OpenLMIS Software Development Plan

Revision History:		
Date	*Authors*	*Description*
July 1, 2013	*Solutions Working Group: Ron Pankiewicz (VillageReach), Ashraf Islam (JSI), Henry Mwanyika (PATH), Amit Chauhan (ThoughtWorks)*	*Describe updated product vision and software development effort to advance OpenLMIS software from v0.9 to v1.0 Global*
September 9, 2012	*Ron Pankiewicz, Kate Waldman (VillageReach), Wendy Bommet-Dodie, Alpha Nsaghurwe, Marasi Mwencha, Jeff Leiner (JSI), Henry Mwanyika, David Lubinski (PATH)*	*Describe product vision and initial software development effort*

For further information, source documents, or if you would like to contribute to this effort, contact ron.pankiewicz@villagereach.org.

Overview

OpenLMIS is a community-focused initiative to create an open source electronic logistics management information system (LMIS) for health commodity supply chains in low-income countries. It is a collaborative project to design, develop, and share open source software, tools and methodologies, from which state-of-the-art, internet-enabled LMIS can be developed and customized for local deployments. Our design goal is for the system to:

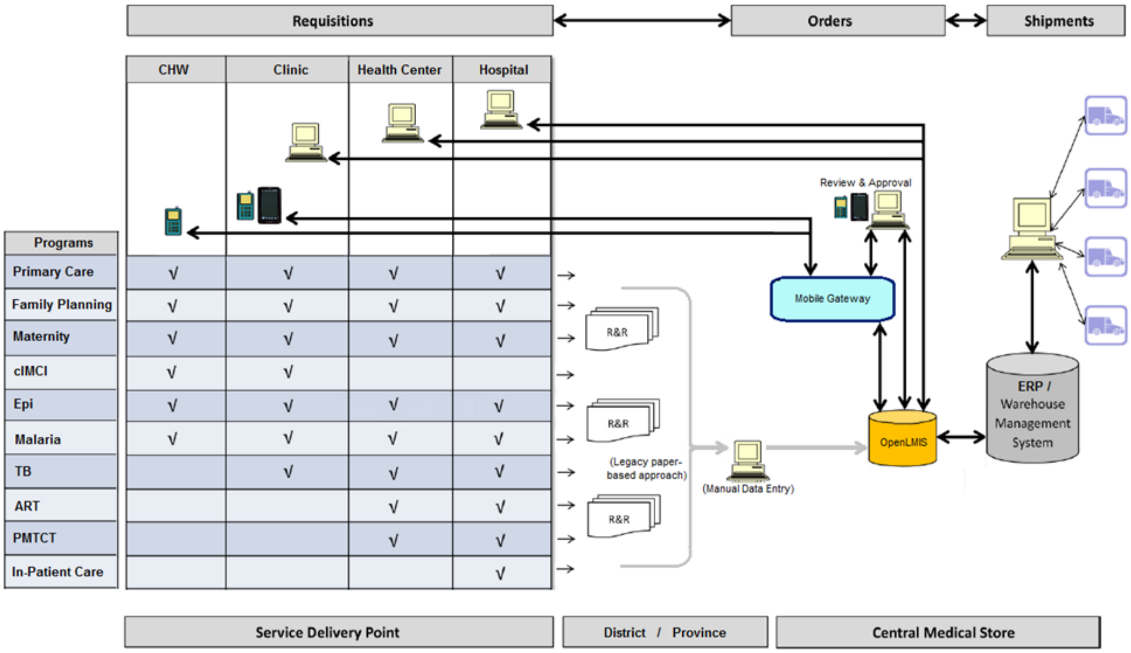
1. Support real-time management of all health commodities from point of origin to the point of delivery;
2. Be adaptable to the unique requirements of each country;
3. Be interoperable with other medical information systems (e.g., warehouse management systems, medical record systems, laboratory information management systems); and
4. Facilitate data collection in low-infrastructure environments for review, aggregation, analysis and forecasting.

During 2011 and 2012, the Tanzania Ministry of Health and Social Welfare and Zambia Ministry of Health, with the support of JSI through the USAID | DELIVER Project, PATH, VillageReach and others, developed a detailed set of requirements for a new electronic LMIS that could be customized, configured and deployed in each country. Last fall, in collaboration with these partners through an Agile development process that has engaged users in Tanzania and Zambia, VillageReach and ThoughtWorks began software development and advanced the software to a March 2013 milestone known internally as v0.9. Significant contributions from the Tanzania and Zambia ministries of health, JSI, PATH, USAID, Rockefeller Foundation, the Bill & Melinda Gates Foundation and others have shaped v0.9 and made this progress possible. Because v0.9, however, does not constitute the features and functionality needed for a minimum deployable system, the group, armed with new learning from the initial development effort, is now able to define the features and functionality needed to meet basic LMIS requirements. Although this system has been designed based on Tanzania and Zambia requirements, it will be a configurable but generic system referred to as "v1.0 Global." The Tanzania and Zambia ministries of health, working with local JSI support, will still need to configure and, to a limited extent, customize and enhance the system for deployment in those countries. The localized versions of v1.0 Global deployed in Tanzania and Zambia will be the first OpenLMIS reference implementations. A third and smaller implementation based on an allocation model for the replenishment cycle is also being developed for Mozambique

The purpose of this document is to define the features and functionality, and the development timeline required to advance from the v0.9 software to v1.0 Global. With the progress in creating a valuable code base that going forward will have multiple contributors and users, it is also now necessary to evolve beyond the simple organizational principles under which OpenLMIS was originally organized to a more mature organizational structure and operating model that supports a larger number of active participants and reference implementations. Work on the OpenLMIS community/organizational plan and associated proposal to build and maintain the appropriate administration model, software maintenance, and repository and related infrastructure is described in the OpenLMIS Organization Plan.

Landscape

Below is a schematic diagram that illustrates how the OpenLMIS software will fit into the supply chain operations of a typical ministry of health*.



Programs	CHW	Clinic	Health Center	Hospital
Primary Care	√	√	√	√
Family Planning	√	√	√	√
Maternity	√	√	√	√
cIMCI	√	√		
Epi	√	√	√	√
Malaria	√	√	√	√
TB		√	√	√
ART			√	√
PMTCT			√	√
In-Patient Care				√

*This is a basic schematic provided for illustrative purposes as it will be slightly varied depending upon each country's specific health system and vertical programs. Although the schematic shows the long-term vision for functionality, not all of which will be completed for v1.0 Global (e.g., v1.0 Global will not support CHW/clinic-based data submission through cellular mobile devices or patient interfacing interactions).

Ministries of health characteristically operate a hierarchy of healthcare facilities, all of which are points where healthcare is delivered to individual patients (the diagram is illustrative and not intended to be prescriptive). As shown on the left half of the diagram, a typical hierarchy can include regional hospitals, large health centers, smaller-scale community clinics, and individual health workers dedicated to a single community or mobile and serving several communities. Each of these service providers manages one or more healthcare programs (e.g., family planning, vaccinations, primary care, malaria treatment) as part of their routine care.

Historically, the replenishment cycle has been driven by a paper-based process of reporting (e.g., recent usage and remaining stock on hand), and requisitioning of desired restocking amounts for applicable medical commodities. Although labor intensive and prone to communication delays, this paper-based process is appropriate for areas where there has been minimal information communications technology (ICT) infrastructure. However, the increasing pace of improvements to ICT infrastructure in developing countries has made the broad-scale deployment of an electronic LMIS not only practical but inevitable.

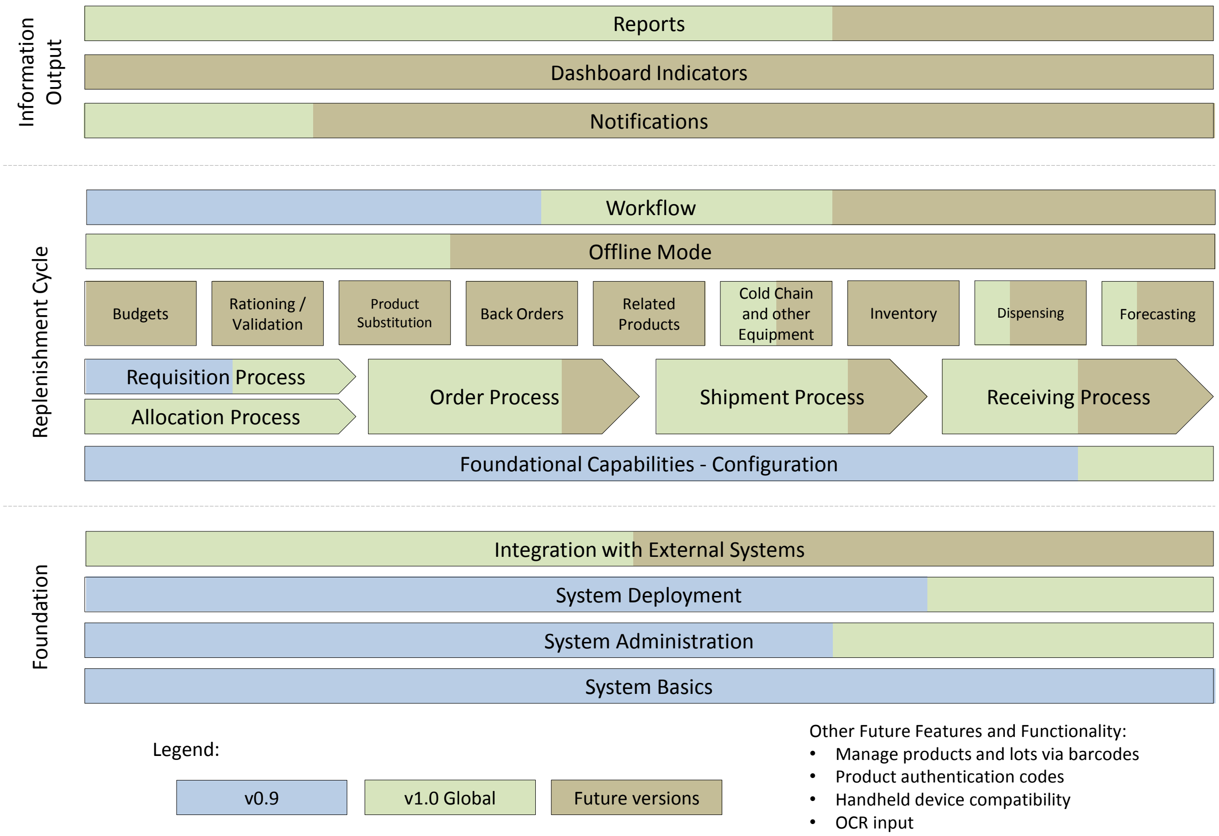
Accordingly, we envision an LMIS that will allow ministries of health and NGOs to provide everyone participating in the replenishment cycle – ranging from the facility manager at a health center who wants to submit a requisition, to a packing clerk at the warehouse who needs to fill an order, as well as related stakeholders who want real-time visibility into how well the supply chain is performing. v1.0 Global will support hierarchies of customizable depth (including intermediate-level stocking depots that may not be providing patient care), and will be suitable for fully integrated supply chains that handle commodities for all programs appropriately at each level (i.e., primary care plus family planning plus vaccines plus malaria care plus lab supplies, etc.). Both requisition and allocation models are supported. In later versions the OpenLMIS system will also support device-appropriate access by means of tablets, smartphones and feature phones, as wireless connectivity is available.

Features and Functionality

v1.0 Global must include the core components required to configure and implement a functioning electronic LMIS within a typical country. Even with these core components, however, a typical real world implementation will require extensive work on data migration, reporting, warehouse/ERP system integration, and other customization for a country's specific replenishment cycle.

While v.9 has made significant progress in each of the areas above, there is more development necessary to get to a deployable system or v1.0 Global. There are a number of additional features and functionality beyond those in v1.0 Global envisioned by OpenLMIS community participants. The table below shows the high level features included in v.9, v1.0 Global and some the features/functionality envisioned for future versions.

OpenLMIS Features and Functionality Roadmap



Other Future Features and Functionality:

- Manage products and lots via barcodes
- Product authentication codes
- Handheld device compatibility
- OCR input

The following provides additional detail regarding the elements of the features/functionality identified in the table above. Details of the features and functionality for v0.9, v1.0 Global and future versions are listed. v1.0 Global is being developed in a collaborative fashion drawing from the work and funding on different projects. These projects are:

- <u>p1.0</u>. This project is building much of the core generic functionality for v1.0 Global. It is managed by VillageReach and ThoughtWorks and is funded by the Bill & Melinda Gates Foundation and the UN Commission for Life Saving Commodities.

- *p*CT. This project is creating interoperability between v1.0 Global and CommTrack v2.0. The work is being performed by Dimagi, VillageReach and ThoughtWorks and is funded by the Bill & Melinda Gates Foundation.

- *p*vrMIS. This project upgrades and ports the vrMIS vaccine distribution application currently used in Mozambique to the OpenLMIS platform. This work will add an allocation process option (i.e., based on a vendor managed inventory replenishment model for vaccine distribution) to v1.0 Global, as well as the vaccine-specific functionality and reporting. Unlike the Tanzania and Zambia implementations which are multi-program and national in scope, Mozambique will be a much smaller program-specific, sub-national implementation. This work is being led by VillageReach and ThoughtWorks with assistance from PATH and others in the vaccine community. It is funded by the Bill & Melinda Gates Foundation

- *p*JSI. This project adds a number of reports, data interchange interfaces with a standalone facility based application to import orders from facilities, and an export of consumption/demand data that can serve as input to 3rd party forecasting applications to v1.0 Global. The work is being done by JSI DC with an internal software development team and is funded through the USAID | DELIVER Project.

- *p*TZM. This project creates the localization and some additional features required by the Tanzania and Zambia ministries of health. The work is being done by JSI Tanzania and Zambia with an internal software development team and is funded through the USAID | DELIVER Project. It is expected that much of the work will be generalized and incorporated into v1.0 Global or a future OpenLMIS software release.

Because open source systems are more likely to be adopted and extended if they are logically architected, easy to understand and the code is understandable, each of the projects listed above will place a high priority on documenting the system and code.

Reference implementations are currently planned for Tanzania, Zambia and Mozambique. These implementations are expected to begin in September-October 2013 prior to completion of v1.0 Global, which is currently anticipated for November 2013. As a result, each of the deployments will have a phased roll out and initially include only subset of the full v1.0 Global features and functionality. User feedback, bug fixes, deployment modifications and insights from the first months of these implementations will be fed into the final months of the v1.0 Global software development effort. After v1.0 Global is released, Tanzania, Zambia and Mozambique can deploy the completed v1.0 Global when and as they determine is best for their country deployment schedules. The table below provides a detailed list of features and functionality by version, as well as, shows the current work being done to get to v1.0 Global and the work slated for the future.

OpenLMIS FEATURES AND FUNCTIONALITY

*** * * 27 June, 2013* * ***

	Completed for v0.9	*Current Projects*	v1.0 Global	Future Development
REPLENISHMENT CYCLE				
Foundational Capabilities -Configuration				
Programs (e.g., HIV/AIDS, TB, Immunization, Maternal health)	✓		✓	
Facilities (with 30 facility-specific attributes), supporting one or more Programs	✓		✓	
Products (with 45 product-specific attributes)	✓		✓	
Products assignable to one or more Programs	✓		✓	
Products assignable to one or more facility types	✓		✓	
Customizable operating schedules	✓		✓	
Facility Groups (aka Requisition Groups), per common Programs, Schedules, approval hierarchies, supplying depots, and delivery points (applicable to distribution & collection).	✓		✓	
Multi-tier requisition/order/fulfillment loops	✓		✓	
Product lots				✓

	Completed for v0.9	*Current Projects*	v1.0 Global	Future Development
Requisitioning Process (request-based replenishment)				
Customizable Requisition Form for each Program	✓		✓	
Arithmetic validation of user entries	✓		✓	
Optional automatic calculation of dependent values (alternative to validation)	✓		✓	
Configurable work flow for review and approval of Requisition, with one or more review levels	✓		✓	
Normal Requisition	✓		✓	
Group Products on Requisition form by product category (anesthetic, antibiotic, etc.)		✓	✓	
Report-only Requisition (for past-due periods)				✓
Emergency Requisition		✓	✓	
Smart-Save (write back to the server only changed data, as user completes each page)		✓	✓	
Automatically populate Requisition with prior shipment/receival data				✓
HMIS Data Collection Tool (configurable form to collect summary patient data, e.g. for ARV or TB regimens)		✓	✓	
Allocation Process (allocation-based replenishment)				
Manage product distributions per delivery zone		✓	✓	
Dynamically format preparation forms and coverage forms, based on updated regimens				✓
Calculate quantities to take on delivery run		✓	✓	
Records actual quantities loaded				✓
Offline select facility		✓	✓	
Offline record visit: cold chain equipment		✓	✓	
Offline record visit: EPI inventory and EPI use		✓	✓	
Offline record coverage: full, children, adults		✓	✓	
Offline record Observations		✓	✓	
Online upload all field data		✓	✓	
Record quantities returned after delivery run				✓
Reports (as not covered under "Vaccine Specific" reports under general Reports section below)		✓	✓	
Enter catchment populations		✓	✓	
Offline data collection (vaccine coverage and delivery) with ODK tools utility		✓	✓	
Order Process				
Release approved Requisitions as Orders		✓	✓	
Generate order export files, per individual Requisition		✓	✓	
Generate order export files with Requisitions grouped by Facility				?
Generate Order Export files for ERP system, routed per Stocking Depot		✓	✓	
View order list, with manual retrieval of individual Order export files		✓	✓	
Automatic re-ordering, based on min-months stock metrics				✓
Shipment Process				
Import Shipment file from ERP system (FTP'd CSV files)		✓	✓	
Generate and print POD ("Proof of Delivery" document, aka packing list)		✓	✓	
Modify shipments of temperature-sensitive Products based on current cold chain status				✓
Modify shipments of lab equipment commodities based on current operational status				✓
Receiving Process				
Update POD records after delivery		✓	✓	
View POD		✓	✓	
Product returns				✓
Automatic initiation of reorder for shorted Products (with manual confirmation)				✓
Automatic initiation of reorder/replacement for defective Products (w/ manual confirmation)				✓
Facility Budgets				
Allocated budgets (as supplied from ERP system)		✓✱	✓	
View and edit budget				✓
Maintain record of Facility's expenditures per Program by Period				✓
Invoice adjustments for short shipments and returned products				✓
Budget adjustments for returns and inter-facility transfers				✓
Cash receipts and supplemental budgets				✓
Rationing/Validation				
Adjust the "Max Months of Stock" for a Product for a Program, by stocking depot or on global basis				✓
Define expiration date for modified "Max Months Stock;" automatically revert to default after expiration				✓
Recompute calculated order quantities for all R&Rs in pipeline, based on new Max Months Stock				✓
Override capability for rationed quantities by designated supervisors				✓
Rationing of non-full supply Products				?
Product Substitutions				
Bulk upload Product substitutions, as defined and approved by MoH staff				✓
Create/manage product substitutions, as defined and approved by MoH staff				✓
System *suggests* substitute Products when order quantities are shorted or rationed				✓
Suggested product substitutions are tailored to current warehouse stocking status				✓
Back Orders				
Generate back orders for shorted or rationed Products				✓
Allow supervisors to confirm or cancel a back orders				✓
Define time-to-live for back orders, based on program, product and replenishment cycles				✓
Merge Backorders into queue of released Orders to release for fulfillment				✓
Close backorder based on partial fulfillment				✓
Related Products				
Evaluate completeness and consistency of Orders, based on ratios of related products				✓
Associate individual Products with specific lab equipment or cold chain equipment, for alerts on R&Rs				✓
Cold Chain and other Equipment				
Periodic remote updates of cold-chain status		TBD		TBD
Real-time or near-real time Cold Chain updates				✓
Cold Chain Alarms				✓
Lab Equipment status				✓
Inventory				
Online SCC's (Stock Control Cards)				✓
Offline SCC's (Stock Control Cards)				✓
Update SCC, Lock SCC				✓
Automatically aggregate data from SCCs and post to Requisitions				✓
Real-time Warehouse updates				✓
Dispensing				
Initiate electronic DAR for specific Programs at any facility (Daily Activity Register)				✓
Capture standard coverage and usage metrics for specific Programs, per patient encounter				✓
View DAR, Lock DAR				✓
Capture data from paper DARs				✓
Automatically aggregate data from DARs and post to Requisitions				✓
Customizable DARs per Regimen				✓
Forecasting				
Forecasting supported through data extracts for Quantimed		✓✱	✓	

	Completed for v0.9	*Current Projects*	v1.0 Global	Future Development
Offline Mode				
Create and submit single-facility Requisitions for one or more Programs, subject to HTML5 limit of 5MB total data payload		TBD		TBD
Facility Edition of eLMIS				
Multiple Facilities' Requisitions in one batch		✓◆	✓	✓◆
Review and Approval of Requisitions		✓◆	✓	✓◆
Manage Stock Control Cards (SCC)		✓◆	✓	
Manage Daily Activity Register (DAR)		✓◆	✓	
Full-function Desktop Offline Application for installations at Facilities with data export/import features		✓◆	✓	✓◆
<u>INFORMATION OUTPUT</u>				
Reports				
Set up Jasper Reporting Server		✓	✓	
Create transaction replication scripts		✓	✓	
Enhance reporting framework to identify current UserID for query parameterization		✓	✓	
Set up unified user login OpenLMIS Jasper ↔ Reporting Server		✓	✓	
Sample Report		✓	✓	
Standard Reports (initial set of ~15) with HTML, PDF and Excel output options:				
Non-reporting Facilities		✓✶	✓	
Adjustment summary by Product		✓✶	✓	
Aggregate Stock Movement by Level				✓✶
MSL/MSDRequisition/Issue Voucher for Medical Supplies (PH81-N)		✓✶	✓	
Average Consumption by Product				✓✶
Quantity ordered Discrepancy Summary Report (Quantity requested, approved, issued/supplied, received)				✓✶
Dispensed to User				✓✶
Facilities stocked out		✓✶	✓	
Report & Requisition feedback		✓✶	✓	
Stock Imbalances		✓✶	✓	
Summary District Consumption Comparison by Product				✓✶
Supply Status by Facility				✓✶
Supply Status by Product, Reporting Group				✓✶
Stock status of warehouse (Central/Zone)				✓✶
Order fill rate				✓✶
Additional Country-Specific Reports				✓
Vaccine-specific reports (per vrMIS migration)		✓	✓	
Country-Specific Standard GIS Map Reports				✓
WHO District Vaccine Data Management Tool (DVDMT) functionality				✓
WHO Vaccine Stock Management Tool (SMT) functionality				✓
Dashboard Indicators				
Create dashboard indicator plug-in framework on the home page				✓
Create tools for Admin to assign plug-ins to users' home page				✓
Create dashboard indicator plug-ins				✓
Develop data warehouse views/stored functions to calculate indicators and create batch jobs				✓
Benchmark batch jobs and performance tune the batch jobs				✓
Notifications				
Reminder Notifications				✓
Event Notifications				✓
<u>FOUNDATION</u>				
System Basics				
User management	✓		✓	
Role-base security for operational responsibilities (requisitioning, approvals, etc.)	✓		✓	
Role-based security for administrative responsibilities	✓		✓	
Password Recovery/Reset	✓		✓	
Basic workflow	✓			
Workflow timed to schedules				✓
System Administration				
User account management GUI	✓		✓	
Rights/Roles management GUI	✓		✓	
Facilities Management GUI	✓		✓	
Schedules management GUI	✓		✓	
Facilities Group management GUI				✓
Products ↔ Facility Types management GUI		✓	✓	
Record every user entry/action		✓	✓	
Configuration consistency checker		✓	✓	
System Deployment				
Insert scripts for Programs, Geographic Zones types, facility types	✓		✓	
Bulk Upload for Geographic Zone and Facilities	✓		✓	
Bulk Upload for Facility groupings, work flow and Supply Lines	✓		✓	
Bulk Upload for Delivery Zones		✓	✓	
Bulk Upload for Products, plus stocking metrics and costs	✓		✓	
Bulk Upload for Users	✓		✓	
Bulk *Updates* of each the above objects		✓	✓	
Multiple language support for all UI elements		✓	✓	
Integration with External System (e.g., CommTrack)				
API to create users		✓	✓	
API to submit Reports or full Requisitions		✓	✓	
API to review and approve Requisitions		✓	✓	
Atom feed for Facility updates		✓	✓	
Atom feed for Requisition status updates		✓	✓	
Atom feed for Product updates		✓	✓	
Import electronic R&R in CSV format (exported from Facility Edition)				✓
<u>FUTURE POTENTIAL CAPABILITIES</u>				
Manage products via barcodes				✓
Manage lots via barcodes				✓
Support product authentication codes (e.g., Sproxil verification)				✓
Handheld Device Compatibility (for Requisitioning, Shipments, SCC's, DARs, PODs)				✓
OCR for data collection from paper forms				✓
<u>DOCUMENTATION</u>				
Online help system		✓✶	✓	
Illustrative step-by-step "How to"		✓✶	✓	
Printable User Guide in book format		✓✶	✓	
Technical documentation		✓	✓	
Installation and Deployment Guide		✓	✓	

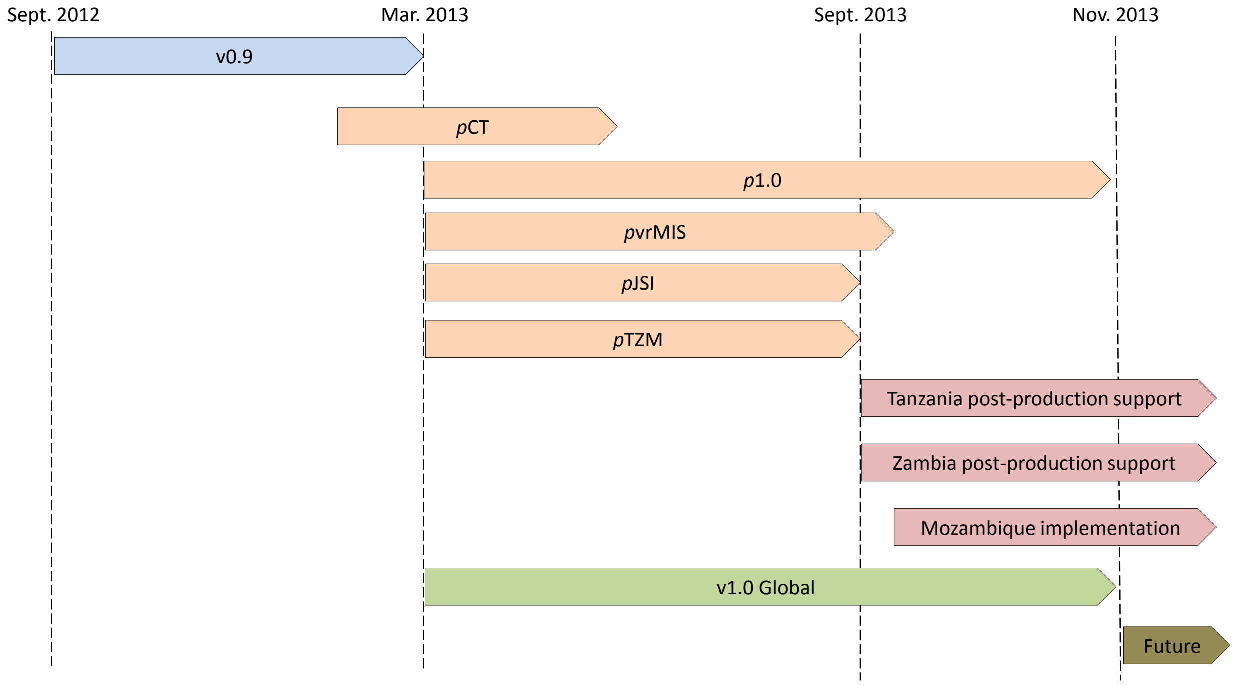
◆ Indicates work done by JSI TZM.

* Indicates work done by JSI DC.

Timeline

The current estimated timeline for v1.0 Global software development and early implementations is shown below. The November 2013 estimated completion date for v1.0 Global shown below is based on a three pair developer level of effort. The longer timeframe for v1.0 Global completion, however, does allow the development effort to take advantage of experience gained from the early implementations.

OpenLMIS Software Development & Early Implementation Timeline


Sept. 2012
Mar. 2013
Sept. 2013
Nov. 2013
v0.9
*p*CT
*p*1.0
*p*vrMIS
*p*JSI
*p*TZM
Tanzania post-production support
Zambia post-production support
Mozambique implementation
v1.0 Global
Future