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evriMED and ETLs DHIS2 Integration

TECHNICAL DOC.

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1. Introduction

1.1 Project background

The NTLP has been implementing DHIS2 since 2014 to strengthen the monitoring and evaluation of the program activities. The system was upgraded in 2017 to improve monitoring of the program activities, especially on case detection and treatment outcomes. Hence, there was a need to strengthen the availability of treatment data from the evriMED (SmartPill Box) system to DHIS2 through the integration of the two systems for easy follow-up on the patient's treatment intake.

KNCV together with NTLP is conducting a project on TB adherence for four regions in Tanzania, where TB-notified cases can be tracked for treatment intake on a particular frequency (daily, weekly, monthly, etc) through the use of the system called evriMED (SmartPill Box).

Through this system, case notifications are monitored for the uptake of TB medicines for easy follow-up. NTLP through HISP Tanzania worked on strengthening the availability of treatment data from the evriMED system to DHIS2 through integration of the two systems by developing a DHIS2 custom Application that directly interacts with the evriMED system.

This document provides in-depth details on the technical aspect of the integration between evriMED and DHIS2 to smoothen the stated process.

1.2 About the Digital Solution

Among the key attributes for the success of the project is the ability to successfully make sure that TB treatment data captured through the evriMED system when TB cases use the TB medications get updated in the ETLs system where all TB cases are registered. The project was developed by HISP Tanzania which worked closely with technical person(s) from the Ministry of Health-NTLP program and KNCV Tanzania to strengthen the availability of treatment data from the evriMED system to DHIS2. The agile approach was used throughout the process.

2. Treatment Adherence App architecture

2.1 Main components

The Treatment Adherence app is a standalone application within DHIS2 that is more generic to any version of the DHIS2 (starting from 2.38 and above) and configurable so that it can be adapted by other countries implementing the same project of using smart pills for TB treatment and prevention.

The application architecture is divided into three main components. The treatment adherence user interface, application tier (backend scripts & APIs), and DHIS2 tracker program (s).

2.1.1 The treatment adherence user interface

This is the communication layer of the application where the end users interact with the application. Its main purpose is to display and collect information to and/or from the user. This is a custom application that is installed and runs within DHIS2.

2.1.2 Application tier

This is the heart of the application, It is where the linkage between the two systems happens. This allows the app in DHIS2 to communicate with the evriMED system using APIs. This is also where the processing and computation of data is done.

2.1.3 DHIS2 tracker program

The tracker program in DHIS2 is where the patient data is captured and this is where we add data pulled from the evriMED system.

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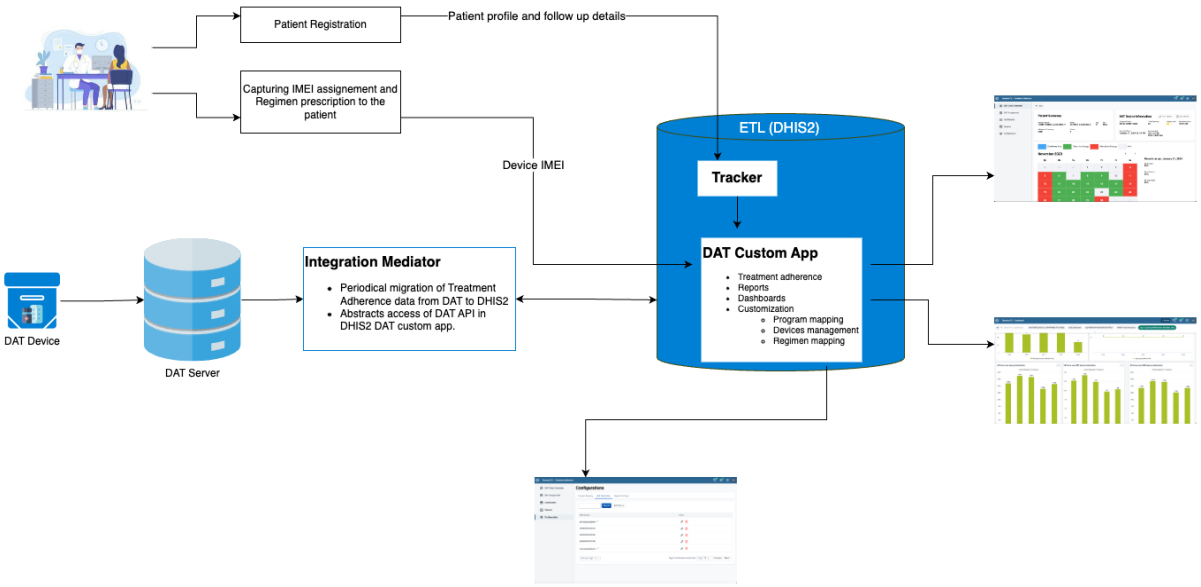

Fig: Application architecture

3.Security and access level

3.1 System Security

The Treatment Adherence web application employs a comprehensive security framework across various layers, spanning from data access to user interaction, to guarantee the integrity, confidentiality, and authenticity of data. These layers encompass:

- **Integration Secrete Phrase**: The use of a secret phrase/password while mapping programs ensures that only admins with proper access can authenticate the app to interact with the evriMED system. This ensures data confidentiality, integrity, and authenticity during data transmission.

- **Application Security**: Continuous maintenance of integration script security through regular vulnerability assessments. Prompt updates are applied to rectify any vulnerabilities that may compromise system integrity.

Overall, the Treatment Adherence Application adopts a multi-layered security approach, encompassing data handling, data transmission, and application security, to maintain the highest standards of data protection and system integrity.

3.2 Treatment Adherence App access levels

Regarding access to the Treatment Adherence Application, access privileges have been categorized into two different levels, encompassing access to the DHIS2 instance and specific modules of the application. Once the user has an account in DHIS2, s/he will be able to access the Treatment Adherence Application. Furthermore, within the app, there are two primary user categories:

- **Administrators**: These individuals are responsible for overseeing application configurations/settings and the overall administration of the app..This includes mapping the programs, adding regimen settings, and adding device IMEI numbers in the system. Their accounts must be added to a group of users with user group code: **DAT_MANAGE**. This user group is automatically given authority to access the app's configuration module.
- **Normal app users**: Treatment Adherence app users play a pivotal role in interacting with the app for monitoring, analysis, and decision-making.

This access categorization ensures that individuals within each role can perform their respective duties effectively and in accordance with their permissions and responsibilities within the app.

4. APIs and Integration Script

The communication of data between the evriMED system and DHIS2 is made possible by a mediator script that integrates these two systems by making use of the APIs from both of the systems. The script facilitates the movement of data from evriMED to DHIS2 for tracking adherence to medication regimens.

The script not only performs data integration but also abstracts the evriMED API, making it accessible to DHIS2 web applications by encapsulating authentication and adding a layer of data sanitization.

Implementation of this integration script provides two services to facilitate data sharing.

4.1 Integration service

This is the service that allows fetching data from the evriMED system and automatically assigning them to a configured DHIS2 program stage for adherence tracking.

The flow for integration services involves the following steps:

- The script starts by fetching DHIS2 program clients with assigned DAT devices from the DAT custom web application.
- Using the episode attributes from the list of clients, the script then fetches the adherence information from the evriMED system.

- The fetched adherence information is sanitized to follow the DHIS2 tracker data model ready for importation. The amount of event data to be imported depends on whether the script is set to run daily or for a range of dates for backlog data upload.
- Lastly, the fetched adherence data from the evriMED system are imported into DHIS2.

This process can be scheduled using native cron support of the operating system or process management tools like pm2.

4.2 API service

This is a service that exposes the API endpoints to be used with the DAT custom DHIS2 web application to access the evriMED APIs. This service is important as it assists with handling the security credentials for accessing the evriMED system. To improve the security of the data, the API is only accessible through a secret key phrase that is set during setup. Additionally, this service assists with data sanitation and any extra logic needed as it mediates the communication between DHIS2 and evriMED.

The following are the functionalities that are exposed through the API service:

- DAT device assignment.
- DAT device alarm settings for taking doses and re-fill appointments.
- Fetching DAT device summaries for reporting.
- Fetching DAT device details.

The installation process of the Integration script is simple and can be followed as documented from the GitHub repository readme.

5. Source codes

The source code for this implementation can be found on the GitHub repositories that are public

6. System troubleshooting and issue resolution

It is a well-known fact in the software development industry that no software is 100% perfect due to various reasons. Acknowledging this, we empathize with the importance of continuous improvement, especially on issues that may arise. Timely and effective troubleshooting is crucial to ensure the smooth operation of the app. This session outlines common issues that may arise and provides a systematic approach to troubleshooting.

- Error messages.
    - In case of any error message, check the browser console if it is client-side. Javascript error or a failed network request can point to issues in the front end
    - If it is a server error, examine server logs where they provide valuable insights into what went wrong.
- Bugs
    - Code Reviews: Review recent code changes. A recent deployment or code update could introduce bugs or compatibility issues.

- Code Profiling: Use profiling tools to identify performance bottlenecks in your code. Slow database queries or resource-intensive functions can impact the application's responsiveness.