Implementing Nigeria's Master Facility List

Software Requirements Specifications

June 2019

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ABBREVIATIONS

admin	administrative user
API	application programming interface
FMOH	Federal Ministry of Health
HFR	Health Facility Registry
IEEE	Institute of Electrical and Electronics Engineers
LGA	local government area
MFL	Master Facility List
MVC	Model View Controller

INTRODUCTION

Purpose

The purpose of this document is to describe Nigeria's Health Facility Registry (HFR) in detail: the purpose and features of the system, the interfaces of the system, what the system will do, the constraints under which it must operate, and how the system will react to external stimuli. This document is intended to help both developers and end users understand the HFR's functional and nonfunctional requirements.

Other resources to support the implementation of Nigeria's Master Facility List are available here: https://www.measureevaluation.org/countries/nigeria/toolkit-for-implementing-the-health-facility-registry-in-nigeria/.

Document Conventions

These HFR software requirements specifications were prepared following the software and systems engineering standards of the Institute of Electrical and Electronics Engineers (IEEE). Each system requirement has been assigned a unique requirement number and priority level. Priorities for higher-level requirements informed the development of detailed requirements.

Intended Audience and Reading Suggestions

People with different skill sets are likely to use this document for their own purposes, as follows:

- **Developers**: This group will use the document to understand the technical requirements specifications and how they will be transformed into a system design when the final software application is written.

- **Testers**: This group will use the document during unit testing and system integration testing to understand all system features and how the system responds to external stimuli.

- **End users**: System end users will be more interested in the overall description of the HFR, which will help them understand the final HFR product that the developers and testers will deliver and be able to propose other requirements that the development team might miss.

Product Scope

The HFR to be designed for the Federal Ministry of Health will be an open-source web portal displaying all of the hospitals, clinics, imaging centers, and laboratories in Nigeria. The system will allow authorized users to capture and store facility details.

The system will be designed to allow users to download and export data in different formats for different purposes. Each facility in the system is be tagged with location attributes (i.e., longitude and latitude) so that users can drill down to a precise facility location.

References

Institute of Electrical and Electronics Engineers (IEEE), Inc. (1998). IEEE Standard 1016-1998, IEEE Recommended Practice for Software Requirements Specifications. New York, NY, USA: IEEE, Inc. Retrieved from http://www.math.uaa.alaska.edu/~afkjm/cs401/IEEE830.pdf

Nigeria Federal Ministry of Health (FMOH). (2019). Implementing Nigeria's Master Facility List: Software Design of the Health Facility Registry. Abuja, Nigeria: FMOH.

OVERALL DESCRIPTION

Figure 1. System environment
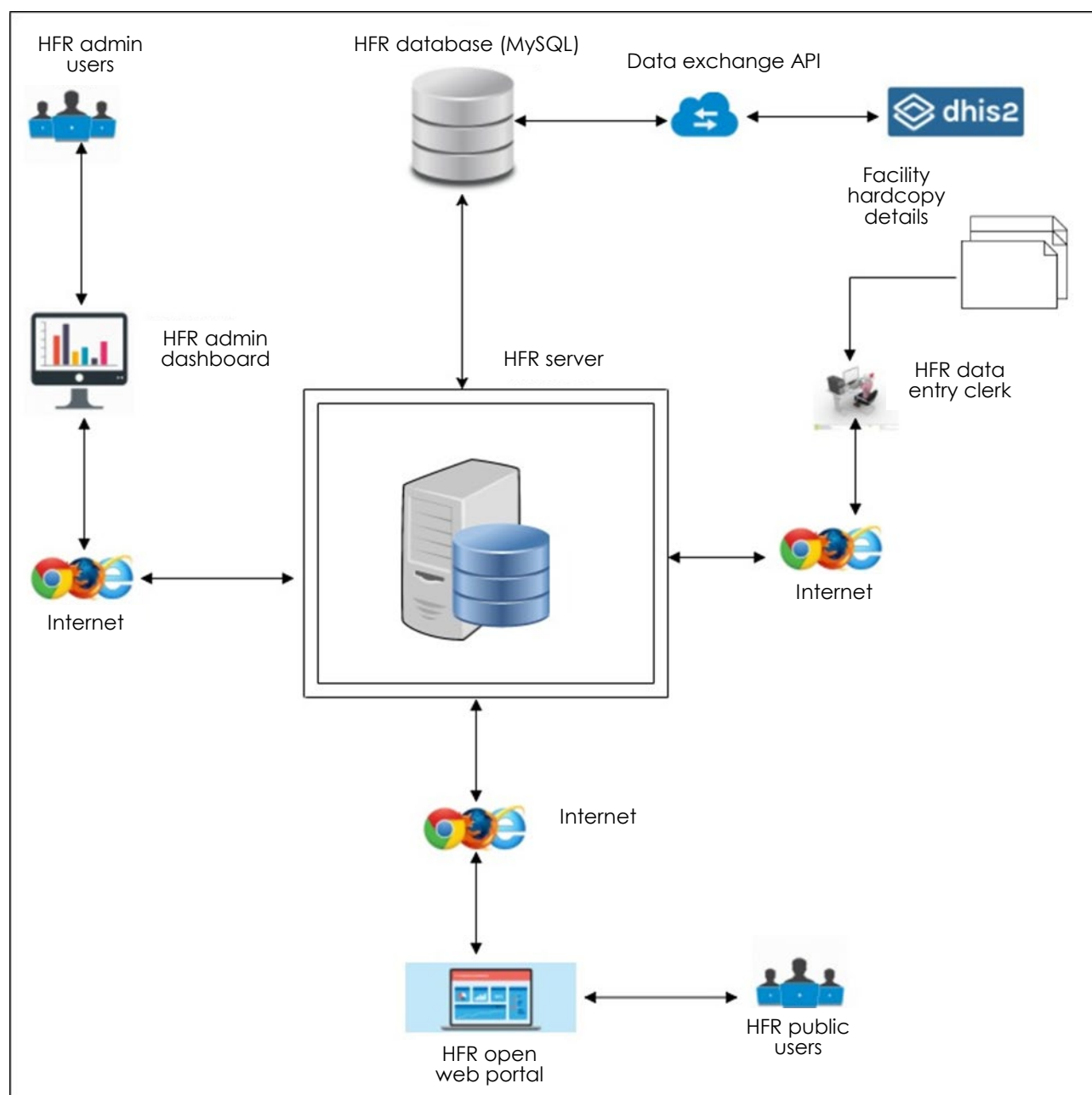
System Description

The HFR has two main actors and one cooperating system. The administrative user ("admin") and the public user all access the system through the Internet. The HFR admin is responsible for the overall management of the system: user management, creating new facilities, and configuring other system settings. The HFR public user accesses the web portal to view and export lists of health facilities of interest to them.

The system shall also be designed to allow for interoperability with other external systems for data exchange.

Product Functions

The System Features section of this document describes the major functions that the HFR will be able to perform in detail. Here is a summary of them:

- The system should allow a user to log in.

- The system should allow a user to search for a facility

- The system should allow a user to view facility statistics/summary.

- The system should allow a user to download/export facility details.

- The system should allow a user to view details about a facility.

- The system should allow a user to see these facility details as visualized on a Google map.

- The system should allow an admin to create a new user account.

- The system should allow an admin to create user roles.

- The system should allow an admin to add/activate/deactivate "lookup values" (explained later).

- The system shall allow an authorized user to add/edit/activate/deactivate a new facility.

- The system shall authorize a user to approve a facility.

- The system shall allow a user to export facility details to an external system via an application programming interface (API).

- The system shall allow a user to import facility details from an external system using an API.

User Classes and Characteristics

HFR Web User

The web users will access the HFR open-source web portal (see the Glossary for an explanation of this term) to view and download facility information to guide them in their implementation of activities related to health interventions.

HFR Administrative User

The administrative user ("admin," in the software) will use the admin dashboard to control the system settings and conduct user management, which covers user creation, user role management, system resource management, and other related system settings.

User Levels

Level 0: This category of users shall have the right to create, update, and submit facility deletion requests to list facilities in the HFR.

Level 1 (Verify): This category of users shall verify and approve/reject all requests initiated by users at Level 0.

Level 2 (Validate): This category of users shall validate and approve/reject all verifications done by users in Level 1.

Level 3 (Publish): This category of users shall approve/reject all requests validated by users at Level 2. The final execution of the requested action shall be done by users at Level 3.

Operating Environment

The system is to be developed using PHP and JavaScript programming languages with MySQL as the back-end (see the Glossary for explanations of these terms). The system shall be hosted on a Linux operating system running Apache web server and shall be accessible from any web browser.

The system is to be designed following the MVC (Model View Controller) framework pattern using the Laravel PHP development framework.

EXTERNAL INTERFACE REQUIREMENTS

Software Interfaces

The HFR system shall interface with other external systems to import and export facility-related data.

System Features

This section of the document describes the functional requirements of the product by system features: the major services provided by the product. This section is written primarily for the developers and describes in technical terms the details of the functionality of the product.

Log In

Description and Priority

This requirement is primarily for the system admin module. Users will be asked to enter their valid username and password to be authenticated into the admin dashboard.

Priority Level: High

Stimulus/Response Sequences

1. The user clicks on the admin login option.

2. The system displays the admin login page.

3. The user supplies username and password and clicks on the "login" button.

4. The system authenticates the user

5. The system displays the admin dashboard upon successful authentication.

Functional Requirements

REQ_01 User shall only be able to log in with valid HFR login credentials.

REQ_02 The system shall authenticate login credentials (username and password) using hashed password encryption mechanisms.

REQ_01.1 The system shall send an authentication token to user's email address to be entered by user for login confirmation.

Search Facility

This feature shall allow a user to search for a facility using different search parameters. The user can search facilities by state, local government area (LGA), and facility name.

Priority Level: High

Stimulus/Response Sequences

1. The user clicks on the Facility List menu item.

2. The system loads all facilities using a blind search.

3. The user selects the state/LGA or types in the facility name and then clicks on the search button.

4. The system displays a list of facilities based on the search criteria.

5. The user clicks on the "Download CSV" ("CSV" refers to comma-separated values) button to download the searched facility list.

Functional Requirements

REQ_03 The system shall allow a user to select a state as part of the search criteria.

REQ_04 The system shall allow a user to select an LGA as part of the search criteria.

REQ_05 The system shall allow a user to type in a facility name as part of the search criteria.

REQ_06 The system shall allow a user to view search results.

REQ_06.1 The system shall allow a user to download a list of facilities based on the search results.

Export Facility list

This feature shall allow a user to download facility lists into Excel/CSV format.

Priority Level: High

Stimulus/Response Sequences

1. The user clicks on the Downloads menu item.

2. The system displays the file download/guest page.

3. The user fills out the guest form and clicks on the submit button.

4. The system generates a verification token and sends it to the user's email address.

5. The user supplies the verification token from the email message.

6. The system displays the data selection page for the user to select the types of data to be downloaded.

7. The user selects the state/LGA and clicks on the Download button.

8. The system generates an Excel/CSV file for the select data set.

Functional Requirements

REQ_07 The system shall allow a user to enter and submit their details into the data download guest form.

REQ_08 The system shall allow a user to set data download parameters and export a list of facilities, according to the selected parameters.

Map Facilities

This feature shall allow a user to view a facility on a Google map.

Priority Level: High

Stimulus/Response Sequences

1. The user clicks on a state on a map.

2. The system loads a pop-up form of the selected state on a Google map.

3. The user clicks on a health facility within the state.

Functional Requirements

REQ_09 The system shall allow a user to select a state on a map.

REQ_10 The system shall allow a user to select a health facility on a state map.

REQ_11 The system shall allow a user to view a selected facility on a Google map.

Add New Facility

This feature shall allow a user to add a new facility. The feature shall interface with the workflow module of the system, which shall contain the different levels a facility shall go through to be viewable or exportable from the HFR.

Priority Level: High

Functional Requirements

REQ_12 The system shall authorize an authenticated user to add a new facility.

REQ_13 The system shall allow a user to save new facility details.

REQ_14 The system shall allow a user to view new facility status (i.e., status of facility on each approval level).

Stimulus/Response Sequences

1. The user logs into the admin dashboard.

2. The system checks if the user is authorized to add facilities.

3. The user clicks on the Add Facility button.

4. The system displays the data entry form for entering facility details.

5. The user enters facility details and clicks on the Save button.

6. The system displays a success or error message, as appropriate.

7. The system transfers the new facility to another approval level for updating before it becomes accessible through the HFR.

Update Facility

This feature shall allow authorized users to initiate an update for a facility.

Priority Level: High

REQ_15 The system shall allow an authorized user to initiate a facility update request and submit it for approval.

REQ_16 The system shall allow a user to view the status of his/her facility update request.

Stimulus/Response Sequences

1. The user logs into the admin dashboard.

2. The system checks if the user is authorized to initiate "facility update" requests.

3. The user clicks on the Update Facility button.

4. The system displays the current details of the selected facility.

5. The user edits the facility details and clicks on the Save button.

6. The system displays a success or error message, as appropriate.

7. The system transfers updated facility details to the next approval level.

Delete Facility

This system feature shall allow authorized users to initiate a delete request for a facility.

Priority Level: High

REQ_17 The system shall allow an authorized user to initiate a facility delete request and submit it for approval.

REQ_18 The system shall allow a user to view the status of his/her facility delete request.

Stimulus/Response Sequences

1. The user logs into the admin dashboard.

2. The system checks if the user is authorized to initiate "facility delete" requests.

3. The user clicks on the Delete Facility button.

4. The system displays a delete request form with a summary of the facility's details.

5. The user types in the reason for deleting the selected facility and clicks on the Submit button.

6. The system displays a success or error message, as appropriate.

7. The system transfers the facility delete request to the next approval level.

Approve Facility

This feature shall allow authorized users to execute approvals for requests to create, update, and delete facilities. The facility approval feature contains four approval levels, as follows:

Approval Level 1

Users at this level do not have approval rights and can only initiate requests (i.e., requests to "Create," "Update," and "Delete" a facility listing.

Approval Level 2 (Verify)

This is the second approval level. Users at this level shall receive create, update, and delete requests from Approval Level 1.

REQ_19 The system shall allow an approver to view details of a newly recorded facility created at Approval Level 1.

REQ_20 The system shall allow an approver to view details of a facility updated at Approval Level 1.

REQ_21 The system shall allow an approver to view details of a facility whose delete request has been initiated at Approval Level 1.

REQ_22 The system shall allow an approver to approve/reject a Create, Update, or Delete request from Approval Level 1.

Approval Level 3 (Validate)

This is the third approval level. Users at this level shall receive Create, Update, and Delete requests from Approval Level 2 in the system.

REQ_23 The system shall allow an approver to view details of a newly recorded facility approved at Approval Level 2.

REQ_24 The system shall allow an approver to view updated facility details approved at Approval Level 2.

REQ_25 The system shall allow an approver to view details of a facility whose delete request has been approved at Approval Level 2.

REQ_26 The system shall allow an approver to approve/reject a Create, Update, or Delete request from Approval Level 2.

Approval Level 4 (Publish)

This is the fourth and highest approval level in the HFR. The final execution of the initiated requests at Approval Level 1 shall depend on the action taken at this level in the system.

REQ_27 The system shall allow an approver to view details of a newly recorded facility approved at Approval Level 3.

REQ_28 The system shall allow an approver to view updated facility details approved at Approval Level 3.

REQ_29 The system shall allow an approver to view details of a facility whose Delete request has been approved at Approval Level 3.

REQ_30 The system shall allow an approver to approve/reject a Create, Update, or Delete request from Approval Level 3.

*REQ_31 The system shall create a new facility and make it available to the public portal for viewing and downloading if the user at this level executes the **approve** action.*

REQ_32 The system shall update the details of an existing facility if a user at this level approves the initiated update request.

REQ_33 The system shall delete the details of an existing facility and remove it from the public portal if a user at this level approves the Delete request.

REQ_34 The system shall keep a record of a deleted facility in the history table of the HFR database.

Add User

This feature shall allow an authorized user to add a new system user.

Priority Level: High

Stimulus/Response Sequences

1. The user logs into the admin dashboard.
2. The system checks if the logged user is authorized for user management.
3. The user clicks on the user management menu item.
4. The system displays the user management dashboard.
5. The user clicks on the Add User button.
6. The user enters user details, assigns user roles, and saves the changes.
7. The system displays a success message.

Functional Requirements

REQ_35 The system shall check if authenticated users are authorized to access the user management module.

REQ_36 The system shall allow authorized users to add new users.

REQ_37 The system shall allow authorized users to view existing users and their roles.

Log Out

This feature is to enable users who have logged in to the system to log out of it.

Priority Level: High

Stimulus/Response Sequences

The user clicks "Logout" to terminate the session in the application.

Functional Requirements

REQ_38 The system shall provide a mechanism for logged users to log out of the system.

REQ_39 When logging a user out, the system shall invalidate the cookie storing the session data.

REQ_40 When logging a user out, the session data shall be removed.

Nonfunctional Requirements

REQ_41 The user shall able to log out from any screen of the HFR application.

MANAGE USER ROLES

This feature shall allow HFR system administrators to manage user access to system resources through user role management.

Priority Level: High

Stimulus/Response Sequences

1. The user logs into the admin dashboard.

2. The system checks if the logged user is authorized for user management.

3. The user clicks on the user management menu item.

4. The system displays the user management dashboard

5. The user selects an appropriate action (i.e., Create User Role, Edit User Role, Assign User Role).

Functional Requirements

REQ_42 The system shall allow an authorized user to create a new user role.

REQ_43 The system shall allow an authorized user to edit a user role.

REQ_44 The system shall allow an authorized user to assign permissions to a user role.

REQ_45 The system shall allow an authorized user to assign a role to a user.

REQ_46 The system shall allow an authorized user to remove a role from a user.

OTHER NONFUNCTIONAL REQUIREMENTS

This section describes the quality attributes of the HFR application: how the HFR application should behave in a normal user environment.

Performance Requirements

REQ_47 The system should have a small turnaround time in displaying the user's search results.

Security Requirements

REQ_48 The system should encrypt all user authentication data.

REQ_49 The system should destroy all of the user's session data after logout.

REQ_50 The system shall make use of CAPTCHA technology to prevent spammers.

REQ_51 The system shall use two-factor authentications, by sending a token to the user's email for login verification.

Software Quality Attributes

Availability. The system should always be available for access by users. The HFR's uptime should always be greater than its downtime.

Interoperability: The system should be easy to integrate with other existing systems for the exchange of data. This should be considered during the design phase of the HFR.

Maintainability: The system should be easy to maintain. All the system documents should be easy to understand so that other teams can improve the HFR. The codebase for the system should follow the right programming standards and should also be thoroughly annotated o allow other developers understand what it does.

Correctness: The system should be able to display the right information to the intended users. All system-computed statistics on the dashboard should be tested, to ensure that correct information regarding facilities is displayed and exported by end users.

APPENDIX. GLOSSARY

Term	Definition
CSV	Comma-separated values
Database	Collection of all of the information monitored by a given system
HFR	Abbreviation of "Health Facility Registry": the software that houses a Master Facility List
JavaScript	The computer language that most web sites use
MFL	Abbreviation of "Master Facility List": a list of all of the health facilities in a given country, along with its location and other identifying attributes
MySQL	A relational database programming language
Open source	Freely available for access and redistribution
PHP	Abbreviation of "hypertext preprocessor": a scripting language that is run on a web server