If the template is pre-populated with data, all this data will come with an Event ID.
- Bioassay date: Event date

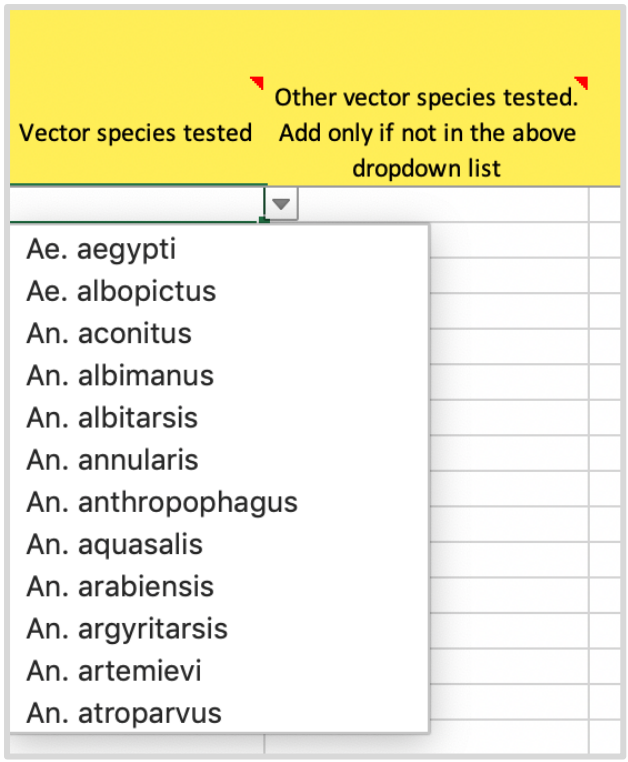
Common columns for datasets

- Org unit
- Period
- CO_RA_Data_Sources



Data model columns

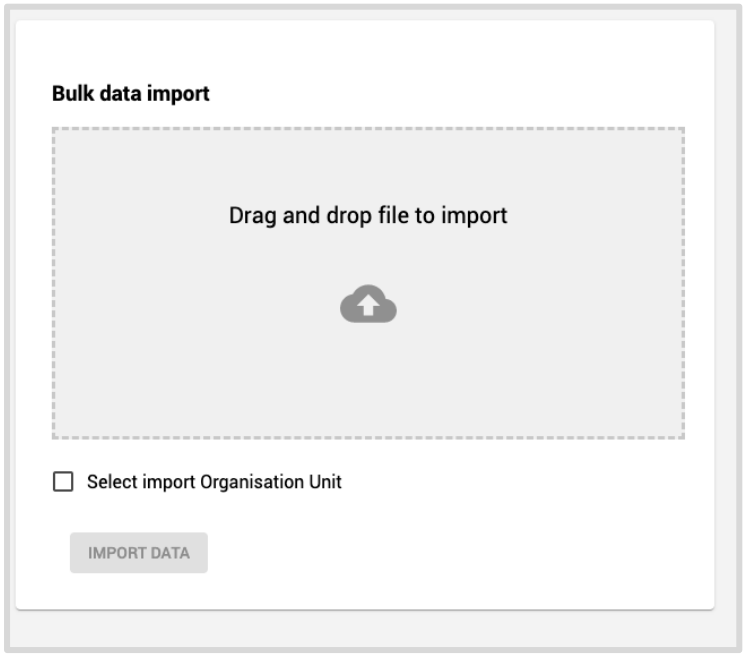
The rest of the columns are particular to each data model, and the fields representing option sets contain dropdown menus from which to select elements.



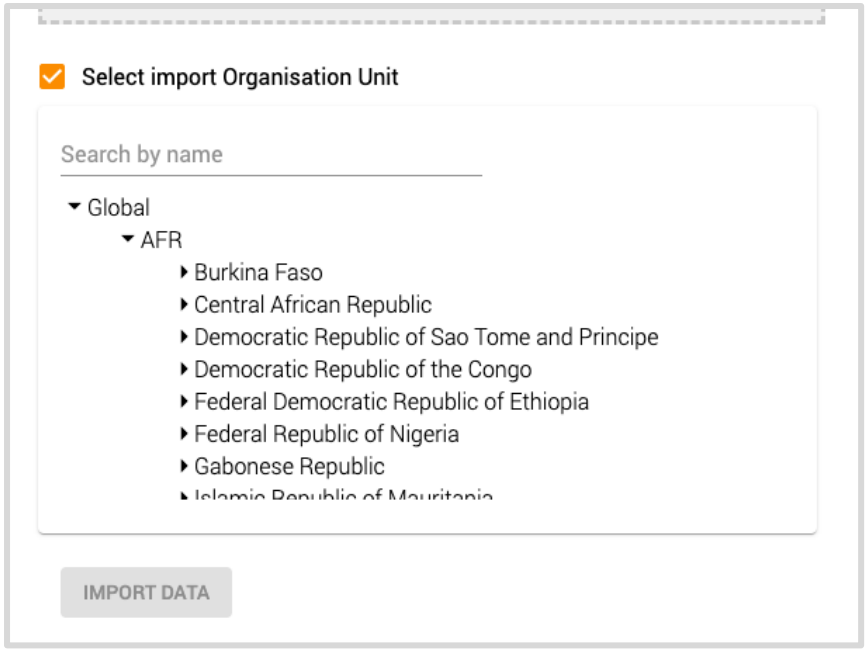
Note: *Validation for a dropdown in Excel is not mandatory. That is, you can still type an option not available in the dropdown list. The cell will display an error, and you can still save the file; however, it will produce an error when importing the data into DHIS2.*

IMPORTING DATA

Import data reads the Excel template filled with data and inserts the data into the corresponding data model in the instance.



Bulk Load can be configured to let you select the organization unit when importing. In this case, the Select import Organization Unit option appears and lets you choose a single organization unit to which all the data will be assigned.



DUPLICATES AND UPDATES

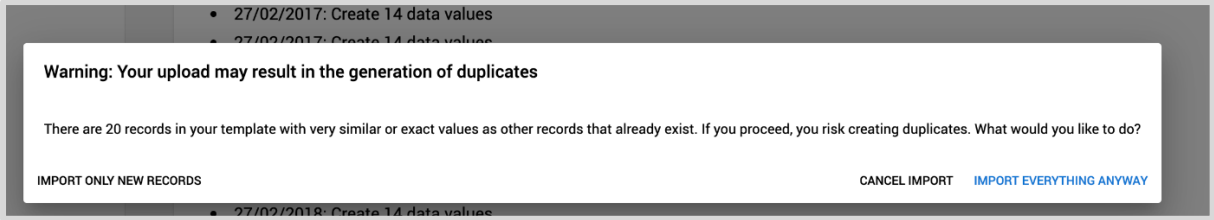
Depending on the information available on the Event id column, the data may be interpreted in different ways.

5	Org Unit *	Options	Event id	Data do teste *	Test type *	Insecticide and discriminating concentration tested *
6	Akrodie Health Centre	default		2017-02-27	WHO tube test	Pirimiphos–methyl 0.25%
7	Akrodie Health Centre	default		2017-02-27	WHO tube test	Pirimiphos–methyl 0.25%
8	Akrodie Health Centre	default	Xwdcx2rAjUJ	2017-02-27	WHO tube test	Permethrin 0.75%
9	Akrodie Health Centre	default	TSpS23ys0C6	2016-02-27	WHO tube test	Pirimiphos–methyl 0.25%
10	Akrodie Health Centre	default	fcBghzsIrEm	2016-02-27	WHO tube test	Permethrin 0.75%

- Event id is empty: Bulk load will treat the row as a new event. In this case, however, the duplication detecting algorithm will take action (see below).
- Event id is not empty: Bulk Load will believe that we want to update an existing event with the same Event if.

Duplicate detection example (for events)

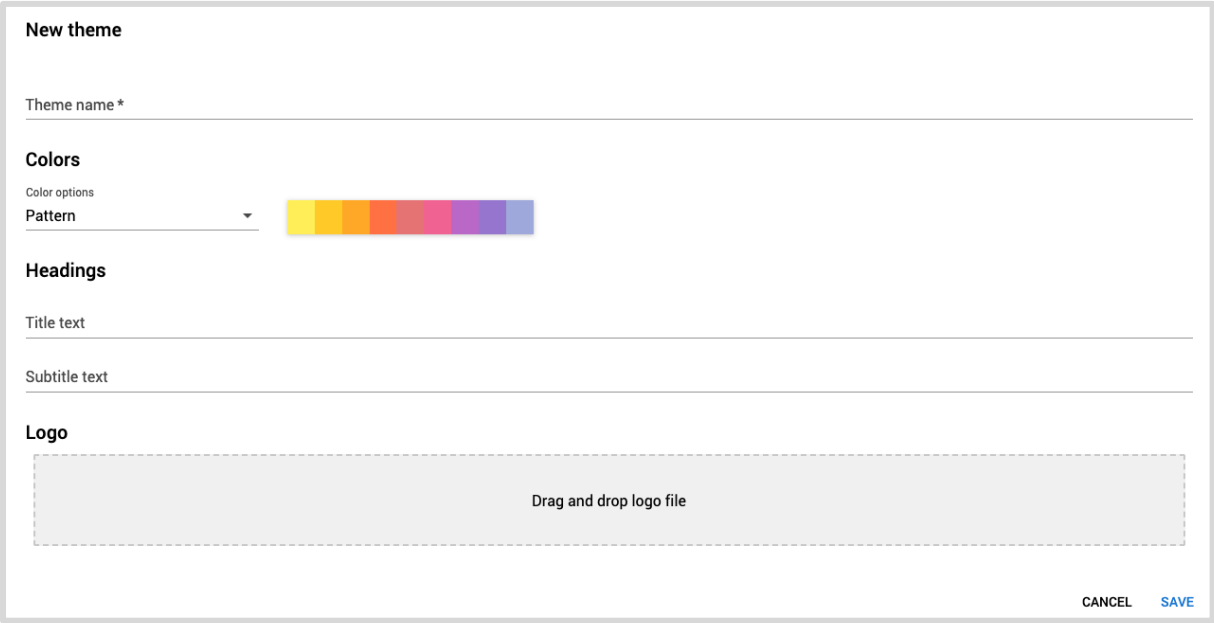
You can configure the duplicate detection feature in the settings section. Before importing the data, Bulk Load will go through each item to deduce whether they already exist in the system. If duplicated items are found, the user can decide whether to import new records only, all records or cancel the process.



ADDING THEMES

Users can grant permission to configure Bulk Load to create new themes. A theme defines the colour palette used to identify the columns and a header with an image, title and subtitle.

This feature is useful if creating an Excel file in accordance with a corporate brand identity.



The colour pattern behaves differently for programs and datasets.

- **Program:** Each section is assigned a different colour
- **Datasets:** Each data element is assigned a different colour.

Once a name is assigned to the theme, it will be available for all Bulk Load users when downloading a new template.

Themes within Bulk Load offer a quick way to personalize Excel files. Other visual aspects such as typography, font colour, and font-weight can also be modified as long as you don't modify the structure of the columns so that the file can be reimported into DHIS2.

Chapter 4: Metadata Synchronization

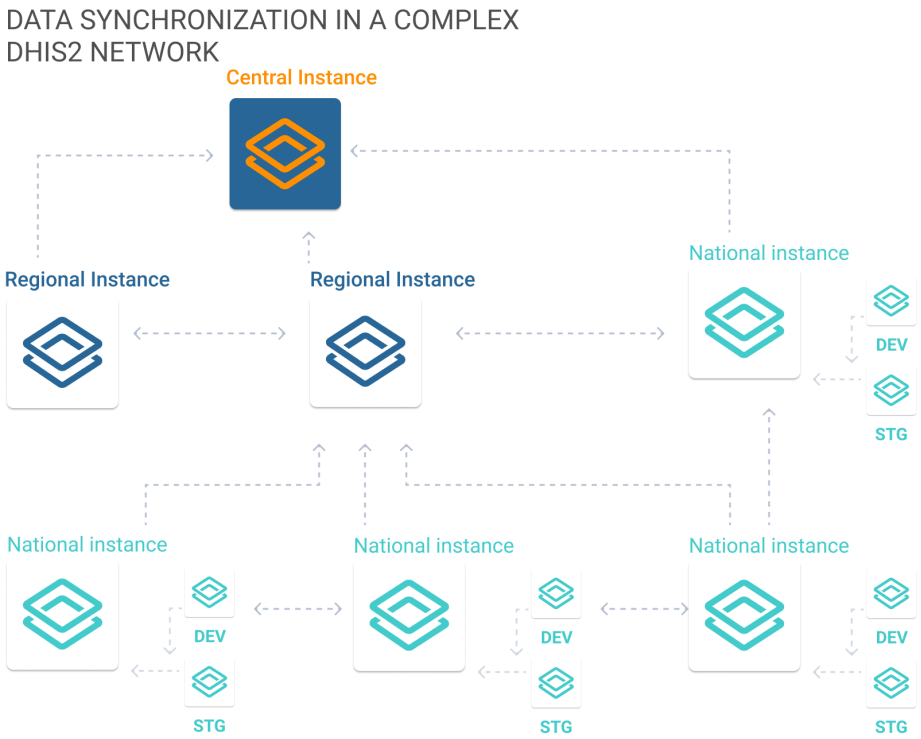
INTRODUCTION

DHIS2 and WHO have developed malaria modules that those working in malaria control and elimination can download and use to improve their data collection process. Course participants will be shown how to implement the standard modules and the national repositories at national level by connecting to a central repository using Metadata Synchronization (MD Sync), accessing and mapping the metadata and importing the final product into national systems.

If you work within the DHIS2 ecosystem, you may already be aware that each instance of DHIS2 is a self-contained environment and sharing data and metadata across multiple implementations can be a challenging and laborious process.

MD Sync is a DHIS2 application that has been conceived and designed to simplify and automate the process of sending data and metadata from one DHIS2 instance to one or several other DHIS2 implementations however different they might be.

This tool will save time and effort that could be spent syncing data and metadata between diverse DHIS2 instances.

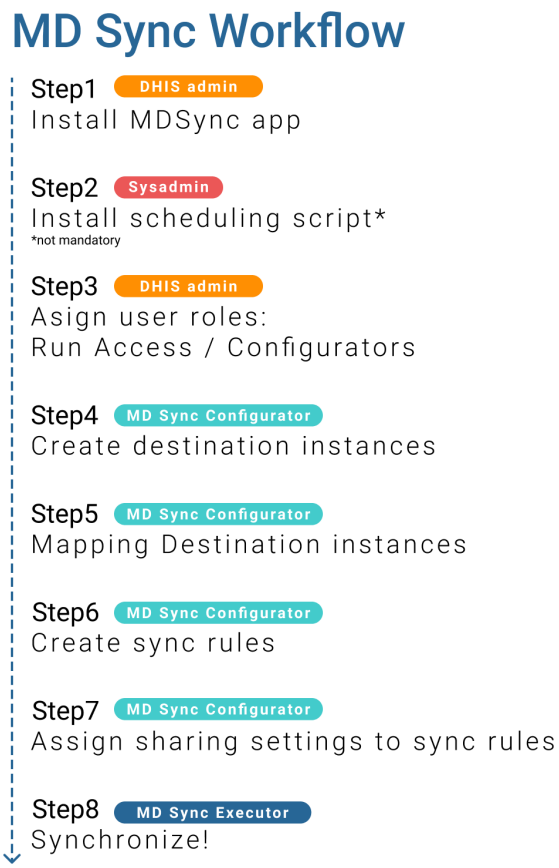


TYPES OF DATA SYNCHRONIZATION

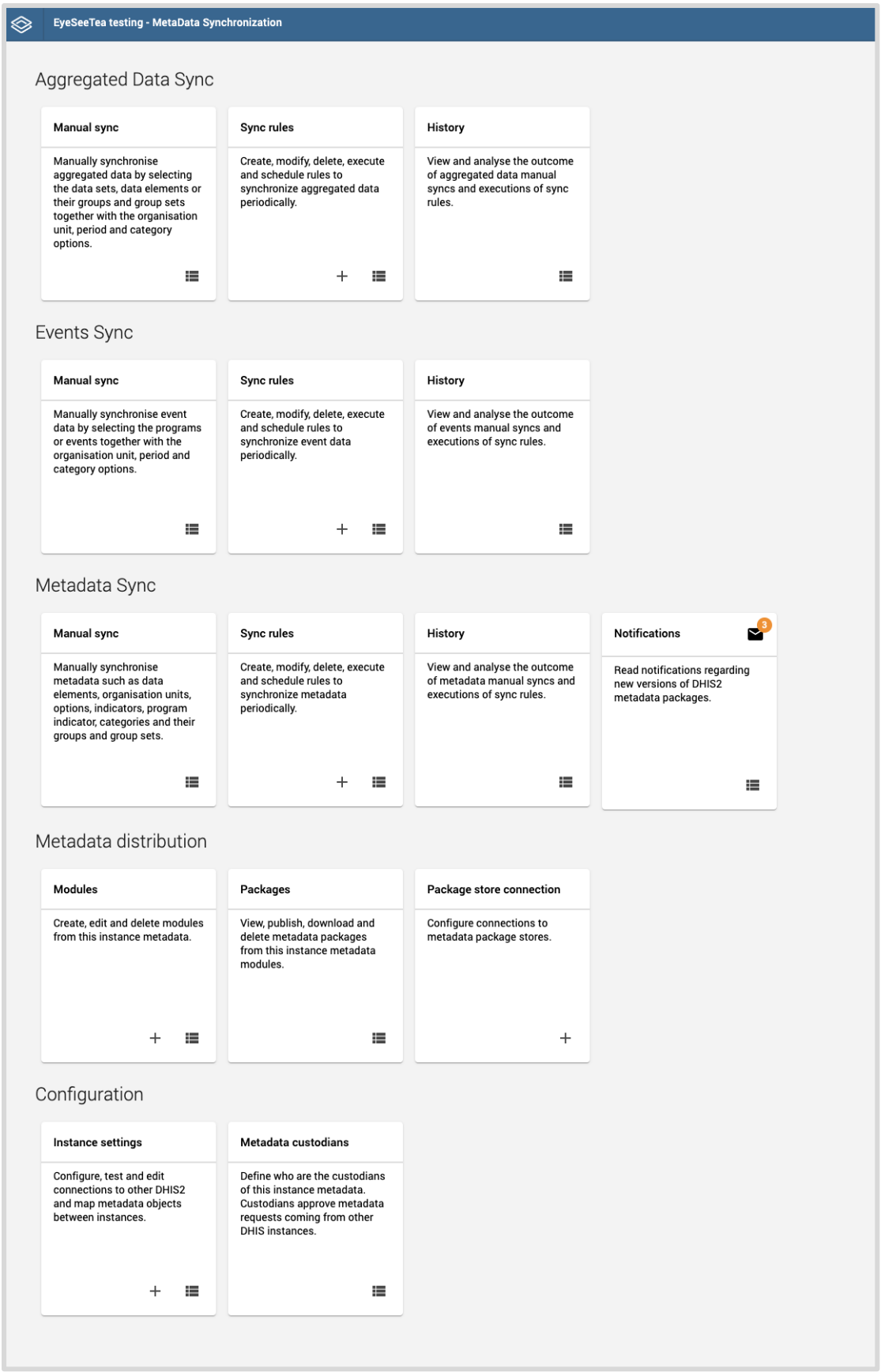
The MD Sync Application can synchronize metadata, events, and aggregated data. An instance running MD Sync can send data towards other instances (push) or retrieve data from other instances (pull). In this document we assume that we are configuring the local instance to push data toward other instances.

1. Aggregated Data Sync
2. Events Sync
3. Metadata Sync

The typical setup and use workflow with Metadata Sync involves these steps and requires different roles: Sysadmin, DHIS2 admin, MD Sync configurator and MD Sync run-only user



With this diagram in mind the main panel can now be understood.



The synching chapter is a comprehensive guide to learn how to create synchronization processes for aggregated data, events and metadata.

USE CASES

Complex DHIS2 data platforms are usually composed of multiple instances (DEV, DEV-CONTINUOUS, PREPROD, PROD etc.). Each instance has a purpose and hence is slightly different from the others. The workflow usually starts with the metadata developed in DEV and later migrated to PREPROD or PROD, to finally migrate to PROD when everything looks fine. When new metadata is ready to be published, a metadata package with its dependencies needs to be moved from DEV to PROD. It is important that only certain parts of the metadata with the desired dependencies can be moved from one instance to another.

MD Sync enables the admins to create profiles of metadata, save them, and then sync them with one or multiple instances.

Maintaining a unique organization unit tree across DHIS2 instances

Having a unique organization unit tree permanently synchronized across multiple DHIS2 instances can be challenging and typically requires a lot of manual transfers of organization units. With MD Sync we can keep the full organization unit tree synchronized across platforms.

Transfer of data between different DHIS2 instances

Countries or organizations may have created infrastructure composed of several DHIS2 instances. For example, international organizations may have different instances implemented at different levels such as regional or national and may need to transfer data between them. In these situations, the (UIDs) of the metadata and organization unit of the different instances may be different, hampering the exchange of data between them. MD Sync app allows for the exchange of data between different DHIS2 instances. It does so by mapping the metadata from these instances and applying the necessary transformation as data is sent from one instance to another.

Sharing anonymized data

There are different situations where data may need to be shared between DHIS2 instances, but the data contains information that shouldn't be shared. For instance, a program may have names, genders and ages of people in its information which is not to be included in the data in the program that has to be shared. By using MD Sync, it is possible to always exclude certain kinds of metadata during the synchronization process.

Managing data within the same DHIS2 instance

MD Sync can change data type within the same DHIS2 instances. For example, if data from the same disease is being collected through a tracker program in one pilot district and aggregated in another one, MD Sync can send tracker data to a dataset.

Installing and configuring a malaria repository

If using a separate DHIS2 instance to create a data repository, MD Sync and be used to load all or selected metadata from the routine HMIS DHIS2 instance to the repository; this includes (OrgUnits, Data Elements, Indicators, Category combinations, OptionSets, Users etc.). Once the metadata is loaded, the system can be used to import data and maintain both metadata and synchronized data.

To store, download and install packages enter the details of these packages and configure as needed. You can use the mapping feature to map the variables in the packages to your local equivalents along with the proper disaggregation.

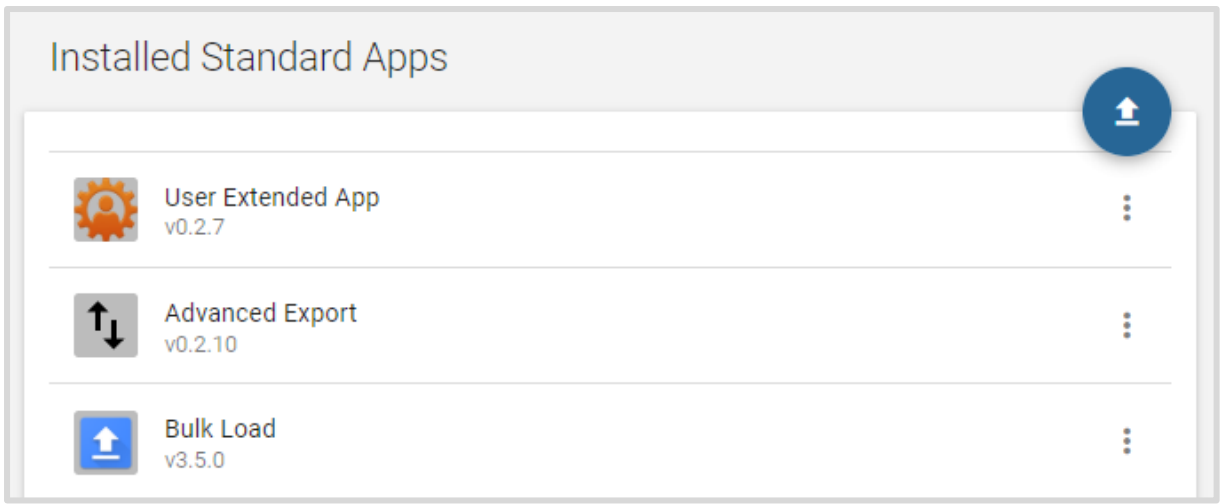
INSTALLATION

MD Sync can be installed on any existing DHIS2 instance in version 2.30 and beyond. It is installed using the built-in app manager. The latest release of the application can be found here in zip format:

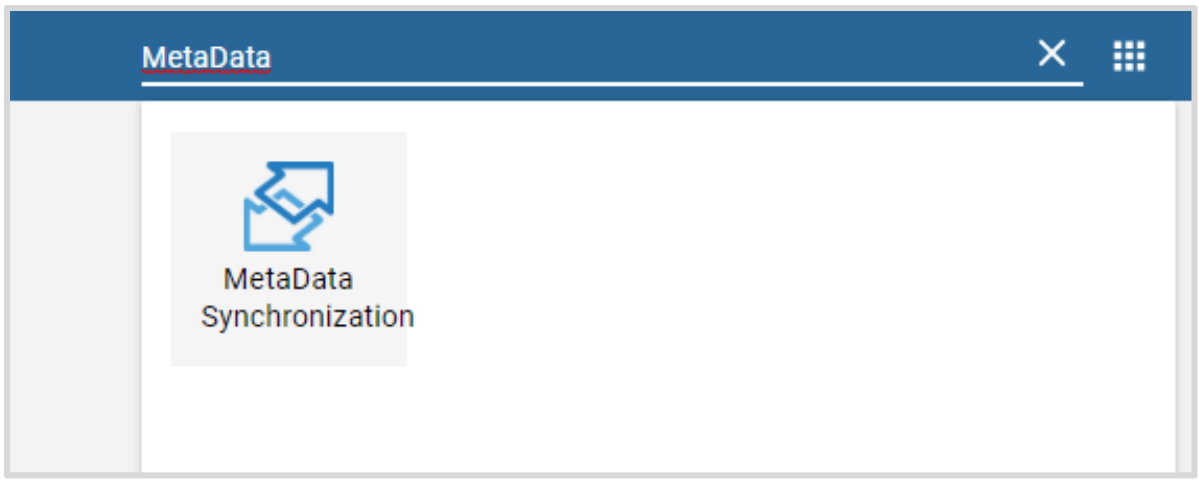
https://github.com/EyeSeeTea/metadata-synchronization-blessed/releases

In that GitHub repository you will find all the releases of MD Sync, make sure to always select the latest release. To download the zip file for a given version, click on "metadata-synchronization.zip" under each Assets section.

Once you have the zip file on your computer, please visit the App Management app on your DHIS2 instance and upload the file you just downloaded.

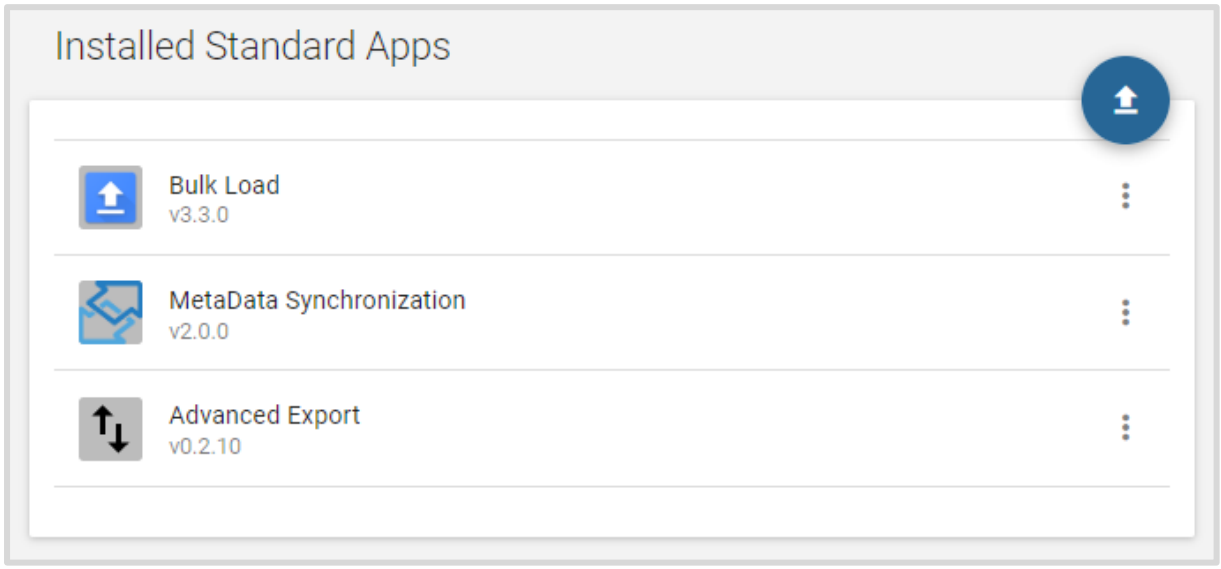


Once the upload finishes you will be able to access the MD Sync app from your applications menu that you can find in the search bar.



Installing updates

To install an update of the application, please visit the Management app on your DHIS2 instance and upload the updated file from the releases page on GitHub.

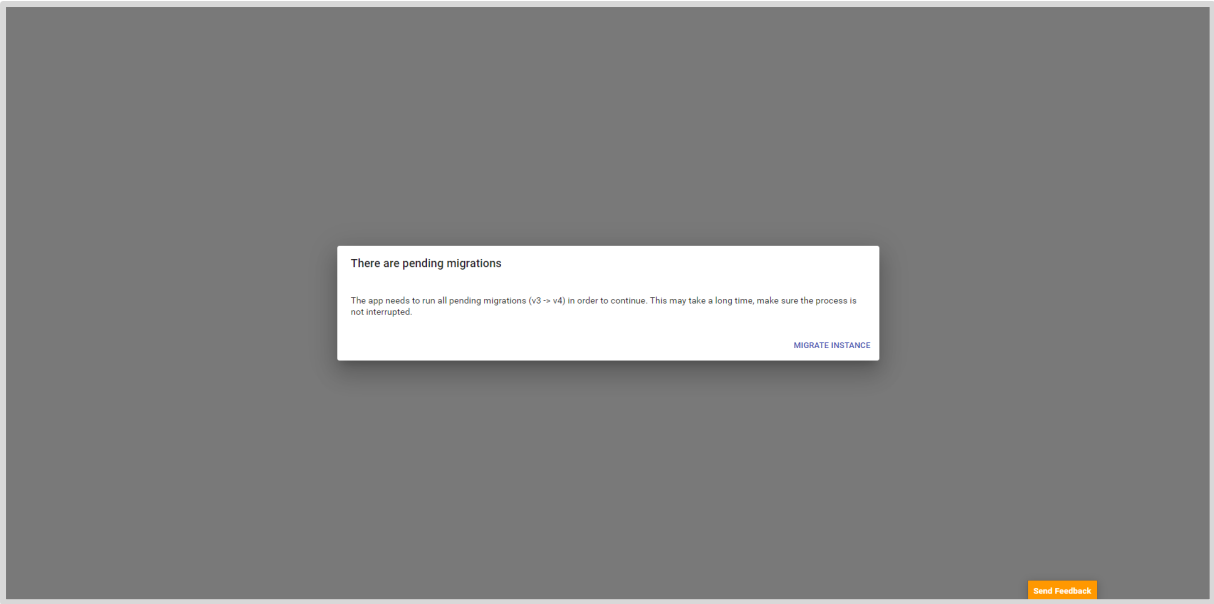


You can check if the application you have installed on your instance is updated by comparing the version number, which is incremental following a major, minor and patch versioning. For example, 2.0.1 is newer than 2.0.0 and 2.1.0 is newer than 2.0.1.

Database upgrades

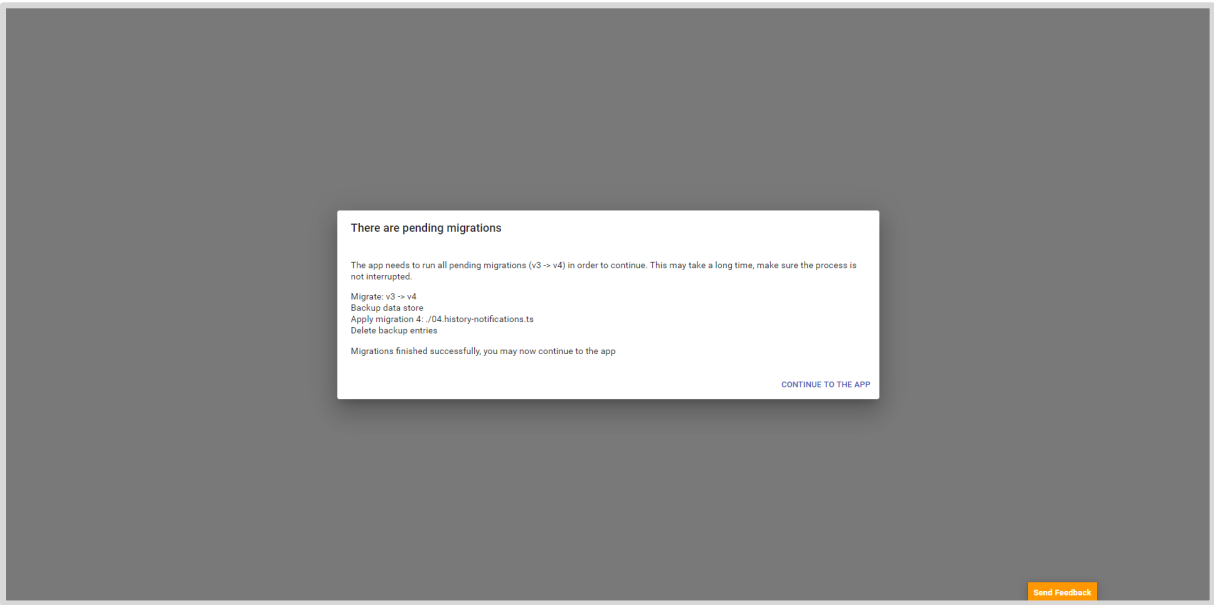
After updating the application, in some cases it is necessary to upgrade its internal database before being able to use the update. That upgrade procedure is called "migrations" inside the application

and will appear before starting the application as a dialog only when these database upgrades are needed.



Before the update, a backup of the database will be created as a safeguard. Do not close the web browser while the update is in progress.

The migrations should only last a few minutes, but it depends on the complexity of the task and the amount of data you have created inside MD Sync. Once finished you will be allowed to continue using the application.

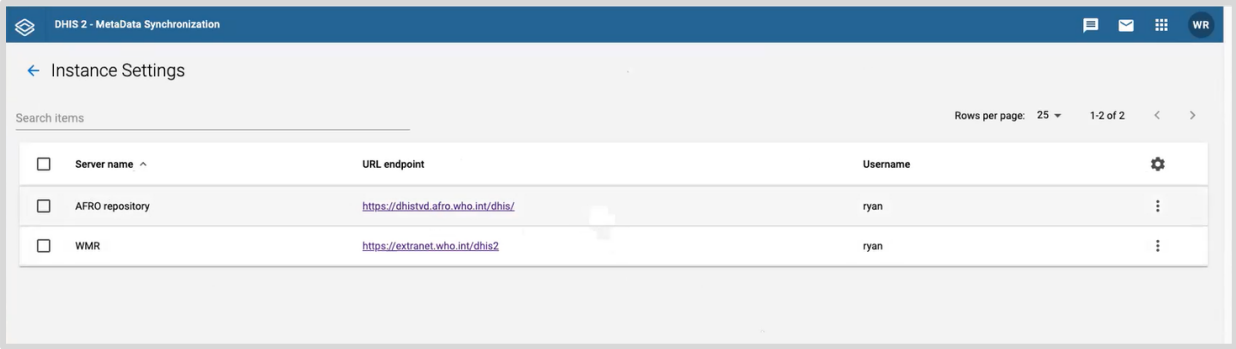


Since the migration process is quite delicate, we recommend the user that has updated the application to enter the application and make sure there are no pending migrations. This way any other user that visits MD Sync won't be prompted with these pages.

CONFIGURING AN INSTANCE

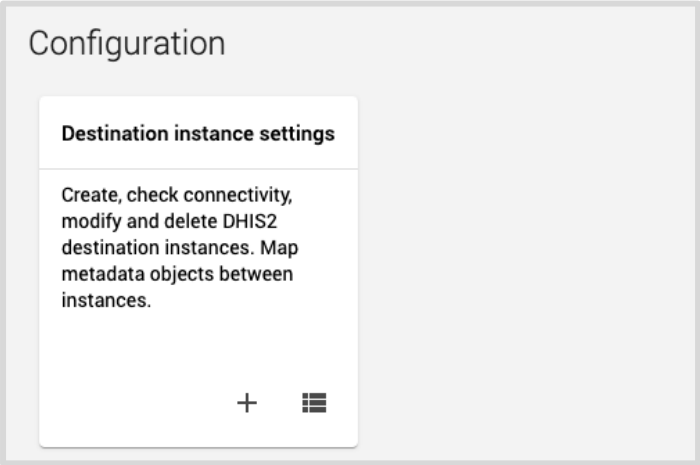
Purpose of configuring an instance

With Instance Configuration you will learn how to set up the destination instance.

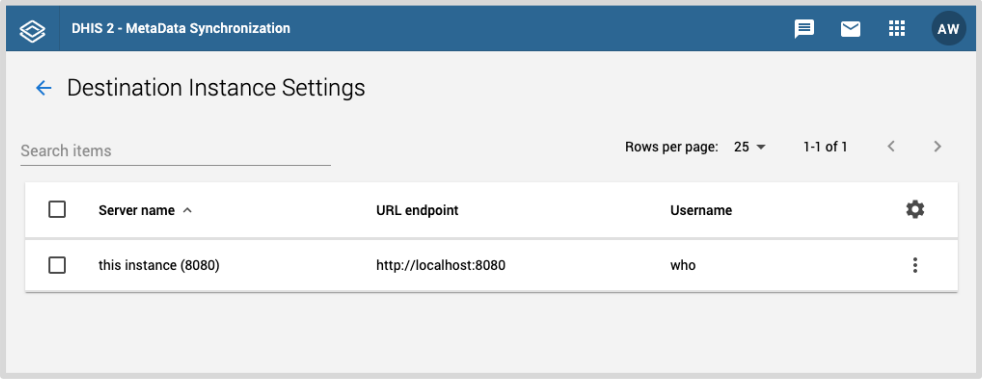


Overview on starting a new instance

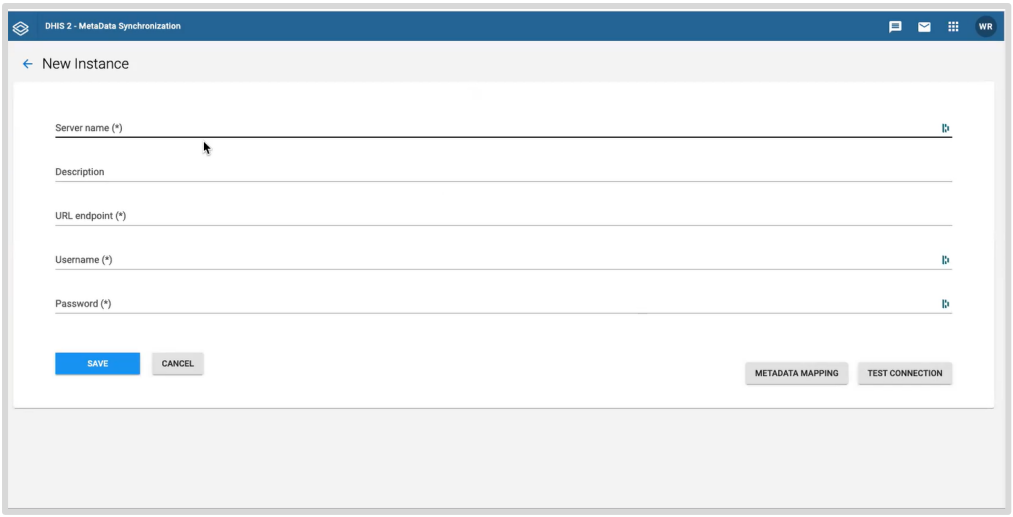
To configure new instances, click on Destination instance settings in MD Sync's main panel.



The first page will show you the list of already configured instances.



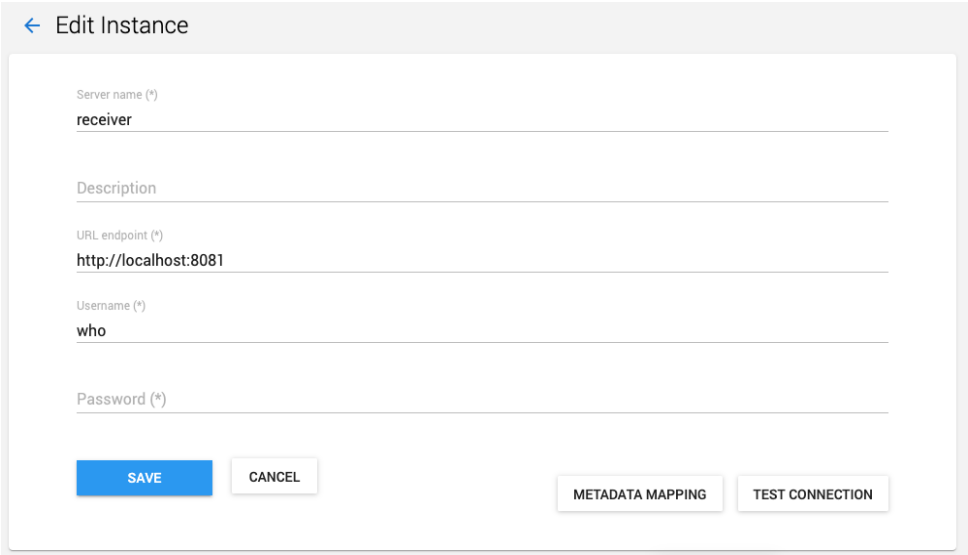
To add a new destination instance, just click on the Add icon at the bottom right corner of the screen.



Note: *You will be required to provide the server name, description as necessary, the actual URL, and your access details. Therefore, the right access to the repository will be needed, which would be the username and password used to access it originally. Your access is limited to a specific part of the repository. For your own country, you'd be able to write at the national level and subnational level. Using your username and password, you can then configure the instance.*

A modal screen appears where you can enter the new server data.

- Server name: A human readable name meaningful for you and your team.
- URL endpoint: The server address
- Username: this must be a user that exists in the destination instance and has the right to edit data and metadata.
- Password for that username



Please test the connection before saving the instance configuration details

Note: *MD Sync needs to be installed only in the source instance. It does not need to be installed in the destination instance.*

Repeat the process for each instance that you need to sync.

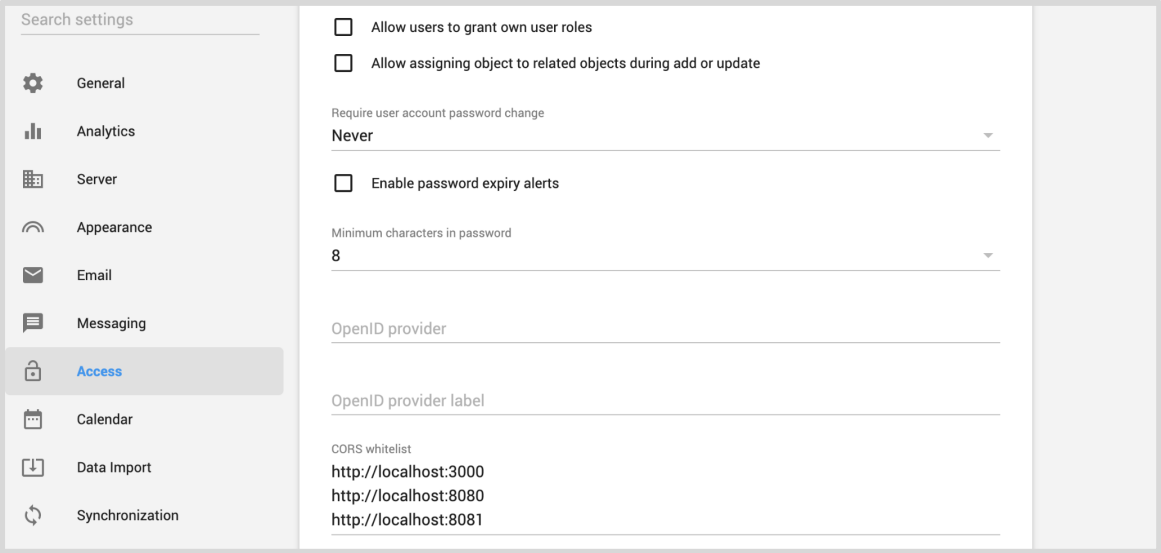
There is another button: Metadata mapping Learn how to map the metadata of the source instance against the destination instance.

CROSS-ORIGIN RESOURCE SHARING (CORS)

Cross-origin resource sharing (CORS) is a mechanism that allows restricted resources (e.g. javascript files) on a web page to be requested from another domain outside the domain from which the first resource was served.

Cross-origin resource sharing (CORS) whitelists) need to be configured on the remote instance, otherwise it is not possible to establish connection with it.

To configure the CORS whitelist, access to DHIS2 System Settings → Access → CORS whitelist section



You need to write each item on a new line. You can write an IP address or hostname. Some examples:

http://127.0.0.1:8000

http://dhis2.myserver1.com

http://localhost

http://dhis2.myserver1.com:8080

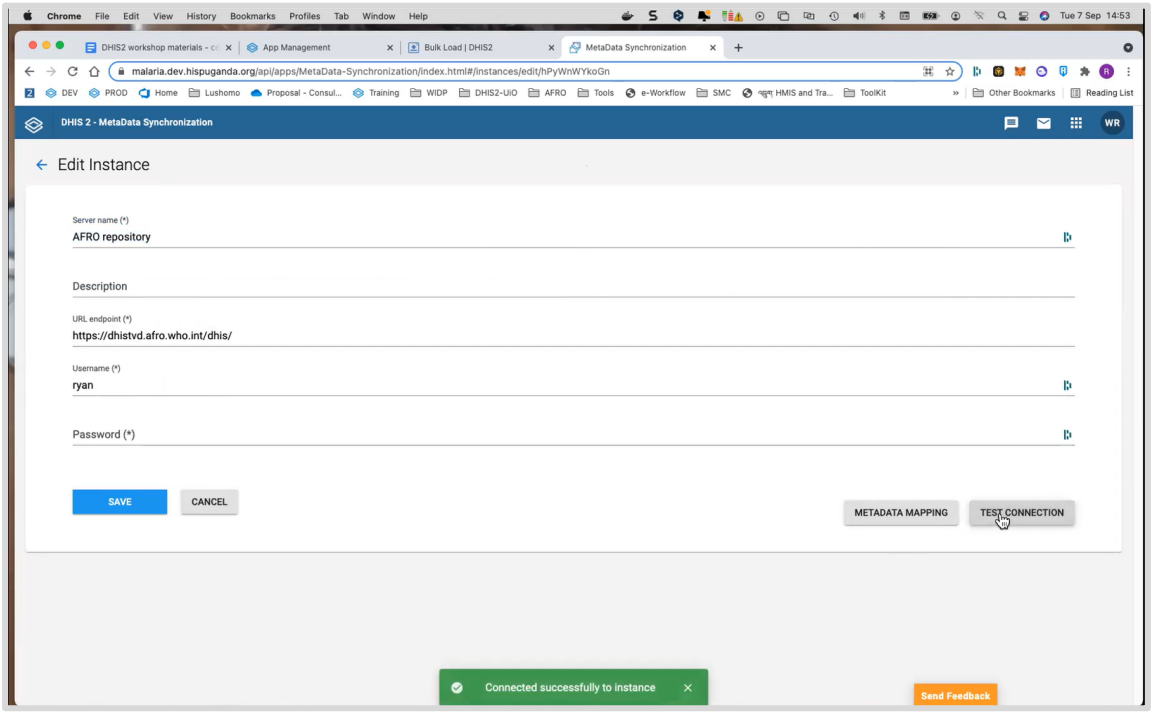
When the route has a path such as http://pro.myserver.com/pro/app then, the whitelist on the remote instance needs to include the full path in different lines:

http://pro.myserver.com

http://pro.myserver.com/pro

http://pro.myserver.com/pro/app

Editing an instance and mapping DHIS2 instances



After providing the server name, type in the actual URL and your login credentials. Afterwards, test the connection to make sure it's working and accepting your access.

If successful, a green bar at the bottom should appear, indicating that it's working properly.

The next thing to do is to map the metadata using the organizational units.

Mapping is a feature that allows you to synchronize data between instances with different metadata.

Why mapping?

Mapping is one of the most powerful features in MD Sync. There are many situations where our destination instance has different metadata than our source instance. This may occur when:

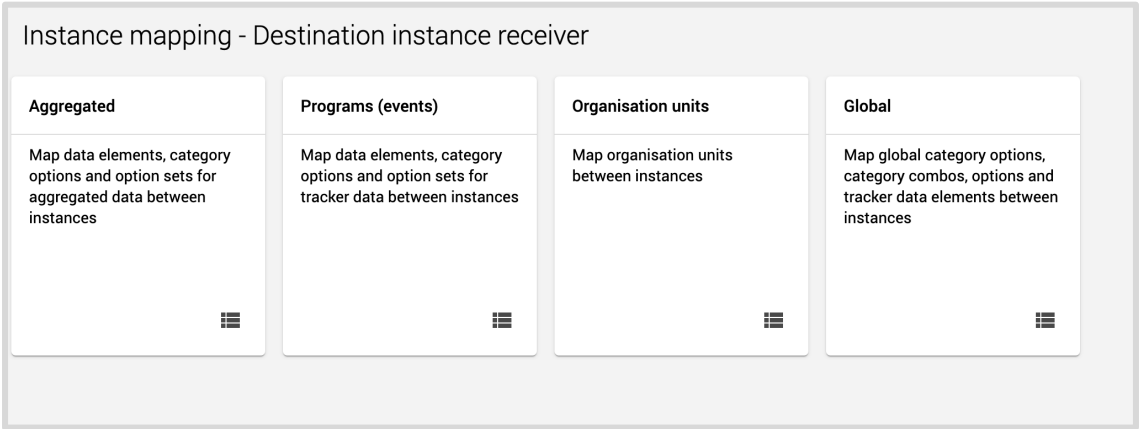
- you are sending data or metadata from a development instance to a production instance. In this case DEV and PROD fall easily out of sync and there may end up being big differences that pose challenges to publish new developments;
- you are collating data from a specific program or disease from different instances (e.g. different country instances). For example, you need to combine data that was gathered in the context of a specific program, but then researchers realize that the information might be useful for another program. Even though metadata is not the same, data could still be synchronized using this mapping feature;
- you have different levels of detail in two instances. (For instance, if the source instance contains data aggregated in five age groups and the destination instance in only two); or
- you need to sync programs that are implemented slightly differently in different organizational units.

In these situations, sending data from one instance to another is a challenging process. MD Sync allows you to overcome this difficulty. It takes data from the source instance and applies the necessary transformation so that it can be received by the destination instance based on the metadata mapping you have previously generated.

How to map

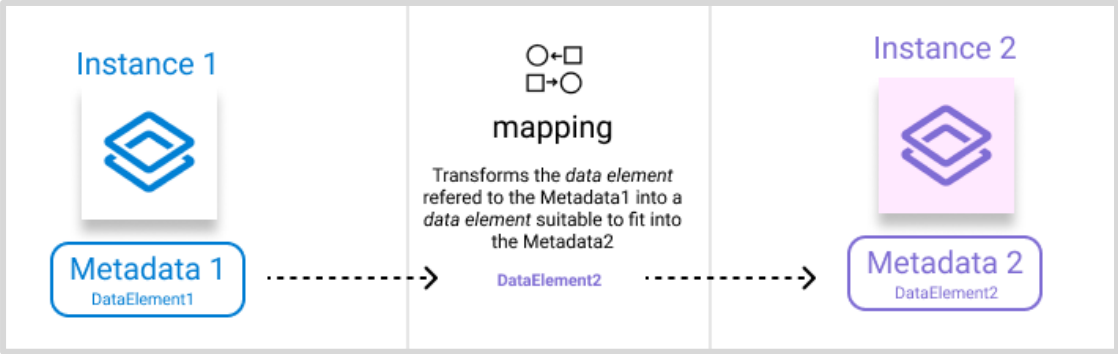
Mapping is done between the source instance and each destination instance. Hence, MD Sync will save one mapping per destination instance. To access the mapping configuration, we do it from

→ MetaData Synchronization / Destination Instance Settings/ 3 Dots menu/ Metadata Mapping



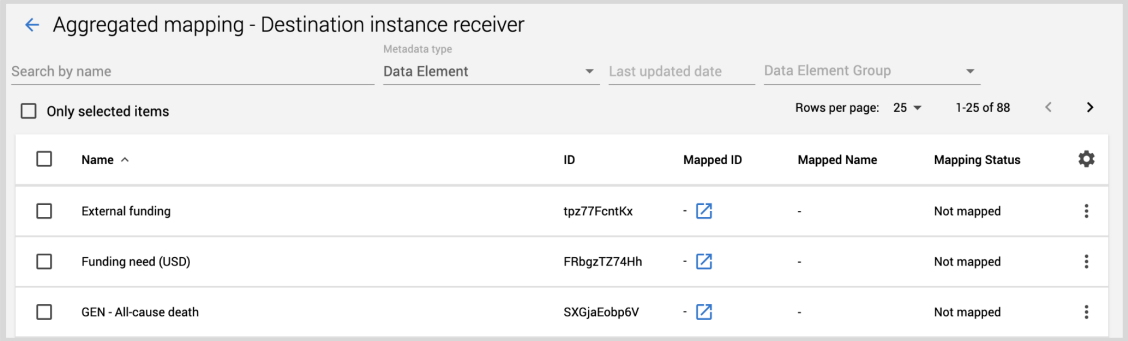
- There are three different sections according to the kind of data you want to send, you may need to map:
  1. Aggregated metadata, including data elements, category options and indicators
  2. Programs (events) Programs, Data elements, indicators
  3. Organization units

- Global mapping complements the previous sections. It is used to create mapping for metadata that appears frequently. Sometimes there are option sets or categories that apply to different data elements. It is not necessary to create a new mapping for each one of these elements every time it appears. Simply add that mapping as a global mapping between instances and it will always be applied. If needed, you can later overwrite this mapping for a specific data.

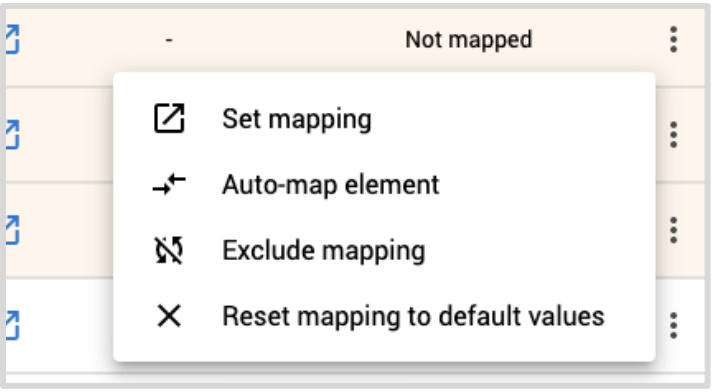


Notes: *Mapping can be manual or automated. Continue reading this article to learn how to create mappings.*

Inside each of the mapping sections, we have the list with all the metadata objects available for mapping.



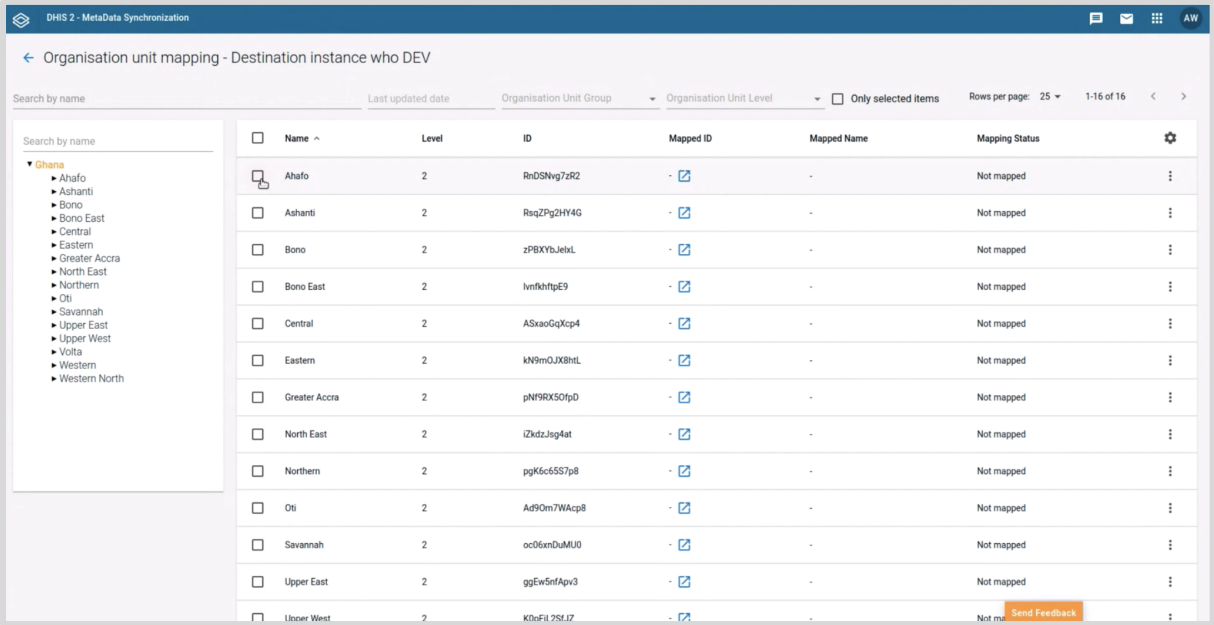
For each item these are the options:



Note: *Remember that we are defining the mapping for a single destination instance.*

Mapping organizational units

A slightly special case of mapping is the organizational unit mapping. If there are differences between the organizational units in the instances, with organizational unit mapping we can define a mapping between one source organizational unit and one destination organizational unit.



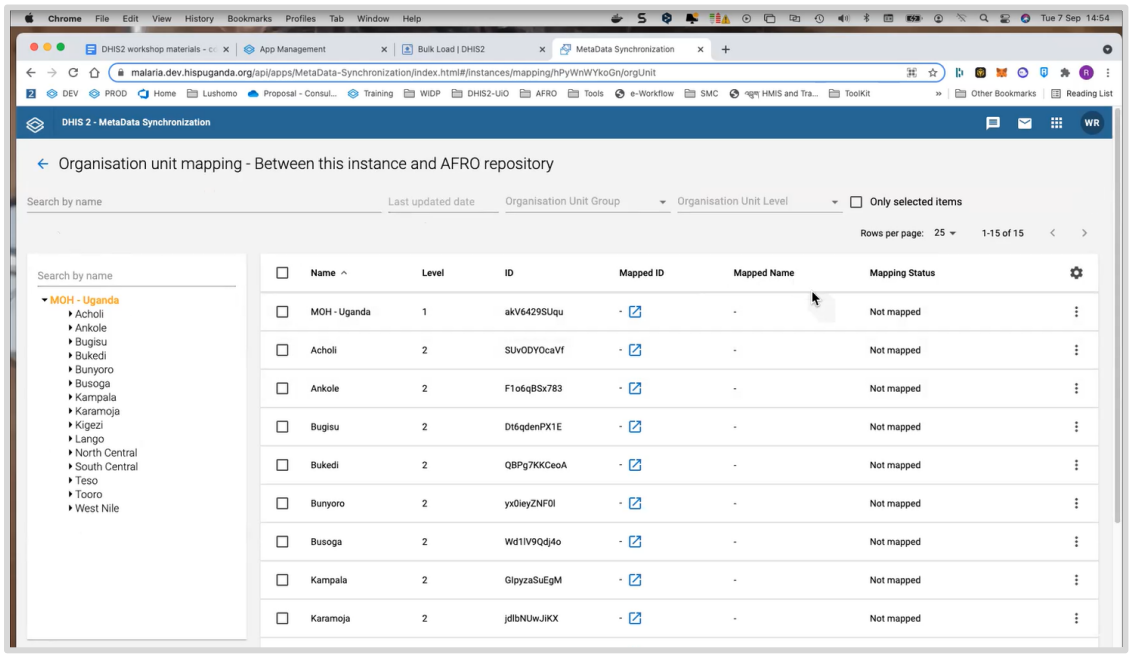
Follow these steps to create an OU mapping:

1. Select the organizational unit in the source instance
2. Click on the Set mapping icon function
3. Select the organizational unit from the destination instance

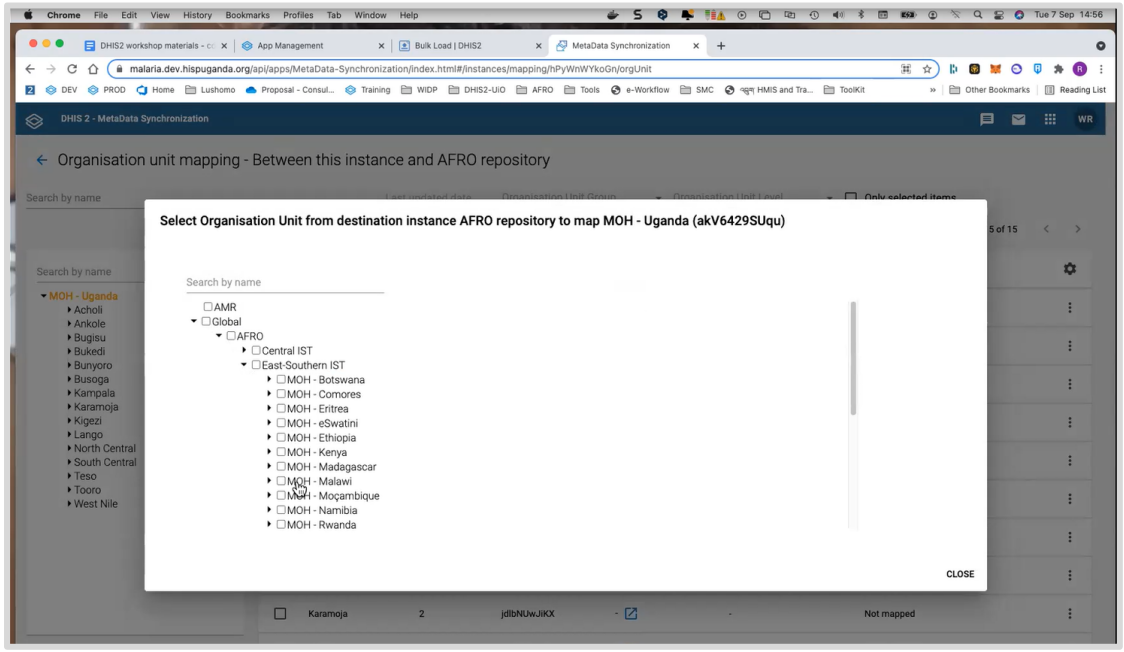
Case study

Organizational unit mapping

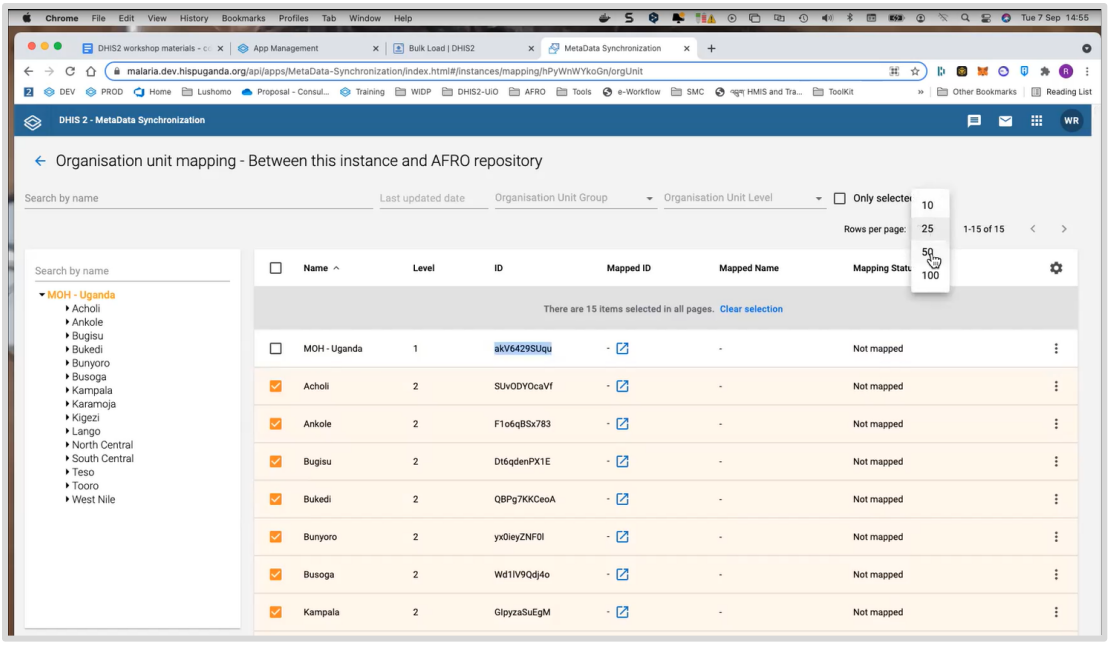
All organizational units in the current system will appear and here is where you'll be able to map them to the AFRO repository. On the left side, you'll see levels and sublevels of regions and districts, which have their own unique ID in the system.



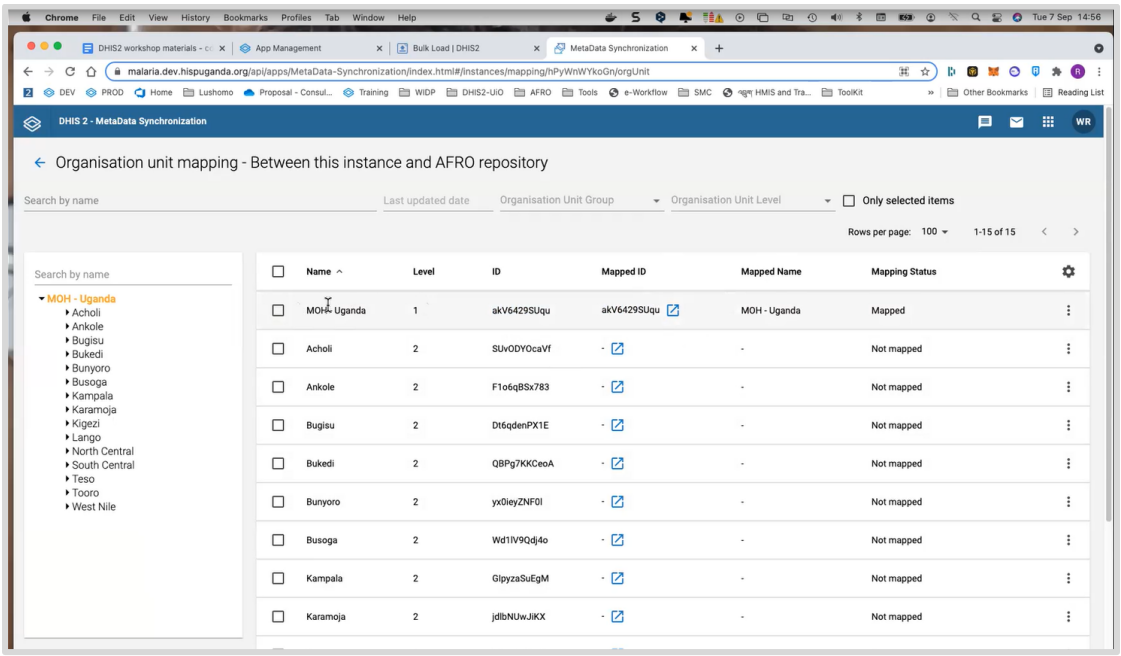
In the remote system, you have the option to select Global, Afro, a specific IST, and the national level. It is not recommended to link it to anything but the national level because that will provoke an error when loading data into the other system.



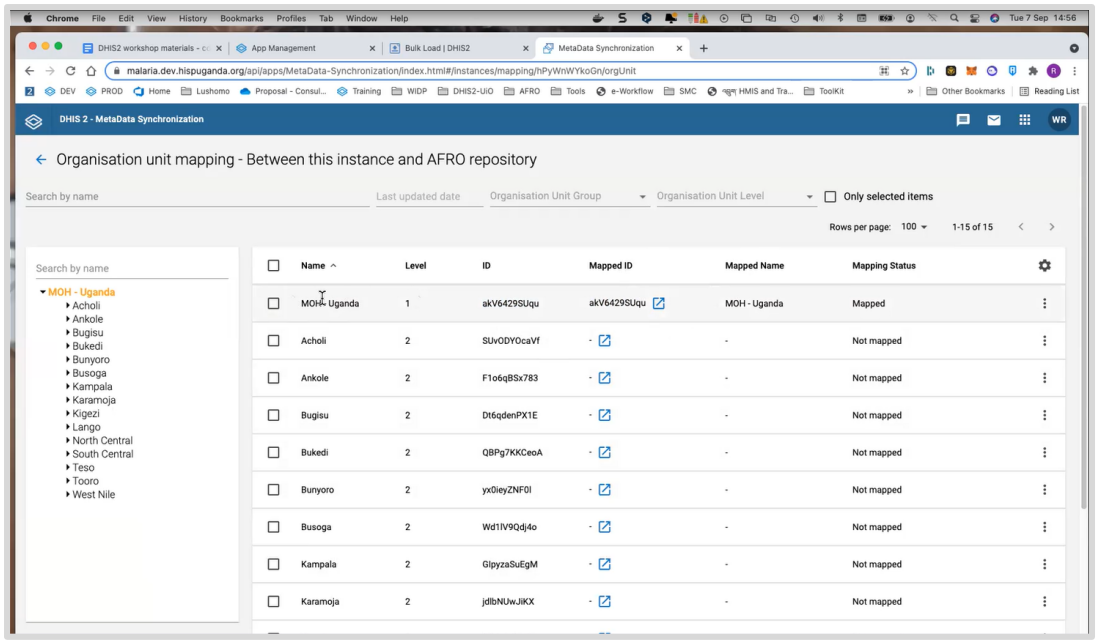
You are free to select all the districts that are being shown across all pages by choosing Show 100 per page and clicking the checkmark box for Select all on each of those pages. Then, you can click on the three dots on the right side of each row to choose an action.



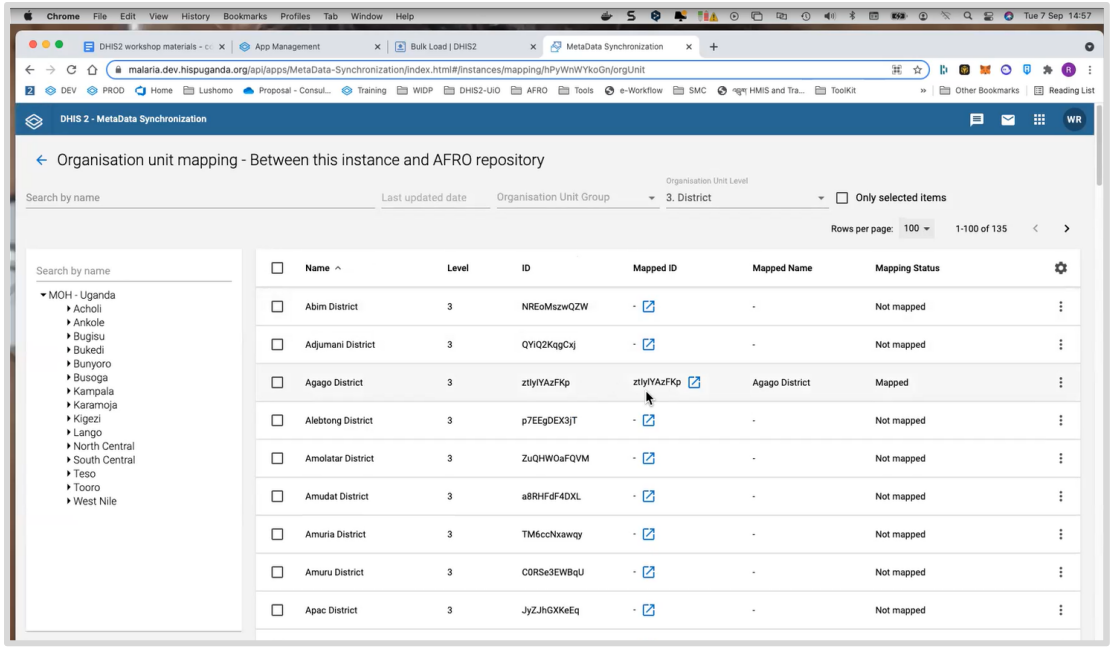
You will see that it has identified the ID and the name in the second system (AFRO repository). They're exactly the same when one loads the information at the national level by importing the data coming from the country's DHIS2. They have the same IDs.



In this other example, we have another way of linking them in a more automated fashion. First, select the organization unit level. In this example, we select the districts only. We will see that we already have one district already mapped.



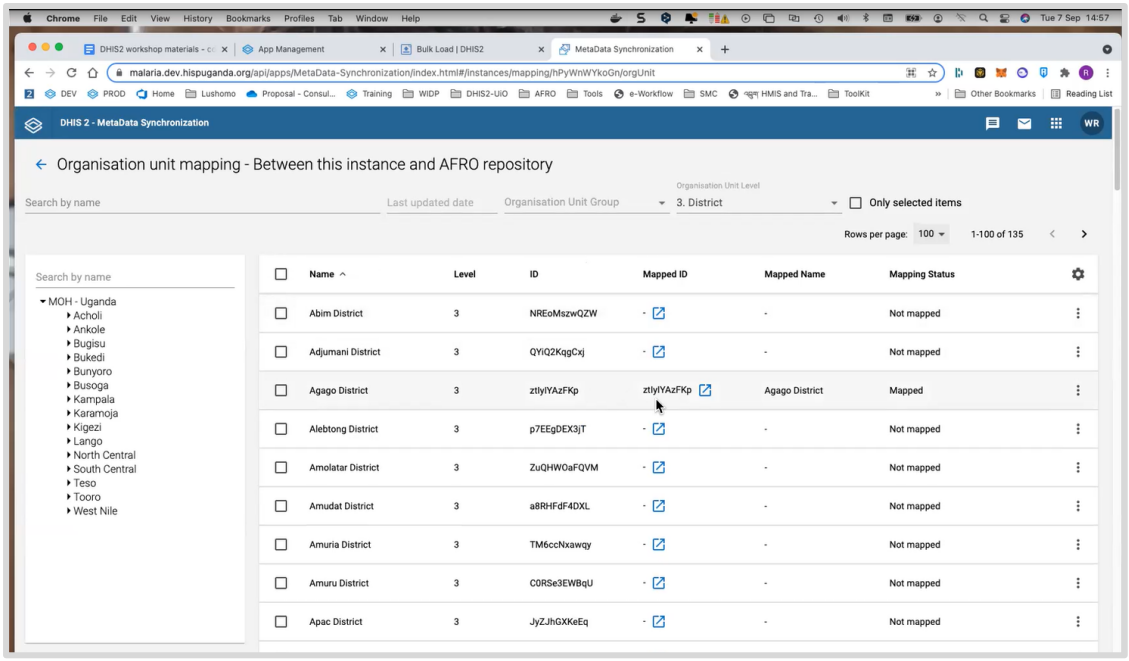
You have the option to auto-map. By selecting that option, the 135 districts in this example will be auto-mapped. It will analyse if the names are similar, if the codes are exactly the same, and if it finds the equivalent UIDs. If the IDs are the same, it will uniquely identify each of these districts once it's done, following that task, it will propose that as its mapped location.



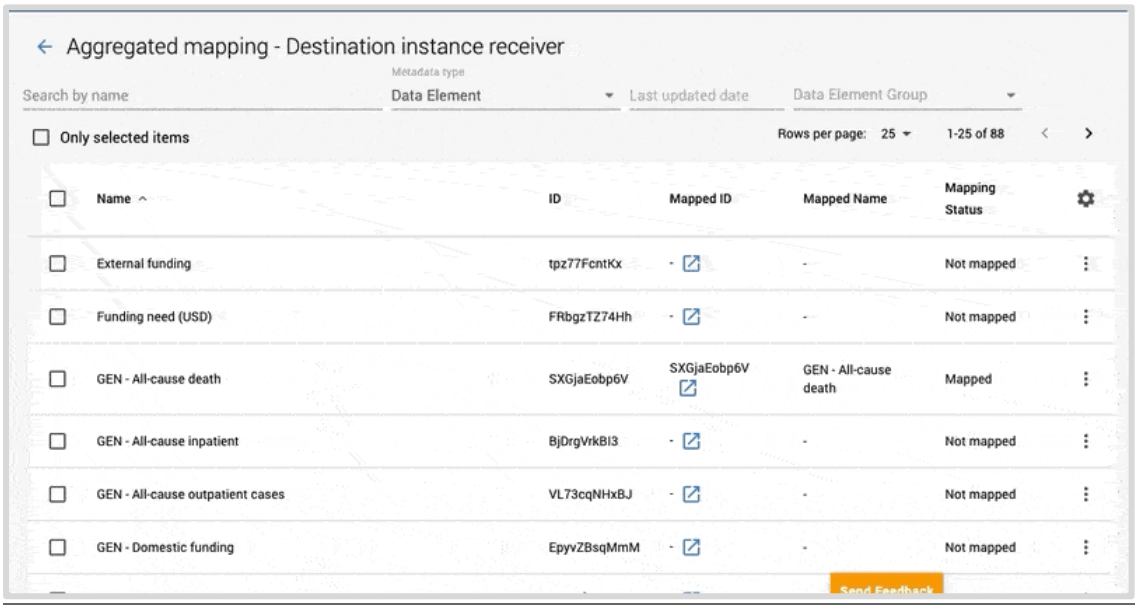
Set mapping (manual mapping)

1. Select the metadata object on the source instance and click on "mapped ID" icon, (or the "set mapping" option in the three dots menu)
2. Find the ID from the destination instance that maps against the metadata element in the source instance. After selecting the source element, MD Sync will retrieve the destination

instance metadata and will let you choose the data elements in the destination instance that maps against it.

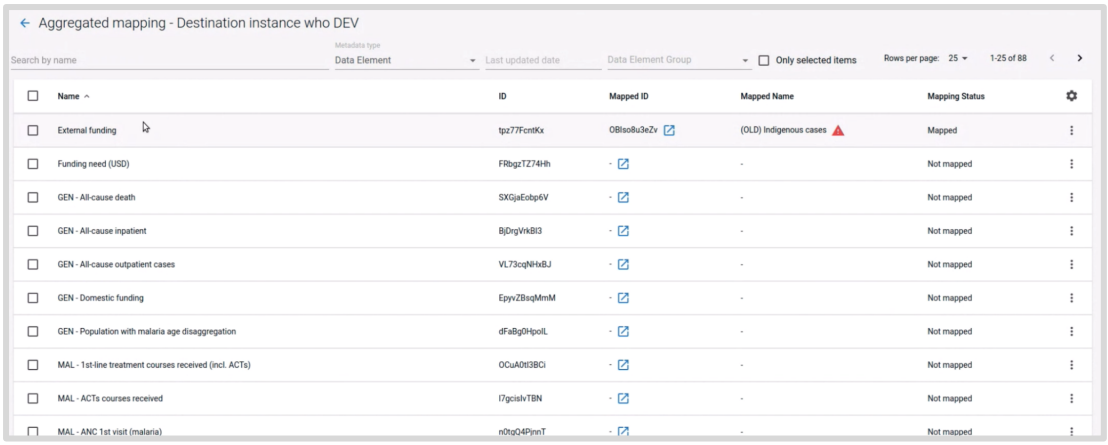


That modal window contains the metadata object list from the destination instance. Choose the one you want to map. For objects without linked metadata this is the end of the process: the mapping is finished.



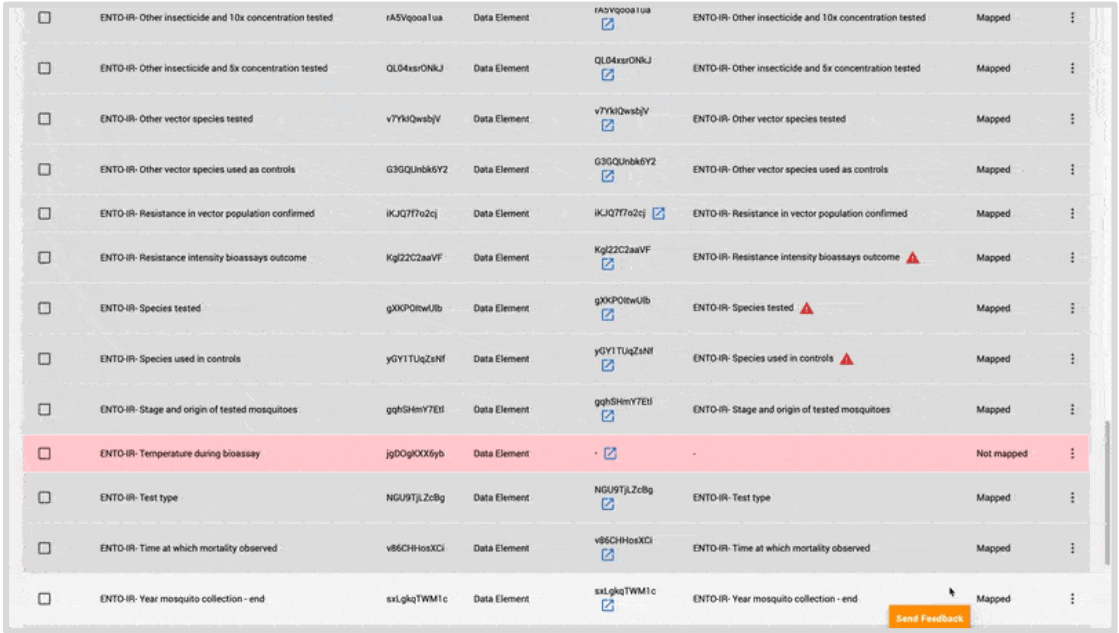
3. Related metadata mapping

There are some data elements for which you need to do additional mapping. If there are related metadata objects to be mapped (for example, options or category options) an alert sign would appear beside the mapped object.



It's necessary to indicate the additional mapping because the related metadata needs to be translated to the destination system metadata too. To do that:

1. Click on the icon to fix the problem.
2. A new window appears with the list of related metadata. The alert icon indicates the objects that need to be fixed.
3. Clicking again on the alert icon for an object shows another list with the available objects at the destination instance.
4. Select the destination object to finish this related metadata mapping.



Note: *If the option set or category option combo that you are mapping applies to more than one data element, it is recommended that it's mapped from the Global window. All maps done in Global will be applied to all metadata elements across the instances.*

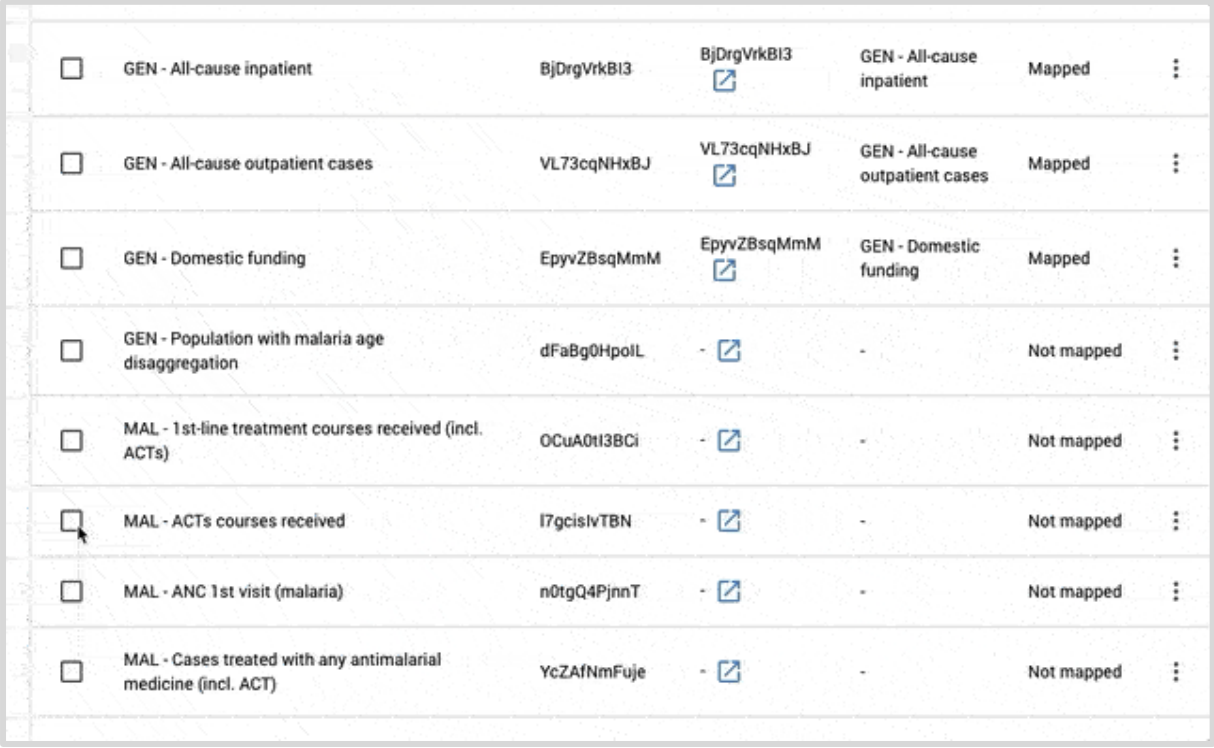
Auto-map element

MD Sync can auto-map metadata objects for you. Instead of letting you manually select the object at the destination instance, it automatically searches for the corresponding object. It does so by:

1. Searching for metadata objects in the destination instance that have the same UIDs as those in the source instance.
2. If there is no match, it searches for metadata objects with the same code
3. if none of the previous steps returns a good candidate, it uses a "best effort" algorithm to look for metadata objects with similar names

To perform this auto-mapping, select as many elements as you need to map, and then select the *three dots menu (or right click) → Auto-map element*

In the following clip, the auto-mapping easily manages to find a destination data element with a slightly different name because they share the same UID:



Exclude mapping

When configuring a synchronization operation you can choose which data elements you are going to sync and which ones you do not want to sync. Supposing that there is a data element that you never want to sync with a destination instance, for example a person's first name or identification. In this case you don't need to exclude that element manually each time a synchronization operation is carried out, you can exclude it from all synchronizations from the mapping page. When you exclude

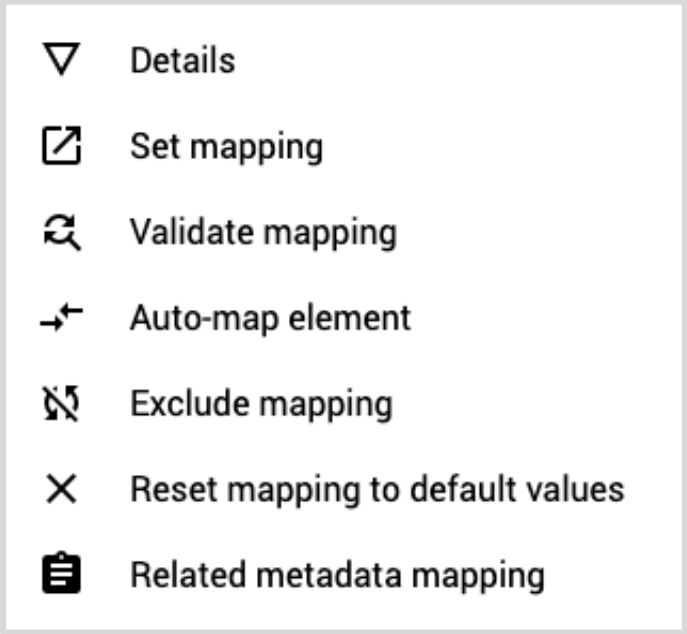
a data element for a particular destination instance, that element will always be ignored during the sync process.

Reset mapping to default values

This sets back the mapping to the default state: not mapped.

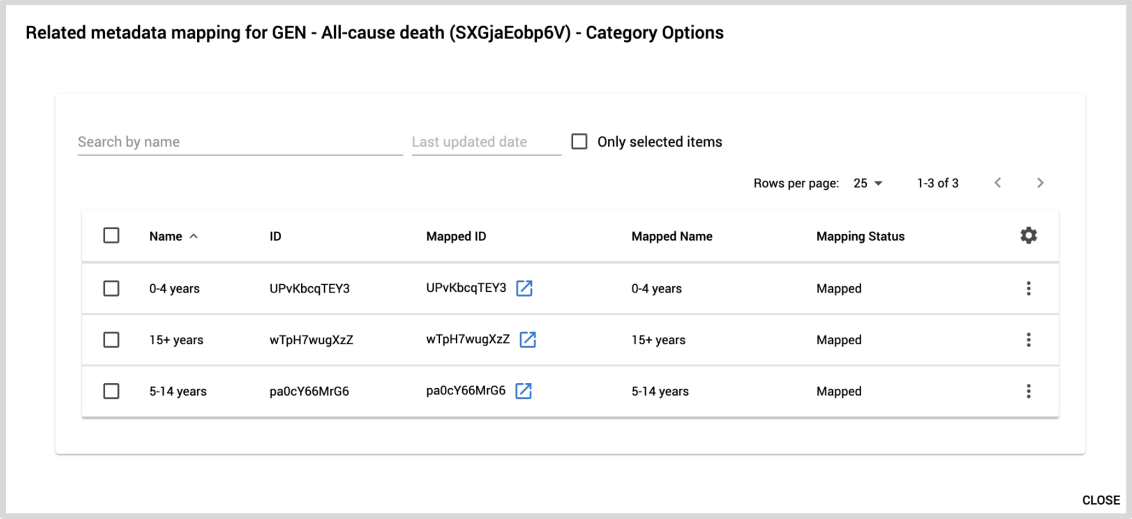
Note: *Take into consideration that if there is no mapping, the synchronization will assume that the same metadata exists at the destination instance. If that is not the case, the process will throw an error, with a detailed log explaining what the inconsistent metadata is.*

Related metadata mapping



This contextual option only appears for mapped objects with related metadata. It is intended for manual mapping of option sets and category options.

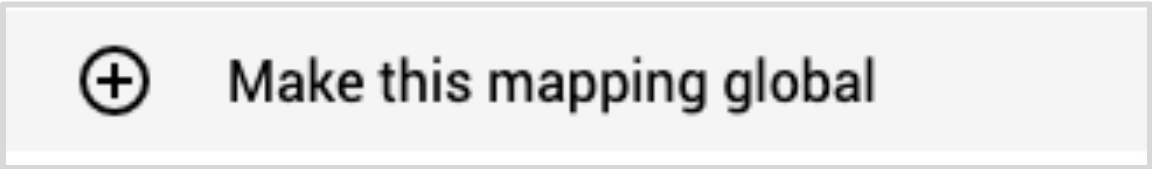
This is an example of related metadata mapping. By clicking on Mapped ID, you can edit the mapping if necessary.



A new window appears with the related metadata objects: Map them with the same three steps:

1. Select source object
2. Click on the set mapping icon
3. Select destination object.

Note: *After creating the mapping, it is possible to configure the same mapping as a global mapping by selecting the right-click-menu option Make this mapping global.*



Validate mapping

This contextual option only appears for already mapped objects.

MANUAL SYNC - METADATA

MD Sync allows you to send the following types of metadata to one or more DHIS2 destination instances:

- Dashboard
- Data Element
- Data Element Group
- Data Element Group Set
- Data Set

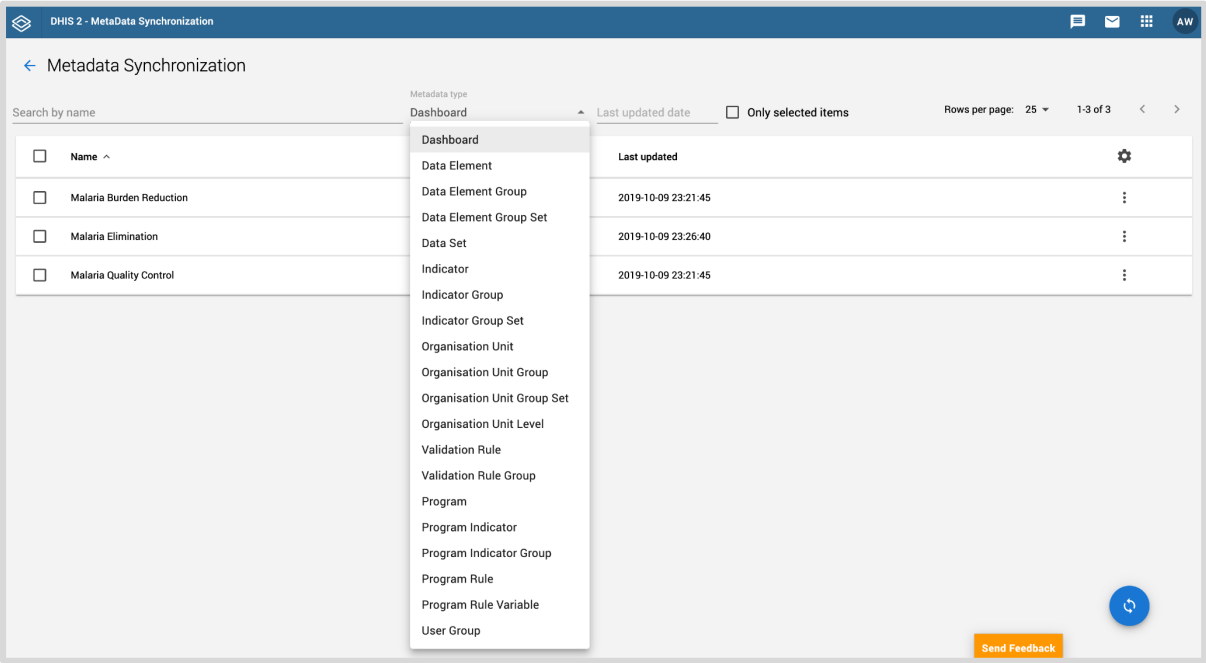
- Indicator
- Indicator Group
- Indicator Group Set
- Organization Unit
- Organization Unit Group
- Organization Unit Group Set
- Organization Unit Level
- Validation Rule
- Validation Rule Group
- Program
- Program Indicator
- Program Indicator Group
- Program Rule
- Program Rule Variable
- User Group

To synchronize metadata manually go to Metadata Synchronization → Manual Sync

The process involves:

1. Select the metadata that you need to sync and start the multistep process
    a. Include or exclude dependencies
    b. Select the destination instance
    c. Review the summary and synchronize.

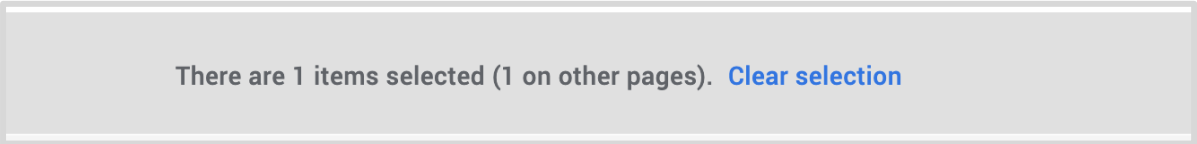
Select metadata



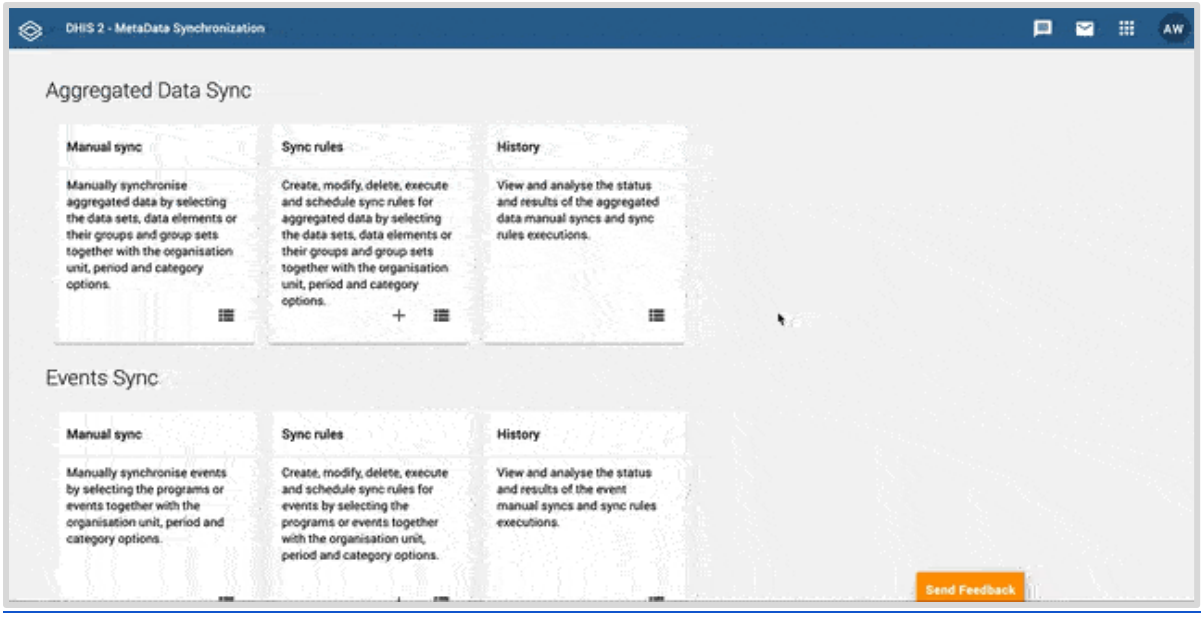
Metadata synchronization main panel

Within this panel you can browse through all the data objects that you have in your instance. As the list is long you can move through the different pages and select exactly what you want to synchronize.

Note: *You can select elements on different pages at the same time. Note that when you have elements from another page you will see this message above the selection.*



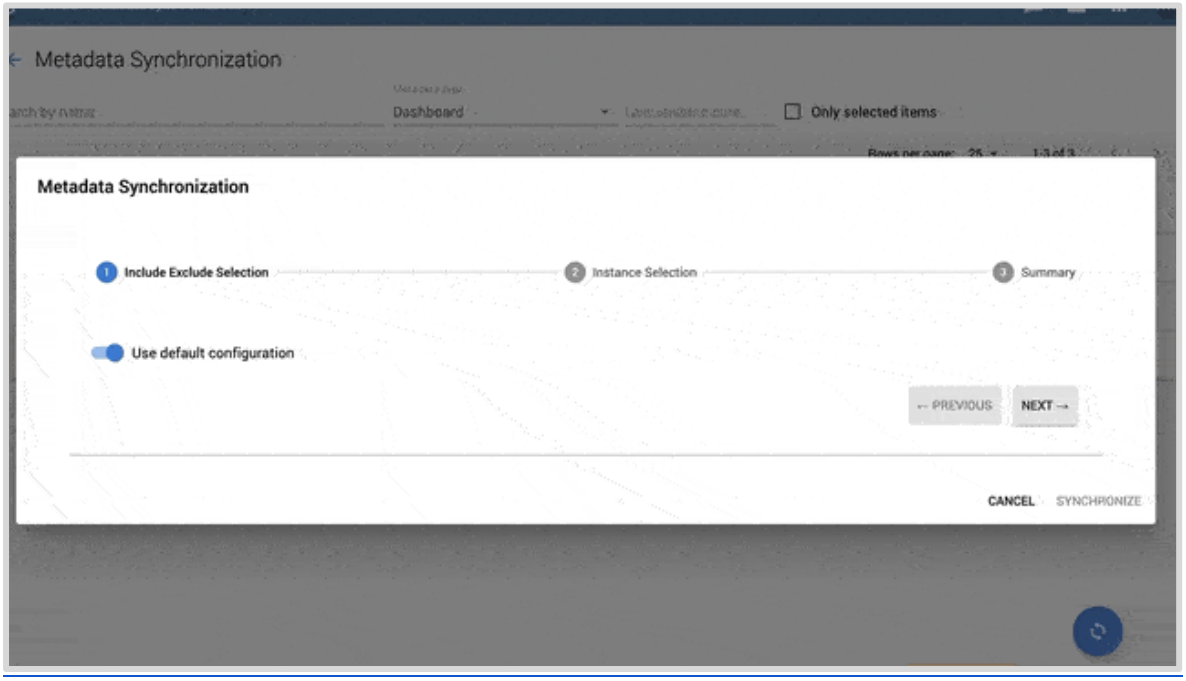
When the selection is ready, click on the sync button (bottom right corner) and the Metadata Synchronization window appears, with three steps:



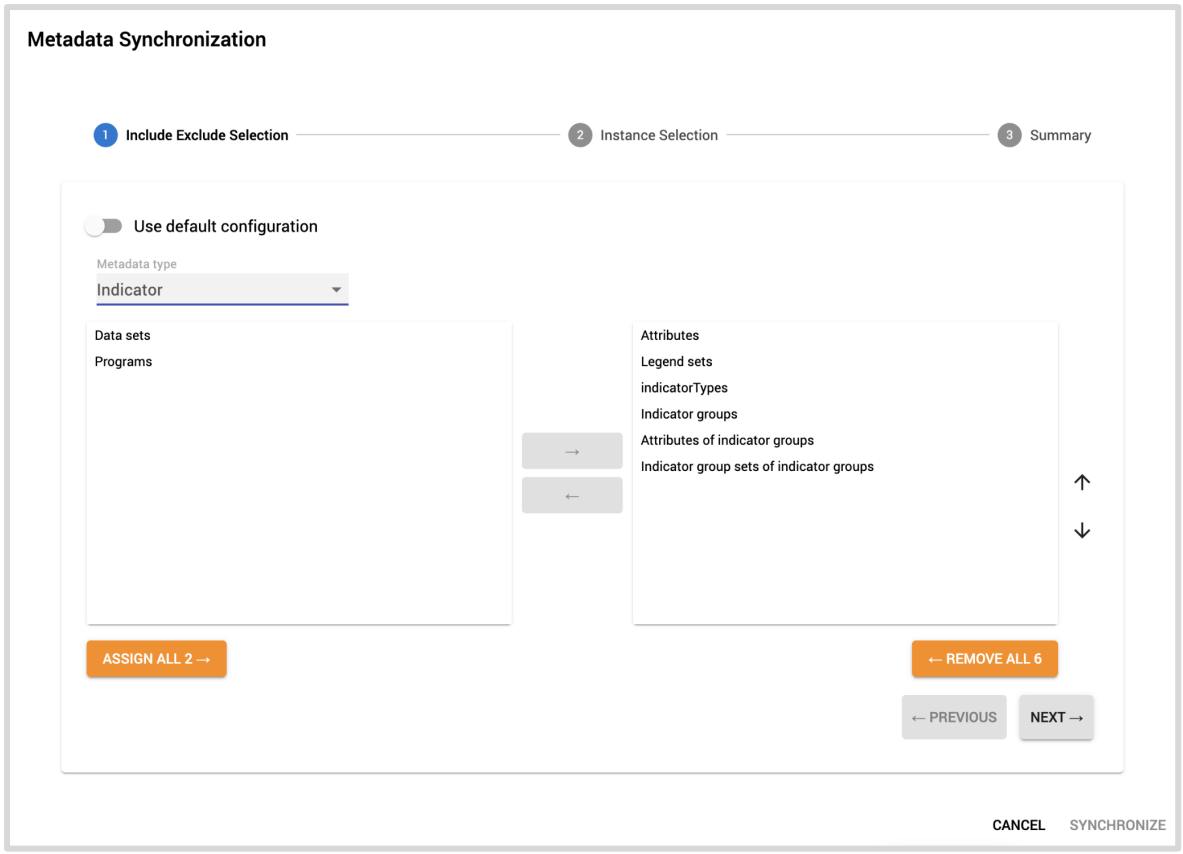
Guided process

Include exclude selection

The metadata sometimes has dependencies (for instance one data element can be associated with an option set). If you deselect "use default configuration" you can browse through the dependency tree and select dependencies manually. If you choose the default configuration MD Sync will include all dependencies by default.

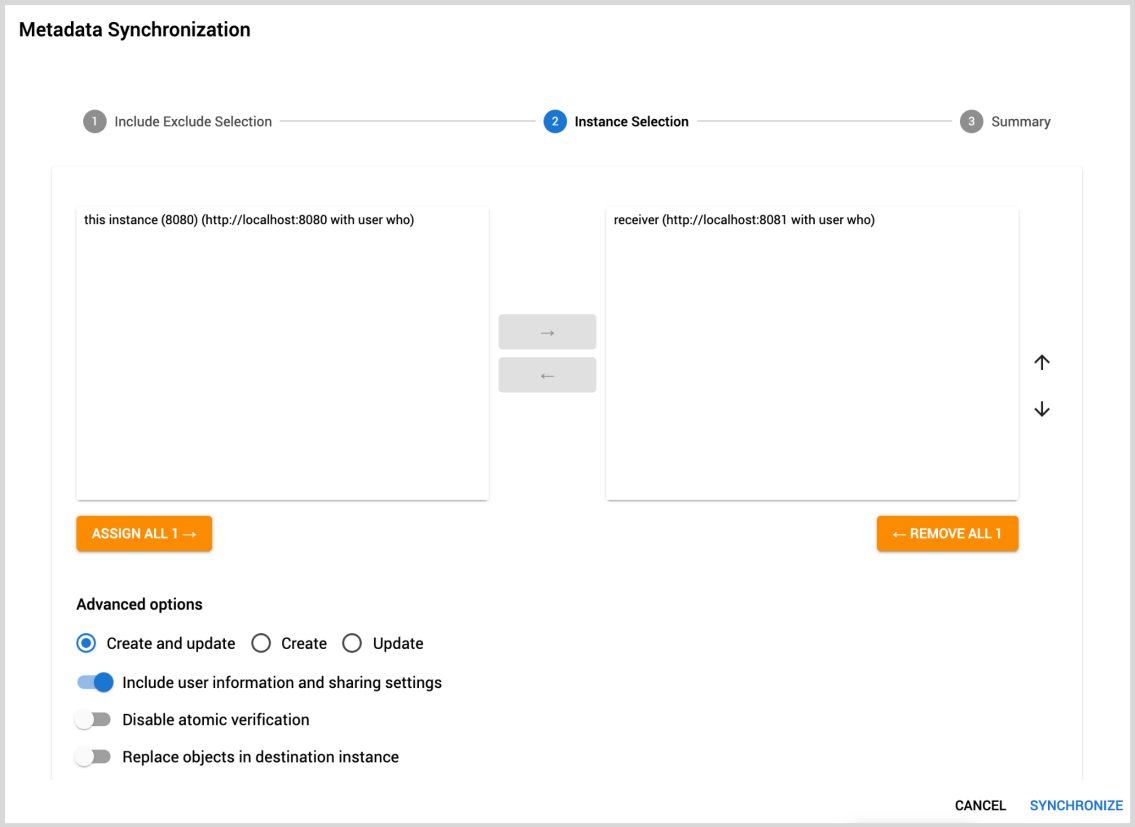


Note: *The dependencies on the right pane will be included in the metadata to be sent and those on the left pane will be excluded.*



Instance selection

On this step you select the instance or instances to push data to. If you haven't configured your instances yet, learn how to do it.



Advanced options

These are the typical options in a DHIS2 import:

- **Include user information and sharing settings:** DHIS2 metadata objects can be shared with DHIS2 users and user groups, this is called sharing settings. You can decide not to include the sharing settings within the object when importing. Why? Imagine that the two instances are quite different and don't have the same users. In that case uncheck this option and the sharing settings on the destination will be imported blank.
- **Replace objects in destination instance:** If this option is selected, objects that already exist in the destination instance will be replaced by the synchronized metadata. If this option is not selected the merge strategy of DHIS2 import will be used: it will only update the modifications.
- **Disable atomic verification:** If this option is active, DHIS2 will only import the metadata objects if the entire import operation is successful. If there are any errors in any of the metadata objects contained in the synchronization files, the import will be cancelled completely. If this option is inactive, DHIS2 will import any objects from the import files that can be imported and exclude those that present errors.

Summary

Within this screen you see the summary of all the operations involved for the synchronization that you just created.

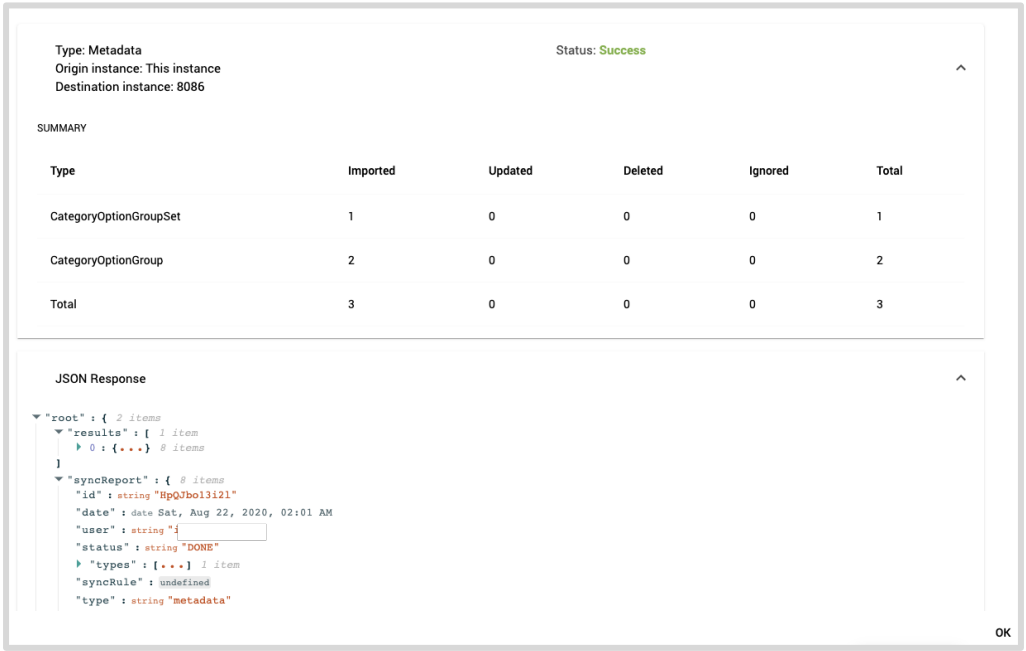
You can choose between:

- **Synchronize now** to actually run the synchronization
- **Download a JSON.** This is a file that contains all the metadata involved in this synchronization. If you choose Synchronize now, it sends that information to the destination instance. If you download the JSON you can import it manually in the destination instance at any point later in time.
- **Save as a sync rule.** To save your selection and to be able to execute the same synchronization again at any time in the future. Rules can be scheduled to be executed at regular time intervals. For instance, a sync rule could help to maintain an organization unit tree permanently synchronized between two instances, so that changes made to one are propagated to the other one. Read more about the rules below.

Synchronization results

When the process is finished, the Synchronization results report provides a summary of the operation with the following information:

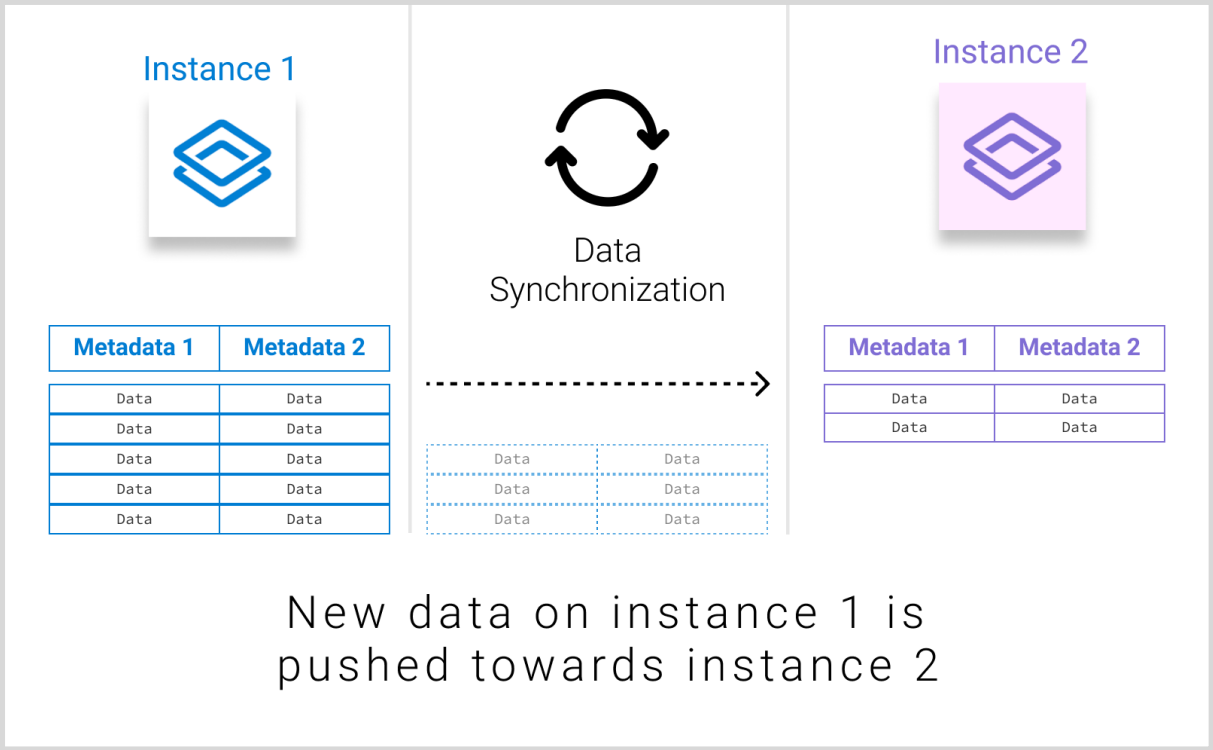
- **Summary:** How many metadata objects were synchronized (deleted, updated, created) or ignored
- **JSON Response:** The raw response from the remote instance.



MANUAL SYNC - DATA

Within this section we explain the manual synchronization interface however, if you create a data synchronization directly as a rule, the process is the same with a couple additional steps.

Note: *If the metadata in the source and destination instance is different then you need to map its metadata before attempting any data synchronization operation. Read more about the mapping process here.*



A couple of common use cases:

- One country sends to a region the data they have gathered for a specific program
- Synching data between DEV and production instances

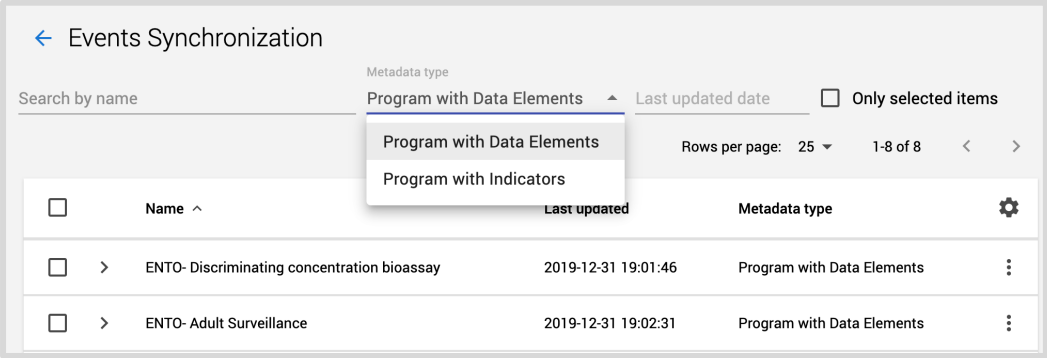
MD Sync let you to sync:

- aggregated data (dataset)
- events (program) with:
    - Indicators: The formula for that indicator will be calculated locally and the result will be received at the destination; and
    - Data elements.

The process is similar in both cases.

Events synchronization

→ MetaData Sync / Events Synchronization / Manual Sync



Select events

The first thing to do is to choose the data that you want to sync. The application displays the list of programs by default. You can unfold a program to select individual data elements or sync the complete list of data elements for that program. Select what you need and press the sync button (bottom right corner).

Once you have selected the type of events that you want to synchronize, MD Sync will take you through a series of steps with multiple options to:

1. Select the organizational unit for which events will be synchronized;
2. Select the period of events that need to be synchronized;
3. Review the list of events matching the two previous filter and manually select them (optional);
4. Aggregate the events (optional);
5. Select the destination instance; and
6. Finally run the synchronization or save it as a rule

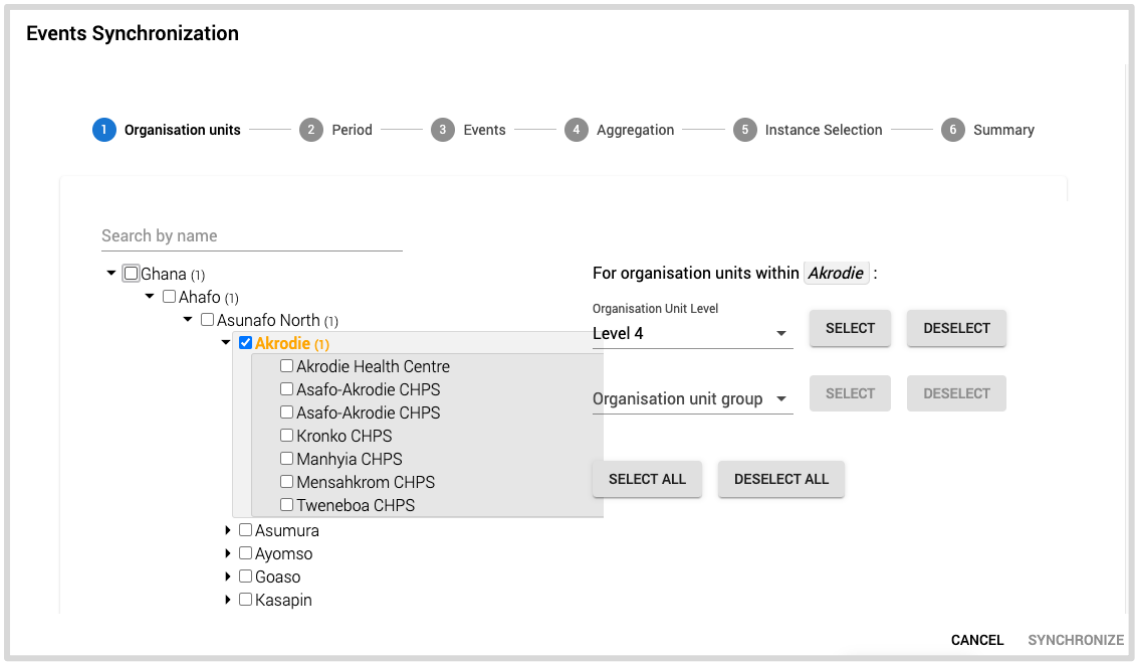
The synching process is a multistep process that provides you the filtering options to choose the events that you need. Those events are connected to a place (The organizational unit where that event was recorded into the system) and the date of the event.

Sometimes you might want to synchronize all the events for a program, but many other times you will need to filter the events you want, according to dates or places. The whole process is explained in the following sections.

Guided process

Organization units

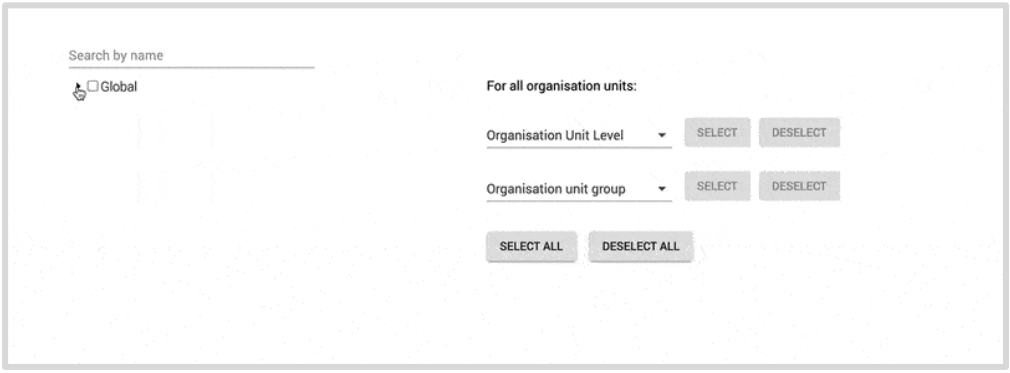
This first step allows you to filter the events based on the organization unit where they were registered. Click on each organization unit that you need to sync or use the selectors on the right to help you with multiple selections.



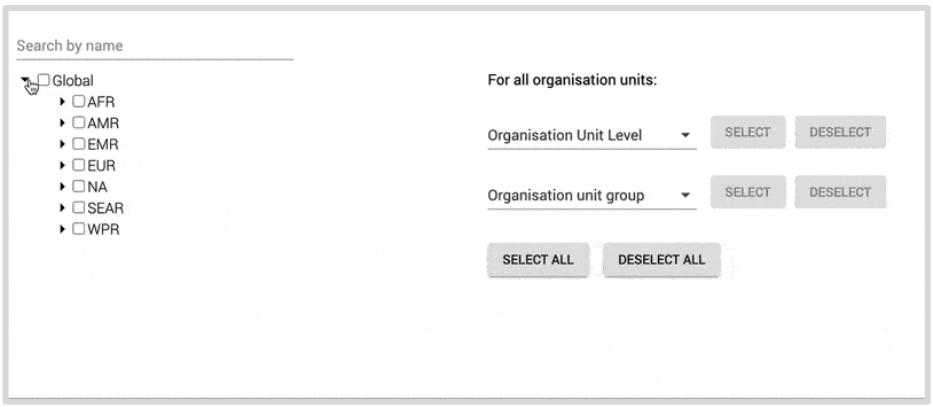
Note: *When selecting an organization unit in the tree: notice that selecting a parent organization unit doesn't mean that you are selecting all its children. This behaviour is different when you choose to aggregate data in step 4.*

On the right side there are some selectors to help you with mass selection. Highlight a branch of the tree clicking over an organization unit name (not over the checkbox). The branch turns a grey background colour. The following operations select certain organization units within this branch.

- Select all organizations with the same level
    - Select one organization unit level and click on Select.



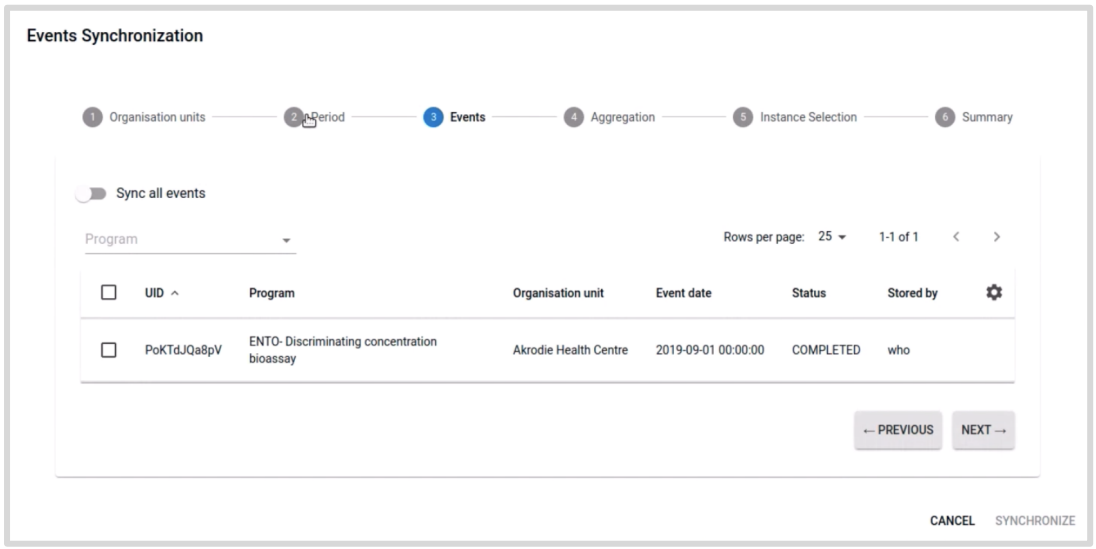
- Select the organizations belonging to a particular organization unit group.



Period

In this step events can be selected based on the date when they were registered. By choosing a time interval you will be sending events that fall within those dates. You can choose a pre-defined period of time or introduce the start and end date.

Events



This screen displays all the events that match the previous filters. You can choose between Sync all events or manually select the events that you want to synchronize.

If you need to display different information for each event, click on the gear icon to hide or show other columns.

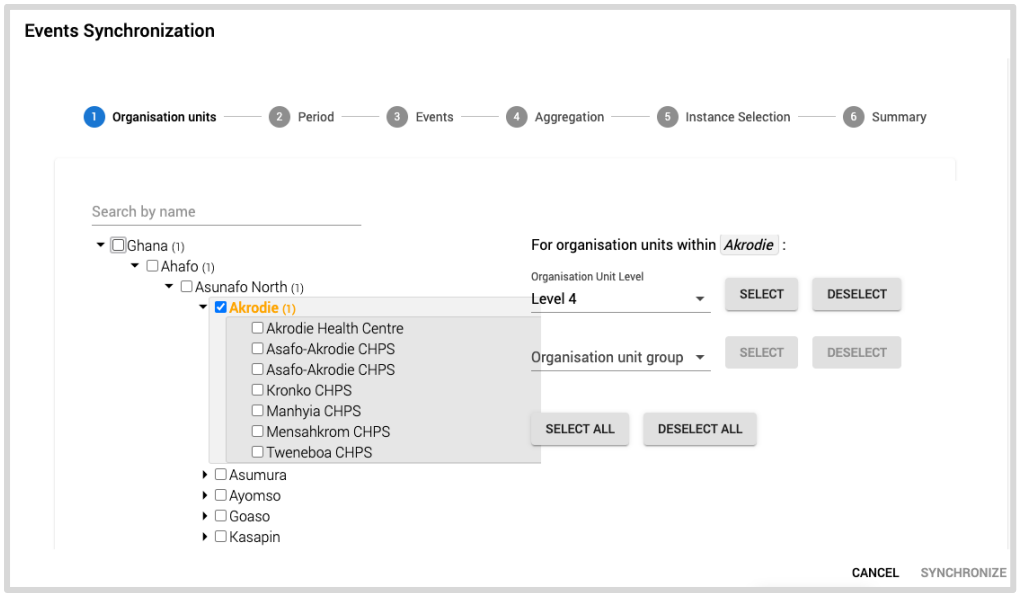
Aggregation

Enabling aggregation at this step allows you to aggregate event data elements and program indicators quickly. This is helpful if you are collecting the same type of information (for example, malaria data) through datasets in one geographical area and through event programs in another.

Aggregation differs if you are synchronizing data elements or program indicators.

Data elements

In this case the aggregation basically modifies the organization unit selection on step 1. When selecting aggregation, the events from children organization units are assigned to the parent element. In the image, Akrodie is selected. When selecting aggregation, the data belonging to the children units in the organization unit tree (Akrodie health centre, Kronko CHPS...) is assigned to the parent organization unit (Akrodie). At the destination instance, the received data elements are the same as in the source except that all events belong to Akrodie.

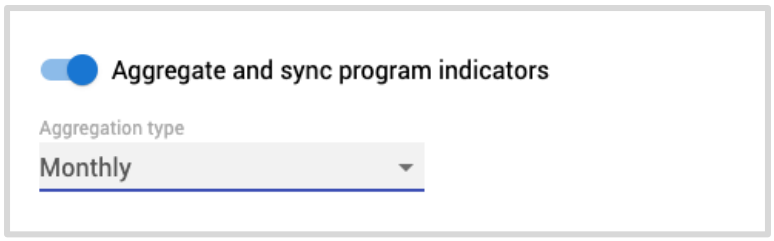


Program indicators

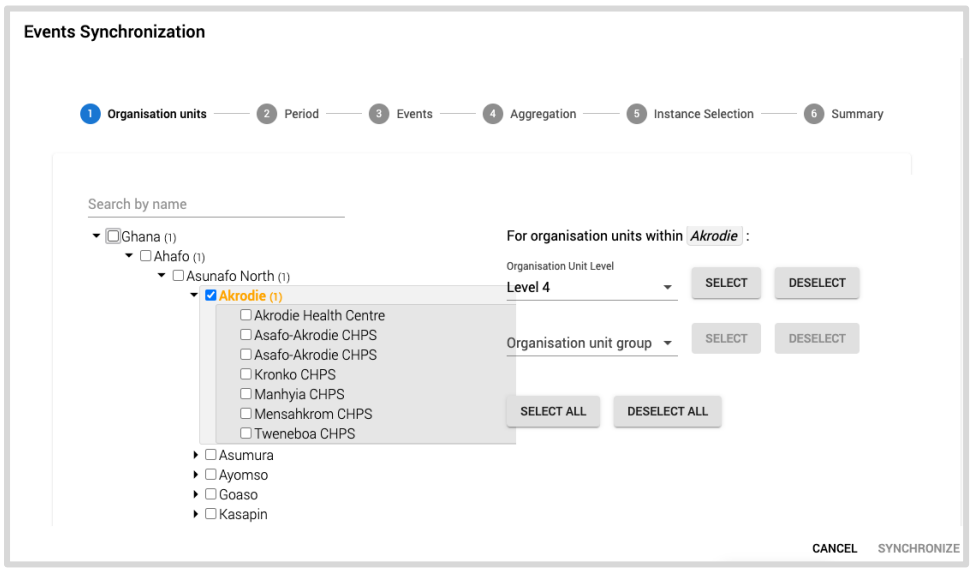
A program indicator is basically a formula calculated using data in the source instance, synchronizing a program indicator with this method means synchronizing only the result of this calculation. To be able to send this result you first need to map each program indicator you want to sync to a data element at the destination instance where the result will be stored.

Program indicators can be aggregated in time and space. With the Aggregation type selector in this step you can define the temporal aggregation to be applied before sending the data to the destination instance. The spatial aggregation means that data coming from organization units below the selected organization unit will be aggregated together with the parent organization unit.

It is easier to understand with an example. To begin with, we select Monthly aggregation in this aggregation step:



And then select one OU, Akrodie in this capture:

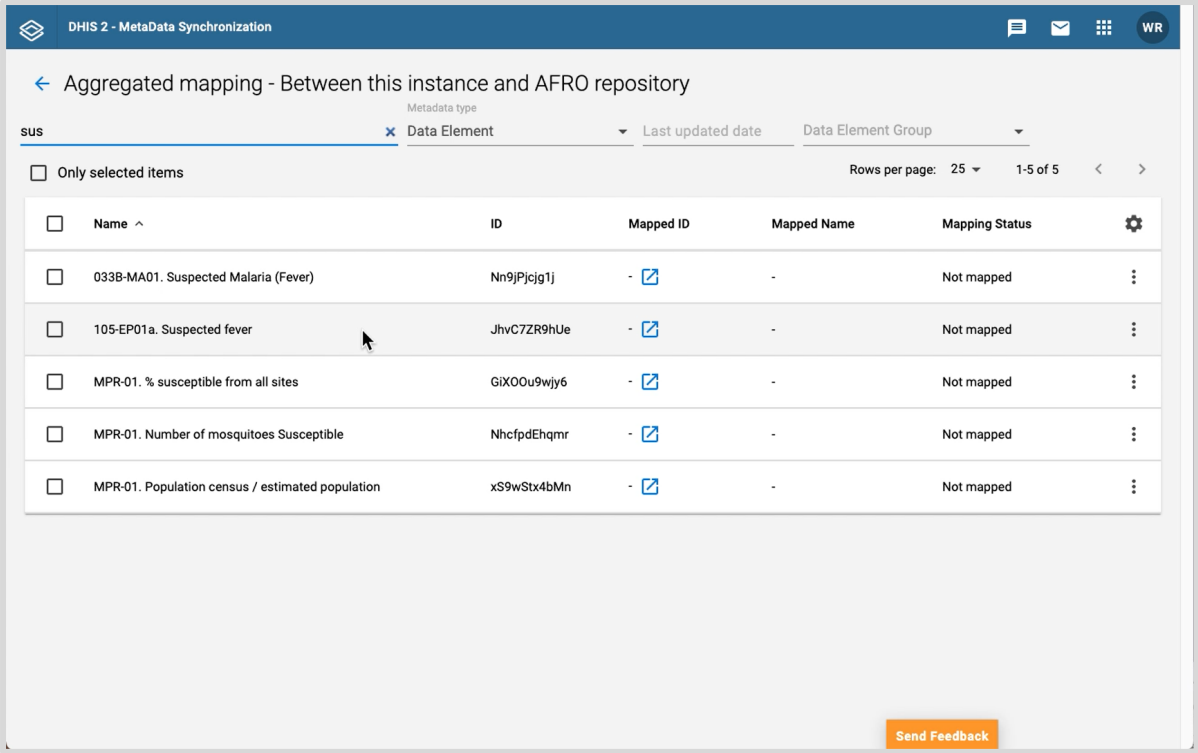


The program indicator will be computed by aggregating the data from Akrodie and its children units in the organization unit tree (Akrodie health centre, Kronko CHPS...) into Akrodie. In this case the Aggregation type is one month (step 4) so the program indicator will be computed for each month within the period defined at step two.

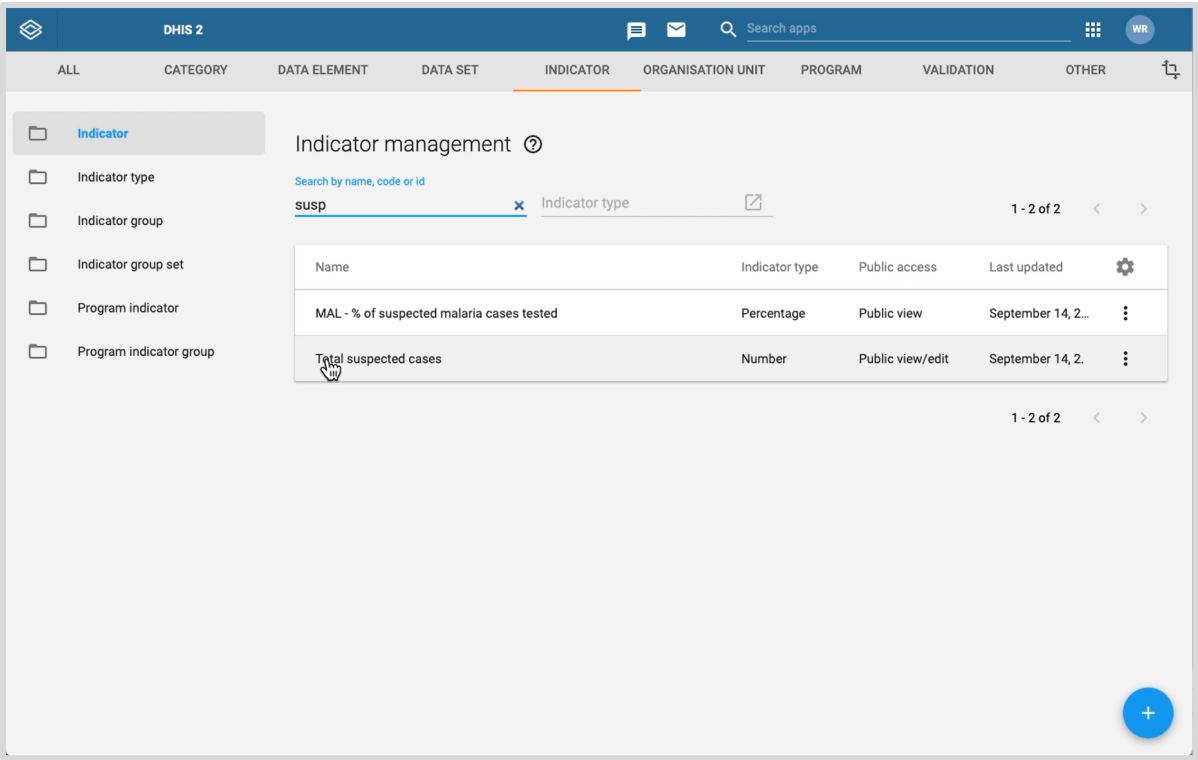
Case study

Mapping a disaggregated data element when there is no disaggregation on the target system

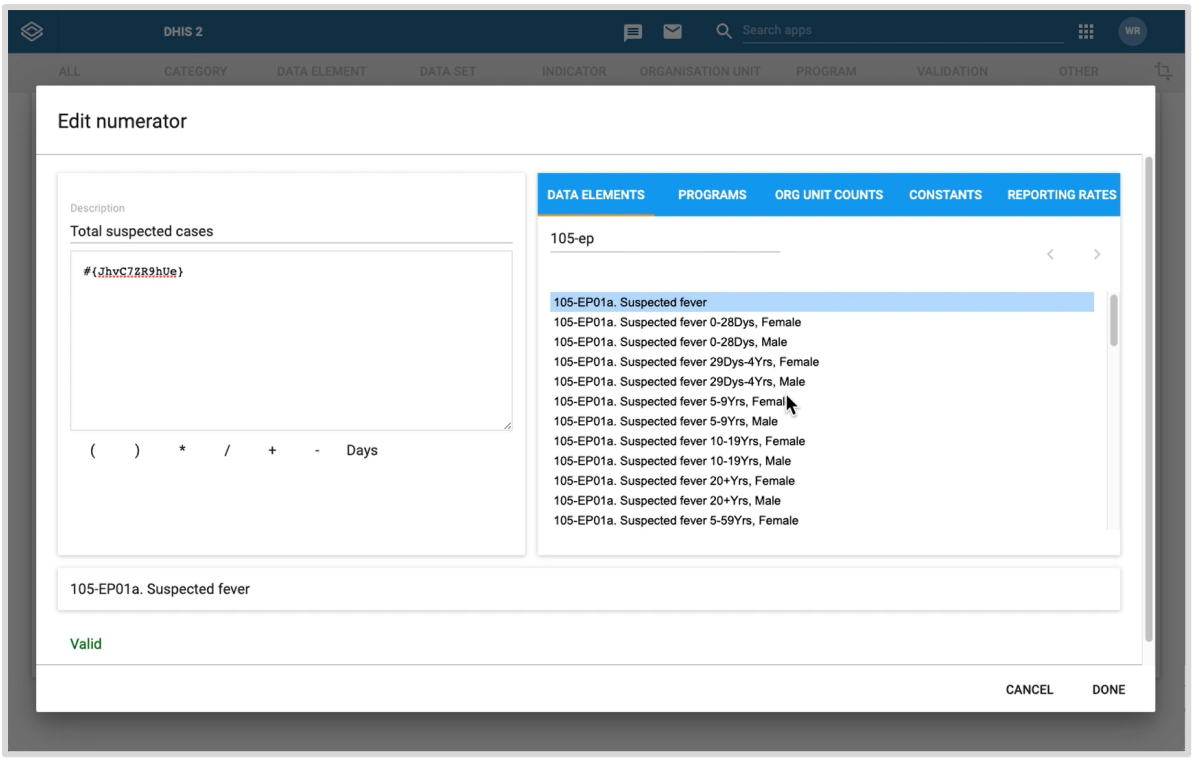
If we were to map suspected fever cases, a disaggregated data element exists here. It is disaggregated by age and by gender. And on the target system, there is no disaggregation. It's one total number.



To achieve an aggregated value, we can create an indicator, "Total suspected cases."

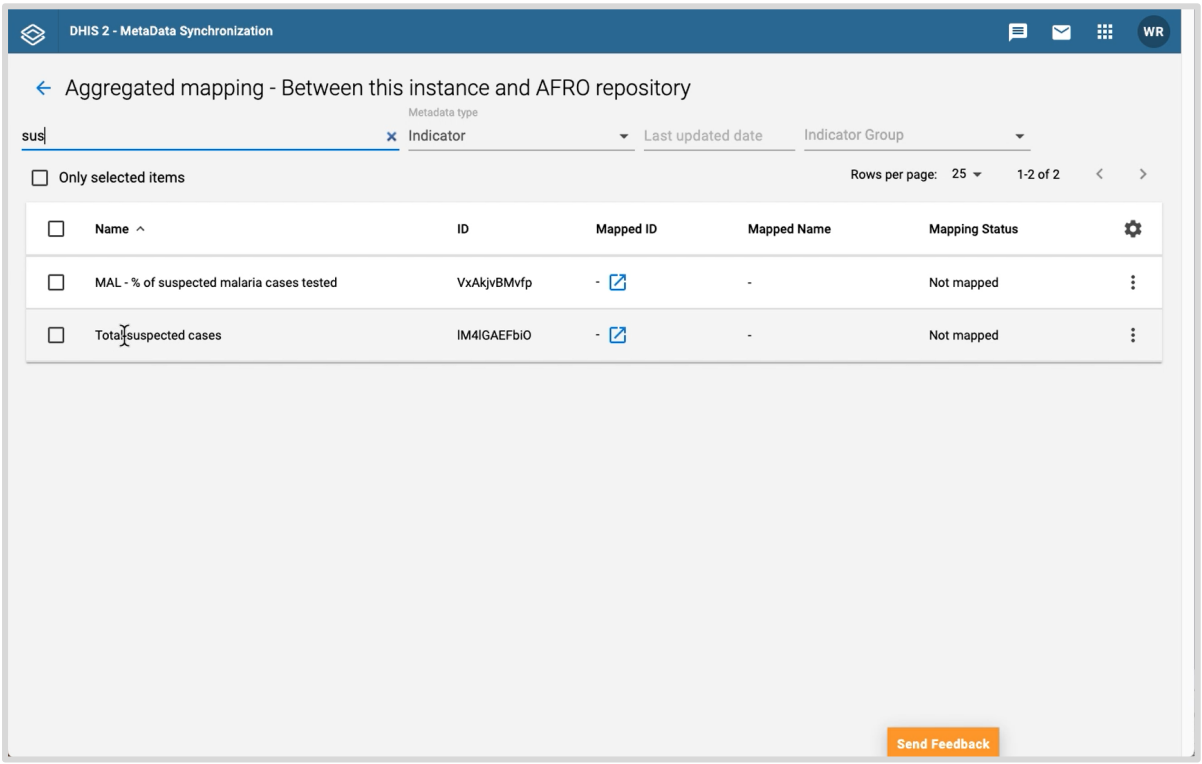


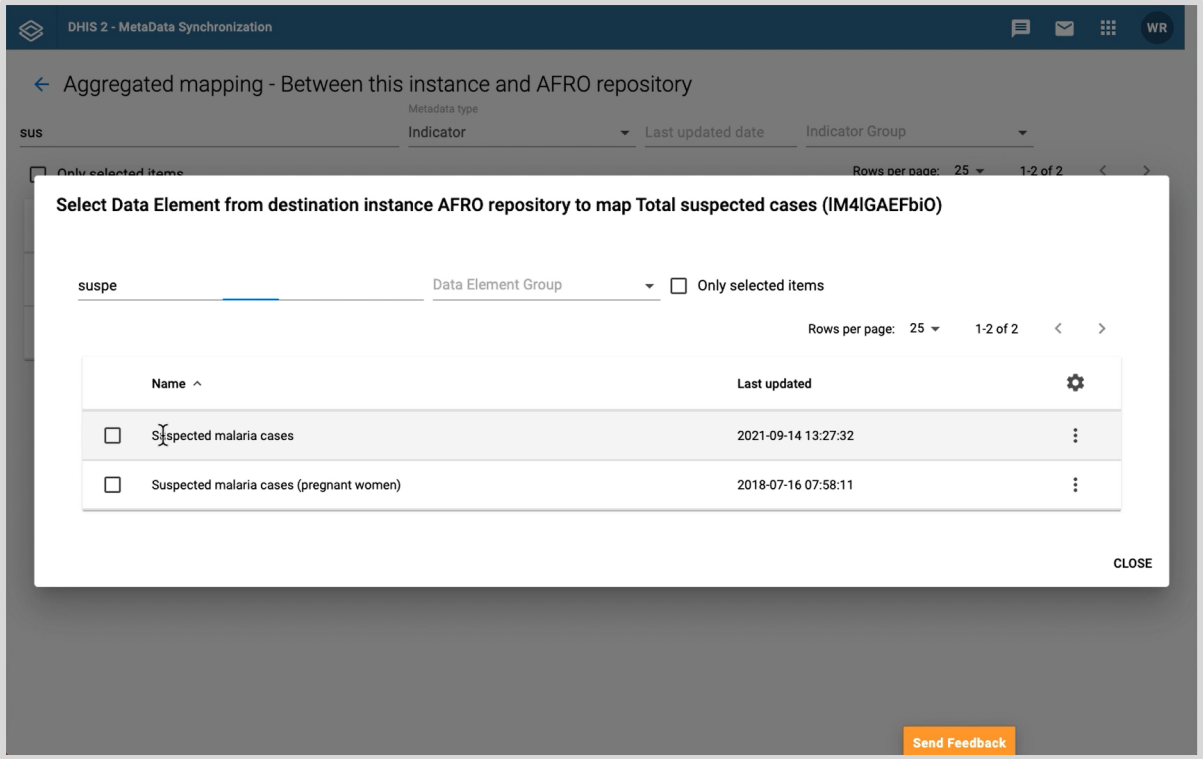
When we select the data element, “105-EP01a. Suspected fever”, we can see that it has a disaggregation of 0 to 28 days, 29 days to 4 years, 5 to 9, and so on, each disaggregated again by gender.



If we select the first entry, the aggregation will be conducted within the indicator of all the sub-elements. All the disaggregated elements will then be combined into this as an indicator.

Once you have set up the indicators, return to mapping. The total suspected cases will be mapped to the suspected cases on the other side without disaggregation.





Instance selection

In this step you select the destination instance where the events will be sent.

Advanced options:

- **Dry run:** In order to test it, try this function without actually applying changes to the destination instance.
- **Generate new UID:** You can decide if you want to keep the same UID or create a new one on the destination instance

Summary

This step summarises the list of actions involved in the synchronization. As in other kinds of synchronization you can choose between:

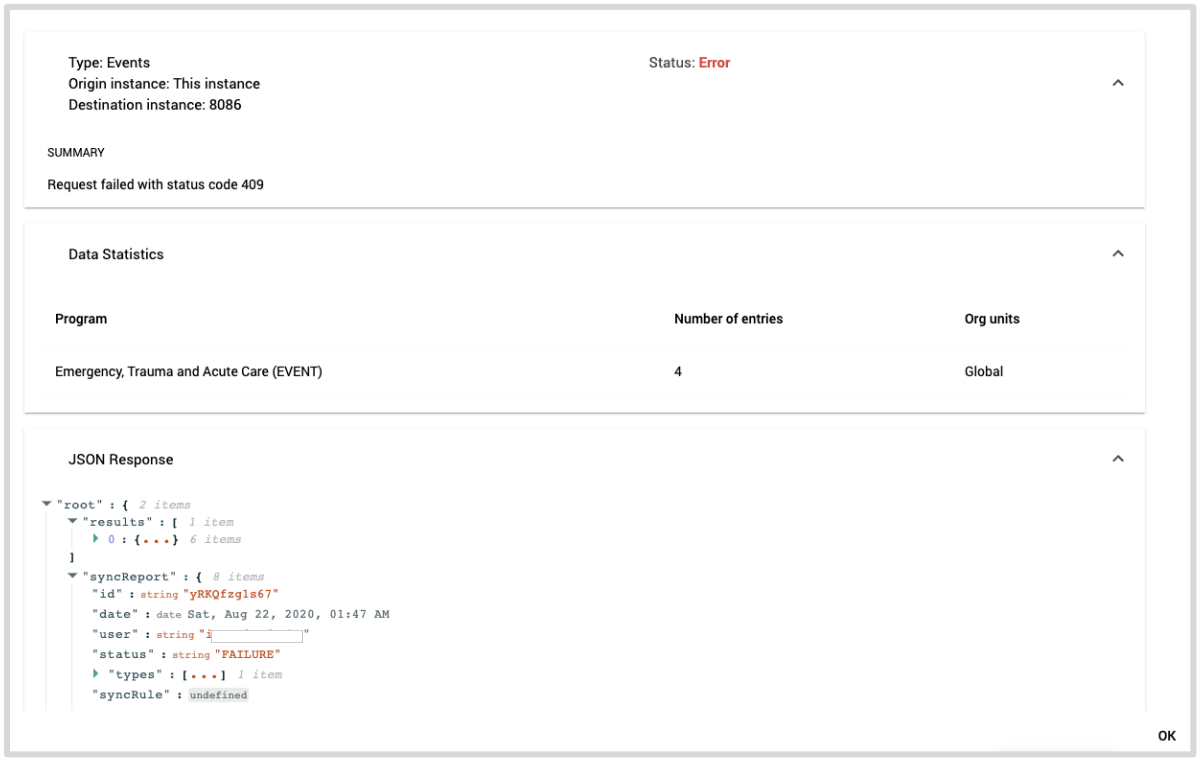
- Synchronize now;
- Save as a rule. Link to the rules; and
- Download the JSON file containing the events to import it later manually into the destination instance.

Synchronization results

When the process is finished, the Synchronization results report provides a summary of the operation with the following information:

- **Summary:** How many values were synchronized (deleted, updated, created) or ignored;
- **Data statistics:** The list of the data elements created, updated or deleted, with the amount of data values (not disaggregated by category options); and
- **JSON response:** The raw response from the remote instance.

An error example



Note: *The reports from all the synchronization attempts are saved at the history section.*

Manual Sync - aggregated data

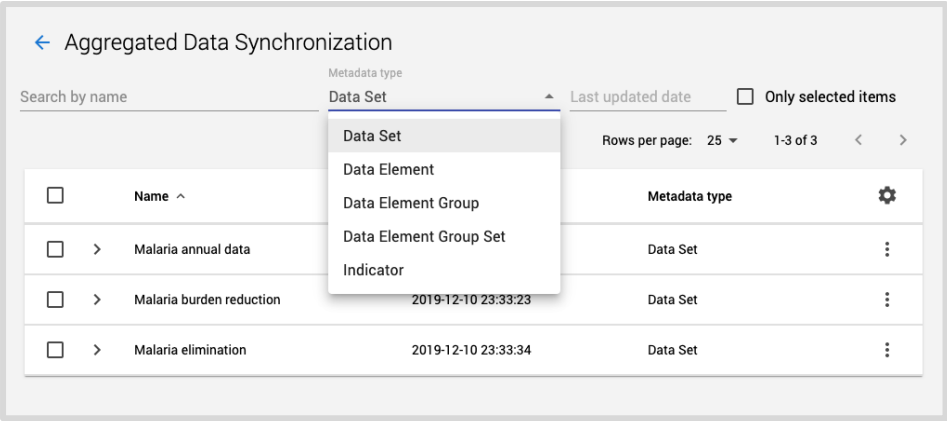
→ MetaData Synchronization / Aggregated data sync / Manual Sync

Select aggregated dataset

Synchronization for datasets is similar to the events synchronization.

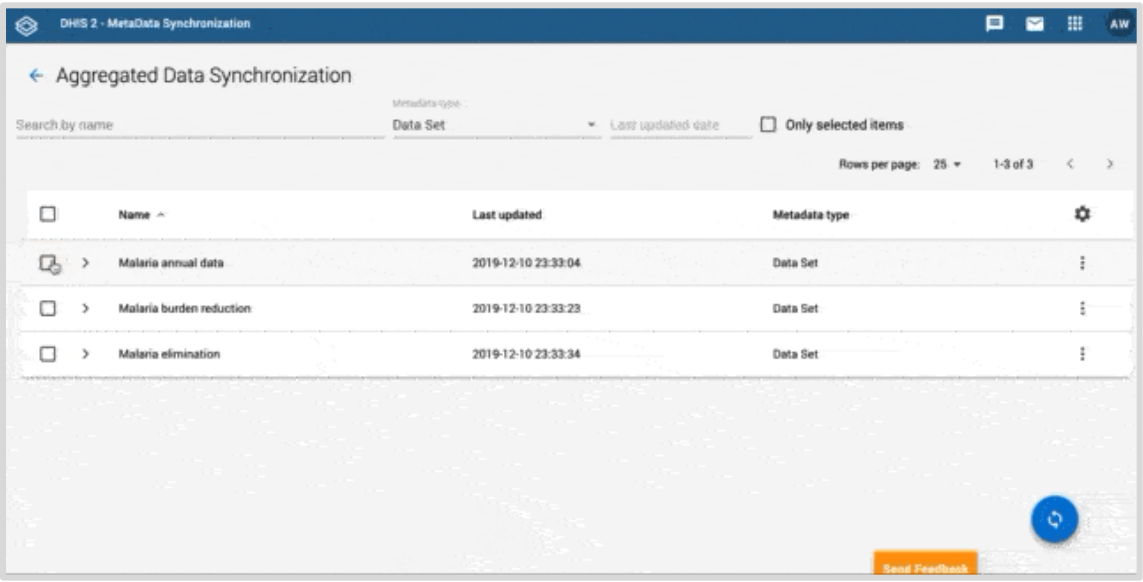
MD Sync will show a screen with a list of metadata objects. To ease search, you can filter these objects by name, by type of metadata and by date of last update.

Note: *If you can't find what you are looking for there might be several pages within this screen. Check the pagination below the search results.*



Note: *Observe that you don't need to sync a whole dataset, within this window you can unfold the dataset and select or deselect the elements within the dataset. This is useful for data anonymization or simply to send only the meaningful information to the destination instance.*

After selecting the elements that you want to sync, start the process by clicking on the sync button in the bottom right corner. The synchronization modal window will appear as a guide in 6 steps. The process is as outlined below.

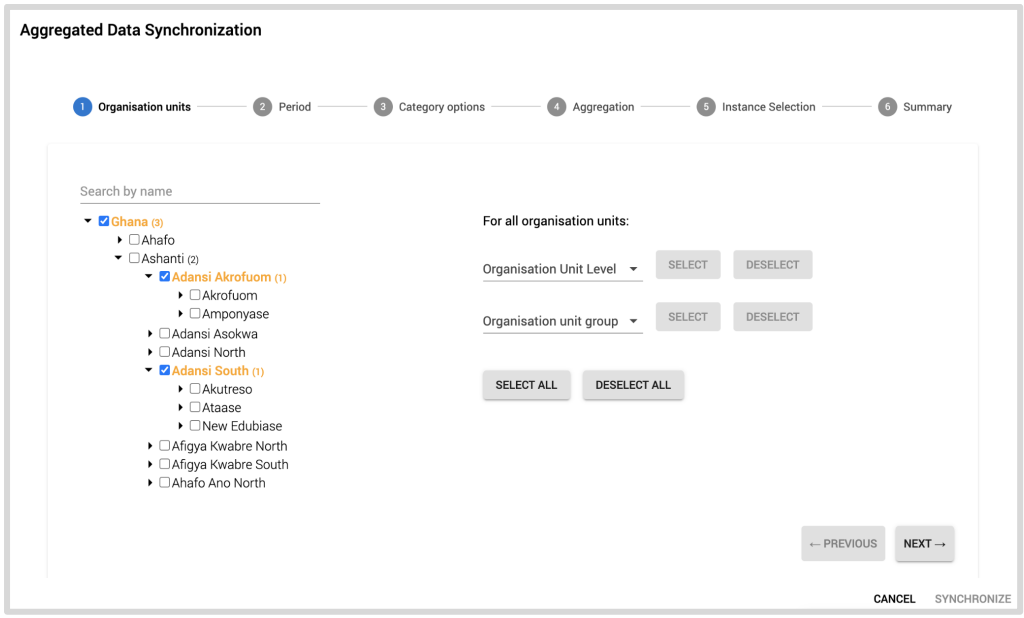


1. Select the organization unit for which datasets will be synchronized,
2. Select the period of data that need to be synchronized
3. Category options. Optional manual selection.
4. Aggregate (optional)
5. Select the destination instance
6. Finally run the synchronization or save it as a rule.

Guided process

Organization units

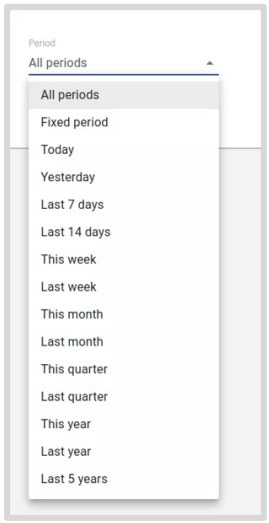
This first step allows you to filter the aggregated data based on the organization unit where it was registered. Click on each organization unit that you need to sync or use the selectors on the right to help you with multiple selections.



Note: *When selecting an organization unit in the tree: observe that selecting a parent organization unit doesn't mean that you are selecting all its children. This behaviour is different when you choose to aggregate data on step 4.*

Period

At this step you select the aggregated data based on its date. You can choose a pre-defined period of time or introduce the start and end date.

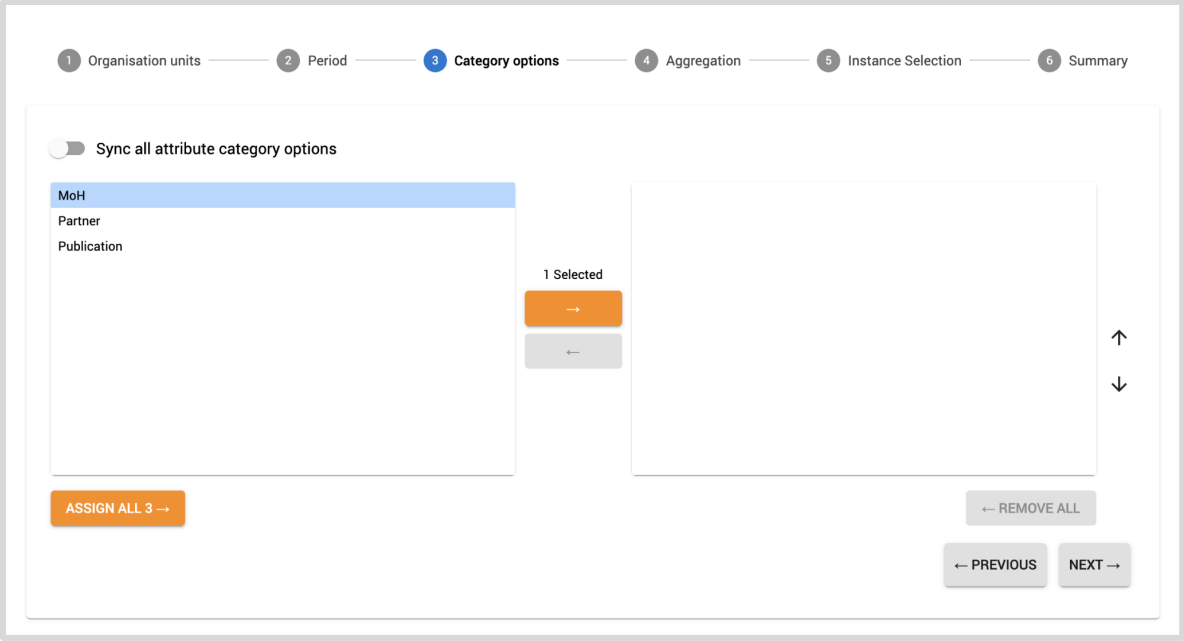


Category options

You can choose between syncing all attribute category options or by going for a manual selection.

When conducting a manual selection, a new panel appears with the subset of category options that are linked to the metadata that you have selected.

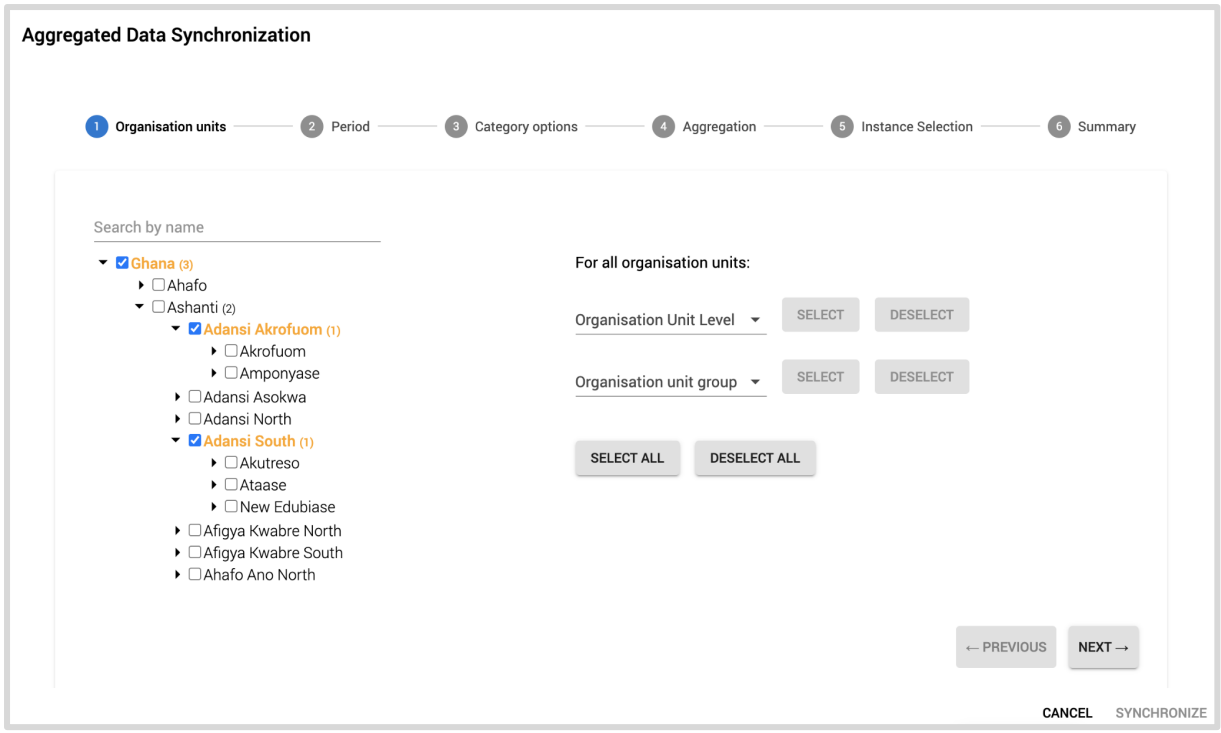
Only data with the categories selected on the right-side panel will be pushed to the destination instance.



Aggregation

Even though we are already syncing aggregated data, at this step we can perform an additional aggregation.

When you enable it, this aggregation will happen in two dimensions: temporal and spatial at the same time. Within this step you choose the temporal aggregation (because the spatial aggregation is defined by the organization units that you selected in step 1). For instance, we might consider what happens when you select Monthly aggregation in this step, and you previously selected three organization units.



The result is that you will send aggregated data corresponding to the three selected organization units and all its children by month. This takes the organization unit that is selected on step one and aggregates the information from itself and the children at the level of that organization unit.

If you do not select aggregation the data won't include children organization units.

Instance selection

In this step you select the destination instance where the aggregated data will be sent.

Advanced options:

- Dry run: In order to test it, conduct a dry run without actually applying changes at the destination instance.
- New and updates / New / Updates
    - New: only synchronizes new data
    - Updates: Synchronizes only data that has changed from source to destination
    - New and Update: both

Summary

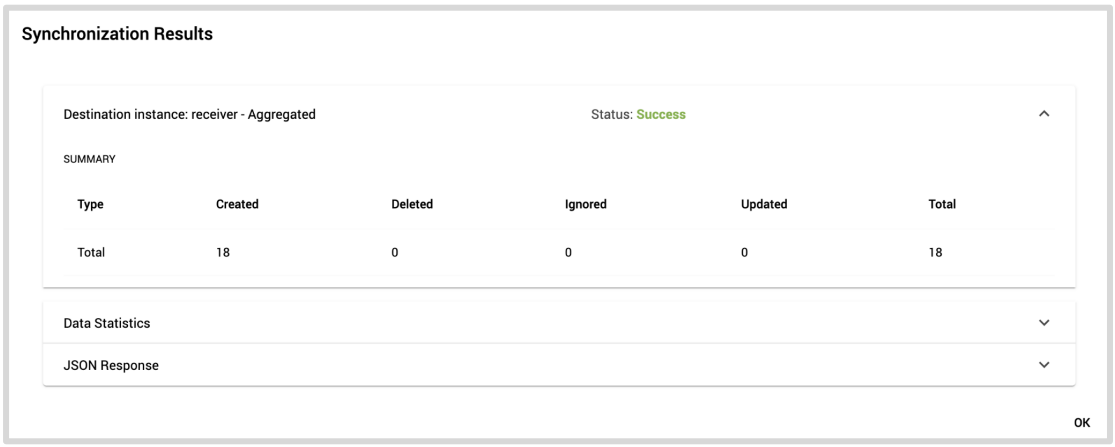
This step shows you the list of actions involved in the sync. As in other kinds of synchronization you can choose between:

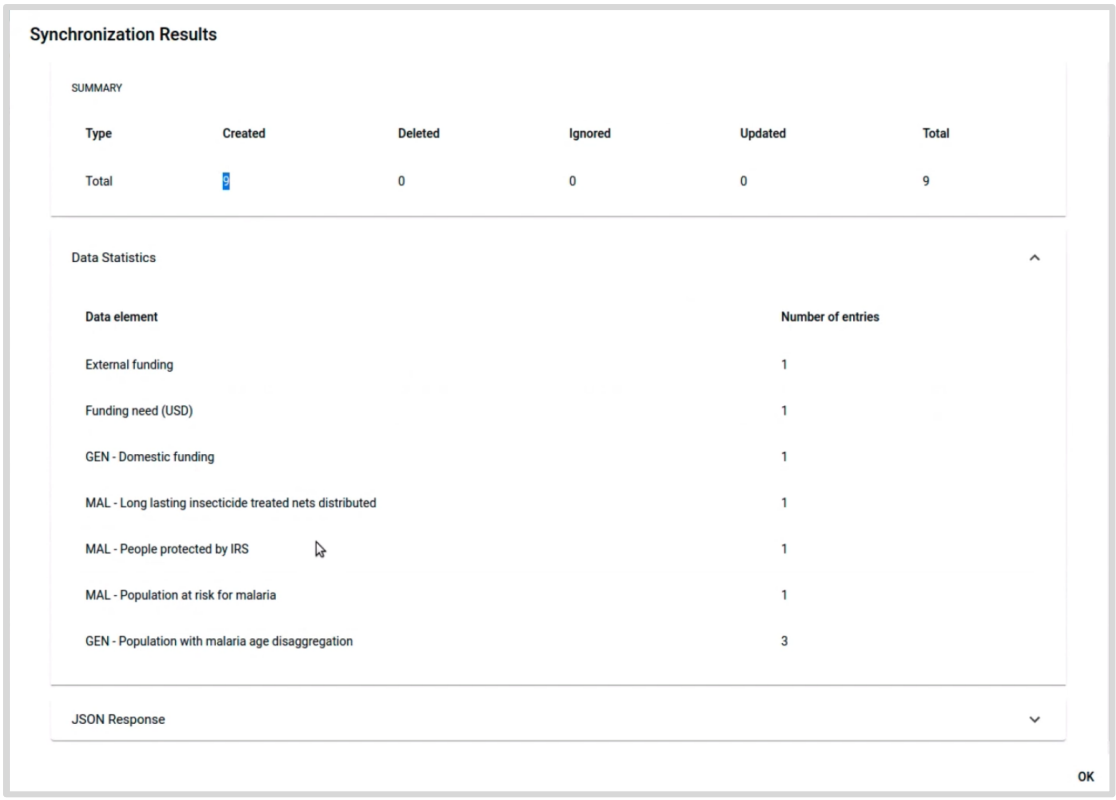
- Synchronize now
- Save as a rule
- Or download the JSON containing the file

Synchronization results

When the process is finished, the Synchronization results report provides a summary of the result with the following information:

- **Summary:** How many values where synchronized (deleted, updated, created) or ignored
- **Data Statistics:** The list of the data elements created, updated or deleted... with the amount of data values (not disaggregated by category options).
- **JSON Response:** The raw response from the destination instance.



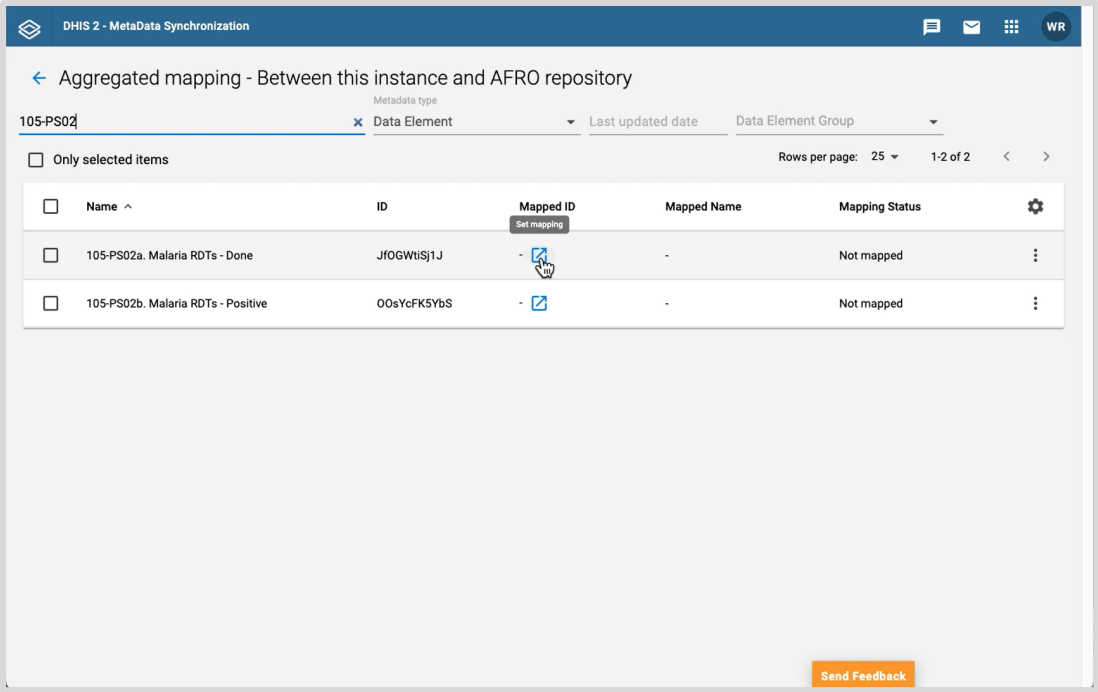


Note: *The reports from every synchronization attempt are saved at the history section.*

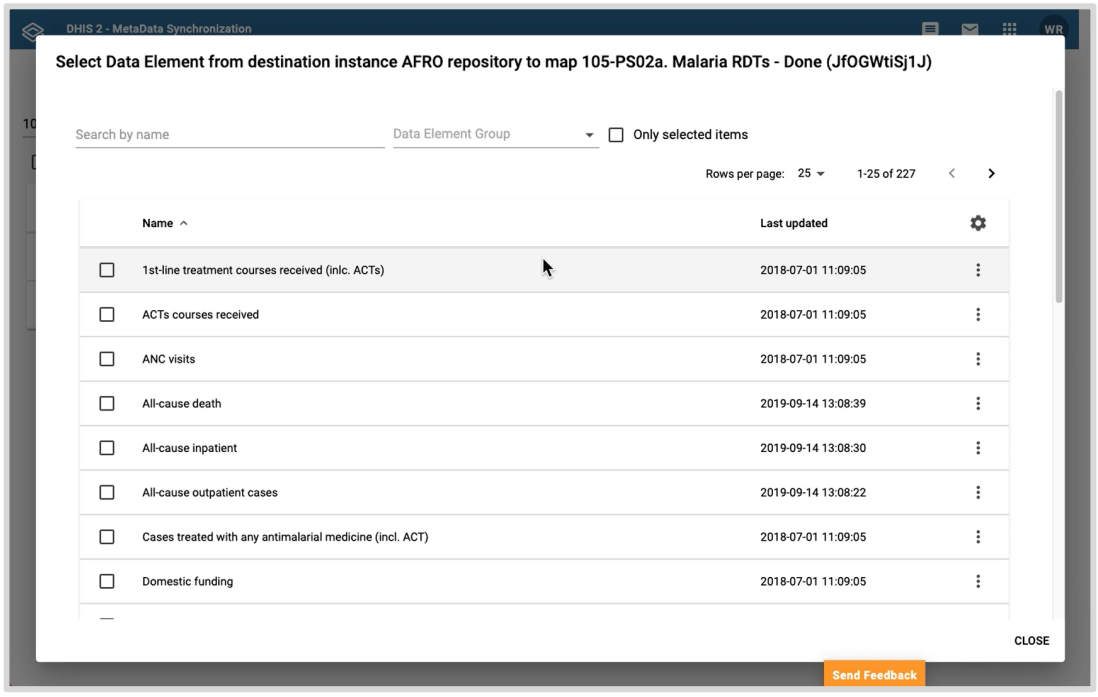
Case study

Aggregated mapping

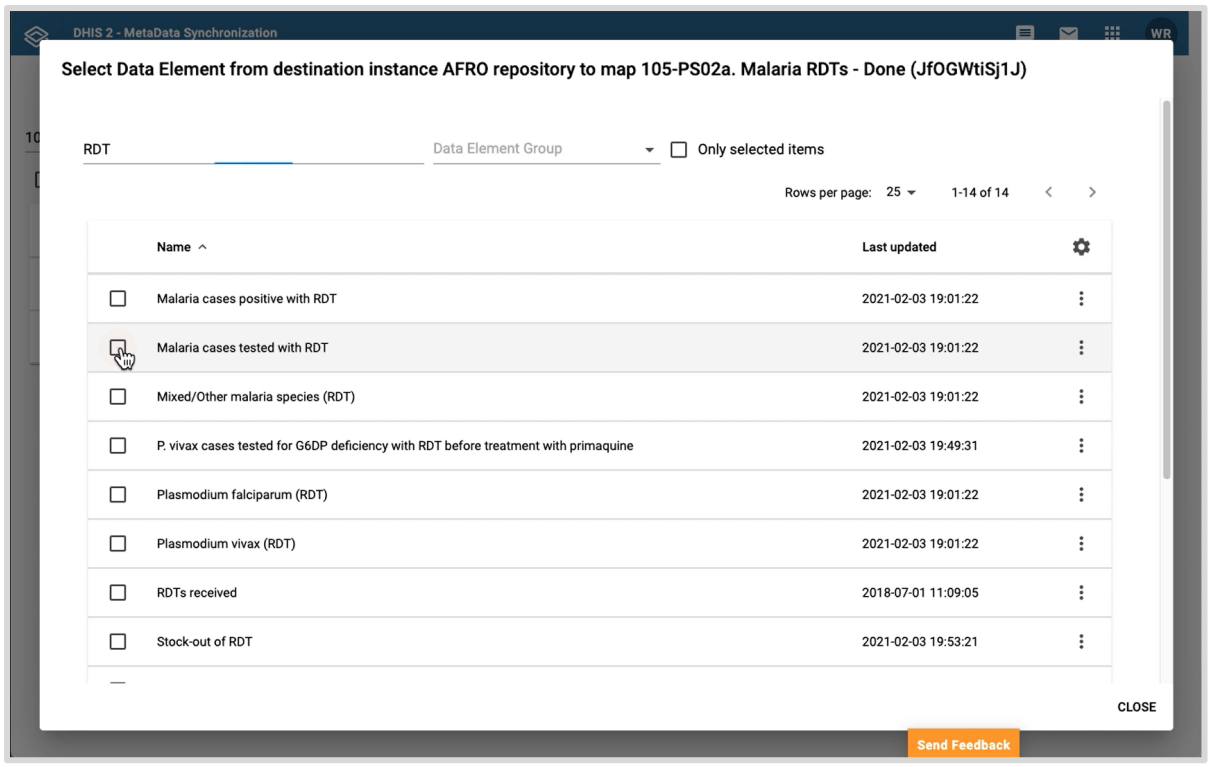
In this example, there is a straightforward data element, meaning there are no disaggregations on the local source system. This is one-to-one mapping with a data element on the target system.



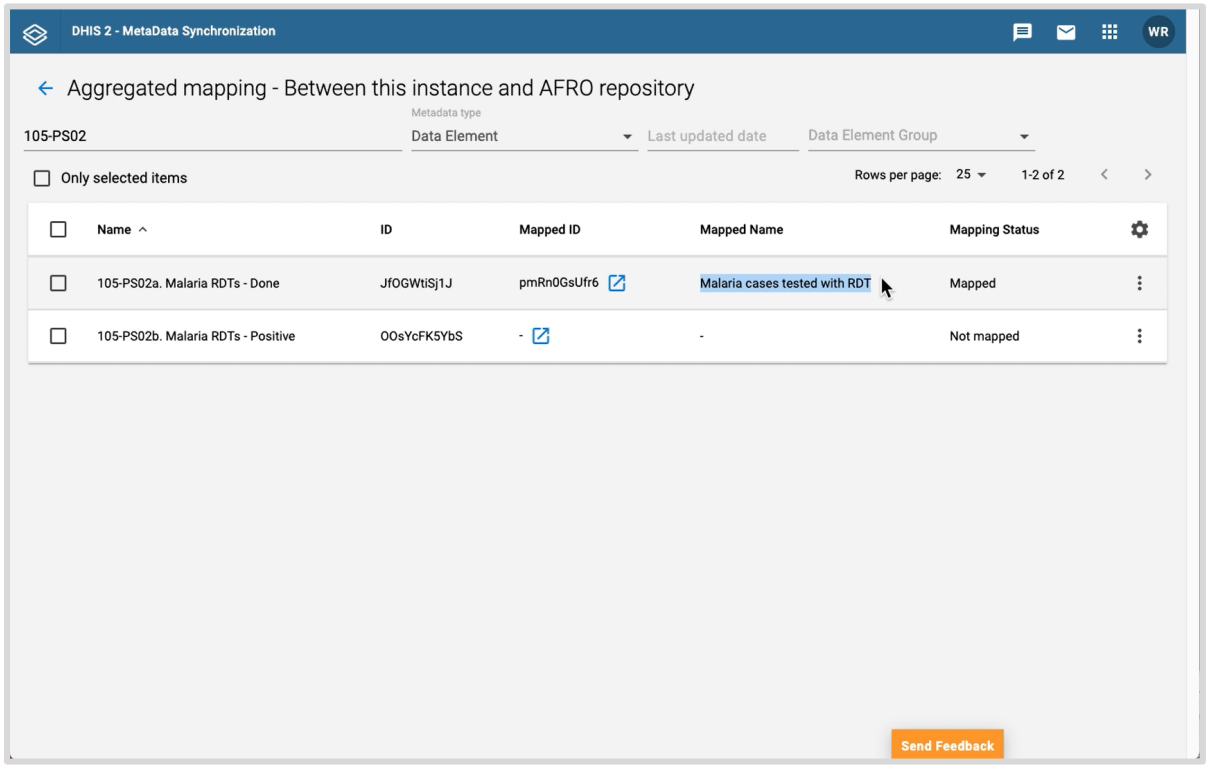
This will then bring up the target system data elements.



We can select “Malaria cases tested with RDT” for example. It will then attempt to map.



Once mapped the element has an ID in the source system, and an ID on the target system. This data element is mapped now to "Malaria cases tested with RDT".



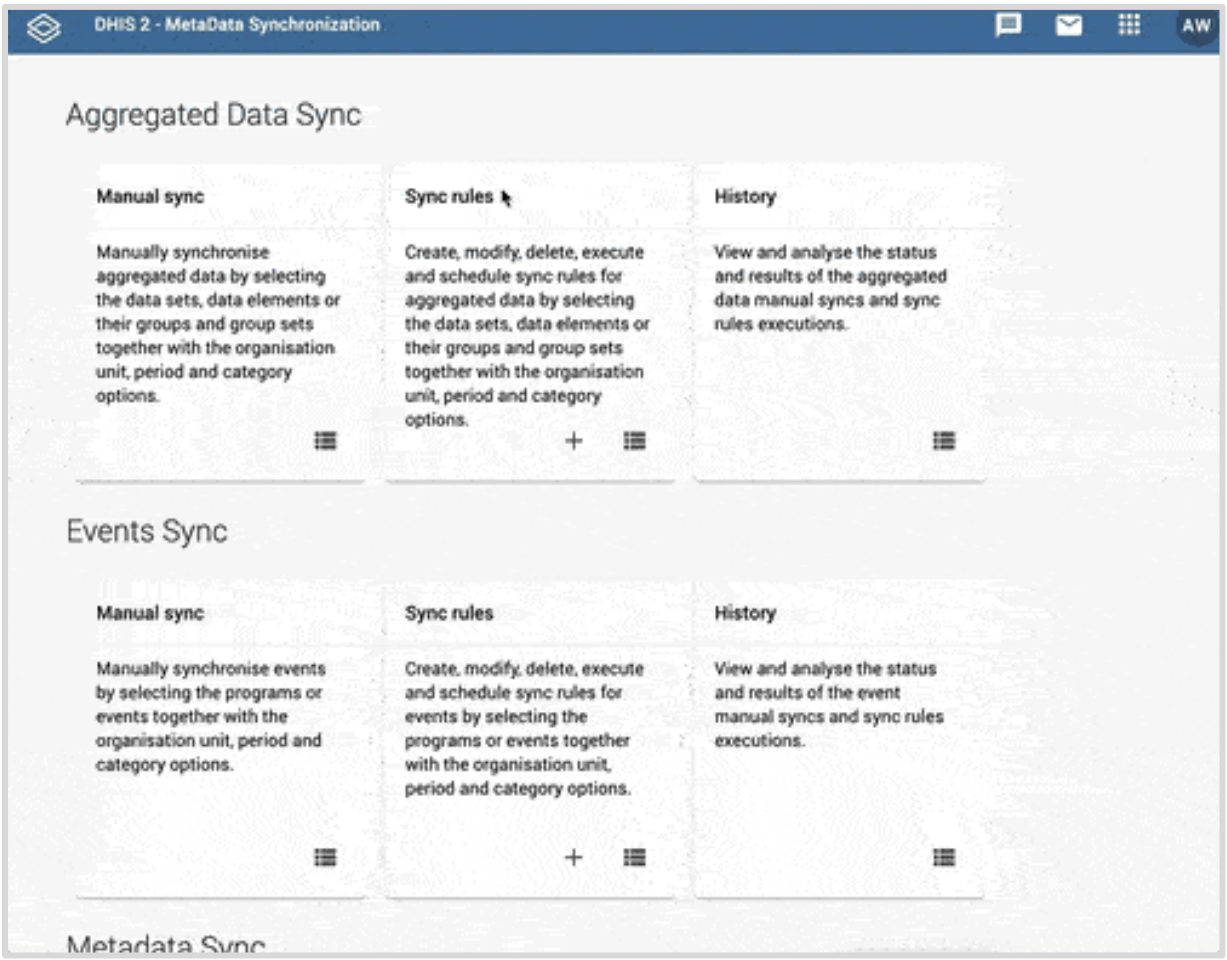
This is a simplified way of mapping. There are two data elements with no disaggregation on the target system.

SYNCHRONIZATION RULES

A rule is a synchronization operation stored to be used more than once. They can be executed manually or scheduled to be executed at regular time intervals. They are helpful when data needs to be transferred from the source to the destination instance at regular time intervals or when we need to keep certain types of metadata (for example, organization unit) constantly synchronized across instances.

You can create a rule for each kind of synchronization:

- Metadata
- Aggregated data
- Events



From the MD Sync main panel, go to Sync rules to view existing rules, edit them or create new ones.

Create a rule

A rule can be created in two different ways:

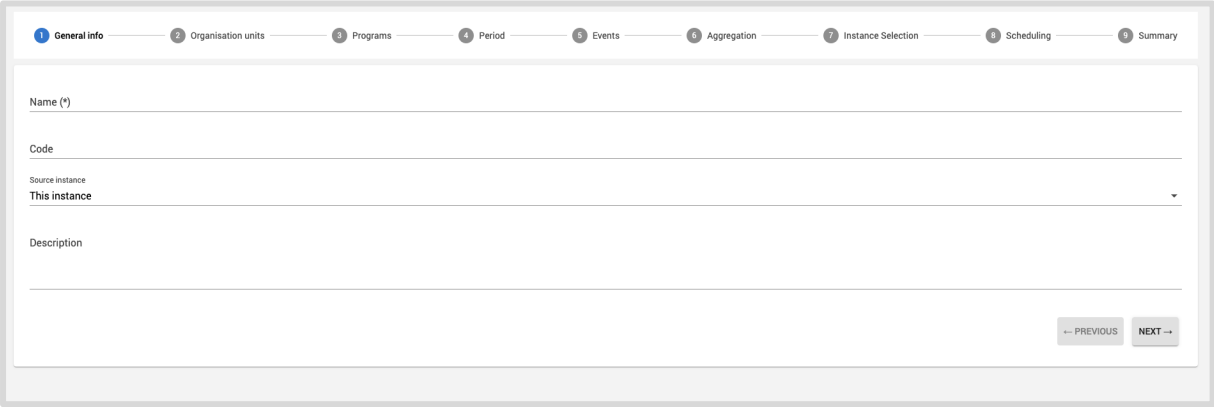
1. By clicking on the Add Rule button within the screen with list of rules
2. When you are creating a Manual Sync, at the last step of the process there is option to save it as a rule

To create a rule, you need to follow the same process as for executing a one time synchronization plus two extra steps: assigning a name to the rule and scheduling.

In this section we focus on the additional steps.

Name and description

The first step for creating a rule is adding its name and description. While any name of choice can be used, it is advisable to give rules a concise and self-explanatory name for easy identification within the rule list. Follow a clear pattern within your team and add a description if necessary.



Scheduling

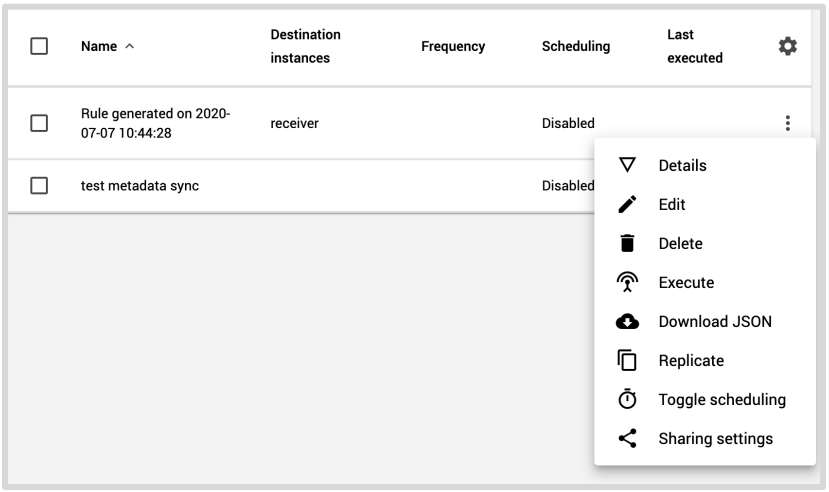
In this option you configure the periodicity at which the rule will be executed. To define that periodicity, we use a syntax that you might know from UNIX administration: "Cron" syntax. A Cron expression is a string comprising six fields separated by white space that represents a routine.

Read the details about Cron expressions here.

You can create your custom Cron expression or use one of the predefined templates for daily, monthly and yearly scheduling.

Rules options

The list of rules has this list of options (right click or three dots menu).



Most of them are obvious, only sharing settings requires further explanation.

- **Details:** displays information about the rule
- **Edit:** Allows you to modify the rule.
- **Delete:** Permanently remove the rule.
- **Execute:** Run the rule once.
- **Download JSON:** The JSON file with the data or metadata in that rule, as described here
- **Replicate:** Creates a copy of the rule.
- **Toggle scheduling:** Turns on and off the scheduling. When a rule has a schedule, you can disable it with this option.
- **Sharing settings:** Configure the permissions for the rule. Read more in the following section.

Sharing settings

→ Synchronization rules/ rule/ three points menu / sharing settings

Special attention should be given to the sharing settings when one instance is shared between different organizations or departments. Rules are public by default. If you do not configure sharing settings, it might happen that people without access to some kind of metadata can run the rule affecting that metadata.

Example scenario

There is a DHIS2 instance shared by two programs with its own users: malaria and hepatitis. The users with access to malaria metadata don't have access to hepatitis metadata and vice versa. In this situation a user from the malaria group, cannot create a rule using hepatitis metadata. But if that rule exists, and it has public access, that user could run the rule. To avoid that situation, the sharing settings for your rule needs to be configured.

There are three access levels for a synchronization rule:

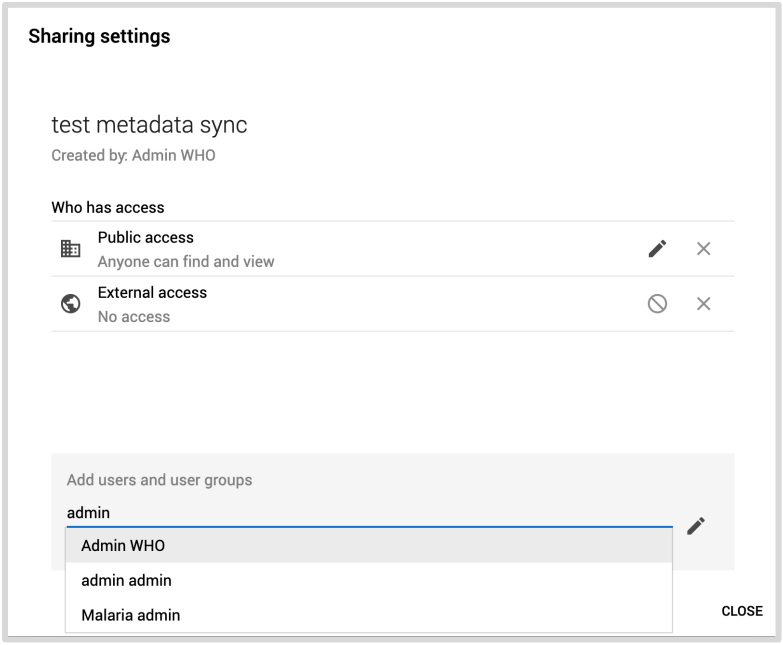
- Edit and view: can edit the rule and run
- View: can run the rule
- No Access

And you can set the access level to:

- Public access (all users within the instance)
- Individual users
- Groups of users
- External access appears only for compatibility reasons. It is disabled.

For instance, you can configure a single user that can edit a rule and at the same time a group which can view and run a rule but not edit it.

With this combination of users and levels, different groups of users can view and execute only a subset of rules, avoiding different user groups interfering in each others' processes.



MD Sync and the DHIS2 user roles

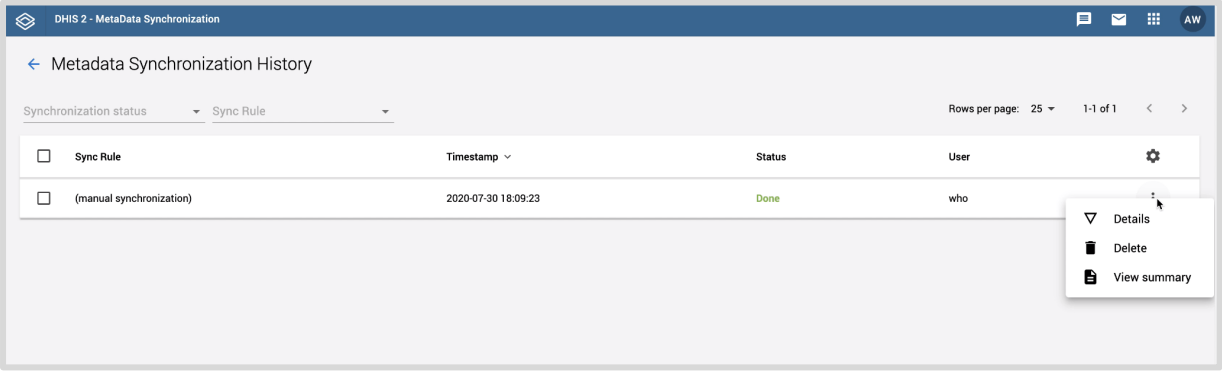
In MD Sync users inherit the permissions they have in DHIS2 core. Hence, a user in the source instance cannot include any metadata object they do not have access to in any synchronization:

MD Sync provides two different additional roles (Additional to those already defined by DHIS2 core)

- **MetaData Sync executor:** Users with this role can only execute sync rules. They cannot execute manual synchronizations or create new sync rules.
- **MetaData Sync configurator:** Users with this role can execute manual synchronizations, create and rune sync rules.

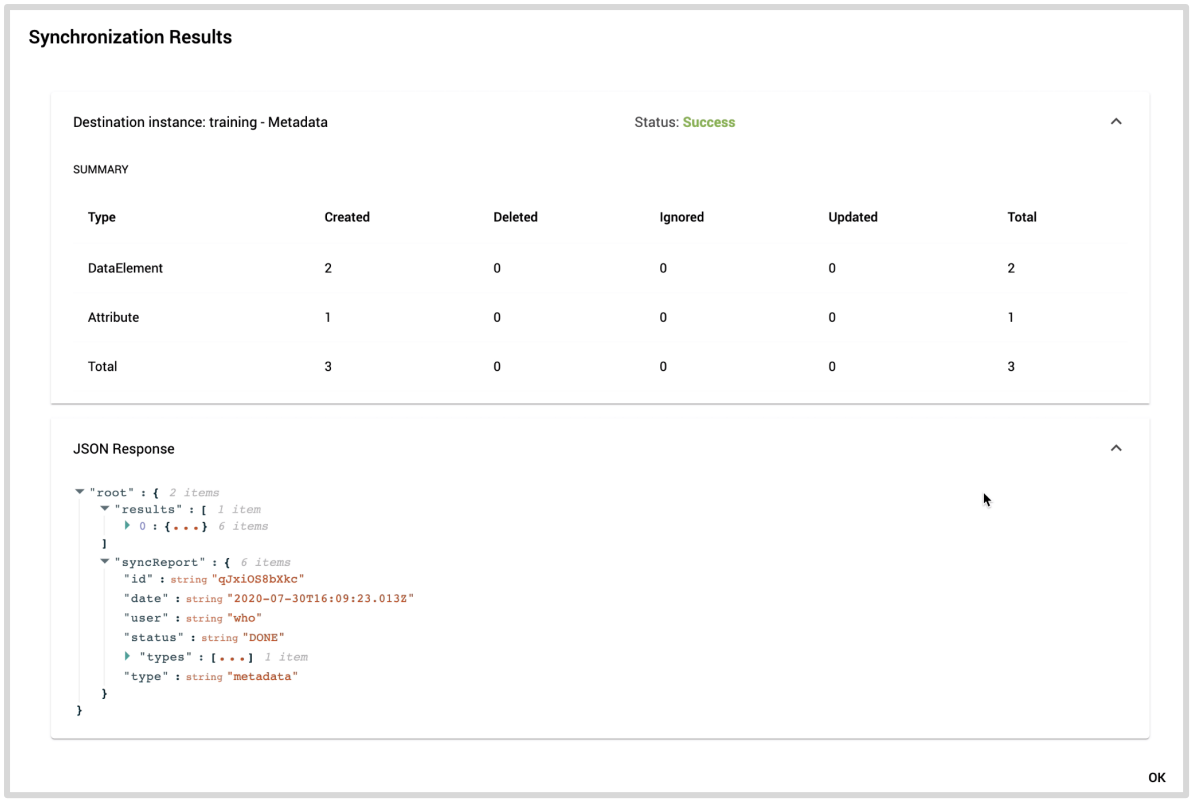
HISTORY

For all the different kinds of synchronization (events, aggregated data and metadata) there is a history section. All attempted synchronizations (manual syncs or executions of sync rules) are stored in a history.

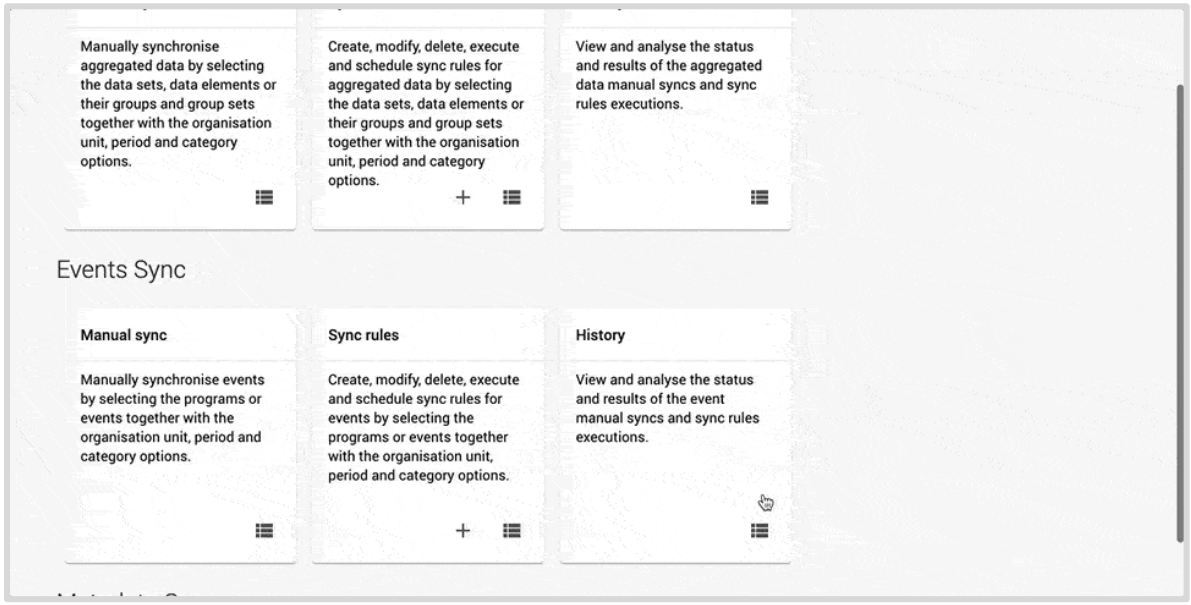


You can filter history elements by rule or by status (success, error). Each entry stores the same information that appears at the end of the synchronization.

- **Status:** success, error;
- **Summary:** How many values were synchronized (deleted, updated, deleted, created) or ignored;
- **JSON response:** The raw response from the remote instance; and
- **Data statistics (only for aggregated data and events):** The list of the data elements created/updated/deleted... with the amount of data values (not disaggregated by category options).



History is a detailed log that makes the process more replicable. It is especially useful during complex synchronizations where it might be easy to lose track of what is done and what is missing.



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