DHIS2 as Common geo-registry workshop
University of Oslo, Oslo, Norway
16-18 April 2018

Executive Summary

I. Background and objectives of the workshop

Geography and time are intrinsically linked to public health and therefore present across its three main functions: (1) assessing and monitoring the health of communities and populations at risk; (2) assuring that all populations have access to quality, timely and cost-effective care; and (3) formulating public health policies designed to solve identified health problems and priorities.

Despite the foundational importance of the above, geography and time are generally among the most poorly captured and therefore analyzed dimensions in the country's Health Information System (HIS) and this simply because capturing and regularly updating the above mentioned dynamic and relationships is difficult.

While part of this issue can be addressed through the development, maintenance, update, and use of master lists for the geographic objects that are core to public health, there is still a need for a technology solution - a common geo-registry - to simultaneously host, maintain, update and openly share these master lists and relationships, together with their associated data, including geography stored in a Geographic Information System (GIS) readable format.

In view of the above, the workshop looked at how *geography* (location, extent, hierarchies and relationships)) and *time* (changes over time in administrative divisions, services, operating status and ownerships of facilities,...) are currently integrated into DHIS2, including its data model. Given this, the aim was to identify gaps and technical requirements for the further enhancement of DHIS2 as a platform to serve as a common geo-registry that includes different master lists starting with the Master Facility List (MFL) as described in the following guidance: http://bit.ly/2FJxeRn.

This workshop has been possible thanks to the support provided by the University of Oslo, the Health GeoLab Collaborative, ADB and the WHO Country office of Indonesia.

II. Agenda of the meeting

The meeting agenda (Annex 1) has been designed to reach the objectives described above. While the order and content of some sessions have finally been modified, all the topics included in this agenda have been covered and are being reported in the present meeting summary.

III. Participants profile

A total of 27 participants attended the workshop representing different groups of stakeholders including country representatives (Cambodia and Indonesia), NGOs, the private and academic sectors including members of the DHIS2 team from the University of Oslo (Annex 2).

Other people joined in via teleconference during the daily recaps. These were: Derek Treatman (Vital Wave), Philippe Veltos (Novel-t), Maria Muniz and Rocco Panciera (UNICEF), Sam Libby (Esri) and Nicolas Oliphant (Global Found).

IV. Meeting Summary

A. Welcome and introduction

Bob Jolliffe opened the workshop by welcoming the participants before describing the objectives set for the workshop. He emphasized the need to ensure that the discussions do not only cover the technical aspects linked to the concepts of master lists and common geo-registry but also the other aspects that would ensure their sustainability on the long term.

A round of introduction was then performed for each participant to know each other and express expectations from the workshop. Among those we can mention: the willingness to know more on the topic in general and use cases in particular, find possible explanations on why GIS is not being more used and see if and how the concept of common geo-registry should be integrated into DHIS2 or managed from a separated platform.

B. Relation between the concept of Health Information System (HIS), Master Facility List (MFL), and common geo-registry - Importance of and challenges in including geography and time into them - Steeve Ebener (HGLC)

The concepts of Health Information System, master lists, registry and common geo-registry were introduced with the objective to ensure for a common understanding during the 3 days of the workshop.

The presentation then described the main benefits as well as some of the technical and non-technical challenges behind the development, maintenance, regular updating and sharing of these master lists through a common geo-registry.

Discussion points:

- The organic way in which the 9 elements of the HIS geo-enabling framework can actually be established (technical and infrastructural ones generally in place before the institutional ones)

Slides: https://drive.google.com/open?id=1NqYWJ3HwStK4LhoK40uwXi1N6nfp9Z7y

C. Country experience in integrating geography and time in the HIS (Cambodia, Indonesia)

Mr Sokna Sek, Vice Chief of HIS bureau of the Department of Planning and Health Information From the Ministry of Health of Cambodia, presented on their experience establishing master lists and a common geo-registry in Cambodia. His presentation first described how the HIS geo-enabling process is being implemented in the MOH under the umbrella of the HIS Master Plan. He then went through the past (June 2017) and current situation as well as way forward when it comes to the health facilities, operational district, administrative divisions and villages master lists before doing the same for the establishment of the common geo-registry into the HMIS/HCP platform.

Slides: https://drive.google.com/open?id=1AI705A8QqOZ3xUDXMbNUQCAzoi6VnN68

Mr Cecep Slamet Budiono, Head of the Data Analysis Section, Pusdatin from the Ministry of Health of Indonesia, presented on the MOH experience in setting a master health facility list in Indonesia. After giving a background, Mr Budiono emphasized on the importance of the master list before describing the purpose and scope of the initiative. He then talked about the content and governance challenges the MOH is currently facing as well as giving the list of requirements the MOH is considering for integration into the master list.

Slides: https://drive.google.com/open?id=1mKJOyucsxBI9EjsU5SnIk1wBjHcQRVJm.

D. How geography and time are currently managed within DHIS2, including in its data model and new DHIS2 Maps app demo - Bjørn Sandvik (UiO)

The concept of organization units within DHIS2 was presented before describing the current main limitations of this concept within the platform. Bjørn then provided a quick demo of the new Maps app before future plans to increase interoperability and performance in this app.

Discussion points:

- The importance and need to be able to track changes in geography through time for some health programs

Slides: https://drive.google.com/open?id=14S-o_3QIuIfxrAntiK8ZeR7TiZJDZWzt

E. Malaria Requirements - Karoline Tufte Lien and Juan Manuel Alcantara Acosta (UiO)

Karolin and Juan Manuel presented on the digital solution for malaria elimination project. This project, financed by the Bill & Melinda Gates Foundation, aims to strengthen and roll out integrated malaria surveillance systems with upgraded core DHIS2 functionality, common goods and effective mobile tools in a sustainable policy and technical environment, across various malaria elimination geographies.

After presenting the technical and operational approach followed by the project, the presentation described the geospatial requirements on the DHIS2 and mobile application side as defined by its Community of Practice.

Discussion points:

- There are three data models currently implemented in DHIS2. The last two have been added to answer specific needs that emerged since the first version
- Where does the responsibility of the developers and implementers towards the users stop for issues going beyond the tool itself (governance, technical capacity, content, processes,...)
- Should the geospatial widget be necessarily plugged to master lists through a common geo-registry or connect to a project specific geo-registry, which can in turn connect to a common geo-registry.
- Potential overlaps between the concepts of organizational units and Tracked Entities (TE) in DHIS2. Different cases for each type of object can be observed based on data collection requirements and if it's necessary to track evolution over time or interventions related to the considered object.

Slides: https://drive.google.com/open?id=1fH0U7gOaGcQH1yPpyjy2p-y_0xtUQ2NgPzcUApXN6D4

F. Link between DHIS2 and QGIS - Christina Mergenthaler and Margo Van Gurp (KIT)

After introducing the Royal Tropical Institute (KIT), the presentation covered the goal of KIT Center for Applied Spatial Epidemiology (KIT-CASE) which is about to be established. The work they are doing to develop a link between DHIS2 and QGIS to allow users to have access to its spatial analytical and modeling capabilities was then presented. The first version of the tool which is being developed (the DHIS2-QGIS data fetcher) is expected to be released within the coming months.

The presentation ended with a description of some of the challenges being encountered when trying to find the right administrative boundary layer matching the content of the considered database for a given time.

Discussion points:

- What are the GIS-related functionalities that DHIS2 should ideally include vs those that should be covered by open source or proprietary GIS software?

- Can/shall the concept of common geo-registry be extended to include the functionalities of a GIS/Map server?
- It would be nice for maps created in DHIS2 to open with the same geographies, attributes and symbology is a GIS software (QGIS, ArcGIS,...)
- Esri has some open source tools that would let you expose data from the database as "ArcGIS-compatible" feature services pretty easily, that runs in NodeJS and is called "koop" - https://github.com/koopjs. It might be worth looking into if it were compatible, or could be an extension on top of the existing API. It could also simply run of the PostgreSQL/PostGIS database

Slides: https://drive.google.com/open?id=1WU8lQTjYUHuSeKLp-DEIsqgpFeBXS2-Z.

G. Introduction to the guidance on the establishment of a common geo-registry for the simultaneous hosting, maintenance, update and sharing of master lists core to public health - Steeve Ebener (HGLC)

The day ended with an introduction to the guidance and assessment matrix on the establishment of a common geo-registry for the simultaneous hosting, maintenance, update and sharing of master lists core to public health.

Discussion points:

- Both the guidance and assessment matrix are living documents meant to be improved through venues such as the one offered by the present workshop

Slides and assessment matrix:
https://drive.google.com/open?id=1TFeotGZade7mWrxHrid2ZE4OFeFA4F7l.

H. Recap Day 1 (morning and afternoon sessions)

The draft executive summary for the previous day was presented to the participants and used as the basis for a short discussion with the people who joined through teleconferencing.

Discussion points:

- The difference between the common geo-registry as repository of master lists and the GIS/Map server as the repository of GIS format layers was clarified once again.
- The need for the geospatial widget currently being developed under the digital solution for malaria elimination project to be able to either connect to master lists from the common geo-registry if they exist or to create separate database in case of lack of master lists.

I. A Semantic Spatial Data Metamodel Implementation - Lessons learned and applicability to a geo-registry - Nathan McEachen and Richard Rowlands (TerraFrame)

The presentation described how TerraFrame has been using a terminology service coupled with a Web Feature Service (WFS) to manage geographic objects, their related hierarchies and corresponding topologies.

An example of application of such implementation was then given to the participants.

Discussion points:

- The time dimension is not yet implemented in this approach. The way this could be done was then discussed among participants
- The data model developed in Cambodia for the HMIS/HCP platform to comply with the requirements of the guidance on common geo-registry was presented as another alternative to manage the geographic and time dimension across different geographic objects

Slides: https://drive.google.com/open?id=1abndaJPfKXXtH-XvBItruDaHrno6c3Ab

J. Potential changes in the data flow, roles and technical requirements included in the guidance - Steeve Ebener (HGLC)

The participants went through the data flow and roles components of the guidance on common geo-registry.

Discussion points:

- The main concern when it comes to integrating geography and time in DHIS2 as presented in the common geo-registry guidance is the impact this will have on the analytical functionalities
- The current data flow already contains the different functionalities that are expected from a platform managing master lists through the use of a common geo-registry
- The roles and coding scheme components of the guidance are seen as important elements that should maybe be expended and emphasized during country implementations
- It would be important to emphasize more on the fact that the number of master lists in the common geo-registry can actually be expanded to cover other object such as Community Health Workers. Similarly, a common geo-registry could potentially include other important georeferenced service delivery points such as mobile clinics. See Nicolas Oliphant input in the following Google spreadsheet for more information: https://bit.ly/2H3qn6x
- There is a need for more detailed and appealing use cases to be documented in order to make a stronger case for DHIS2 to be used as common geo-registry. In this regards:
    - The representatives from the MOH of Indonesia mentioned their need to cover all the health programs and to records the historic changes not only for health facilities but also for administrative divisions as data are being reported at different levels

- The need for immunization programs to have access to the information from the previous year as part of the micro-planning process was then mentioned as another use case. See Rocco Panciera comment in the following Google spreadsheet for more details: https://bit.ly/2H3qn6x
- The need to assess determinants of coverage (i.e. Tanahashi Framework) in the context of their bottleneck analysis app/approach for use in DHIS2 was also mentioned. See Maria Muniz comment in the following Google spreadsheet for more details: https://bit.ly/2H3qn6x
- Health programs in general, and malaria elimination in particular, need to be able to conduct audit trails that spans over the all implementation of a national strategy (4 to 5 years depending on the country)

K. What does DHIS2 already support for technical requirements for common geo-registry

The participants went through the requirements for some of the functionalities which might need to be developed or enhanced in DHIS2 (curation, updating, sharing).

Discussion points:

- Users are having difficulties to communicate their needs to the DHIS2 Team.
- DHIS2 currently supports:
  - A list of health facilities with identifiers, attributes, coordinates and associated time series data
  - A single hierarchy of "organization units" for spatial aggregation in analytics, including identifiers and associated shapefiles.
  - An API and web app extension mechanism for third party applications.
- There are existing Jira issues defined which relate to some geo registry requirements. Among those we can mention http://jira.dhis2.org/browse/DHIS2-138 that is describing the problematic of managing hierarchies through time and could serve as the basis for a possible implementation within DHIS2
- It would be interesting to see if other Jira tickets are also covering other geographic/time related issues through the use of a new set of labels
- Some country (Bangladesh, Vietnam,...) or project specific (DATIM with PEPFAR) implementations of DHIS2 might have already led to the development of some of the functionalities of a common geo-registry and this including some implementations which have created curation, workflow functionality outside of the DHIS2 core
- Going through few requirements linked to the curation functionality highlighted:
  - The difference in data model between what is currently being implemented in DHIS2 and the one followed in Cambodia and the need to document the later
  - The need to clarify some of the terms being used in the guidance document and more requirements to be possibly added
  - The need to apply the rest of the assessment matrix to DHIS2 and the possibility for this to be one of the activities of the DHIS2 Sub CoP on geo-related issues
- A pilot project could be conducted in Lao and this taking advantage of several project taking place there at the moment (MORU and PSI for malaria elimination, Bill & Melinda Gates Foundation in relation to the establishment of an Emergency Operation Center)

L. Recap Day 2 (morning and afternoon sessions)

Like for the previous day, the draft executive summary was presented to the participants and used as the basis for a short discussion with the people who joined through teleconferencing.

Discussion point:

- Important to take advantage of DHIS2 Community Health Information System Guidelines to include the concerned geographic objects in the common geo-registry: https://drive.google.com/file/d/0B5Jsq_TjUPGjdFNVTzZNYnhlYzQ/view
- Emphasized once again the existence of objects that do change through time, depending on seasons for example (impact of floods during rainy season,...). These can cover but is not limited to outreach vaccination sites which do also have an impact on catchment areas that might have to be created on the fly.
- It is recommended for the service domain data to be stored separately from the health facilities master list and to ensure the link through the use of the official coding scheme. This does not only facilitate the sharing of the master list content but also ensure for the service domain data to remain close to the mandated entity.

M. Introducing existing timeline and development process - Philip Larsen Donnelly (UiO)

The presentation took the participants through the process that goes from tickets being submitted in Jira until its implementation in a revision of DHIS2.

Discussion points:

- UiO Supports the past 3 versions of DHIS and there are 3 releases per year (2.30 to be released by July 4, 2018)
- 1 ticket should be able being solved within the timeframe of a milestone (4 weeks). If it goes beyond one milestone it becomes an EPIC which can be described as a group of tickets
- Lobbying the product manager, well defined tickets, source of the ticket (RCAT (HISP and other DHIS2 partners, Ministries), tickets leading to clear deliverables, funds to implement the ticket, inputs from groups such as TWGS are elements that helps for the ticket to be prioritized
- There are 3 separated development teams working on implementing the prioritized tickets: Analytics, Tracker and Apps

Slides: https://drive.google.com/open?id=1I9r1UgEMEeFUXrf_GVqpqhMe2cfGBD3c

N. Establish a DHIS2 Sub CoP on Geo-related issues, including registries, under the DHIS2 CoP

The participants discussed the possibility to establish a Sub Community Of Practice (CoP) to ensure for the discussion that started during the workshop to continue and answer to the initial question: Can/shall a common geo-registry be included into DHIS2 or developed as a connected App?

Discussion points:

- The trend for UiO is to develop apps connected to the DHIS2 API
- UiO is only involved in 5% of implementations and those are edge implementations that push the software forward. One of the reason for this is UiO's willingness to building local capacity to maintain the platform.
- UiO needs to provide more guidance and wants to become the knowledge hub for existing knowledge and experience. The DHIS2 Community of Practice comes from this need
- The DHIS2 CoP is aiming at ensuring for users to find answers and material related to a specific issue and is currently running under Knowledge Gateway but will be migrated to Discourse in the near future
- Going through the current list of geo-related tickets could serve as the starting point for the activities of the Sub CoP on DHIS2 geo-related issues
- Role for the Sub CoP on DHIS2 geo-related issues:
    - Development of configuration guidelines, documentation of good/best/bad/worst practices and use cases
    - Linking implementers with users
    - Discuss issues linked to the integration of geography and time into DHIS2 (for example solve the question of the workshop) including the prioritization of future features
- The Sub CoP on DHIS2 geo-related issues could be lead by PSI and the UiO Malaria Team.
- Would like to be involved in the Sub Cop:
    - KIT (can collaborate on development of use cases; can share beta version of a common geo-registry with National TB Program DHIS2 users for feedback)
    - Health GeoLab Collaborative
    - MORU (could provide some administrative support)
    - TerraFrame
    - Ministry of Health of Indonesia
    - Universitas Gadjah Mada (Indonesia)
    - Global Found (Nicolas Oliphant)
- The Sub CoP Should be promoted through HISP and other networks as well as to national programs using DHIS2

O. Next steps and conclusion of the workshop

- This week workshop:
    - Provide inputs to the workshop executive summary by April 20, 2018
    - Distribute the final executive summary to interested parties during the week of April 23rd, 2018
- Sub CoP on DHIS2 geo-related issues:
    - Karolin and Scott to discuss when a platform could be setup
    - Develop a spreadsheet with the list and contact information of potential members
    - Piece part Jira to facilitate the identification of geo-related tickets
- Pilot project for the establishment of a common geo-registry App built on DHIS2 in Lao:
    - Define what this App would be based on the requirements from the guidance
    - Proof of concept building on the already existing Apps and scripts (link with Jira and the CoP)

Bob Jolliffe ended the workshop by thanking the participants and underline the importance to ensure for the CoP to be established and maintained.

Annex 1 - List of participants (by alphabetical order)

First Name	Surname	Organization	Email address
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Viktor	Varland	UiO	viktor@dhis2.org

Annex 2- Agenda

16 April 2018

Time	Activity	Facilitator
9:00 - 9:30	Welcome remark, objective of the workshop, round of introduction and expectation from the participants	Bob Jolliffe - UiO
9:30 - 10:00	Relation between the concept of Health Information System (HIS), Master Facility List (MFL), and common geo-registry - Importance of and challenges in including geography and time into them	Scott Russpatrick - UiO / Steeve Ebener - HGLC
10:00 - 10:30	Break	
10:30 - 12:00	Country experience in integrating geography and time in the HIS (Cambodia, Indonesia)	Mr Sokna Sek - MOH Cambodia / Cecep Slamet Budiono - MOH Indonesia
12:00 - 13:00	Lunch	
13:00 - 14:00	How geography and time are currently managed within DHIS2, including in its data model	Bjørn Sandvik - UiO
14:00 - 14:15	New DHIS2 Maps App Demo	Bjørn Sandvik - UiO
14:15 - 14:30	Break	
14:30 - 15:30	Malaria Requirements	Juan Manuel Alcantara Acosta, Karoline Tufte Lien - UiO
15:30 - 16:00	Link between DHIS2 and QGIS	Christina Mergenthaler - KIT
16:00 - 17:00	Introduction to the guidance on the establishment of a common geo-registry for the simultaneous hosting, maintenance, update and sharing of master lists core to public health	Steeve Ebener - HGLC

17 April 2018

Time	Activity	Facilitator
9:00 - 9:20	Recap day 1 and objective of day 2 (potential call in)	Steeve Ebener - HGLC

9:20 - 10:00	Potential changes in the data flow, roles and technical requirements included in the guidance	Steeve Ebener - HGLC
10:00 - 10:30	Break	
10:30 - 11:00	What does DHIS2 already support for technical requirements for common geo-registry.	Scott Russpatrick and Viktor Varland - UiO
11:00 - 12:00	Compare the data flow and technical requirements of a common geo-registry and emerging use-cases with DHIS2 functionalities to identify potential gaps	Scott Russpatrick and Viktor Varland - UiO
12:00 - 13:00	Lunch	
13:00 - 14:30	Technical requirements, data types, new features to DHIS2. - Demo of current org hierarchy maintenance checks. Review of user stories for georegestry maintenance.	Scott Russpatrick and Viktor Varland - UiO
14:30 - 15:00	Break	
15:00 - 16:00	Identify relevant standards to use for exchanging data with client applications (e.g., OGC WFS, OGC WMS, Vector Tiles)	Nathan McEachen - TerraFrame

18 April 2018

Time	**Activity**	**Facilitator**
9:00 - 9:20	Recap of day 2, agenda and objectives of day 3 (potential call in)	Scott Russpatrick - UiO
9:20 - 10:00	Recommendations and a way forward, how this links to existing initiative, and country perspectives	Bob Jolliffe - UiO
10:00 - 10:30	Break	
10:30 - 11:00	Introducing existing timeline and development process	Philip Larsen Donnelly- UiO
11:00 - 12:00	Prioritizing development of newly identified features	Viktor Varland - UiO
12:00 - 13:00	Lunch	
13:00 - 14:00	Establish DHIS2 TWG on Geo-related issues, including registries, under the DHIS2 CoP	Scott Russpatrick - UiO
14:0 0 - 14:30	Way forward and closing of the workshop	Bob Jolliffe - UiO