

# Department of Veterans Affairs

## Health Management Platform Extended Version

### System Design Document



October 2014

**Version 1.3**

## Revision History

Note: The revision history cycle begins once changes or enhancements are requested after the System Design Document has been baselined.

Date	Version	Description	Author
October 2014	1.3	Update for next increment	
March 2014	1.1	Removed reference to MDWS and updated text and diagrams	
May 2013	1.0	Group Edits	
April 2013	0.0	Initial	

## Artifact Rationale

The System Design Document (SDD) is a dual-use document that provides the conceptual design as well as the as-built design. This document will be updated as the product is built, to reflect the as-built product. Per the Project Management Accountability System (PMAS) Guide, the SDD with conceptual design is required prior to the Milestone 1 Review. The as-built for each delivery must be incorporated prior to the Milestone 2 Review.

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# 1. Introduction

The Health Informatics Initiative (hi<sup>2</sup>) is focused on delivery of foundational and clinical modules for incorporation into the HMP framework. The HMP framework will lay the foundation for evolving CPRS into a Health Management Platform Extended Version (HMP EV) that transforms the way teams deliver care. It will also promote interoperability and data exchange through standards-based, accessible data schemas that support a team-based, patient-centric model of care. This data structure will support exchanges with Nationwide Health Information Network (NwHIN), Virtual Lifetime Electronic Record (VLER) and integrated Electronic Health Record (iEHR).

The Health Management Platform Extended Version (HMP EV) builds on the goals and principles of HMP to implement a modernized electronic health record for clinicians and Veterans. The HMP architecture and system derive from two IT development projects: HMP and HMP EV. The HMP EV project builds on the Team Facing (TF), System Facing (SF), Patient Facing (PF) components and functionality of HMP project. For ease of reference, in all HMP EV documentation, system references will be noted as HMP.

As of October 1, 2014 Hi2 will be organizationally transitioned under Health Solutions Management (HSM). The code produced by HMP EV will be merged and ultimately released by eHMP.

## 1.1. Purpose of this document

This document provides details regarding how HMP is to be constructed. The system design document (SDD) translates the requirement specifications document (RSD) into a document of record from which project developers can create the actual system. It details the top-level system architecture and identifies hardware, software, communication, and interface components.

## 1.2. Identification

This SDD applies to the development of logical infrastructure for HMP, which leverages data and clinical functionality in VistA. It will support existing American National Standards Institute (ANSI) and International Standards Organization (ISO) standards inherent to current VistA. Data exchanges will support Healthcare Information Technology Standards (HITSP) document standard C32 in the immediate short term and other standards such as C83 in the long term. Domain-specific standards will be applied for data modeling and interoperability as required, including RxNorm for Pharmacy and Logical Observation Identifiers Names and Codes (LOINC) for Lab Data Exchange.

## 1.3. Scope

**Table 1: Scope Inclusions**

<b>Includes</b>
Health Management Platform
Healthcare Team-facing Health Management Platform
Patient-facing Health Management Platform
Healthcare System-facing Health Management Platform

**Table 2: Scope Exclusion**

<b>Excludes</b>
Deliverables for NwHIN, VLER, iEHR
Any Version of CPRS
Integrated Medication Manager

## 1.4. Relationship to Other Plans

The following documents relate to this SDD and may provide further understanding of the project.

**Table 3: Related Documents**

<b>Document</b>	<b>Link/Location</b>
hi <sup>2</sup> Business Requirements Document (BRD)	
Acceptance Criteria Plan	
User Stories-Healthcare Team-facing	

Document	Link/Location
Development Collaboration Site-System and Patient-facing	
Master Test Plan	
Business and Technical Architecture Principles in support of Health Informatics Initiative (hi <sup>2</sup> )	
Operating Plans	

## 1.5. Methodology, Tools, and Techniques

The HMP development model is based upon agile, rapid, and iterative methodologies. Software releases occur in small, incremental steps as prototype modules. Close collaboration occurs throughout the development process between developers, end users, and requirement analysts. All of these entities work together as an integrated team.

The development teams will use the following tools to create HMP deliverables in the near term: Eclipse, Maven, Jenkins, Nexus, and the Atlassian Suite for agile development which occurs outside of the VA firewall. HMP System-Facing and HMP Patient-Facing development leverages the following additional tools: RxNorm, MedlinePlus, Pillbox, and the Medication Image Library (MIL).

Among other sources, it is possible for ideas and high-level requirements to enter the HMP model from initiative stakeholders, mock-ups, field development teams, and the open source community. Because the agile process specifies initial development based only on high-level requirements (in the form of epics and user stories), initial analysis and vetting occurs quickly. Prioritized functionality that fits within the HMP model and framework are iteratively prototyped by the integrated developer, end user, and analyst team. It is during these iterative cycles that requirements are elaborated.

## 1.6. Constraining Policies, Directives and Procedures

Policies, directives, and procedures should reflect business drivers, regulatory drivers and mandates, and technology trends as documented in the VHA Health Information Strategic Plan:

- Business drivers
  - Provider shortages
  - Chronic care/chronic disease management
  - Privacy and security
  - Medical identity
  - VA-DoD interoperability and data sharing
  - Public health informatics
  - Personalized medicine
  - Rural health
  - Population health
- Regulatory Drivers and Mandates
  - Meaningful use
  - Center for Medicare and Medicaid Services (CMS) quality measures
  - Joint Commission on Accreditation of Health Care Organizations (JCAHO) medication reconciliation
  - National Defense Authorization Act for Fiscal Year 2008 (requiring increased health information sharing and fully interoperable electronic health record system or capabilities)
  - Open Government
  - VHA directives for patient access
  - VA Handbooks and Directives for Security (6212, 6500), Protected Health Information (PHI), Privacy (6600, 6507), and Section 508
  - National Institute for Standards and Technology (NIST)
  - Federal Information Processing Standards (FIPS)
  - Patient safety (i.e., Joint Commission National Patient Safety Goals, VA National Center for Patient Safety Patient Safety Improvement Handbook, etc.)
  - Quality of care foundational vision concepts
  - VA Policy on Mobile Devices and Mobile Applications

## 1.7. Constraints

Constraints reflect mandated design or requirement aspects of the project for which it has no control to alter. Constraints are usually edicts that arise from enterprise concerns. The effort is constrained by the enterprise architectural guidelines for development infrastructure. The design must remain in compliance with the specifications and requirements identified by the Office of Information & Technology (OIT). Furthermore, the system must enforce privacy and security policies that best serve participating organizations and patients.

- The system shall comply with and follow HITSP standards for clinical documents that will be exchanged with NwHIN.

- The system design will be compliant with VistA interface specifications for successful communication with other systems, including Veterans Authorizations and Preferences (VAP), and Master Veteran Index (MVI)/ Master Patient Index (MPI).
- The system shall use Web Services to aggregate data from multiple sources.

## 1.8. Design Trade-offs

HMP is using agile development practices, which promote user-centered design and testing, thereby supporting product adoption throughout the lifecycle. During the development process, tradeoffs will be discussed with the business-user community on a case-by-case basis and an optimal balance will be achieved.

The HMP systems are designed to interoperate with other systems via a SOA architecture, web services, SOAP messages, and RESTful services. This architecture and service approach enhances scalability and the robustness of the system through horizontal and vertical platform scaling and fault-tolerance through redundancy. There is a trade-off here in that this redundancy and scalability comes at a cost for infrastructure (hardware, power, cooling) and performance via the introduction of network latency when interacting with remote services.

## 1.9. User Characteristics

HMP will fulfill the needs of a cross-sectional group of users, including but not limited to: clinicians, ancillary staff, veterans, caregivers, researchers, and administrators. Recognizing vast differences in software-use proficiency among these groups, hi<sup>2</sup> has formed a workgroup (the User Experience workgroup) to generate innovative ideas for improving users' experiences with the software. Although the software's focus will change as developers move through the agile process from one deliverable increment to the next, the workgroup will coordinate with developers and the user community to formulate a consistent set of training and education methodologies.

Incorporating recommendations from this workgroup, developers will create intuitive, veteran-centric and healthcare-team-driven modules. These modules will enable functionality that decreases cognitive load; effectively manages relationships between conditions, interventions, and observations; acquires data (including documentation) as a by-product of workflow; and ultimately supports safe, higher-quality patient care and clinician satisfaction. User proficiencies are being developed to support the end state software.

## 1.10. User Problem Statement

The need for this software was identified after two realizations were made: 1) the majority of the Secretary's transformational initiatives depend on enhanced clinical information systems and 2) development of clinical applications software is not occurring at the level required. Clinicians cite that the current system is unable to support context based patient care.

Once the international standard for advanced electronic medical records (EMRs), CPRS is no longer able to keep pace with the functionality of other EMRs. The complex relationships between various software elements and inherent limits of the CPRS technology are now insurmountable

barriers to significant improvement. Also, CPRS is based on assumptions that reflect realities that are no longer true—including the following assumptions:

- The VA system is largely an inpatient hospital system.
- The goal is to move from a paper-chart model to an electronic system that mimics the paper chart.
- Hospital-clinic ancillary services, such as hospital pharmacies, process and fill orders.
- The system should run on local hospital networks between local servers and clinicians' desktop computers.
- Memory and hard drive space are scarce and expensive.

However, today's VA delivers care in a variety of locations—including patients' homes (via Home Telehealth); the single-provider, single-patient model that engendered traditional paper charts has given way to multi-provider, multi-patient, team-based care models better suited to worksheets that reflect workflow activities; patients fill prescriptions at locations that make sense for them; and hard-drive space is inexpensive and plentiful.

Software based on these new realities requires an open, extensible architecture and modern technologies to accelerate innovation in co-existence with legacy VistA.

## 2. Background

The HMP system is the IT project that will support the VA's Transformational Initiative 16: Transforming Health Care Delivery through Health Informatics herein referred to as the Health Informatics Initiative (hi<sup>2</sup>). This initiative supports Presidential Executive Order 13410, *Promoting Quality and Efficient Health Care in Federal Government Administered or Sponsored Healthcare Programs*. This executive order requires federal agencies to use recognized health interoperability standards to promote the direct exchange of health information between federal agencies and non-federal entities in supporting quality and efficient healthcare. Toward this vision and guidance, this initiative will shape the future of VHA clinical information systems through deliberate application of health IT and informatics to deliver solutions that transform healthcare delivery to veterans and directly improve quality and accessibility while optimizing value. It incorporates robust clinical business owner representation and participation in the product development and implementation of healthcare technology processes. The Veterans Health Administration has long been considered the world leader in using information technology (IT) to deliver higher quality, cost effective healthcare to patients. The Health Management Platform (HMP) is a pathway for the modernization of these IT systems.

The Initiative has two main goals: 1) Assist with VHA's transition from a medical model of care to a patient-centered model of care; and 2) Build a sustainable, collaborative, and collegial relationship between Veterans Health Administration (VHA) and the Office of Information and Technology (OIT). Promoting and fostering open, transparent communication between health care providers and software development teams through shared responsibility and accountability is a central focus for hi<sup>2</sup>. The initiative is organized into three work streams: 1) Workstream 1-Build (WSB) produce prototypes that will allow modernization of the Health Management Platform and 2) Workstream 2-Create (WSC) strengthen the informatics and analytics capacities of the VA workforce. 3) Workstream 3-Deliver (WSD) provides the communication and stakeholder engagement strategy.

## 2.1. Overview of the System

HMP: Team Facing will enable migration from an electronic chart to a knowledge-driven health management platform that encompasses the cognitive workflow in a patient centered, multi-patient, team-based care environment. This will require delivering working software that addresses clinical needs in a timely fashion and with clinical collaboration. This development is the next generation of CPRS tailored to meet contemporary demands. This effort integrates health informatics and IT in the delivery of health care IT products and provides a succession plan to transition CPRS to the next generation of browser-based Electronic Health Record (EHR). The workstream will pioneer software solutions using an agile development model that involves clinical subject matter experts throughout the software development life cycle.

HMP: System Facing is a working web-based software system that improves healthcare delivery at the level of the Veteran population and the VA healthcare system itself. System Facing additionally implements a robust SDK providing multiple tools presented as separate provider workspaces. These tools support targeted cohort generation (e.g., IVtoPO, Double Anaerobic, Congestive Heart Failure, Kalied), visualization and analysis of related data (e.g., delivery of care, facility support, research/study), clinician practice of medicine (e.g., review patient charts, enter notes, place orders). System Facing users are comprised of clinicians, facility healthcare personnel, care providers, and researchers.

HMP: Patient Facing is a modern web-based application that empowers Veterans to take an active role in the quality and accuracy of the health care that they are provided by enabling them to enter data about the non-VA prescribed medications, OTC products, and other herbs and supplements that they are taking. Patient Facing users are comprised by two major categories: VA health care providers and the Veterans whom they serve. In serving these two customer groups Patient Facing straddles the internal VA network and the external public internet.

## 2.2. Overview of the Business Process

HMP development cycles replace multi-year product releases with small-step functionality modules released in six months or less, in accordance with PMAS principles. The deliveries themselves will add incremental value to the product and end-user, and may or may not be candidates for national release. During each delivery cycle, the development team takes HMP software through multiple iterations, each of which involves multiple sprints.

Software passes through each of the following phases at least once (and usually multiple times) in every iteration. In turn, each phase includes its own internal iterative cycles. Sprints are often based on these cycles:

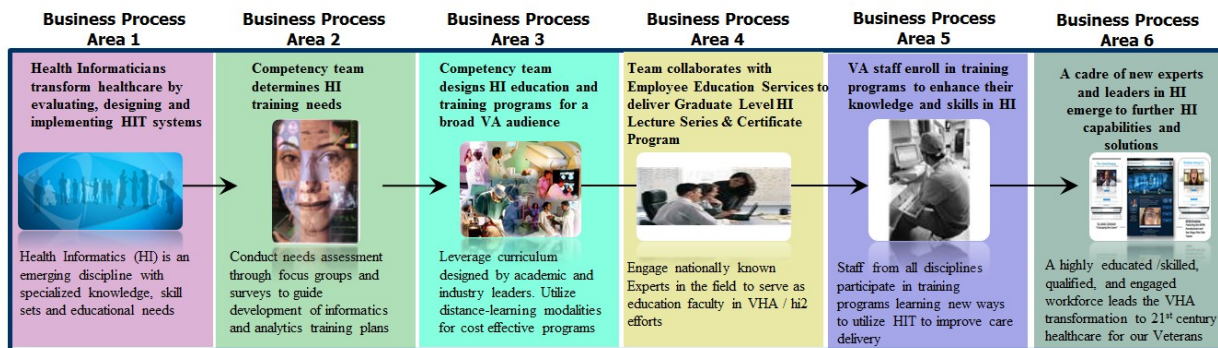
- Define
- Evolve
- Refine
- Evaluate

During the final iteration, which incorporates many six-month development cycles, the software goes through a final phase, during which the HMP development team hands off the software to a VA team tasked with taking the software through the national-release process. HMP passes

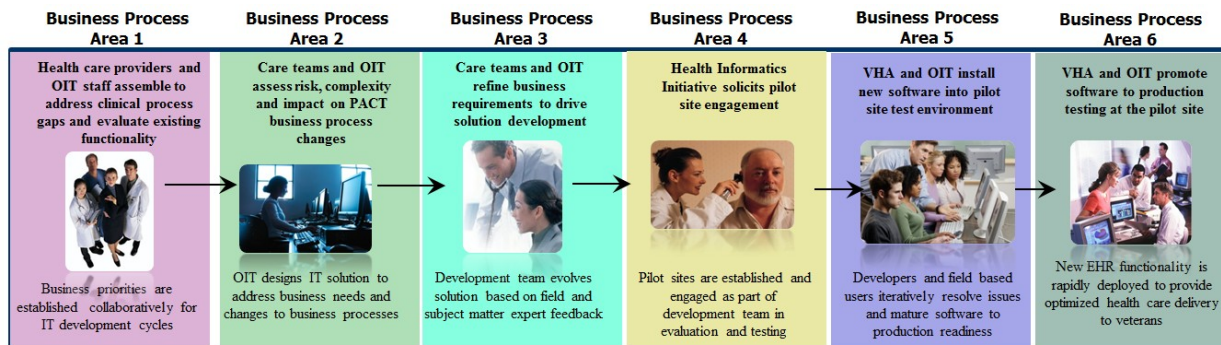
through the productize phase only when, in the course of multiple six-month development cycles, the software has accumulated enough value to make it worth the time, money, and effort required for a national release. For this phase, the term value is synonymous with functionality.

The business processes shown below are outlined in the HMP BRD, and they support Team Facing, Systems Facing and Patient Facing aspects of the business process.

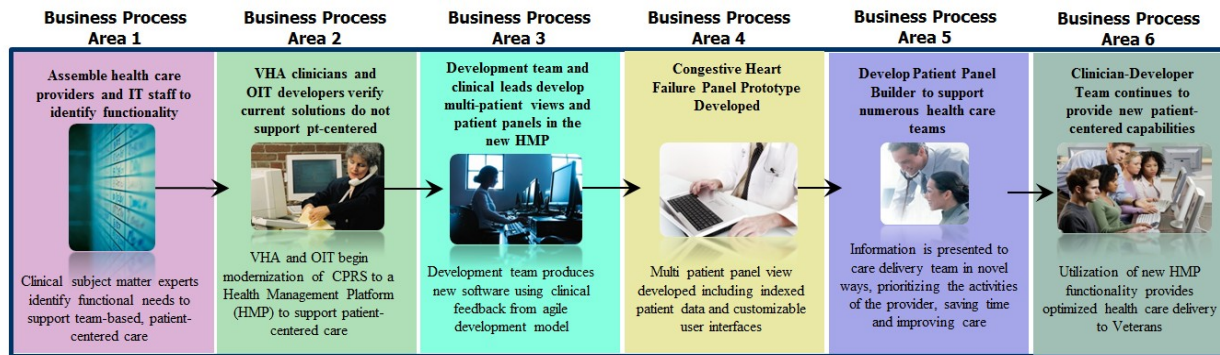
**Figure 1: Create Health Informatics Capacity**



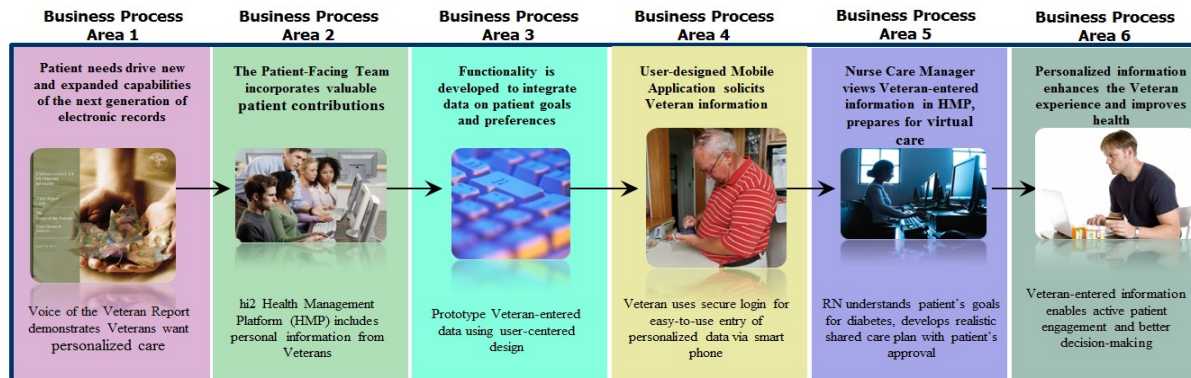
**Figure 2: Adopt a Health IT Collaborative**



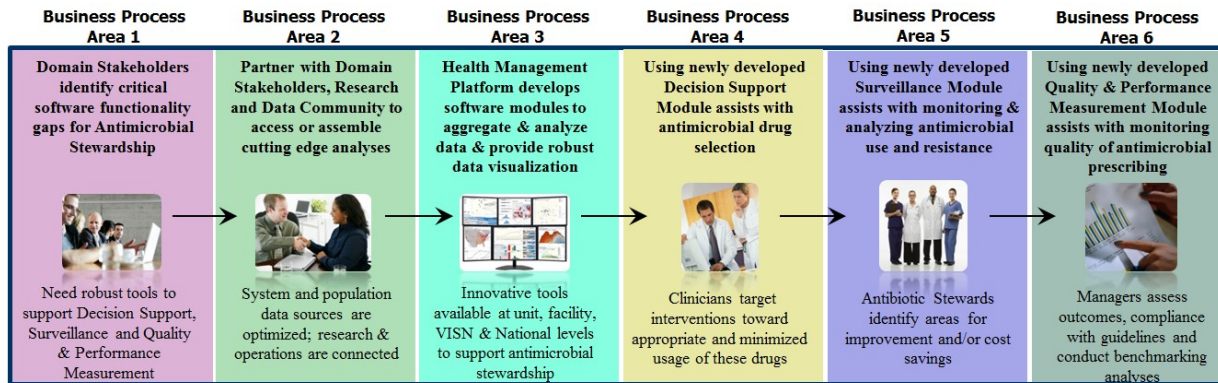
**Figure 3: Build a Health Management Platform (HMP) Extended Version of foundational IT products that transition the healthcare team experience to a patient-centered model of care**



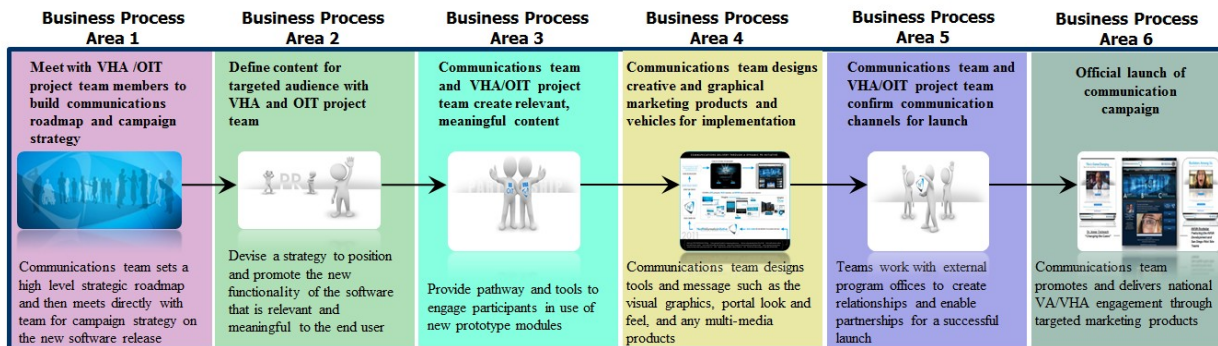
**Figure 4: Build a Health Management Platform (HMP) Extended Version of foundational IT products that enhance patient engagement, improving Veterans experience and health outcomes**



**Figure 5: Build a Health Management Platform (HMP) Extended Version of foundational IT products that look across VA's data systems and patient populations to improve health care delivery and system performance**



**Figure 6: Deliver Communication and Drive Change**



## 2.3. Assumptions

Details regarding design assumptions for HMP are still under development at this time. The Current design assumptions are listed below:

- Identity and Access Management (IAM) will support HMP compliance with enterprise requirements related to identity resolution
  - Pending IAM's national release of the necessary authentication and authorization services internal mechanisms will be used

- CDW will support HMP Analytic Processes
- VistA and VPR Data Extraction will support the HMP VPR
- PGD (Patient Gathered Data) will be available and will have the needed standardization support
- MIL will provide medication images for HMP
- RxNorm will provide canonical standardized medication information for HMP

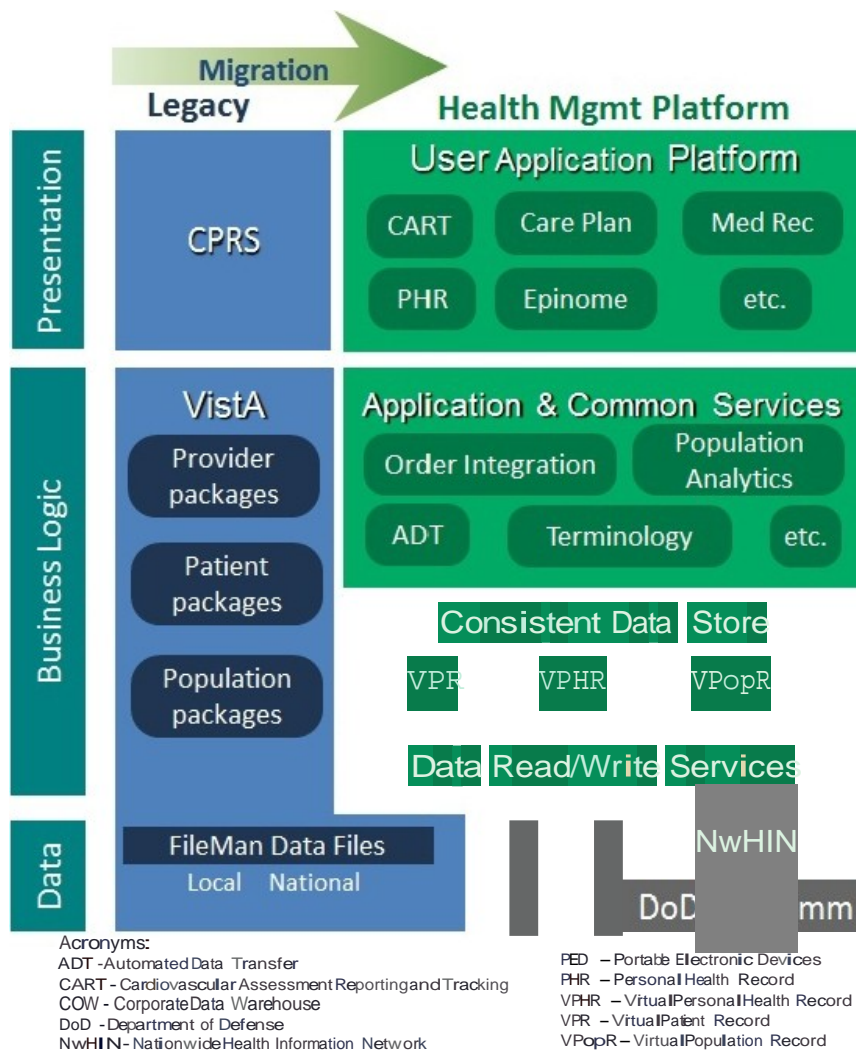
## 2.4. Legacy System Retirement

**Table 4: Proposed Legacy Retirements**

Legacy System or Legacy System Component	System Retired or Workload Reduced	Quantify the Workload Reduction
CPRS	Work load reduced	increased HMP usage

### **3. Conceptual Design**

Figure 7: TF, Conceptual Design

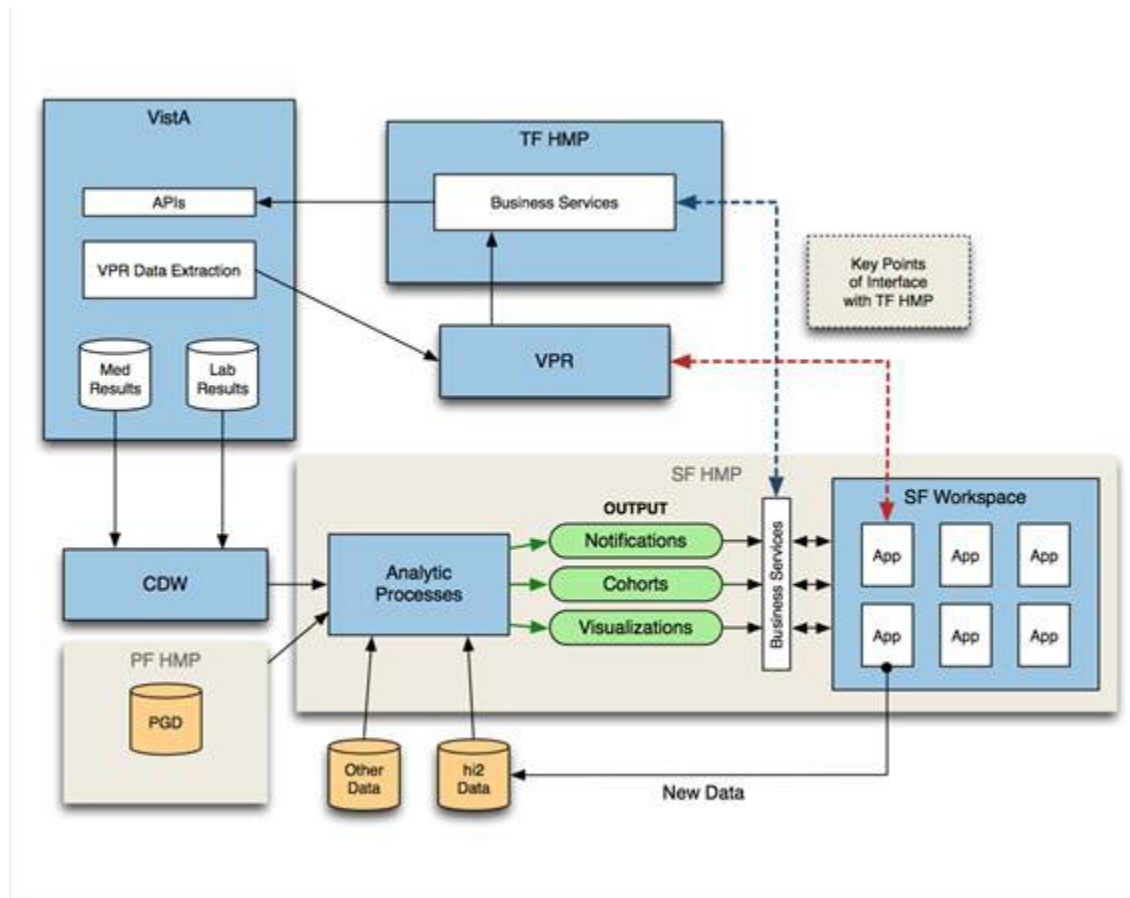


### 3.1 Conceptual Application Design

The conceptual application architecture for the Team, System and Patient components of HMP are detailed in a composite diagram shown below. For reference, specific components are labeled as shown:

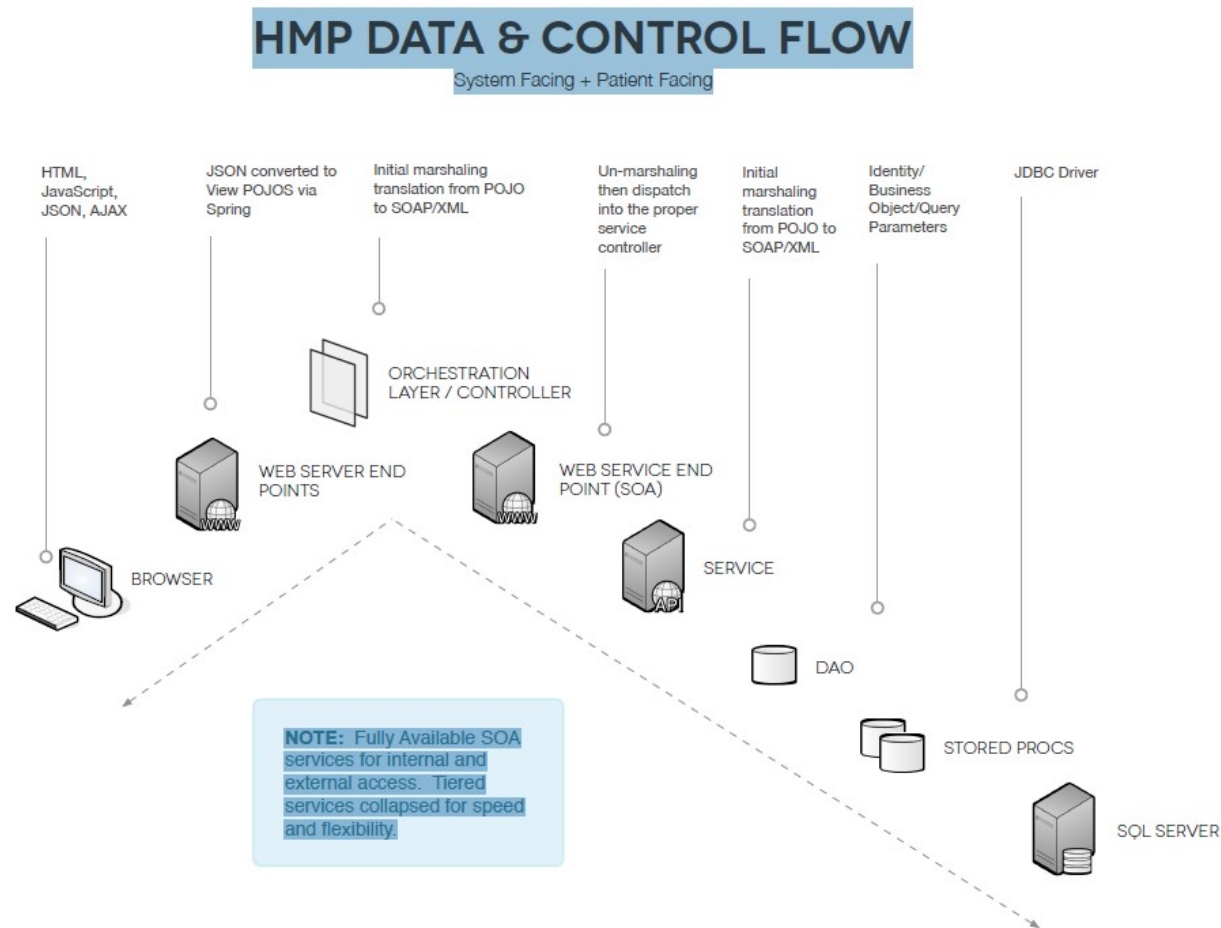
- TF – Team Facing
- SF – System Facing
- PF – Patient Facing

**Figure 8: Conceptual application architecture for the Team, System and Patient components of HMP**



Additional aspects of the conceptual application design are further detailed in the data and control flow diagram for HMP: SF and HMP: PF which follows:

**Figure 9: HMP Data and Control Flow, SF and PF**



This section provides the conceptual design of the application that is being produced by this project.

### 3.1.1. Application Context

In section 3 above, the Conceptual Design diagram details the context in which HMP will exist. In this diagram the subsystems in the area labeled “Health MGMT Platform” represent a single object that represents the HMP system; the block labeled *Legacy* represents all packages and data files that comprise the VistA system. Other blocks in the diagram represent data sources.

While the HMP system does not interact directly with CPRS, CPRS appears in the diagram to represent functionality that HMP will eventually provide.

**Table 5: Objects**

ID	Name	Description	Interface Name	Interface System
	CPRS			
	User application Platform	Includes packages CART, Care Plan, Med Rec, PHR, Epinome, Etc...		VistA
	VistA			
	Application Common Service	Includes packages Order Integration, Population Analytics, ADT, Terminology, Etc.		IAM
	Consistent Data Store	Includes packages VPR, VPHR, VPopR, Etc.		
	Fileman Data Files			
	CDW	Corporate Data Warehouse	SQL Server	SQL Server Drivers
	PED	Personal Electronic Data		
	NwHIN	Nationwide Health Information Network		
	DoD	Department of Defense		
	Comm	Common Services		

**Table 6: Interfaces External to OIT**

ID	Name	Related Object	Input Messages	Output Messages	External Party

**Table 7: Interfaces Internal to OIT**

ID	Name	Related Object	Input Messages	Output Messages	External Party
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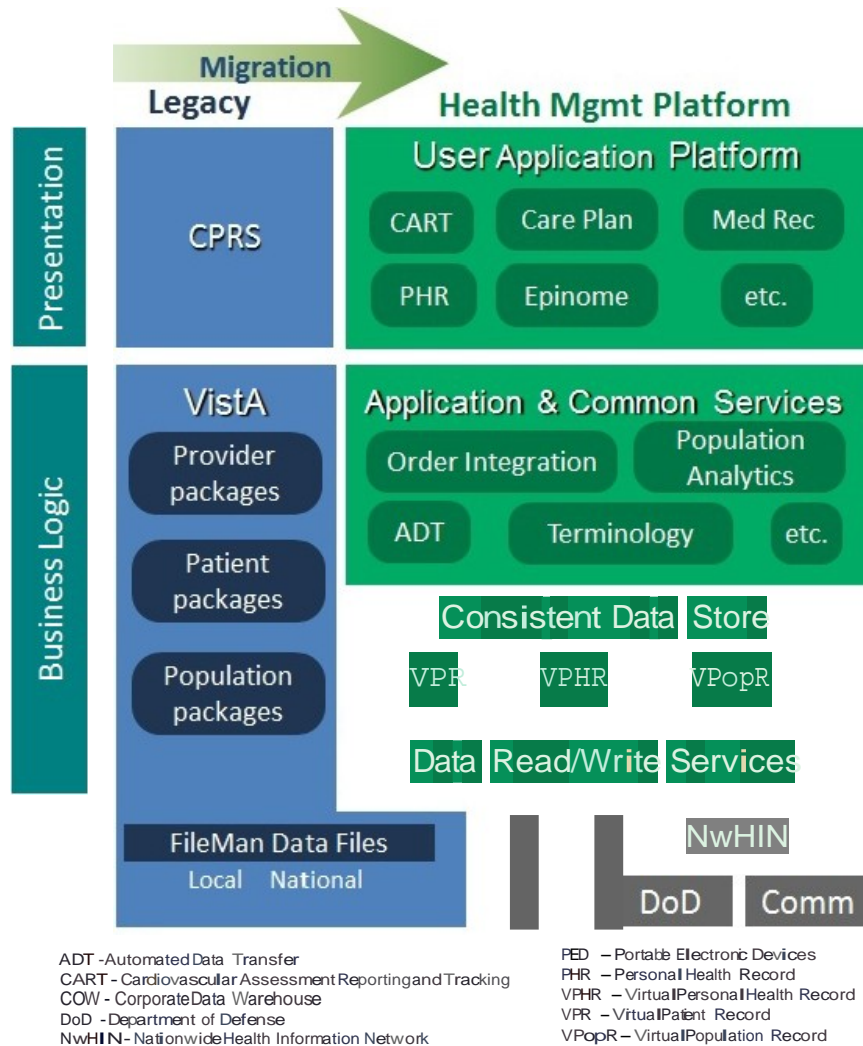
ID	Name	Related Object	Input Messages	Output Messages	External Party
	CPRS				
	User application Platform	CART, Care Plan, Med Rec, PHR, Epinomen			
	VistA				
	Application Common Service	Order Integration, Population Analytics, ADT, Terminology			
	Consistent Data Store	VPR, VPHR, VPopR			
	Fileman Data Files				
	CDW		SQL	SQL	
	VINCI Data Services	facilities, cohort generation, visualization data, medication data	SOAP	SOAP	VINCI
	NwHIN				
	DoD				
	Comm				

**Table 8: Externally Shared Data Stores**

ID	Name	Data Stored	Owner	Access

### 3.1.2. High-Level Application Design

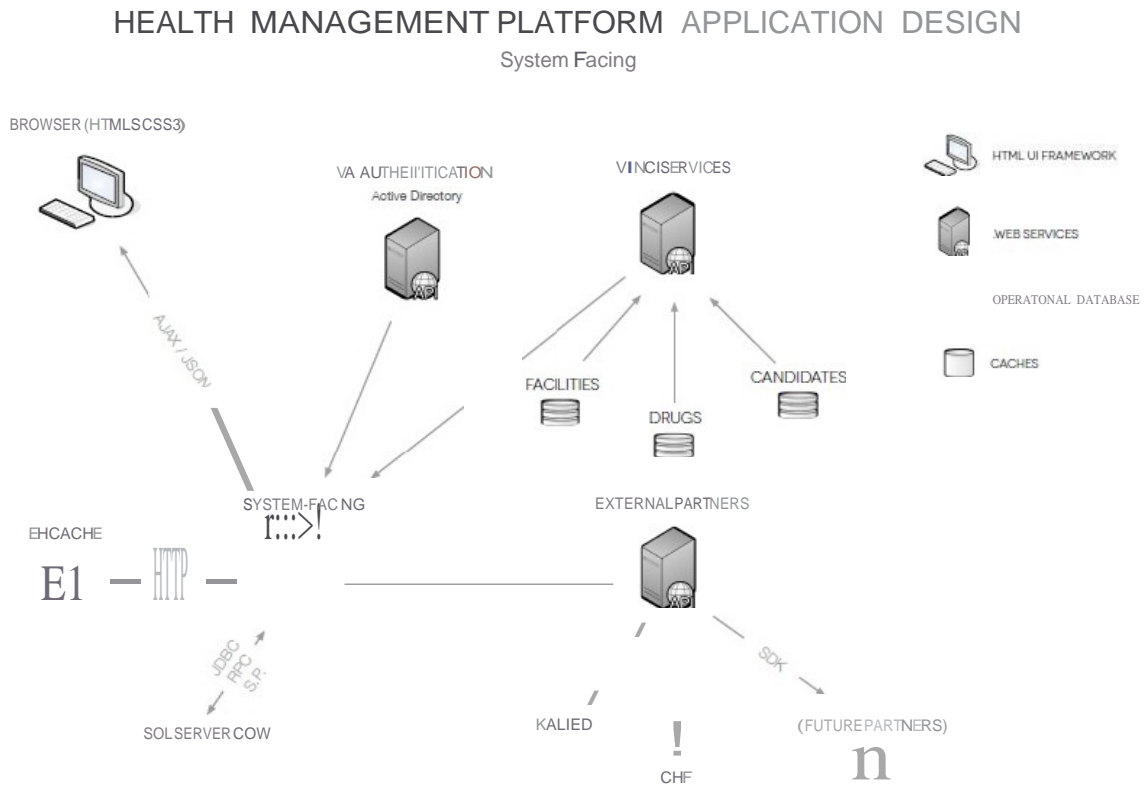
Figure 10:TF,High Level Application Design



# Health Management Plattform Extended Version System Design Document



Figure 12:HMP SF:Application Design



**Table 9: Objects in the High Level Application Design**

<b>ID</b>	<b>Name</b>	<b>Description</b>	<b>Service or Legacy Code</b>	<b>External Interface Name</b>	<b>External Interface ID</b>	<b>Internal Interface Name</b>	<b>Internal Interface ID</b>	<b>SDP Sections 1&amp;2</b>
	Web Browser: HMP	This object represents the user-application platform, which provides a Web-based interface in which end-user applications run. The first HMP deliverable is a text-based search service, which is a Flex application that runs within HMP's HTML-based UI framework.	The UI will support applications written in programming languages that are compatible with HTML.	HMP business services.				Under development.

ID	Name	Description	Service or Legacy Code	External Interface Name	External Interface ID	Internal Interface Name	Internal Interface ID	SDP Sections 1&2
	HMP Business Services	This object represents all individual business services that are (currently a search service) or will provide HMP functionality.	Business services will leverage (and expose) rules that are currently available in VistA and offer new functionality (functionality that is not available in VistA).	Local VistA implementations, , Solr index, VPR, Web-browser interface.				Search service complete, other services under investigation.

**Table 10: Internal Data Stores**

ID	Name	Data Stored	Steward	Access
Solr Index	Indices (Lucene) that the application's Solr-based search functionality uses to find and retrieve results for users' text-based searches.	HMP	Indices reside in SQL tables running on the application's Cachè server.	Solr Index

ID	Name	Data Stored	Steward	Access
VPR	Currently stores patients' demographics, problems, notes, laboratory results, allergies, and medications.	Local VistA systems are the authoritative data source.	HMP's VPR services aggregate, retrieve, and store this information in SQL tables running on the application's Cachè server.	VPR
Local VistA	The application stores some data in local VistA systems.	Local VistA systems are the authoritative data sources.	This data resides in local VistA systems' Cachè databases.	Local VistA

### 3.1.3. Application Locations

**Table 11: Application Locations**

Application Component	Description	Location at Which Component is Run	Type
Web Browser: HMP	This component runs users' web browsers.	User Location	Presentation logic
HMP Business Services	Services that run in the system's Java middle tier.	Central location—currently in Region 1 Data Centers at Sacramento and Denver.  PF & SF - Austin Data Center.	Business logic for outward-facing application services; data logic for inward-facing data services (such as the VPR).
Operational databases	Indices and VPR data tables.	Central location—currently in Region 1 Data Centers at Sacramento and Denver.  PF & SF – Austin Data Center.	Data logic
HDR Connection Mechanism	Retrieves data from remote VistA implementations using the VPR RPCs	Central location—Austin Data Center	Data logic
VistA	Local VistA implementations.	Located in VAMC or regional data centers.	Business logic and data logic.
VINCI Data Services	Services that run in the system's Java middle tier.	Located in the Austin Data Center.	Business logic.

### 3.1.4. Application Users

**Table 12: Application Users**

Application Component	Location	User
Web browser: HMP	HMP pilot sites	HMP services will be role-based; pilot sites will set up role-based access to services based on locally determined best practices.
Web browser	Users mobile device/desktop	Veterans, VA personnel, Contractors

## 3.2. Conceptual Data Design

HMP's architecture incorporates the following four tiers:

- A user-application platform: this tier encompasses a Hypertext Markup Language (HTML) user interface (UI) framework that is capable of housing and displaying a variety of selectable applications. These applications can be general-use HMP deliverables (such as the text-based search application) or specialty-specific applications that other projects create—such as the Cardiovascular Assessment Reporting and Tracking (CART) application or the Integrated Medications Management application (IMM). HMP's open, HTML framework supports a variety of programming languages, including Flex (the language in which HMP's text-search service is written), Java, and .Net.

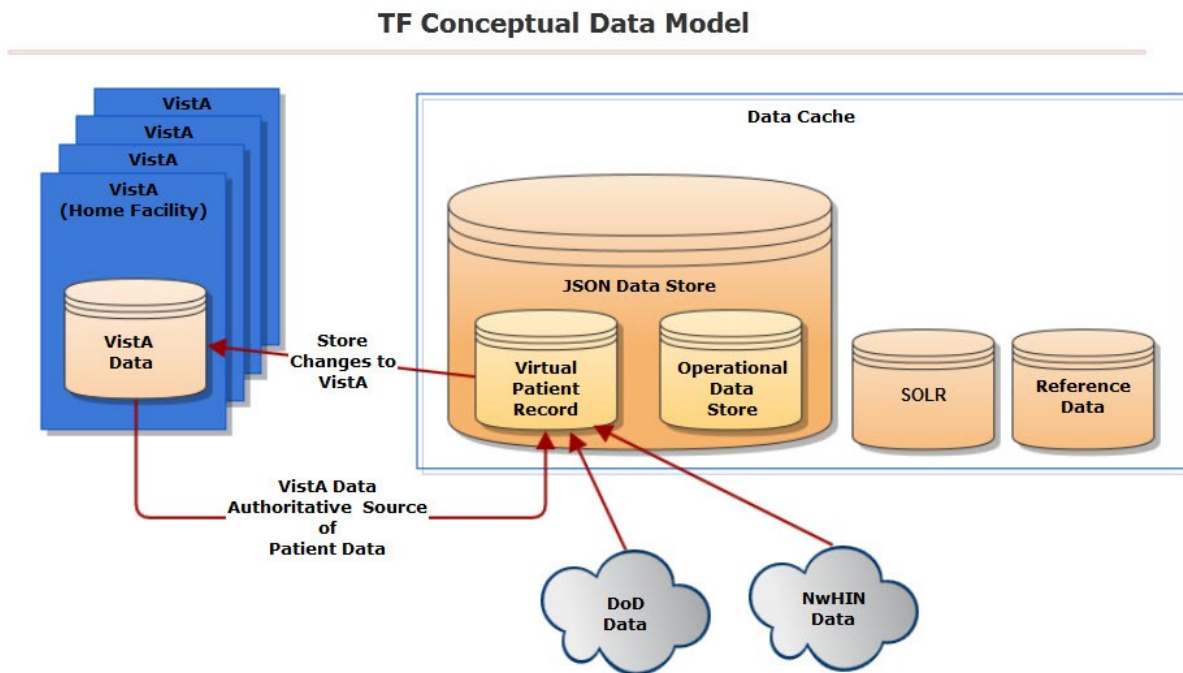
This tier's modular development environment is capable of enforcing shared clinical contexts and of supporting device types such as tablets, smart phones, accessibility tools, and large displays—depending upon the platform in which a given application is designed to run.

- A business-services tier: this tier performs new business functionality and enforces corresponding business rules. Its flexible design can incorporate robust new services that provide new capabilities while isolating and exposing existing VistA services. This tier also supports communications between business services. For example, an order-entry service can communicate with a pharmacy service.
- For HMP: Team Facing a consistent data cache: this tier allows business services to assume they have at their disposal a virtual patient record (VPR) that contains patient data from all sources at all times. It communicates with the data-access tier, receiving aggregated data from VistA, and then transforming VistA domain objects into a highly indexed representation that supports HITSP standards. This tier consolidates and indexes data (by author, date, title, and so forth) to support the specific needs of an EHR. The application rebuilds and refreshes the cache as necessary; the authoritative data source is the originating data source. In addition to the VPR, this tier includes caches such as the search index, tracking logs, and so forth. This tier's outputs include a non-proprietary, standardized schema (with documentation) and a VPR service feed.
- For HMP: System Facing and HMP: Patient Facing a consistent data cache: this tier allows business services to provide data at higher rates of speed. It communicates with the data-access tier, receiving data from CDW databases, internal data stores, external data services (MIL, RxNorm) and consolidates and stores these in a fashion far quicker to access than the persistent data-access layer.
- For HMP: Team Facing a data-access layer: this tier will use an enhanced version of a web services software to access data from multiple sources—currently VistA and Department of Defense-Bidirectional Health Information Exchange (DoD-BHIE). It relies on web services to access this data and expose it as a uniform set of simple objects that model the medical domain. This tier also includes new VistA RPCs that will facilitate migration to a more complete, standardized, computable data set; the project has shared one such RPC to support the NwHIN effort.
- For HMP: SF and HMP: PF a data-access layer: this tier uses the standard SQL Server SqlConnection technologies to interoperate with multiple Microsoft SQL Server databases. Currently these databases consist of various CDW instances and the SF and PF internal databases. In addition this tier utilizes external data services, MIL and RxNorm, via RESTful APIs to facilitate data normalization and completion.

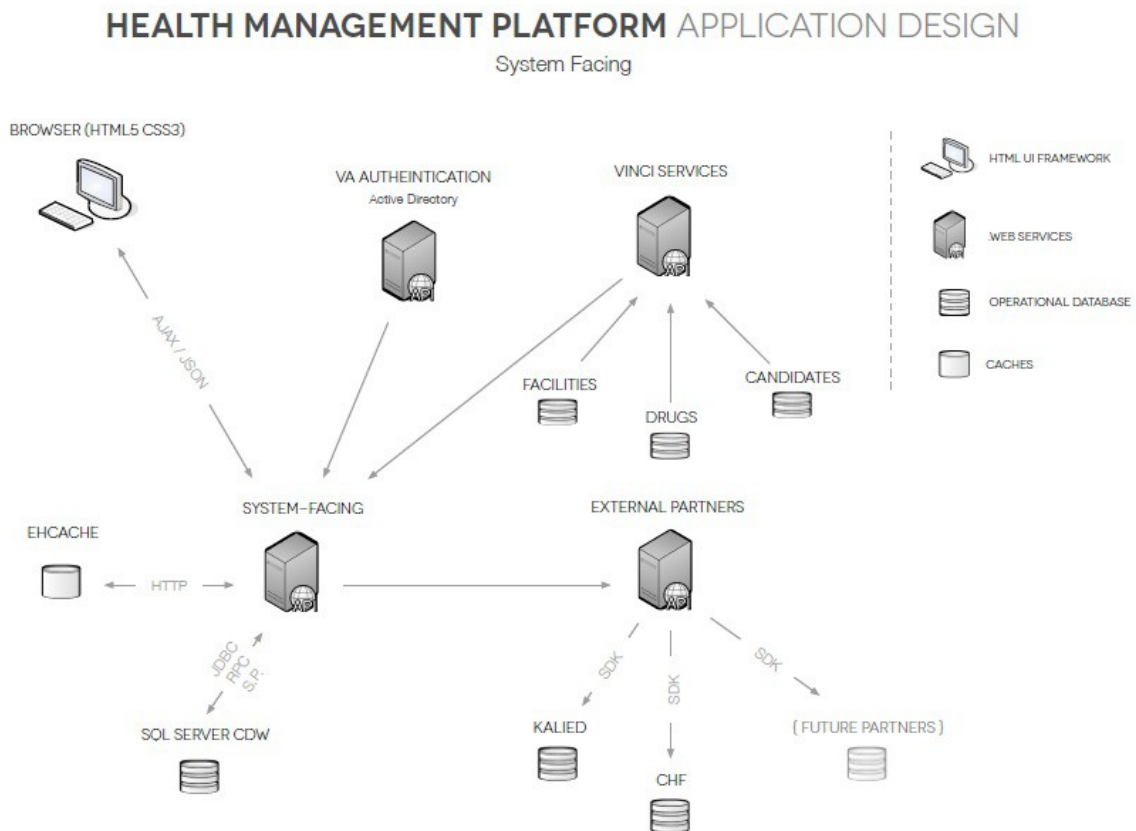
For HMP: Team Facing figure 2 illustrates how these tiers fit within, and compare to, the conceptual design of the current CPRS-VistA system.

### 3.2.1. Project Conceptual Data Model

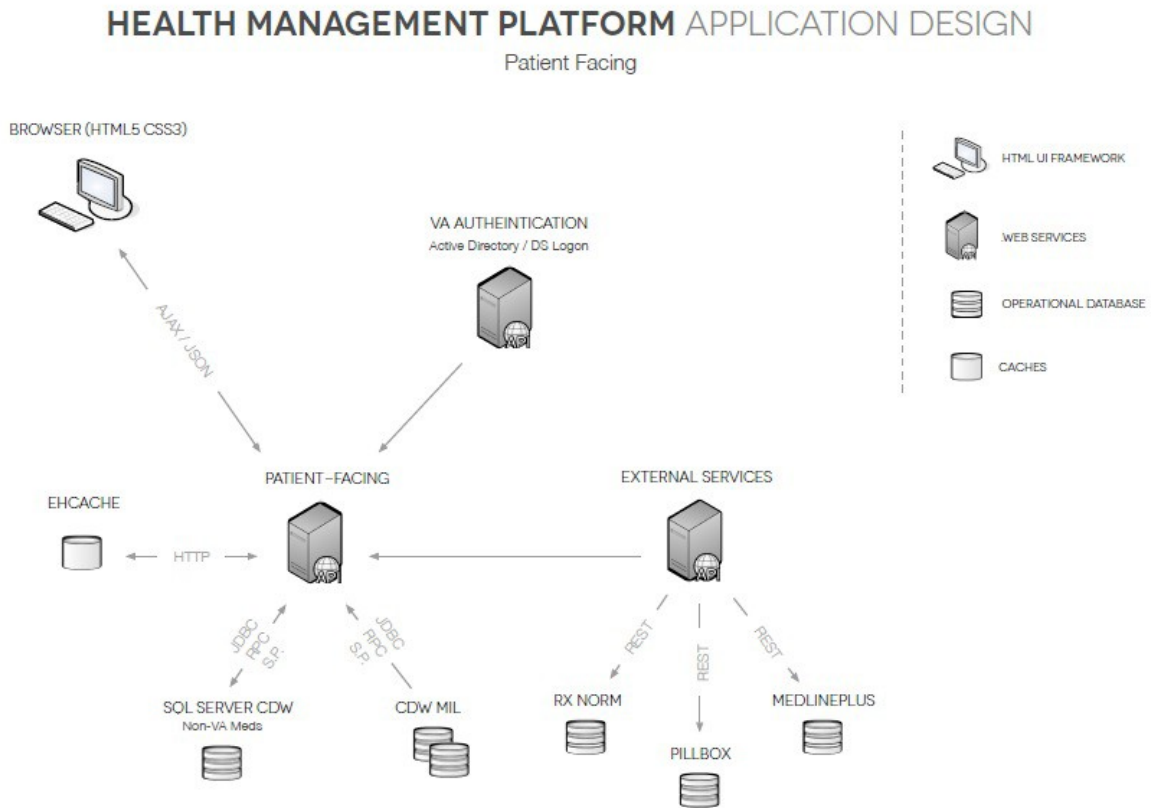
Figure 13: TF Conceptual Data Model



**Figure 14: HMP SF**



**Figure 15: HMP PF**



### 3.2.2. Database Information

**Table 13: Database Inventory**

Database Name	Description	Type	Steward
Virtual Patient Record	This database provides a rebuildable cache containing aggregated, highly indexed data from VistA.	Create	Application
Solr	This database contains indices of aggregated data from VistA.	Create	Application

Database Name	Description	Type	Steward
VistA	This database runs locally as part of sites' VistA implementations.	Interface	Local sites
CDW	This database is read-only and provides cohort data, visualization data, MIL.	Interface	Application
RxNorm	This database is read-only and provides information about medication names, strength and form options, dosage schedules, etc.	Interface	Application

### 3.2.3. User Interface Data Mapping

This section describes and defines the format and information that will be available for users of the product to be able to enter data into the database or to retrieve information from the database, if applicable.

#### 3.2.3.1. Application Screen Interface TF

To understand the TF screens/displays included in this section, it is helpful to have some background information.

There are two clinical applications: Clinical Practice Environment (CPE) and Team Management, as well as system configuration tools.

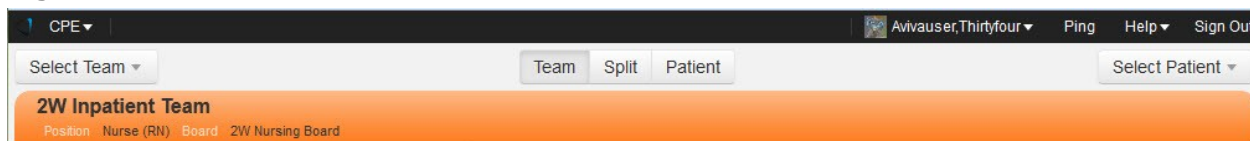
**Figure 16: Clinical Practice Environment, Menu**



CLINICAL APPS/CPE is the main TF application that allows users to access their teams, view patient lists, select patients, view and manage patient data.

CPE team information displays in the header. When the user logs in and selects a team, team information displays in the header, including the name of the board that will display when the Team view is selected.

**Figure 17: Clinical Practice Environment, Header**



There are three views to help users do their work more efficiently.

CPE Team view displays a multi-patient view of the patients assigned to the team with a board made up of columns of information that were selected according to the team position. Users can quickly see information in order to more effectively and efficiently perform triage, make decisions and manage/prioritize their workflow. When applicable, information in the custom columns can be entered by clicking on the item to reveal a data entry box. This data is stored in the VistA database in the new VPR Patient Object file 560.1.

**Figure 18: Clinical Practice Environment, Patient View**

Phot	Patient	Room/Bed	Reason For Visit	Inpt. Meds Due	Last Vital Signs PN,BP,T	Fluids In/Out	Comments This Visit
	<b>Avivapatient,Twentyeight</b> 666-00-0008 Apr 07,35 (78yo M)		No Current Visit		<b>Dec 21,12 15:38</b> BP 120/70 T 98.6 F <b>Mar 05,10 09:00</b> PN 1	T: 0 + Y: 0 = 0	No Current Visit
	<b>Avivapatient,Twentythree</b> 666-00-0003 Apr 07,35 (78yo M)		No Current Visit		<b>Feb 20,11 09:00</b> BP 135/70 T 99 F <b>Mar 05,10 09:00</b> PN 1	T: 0 + Y: 0 = 0	No Current Visit
	<b>Avivapatient,Twentytwo</b> *Sensitive*	722-D 501-2 A-4	CHF	Loading...	<b>Feb 01,13 15:53</b> BP 122/72 <b>Feb 21,12 13:42</b> PN 2 T 98.6 F	T: 0 + Y: 0 = 0	Loading...

The TF Team view can be customized to suit the immediate needs of the user.

**Figure 19 TF Team View**

2W Inpatient Team									
Position Nurse (RN) Board 2W Nursing Board									
Phc	Patient	Room/Bed	Reason For Visit	Inpt. Meds Due	Last Vital Signs PN,BP,T	Fluids In/Out	Unverifie		
	<div> <div>Avivapatient, Twentyeigl</div> <div>666-00-0008 07,35 (78)</div> </div>				<div>Dec 21,12 15:38</div> <div>BP 120/70</div> <div>T 98.6 F T 0 + Y 0 = 0</div>				
	<div> <div>Avivapatient, Twentythre</div> <div>666-00-0003 07,35 (78)</div> </div>		No Current V						
	<div> <div>Avivapatient, Twentytwo</div> <div>666-00-0009 07,35 (78)</div> </div>	722-D 501-2 A-4	CHF						
	<div> <div>Avivapatient, Twentynine</div> <div>666-00-0005 07,35 (78)</div> </div>								
	<div> <div>Avivapatient, Twentyfive</div> <div>666-00-0005 07,35 (78)</div> </div>								

↑ Sort Ascending

↓ Sort Descending

Columns

Group by this field

Show in groups

☒ Photo

☒ Room/Bed

☒ Reason For Visit

☒ Inpt. Meds Due

☒ Last Vital Signs

☒ PN,BP,T

☒ Fluids In/Out

☒ Road Trip In

☒ Unverified Orders

☒ Treatments Due

qfilter\_status: ACTIVE, PENDING, DISCONTINUED, EXPIRED

☒ Comments This Visit

☐ Appointments

Appt. Date Range: +1w

☐ Appt Check-in

☐ updated

CPE Split view displays a simple multi-patient view next to a detailed view of the selected patient's record. Users can use this view to work through a list of patients assigned to the team and review their detailed records.

Figure 20: Clinical Patient Environment, Multi Patient View

The screenshot displays the CPE Multi Patient View interface. At the top, there are navigation tabs for 'Team', 'Split', and 'Patient'. The 'Team' tab is selected, showing the '2W Inpatient Team' with a list of patients. The 'Patient' tab is also visible, showing the selected patient's details. The interface is divided into two main sections: a patient list on the left and a detailed patient record on the right.

**Patient List (Left):**

Photo	Patient
	AvivapatientTwentyeight 666-00-0008 Apr 07,35 (78yo M)
	AvivapatientTwentythree 666-00-0003 Apr 07,35 (78yo M)
	AvivapatientTwentytwo *Sensitive*
	AvivapatientTwentyone 666-00-0005 Apr 07,35 (78yo M)
	AvivapatientTwentyfive 666-00-0005 Apr 07,35 (78yo M)
	AvivapatientTwentyone 666-00-0001 Apr 07,35 (78yo M)

**Patient Detail View (Right):**

**Patient Information:**

- Name:** Avivapatient, Twentynine
- ID:** 666 00 0009
- Date of Birth:** 1935 04-07 (78yo M)
- Visit Status:** No Visit Selected
- Team:** He Primary Care Team1 / Unassigned
- Postment:** Unassigned
- Postment Code:** CWAD

**Medication Orders:**

Medication	Order Type	Fill Status	Dose	Frequency	Status	Renew Date
ABACAVIR TAB	1 order	1 fill	600 MG	PO MO-WE-FR	ACTIVE	Renew By Mar 15, 13
ATORVASTATIN TAB	1 order	1 fill	10 MG	P03XW	ACTIVE	Renew By Dec 17, 12
BIPERIDEITAB	2 orders	2 fills	PO	MO-WE-FR	ACTIVE	Renew By Nov 01, 12
CAFFEINEJERGOTAMINE TAB	1 order	1 fill	PO	Q12H	ACTIVE	Renew By Oct 07, 12
METOPROLOLTARTRATE TAB	3 orders	4 fills	50 MG	PO BID	ACTIVE	Renew By Nov 24, 10
SIMVASTATIN TAB	7 orders	8 fills	40MG	POQPM	ACTIVE	Renew By Nov 24, 10
ACARBOSE TAB	1 order	0 fill	50MG	P03XW	ACTIVE	Stop Date Jul 12, 12
ASPIRIN TAB,EC	1 order	0 fill	81MG	POQAM	ACTIVE	Stop Date Apr 11, 07
AMINOCAPROIC ACID INJ, SOLN in DEXT	1 order	0 fill	null	IV	ACTIVE	Last Admm
FOLIC ACID INJ, SOLN in KCL20MEQID5N	1 order	0 fill	null	IM Q2H	ACTIVE	Last Admm

CPE Patient view allows a user to see details for a single patient displayed across the full screen.

Figure 21: Clinical Patient Environment, Single Patient Details

The screenshot displays the CPE Patient Environment interface for a single patient, Avivapatient, Twentynine. The interface is organized into several sections:

- Header:** Includes user information (User: ThH/four), a Pmg button, and links for Help and SignOut.
- Patient Summary Bar:** Displays the patient's name (Avivapatient, Twentynine), age (66), gender (00), and date of birth (0009). It also shows the patient's status (No Visit Selected) and the assigned team (He Primary Care Team1 / Unassigned).
- Navigation Tabs:** Includes New Task, New Med Order, More..., Meds Review (active), Lab Review, Observations, and Patient Teams.
- Medication List:**
  - Outpatient Meds:**
    - ABACAVIR TAB: 600 MG PO MO, WE-FR. ACTIVE. Renew By Mar 15, 13.
    - ATORVASTATIN TAB: 10 MG PO Q3XW. ACTIVE. Renew By Dec 17, 12.
    - BIPERIDEN TAB: POMO-WE-FR. ACTIVE. Renew By Nov 01, 12.
    - CAFFEINE/ERGOTAMINE TAB: PO Q12H. ACTIVE. Renew By Oct 07, 12.
    - METOPROLOL TARTRATE TAB: 50 MG PO BID. ACTIVE. Renew By Nov 24, 10.
    - SIMVASTATIN TAB: 40 MG PO QPM. ACTIVE. Renew By Nov 24, 10.
  - Non-VA Meds:**
    - ACARBOSE TAB: 50 MG PO Q3XW. ACTIVE. Stop Date Jul 12, 12.
    - ASPIRIN TAB, EC: 81 MG PO QAM. ACTIVE. Stop Date Apr 11, 07.
  - Inpatient Meds:**
    - AMITOCAPROIC ACID TAB, SOLIN DEXT 5: null V 3XW. ACTIVE. Last Admin.
    - FOLIC ACID TAB, SOLIN KCL 20 MEQ ID 5: null IM Q2H. ACTIVE. Last Mmin.

The patient detail screen is highly customizable. The data display is based on a grid which includes features for sorting, adding/removing columns, filtering and grouping data. There are also Actions to save the user time and links to outside sources that provide current information on medications.

**Figure 22: Clinical Patient Environment, Patient Details**

The screenshot displays the 'Patient Details' screen for 'Avivapatient, Twentynine'. The interface is organized into a grid with various sections. At the top, there's a navigation bar with 'CPE', 'Avivauser,Thirtyfour', 'Ping', 'Help', and 'Sign Out'. Below this, a header section shows patient information: 'Avivapatient, Twentynine', '666-00-0009', '1935-04-07 (78yo M)', 'No Visit Selected', 'Hc Primary Care Team1 / Unassigned', 'Attending', 'Unassigned', and 'Postings CWAD'. The main content area is titled 'Outpatient Meds' and lists several medications. The 'ATORVASTATIN TAB' is highlighted, showing details like '10 MG PO 3XW', 'ACTIVE', and 'Renew By Dec 17, 12'. A sidebar on the left contains 'Actions (3)' and 'Links (3)', with the 'Links (3)' section circled in orange, listing 'UpToDate: Search UpToDate', 'Micromedex: Search', and 'MedlinePlus: Patient education'. The top navigation bar includes 'CPE', 'Avivauser,Thirtyfour', 'Ping', 'Help', and 'Sign Out'.

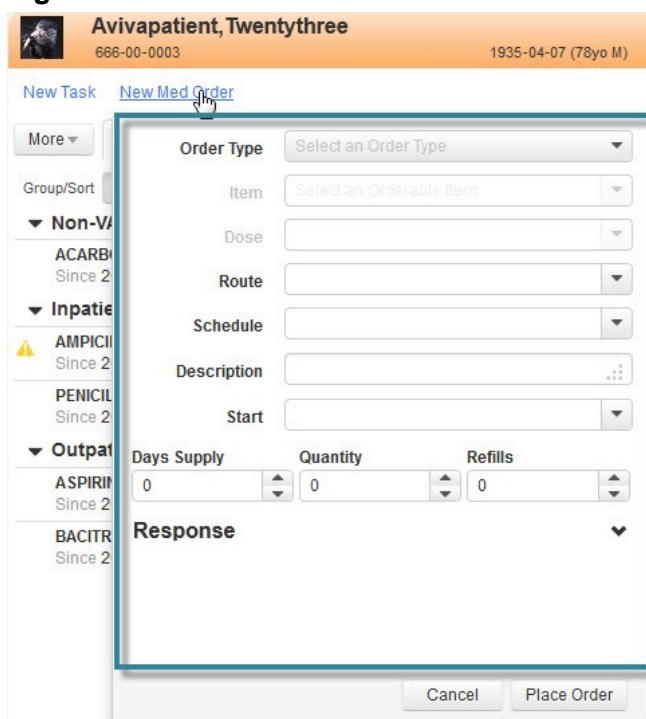
The TF Patient view has been developed so it can be configured to display tabs with information that meets the needs of the user.

**Figure 23: TF Patient View**




New Med Order allows users to place new medication orders that will update the VistA database Order file 100.

**Figure 24: TF New Med Order**



New Task allows users to create tasks for themselves and for other team members. This information is stored in the VistA database in the new VPR Patient Object file 560.1.

**Figure 25: TF New Task**



Avivapatient, Twentythree  
666-00-0003

No  
1935-04-07 (78yoM)

[New Task](#) [New MedOrder](#)

Title

Due

Type Administrative

Description Tahoma 8 / !J T• r• •

Claim this task [J]

Cancel

Save

CLINICAL APPS/Team Management allows authorized users to set up the teams that are used in CPE. Team information is stored in the VistA VPR Object file 560.11.

The TF clinical application Team Management allows authorized users to:

- Configure teams that include patients and staff members
- Configure boards that determine which columns of patient information are displayed together
- Assign boards to team staff members based on their role on the team

**Figure 26: TF Team Management**

The screenshot displays the 'Team Management' interface. At the top, there are tabs for 'Configure Teams', 'Configure Team Positions', 'Configure Team Categories', 'Configure Boards', and 'Configure Locations'. The 'Configure Teams' tab is active.

**Teams Section:** A list of teams is shown on the left. The '2W Inpatient Team' is selected and highlighted in blue. Other teams include '5 East', 'BETH2', 'Blue Cheese Team', 'darnley101', 'Darnley\_s26', 'DARNLEY\_S27', 'Delete This Team', 'DMB S29-2', 'DMB-S28', 'DMB-S28-2', 'dmb-s28-3', 'DMB-s28-4', 'DMB-S29', 'DMB-S31', 'DMB-S31-2', 'DMB-S32', and 'DMB-S32-3'.

**2W Inpatient Team Draft Form:**

- Name:** 2W Inpatient Team
- Created By:** Avivauser,Thirtyfour
- Description:** This is my team for inpatients
- Categories:** Inpatient

**Patients Section:** A list of patient IDs is shown, including AVIVAPATIENT,TWENTYEIGHT, AVIVAPATIENT,TWENTYTHREE, AVIVAPATIENT,TWENTYTWO, AVIVAPATIENT,TWENTYNINE, AVIVAPATIENT,TWENTYFIVE, and AVIVAPATIENT,TWENTYONE.

**Staff Section:** A list of staff members is shown, including Avivauser,Thirtyfour (Physician-Primary Care), Vehu,Three (Occupational Therapist), and others.

**Boards Section:** A list of boards is shown, including 2W Nursing Board, BethBoard, BoredBoard, DARNLEYS26, and Delete This Board.

**Figure 27: TF Team Management**

The screenshot displays the 'Team Management' application interface. At the top, there is a navigation bar with the title 'Team Management' and user information 'Avivauser,Thirtyfour'. Below this, a series of tabs allows navigation between 'Configure Teams', 'Configure Team Positions', 'Configure Team Categories', 'Configure Boards' (which is currently selected), and 'Configure Locations'.

The main content area is divided into two primary sections. On the left, under the heading 'Boards', there is a list of existing boards. The '2W Nursing Board' is highlighted in blue. Other boards listed include 'BethBoard', 'BoredBoard', 'BoredBoard', 'DARNLEYS26', 'Delete This Board', 'dmb-s26-2', 'dmb-s26-2', 'DMB-S28', 'DMB-S31', 'dmb-s32', 'DMBS29-2', 'hc s32 all col board', 'hc s32 board 1', 'hc s32 board 3', 'hc s32 board 4', 'hc s32 board 5', and 'hc s32 board 6'. Each board entry has a 'Draft' status and a small edit icon.

On the right, the '2W Nursing Board' configuration form is shown. It includes fields for 'Name' (set to '2W Nursing Board'), 'Created By', and 'Description'. There is also a 'Categories' field. Below these fields is a 'Columns' section with an 'Add Column' link. A list of potential columns is displayed, including 'Room/Bed', 'Reason For Visit', 'Inpt. Meds Due', 'Last Vital Signs', 'Fluids In/Out', 'Road Trip', 'Unverified Orders', 'Treatments Due', 'Comments This Visit', 'Appointments', and 'Appt Check-in'.

At the bottom of the interface, there is a 'Preview Roster' button and a dropdown menu labeled '<Select Patient LI'.

ADMIN TOOLS/System Config System Config tools control extract of patient data from VistA, the authoritative source of VA patient data and store it in the Virtual Patient Record (VPR).

The Sync Patients configuration tool uses VPR extract routines to get data for selected patients from VistA domains, as well as other sources, and store it in a local VPR database so it can be accessed by the TF Web application. Automatic updates can be enabled to provide data freshness.

**Figure 28: TF System Configuration**

The screenshot shows the 'System Config' window with the 'Virtual Patient Records' section expanded. The 'Sync Patients' option is selected. The 'Stats' table displays the following data:

Name	Value
Total Patients	1634
Loaded Patients	24
Patients with Errors	1
Sync Errors	1
Syncing Patients	0
Work Queue	0
Automatic Updates	Enabled

Buttons visible include 'Clear All Sync Errors', 'Cancel Pending Work', and 'Disable Automatic Updates'. Below the stats, there are sections for 'Synchronize a Team's Patients', 'Synchronize a Roster of Patients', 'Synchronize a Patient', 'Unload', and 'Reindex', each with input fields and action buttons.

**Figure 29: TF System Configuration**

The screenshot shows the 'System Config' window with the 'Operational Data Cache' section expanded. The 'Sync Operational Data' option is selected. The 'Stats' table displays the following data:

Name	Value
Total Patients	1634
Loaded Patients	24
Patients with Errors	1
Sync Errors	1
Syncing Patients	0
Work Queue	0
Automatic Updates	Enabled

Buttons visible include 'Clear All Sync Errors', 'Cancel Pending Work', and 'Disable Automatic Updates'. Below the stats, there is a section for 'Synchronize Operational Data' with a dropdown menu and two buttons: 'Synchronize All Operational Data' and 'Synchronize Selected Domain'.

### 3.2.3.2. Application Screen Interface SF

Key capabilities which are provide by HMP System Facing screens are shown in screen shots below. For reference, these screen shots are dated 5/2013.

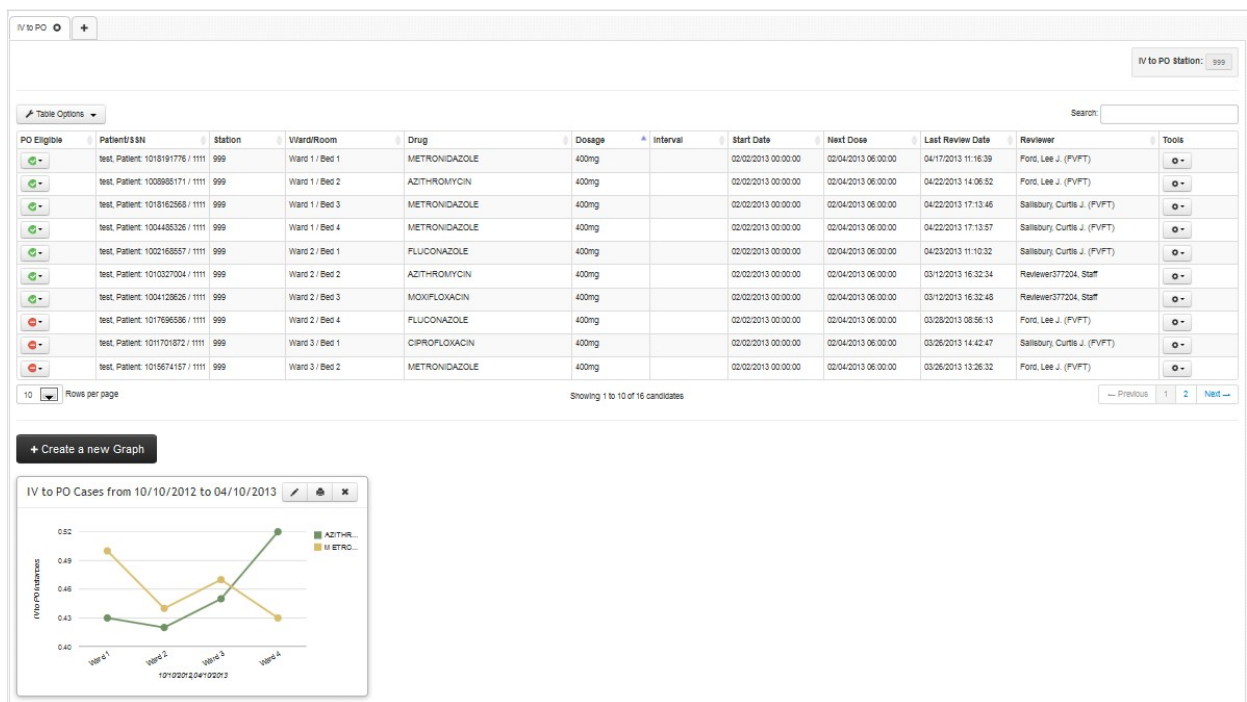
A range of Clinical Analysis Tools are available from this screen. Detailed images from each analysis tool follow.

**Figure 30: SF, Clinical Analysis Tools**



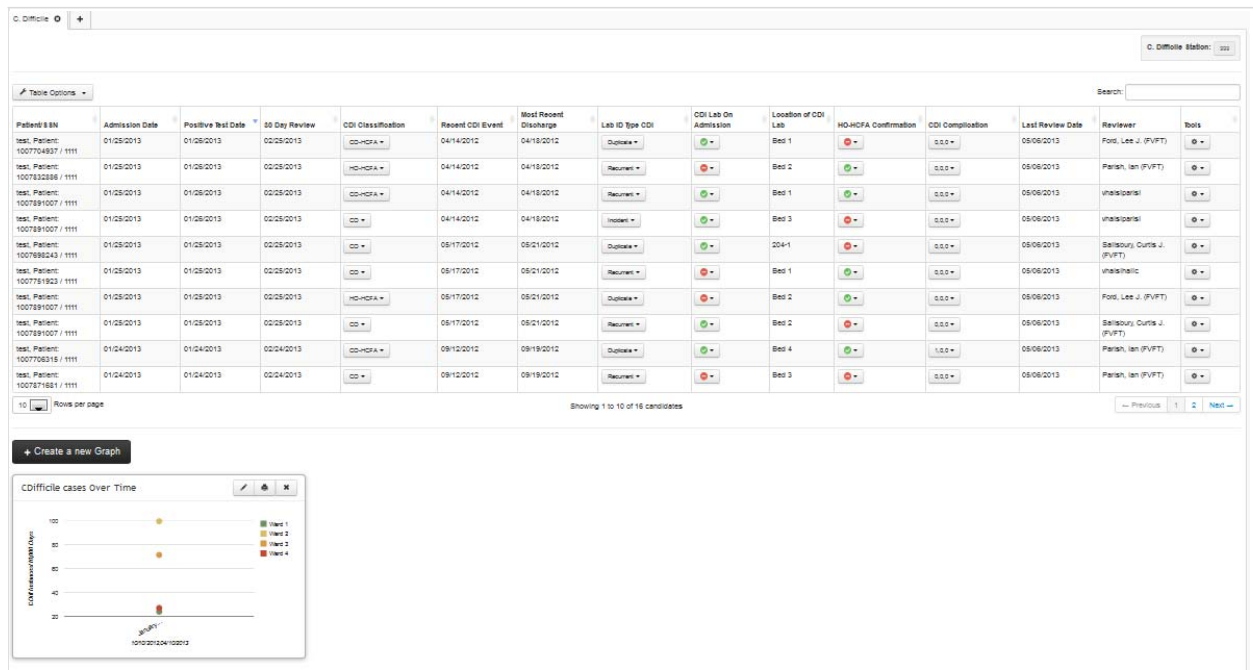
IV to PO Interchange – This screen shows a detailed clinical analysis tool including advanced graphing capabilities.

**Figure 31: IV to PO Interchange**



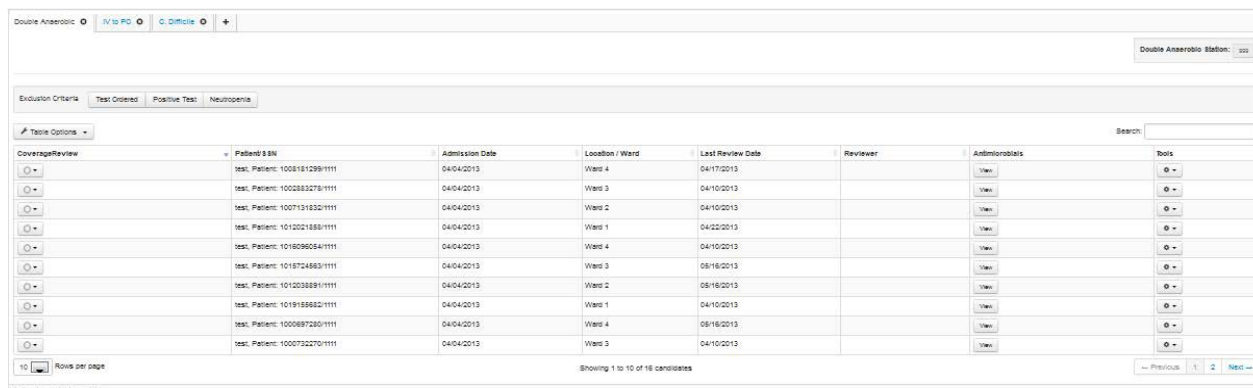
CDIFF – This analytic tool summarizes information related to CDIFF cases. This tool includes both comparison and graphical capabilities at various levels of patient aggregation.

**Figure 32: CDIFF**



Double Anaerobics – This tool will be used to assist in the avoidance of double coverage.

**Figure 33: Double Anaerobics**



The Graph Builder screen provides common CPRS graphical functionality in familiar and readily accessible screens.

**Figure 34: Graph Builder**

The screenshot shows a 'Graph Builder' window with two tabs: 'Configure Graph' and 'Enter Criteria'. The 'Configure Graph' tab is active. It contains several sections: 'Graph Type' with line and bar chart icons; 'Graph Theme' with three theme icons; 'Scope' with buttons for 'Time Period', 'Location', and 'Antimicrobials'; and 'X-axis' with buttons for 'Location' and 'Antimicrobials'. The 'Enter Criteria' tab is also visible, showing 'Time Period' (Scope), 'Monthly', 'Quarterly', 'Yearly', 'Select a Date Range', 'Location' (X-axis), 'Select Locations', 'Antimicrobials' (Series), 'Select Antimicrobials', and 'Cancel' and 'Create Graph' buttons.

### **3.2.3.3. Application Screen Interface PF**







Key capabilities which are provide by HMP Patient Facing screens are shown in screen shots below.

The Manage Non VA Medications application entry screen provides a range of categories to guide the veteran as they enter the appropriate information.

**Figure 35: PF Manage Non-VA Medications**

Manage Non-VA Medications > Add New Medication Cancel

What type of medication from outside the VA would you like to add?

-  **Medication Prescribed by a Provider**  
(outside the VA) 
-  **Non-prescribed Medication Purchased Over-The-Counter**  
(like Tylenol, cough syrup, etc.) 
-  **Other Herbal/Supplemental Medication**  
(like Ginseng, St. Johns Wart, multivitamins, Boost, Ensure, etc.) 

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The entry of Non-VA medication information by the veteran proceeds through a guided dialog as shown in the screen below:

**Figure 36: PF, Manage Non-VA Medications**

Manage Non-VA Medications > Add New Medication Cancel

1 What? 2 How Much? 3 Why? 4 Submit

What is the name of the medication you are taking?

ibuprofen Go

What is the **strength** and **form** of the ibuprofen you are taking?

800mg, Tablet, Oral
200mg, Capsule, Oral
100mg, Tablet, Oral
50m/1.25 mL, Drops, Suspension, Oral
400mg, Tablet, Oral
200mg, Tablet, Oral
20 MG, Enteric Coated Capsule

← Previous Next →

The guided dialog culminates in an easy to read summary for the veteran to review and confirm their entered information.

**Figure 37: PF, Guided Dialog**

**Patient Entered Non-VA Meds App**

Manage Non-VA Medications + Add New Medication Cancel

What? How Much? Why? Submit

**ibuprofen**

20 MG, Enteric Coated Capsule  
2 Capsules, Three Times a Day

I take this because I had surgery on my left shoulder 2 weeks ago.

Please review the information you have entered above for accuracy.

**SAVE & SUBMIT**  
Everything here looks correct

Previous Next

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Health Informatics Initiative

### 3.2.3.3.1. System Facing:

**Figure 38: IV to PO Table Screen**

IV to PO +

IV to PO Station: 999

Table Options Search

PO Eligible	Patient's SSN	Station	Ward/Room	Drug	Dosage	Interval	Start Date	Next Dose	Last Review Date	Reviewer	Tools
	test.Patient: 1018191776 / 1111	999	Ward 1 / Bed 1	METRONIDAZOLE	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	04/17/2013 11:16:39	Ford, Lee J. (FVFT)	
	test.Patient: 100898171 / 1111	999	Ward 1 / Bed 2	AZITHROMYCIN	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	04/22/2013 14:06:52	Ford, Lee J. (FVFT)	
	test.Patient: 1018162568 / 1111	999	Ward 1 / Bed 3	METRONIDAZOLE	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	04/22/2013 17:13:46	Sallsbury, Curtis J. (FVFT)	
	test.Patient: 1004485326 / 1111	999	Ward 1 / Bed 4	METRONIDAZOLE	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	04/22/2013 17:13:57	Sallsbury, Curtis J. (FVFT)	
	test.Patient: 1002168857 / 1111	999	Ward 2 / Bed 1	FLUCONAZOLE	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	04/23/2013 11:10:32	Sallsbury, Curtis J. (FVFT)	
	test.Patient: 1010327004 / 1111	999	Ward 2 / Bed 2	AZITHROMYCIN	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	03/12/2013 16:32:34	Reviewer377204, Staff	
	test.Patient: 1004128626 / 1111	999	Ward 2 / Bed 3	MOXIFLOXACIN	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	03/12/2013 16:32:48	Reviewer377204, Staff	
	test.Patient: 1017696586 / 1111	999	Ward 2 / Bed 4	FLUCONAZOLE	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	03/28/2013 08:56:13	Ford, Lee J. (FVFT)	
	test.Patient: 1011701872 / 1111	999	Ward 3 / Bed 1	CIPROFLOXACIN	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	03/26/2013 14:42:47	Sallsbury, Curtis J. (FVFT)	
	test.Patient: 1015674157 / 1111	999	Ward 3 / Bed 2	METRONIDAZOLE	400mg		02/02/2013 00:00:00	02/04/2013 06:00:00	03/26/2013 13:26:32	Ford, Lee J. (FVFT)	

10 Rows per page Showing 1 to 10 of 16 candidates Previous 1 2 Next

**Table 14: IV to PO Table Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
--------------------------------------	---	---	----------

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
PO Eligible	In development	In development	Determination of the PO Eligibility
Patient/SSN	In development	In development	Read only
Station	In development	In development	Read only
Ward/Room	In development	In development	Read only
	In development	In development	Read only
Dosage	In development	In development	Read only
Interval	In development	In development	Read only
Start Date	In development	In development	Read only
Next Dose	In development	In development	Read only
Last Review Date	In development	In development	Read only
Reviewer	In development	In development	Read only
Tools	In development	In development	In development

**Figure 39: C Difficile Table Screen**

Patient ID/SSN	Admission Date	Positive Test Date	30 Day Review	CDI Classification	Recent CDI Event	Read/Recent Discharge	Lab ID Type CDI	CDI Lab On Admission	Location of CDI Lab	HQ-HCFA Confirmation	CDI Complication	Last Review Date	Reviewer	Tools
test: Patient: 1007704937 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI-HCFA	04/14/2012	04/18/2012	Options	+	Bed 1	+	0.00	05/06/2013	Foris, Lee J. (PVFT)	+
test: Patient: 1007522886 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI-HCFA	04/14/2012	04/18/2012	Recurse	+	Bed 2	+	0.00	05/06/2013	Parish, Ian (PVFT)	+
test: Patient: 1007591007 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI-HCFA	04/14/2012	04/18/2012	Recurse	+	Bed 1	+	0.00	05/06/2013	Parish, Ian (PVFT)	+
test: Patient: 1007591007 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI	04/14/2012	04/18/2012	Insert	+	Bed 3	+	0.00	05/06/2013	Parish, Ian (PVFT)	+
test: Patient: 1007591007 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI	05/17/2012	05/21/2012	Options	+	2041	+	0.00	05/06/2013	Seaborn, Curtis J. (PVFT)	+
test: Patient: 1007591007 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI	05/17/2012	05/21/2012	Recurse	+	Bed 1	+	0.00	05/06/2013	Parish, Ian (PVFT)	+
test: Patient: 1007751923 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI	05/17/2012	05/21/2012	Options	+	Bed 2	+	0.00	05/06/2013	Foris, Lee J. (PVFT)	+
test: Patient: 1007591007 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI-HCFA	05/17/2012	05/21/2012	Options	+	Bed 2	+	0.00	05/06/2013	Seaborn, Curtis J. (PVFT)	+
test: Patient: 1007591007 / 1111	01/25/2013	01/26/2013	02/25/2013	CDI	05/17/2012	05/21/2012	Recurse	+	Bed 2	+	0.00	05/06/2013	Parish, Ian (PVFT)	+
test: Patient: 1007706316 / 1111	01/24/2013	01/24/2013	02/24/2013	CDI-HCFA	09/12/2012	09/19/2012	Options	+	Bed 4	+	0.00	05/06/2013	Parish, Ian (PVFT)	+
test: Patient: 1007706316 / 1111	01/24/2013	01/24/2013	02/24/2013	CDI	09/12/2012	09/19/2012	Recurse	+	Bed 3	+	0.00	05/06/2013	Parish, Ian (PVFT)	+

**Table 15: C Difficile Table Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Patient ID/SSN	In development	In development	Read only
Admission Date	In development	In development	Read only
Positive Test Date	In development	In development	Read only

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
30 Day Review	In development	In development	Read only
CDI Classification	In development	In development	
Recent CDI Event	In development	In development	Read only
Recent Discharge	In development	In development	Read only
Lab ID Type CDI	In development	In development	
CDI Lab on Admit	In development	In development	
Location of CDI Lab	In development	In development	Read only
HO-HCFA Confirmation	In development	In development	
CDI Complication	In development	In development	
Last Review Date	In development	In development	Read only
Reviewer	In development	In development	Read only
Tools	In development	In development	

**Figure 40: Double Anaerobics Table Screen**

Coverage/Review	Patient ID/SSN	Admission Date	Location / Ward	Last Review Date	Reviewer	Antimicrobials	Tools
<input type="checkbox"/>	test: Patient: 1008151295/1111	04/04/2013	Ward 4	04/17/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 100283276/1111	04/04/2013	Ward 3	04/10/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 1007131832/1111	04/04/2013	Ward 2	04/10/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 1012021650/1111	04/04/2013	Ward 1	04/22/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 1018096054/1111	04/04/2013	Ward 4	04/10/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 1018724863/1111	04/04/2013	Ward 3	05/16/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 1012038891/1111	04/04/2013	Ward 2	05/16/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 1019155662/1111	04/04/2013	Ward 1	04/10/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 100697230/1111	04/04/2013	Ward 4	05/16/2013		Yes	<input type="checkbox"/>
<input type="checkbox"/>	test: Patient: 1000732270/1111	04/04/2013	Ward 3	04/10/2013		Yes	<input type="checkbox"/>

**Table 16: Double Anaerobics Table Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Coverage Review	In development	In development	Determination of the coverage review
Patient ID/SSN	In development	In development	Read only
Admission Date	In development	In development	Read only
Location/Room	In development	In development	Read only

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Last Review Date	In development	In development	Read only
Reviewer	In development	In development	Read only
Antimicrobials View	In development	In development	
Tools	In development	In development	

**Figure 41: Graph Builder Screen**

The screenshot shows the 'Graph Builder' window with the following sections:

- Configure Graph** and **Enter Criteria** buttons at the top.
- Graph Type**: Two icons representing a line graph and a bar chart.
- Graph Theme**: Three icons representing different visual themes.
- Scope**: A vertical stack of buttons: 'Time Period', 'Location', and 'Antimicrobials'.
- X-axis**: Two buttons: 'Location' and 'Antimicrobials'.
- Time Period**: A dropdown menu currently set to 'Scope', with options 'Monthly', 'Quarterly', and 'Yearly' visible below it.
- Location**: A dropdown menu currently set to 'None', with a 'Select Locations' list below it.
- Antimicrobials**: A dropdown menu currently set to 'None', with a 'Select Antimicrobials' list below it.
- Buttons**: 'Cancel' and 'Create Graph' buttons at the bottom right.

**Table 17: Graph Builder Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Graph Type	In development	In development	Choose either a line or bar graph
Graph Theme	In development	In development	Choose a different theme for your graphs
Scope	In development	In development	Choose the Scope of your graph
X-Axis	In development	In development	

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Time Period	In development	In development	Select a specific date range for the graph
Location	In development	In development	Select one or more locations to graph
Antimicrobials	In development	In development	Select one or more Antimicrobials for the graph

### 3.2.3.3.2. Patient Facing

Figure 42: PF, Homescreen

The screenshot shows a web application interface for 'Non-VA Medication'. At the top, there is a navigation bar with 'Non-VA Medication' and a link to 'Add New Medication'. The main content area has a heading 'What type of medication from outside the VA would you like to add?'. Below this heading are three selectable options, each with an icon and a description:

- Medication(s) prescribed by a Provider (outside the VA)
- Non-prescribed Medication purchased Over The Counter (like Tylenol, cough syrup, etc.)
- Other Herbal/Supplemental Medication (like Ginseng, St. Johns Wort, multivitamins, Boost, Ensure, etc.)

Table 18: Homescreen Screen Description

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Medication(s) prescribed by a Provider	In development	In development	
Non-Prescribed Medication purchased OTC	In development	In development	
Other Herbal/Supplemental Medication	In development	In development	

**Figure 43: PF, Enter Type of Medication Screen**

Non-VA Medication > Add New Medication

What? > How Much & How Often? > Why? > Submit ✓

What is the **name** of the medication prescribed?

Tylenol Go

back next

**Table 19: Enter Type of Medication Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Type of Medication	In development	In development	

**Figure 44: PF, Strength and Form of Medication Screen**

Non-VA Medication > Add New Medication

What? > How Much & How Often? > Why? > Submit ✓

What is the **name** of the medication prescribed?

Tylenol Go

The **strength** and **form** of the medication I am taking is

800 mg, oral, tablet

back next

**Table 20: Strength and Form of Medication Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Strength and Form of Medication	In development	In development	Select the dosage and form you are taking

**Figure 45: How Much How Often Screen**

The screenshot shows a web application interface for 'Non-VA Medication' with a sub-header 'Add New Medication'. The main content area is titled 'Tylenol'. Below the title, there are two sections: 'Each time you take Tylenol, how much do you take?' with a numeric input field showing '1.0' and a unit dropdown, and 'How often do you take Tylenol?' with a dropdown menu labeled 'Choose...'. At the bottom right, there are 'back' and 'next' buttons. The interface also includes a 'DB Image' placeholder and a 'Submit' button in the top navigation bar.

**Table 21: How Much How Often Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
How much do you take	In development	In development	Enter the amount you take
How often do you take	In development	In development	Enter how often you are taking the amount

**Figure 46: Why Screen**

Non-VA Medication > Add New Medication

What? > How Much & How Often? > Why? > Submit ✓

DB Image Tylenol  
2.0, When my home care provider tel

Why do you take Tylenol?

Enter reason.....

back next

**Table 22: Why Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Reason	In development	In development	Enter a reason for taking the medication

**Figure 47: Submit Screen**

The screenshot shows a web interface for adding new medication. At the top, there's a header 'Non-VA Medication > Add New Medication'. Below it, a navigation bar has four tabs: 'What? >', 'How Much & How Often? >', 'Why? >', and 'Submit ✓'. The main content area displays medication information for 'Tylenol': '800 mg, oral, tablet', '3.5, Three Times a Day', and a note 'I take tylenol for pain'. A 'DB Image' placeholder is on the left. A large blue button labeled 'SAVE & SUBMIT' with a checkmark and the text 'Everything here looks correct' is on the right. Below it, a smaller button says 'back' and another says 'next'. A message at the bottom right says 'Please review the information you have entered above for accuracy.'

**Table 23: Submit Screen Description**

Graphical User Interface (GUI) Field	Table (Database Table that field connects to)	Field (Field in Table that the GUI field connects to)	Comments
Save and Submit	In development	In development	Review the information for accuracy and then save it

#### **3.2.3.4. Application Report Interface**

This section describes and defines the reports that will be available in the user interface, if applicable.

HMP TF: Currently there are no reports available.

HMP SF: Currently there are no reports available.

HMP PF: Currently there are no reports available.

### **3.3. Conceptual Infrastructure Design**

This document refers to the infrastructure and design HMP developers are creating for development and pilot-site use. Using agile development methodologies, the HMP team will formulate a nationally relevant conceptual infrastructure design only after it has vetted the feasibility of its internal and pilot-site-facing designs. Currently, the infrastructure design is still under development review.

HMP provides a Collaborative Development site for communications between developers and the Pilot sites. This toolset is detailed in the screen shots below. For reference, these screen shots are dated 5/2013.

The Home screen shown below is the portal for developer and Pilot Site users to coordinate activities.

**Figure 48: Pilot Site Partners Home Screen**

Image redacted








This screen enables reporting and tracking of defects found during the HMP software development process.

**Figure 49: Submitting Defects Screen**

**Submitting Defects**

You will be using a web based defect reporting tool called Bonfire. Once a defect is reported using Bonfire, it will automatically be entered into the issues database. The defects will be reviewed by the development team. You will be able to see a summary of issues on this page in the table below.

**Active Defects**

Type	Summary	Reporter	Fixversion	Status	Created	Description
	<a href="#">Bug: Site: Very often, I receive request errors.</a>	Andy Mosley	P23 JSON Views	 Backlog	30/May/12	Very often, I receive request errors. Multiple occurrences over multiple log-ins. Sometimes reloading resolves, often it does not and I must log off and start over. It
	<a href="#">Bug: Search Functionality doesn't display search result</a>	Bharath Kannan	P24 EXTJS4.1, PL Kick	 Backlog	30/May/12	I was searching for a specific test: CREAT and it did not display in the search result
	<a href="#">Bug: Site: Patient has CBC lab result since CPRS. Not available in P-18.</a>	Andy Mosley	P23 JSON Views		30/May/12	lab result since CPRS. Not CBC resulted on
	<a href="#">Bug: Error on login</a>	Beth Wodzinski	P26 Target			g in at nnovations.us:8080 e screen shot
	<a href="#">Bug: Search: Partial searching does not appear to work.</a>	Honey Chipman	P24 EXTJS			s a procedure titled eached on "tonsil" and If I search "tonsilectomy" I ult returned referencing the

Asynchronous communication between pilot site team and development team

This is the development partner's home screen; it enables technical discussions between developers.

### **Figure 50: Home Screen**

Image redacted

This screen enables discussion between members of the field collaborative team to review application designs including mockups and workflows.

### **Figure 51: Home Screen**

Image redacted

Voting is supported for decision support.

### **Figure 52: Voting Screen**

Image redacted

Bulletin board is supported to enable free flowing communication within the development community.

## **Figure 53: Bulletin Board**

Image redacted

### **3.3.1. System Criticality and High Availability**

The specific details regarding these requirements are still under development however it has been determined that the systems will be high in criticality and availability for HMP. This section will be updated as details are finalized.

The service oriented architecture of the HMP projects naturally lends itself to the horizontal and vertical scaling necessary for highly available systems, by providing for redundancies across software service points as well as entire machines. In addition having multiple instances of each component provides the option for load-balancing to better utilize the capacities of the hardware systems.

These nodes in the HMP system will be able to be highly geographically distributable and will, via the service bus (or web server), utilize the closest service end-point.

### **3.3.2. Special Technology**

Not applicable

### **3.3.3. Technology Locations**

Currently located in the Region 1 Data Centers in Denver and Sacramento for pilot site testing. Locations for national release are to be determined.

Additionally nodes are located in the AITC in Austin. Locations for national release are yet to be determined.

**Table 24: Technology Location Details**

<b>Technology Component Production 1</b>	<b>Location</b>	<b>Usage</b>
Workstations		
Special Hardware		
Interface Processors		
Legacy Mainframe		
Legacy Application Server		
Legacy Databases		
Other		

**Table 25: SF and PF, Technology Locations**

<b>Technology Component Production 2</b>	<b>Location</b>	<b>Usage</b>
System Facing UAT	VHACDWTSPS03	Windows 2008 Server R2 SP1 Processor: Intel XEON dual core @ 3.07GHz RAM: 2.07 GB HDD: 39.8GB with 23.1GB free
Patient Facing UAT	VHACDWTEST05	Windows 2008 Server R2 SP1 Processor: Intel XEON dual core @ 3.07GHz RAM: 2.34GB HDD: 39.8GB with 7.94GB free

**Table 26: Certification Technology Locations**

<b>Technology Component Certification</b>	<b>Location</b>	<b>Usage</b>
NA		

**Table 27: Education Technology Locations**

Technology Component Education	Location	Usage
NA		

**Table 28: Test Technology Locations**

Technology Component Test	Location	Usage
System Facing Test Server	VHACDWTEST04	Windows 2008 Server R2 SP1 Processor: Intel XEON dual core @ 3.07GHz RAM: 3.21GB HDD: 49.8GB with 10.1GB free
Patient Facing Test Server	VHACDWTEST09	Windows 2008 Server R2 SP1 Processor: Intel XEON dual core @ 3.07GHz RAM: 2.37GB HDD: 39.8GB with 7.78GB free

**Table 29: Development Technology Locations**

Technology Component Development	Location	Usage
Dev Server	VHACDWTSPS02	Windows 2008 Server R2 SP1 Processor: Intel XEON dual core @ 3.07GHz RAM: 8GB HDD: C:\ 159 GB with 63.6GB free D:\ 39.9GB with 3.25 GB free
Dev Server	VHACDWTSPS04	Windows 2008 Server R2 SP1 Processor: Intel XEON dual core @ 3.07GHz RAM: 8GB HDD: 49.8GB with 7.18GB free

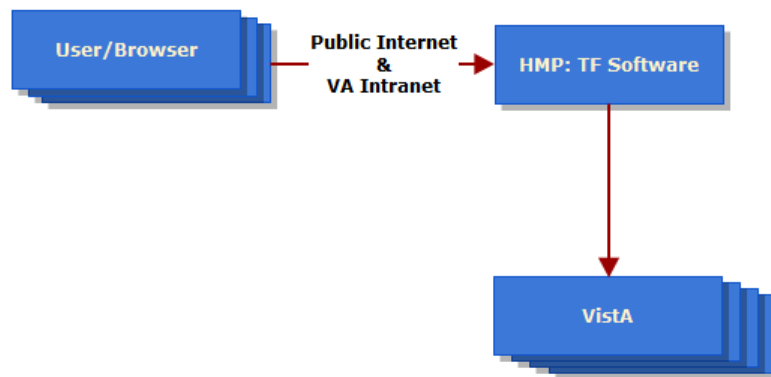
### 3.3.4. Conceptual Infrastructure Diagram

The following diagram illustrates the HMP network topology for the San Diego pilot site. Long term (national deployment) plans for the HMP server's location are still in development.

**Figure 54: HMP TF**

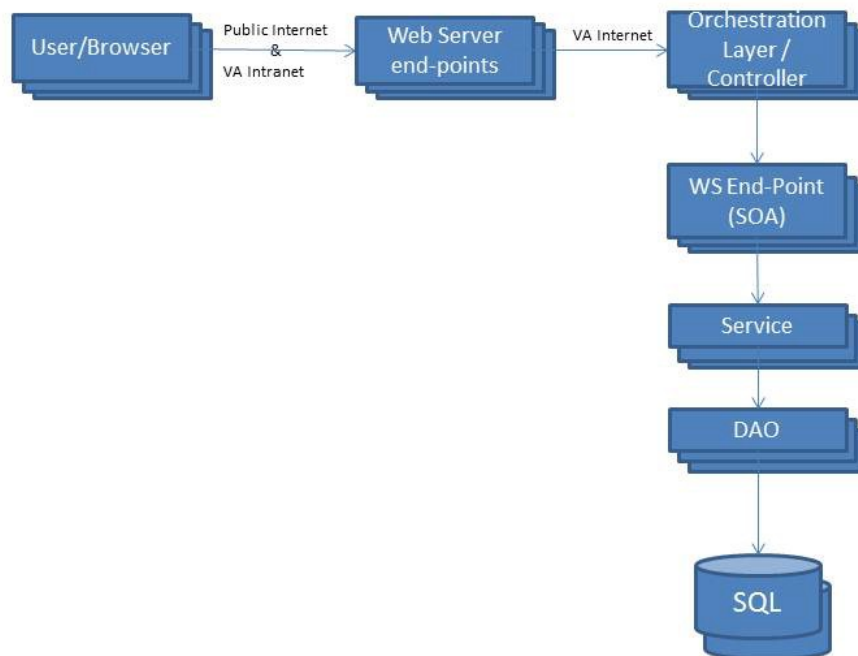
**HMP:TF Infrastructure Diagram**

---



**Figure 55: HMP SF and HMP PF**

## HMP:SF & PF Infrastructure Diagram



### 3.3.4.1. Location of Environments and External Interfaces

## Figure 56: Conceptual Networks and Environments

Image redacted

### 3.3.4.2. Conceptual Production String Diagram

This is under development and will be updated prior to national release.

## 4. System Architecture

### HMP: TF System Architecture:

Several issues and solutions were identified early on as the architectural drivers for TF HMP.

**Table 30: Architectural Drivers**

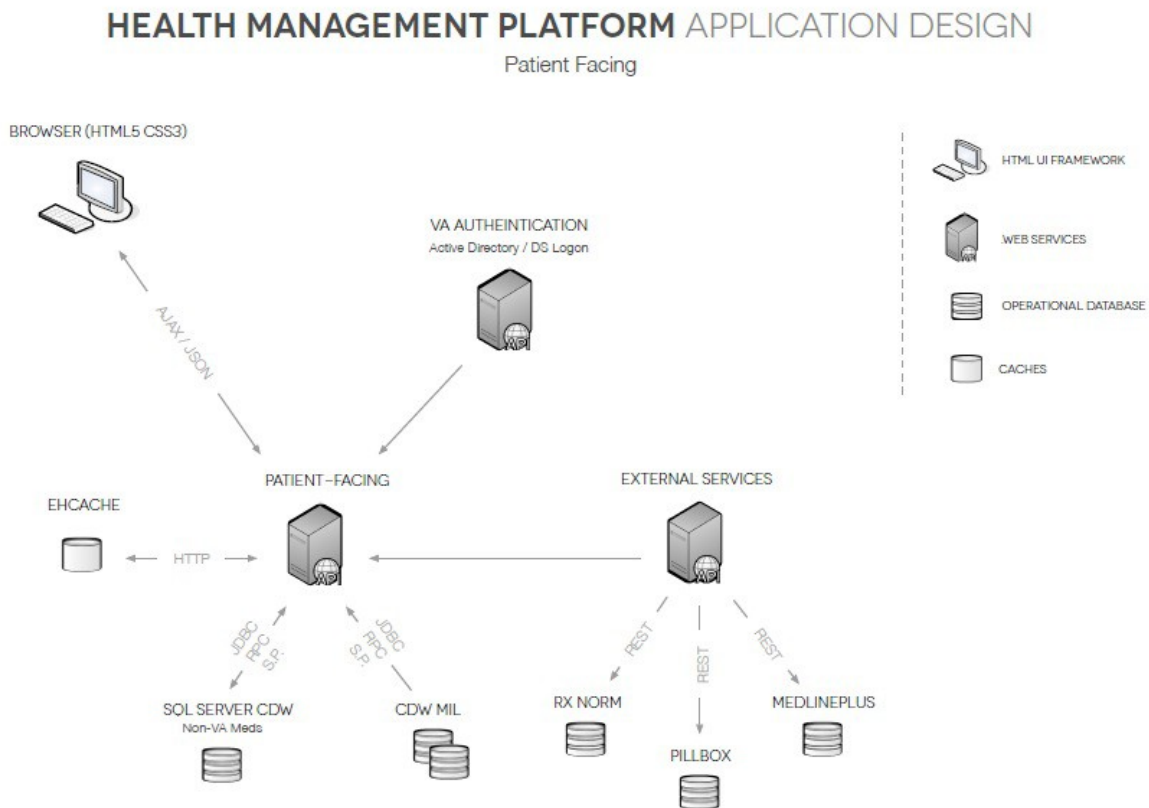
<b>Issues</b>	<b>Solutions</b>
Monolithic applications that require client	A modular user interface (UI) that VA can

deployment	deploy via the Web
Tightly-coupled business logic	Decoupled business services
Inaccessible business logic	Accessible business logic via new VistA Web services
Proprietary VistA data schemas and non-coded data	Standards-based data schemas and coded, computable data
Local-VA-facility-data-centric infrastructure (the system anticipates data from local sources)	Patient-data-centric infrastructure (the system anticipates data from multiple sources)
Closed, fairly static system	Open, extensible system

Figure 57: TF Architecture

## HMP: PF System Architecture:

Figure 58: PF System Architecture



The HMP: PF system architecture is comprised of a web application front-end with a JAVA web server back-end.

The web application front-end is implemented as an HTML5/CSS3 system utilizing AJAX and JSON to communicate with the Java web-server back-end. Security is provided by utilizing the HTTPS protocol when encryption is needed for data protection. Plain-text HTTP is used when the protection of encryption is not needed.

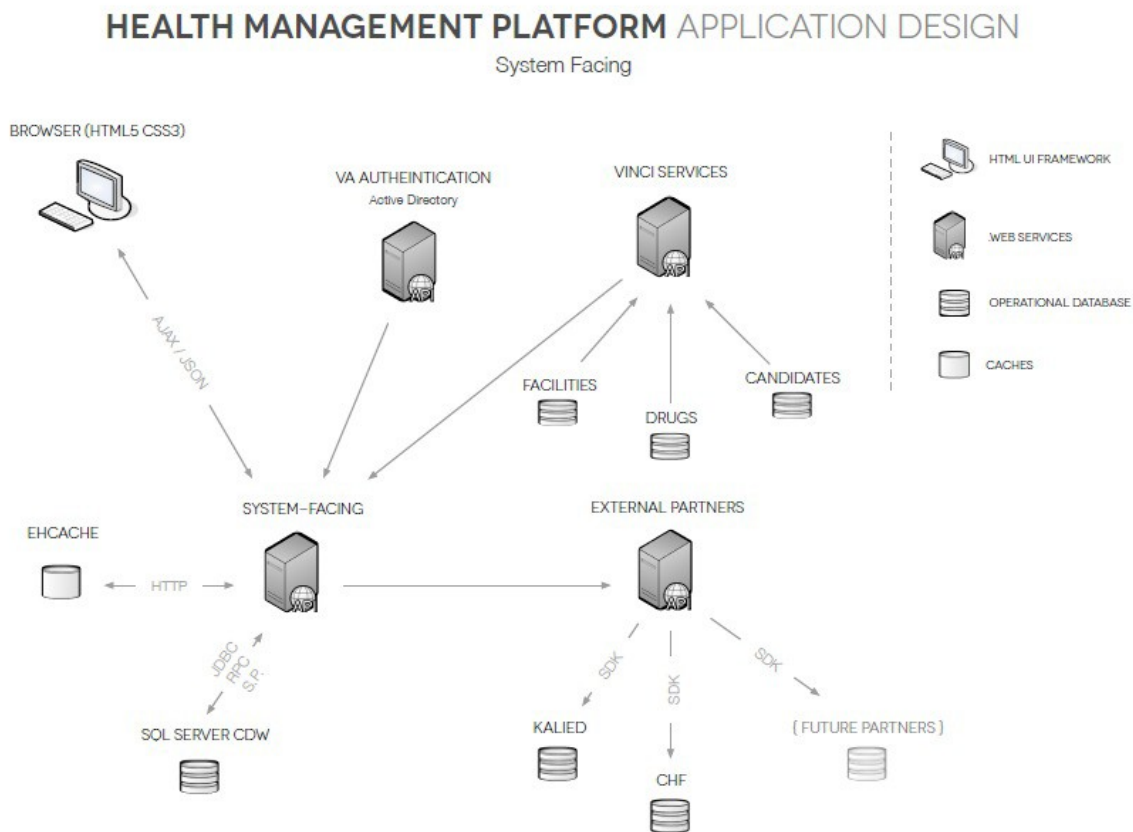
The HMP: PF server authenticates the user as they log in to the system via external VA services that provides authentication and authorization. HMP: PF currently utilizes both the internal VA Active Directory Global Catalog for internal clinicians and VA personnel, and the DSLogon service for the Veteran population.

Utilizing SOA services the HMP: PF server stores patient generated data in a Microsoft SQL Server 2012 database housed within the VA's CDW. When a proper final destination for patient generated data is available the HMP: PF application will save that patient entered data there. To enhance system responsiveness Cache, an inline caching mechanism, is utilized to reduce the number of long-haul round trips to the SQL database.

The HMP: PF server utilizes external services which provide standardization of terminology and medication details, enhanced information, images, drug-drug interactions, and educational literature. These 3rd party data sets are accessed via RESTful interfaces.

## HMP: SF System Architecture:

**Figure 59: SF System Architecture**



The HMP: SF architecture is purposefully similar to the HMP: PF architecture. This was by design and met the architecture and design goals.

As with HMP: PF the HMP: SF system architecture is comprised of a web application front-end with a JAVA web server back-end.

The web application front-end is implemented as an HTML5/CSS3 system utilizing AJAX and JSON to communicate with the Java web-server back-end. Security is provided by utilizing the HTTPs protocol when encryption is needed for data protection. Plain-text HTTP is used when the protection of encryption is not needed.

The HMP: SF server authenticates the user as they log in to the system via external VA services that provides authentication and authorization. HMP: SF currently utilizes the internal VA Active Directory Global Catalog for internal clinicians, healthcare providers and facility support personnel.

Utilizing SOA services the HMP: SF server stores cohort and candidate data in a Microsoft SQL Server 2012 database housed within the VA's CDW. To enhance system responsiveness Cache, an inline caching mechanism, is utilized to reduce the number of long-haul round trips from the server to the SQL database and back.

The HMP: SF server utilizes external VINCI services which provide cohorts list, facility details, patient candidates for specific healthcare tools and actions.

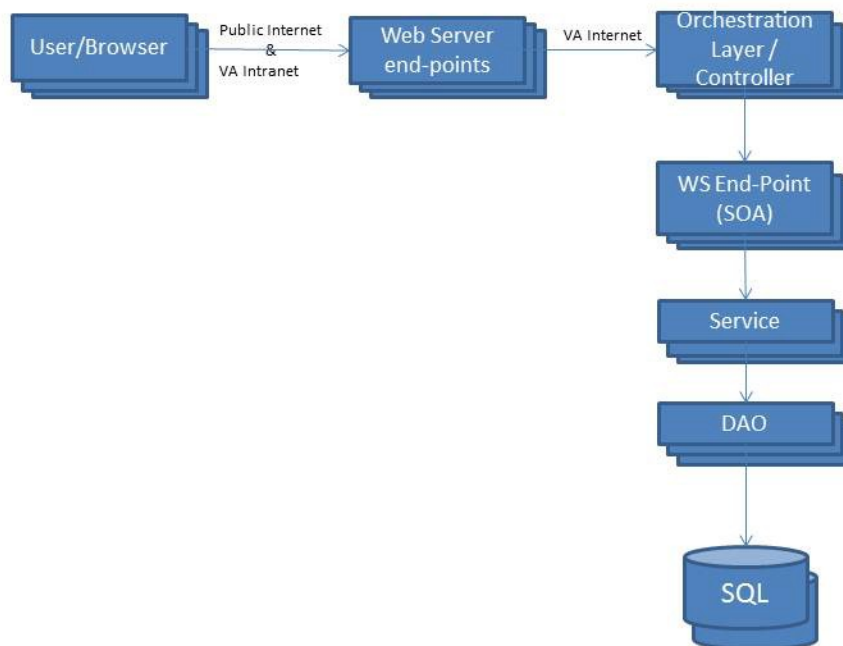
HMP: SF also allows 3<sup>rd</sup> party developers to integrate their products into the HMP: SF platform via an SDK. Once integrated into the HMP: SF platform these 3<sup>rd</sup> party software products are then presented to the end-user. The integration mechanism employed is discussed in [Section 6.2 Software Detailed Design](#)

## 4.1. Hardware Architecture

HMP: PF and HMP: SF has no specialized hardware requirements. The systems are a suite of software products that can be deployed on 1-to-N nodes. Each node can have 1 or more of the software elements installed for: regional localization, separation for scalability, redundancy for both fault tolerance and scalability, or full replication.

**Figure 60: SF and PF, Infrastructure Diagram**

### HMP:SF & PF Infrastructure Diagram



This diagram represents function SOA elements. There will be many users with various browsers accessing the system. For HMP: PF this hardware is owned and operated by the Veterans themselves. For HMP: SF this hardware will be VA/Facility/Contractor owned equipment which has been allowed access to the VA internal networks. Web Server end-points can be deployed to 1 or more nodes providing local access to the entry point to the HMP systems. The Orchestration/Controller layer facilitates utilizing the proper web service end-points, shortest hop or lowest load, for the proper performance of the software. The WS SOA End-Points can be deployed singularly or in combination on 1 or more nodes as described above. Similarly the Service and Data Access Object (DAO) layers can be installed on 1 or more node. As can the SQL database engines.

HMP: TF:

VM Ware

RedHat Enterprise Linux

**Figure 61: TF, Infrastructure Diagram**

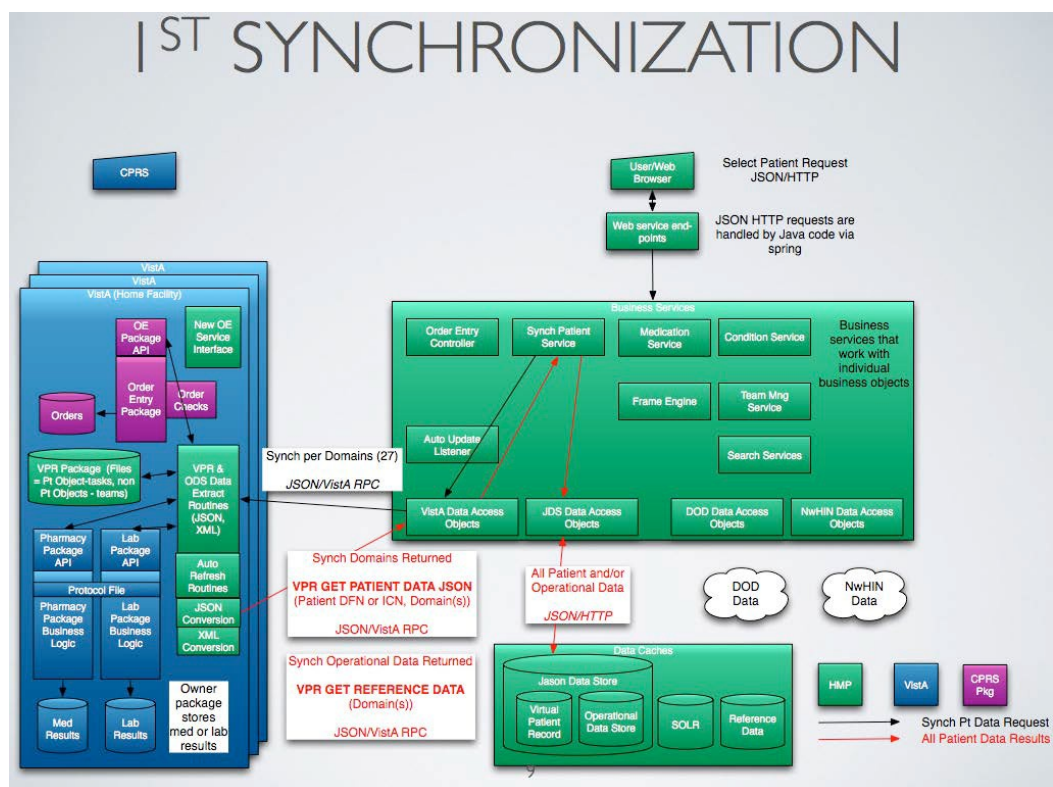
Image redacted

## **4.2. Software Architecture**

### **HMP TF**

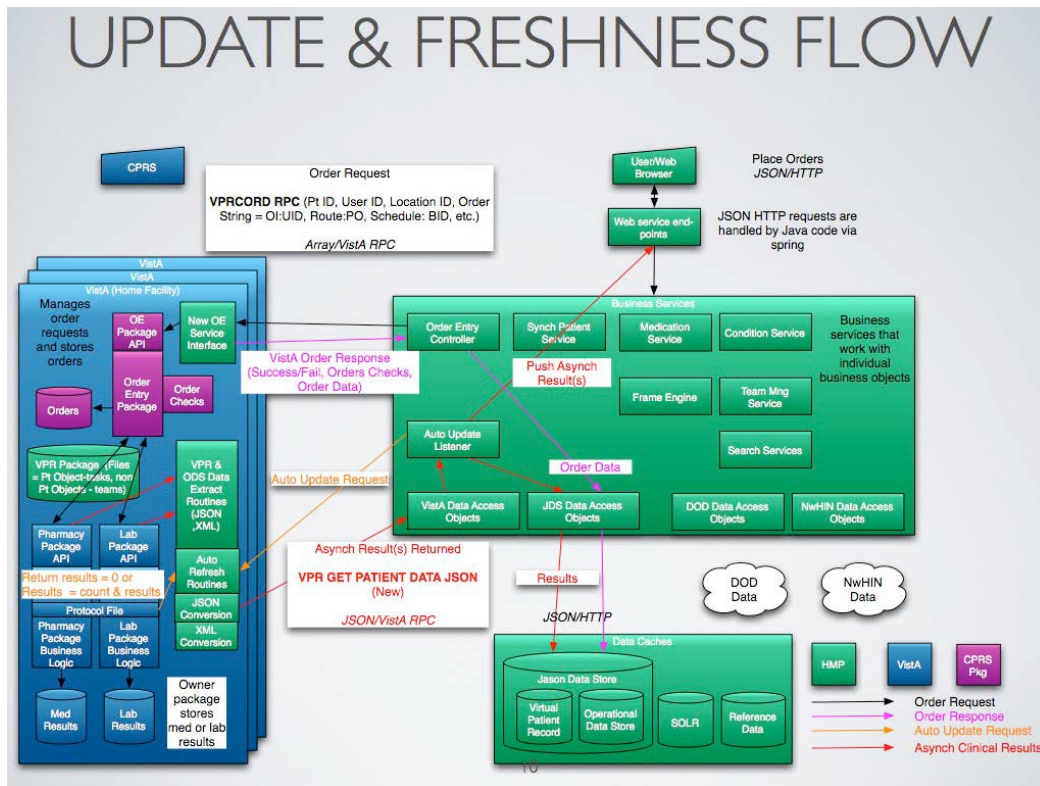
The authoritative data source for VA patient data is the patient data stored in the VistA database. Initially, a list of patients is created in TF; VPR RPCs are accessed to extract the patient data from VistA and stored in the VPR in the JSON Data Store.

Figure 62: TF, Software Architecture



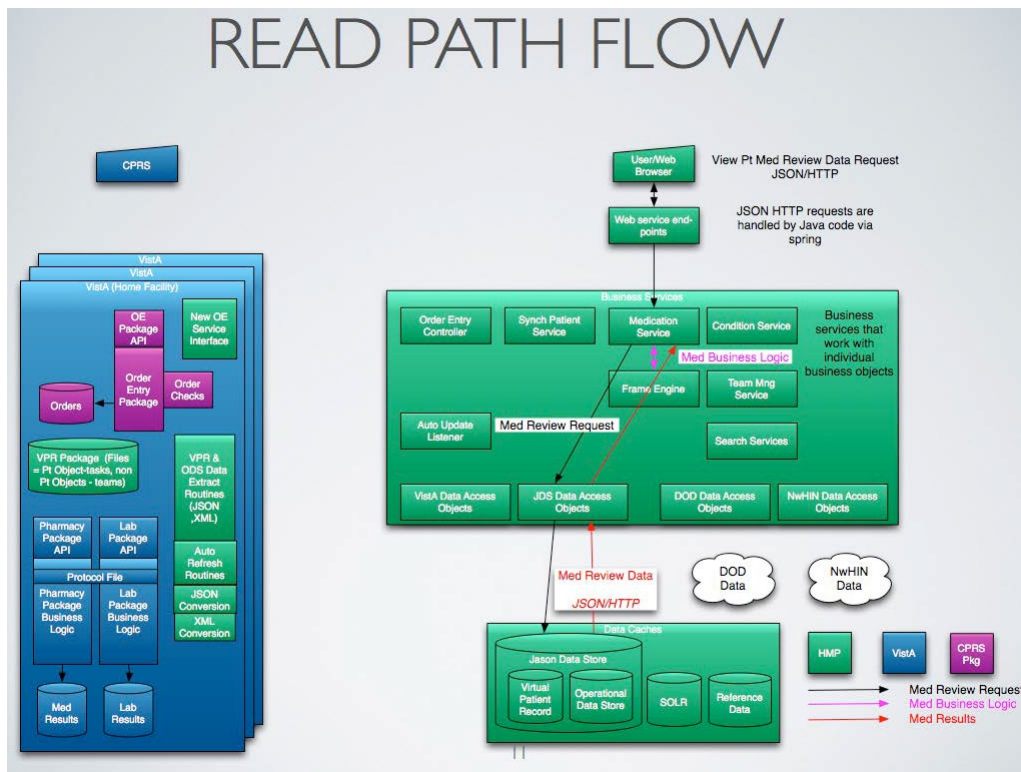
When an order is placed in the TF application, TF interfaces with the Order Entry package in VistA to create a valid order. The VPR is not updated during this process. If TF is configured for an automatic update, the order will be added to the VPR as the result of a request for fresh data. If TF is not configured for automatic update, a user can manually update an individual patient or a group of patients.

**Figure 63: TF, Software Architecture**



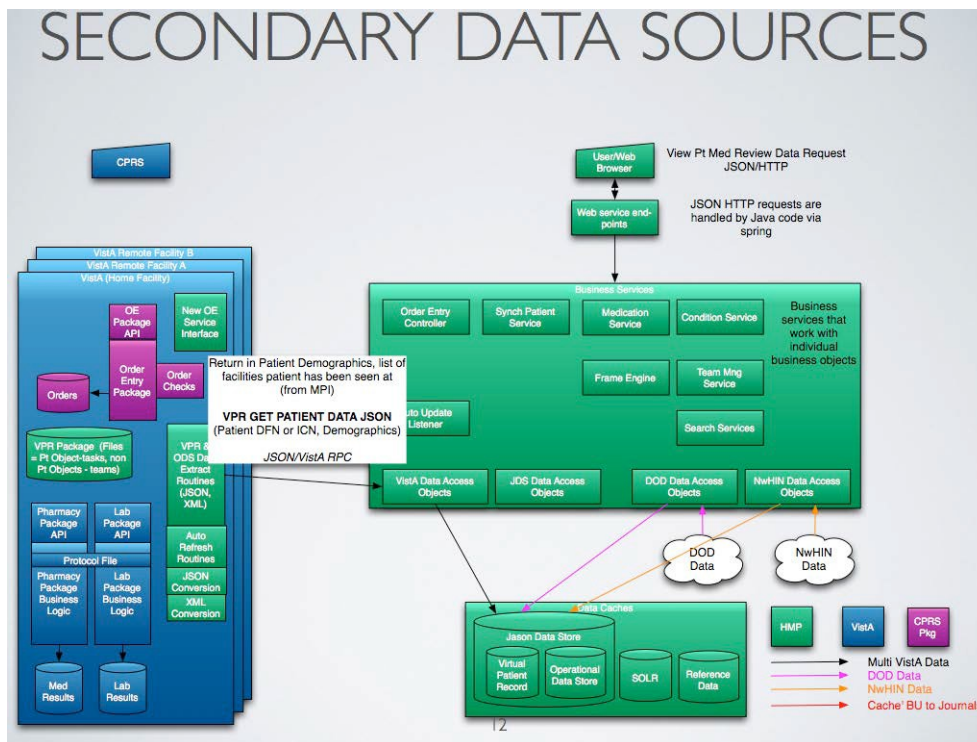
When patient data is displayed in TF, the data is retrieved from the VPR in the JSON Data Store.

**Figure 64: TF, Software Architecture**



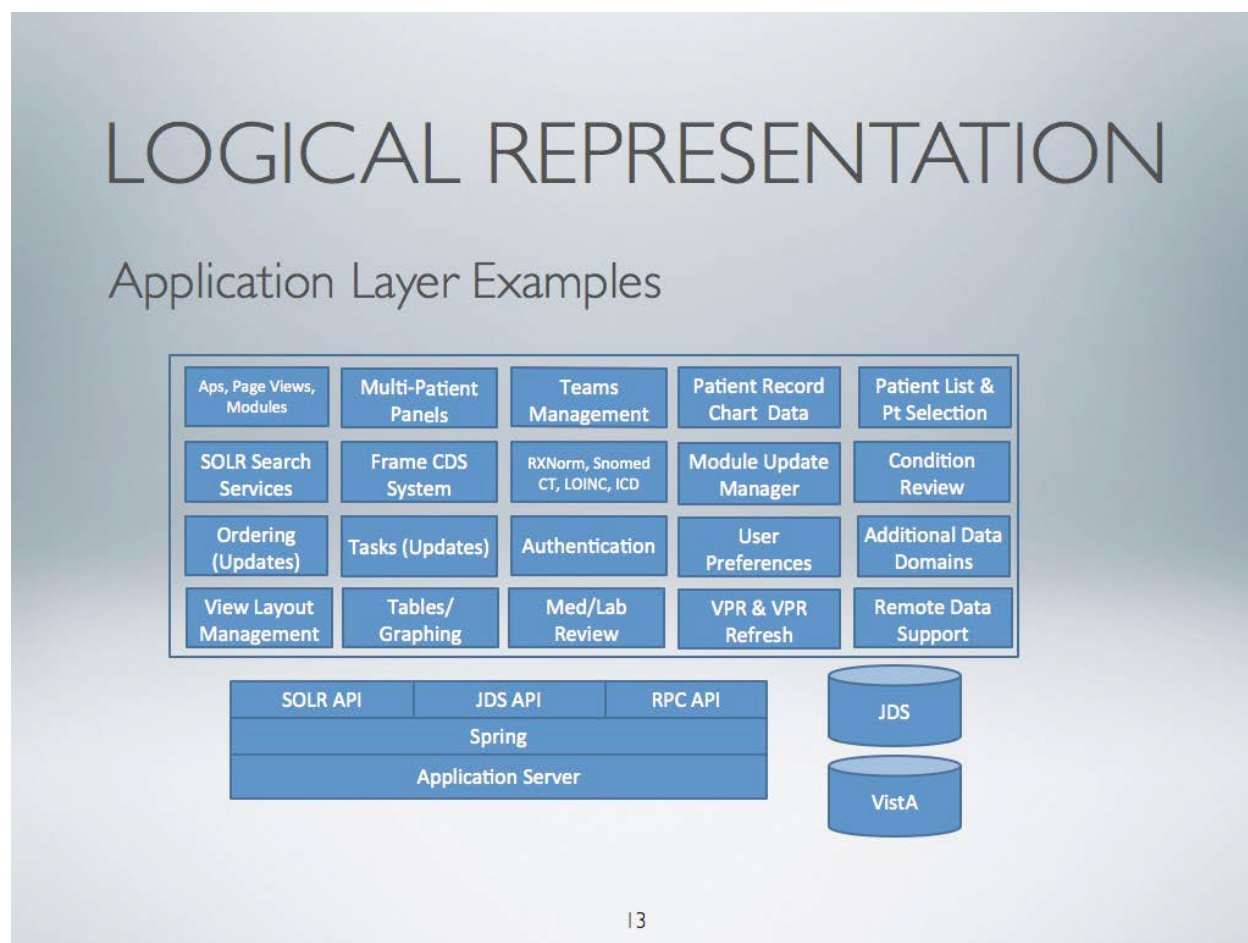
The authoritative data source for VA patient data is the patient data stored in the VistA database. In addition to VistA, patient health data can come from sources outside the VA, such as DoD and NwHIN, a source for data from other health agencies.

**Figure 65: TF, Software Architecture**



This diagram shows the logical representation of TF application layers.

**Figure 66: TF, Application Layers**



HMP: PF and HMP: SF is implemented with properly similar architectures. Each is implemented with a Java 1.7 and open-source based technology stack. Having been developed using Java this system can run on a variety of Operating Systems, however specific decision require the use of Windows to facilitate Active Directory based authentication. Development is performed utilizing a standardized toolset comprised of: Eclipse for software editing and debugging, Maven for building and generating WAR release files, Jenkins for automated build and deployment, Nexus as an artifact repository.

The required software for the support of the server-side systems are:

- Microsoft SQL Server 2012 – Neither open source nor Java based but an intrinsic part of the system.
- Apache Tomcat 6 – A Java-centric web server.
- MAVEN 3.0.4 – the industry standard build automation system for Java.
- Jenkins 1.500 – provides continuous integration services for Java software development. (Used with MAVEN)
- Java JDK 7 – The chosen version of the Java Development Kit.

- Hibernate 4.1.7 – a framework for mapping an OO model to a traditional relational database.
- JAXB 1.2 – provides the ability to marshal Java obj into XML and the inverse.
- Spring 3.1.2 – framework for automatic POJO/class “plumbing”, security, authentication and sessioning.
- JDOM 2.0.2 – Java Document Object Model for XML. Supports XPath and XSLT.
- Jaxen 1.1.3 – Java XPath support library.
- Apache Commons 2.x.x – The purpose of the Commons is to provide reusable, open source Java software.
- Log4j 1.2.16 – A standard logging facility.
- cglib 2.2 – a powerful, high performance code generation library, operates at runtime.
- jackson 1.5.3 – multi-purpose library for processing the JSON data format.
- java mail 1.4.5 – Oracle provided platform and protocol-independent framework to deal with mail/msg’ing.
- testNG 6.3.1 – a testing framework, superior to JUnit and NUnit. (More powerful and easier to use.)
- xerces 2.10.0 – a high performance, fully compliant XML parser from Apache.
- xalan 2.7.1 – an XSLT processor for transforming XML docs into HTML/text/other XML document types.
- ehCache 2.6.0 – a widely-used cache for boosting performance, offloading your database, adding scalability.
- Com4j 1.0 – allows Java to seamlessly interoperate with MS Component Object Model. (AD integration)

The required software for the support of the browser UI portions of the systems are:

- HTML5 – A broadly accepted version of HTML with common mobile framework.
- CSS3 – This is the current style sheet syntax.
- JavaScript – Custom in-house work as well as 3<sup>rd</sup> party libraries.
  - JSON – Standard for taking advantage of object based notation directly.
  - jQuery – Standard library for accessing and traversing DOM elements.
  - AJAX – Live active updating interface
  - Mustache.js – Used for templating to make JavaScript to HTML dynamic.
  - Datatables.js – Provides grid functionality including sort, hide column, etc.
  - Bootstrap – Full User Interface library and functionality.
  - Bootstrap jQuery-ui-fileupload – Provides async file upload.

- Bootstrap BWizard – A multi-page wizard component.
- Chosen.js – Drop-down widgets and selection mechanisms.
- Datepicker.js – A 508 compliant calendar/date selector.

## 4.3. Communications Architecture

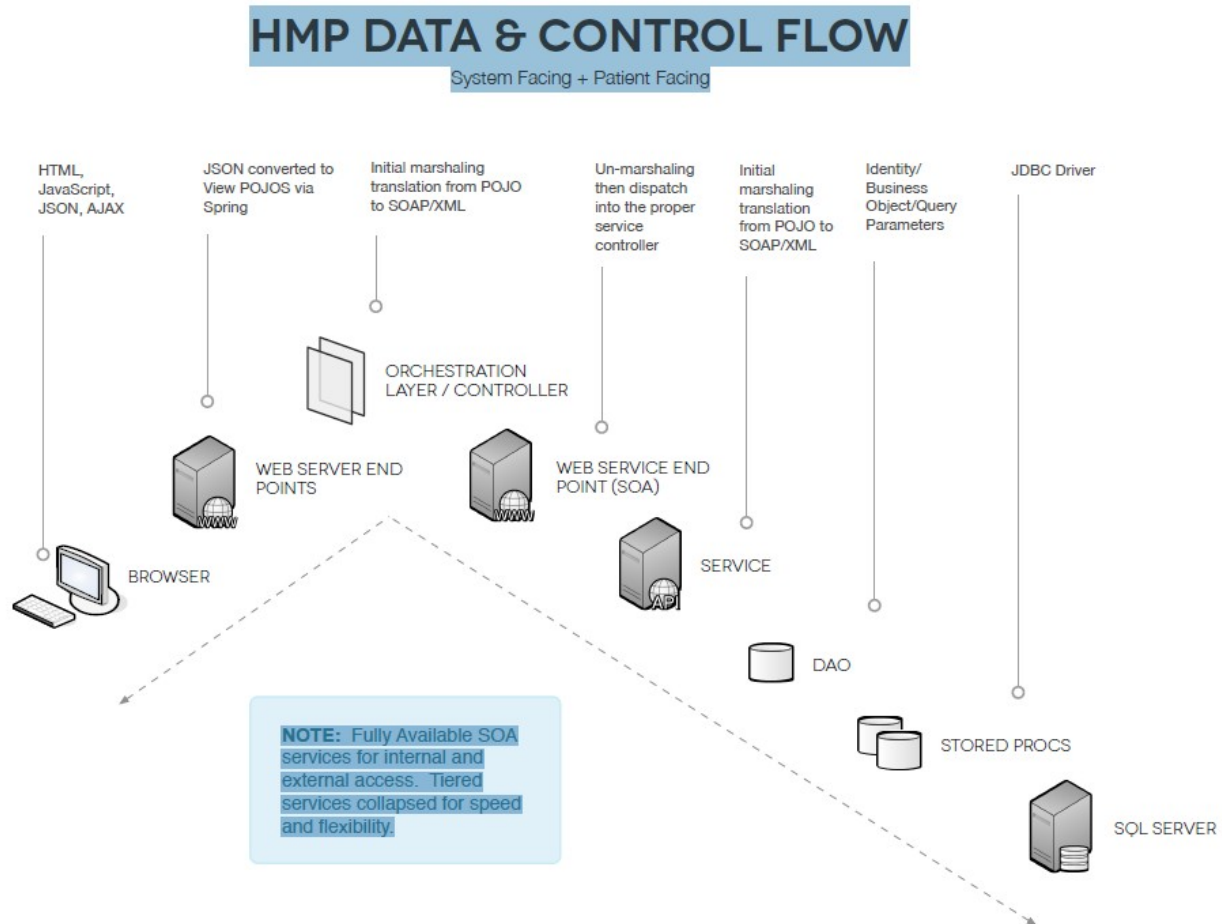
HMP TF: communications architecture for the pilot sites is listed below.

### **Figure 67: TF, Communications Architecture**

Image redacted

For the HMP national release this communications architecture will be customized for each site that is using the software. It is recommended that the server be collocated on the same LAN as Vista to eliminate the need for traffic over a WAN.

**Figure 68: SF and PF, Data and Control Flow**



HMP: PF and HMP: SF use standard TCP/IP protocols for all communications, and those protocols that extend from it, most notably Hypertext Transport Protocol (HTTP). HTTPs is used when secure data transfer is needed, and plain-text HTTP when it is not required.

Communication within the system behaves as depicted within the diagram in this section.

## 5. Data Design

HMP: TF uses Vista for the authoritative Data source.

HMP: SF uses CDW for the authoritative Data source.

HMP: PF data store is still to be determined

## 5.1. DBMS Files

HMP TF:

HMP TF has created two new DBMS files in VistA so the application can collect and store data that will persist between user login sessions.

The new VistA file 560.1 VPR Patient Object stores patient-related data that is entered into the CPE so it will persist between login sessions. This data does not exist in legacy VistA files and is only available to the TF application.

The new VistA file 560.11 VPR Object stores data that is entered into the TF application and is *not* associated with a patient so it will persist between login sessions. This data does not exist in legacy VistA files and is only available to the TF application.

HMP TF has created two new DBMS files in VistA so the application can collect and store data that will persist between user login sessions.

The new VistA file 560.1 VPR Patient Object stores patient-related data that is entered into the CPE so it will persist between login sessions. This data does not exist in legacy VistA files and is only available to the TF application.

The new VistA file 560.11 VPR Object stores data that is entered into the TF application and is *not* associated with a patient so it will persist between login sessions. This data does not exist in legacy VistA files and is only available to the TF application.

STANDARD DATA DICTIONARY #560.11 -- VPR OBJECT FILE  
MAY 23, 2013@18:00:37 PAGE

1  
STORED IN ^VPR(560.11, (302 ENTRIES) SITE: VEHU MASTER UCI: SQA,SQA  
(VERSION 1.0)

DATA ELEMENT	NAME TITLE	GLOBAL LOCATION	DATA TYPE
-----------------	---------------	--------------------	--------------

-----

--

DD ACCESS: @  
RD ACCESS: @  
WR ACCESS: @  
DEL ACCESS: @  
LAYGO ACCESS: @  
AUDIT ACCESS: @

CROSS REFERENCED BY: UID(B)  
CROSS REFERENCED BY: COLLECTION(C)

560.11,.01 UID 0;1 FREE TEXT (Required)

INPUT TRANSFORM: K:\$L(X)>63!(\$L(X)<3)!'(X'?1P.E) X  
 LAST EDITED: NOV 29, 2012  
 HELP-PROMPT: Answer must be 3-63 characters in length.  
 DESCRIPTION: The fully specified Universal ID string for this object.

TECHNICAL DESCR: urn:va:{collection}:{systemId}:{ien}

CROSS-REFERENCE: 560.11^B  
 1)= S ^VPR(560.11,"B",\$E(X,1,63),DA)=" "  
 2)= K ^VPR(560.11,"B",\$E(X,1,63),DA)

560.11,.03 COLLECTION 0;3 FREE TEXT

INPUT TRANSFORM: K:\$L(X)>30!(\$L(X)<3) X  
 LAST EDITED: NOV 29, 2012  
 HELP-PROMPT: Answer must be 3-30 characters in length.  
 DESCRIPTION: The name of the type or kind of data this object belongs to.

CROSS-REFERENCE: 560.11^C  
 1)= S ^VPR(560.11,"C",\$E(X,1,30),DA)=" "  
 2)= K ^VPR(560.11,"C",\$E(X,1,30),DA)

560.11,1 DATA 1;0 WORD-PROCESSING #560.111  
 ( IGNORE " | " )

INPUT TEMPLATE(S):  
 PRINT TEMPLATE(S):  
 SORT TEMPLATE(S):  
 FORM(S)/BLOCK(S):

1

STORED IN ^VPR(560.1, (152 ENTRIES) SITE: VEHU MASTER UCI: SQA,SQA  
(VERSION 1.0)

DATA ELEMENT	NAME TITLE	GLOBAL LOCATION	DATA TYPE
-----			
--			
	DD ACCESS: @		
	RD ACCESS: @		
	WR ACCESS: @		
	DEL ACCESS: @		
	LAYGO ACCESS: @		
	AUDIT ACCESS: @		

(NOTE: Kernel's File Access Security has been installed in this UCI.)

CROSS REFERENCED BY: UID(B)

INDEXED BY: PATIENT & COLLECTION (C)

560.1,.01	UID	0;1 FREE TEXT (Required)
	INPUT TRANSFORM:	K:\$L(X)>63!(\$L(X)<3)!'(X'?1P.E) X
	LAST EDITED:	NOV 29, 2012
	HELP-PROMPT:	Answer must be 3-63 characters in length.
	DESCRIPTION:	The fully specified Universal ID string for this object.
	TECHNICAL DESCR:	urn:va:{systemId}:{DFN}:{collection}:{ien}
	CROSS-REFERENCE:	560.1^B 1)= S ^VPR(560.1,"B",\$E(X,1,63),DA)=" " 2)= K ^VPR(560.1,"B",\$E(X,1,63),DA)
560.1,.02	PATIENT	0;2 POINTER TO PATIENT FILE (#2) (Required)
	LAST EDITED:	NOV 29, 2012
	HELP-PROMPT:	Enter the patient that owns this object.
	DESCRIPTION:	Patient file #2 ien
	RECORD INDEXES:	C (#988)
560.1,.03	COLLECTION	0;3 FREE TEXT
	INPUT TRANSFORM:	K:\$L(X)>30!(\$L(X)<3) X
	LAST EDITED:	NOV 29, 2012
	HELP-PROMPT:	Answer must be 3-30 characters in length.
	DESCRIPTION:	The name of the type or kind of data this object belongs to.

```

RECORD INDEXES:    C (#988)

560.1,1           DATA                               1;0   WORD-PROCESSING #560.101
                  (IGNORE " | ")

FILES POINTED TO           FIELDS

PATIENT (#2)                PATIENT (#.02)
INDEX AND CROSS-REFERENCE LIST -- FILE #560.1                05/23/13
-----
--

File #560.1

Record Indexes:

C (#988)    RECORD    REGULAR    IR    LOOKUP & SORTING
Short Descr: Index by patient, collection
Set Logic:   S ^VPR(560.1,"C",X(1),X(2),DA)=" "
Kill Logic:  K ^VPR(560.1,"C",X(1),X(2),DA)
Whole Kill:  K ^VPR(560.1,"C")
X(1):        PATIENT  (560.1,.02) (Subscr 1) (forwards)
X(2):        COLLECTION (560.1,.03) (Subscr 2) (forwards)

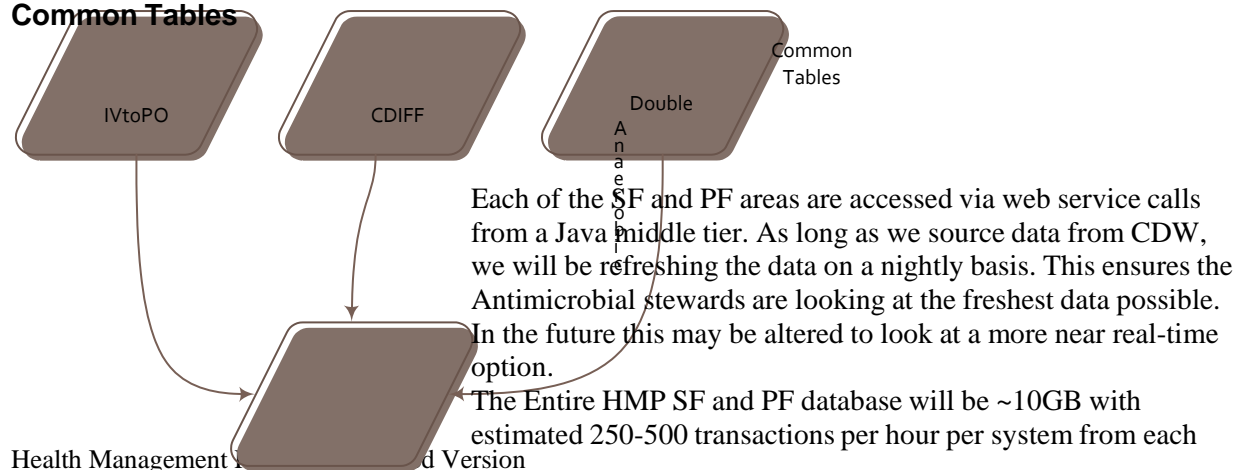
INPUT TEMPLATE(S):
PRINT TEMPLATE(S):
SORT TEMPLATE(S):
FORM(S)/BLOCK(S):

```

#### HMP SF and HMP PF:

In each of the SF and PF areas, a set of common tables are utilized. In SF this includes patient level data like Patient, Facility, Ward, Room, ADT, etc... this data is pulled from CDW. Currently, the PF areas are still being developed. The figure below shows the HMP SF data model.

**Figure 69: SF and PF, Common Tables**



sub-system.

HMP is a modular, n-tier design, featuring service, interface and component abstraction as well as component reuse. The design of each of the three major components of HMP is detailed below.

## **5.2. Non-DBMS Files**

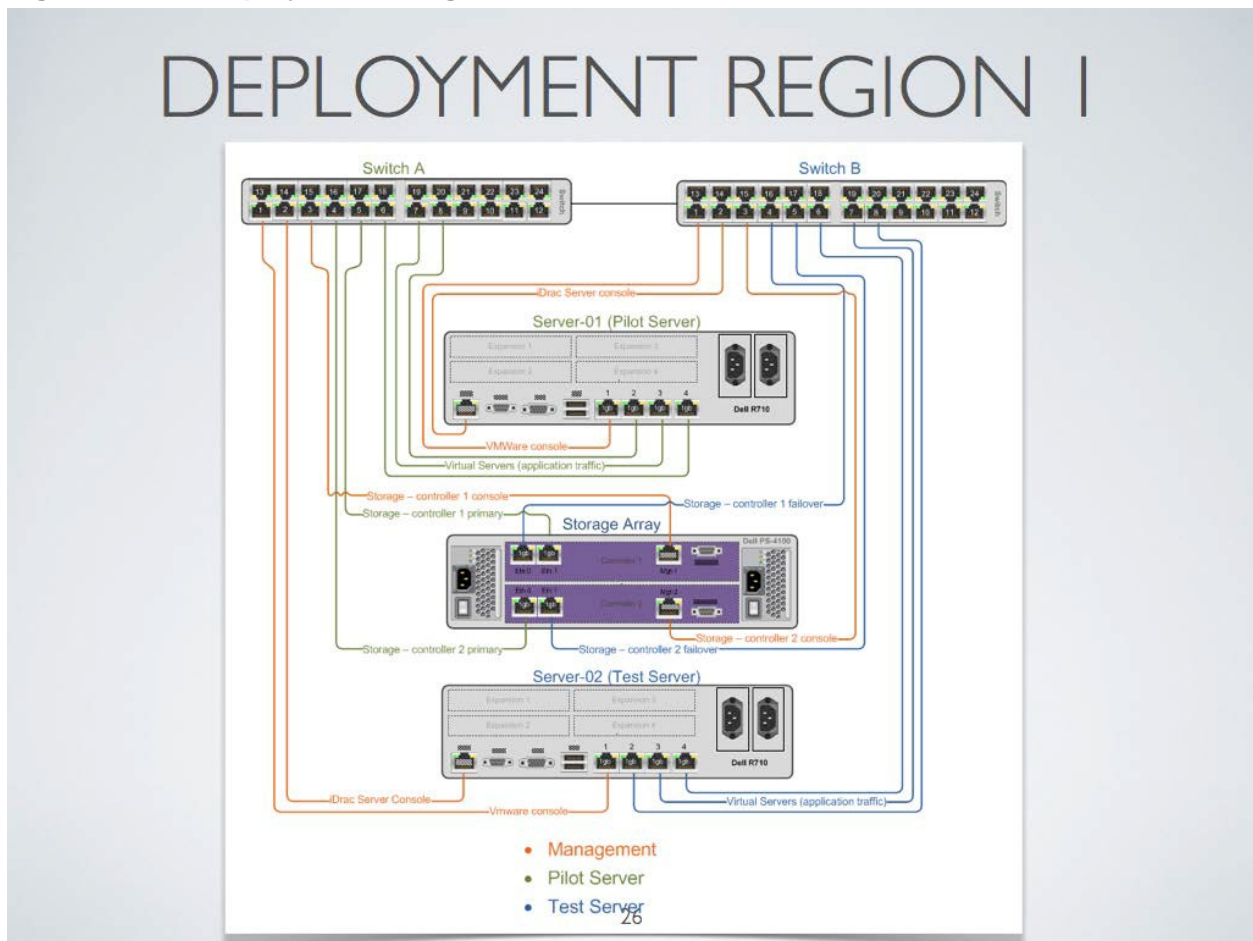
Non Applicable

# **6. Detailed Design**

## **6.1. Hardware Detailed Design**

HMP has no specific brand of hardware or platform requirements. Each system is a suite of software products that can be run on a standard VA virtual machine with no need for specialized hardware, cables, ports, connections, power requirements or cooling.

**Figure 70: TF, Deployment Design**



These are not applicable to HMP: SF and HMP: PF. These instances are pure VMs and the connections, cable types, etc... are determined elsewhere for the machine as a whole. There are no specific requirements for these software systems.

## 6.2. Signal impedances and logic states. Software Detailed Design

HMP has the following detailed design and goals:

- Consistent use of design patterns, languages, code and libraries across both of the projects.
- Cross product coding standards:
  - Reduce the cost of the development.
  - Improve development velocity.
  - Utilize team expertise more fully on both projects.
  - Facilitate cross project sharing of code.

- Responsive Design as far as it is correct and useable.
  - Provide modern Web 2.0 user interfaces leveraging industry leading-edge best practice approaches and libraries.
  - HMP: PF starts at iPhone resolution and adds capabilities as screen sizes and resolutions increase.
  - HMP: SF is tablet- and desktop-based, but increased resolution enhances User Experience (UX).
- Separation of major systems into disparate components.
  - Authentication and Authorization as well as Identity Management modules are implemented in separate WAR files which are shared between both projects.
  - Whenever possible common source code objects and classes are also split out into WAR file libraries for re-use between SF and PF, possible future replacement, and sharing with other HMP projects in the future. WAR files facilitate sharing run-time elements with no repeated source code.
  - To use these WAR files all that is required is dependency injection in the maven POM files.
- For the HMP: SF platform SDK partners and external plugins will operate in a related fashion: an external team will build their own WAR file that is then introduced as a dependency for HMP: SF.
  - Allowing for a separation of concerns that allows for continued direct ownership and responsibility for the modules created by 3<sup>rd</sup> parties so that 3<sup>rd</sup> party source code is maintained and updated directly by the originating team while the HMP:SF source code is maintained and updated by the HMP:SF team.
- All inter- and intra-system communication is defined in industry standard XSD and WSDL files using the Simple Object Access Protocol (SOAP). In addition these communication end-points can be exposed via a RESTful interface.
  - These SOAP services and messages are directly supported by the features of the Spring framework.
  - The Spring framework also supports exposing defined interface as REST services.
- Maximize development speed by utilizing open-source software when appropriate.
  - Selection of libraries, modules, code that conform to industry standards and best practices.
  - Open-source options must be under active development and actively supported, with wide user adoption.
  - Selections must solve a direct need, be light-weight, to reduce object and payload sizes whenever possible.
- The software selections and design mythologies must provide proper levels of responsiveness to the users in both HMP: SF and HMP: PF systems.
- Ensure 508 Compliance from the design stage all the way through deployment.

## **6.2.1. Conceptual Design**

### **6.2.1.1. Product Perspective**

The release of the HMP framework and associated team-based, patient-based, and population health components will support the health care team, business stakeholders, Veterans and their families.

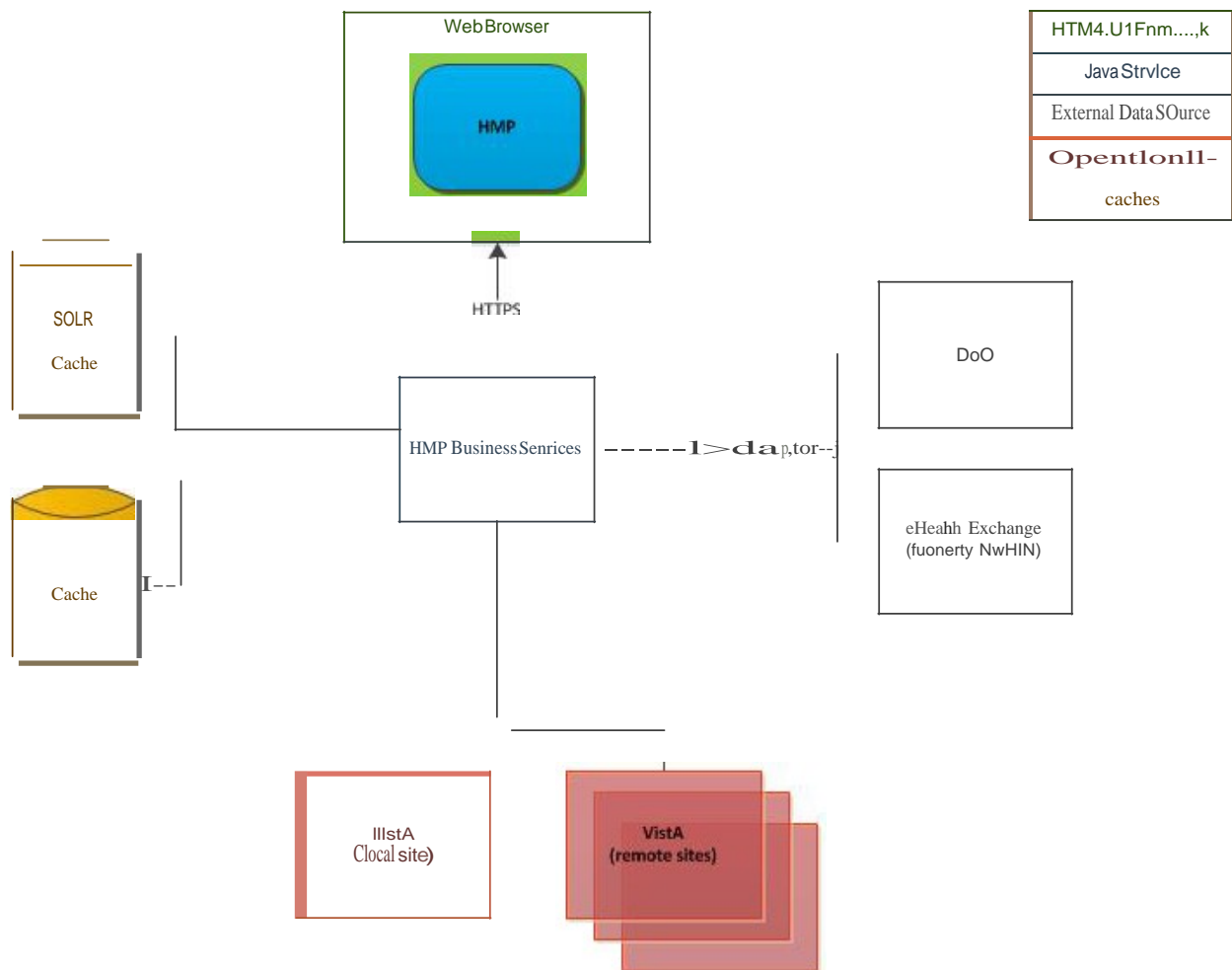
HMP: TF Initiative is organized into three major work streams that (1) create a collaborative Health Information Technology (HIT) development framework and produce prototypes that will allow modernization of Veterans Health Information Systems and Technology Architecture (VistA)/Computerized Patient Record System (CPRS) into the HMP, (2) strengthen the informatics and analytics capacities of the VA workforce; and (3) lead and manage change through communication and proactive engagement of relevant stakeholders.

HMP: SF is a web-based software system that improves healthcare delivery at the level of the Veteran population and the VA healthcare system itself. System facing implements multiple tools presented as separate provider workspaces. These tools support targeted cohort generation (e.g., IVtoPO, Double Anaerobic, Congestive Heart Failure, Kalied), visualization and analysis of related data (e.g., delivery of care, facility support, research/study), clinician-practice of medicine (e.g., review patient charts, enter notes, place orders).

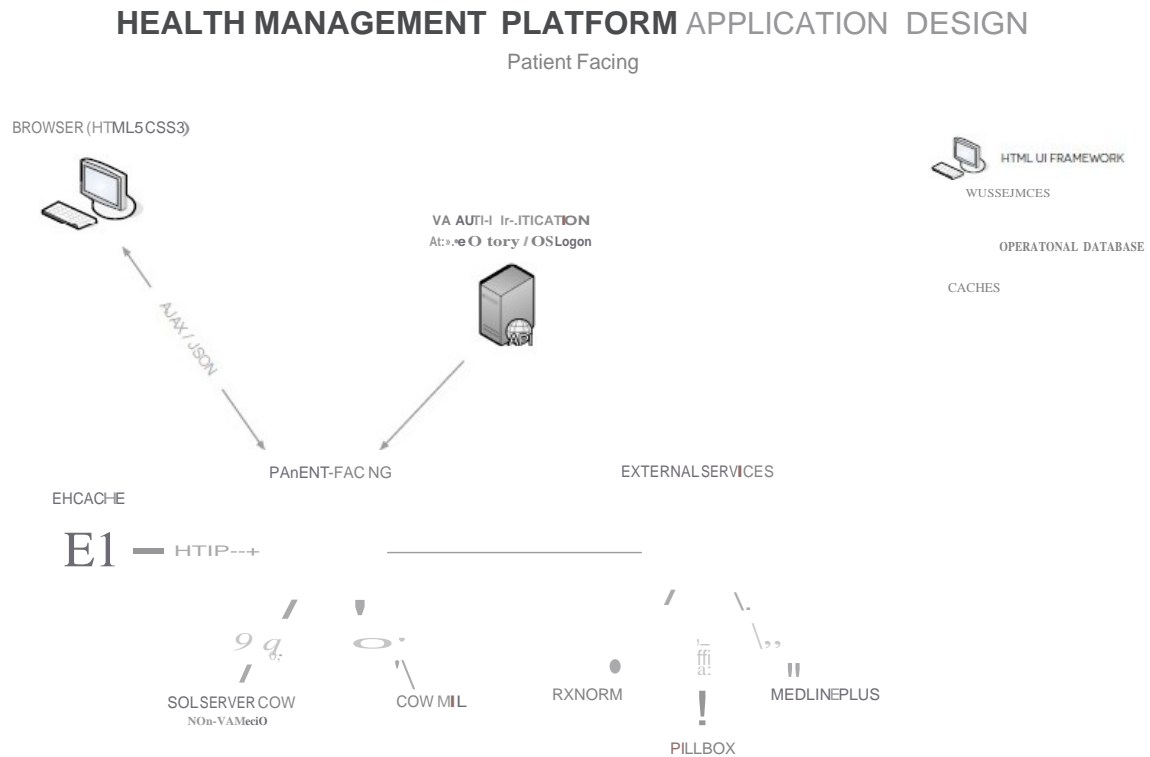
HMP: PF is a modern web-based application that empowers Veterans to take an active role in the quality and accuracy of the health care that they are provided by enabling them to enter data about the non-VA prescribed medications, OTC products, and other herbs and supplements that they are taking. In serving the Veteran population as well as medical professionals within the VA HMP: PF must straddle the internal VA network and be exposed on the external public internet.

Figure 71: Conceptual Design

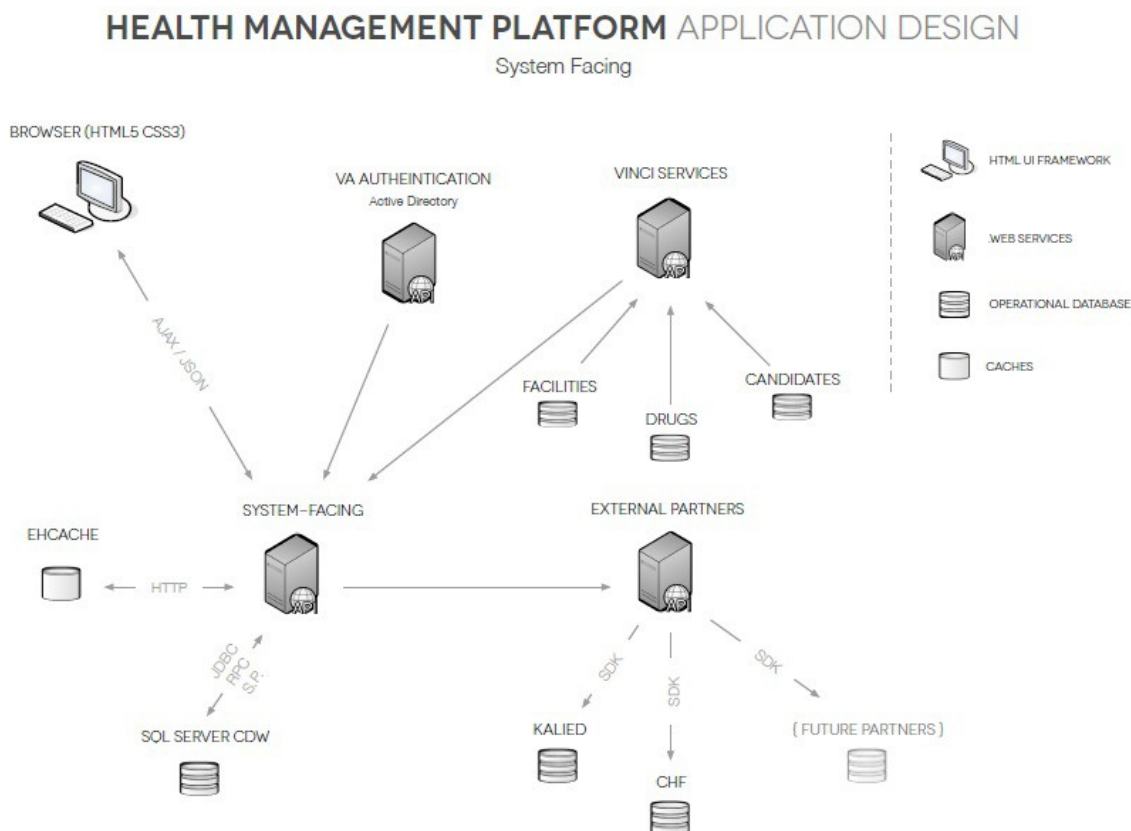
## High Level Health Management Platform Application Design



**Figure 72: PF, Application Design**



**Figure 73: SF, Application Design**



#### **6.2.1.1.1. User Interfaces**

The HMP user interface is implemented in HTML5/CSS3 which are in turn rendered by the users' web browser on their local hardware. The configuration options are presented within the HMP tools, persisted in the HMP databases per user profile, and affects the display options of the system appropriately for that user. The look and feel of the HMP systems is modeled after modern Web 2.0 standards.

#### **6.2.1.1.2. Hardware Interfaces**

HMP has no specific hardware interfaces.

#### **6.2.1.1.3. Software Interfaces**

HMP: TF operates under Linux and interfaces with external services comprised of: NWHIN, DoD, and Infobutton services. These third party services are accessed via live web service calls utilizing whatever versions are available and hosted in the published locations and are specifically not bound to any version.

HMP:SF and HMP:PF operate under Windows Server 2008, and interface with external services comprised of: CDW SQL Server Databases, RxNorm, NDF, MedlinePlus, Pillbox, and the Medication Image Library (MIL) hosted in CDW. These 3<sup>rd</sup> party web services accessed by HMP via live web service calls utilizing whatever versions are available and hosted in the published locations and are specifically not bound to any version.

#### **6.2.1.1.4. Communications Interfaces**

HMP uses the following standard communication protocols:

- TCP/IP
- HTTP
- HTTPS
- SOAP
- REST

#### **6.2.1.1.5. Memory Constraints**

HMP:SF and HMP:PF have no specific memory constraints. The standard of 8GB of RAM for the virtual machine on which they will run has proven to be sufficient for proper system operation.

#### **6.2.1.1.6. Special Operations**

Below are the non-functional requirements from the HMP-EV BRD.

**Table 31: Non Functional Requirements**

<b>ReqPro Tag</b>	<b>Operational Environment Requirements</b>
NONF2636	The primary and back-up sites for data storage shall be the same sites used for VistA applications.
NONF2392	The system shall respond to user actions in three seconds or less in 90% of the attempts, and never more than ten seconds.
NONF2393	System response times and page load times shall be consistent with VA standards (e.g., CPRS).
NONF2637	Maintenance, including maintenance of externally developed software incorporated into the Health Management Platform shall be scheduled during off peak hours or in conjunction with relevant maintenance schedules.
NONF1608	Information about response time degradation resulting from unscheduled system outages and other events that degrade system functionality and/or performance shall be disseminated to the user community within 30 minutes of the occurrence. The notification shall include the information described in the current Automated Notification Reporting (ANR) template maintained by the VA Service Desk. The business impact must be noted.
NONF2638	Provide a real-time monitoring solution.

NONF1610	Notification of scheduled maintenance periods that require the service to be offline or that may degrade system performance shall be disseminated to the user community a minimum of 48 hours prior to the scheduled event.
	<b>Usability/User Interface Requirements</b>
NONF2639	User acceptance testing personnel shall include clinical staff that is able to confirm acceptable changes to their workflow.
NONF2227	The applications shall include user prompts to guide the use of the applications so that minimal technical support is needed by the user.
NONF2352	The system shall provide context sensitive help.
NONF2353	The system shall provide meaningful prompts and error messages to aid in completing a specific task.
NONF2640	User-centered requirements, design, and testing with engagement of end-users will be utilized throughout the product lifecycle. Processes to ensure this would include provision of user membership on executive management groups and use of focus groups to gather requirements in addition to traditional usability testing.
	<b>Documentation Requirements</b>
NONF2228	Updates shall be made, as necessary, to applicable user manuals and other training tools and shall be delivered to all levels of users. If no user documentation exists, it shall be produced.
NONF2641	Updates shall be made, as necessary, to the applicable technical documentation including Operations and Maintenance (OM) Plans related to the Health Management Platform application located on the VA Software Documentation Library. If no User or OM documentation exists, it shall be produced.
NONF1612	A technical training curriculum shall be developed and delivered to all levels of staff users.
NONF2642	The training curriculum shall state the expected training time for primary users and secondary users to become productive at using the Health Management Platform application.
NONF2643	All training curricula, user manuals and other training tools shall be updated by the Health Informatics Program within the Office of Informatics and Analytics and delivered to all levels of users including but not limited to: providers, PACT, Nursing, Pharmacy, Health Information Management (HIM), Research Office, Quality and Performance. Training tools will be delivered 2-4 weeks in advance of the release of the enhancement through nationwide conference calls and PowerPoint presentations. The curricula shall include all aspects of the new/enhanced HMPapplication(s) and all changes to processes and procedures.
NONF1613	The training curriculum shall state the expected task completion time for primary and secondary users.
	<b>Implementation Requirements</b>
NONF2644	An implementation plan shall be developed for all aspects of the Health Management Platform program.
NONF2645	Technical Help Desk support for the applications shall be provided for users to

	obtain assistance with system software issues.
NONF1614	The IT solution shall be designed to comply with the applicable approved Enterprise Service Level Agreements (SLA).
NONF2646	The update will be implemented in the following manner: Phased approach starting with a few select pilot sites and gradually moving to the VISN/Region level.
NONF2647	The first release of the Health Management Platform is expected by 12-31-2014.
	<b>Data Protection/Back-up/Archive Requirements</b>
NONF1615	Provide a back-up plan for when the system is brought off-line for maintenance or technical issues/problems.
NONF2405	Data protection measures, such as back-up intervals and redundancy shall be consistent with systems categorized as critical.
	<b>Data Quality/Assurance</b>
NONF2229	A monitoring process shall be provided to ensure that data is accurate and up-to-date and provides accurate alerts for malfunctions while minimizing false alarms.
	<b>User Access/Security Requirements</b>
NONF1616	Due to patient safety considerations, data protection measures such as backup intervals and/or redundancy shall be consistent with systems categorized as critical.
NONF1617	Ensure the proposed solution meets all VHA Security, Privacy and Identity Management requirements including <a href="#">VA Handbook 6500</a> . (See Enterprise Requirements Appendix).

### 6.2.1.2. Product Features

HMP is divided into three major product sets; each is described below with a summary of the high level features of each product set.

Team facing component – This platform creates a browser-based, clinical user-interface modules that are healthcare team-driven and enable elegant functionality which decrease cognitive load, effectively manage relationships between conditions, interventions and observations, acquire data [including documentation] as a by-product of workflow and ultimately support higher quality, safe patient care and clinician satisfaction.

Patient-facing component – This platform should provide modular, web-based, device-agnostic applications for Veteran/family/service member engagement in their health and their health care.

System facing component – This platform addresses the need to look across VA’s IT systems and patient populations to improve health. The platform should support research, registries, business and clinical predictive modeling, decision support and other activities that will facilitate population health and achieve a “healthy health system” beyond the current model of one-patient-one-provider at a time.

### 6.2.1.3. User Characteristics

HMP is divided into three major product sets; each is described below with a summary of the characteristics of their users.

HMP TF: Components

Developers, VA employees and contractors who are highly technical IT professionals who work collaboratively with end users to create a development framework

#### HMP PF: Components

Veterans, Care Givers, Beneficiaries, Advocates, Guardians and Family Members. These users are of widely varying IT proficiency and are proficient with elementary Windows, Web and Mobile application usage and graphical conventions.

#### HMP SF: Components

VA staff that provides IT analytics and management support using highly technical analytic toolsets and techniques.

### 6.2.1.4. Dependencies and Constraints

Design Constraints for HMP include the following:

- Design – use of Enterprise Data Access Service Layer components for cross-facility, cross-institution health data
- Design – CCOW compliance, as prescribed by enterprise requirements
- Organizational – use of VA Web & Mobile Solutions Program Office for end user application product development

HMP Dependencies include:

- Enterprise Data Access Service Layer components for consolidated, multi-site, EHR data
- RDC for Operations
- VistA for authoritative EHR data
- NwHIN for external EHR data

## 6.2.2. Usability (including 508 compliance).Specific Requirements

### 6.2.2.1. Database Repository

The standard set of VistA patient files will continue to be the authoritative source for patient data. Data that is collected in HMP: TF for the purpose of updating the patient record is stored in VistA under the current data structures. Requirements for frequency of use, accessing capabilities, data entities and their relationships, integrity constraints and data retention requirements for VistA files have not changed as a result of this project. Two new files have been created for the exclusive use of HMP: TF so they can store data that must persist and is not available in the current VistA files. These new files will governed by the established rules for VistA.

### 6.2.2.2. System Features

The System features are identified by the business needs (NEED) requirements. Each business need (NEED) requirement is then further developed in subordinated business-owner requirements (OWNR) requirements. This structure is shown in the table below, and is documented in the *Health Management Platform Extended Version Business Requirements Document (BRD)*.

**Table 32: System Features**

ReqPro Tag	Business Need (BN)	OWNR Number	Owner Requirement (OWNR)	Priority*
NEED1555	BN 1: Adhere to the Enterprise Level requirements within the Requirements Management Repository (RMR) and as specifically addressed in Appendix D of the Business Requirements Document (BRD).			
NEED2545	BN 2: Utilize nationally standardized terminology for all Health Management Platform Extended Version (HMP) components.			
OWNR170		2.1	Provide the ability to express all content using nationally recognized reference and authoritative terminology standards (e.g., Logical Observation Identifiers, Names, and Codes [LOINC], Systematized Nomenclature of Medicine Clinical Terms [SNOMED CT], etc.).	High
OWNR8836		2.2	Provide the ability to record observations using standardized terms.	High
OWNR8837		2.3	Provide the ability for users to submit a request to Standards and Terminology (STS) for new standardized terms (e.g., via New Term Rapid Turnaround [NTRT] process).	High
OWNR10366		2.4	Provide the ability for Standards and Terminology Service to distribute the newly standardized terms to each instance of the Health Management Platform.	High
NEED2546	BN 3: Create a Health Management Platform Team-facing component – (The platform for browser-based, clinical user-interface modules that are healthcare team-driven and enable elegant functionality which decrease cognitive load, effectively manage relationships between conditions, interventions and observations, acquire data [including documentation] as a by-product of workflow and ultimately support higher quality, safe patient care and clinician satisfaction).			
OWNR10367		3.1	Provide the ability to use tools to support Veteran/Active-Duty patient aligned care teams.	High
OWNR10368		3.1.1	Provide the ability to utilize a team-based, multi-patient care environment, such as a multi-patient data/list view.	High
OWNR10369		3.1.2	Provide the ability to utilize a clinic-centric view customizable by provider, team, specialty, etc.	High
OWNR10370		3.1.3	Provide the ability to utilize an indexed based search capability.	High

ReqPro Tag	Business Need (BN)	OWNR Number	Owner Requirement (OWNR)	Priority*
OWNR10371		3.1.4	Provide the ability to utilize workflow driven, role-based activity systems.	High
OWNR10372		3.2	Provide the ability to utilize knowledge management capabilities for point of care information availability.	High
OWNR10373		3.3	Provide the ability to utilize clinical decision support capabilities (Incorporate Evidence-Based Clinical Care standards and processes for preventive and chronic disease management).	High
OWNR10374		3.3.1	Provide the ability to utilize knowledge-driven, context sensitive clinical decision support tools capable of maximizing patient-specific computable data.	High
NEED2547	BN 4: Create a Health Management Platform - Patient-facing component – (This platform should provide modular, web-based, device-agnostic applications for Veteran/family/service member engagement in their health and their health care.)			
OWNR10375		4.1	Provide the ability for patients and family caregivers to share data bidirectionally.	High
OWNR10376		4.1.1	Provide the ability for patients to self-enter data.	High
OWNR10377		4.1.2	Provide the ability for patients to enter their non-VA medications via a mobile application.	High
OWNR10378		4.2	Provide the ability for patients to enter data that is available to and consumable by care teams.	High
NEED2548	BN 5: Create a Health Management Platform – Population/System-facing component (This component addresses the need to look across VA’s IT systems and patient populations to improve health. The platform should support research, registries, business and clinical predictive modeling, decision support and other activities that will facilitate population health and achieve a “healthy health system” beyond the current model of one-patient-one-provider at a time.)			
OWNR10379		5.1	Provide the ability to utilize a system-facing Health Management Platform user workspace.	High
OWNR10380		5.1.1	Provide the ability to utilize multiple tools for viewing and analyzing data.	High
OWNR10381		5.2	Provide the ability to utilize new tools with research and operational partners to support system and population health.	High

<b>ReqPro Tag</b>	<b>Business Need (BN)</b>	<b>OWNR Number</b>	<b>Owner Requirement (OWNR)</b>	<b>Priority*</b>
OWNR10382		5.2.1	Provide the ability to utilize tools to support Antimicrobial Stewardship.	High
OWNR10383		5.2.1.1	Provide the ability to utilize intravenous (IV) to by mouth (PO) antibiotic identification, validation, and reporting tools.	High
OWNR10384		5.2.1.2	Provide the ability to utilize double anaerobic antibiotic identification, validation, and reporting tools.	High
OWNR10385		5.2.1.3	Provide the ability to utilize general antibiotic use and resistance reporting tools.	High
OWNR10386		5.2.2	Provide the ability to utilize tools to support Infection Preventionists.	High
OWNR10387		5.2.2.1	Provide the ability to utilize C. Difficile identification, validation, and reporting tools.	High
OWNR10388		5.3	Provide the ability to integrate existing tools to support system and population health through collaborations with research and operational partners.	High
OWNR10389		5.3.1	Provide the ability to utilize tools that would assist in the management of Congestive Heart Failure patients.	High
NEED2549	BN 6: Create and share services and utilities to promote a collaborative development environment to support interaction between the business and technical community for sharing ideas, best practices, and foster dialogue for the next generation of requirements as business challenges emerge.			
OWNR10390		6.1	Provide the ability to add more data domains to the Virtual Patient Record (VPR) <sup>1</sup> for sharing with partner systems.	High

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<sup>1</sup> VPR is a robust data layer that promotes interoperability and data exchange through industry standards and accessible data schemas.

<b>ReqPro Tag</b>	<b>Business Need (BN)</b>	<b>OWNR Number</b>	<b>Owner Requirement (OWNR)</b>	<b>Priority*</b>
OWNR10391		6.2	Provide the ability to utilize the Collaborative Development Environment (CDE) to support collaborative development with various partner systems (e.g., iEHR, OSEHRA, Massachusetts Veterans Epidemiology Research and Information Center [MAVERIC], VA Informatics and Computing Infrastructure [VINCI], Virtual Lifetime Electronic Record [VLER], and Nationwide Health Information Network [NwHIN].)	High
OWNR10392		6.3	Provide the ability to create a framework/architecture that would allow distributed or community development of additional modules and functionalities that would fit into this framework.	High
NEED2550	BN 7: Build common components of Health Management Platform that will be shared across the three components (Team, Patient, and System/Population).			
OWNR10393		7.1	Provide the ability to create common components for cross-Health Management Platform usage.	High
OWNR10394		7.2	Provide the ability to create tools and utilities that would help utilize VA's existing security architecture and services, and provide seamless access for users from one Health Management Platform component to the other.	High
NEED2551	BN 8: Provide interfaces between the Health Management Platform and multiple systems.			

ReqPro Tag	Business Need (BN)	OWNR Number	Owner Requirement (OWNR)	Priority*
OWNR10395		8.1	Provide the ability for the Health Management System to interface with the following applications, including but not limited to: Outpatient Pharmacy, Inpatient Pharmacy, Laboratory, Order Entry, Results Reporting, VistA Imaging, Bar Code Medication Administration (BCMA), Alerts, Clinical Reminders, VistAWeb, Remote Data View, Crisis Notes, Warning Notes, Allergies and Directives (CWAD), Text Integration Utility (TIU), Patient Look-Up, Authorization Subscription Utility (ASU), and Health Factors. Connectivity with NwHIN/Virtual Lifetime Electronic Record (VLER), Austin Information Technology Center (AITC), repositories/registries, the Corporate Data Warehouse (CDW) and the VA Informatics and Computing Infrastructure (VINCI).	High

### 6.2.2.3. Design Element Tables

This section is still under development.

#### 6.2.2.3.1. Routines (Entry Points)

This section is still under development.

**Table 33: Routines (Instructions)**

Routines	Instructions
Routine Name	
Enhancement Category	
RTM	
Related Options	
Related Routines	
Data Dictionary (DD) References	
Related Protocols	

<b>Related Integration Control Registrations (ICRs)</b>	
<b>Data Passing</b>	
<b>Input Attribute Name and Definition</b>	
<b>Output Attribute Name and Definition</b>	
<b>Current Logic</b>	
<b>Modified Logic (Changes are in bold)</b>	

**Table 34: Routines**

<b>Routines</b>	<b>Activities</b>
<b>Routine Name</b>	
<b>Enhancement Category</b>	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
<b>RTM</b>	
<b>Related Options</b>	

<b>Related Routines</b>	<b>Routines “Called By”</b>	<b>Routines “Called”</b>

<b>Routines</b>	<b>Activities</b>
<b>Data Dictionary (DD) References</b>	
<b>Related Protocols</b>	
<b>Related Integration Control Registrations (ICRs)</b>	
<b>Data Passing</b>	<input type="checkbox"/> Input <input type="checkbox"/> Output Reference <input type="checkbox"/> Both <input type="checkbox"/> Global Reference <input type="checkbox"/> Local
<b>Input Attribute Name and Definition</b>	Name: Definition:
<b>Output Attribute Name and Definition</b>	Name: Definition:

Current Logic

Modified Logic (Changes are in bold)

### 6.2.2.3.2. Templates

This section is still under development.

**Table 35: Templates (Instructions)**

Templates	Instructions
Template Name	
Enhancement Category	
RSD Traceability	
Template Type	
Related Options	
Related Routines	
Data Dictionary (DD) References	
Global References	

**Table 36: Templates**

Templates	Description
Template Name	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
RSD	
Template Type	<input type="checkbox"/> Sort <input type="checkbox"/> Input <input type="checkbox"/> Print <input type="checkbox"/> Other
Related Options	

Related Routines	Routines “Called By”	Routines “Called”

Routines	Description
Data Dictionary (DD) References	
Global References	

#### 6.2.2.3.3. Bulletins

This section is still under development.

**Table 37: Bulletins (Instructions)**

Bulletins	Instructions
Bulletin Name	
Enhancement Category	
RTM	
Related Options	
Related Routines	
Mail Subject	
Mail Group	
Parameters	
Data Dictionary (DD) References	

**Table 38: Bulletins**

Bulletins	Description
Bulletin Name	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
RTM	

Related Routines	Routines “Called By”	Routines “Called”

Routines	Description
Mail Subject	
Mail Group	
Parameters	
Data Dictionary (DD) References	

#### 6.2.2.3.4. Data Entries Affected by the Design

This section is still under development.

**Table 39: Data Entries Affected by the Design**

Field Name	Current Value	New Value
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Field Name	Current Value	New Value

#### 6.2.2.3.5. Unique Record(s)

This section is still under development.

**Table 40: Unique Record ID**

Field Name(s)	Current Value	New Value

#### 6.2.2.3.6. File or Global Size Changes

This section is still under development.

**Table 41: File or Global Size Changes**

File/Global Name(s)	Estimated Increase	Estimated Decrease

#### 6.2.2.3.7. Mail Groups

This section is still under development.

**Table 42: Mail Groups (Instructions)**

Mail Groups	Instructions
Mail Group Name	
Enhancement Category	
Related Options	
Related Routines	
Data Dictionary (DDs) References	
Related Protocols	
Mail Group Description	
Self-Enrollment Allowed	
Type	

**Table 43: Mail Groups**

Mail Groups	Activities
Mail Group Name	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
Related Options	

Related Routines	Routines “Called By”	Routines “Called”

Mail Groups	Instructions
Data Dictionary (DD) References	
Related Protocols	
Mail Group Description	
Self-Enrollment Allowed	<input type="checkbox"/> Yes <input type="checkbox"/> No
Type	<input type="checkbox"/> Public <input type="checkbox"/> Private

#### 6.2.2.3.8. Security Keys

This section is still under development.

**Table 44: Security Keys (Instructions)**

Security Keys	Instructions
Security Key Name	
Enhancement Category	
Related Options	
Related Routines	
Data Passing	
Security Key Description	
Subordinate Keys	
Mutually Exclusive Keys	
Granting Condition Logic	
Current Logic	
Modified Logic (Changes are in bold)	
Hierarchical Precedence	

**Table 45: Security Keys**

Security Keys	Activities
Security Key Name	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
Related Options	

Related Routines	Routines “Called By”	Routines “Called”

Security Keys	Activities
Data Passing	<input type="checkbox"/> Input <input type="checkbox"/> Output <input type="checkbox"/> Both <input type="checkbox"/> Global Reference <input type="checkbox"/> Local Reference
Security Key Description	
Subordinate Keys	
Mutually Exclusive Keys	
Granting Condition Logic	

Current Logic

Modified Logic (Changes are in bold)

Security Keys	Activities
Hierarchical Precedence	

#### 6.2.2.3.9. Options

This section is still under development.

**Table 46: Options (Instructions)**

Options	Instructions
Option Name (MENU TEXT field)	
Enhancement Category	
Associated Menu Options that will invoke this reference	
Data Passing	
Menu Text Description	
Option Type	
Option Definition	
Current Entry Action Logic	
Modified Entry Action Logic (Changes are in bold)	
Current Exit Action Logic	
Modified Exit Action Logic (Changes are in bold)	

**Table 47: Options**

Options	Activities
Option Name	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
Associated Menu Options that will invoke this reference	
Data Passing	<input type="checkbox"/> Input <input type="checkbox"/> Output <input type="checkbox"/> Both <input type="checkbox"/> Global Reference <input type="checkbox"/> Local Reference
Menu Text Description	
Option Type	<input type="checkbox"/> Edit <input type="checkbox"/> Print <input type="checkbox"/> Menu <input type="checkbox"/> Inquire <input type="checkbox"/> Action <input type="checkbox"/> Run Routine <input type="checkbox"/> Other
Associated Routine	
Option Definition	

<b>Current Entry Action Logic</b>
<b>Modified Entry Action Logic (Changes are in bold)</b>
<b>Current Exit Action Logic</b>
<b>Modified Exit Action Logic (Changes are in bold)</b>

#### 6.2.2.3.10. Protocols

This section is still under development.

**Table 48: Protocols (Instructions)**

Protocols	Instructions
Protocol Name	
Enhancement Category	
Associated Protocols	
Data Passing	
Item Text Description	
Protocol Type	
Associated Routine	
Current Entry Action Logic	
Modified Entry Action Logic (Changes are in bold)	
Current Exit Action Logic	
Modified Exit Action Logic (Changes are in bold)	

**Table 49: Protocols**

Protocols	Activities
-----------	------------

Protocols	Activities
Protocol Name	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
Associated Protocols	
Data Passing	<input type="checkbox"/> Input <input type="checkbox"/> Output <input type="checkbox"/> Both <input type="checkbox"/> Global Reference <input type="checkbox"/> Local Reference
Item Text Description	N/A
Protocol Type	<input type="checkbox"/> Action <input type="checkbox"/> Menu <input type="checkbox"/> Protocol <input type="checkbox"/> Protocol Menu <input type="checkbox"/> Limited Protocol <input type="checkbox"/> Extended Action <input type="checkbox"/> Dialog <input type="checkbox"/> Other
Associated Routine	

Current Entry Action Logic

Modified Entry Action Logic (Changes are in bold)

Current Exit Action Logic

Modified Exit Action Logic (Changes are in bold)

#### 6.2.2.3.11. Remote Procedure Call (RPC)

This section is still under development.

**Table 50: RPCs (Instructions)**

RPCs	Instructions
Name	
TAG^RTN	
Input Parameters	
Results Array	
Description	

**Table 51: RPCs**

RPCs	Activities
<b>Name</b>	
<b>TAG^RTN</b>	
<b>Input Parameters</b>	
<b>Results Array</b>	<input type="checkbox"/> Single Value <input type="checkbox"/> Array <input type="checkbox"/> Word Processing <input type="checkbox"/> Global Array <input type="checkbox"/> Global Instance
<b>Description</b>	

**6.2.2.3.12. Constants Defined in Interface**

This section is still under development.

**Table 52: Constants Defined in Interface**

Name	Description

**6.2.2.3.13. Variables Defined in Interface**

This section is still under development.

**Table 53: Variables Defined in Interface**

Name	Type	Description

**6.2.2.3.14. Types Defined in Interface**

This section is still under development.

**Table 54: Types Defined in Interface**

Name	Type	Description

**6.2.2.3.15. GUI**

This section is still under development.

**Table 55: GUI**

Unit Name	Description

**6.2.2.3.16. GUI Classes**

**Table 56: GUI Classes (Instructions)**

GUI Classes	Instructions
Class Name	
Derived From Class	
Purpose	

**Table 57: GUI Classes**

GUI Classes	Instructions
Class Name	
Derived From Class	
Purpose	

**6.2.2.3.17. Current Form**

This section is still under development.

**6.2.2.3.18. Modified Form**

This section is still under development.

**6.2.2.3.19. Components on Form****Table 58: Components on Form**

Name	Type	Description

**6.2.2.3.20. Events****Table 59: Events**

Name	Type	Description

**6.2.2.3.21. Methods****Table 60: Methods**

Method Name	Procedure/Function	Description

**6.2.2.3.22. Special References**

Special Reference Name	Type	Description

#### 6.2.2.3.23. Class Events

Table 61: Class Events

Name	Type	Description

#### 6.2.2.3.24. Class Methods

Table 62: Class Events

Name	Procedure/Function	Description

#### 6.2.2.3.25. Class Properties

Table 63: Class Properties

Class Properties Name	Type	Visibility	Description

#### 6.2.2.3.26. Uses Clause

This section is still under development.

#### 6.2.2.3.27. Forms

This section is still under development.

Table 64: Forms (Instructions)

Forms	Instructions
Form Name	
Enhancement Category	
Form Functionality	
Current Form Layout	
Modified Form Layout (Changes are in bold)	

Table 65: Forms

Forms	Description
Form Name	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change

Forms	Description
Form Functionality	

Current Form Layout

Modified Form Layout (Changes are in bold)

#### 6.2.2.3.28. Functions

This section is still under development.

**Table 66: Forms (Instructions)**

Functions	Instructions
Function Name	
Short Description	
Enhancement Category	
Related Options	
Related Routines	
Data Dictionary (DD) References	
Related Protocols	
Related Integration Control Registrations (ICRs)	
Data Passing	
Input Attribute Name and Definition	
Output Attribute Name and Definition	
Current Logic	
Modified Logic (Changes are in bold)	

**Table 67: Forms**

Function Name	Activities
Short Description	

<b>Function Name</b>	<b>Activities</b>
<b>Enhancement Category</b>	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
<b>Related Options</b>	

<b>Related Routines</b>	<b>Routines “Called By”</b>	<b>Routines “Called”</b>

<b>Function Name</b>	<b>Activities</b>
<b>Data Dictionary (DD) References</b>	
<b>Related Protocols</b>	
<b>Related Integration Control Registrations (ICRs)</b>	
<b>Data Passing</b>	<input type="checkbox"/> Input <input type="checkbox"/> Output <input type="checkbox"/> Both <input type="checkbox"/> Global Reference <input type="checkbox"/> Local Reference
<b>Input Attribute Name and Definition</b>	Name: Definition:
<b>Output Attribute Name and Definition</b>	Name: Definition:

<b>Current Logic</b>

<b>Modified Logic (Changes are in bold)</b>

#### 6.2.2.3.29.      **Dialog**

This section is still under development.

**Table 68: Dialog (Instructions)**

Dialog	Instructions
Dialog Message (Description)	
Enhancement Category	
Dialog Message (Description) Condition	
Current Dialog Message (Description)	
Modified Dialog Message (Description) (Changes are in bold)	

**Table 69: Dialog**

Dialog	Instructions
Dialog Message (Description)	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
Dialog Message (Description) Condition	
Current Dialog Message (Description)	
Modified Dialog Message (Description) (Changes are in bold)	

#### 6.2.2.3.30. Help Frame

This section is still under development.

**Table 70: Help Frame (Instructions)**

Help Frame	Instructions
Help Frame Text	
Enhancement Category	
Help Frame Text Calling Mechanism	
Current Help Frame Text	
Modified Help Frame Text (Changes are in bold)	

**Table 71: Help Frame**

Help Frame	Description
Help Frame Text	
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
Help Frame Text Calling Mechanism	

Current Help Frame Text

Modified Help Frame Text (Changes are in bold)

#### 6.2.2.3.31. HL7 Application Parameter

**Table 72: HL7 Application Parameter (Instructions)**

HL7 Application Parameter	Instructions
HL7 Application Parameter Name	
Enhancement Category	
Application Status	
Facility Name	
Country Code	
HL7 Field Separator	
HL7 Encoding Characters	
Mail Group	

**Table 73: HL7 Application Parameter**

HL7 Application Parameter Name	Description
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change
Enhancement Category	<b>Current</b> <b>Modified</b>
Application Status	<input type="checkbox"/> Active <input type="checkbox"/> Inactive <input type="checkbox"/> Active <input type="checkbox"/> Inactive
Facility Name	
Country Code	
HL7 Field Separator	

HL7 Application Parameter Name	Description	
HL7 Encoding Characters		
Mail Group		

### 6.2.2.3.32. HL7 Logical Link

Table 74: HL7 Logical Link (Instructions)

HL7 Logical Link	Instructions
HL7 Logical Link Parameter (LLP) Name	
Enhancement Category	
Node	
Institution	
Domain	
Autostart	
Queue Size	
LLP Type	

Table 75: HL7 Logical Link

HL7 Logical Link	Description	
HL7 Logical Link Parameter Name		
Enhancement Category	<input type="checkbox"/> New <input type="checkbox"/> Modify <input type="checkbox"/> Delete <input type="checkbox"/> No Change	
Enhancement Category	Current	Modified
Node		
Institution		
Domain		
Autostart		
Queue Size		
LLP Type		

### 6.2.2.3.33. COTS Interface

This section is still under development.

Table 76: COTS Interface (Instructions)

COTS Interface	Instructions
----------------	--------------

COTS Interface	Instructions
Communication Method	
Application Interface	

**Table 77: COTS Interface**

COTS Interface	Description
Communication Method	
Application Interface	

## **6.3. Communications Detailed Design**

This section is still under development.

# **7. External Interface Design**

This section is still under development.

## **7.1. Interface Architecture**

This section is still under development.

## **7.2. Interface Detailed Design**

This section is still under development.

# **8. Human-Machine Interface**

This section is still under development.

## **8.1. Interface Design Rules**

This section is still under development.

## **8.2. Inputs**

This section is still under development.

## **8.3. Outputs**

This section is still under development.

## **8.4. Navigation Hierarchy**

This section is still under development.

### **8.4.1. Screen [x.1]**

This section is still under development.

### **8.4.2. Screen [x.2]**

This section is still under development.

### **8.4.3. Screen [x.3]**

This section is still under development.

## **9. System Integrity Controls**

This section is still under development.

## 10. Approval Signatures

The signature below is an acknowledgement that the signatory understands the purpose and content of this document.

Signed: \_\_\_\_\_

Integrated Project Team Chair and Business Sponsor

Signed: \_\_\_\_\_

IT Program Manager

Signed: \_\_\_\_\_

Project Manager

Signed: \_\_\_\_\_

Enterprise Architecture

Signed: \_\_\_\_\_

Service Delivery and Engineering

## **A. Additional Information**

No addition information available at this time that supplements the design specification.

### **A.1. RTM**

No RTM is available at this time which traces modules and data structures to the software requirements.

### **A.2. Packaging and Installation**

No special considerations are available at this time for software packaging and installation.

### **A.3. Design Metrics**

No metrics have been established at this time to be used during the design activity.

### **A.4. Acronym List and Glossary**

<b>Term</b>	<b>Acronym</b>
AoA	Analysis of Alternatives
BPMN	Business Process Model Notation
AViVA	A Virtual Implementation of VistA
C. Difficile	Clostridium difficile
CMS	Center for Medicare and Medicaid Services
CPRS	Computerized Patient Record System
CPT	Collaborative Program Team
CPT-4	Current Procedural Terminology-4
COTR	Contract Officer's Technical Representative
DoD	Department of Defense
EHR	Electronic Health Record
EMR	Electronic Medical Record
HHS	Health and Human Service
hi <sup>2</sup>	Health Informatics Initiative
HIT	Health Information Technology
HL7	Health Level 7
HMP	Health Management Platform
HMP EV	Health Management Platform Extended Version
IAC	Industry Advisory Council
ICD-10	International Class of Disease
IGCE	Independent Government Cost Estimate
IPO	Interagency Program Office
IV	Intravenous
JCAHO	Joint Commission on Accreditation of Health Care Organization
LOINC	Logical Observation Identifier Names and Codes
MHS	Military Health Service

Term	Acronym
MOU	Memorandums of Understanding
NSR	New Service Request
OHI	Office of Health Information
OHT	Office of Health Care Transformation
OIA	Office of Informatics and Analytics
OIT	Office of Information and Technology
OPR	Office of Primary Responsibility
OLTP	Online Transaction Processing
PDUSH	Principal Deputy Under Secretary of Health
PDLC	Product Development Lifecycle
PHR	Personal Health Record
PLO	VHA Procurement & Logistics Office
PMAS	Project Management Accountability System
PO	Per os, Latin for by mouth
PWS	Performance Work Statement
RME	Reusable Medical Equipment
SDK	Software Development Kit
SNOMED-CT	Systematic Nomenclature of Medicine Clinical Terms
SOA	Service Oriented Architecture
TSPR	Technical Services Project Repository
UML	Universal Modeling Language
VA	Veterans Affairs
VAi2	Veterans Affairs Innovations Initiative
VHA	Veterans Health Administration
VINCI	VA Informatics and Computing Infrastructure
VLER	Virtual Lifetime Electronic Record

**Table 78: Glossary**

## **A.5. Required Technical Documents**

The following documents must be submitted for review to support proper approval:

- Conformance Validation Statement (CVS) - Section 508

For additional information regarding how to obtain proper approval for this project, refer to the following documents:

- IT Infrastructure Standards
- Systems Engineering and Design Review (SEDR) process
- Enterprise Architecture Web page
- One-VA TRM

## Template Revision History

Date	Version	Description	Author
March 2013	1.1	Formatted to current ProPath documentation standards and edited to conform with latest Alternative Text (Section 508) guidelines	Process Management
January 2013	1.0	Initial Version	PMAS Business Office