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Executive Summary

Hospital Information Systems (HIS) are essential to the record-keeping functions and clinical care management of a medical center. The costs associated with the acquisition and support of HIS can indirectly affect the quality of health care by limiting the availability of timely and accurate access to electronic patient records. One solution is to lower the cost of HIS by using a software stack consisting of open-source, free software (OSFS).

The Department of Veterans Affairs (VA) of the United States government has developed and continues to maintain the VistA Hospital Information System (http://www.va.gov/vista_monograph) to provide a high-quality medical environment for veterans of the armed forces of the United States.

VistA has a proven track record of supporting a large variety of clinical settings and medical delivery systems. Facilities range from small clinics that provide solely outpatient care to large medical centers with significant inpatient populations with their associated specialties, such as surgical care or dermatology. These systems focus on clinically relevant record keeping that improves patient care by improving clinical and administrative decision making. Versions of this system are in active use in the US Department of Defense, US Department of Interior's Indian Health Service, and internationally as well, e.g., Berlin Heart Institute of Germany (Deutsches Herzzentrum Berlin, Deutschland), and National Cancer Institute of Cairo University in Egypt.

Since VistA is in the public domain and available through the US Freedom of Information Act (FOIA), software license fees do not limit its deployment.

Other components of the OSFS HIS stack are GT.M™ (http://www.sanchez-gtm.com), an implementation of the M programming language and database platform required by VistA; the GNU/Linux operating system (http://linux.org and http://gnu.org) on industry standard x86 architecture computing platforms. In the near future, the OSFS HIS stack for VistA will include EsiObjects™ (http://www.esitechnology.com), an integrated, standards-based object-oriented database system.

This document is a framework plan for implementing VistA in a country where there is not already a VistA support infrastructure in place, but where there is local computer expertise. Countries as diverse as Great Britain, Brazil, and Malaysia fall into this category.

Statement of Need

Although VistA is the most comprehensive OSFS HIS in existence today (and it is also arguably more comprehensive than any commercially available system), implementing and using it requires forethought and planning

Since VistA has been fully deployed throughout the VA for so many years, the VA does not need procedures to create a VistA installation from scratch (the so-called bootstrapping problem). The initial installations of VistA were performed by its original authors, who had intimate knowledge of the system, which was considerably simpler at the time than it is today. Expertise within the VA focuses on upgrading existing installations, rather than deploying new ones. There is some amount of limited expertise outside the VA for greenfield VistA deployment, but there is no cookbook. It is a goal of WorldVistA to bring such documentation into existence.

Although VistA is in daily use within the VA by people of diverse backgrounds and skills – over 100,000 as of the drafting of this document – its breadth of functionality implies a level of complexity that requires a support infrastructure.

The size and complexity of VistA also mean that no one individual – or even a small group – can be expert in all aspects of the software.

While the underlying physiology of humans and the pathology of illness are common, procedures and treatments vary widely around the world. VistA is designed to serve the needs of the VA, and will need to be adapted locally to the needs of each country.

Ergo, while backup support can – and indeed today must – be provided from the US, most of the support infrastructure must be local in order to be cost-effective. Successful use of VistA within a country requires the development of local expertise and infrastructure in VistA. Furthermore, expertise in GT.M and EsiObjects will probably not exist locally, and must be developed. This document addresses these needs.

Local expertise in GNU/Linux and general software and computer expertise is beyond the scope of this document, and is treated as a required prerequisite. In other words, development of VistA is considered feasible only in countries with a certain penetration of computer expertise in general and GNU/Linux in particular.

Objective

The need can be stated in terms of two objectives, one short term and the other long term, to be pursued in phases:

1. The first objective is to implement VistA and deploy in production for a well-defined set of applications at one institution, with

    a. IT staff trained in daily operation of VistA (system startup & shutdown, backups, etc.), and capable of providing first-line support to users.

b. Access to second-tier support within the country, perhaps within the institution if it is large, but most likely from a third party within the country. (Third-tier support will be provided from the United States by WorldVistA or an organization designated by WorldVistA.) The second-tier skill set must be sufficient to deal with routine issues, and to create an appropriate issue description and test cases when engaging third tier support.

c. Resources within the country, either within the institution or from a third party, capable of minor programming changes, and skilled enough to create requirements and functional specifications for more complex programming changes that must be made in the US, at least today.

2. Once the first objective has been met, the second objective is to have the ability to implement and support VistA completely with resources within the country, with minimal involvement from WorldVistA.

Proposed Solution

Philosophy

WorldVistA believes that an important goal and benefit of VistA and OSFS is technology transfer and the development of self-sufficiency. While it is probably more efficient for a team of specialists from the United States to deploy and support VistA, this will lead to dependence rather than self-sufficiency. More importantly, VistA offers a complex enough set of features that no single group of experts can possibly keep up with the support needs of all users worldwide, so that the only viable long-term strategy is to spread expertise as widely as possible among the organizations that use and support VistA.

Therefore, WorldVistA believes that the deployment and support of VistA in a country should be led, managed, and financed from within the country, with WorldVistA and other specialists from the US providing training and mentoring. Even when funding comes from organizations such as the UN, EU, and USAid, the project should be led and managed locally.

Also, WorldVistA as a non-profit organization must use its participation in these projects as a way to generate funding to sustain and grow its mission.

Since the health care in every country is unique, it is reasonable to expect that there will be a unique set of issues that will arise, and which must be dealt with, for VistA to be successful in each country. Thus, the deployment of VistA in a country should be divided into (at least) two phases. In the first phase, a subset of VistA would be deployed at a single institution. The experience from that first institution will be used to develop and refine the deployment of VistA throughout the country.

A further reason to stage the deployment of VistA is financial. For VistA to succeed in the long run, and for a country to build self-suffciency, an “ecosystem” must be developed of individuals and organizations that add value by providing services at a profit. Such an ecosystem cannot evolve overnight.

Overview Phase One

The following is the approximate sequence of events in order to get the first successful implementation of VistA in a country:

1. An organization (hereinafter referred to as the Local Partner) within the country becomes interested in VistA and makes contact with WorldVistA. Through discussions with WorldVistA and independent research, the Local Partner determines for itself the scope of the effort to deploy VistA, and makes the decision to proceed. The milestone for completion of this step is the appointment of a Project Manager by the Local Partner and the signing of a Memorandum of Understanding with WorldVistA.

2. With WorldVistA's assistance, the Local Partner becomes knowledgeable about the capabilities of VistA. Working with a modified version of this document tailored by WorldVistA and the Local Partner to specific country needs, the following decisions are made by the Local Partner (in consultation with WorldVistA) and written up in the form of a project plan covering the areas below. The milestone for completion of this step is the completion of the Project Plan, and the signing of all agreements to allow the project to proceed.

a. The institution within the country for the first implementation of VistA.

b. The subset of VistA functionality to be initially implemented at that first institution. This should include a maximum of perhaps three medical areas (e.g., Order Entry, Laboratory, Pharmacy) and underlying functionality needed to support the selected medical areas (e.g., the electronic patient record). The medical areas to be implemented should be those where the functionality in VistA most matches medical practices within the country. Any enhancements that are required to support the selected functionality would also be identified and documented. Such enhancements include (but are not limited to):

   i. User interface language translations.

   ii. Connection to and integration with existing applications.

c. Computing and networking infrastructure enhancements required to support the above. At a minimum, there is a need for a central industry standard x86 architecture PC with adequate RAM, disk, and backup capability, as well as user interface machines (terminals, PCs[1] or thin clients) and network gear.

d. Training plan. For successful use of VistA, the classes of people who will interface with VistA must be identified (laboratory technicians, physicians, programmers, computer operators, etc.) in a culturally appropriate way, since the job classifications may vary from country to country. Skill sets for each class of user must be defined, and appropriate training must be planned for. One mandatory class of user that must be created is VistA experts, who will be responsible for installing, updating, and tuning VistA locally; these users need expertise in the M programming language, and if local programmers qualified in M are not available, training must be planned for. Similarly, GT.M database administration and operations expertise is required to operate VistA successfully.

e. Documentation plan. Various user manuals in the local language with locally appropriate examples are required for VistA users, and an operations manual will be required for the institution's computer operations staff. Depending on the level of customization required, a programmer's guide may also be required. This will be developed by the Local Partner in consultation with local and US technical resources (personnel as well as the VA's VistA Documentation Library at http://www.va.gov/vdl).

f. Support plan. It is expected that the institution's own staff will from time to time need to call on the assistance of more expert outside resources, either in-country or from the United States. Resources must be identified and procedures defined and documented.

[1] PCs that are considered too old for normal use make excellent user interface machines.

g. Resources (local and in the United States) to be identified and brought into the project must be documented. For a hospital of any real size, each service line must provide staff who will become experts in the software package that serves that service line. These package experts must have the complete support of their management in the pursuit of such duties if the service it to fully reap the benefits of using VistA. For large, complex service lines, multiple package experts will be needed. Funding and oversight of such staff may need to be altered to support their work.

h. An execution plan (tasks, resources, and time lines depicted in a Gantt chart) must be written, reviewed, and agreed to by all stakeholders.

i. Management plan. This is the plan for managing VistA. Since the initial management focus will be on monitoring and project review, the procedures for monitoring the progress of the project must be documented and agreed to (e.g., weekly status conference calls with a monthly status report). But, the real worth of VistA is as a catalyst for change to improve both the quality and affordability of health care. So, the long-term focus of the management plan must be to implement a process to institutionalize change in the delivery of healthcare by leveraging the 24x7 real-time access to integrated electronic health records that VistA provides.

j. Financial (budget, cash-flow projection, and funding sources). Spreadsheets with financial plans must be created and agreed to, and financing secured.

3. Execution of the project, following the Project Plan. The milestone for the end of this step is the going live of VistA at the first institution.

4. Debriefing. The Project Manager will interview key players who participated in the project, and write a Postmortem Report in consultation with WorldVistA.

Overview Phase Two

The objective of Phase Two is to build on a beachhead established in Phase One, to enable penetration of VistA throughout the health care delivery system of a country. The formula will vary from country to country, but will involve planning and execution steps. It is quite possible that the Local Partner will need to bring other organizations and resources into the picture to be successful. In the long run, VistA will be successful in a country if there is an in-country ecosystem of individuals and organizations whose livelihood and profitability is built on VistA. Issues to be identified and addressed in Phase Two include, but are not limited to:

1. Adoption: the creation of awareness, demand, and acceptance for VistA among institutions within the country.

2. Development: the adaptation that is needed for each module to meet the needs of local requirements.

3. Community participation: how those involved in the in-country deployment of VistA will participate in the global VistA community, and contribute their development back to the global

4. community as OSFS.

5. Resources: what resources will need to be involved, both in-country and from the United States.

6. Business models: how the Local Partner, other local organizations (Government and non-Government), and WorldVistA will benefit from and be able to sustain the widespread deployment of VistA within the country.

Although Phase Two should lag Phase One, the beginning of the former need not await the completion of the latter. As human and financial resources become available, and as the lessons of Phase One start to emerge, Phase Two can begin.

Financial Worksheet

Appendices

Open-Source Free Software

A recent counter-current of the trend toward proprietary software solutions has been the rise of Open-Source Free Software (OSFS) projects. For example, as of January, 2003, there are over 54,000 OSFS projects hosted by Source Forge, a popular hosting site (http://sourceforge.net). As one may expect, the quality of the projects and the associated software varies dramatically. The vast majority of OSFS projects are created by enthusiastic amateurs, whose ambitions and dreams are bigger than their ability deliver comprehensive, high-quality software. Nevertheless, in numerous cases, open-source free software is the "best of breed" solution – witness the fact that most of the Internet infrastructure is built on OSFS, and that the OSFS Apache software (http://apache.org) powers approximately 60% of the web servers in the world (http://netcraft.com/survey).

The GNU/Linux operating system (http://linux.org and http://gnu.org) has become a widespread and robust foundation for computer services, as reflected by its adoption, not just by users, but also by major players in the computer and software industry, such as IBM and Oracle. Confidence in the Linux software within the US federal government is clear, as shown by the National Security Agency's decision to use Linux as a platform for its research on access controls (http://www.nsa.gov/selinux). The results of the agency's work – called Security-Enhanced Linux - is itself OSFS.

There are many other OSFS applications that can also help meet health-care computing needs beyond those associated with the electronic patient record. For example, this document is being drafted on the Open Office office suite (http://openoffice.org), which has an XML-based architecture for office documents, spreadsheets and presentations. FreeS/WAN (http://www.freeswan.org) provides secure, encrypted, virtual private networks (VPNs) over the insecure, public Internet. OpenSSH (http://openssh.org) is a secure shell for accessing computer systems over the public Internet. Concurrent Versions System (CVS) (http://cvshome.org) is the most popular application for software version control. There are innumerable robust OSFS applications for the software needs of an organization, such as mail, group calendar sharing, and project management. Deploying an OSFS HIS stack will have the intangible benefit of raising the awareness and knowledge of cutting edge software within a country. The free availability of the program source code can significantly contribute to technical education. Thus, an application software stack of the VistA system on GT.M on Linux can act as a seed and a catalyst for this transformation, through diffusion, starting with the training that will be provided to allow VistA implementations to be locally managed and operated.

It is important to note that the word "free" in open-source free software refers to two complementary aspects of the software. The first is that there are no license fees, which translates into the freedom to deploy systems based on the software. The second is that the operating principles and code are freely available, providing a solid foundation for development and allowing the freedom to evolve the software. Since programmers need to earn to live, the OSFS economy is service based, with customers paying for training, maintenance, support, as well as required enhancements and customization, rather than for restrictive licenses. The open nature of the program source code helps to ensure that affordable services are available in a dynamic market. If one provider demands too much money, others can step in. An organization may choose to fund and provide services internally, instead of relying on external providers.

http://www.fsf.org/philosophy/free-sw.html has a good discussion of these OSFS concepts.

Limitations in FOIA VistA

VistA has evolved to meet the needs of the US Department of Veterans Affairs, which serves the service-related health care needs of veterans of the US armed forces. Consequently, VistA does not have modules for Obstetrics/Gynecology or Pediatrics/Neonatology. The Emergency Room application also is different from that of typical health care institutions, and the Billing related applications are minimal.

Versions of VistA in use by the Department of Defense and Indian Health Service have modules for Obstetrics/Gynecology, Pediatrics/Neonatology and Emergency Room, but these versions are not available under FOIA.

There is some hope that DoD and/or IHS will contribute their modules in the near future. Otherwise, as VistA is deployed around the world, the hope and expectation is that appropriate modules will be developed and become available.

Billing is always expected to vary from one country to another, and often even from one health care institution within a country to another.

WorldVistA

WorldVistA (http://worldvista.org) is a non-profit corporation incorporated in the state of California with the mission of furthering the cause of affordable health care information technology worldwide. It aims to achieve its mission by championing and promoting the deployment of the OSFS HIS stack of VistA on GT.M on x86 GNU/Linux. In the near future, ESIObjects is expected to become a member of this stack.

WorldVistA recommends the use of OSFS and open standards, beyond the HIS stack.