

Department of Veterans Affairs

Multiple Sclerosis Surveillance Registry (MSSR) (Increment 2)

System Design Document



**May 2014
Version2.0**

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
5/21/2014	2.0	Updated for Increment 2	[REDACTED] / [REDACTED]
1/31/2014	1.0	Final version of the MSSR SDD that is approved by [REDACTED] and [REDACTED]	[REDACTED]
1/30/2014	0.3	Corrected minor system design updates	[REDACTED]
1/29/2014	0.2	Includes new MSSR Data Flow and System Diagram, and added content from section 3.1 to section 10.	[REDACTED]
11/18/2013	0.1	Initial draft for Increment 1, up to section 3.1.	[REDACTED] / [REDACTED]

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.

Table of Contents

1. Introduction	5
1.1. Purpose of this document.....	5
1.2. Identification	6
1.3. Scope	7
1.4. Relationship to Other Plans.....	7
1.5. Methodology, Tools, and Techniques.....	8
1.6. Constraining Policies, Directives and Procedures	8
1.7. Constraints.....	9
1.8. Design Trade-offs	10
1.9. User Characteristics	10
1.10. User Problem Statement	11
2. Background	11
2.1. Overview of the System	12
2.2. Overview of the Business Process	12
2.3. Assumptions	15
2.4. Legacy System Retirement	16
3. Conceptual Design.....	16
3.1. Conceptual Application Design	16
3.2. Conceptual Data Design.....	24
3.3. Conceptual Infrastructure Design	44
4. System Architecture	48
4.1. Hardware Architecture	49
4.2. Software Architecture.....	51
4.3. Communications Architecture.....	53
5. Data Design	54
5.2. DBMS Files	57
5.3. Non-DBMS Files	59
6. Detailed Design	59
6.1. Hardware Detailed Design.....	61
6.2. Software Detailed Design.....	61
6.3. Communications Detailed Design	68
7. External Interface Design	69
7.1. Interface Architecture.....	69
7.2. Interface Detailed Design	71
8. Human-Machine Interface	76
8.1. Interface Design Rules	76

8.2. Inputs	81
8.3. Outputs	81
8.4. Navigation Hierarchy	81
9. System Integrity Controls	82
9.1. Audit Process.....	82
9.2. Audit Tables	83
10. Approval Signatures	85

1. Introduction

In response to Congressional legislation, the VHA established two Multiple Sclerosis Centers of Excellence (MSCoE) in 2003. These Centers (East and West) were subsequently made permanent by “The Veteran’s Benefits, Healthcare and Information Technology Act of 2006.” The MSCoEs were mandated to report on the epidemiology, healthcare use, and costs of the Veteran Multiple Sclerosis (MS) population. Current tools to date have failed to fulfill this mandate that is critical to all MSCoE functions. A VHA Handbook entitled Multiple Sclerosis System of Care Procedures 1011.06, was released to the field on December 7, 2009. This approved Handbook (which includes reference to the Congressional Mandate for the MSCoE) established policy and procedure for healthcare services for patients with MS and requires ongoing surveillance of this patient population.

The goal of this procurement is to create a surveillance system for the entire MS patient population within VHA. This objective will be met through the collection of clinical utilization, demographic, and epidemiologic data. The scope entails the creation of a front end portal within the Computerized Patient Record System (CPRS) for the entry of data by clinicians, as well as a back end data storage capability. The portal tool will be triggered annually for any patient with an MS diagnosis and will provide a user interface for data entry into the database. The tool will prompt providers to enter standard demographic and clinical variables important for clinical, quality improvement, and research activities mandated by VHA (which can be found in Appendix C of the VHA Handbook, Multiple Sclerosis System of Care Procedures 1011.06). Data shall be stored centrally at the enterprise level.

VA also requires development of a new registry system leveraging VA’s existing Converged Registries Solution (CRS) to provide clinical data surveillance tools and a back end registry database for surveillance of the entire MS population within VHA, along with software enhancements to the following existing systems: Converged Registries Solution, Traumatic Brain Injury Registry, Oncology Registry, and Clinical Case Registry. Both MSCoE (East and West) require real-time access to this data, so to provide up-to-date surveillance data on the MS patient population. Relevant clinical and administrative data from other VHA databases, such as VistA, (made available to the MS Registry) shall be aggregated and reported as required to allow for systematic evaluation and analysis. This effort is intended to provide VHA with a population- focused perspective for the MS patient population.

1.1. Purpose of this document

The purpose of this System Design Document (SDD) is to describe, in sufficient detail, how the proposed Multiple Sclerosis Surveillance Registry (MSSR) is to be constructed. This SDD translates the requirement specifications into functional and non-functional design specifications, from which the developers can create MSSR. It identifies the top-level registry architecture, and identifies any hardware, software, communication, and interface components.

The intended audience of this SDD includes the Front End .Net Developers, Back End Database Developers, SQA Analysts, Application / Functional Analysts, Project Management, and

Stakeholders. The design elements specified in this SDD are pursuant to the Multiple Sclerosis Surveillance Registry (MSSR) System and Registries Enhancements Performance Work Statement (PWS).

1.2. Identification

This SDD applies to the Multiple Sclerosis Surveillance Registry (MSSR), which is also identified as the “MSSR” and “MS Registry”. Once released, the version number for MSSR shall be v1.0.

All of the applicable standards for design have been identified as follows:

- Office of Management and Budget (OMB) Circular A-130, *Appendix III, Security of Federal Automated Information Resources*, located at:
[REDACTED]
- *Section 508 of the Rehabilitation Act of 1973*, as amended (29 U.S.C. 794d). Section 508 Compliance requirements are listed on the VA Section 508 Office website at
[REDACTED]
- VHA Handbook 1011.06, *Multiple Sclerosis System of Care Procedures*, December 7, 2009, which can be found in its entirety at: [REDACTED]
- VA Directive 6500, *Information Security Program*, located at:
[REDACTED]
- VA Handbook 6500.3, *Certification and Accreditation of VA Information Systems*, located at:
[REDACTED]
- VA Handbook 6500.6, *VA Information And Information System Security/Privacy Language*, Appendix C, March 12, 2010, Attachment 002, which can be found in its entirety at:
[REDACTED]
- *Multiple Sclerosis Surveillance Registry (MSSR) Requirements Specification Document (RSD)*, which can be found in its entirety at:
[REDACTED]
- Task Order No. TAC-13-09129, *Multiple Sclerosis Surveillance Registry and Registries Enhancements Performance Work Statement (PWS)*, August 28, 2013, Contract No. VA118-11-D-1003, Order No. VA118-1003-0052, which may be found in its entirety at:
[REDACTED]

1.3. Scope

The scope for the MSSR conceptual design in Increment 2, as well as the “as-built” design, is established within the boundaries of this SDD. Both features within and outside the project scope have been documented in the in the MSSR Requirements Specification Document (RSD) for Increment 2.

1.4. Relationship to Other Plans

This System Design Document for Increment 2 is an output of the MSSR Requirements Specification Document (RSD) for Increment 2 and the formal documentation located in the Technical Services Project Repository (TSPR) at: [REDACTED] .

Additionally, the relationship of this SDD to other plans is described in Table 1 below:

Table 1: MSSR SDD Relationship to Other Plans

Plan	Purpose	Relationship to the SDD
Contractor's Project Management Plan (CPMP)	Describes the formal, approved manage plan used to guide both project execution and project control, in order to plan assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines.	The CPMP will provide guidance for and drive all aspects of the design and development details outlined in this SDD.
Communication Plan	Describes the communications strategy, methodology, goals/objectives, channels, and metrics that will assist in successful project development.	The Communications Plan will assist in ensuring that the design requirements in this SDD address any and all impacted and identified stakeholders.
Operational Acceptance Plan (OAP)	Describes the project's challenges and successes to understand causes of difficulties and to achieve greater success in the future.	The OAP documents the results of the SDD, by recording any challenges and successes of the project development team in executing the design and development outlined in this SDD.
Master Test Plan (MTP)	Describes and identifies the items to be tested, testing approach, testing techniques, test deliverables, test schedule, test environments, roles responsible for testing, testing risks/constraints, and test metrics.	The MTP uses the SDD as one of the many sources for deriving the testing approach, testing techniques, testing schedule, test environments, and testing risks/constraints.

1.5. Methodology, Tools, and Techniques

The MSSR development project in Increment 2 uses the Scrum-based Agile methodology. The development team uses the following software tools (or techniques) to perform the activities outlined in this SDD:

- Microsoft Visual Studio 2008 for Software Development
- Microsoft ASP.NET (C#) for Development Environment
- Microsoft .Net Framework 3.5, SP1 for Software Development
- Microsoft Windows Server 2008 R2 Enterprise 64-bit
- Microsoft IIS 7.5 for Web Server
- Microsoft SQL Server® 2008 Enterprise R2 with:
 - SQL Server Integration Services (SSIS)
 - SQL Server Analysis Services (SSAS)
 - SQL Server Reporting Services (SSRS) 2008
- Open Source Mirth® Connect, 2.x
- Rational Team Concert for Source Code Version Control, Software Configuration Management, User Story and Defect Tracking, and Backup of Database and Source Objects
- Three-Tier Client / Server Architecture Layer Separation
- Language Integrated Query (LINQ) to Structured Query Language (SQL) for Data Accessibility
- Job Access with Speech (JAWS) Reader for Section 508 Compliance Testing
- JQuery to enforce Data Retention

1.6. Constraining Policies, Directives and Procedures

The constraints or requirements, placed on this SDD and driven by policies, directives, and procedures, are as follows:

- 1.6.1.** Office of Management and Budget (OMB) Circular A-130, *Appendix III, Security of Federal Automated Information Resources*, which may be found in its entirety at:




- 1.6.2.** *Section 508 of the Rehabilitation Act of 1973*, as amended (29 U.S.C. 794d). Section 508 Compliance Requirements are listed on the VA Section 508 Office Web site at:
[REDACTED]
- 1.6.3.** VHA Handbook 1011.06, *Multiple Sclerosis System Of Care Procedures*, December 7, 2009, which can be found in its entirety at:
[REDACTED]
- 1.6.4.** VA Directive 6500, *Information Security Program*, which may be found in its entirety at: [REDACTED]
- 1.6.5.** VA Handbook 6500.3, *Certification and Accreditation of VA Information Systems*, which may be found in its entirety at: [REDACTED]
- 1.6.6.** VA Handbook 6500.6, *VA Information And Information System Security/Privacy Language*, Appendix C, March 12, 2010, Attachment 002, which can be found in its entirety at: [REDACTED]
- 1.6.7.** *Multiple Sclerosis Surveillance Registry (MSSR) Requirements Specification Document (RSD)*, which can be found in its entirety at:
[REDACTED]
- 1.6.8.** Task Order No. TAC-13-09129, *Multiple Sclerosis Surveillance Registry System and Registries Enhancements Performance Work Statement (PWS)*, August 28, 2013, Contract No. VA118-11-D-1003, Order No. VA118-1003-0052, which may be found in its entirety at:
[REDACTED]

1.7. Constraints

The constraints that are placed upon executing the design and development activities in this SDD are as follows:

- The registry application shall be web-based, without installing any client plug-ins in the internet browser.
- The activities of this SDD are constrained by the schedule requirements outlined in the Performance Work Statement (PWS) for MSSR and Registries Enhancements.
- The technical constraints imposed upon this design and development includes the following VA supplied and licensed products:
 - Microsoft ASP.NET for development platform
 - Microsoft Windows Server 2008 R2 Enterprise 64-bit

- Microsoft IIS 7.5
- Microsoft .Net Framework 3.5, SP1
- Microsoft SQL Server® 2008 Enterprise R2 with:
 - SQL Server Integration Services (SSIS)
 - SQL Server Analysis Services (SSAS)
 - SQL Server Reporting Services (SSRS)
 - Open Source Mirth® Connect, 2.x
- Converged Registries Solution (CRS) relational database framework and architecture imposes database and GUI design and development
- VA mandate for *Section 508 of the Rehabilitation Act of 1973*, as amended (29 U.S.C. 794d). Section 508 Compliance Requirements are listed on the VA Section 508 Office website at 

1.8. Design Trade-offs

The trade-offs involved with the design chosen for MSSR in Increment 2 are as follows:

- 1.8.1. Interoperability:** This application is required to interoperate with the Converged Registries Solution (CRS) framework, Computerized Patient Record System (CPRS), Veterans Health Information Systems and Technology Architecture (VistA), Corporate Data Warehouse (CDW), and Medical Domain Web Services (MDWS) [to be superseded by VistA Integration Adapter (VIA)]. This increased interoperability entails a decrease in the simplicity of the system.
- 1.8.2. Performance:** This application is required to reside within the Converged Registries Solution (CRS) framework, which is hosted on the Austin Information Technology Center (AITC) environment. This framework and architecture requires design and development restrictions to be considered, so as to fulfill complete integration.
- 1.8.3. Usability:** This application is required to be 508 compliant, which restricts the choice of controls for the graphical user interface (GUI). The CRS framework that will be used for developing MSSR is 508 compliant.

1.9. User Characteristics

Table 2 describes the attributes of the user community (and their proficiency with the software system), and the technical community (and their familiarity with support and maintenance) for MSSR.

Table 2: MSSR User Characteristics Attributes

User Role	User Community	Background / Experience	System Proficiency	Tech Support / Maint Expertise	Access Privileges
MSSR System Administrator	Health Registries Administrator	Mid	High	High	Full
MSSR Local Administrator	Local Facility Registry Administrator	Mid	Mid	Mid	Full (Local)
MSSR National	MSCoE Directors, NW Innovation Center	High	Mid	Low	Full
MSSR National Read Only	MSCoE Administrative / Clerical Staff	Varies	Varies	Low	Reporting
MSSR Local	Clinicians	Varies	Varies	Low	Local VISN
MSSR Local Read Only	Administrative / Clerical Staff	Varies	Varies	Low	None

1.10. User Problem Statement

In response to Congressional legislation, the VHA established two Multiple Sclerosis Centers of Excellence (MSCoE) in 2003. These Centers (East and West) were subsequently made permanent by “The Veteran’s Benefits, Healthcare and Information Technology Act of 2006”. The MSCoEs were mandated to report on the epidemiology, healthcare use, and costs of the Veteran Multiple Sclerosis (MS) population. Current tools to date have failed to fulfill this mandate that is critical to all MSCoE functions.

2. Background

In response to Congressional legislation, the VHA established two Multiple Sclerosis Centers of Excellence (MSCoE) in 2003. These Centers (East and West) were subsequently made permanent by “The Veteran’s Benefits, Healthcare and Information Technology Act of 2006”. The MSCoEs were mandated to report on the epidemiology, healthcare use, and costs of the Veteran Multiple Sclerosis (MS) population. Current tools to date have failed to fulfill this mandate that is critical to all MSCoE functions. A VHA Handbook entitled Multiple Sclerosis System of Care Procedures 1011.06, was released to the field on December 7, 2009. This approved Handbook (which includes reference to the Congressional Mandate for the MSCoE) established policy and procedure for healthcare services for patients with MS and requires ongoing surveillance of this patient population.

The goal of this procurement is to create a surveillance system for the entire MS patient population within VHA. This objective will be met through the collection of clinical utilization,

demographic, and epidemiologic data. The scope entails the creation of a front end portal within the Computerized Patient Record System (CPRS) for the entry of data by clinicians, as well as a back end data storage capability. The portal tool will be triggered annually for any patient with an MS diagnosis and will provide a user interface for data entry into the database. The tool will prompt providers to enter standard demographic and clinical variables important for clinical, quality improvement, and research activities mandated by VHA (which can be found in Appendix C of the VHA Handbook, Multiple Sclerosis System of Care Procedures 1011.06). Data shall be stored centrally at the enterprise level.

VA also requires development of a new registry system leveraging VA's existing Converged Registries Solution (CRS) to provide clinical data surveillance tools and a back end registry database for surveillance of the entire MS population within VHA, along with software enhancements to the following existing systems: Converged Registries Solution, Traumatic Brain Injury Registry, Oncology Registry, and Clinical Case Registry. Both MSCoE (East and West) require real-time access to this data, so to provide up-to-date surveillance data on the MS patient population. Relevant clinical and administrative data from other VHA databases, such as VistA, (made available to the MS Registry) shall be aggregated and reported as required to allow for systematic evaluation and analysis. This effort is intended to provide VHA with a population-focused perspective for the MS patient population.

2.1. Overview of the System

MSSR shall be a web-based registry application that provides clinical data surveillance tracking and longitudinal patient data analysis and reporting for the entire MS population within VHA. Due to the VA mandate for the Multiple Sclerosis Centers of Excellence (MSCoEs) to report on the epidemiology, healthcare use, and costs of the Veteran Multiple Sclerosis (MS) population, the new development of a national health registry for MSSR is required. The benefits of developing MSSR include, but are not limited to, providing the MSCoE Directors the ability to track and monitor the MS patient population at a national level, wherein all clinicians can enter and track MS data for their patients, and the ability to retrieve, extract, analyze, and report data. The major users of the registry application include the MSCoE Directors, Northwest Innovation Center, and any approved Clinicians, who will engage in the data entry, analysis, and reporting functionalities of MSSR. The participants in its operation include the MSSR Administrators at both the Local Facility and National levels, who will provide technical support and maintenance of MSSR.

2.2. Overview of the Business Process

Below you will find the overview of the business processes that MSSR plans to support, depicted as a Conceptual Data Flow and System Diagram in Figure 1. Each process in the diagram traces to the list of business processes in Table 3.

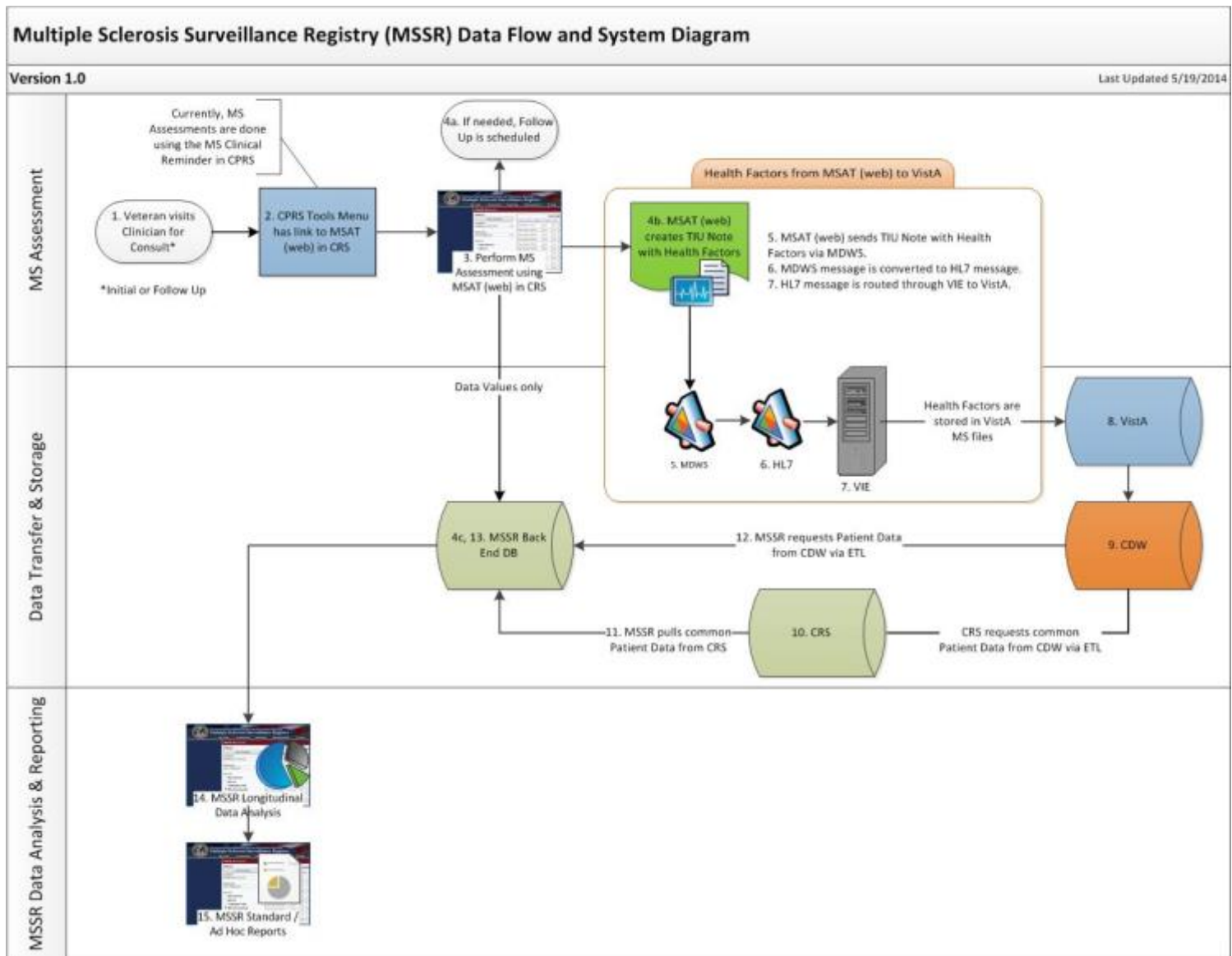


Figure 1: MSSR Data Flow and System Diagram (Conceptual)

Below you will find Table 3, which maps to the MSSR Data Flow and System Diagram above. Each business processes is assigned a unique numeric identifier that traces back to the MSSR Data Flow and System Diagram in Figure 1 above.

Table 3: Business Processes for MSSR

Business Process ID	Business Process Name	Type	Owner	Description
1	Veteran visits Clinician for Consult	Existing	VA	Veteran visits the Clinician (Neurologist or MS Specialist) for Initial or Follow Up Consult.
2	CPRS Tools Menu has link to MSAT (web) in CRS	New	VHA Clinician	Currently, MS Assessments are done using the MS Clinical Reminder in CPRS, but once MSAT and MSSR are developed, the CPRS Tools Menu should be configured to contain a link to MSAT (web) in CRS.
3	Perform MS Assessment using MSAT (web) in CRS	New	VHA Clinician	Clinician uses MSAT (web), which is part of MSSR (inside CRS framework), to complete the MS Assessment.
4c	If needed, Follow Up is scheduled	Existing	VHA Clinician	After performing the MS Assessment, if the Veteran needs it, a Follow Up consultation is scheduled by the Clinician.
4b	MSAT (web) creates TIU Note with Health Factors	New	VA OI&T Health Registries	MSAT (web) creates the TIU Progress Note with Health Factors to be eventually transmitted to VistA.
4c	MSSR Back End DB	New	VA OI&T Health Registries	MSAT (web) sends data values only to be stored in the MSSR Back End Database.
5	MDWS	Existing	VA OI&T	MSAT (web) sends TIU Note with Health Factors via MDWS Web Service call.
6	HL7	Existing	VA OI&T	MDWS message is converted to HL7 message.
7	VIE	Existing	VA OI&T	HL7 message is routed through VIE to VistA.
8	VistA	Existing	VA OI&T	Health Factors are stored in VistA MS files via VIE.
9	CDW	Existing	VA OI&T	VistA stores MS Clinical Data in CDW.

Business Process ID	Business Process Name	Type	Owner	Description
10	CRS	Existing	VHA OI&T Health Registries	CRS requests common Patient Data from CDW via ETL.
11	MSSR pulls common Patient Data from CRS	New	VHA OI&T Health Registries	MSSR pulls common Patient Data from CRS.
12	MSSR requests Patient Data from CDW via ETL	New	VHA OI&T Health Registries	MSSR requests Patient Data from CDW via ETL
13	MSSR Back End DB	New	VHA OI&T Health Registries	Receives Common Patient Data from CRS and MS-related Clinical Data from CDW.
14	MSSR Longitudinal Data Analysis	New	VHA OI&T Health Registries	With comprehensive MS-related Clinical Data from both MSAT and CDW, MSSR is able to provide Longitudinal Data Analysis.
15	MSSR Standard / Ad Hoc Reports	New	VHA OI&T Health Registries	With comprehensive MS-related Clinical Data from both MSAT and CDW, MSSR is able to provide Standard and Ad Hoc Reports.

2.3. Assumptions

The following assumptions impact the design of the system in Increment 2:

- 2.3.1. Government Furnished Equipment (GFE):** Pursuant to Section 4.5 of the MSSR PWS, this application assumes that the MSSR Development Team will be provided the necessary VA GFE machine with the necessary hardware and software, in a timely manner, in order to design and develop the activities listed in this SDD on time and within scope.
- 2.3.2. VA Approved Software and Hardware:** This application assumes that the VA approved software and hardware necessary for the activities listed in this SDD do not limit the design and development activities required to meet the project scope and needs.
- 2.3.3. Stakeholders:** This application assumes that the MSSR Stakeholders provide timely and sufficient feedback and input, in order to execute the design activities outlined in this SDD.
- 2.3.4. Interfaces:** This application assumes that the interfaces with CRS, CPRS, MDWS, TIU, HL7, VIE, VistA, and CDW, which are required to execute the design and

development activities within this SDD, are maintained and do not compromise the integrity of MSSR as defined in the MSSR PWS.

2.4. Legacy System Retirement

This section is not applicable to the MSSR system, as it is a new and does not retire a legacy system.

3. Conceptual Design

This section of the SDD provides details about the following topics:

- Conceptual Application Design
- Conceptual Data Design
- Conceptual Infrastructure Design

3.1. Conceptual Application Design

3.1.1. Application Context

Figure 2 below represents the conceptual application context within which MSSR will exist.

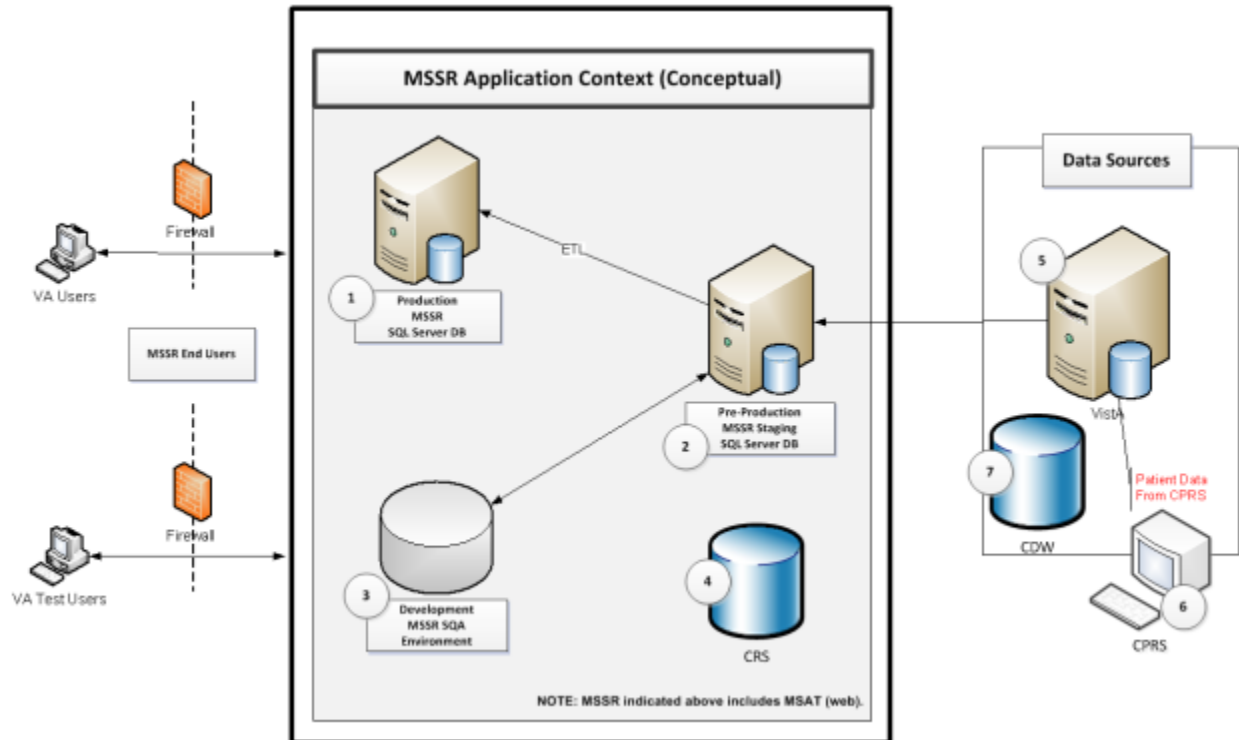


Figure 2: Application Context Diagram for MSSR (Conceptual)

Below you will find Table 4, which describes the information in the Application Context Diagram for MSSR above in four sections. Note that since MSSR is represented by the objects in the center of Figure 2 above, it is not referred to in Table 4 below.

Table 4: Application Context Description for MSSR (Conceptual)

ID	Name of Entity	Description (High Level Purpose of Interchange)	Interface Name (to this entity)	Interface System (from this entity)
1	Production MSSR SQL Server DB	Hosts Database Manager (SQL SERVER) and database housing MSSR Production data.	CPRS (via link to MSAT)	CRS, CDW, VistA
2	Pre-Production MSSR SQL Server DB	Hosts Database Manager (SQL SERVER) and database housing MSSR Pre-Production and Staging data.	N/A	N/A
3	Development MSSR SQA Environment	Hosts Database Manager (SQL SERVER) and database housing MSSR development data. This environment also serves as the SQA testing environment.	N/A	N/A
4	CRS	Hosts Database Manager (SQL SERVER) and database housing common patient data.	MSSR, MSAT	CDW, VistA
5	VistA	Collects most of the MSSR Clinical Data via CPRS	CPRS, MSAT	CDW
6	CPRS	Most of MSSR Clinical Data is entered in CPRS	VistA, MSAT	VistA
7	CDW	Stores all of the MSRR Clinical Data via VistA	VistA, CRS, MSSR	N/A

Interfaces External to OIT

ID	Name	Related Object	Input Messages	Output Messages	External Party
None	No interfaces from the object rows above are external to OIT.	No related object from the list above is the source of this interface.	No input message of the data being input.	No output message of the data being output.	No external party.

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
1	Production MSSR SQL Server DB	No object from the list above is the source of this interface.	MSSR Production Data	MSSR Production Data	CRS, CDW, VistA
2	Pre-Production MSSR SQL Server DB	No object from the list above is the source of this interface.	MSSR Pre-Production and Staging Data	N/A	N/A
3	Development MSSR SQA Environment	No object from the list above is the source of this interface.	MSSR Development Data	N/A	N/A
4	CRS	No object from the list above is the source of this interface.	Common Patient Data	Common Patient Data	CDW, VistA
5	VistA	No object from the list above is the source of this interface.	MSSR Clinical Data from CPRS and MSAT	MSSR Clinical Data	CDW, CPRS, MSAT
6	CPRS	No object from the list above is the source of this interface.	MSSR Clinical Data from VistA	MSSR Clinical Data to VistA	MSAT, VistA
7	CDW	No object from the list above is the source of this interface.	All MSSR Clinical Data from VistA	All MSSR Clinical Data from VistA	CRS, MSSR, VistA

Externally Shared Data Stores

ID	Name of Ext Shared Data Store	Data Stored (Externally)	Owner or System	CRUD Access
4	CRS	Common Patient Data	VHA OI&T Health Registries	Create, Delete
6	CDW	All MSSR Clinical Data from VistA	VA OI&T	Read only

3.1.2. High-Level Application Design

The high-level application design for MSSR identifies the major components of the application and the relationships of the major application components to each other and to the surrounding applications. The major components of the application are at the subsystem or top-level service area. Lower-level services will be defined and documented in the Logical Application Design.

Figure 4 illustrates a High-Level Application Design in the form of a dataflow diagram. This diagram differs from the diagram in Figure 3 in that the single object representing this system in is decomposed into its major components. Table 5 to describe the objects in Figure 4.

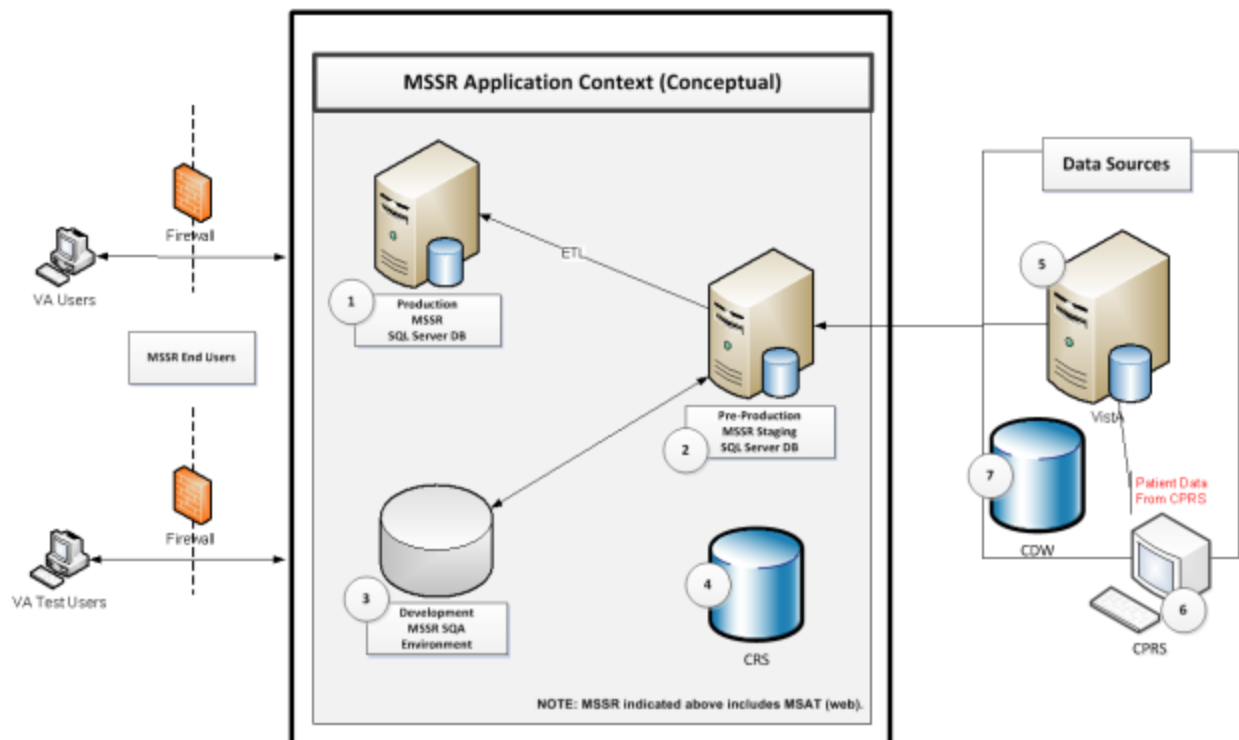
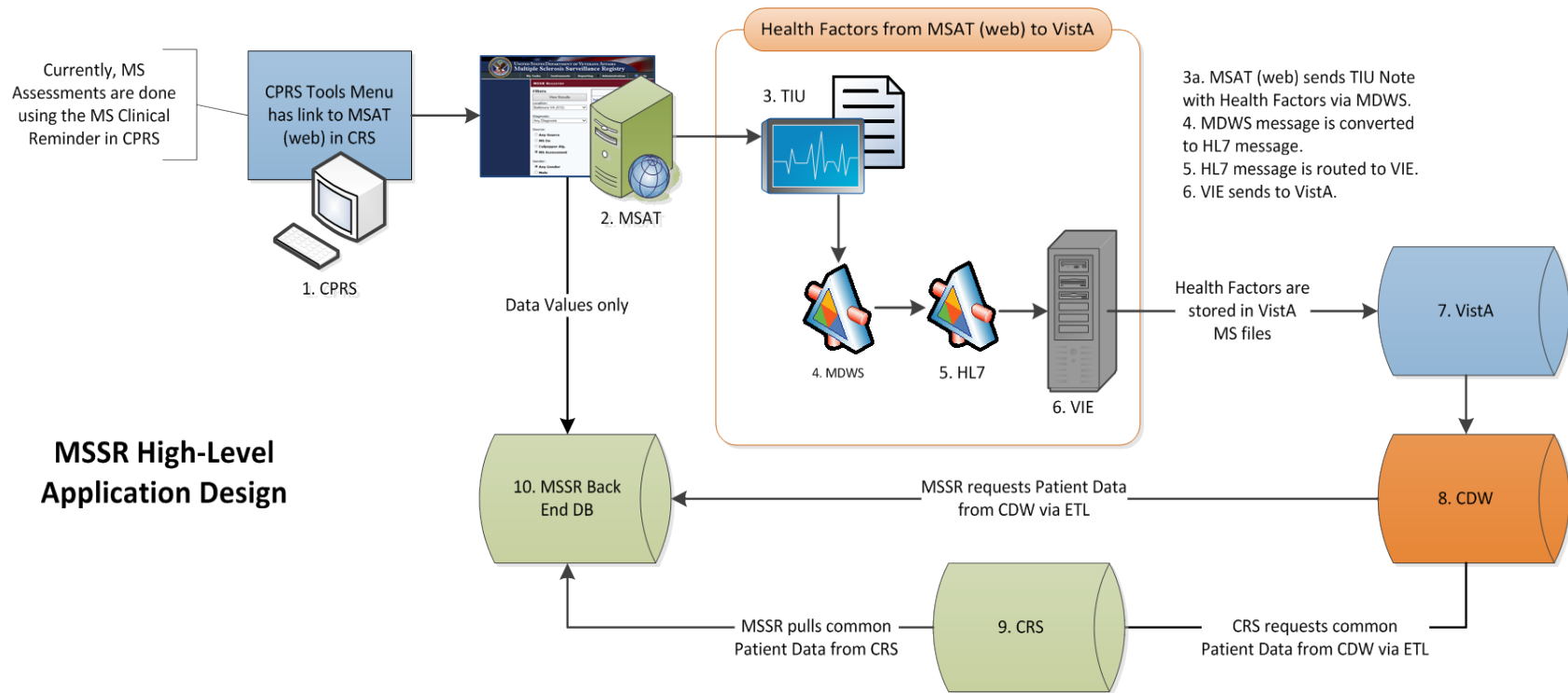


Figure 3: Application Context Diagram for MSSR (Conceptual)



Last Updated 1/28/2014

Figure 4: MSSR High-Level Application Design (Conceptual)

Table 5: Objects in the MSSR High-Level Application Design (Conceptual)

Objects

ID	Name	Description (Business Level Role)	Service or Legacy Code	External Interface Name	External Interface ID	Internal Interface Name	Internal Interface ID	SDP Sections 1&2
1	CPRS	Thick client front end GUI application for VistA, which then sends data to CDW	N/A	MSAT, VistA	2, 7	None	None	N/A
2	MSAT	National MS Assessment Tool with Front End Web GUI and Back End DB shared with MSSR; interfaces with CPRS via TIU Notes sent by MDWS calls	N/A	CPRS, VistA	1, 7	MSSR, CRS	10, 9	N/A
3	TIU	CPRS tool that creates progress notes between MSAT and VistA	N/A	MSAT, VistA	2, 7	CPRS	1	N/A
4	MDWS	Provides WebService calls between CPRS and MSAT	N/A	MSAT, CPRS	2, 1	N/A	None	N/A
5	HL7	Converts MDWS message to HL7 message (RPC) to VistA Interface Engine (VIE), HL7 messages are the unit of data exchange between systems.	N/A	MDWS, VIE	4, 6	N/A	None	N/A
6	VIE	Sends HL7 message to Generic HL7 app that stores message in TIU for CPRS to pull	N/A	HL7, CPRS	5, 1	CPRS, VistA	1, 7	N/A
7	VistA	Back end DB structure for CPRS; VistA provides clinical data and it is the primary source of data in CDW.	N/A	CPRS, CDW	1, 8	VIE	6	N/A

ID	Name	Description (Business Level Role)	Service or Legacy Code	External Interface Name	External Interface ID	Internal Interface Name	Internal Interface ID	SDP Sections 1&2
8	CDW	National repository of data from VistA and several other VHA systems; CDW is a relational database organized into a collection of data domains, most of data is from VistA	N/A	MSSR, CRS, VistA	10, 9, 7	N/A	N/A	N/A
9	CRS	Relational DB framework for all National Registries; CRS is a relational database organized into a collection of data domains that shares common patient data (retrieved from CDW) between the national registries	N/A	CDW	8	MSSR, MSAT,	10, 2	N/A
10	MSSR	National MS Registry with Front End Web GUI and Back End DB in CRS; interfaces with CPRS via TIU Notes sent by MDWS calls	N/A	CDW	8	CRS, MSAT	9, 2	N/A

Internal Data Stores

ID	Name	Data Stored	Steward	Access
None	None	Patient Demographics, Current Status (last assessment information), previous assessments, medications.	N/A	N/A

3.1.3. Application Locations

MSSR and the related Multiple Sclerosis Assessment Tool (MSAT) are located at the Austin Information Technology Center (AITC).

Table 6: Application Locations for MSSR

Application Component	Description	Location at Which Component is Run	Type
MSSR, MSAT	All of the structural components necessary to support MSSR and MSAT	AITC	N/A

3.1.4. Application Users

Table 7 identifies the user roles of the individuals who will use MSSR and MSAT.

Table 7: Application Users for MSSR

Application Component	Location	User
MSSR, MSAT	MSCoE-East MSCoE-West NW Innovation Center Local Facilities Remote	MSSR_SYSTEM_ADMINISTRATOR MSSR_NATIONAL MSSR_LOCAL_ADMINISTRATOR MSSR_LOCAL MSSR_NATIONAL_READONLY MSSR_LOCAL_READONLY

3.2. Conceptual Data Design

3.2.1. Conceptual Data Model

The conceptual data model (CDM) for MSSR in Figure 5 below is a high-level representation of the data entities and their relationships. It does not include the data elements that comprise each entity, but it is the first step toward developing the more detailed logical data model (LDM).

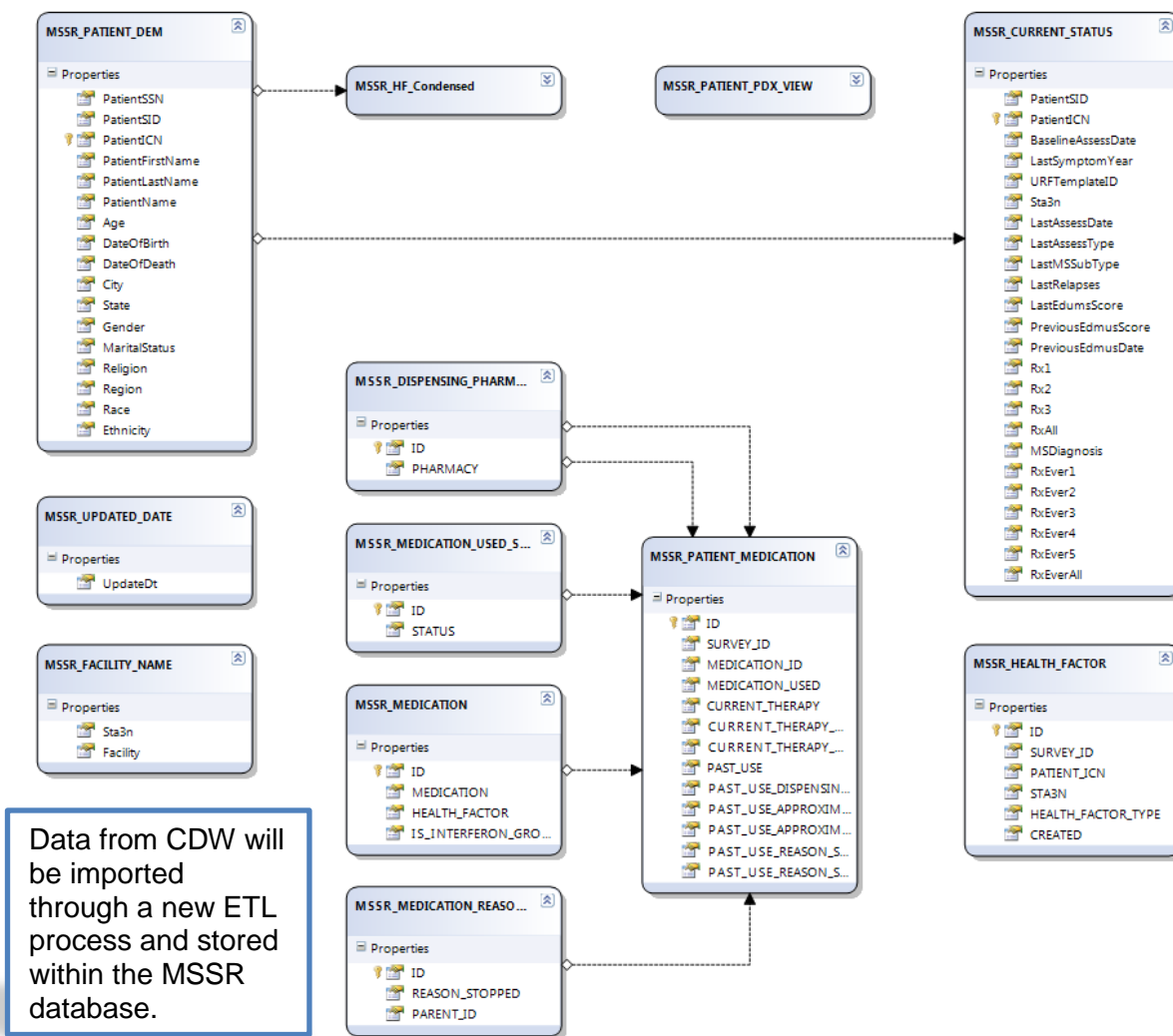


Figure 5: Conceptual Data Model for MSSR

3.2.2. Database Information

Table 8 below identifies all the databases that will be created, replaced, interfaced with, or whose structure will be modified (i.e., add or delete tables or add or delete columns to a table) as part of this effort.

Table 8: Database Inventory for MSSR

Database Name	Description	Type	Steward
Converged Registries Solution (CRS)	Relational Database Framework that contains common patient data that would be pulled by MSSR.	Interface	AITC
CDW	Relational Database that contains all MS Clinical Data.	Interface	AITC

Database Name	Description	Type	Steward
VistA	Back End Architecture for CPRS that populates most of the data in CDW	Interface	AITC

3.2.3. User Interface Data Mapping for MSSR

The User Interface Data Mapping for MSSR describes and defines the information that will be available for users to be able to enter data using MSAT or to retrieve information using MSSR.

The user interface data mapping is detailed below.

3.2.3.1. MSSR Screen Interfaces (Conceptual)

Figure 6 below illustrate the conceptual screen user interfaces of the MSSR that users will have access to, in order to retrieve, extract, analyze, display, and report MS clinical and administrative data.

Proceeding the figure, Table 9 describes what each screen accomplishes, the Graphical User Interface (GUI) field, the name of the database table that this field connects to, the name of the field in the table that the GUI field connects to, and any comments that are relevant to the tester.

UNITED STATES DEPARTMENT OF VETERANS AFFAIRS
Multiple Sclerosis Surveillance Registry

[Patients](#)
[Reporting](#)
[Administration](#)
[Help](#)
[Check System](#)

Assessments

MSSR PATIENTS

Filters
[Hide](#)

Name or SSN:

Location:
Any Location

Diagnosis:
Any Diagnosis

Source:
Any Source
MS Dx
Culpepper Alg.
MS Assessment

Gender:
Any Gender
Male
Female

EDMUS Score between:
0
and
10

Next Assessment Due:
Anytime

DMT MS Medications:

Status:
Any

Timeframe:
Currently

Reported relapses:
Any Number
0
1
>1

Meds:
Any MS DMT

View Results

PATIENT				MS ASSESSMENT				MS/NMO MEDS					
Patient Name (SSN#)	Facility	Age	Gender	Race/Ethnicity	Baseline	Last Assessment	Year of 1st Symptom	Dx	MS Subtype	Relapses past Yr.	EDMUS Score	Prev. EDMUS	Current VA

Page 1 of 38.

Record Total: 374 (Showing Records 1 - 10)

Figure 6: MSSR – Patients View (Conceptual)

Table 9: Screen Descriptions for MSSR (Conceptual)

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
MSSR Patients	Provides a comprehensive patient query and filter.	Name or SSN	MSSR_PATIENT_DEMS	PatientName & PatientSSN	Enter any comments relevant to the Tester.
		Source	N/A	N/A	Currently, only using MS Assessments as source
		Gender	MSSR_PATIENT_DEMS	Gender	Will be 'F', 'M', or empty
		Location	MSSR_CURRENT_STATUS	Sta3n	Facility code where assessment was completed.
		EDMUS Score	MSSR_CURRENT_STATUS	LastEdmusScore	Shows the Edmus score reported during the latest assessment
		Diagnosis	MSSR_CURRENT_STATUS	MSDiagnosis	Shows the MS Diagnosis reported during the latest assessment
		Next Assessment Due	MSSR_CURRENT_STATUS	LastAssessmentDate	System compares the last assessment date to the current date and determines if the patient should be re-assessed
		Reported relapses	MSSR_CURRENT_STATUS	LastRelapses	Shows the number of relapses during the past 12 months during the latest assessment
		DMT MS Medications: Status	MSSR_CURRENT_STATUS	RxAll or RxEverAll	Used for filtering if a patient is, or ever has been, on a particular medication

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
		DMT MS Medications: Timeframe	MSSR_CURRENT_STATUS	RxAll or RxEverAll	Used for filtering if a patient is, or ever was, on a particular medication
		DMT MS Medications: Meds	MSSR_MEDICATION	MEDICATION	Used for filtering patients using a particular medication
MSSR Reporting	Provides standard charts and adhoc reporting capabilities.	N/A	N/A	N/A	None

3.2.3.2. MSAT Screen Interfaces (Conceptual)

Figure 7 through Figure 12 below illustrate the conceptual screen user interfaces of the MSAT that users will have access to, in order to enter or update MS patient assessments.

Proceeding the figures, Table 10 describes what each screen accomplishes, the Graphical User Interface (GUI) field, the name of the database table that this field connects to, the name of the field in the table that GUI field connects to, the name of the field in the table that the GUI field connects to, and any comments that are relevant to the tester.

The screenshot shows the 'Multiple Sclerosis Assessment Tool' interface. At the top is a header with the Department of Veterans Affairs logo and the text 'UNITED STATES DEPARTMENT OF VETERANS AFFAIRS Multiple Sclerosis Surveillance Registry'. Below the header is a 'Help' link. The main title 'Multiple Sclerosis Assessment Tool' is centered. The form contains several fields: 'Name:' with a redacted value, 'Last 4: 2294', 'Date: *' with a date picker set to 6/4/2014, 'Assessment Type *' with radio buttons for Baseline, Annual (selected), Interim, and Ad Hoc, and 'Interview Completed by *' with radio buttons for Telephone, Clinical Video Teleconferencing (selected), and In-person Assessment. Below these are three sections: '1. Race, as defined by patient *' with radio buttons for American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White (selected), and Other; '2. Ethnicity, as defined by patient *' with radio buttons for Hispanic and Not Hispanic (selected); and '3. Gender *' with radio buttons for Male and Female (selected).

Figure 7: MSAT View (Conceptual) – 1 of 5

4. Biological family history of Multiple Sclerosis? *

☐ Unknown

☐ None

☒ Yes

☐ Mother

☐ Father

☐ Daughter

☐ Son

☒ Sister

☐ Brother

☐ Other

5. Biological family history of Clinically Isolated Syndrome? *

☐ Unknown

☒ None

☐ Yes

6. Biological family history of Neuromyelitis Optica/Devic's Disease? *

☐ Unknown

☒ None

☐ Yes

7. Diagnosis History *

☒ Multiple Sclerosis

☐ Possible Multiple Sclerosis

☐ Clinically Isolated Syndrome (CIS)

☐ Neuromyelitis Optica / Devic's Disease

☐ Determined NOT to have Multiple Sclerosis

Date of first neurological sign/symptom (if known)

2007 (i.e. year = YYYY)

Date of MS diagnosis

2009 (i.e. year = YYYY)

8. Type of initial MS/NMO symptom (check all that apply) *

☒ Motor ☐ Cerebellar ☐ Bowel/Bladder

☐ Sensory ☒ Optic Neuritis ☐ Spinal Cord

☐ Brainstem ☒ Cognitive

9. Multiple Sclerosis Subtype *

☒ Relapsing-Remitting (RRMS)

☐ Secondary Progressive (with or without relapses; SPMS)

☐ Primary Progressive (PPMS)

☐ Progressive-Relapsing (PRMS)

☐ Not applicable (CIS or NMO)

10. MS Service-Connection Status *

☒ Patient is service-connected for MS

☐ Patient is not service-connected for MS

Figure 8: MSAT View (Conceptual) – 2 of 5

11. Current MS or NMO Disability *

- ☐ 1 = No disability; minimal signs on neurological examination
- ☐ 2 = Minimal and not ambulation-related disability; able to run
- ☐ 3 = Unlimited walking distance without rest but unable to run, or a significant not ambulation-related disability
- ☐ 4 = Walks without aid; limited walking distance, but greater than 500 meters without rest
- ☒ 5 = Walks without aid; walking distance less than 500 meters without rest
- ☐ 6a = Walks with permanent unilateral support; walking distance less than 100 meters without rest
- ☐ 6b = Walks with permanent bilateral support; walking distance less than 100 meters without rest
- ☐ 7 = Home-restricted; a few steps with wall or furniture assistance; walking distance less than 20 meters without rest
- ☐ 8 = Chair-restricted; unable to take a step; some effective use of arms
- ☐ 9 = Bedridden and totally helpless
- ☐ 10 = Death due to MS

12. Number of relapses* over the past twelve months *

2 *relapse = worsening neurological symptoms for > 24hrs that stabilize or resolve

Medications

- MS or NMO medications (for baseline, be sure to document ALL medications)

Regular Medications:

Azathioprine (Imuran)

- ☐ Never Taken
- ☒ Current Use / Past Use

- ☒ Current Therapy
- Dispensing Pharmacy:
 - ☒ VA Pharmacy
 - ☐ Non-VA Pharmacy

Approximate date started:
2/2008

- ☐ Past Use
- Dispensing Pharmacy:
 - ☐ VA Pharmacy
 - ☐ Non-VA Pharmacy

Approximate date started:

Approximate date stopped:

- Reason Stopped:
- ☐ Ineffective
 - ☐ Intolerance to medication
 - ☐ Treatment cycle completed
 - ☐ Maximum dose reached
 - ☐ Serum JC antibody positive
 - ☐ Significant adverse event

Figure 9: MSAT View (Conceptual) – 3 of 5

<p>Cydophosphamide (Cytosan)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Dacizumab (Zenapax)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Dimethyl Fumarate</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Fingolimod (Gilenya)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Glatiramer (Copaxone)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Neutralizing Interferon Antibody status</p> <p><input checked="" type="radio"/> Positive</p> <p><input type="radio"/> Negative</p> <p><input type="radio"/> Unknown</p> <p>Positive Date: <input type="text" value="2/2008"/></p> <p>Is Patient being monitored for cardiotoxicity?</p> <p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p>Serum anti-JC virus antibody status</p> <p><input checked="" type="radio"/> Negative</p> <p><input type="radio"/> Positive</p> <p><input type="radio"/> Unknown</p> <p>Date: <input type="text" value="3/2008"/></p> <p>Interferon Group Medications:</p> <p>Interferon beta-1a (Avonex)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Interferon beta-1a (Rebif)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Interferon beta-1b (Betaseron)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p> <p>Interferon beta-1b (Extavia)</p> <p><input checked="" type="radio"/> Never Taken</p> <p><input type="radio"/> Current Use / Past Use</p>
--

Figure 10: MSAT View (Conceptual) – 4 of 5

Methotrexate (Trexall)
☒ Never Taken
☐ Current Use / Past Use

Mitoxantrone (Novantrone)
☒ Never Taken
☐ Current Use / Past Use

Mycophenolate Mofetil (Cellcept)
☒ Never Taken
☐ Current Use / Past Use

Natalizumab (Tysabri)
☒ Never Taken
☐ Current Use / Past Use

Rituximab (Rituxan)
☒ Never Taken
☐ Current Use / Past Use

Corticosteroids (only include those used for maintenance therapy, not relapse therapy)
☒ Never taken
☐ Current use / Past use

Save Draft Save and Prepare Note Cancel

Note Preview:

Assessment Type
Annual
Interview Completed by
Clinical Video Teleconferencing
Question 1: Race, as defined by patient
White
Question 2: Ethnicity, as defined by patient

Health Factors Preview:

MSCOE.ANNUAL ASSESSMENT, MSCOE.INTERVIEW.VIDEO CONFERENCE, MSCOE.RACE.WHITE, MSCOE.ETHNICITY.NON HISPANIC, MSCOE.FMX.MS CONFIRMED, MSCOE.FMX.MS SISTER, MSCOE.FMX.CIS NEGATIVE, MSCOE.FMX.NMO NEGATIVE, MSCOE.DX.MS, MSCOE.YEAR OF FIRST MS SYMPTOM, MSCOE.YEAR OF MS DIAGNOSIS, MSCOE.ISX.MOTOR, MSCOE.ISX.OPTIC NEURITIS, MSCOE.ISX.COGNITIVE, MSCOE.SUBTYPE.SRMS, MSCOE.MS SC.YES, MSCOE.EDMUS.05, MSCOE.RELAPSE.IN PREVIOUS YEAR, MSCOE.ALATHIOPRINE.NEVER, MSCOE.CYTOKAN.NEVER, MSCOE.DACLIZUMAB.NEVER, MSCOE.DIMETHYL FUMERATE.NEVER, MSCOE.FINGOLIMOD.NEVER, MSCOE.GLATIRAMER.NEVER, MSCOE.IS1A AVONEX.NEVER, MSCOE.IS1A REBIF.NEVER, MSCOE.IS1B BETASERON.NEVER, MSCOE.IS1B EXTAVIA.NEVER, MSCOE.METHOTREXATE.NEVER, MSCOE.MITOXANTRONE.NEVER, MSCOE.MYCOPHENOLATE.NEVER, MSCOE.NATALIZUMAB.NEVER, MSCOE.RITUXIMAB.NEVER

Current User: KRINECK, RYAN

Figure 11: MSAT View (Conceptual) – 5 of 5

UNITED STATES DEPARTMENT OF VETERANS AFFAIRS
Multiple Sclerosis Surveillance Registry

Patient
[Redacted]

Confirm Patient SSN(###-##-####) *:
[Redacted]

Select Note Title *:
-- Select a Value --

Continue

Current User: SHELLEY, BRETT

Figure 12: MSAT Patient Confirmation View (Conceptual)

Table 10: Screen Descriptions for MSAT (Conceptual)

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
MSAT View	Provides a comprehensive MS assessment utility and tool for clinicians to enter patient data.	Date	MSSR_CURRENT_STATUS and SURVEY_RESULTS	LastAssessmentDate	Assessment Date
		Assessment Type	MSSR_CURRENT_STATUS and SURVEY_RESULTS	LastAssessmentType	Baseline, Interim, Annual, Ad-hoc
		Interview Completed by	SURVEY_RESULTS and MSSR_HF_CONDENSED	RESULT_TEXT / CHOICE_ID, MSInterview	Stored for both GUI display and backend storage
		Race, as defined by patient	MSSR_CURRENT_STATUS and SURVEY_RESULTS	Race / RESULT_TEXT	Stored for both GUI display and backend storage
		Ethnicity, as defined by patient	MSSR_CURRENT_STATUS and SURVEY_RESULTS	Ethnicity / RESULT_TEXT	Stored for both GUI display and backend storage
		Gender	MSSR_CURRENT_STATUS and SURVEY_RESULTS	Gender, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Biological family history of Multiple Sclerosis?	SURVEY_RESULTS	RESULT_TEXT / CHOICE_ID	Stored in Assessment results
		Biological family history of Clinically Isolated Syndrome?	SURVEY_RESULTS	RESULT_TEXT / CHOICE_ID	Stored in Assessment results

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
		Biological family history of Neuromyelitis Optica / Devic's Disease?	SURVEY_RESULTS	RESULT_TEXT / CHOICE_ID	Stored in Assessment results
		Diagnosis History	MSSR_HF_CONDENSED, MSSR_CURRENT_STATUS, and SURVEY_RESULTS	MSDiagnosis, LastMSSubtype	Stored in Assessment results as well as GUI display table
		Date of first neurological sign / symptom (if known)	MSSR_HF_CONDENSED, MSSR_CURRENT_STATUS, and SURVEY_RESULTS	SymptomYear, LastSymptomYear, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Date of MS diagnosis	MSSR_CURRENT_STATUS and SURVEY_RESULTS	DiagnosisYear, LastAssessmentDate, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Type of initial MS/NMO symptom (check all that apply)	MSSR_HF_CONDENSED and SURVEY_RESULTS	ISXBowelBladder, ISXBrainstem, ISXCerebellar, ISXMotor, ISXNeuritis, ISXSensory, ISXSpinalCord, RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Multiple Sclerosis Subtype	MSSR_HF_CONDENSED, MSSR_CURRENT_STATUS, and SURVEY_RESULTS	LastMSSubtype	Stored in Assessment results as well as GUI display table
		Date transitioned	MSSR_HF_CONDENSED and SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
		MS Service-Connection Status	MSSR_HF_CONDENSED and SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Current MS or NMO Disability	MSSR_CURRENT_STATUS, MSSR_HF_CONDENSED and SURVEY_RESULTS	LastEdmusScore, CurrentDisabilityScore, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Number of relapses over the past twelve months	MSSR_CURRENT_STATUS, MSSR_HF_CONDENSED and SURVEY_RESULTS	LastRelapses, Relapses, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Azathioprine (Imuran)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Cyclophosphamide (Cytoxan)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Daclizumab (Zenapax)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Dimethyl Fumerate	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Fingolimod (Gilenya)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
		Glatiramer (Copaxone)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Neutralizing Interferon Antibody status	MSSR_HF_CONDENSED, SURVEY_RESULTS	InterferonAntibodies, RESULT_TEXT/CHOICE_ID???	Stored in Assessment results as well as GUI display table
		Positive Date	MSSR_HF_CONDENSED, SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Is Patient being monitored for cardiotoxicity?	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Serum anti-JC virus antibody status	MSSR_HF_CONDENSED, SURVEY_RESULTS	MedAntiJCVirus, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Date	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Interferon beta-1a (Avonex)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Interferon beta-1a (Rebif)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Interferon beta-1b (Extavia)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
		Methotrexate (Trexall)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Mitoxantrone (Novantrone)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Mycophenolate Mofetil (Cellcept)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Natalizumab (Tysabri)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Rituximab (Rituxan)	MSSR_CURRENT_STATUS, MSSR_PATIENT_MEDICATION, SURVEY_RESULTS	RxAll/RxEverAll, MEDICATION_ID, RESULT_TEXT/CHOICE_ID	Stored in Assessment results as well as GUI display table
		Corticosteroids	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Current Therapy	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
		Dexamethasone IV (Decadron): -Dispensing Pharmacy -Schedule -Approximate date started	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Methylprednisolone IV (Solumedrol): -Dispensing Pharmacy -Schedule -Approximate date started	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Methylprednisolone PO (Medrol): -Dispensing Pharmacy -Schedule -Approximate date started	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Prednisone PO: -Dispensing Pharmacy -Schedule -Approximate date started	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Past Use	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
		Dexamethasone IV (Decadron): -Dispensing Pharmacy -Schedule -Approximate date stopped	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Methylprednisolone IV (Solumedrol): -Dispensing Pharmacy -Schedule -Approximate date stopped	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Methylprednisolone PO (Medrol): -Dispensing Pharmacy -Schedule -Approximate date stopped	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results
		Prednisone PO: -Dispensing Pharmacy -Schedule -Approximate date stopped	SURVEY_RESULTS	RESULT_TEXT/CHOICE_ID	Stored in Assessment results

Screen Title	Purpose	Graphical User Interface	Table	Field	Comments
MSAT Patient Confirmation Page	Provides the clinician the ability to confirm the entered patient before submitting the assessment.	N/A	N/A	N/A	N/A

3.2.3.3. MSSR Reporting Interface (Conceptual)

This section describes and defines the reports that will be available in the user interface. Figure 13 below illustrates the conceptual screen user interfaces of the MSSR Reporting interface that users will have access to, in order to analyze, display, and report MS clinical and administrative data.

Proceeding the figure, Table 11 describes the report column, what each report accomplishes, and the data source.



Figure 13: MSSR Reporting – Charts View (Conceptual)

Table 11: Report Descriptions for MSSR (Conceptual)

Report	Purpose	Data Source
MS Patients with Assessments by Facility	Displays the number of MS patients per facility	MSSR_CURRENT_STATUS
MS Assessments Completed by Facility	Displays the number of MS assessments completed per facility	MSSR_HF_CONDENSED
Previous EDMUS Disability Score Recorded on Assessment	Displays the number of MS patients with previous EDMUS disability scores recorded on their assessments	MSSR_HF_CONDENSED
Current VA Medications for MS Patients	Displays a breakdown of the current VA medications used by MS patients	MSSR_CURRENT_STATUS

3.2.3.4. Unmapped Data Element

There are no new unmapped data elements for the new MSSR in Increment 2.

3.3. Conceptual Infrastructure Design

MSSR consists of three system environments: Development, Pre-Production (Staging environment) and Production. These environments are located at the Austin Information Technology Center (AITC) and AITC system administrators and IT specialists service, administer, and maintain the hardware and software. AITC also strictly enforces configuration control and installation of the code in the Preproduction and production environments. Developers are able to add, remove or change application and database code only in the Development environment. Only AITC personnel can add, remove, or change hardware or software or configuration settings in all three environments. See Figure 14 below for the VA WAN Infrastructure.

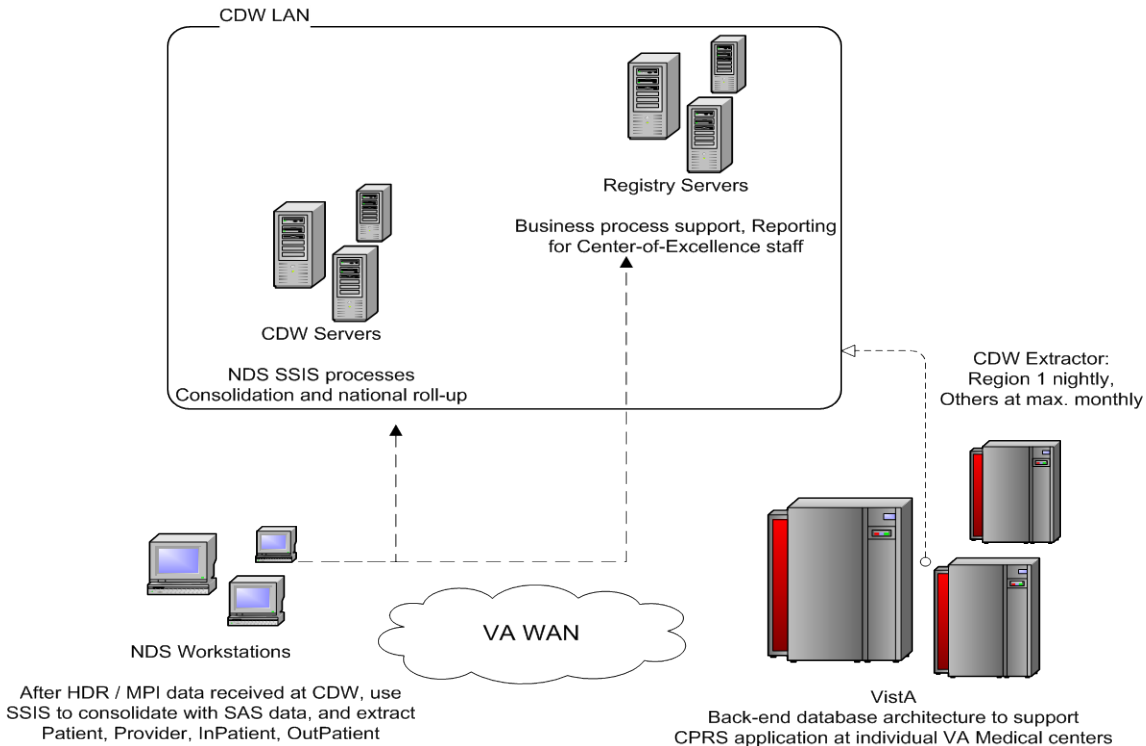


Figure 14: VA WAN Infrastructure

3.3.1. Development Environment

The developers run Visual Studio 2008 on their local machine. The database is located on a development server. Each developer runs their own development instance, using the Web server that comes with Visual Studio 2008 (not IIS). The code is synchronized between the developers using Rational Team Concert source control. In other words, the only server components used in the development environment are SQL server and Rational Team Concert source control. Everything else is done locally on the VA GFE laptop.

3.3.2. Pre-Production (SQA/System Test) Environment

The Pre-Production (SQA/System Test) environment includes one application server and one database server. The application server is a virtual VMware server, while the database server is located in a separate physical machine. The application server runs IIS, and the database server runs SQL Server. The application communicates to the database via a domain service account and impersonation, which is configured inside IIS. The LINQ data context connects using connection string information located within the Web.config, also located on the application server.

3.3.3. Production Environment

The Production environment uses the same separation between the database server and application server as the Pre-Production environment. This environment also uses the same hardware topology as Pre-Production, running an application server on a virtual server and a database server on its own physical machine. A detailed diagram of the production environment is shown in below in Figure 15.

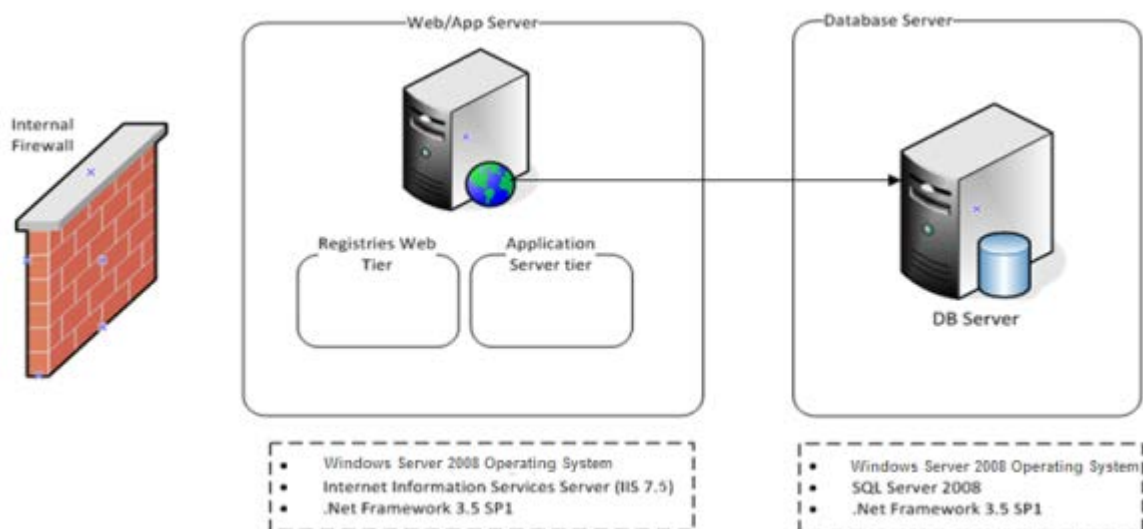


Figure 15: Registries Infrastructure in Production Environment

3.3.4. System Criticality and High Availability

There is no system criticality or high availability with regards to MSSR. However, the system is availability and business continuity level routine support is administered by the CRS relational database framework.

3.3.5. Special Technology

MSSR in Increment 2 requires no new special technology or devices.

3.3.6. Technology Locations

MSSR in Increment 2 uses the following technology components at the following locations, as listed in Table 12 below.

Table 12: Technology Location Details for MSSR

Technology Components	Location	Usage
For Development, Pre-Production, and Production		

Technology Components	Location	Usage
Workstations	Any physical location that allows access to VHA network either through direct connection or Virtual Private Network (VPN), and access to CPRS.	Accessing CPRS for MSAT or a compatible Web Browser for MSSR.
Special Hardware	None	None
Interface Processors	AITC	Creating a TIU Note to be sent via MDWS and HL7, and routed through VIE into VistA.
Legacy Mainframe	N/A	N/A
Legacy Application Server	N/A	N/A
Legacy Databases	N/A	N/A
Other	N/A	N/A

3.3.7. Conceptual Infrastructure Diagram

3.3.7.1. Location of Environments and External Interfaces

For the location of environments and external interfaces, refer to section 3.3.6 above.

3.3.7.2. Conceptual Production String Diagram

MSSR intends to use Medical Domain Web Service (MDWS) calls, in a client (sender) process for each remote system to send HL7 messages. This messaging process requires a TCP socket. The client process sends HL7 messages to the remote system and receives accept acknowledgment messages from the remote system. The diagram below in Figure 16 depicts the sequence of events for an outbound message regarding messages and acknowledgments.

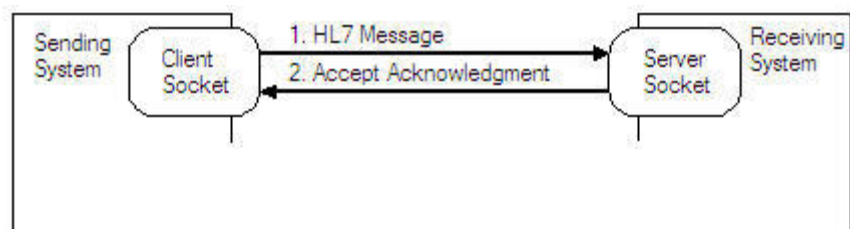


Figure 16: Conceptual Production String Diagram for MSSR Messaging

4. System Architecture

The MSSR application is conceptually a number of web-based data entry forms that communicate with a database (see Figure 17 for the system architecture). This database communication does not use any direct SQL statements, but is routed through an Object Relation Mapper. For the Object Relational Mapper, Microsoft LINQ-to-SQL was selected, which is included in .Net Framework 3.0. A correct understanding of this mapper is required to understand the detailed modules in the section below. The following is a description of how the mapper functions:

1. Database: The MSSR application uses a single database. This database represents all registry entities, using tables.
2. LINQ Database Markup Language (DBML): The DBML contains one-to-one mappings to each database table. This means each table creates an individual object inside the LINQ DBML. These objects are called LINQ entities.
3. Business Objects: LINQ entities do not necessarily represent a full object used in the business layer. Frequently, several entities need to be combined into one business object; for example, a patient entity and an address entity can be combined into a patient business object.

Additionally, LINQ entities do not contain any business logic. The business objects are conceptually the place to describe which LINQ entities belong together, and how these objects are allowed to function.

The business objects use an object-oriented concept called partial classes, which allows inheritance from the LINQ entities and addition of business logic and validators.

The business objects represent how a particular object is defined and how it behaves, but it does not provide creation or storage. The next tier, the business managers, accomplishes these tasks.

4. Business Managers: Provide all the Create, Read, Update, and Delete (CRUD) operation to the business objects. The managers are not limited to four operations each, but can have multiple operations using different criteria, such as a patient select by region or a patient select by ID.

The CRUD methods can either operate on one single business object individually, or return/provide generic lists of business objects, such as for inclusion in data grids.

5. User Interface: The user interface interacts exclusively through those business managers, which means the user interface is decoupled from what the object does (business logic) and how it stores (Object Relational Mapper (ORM) and database).
6. The business managers are usually consumed by the User interface (UI) using Object Data sources.

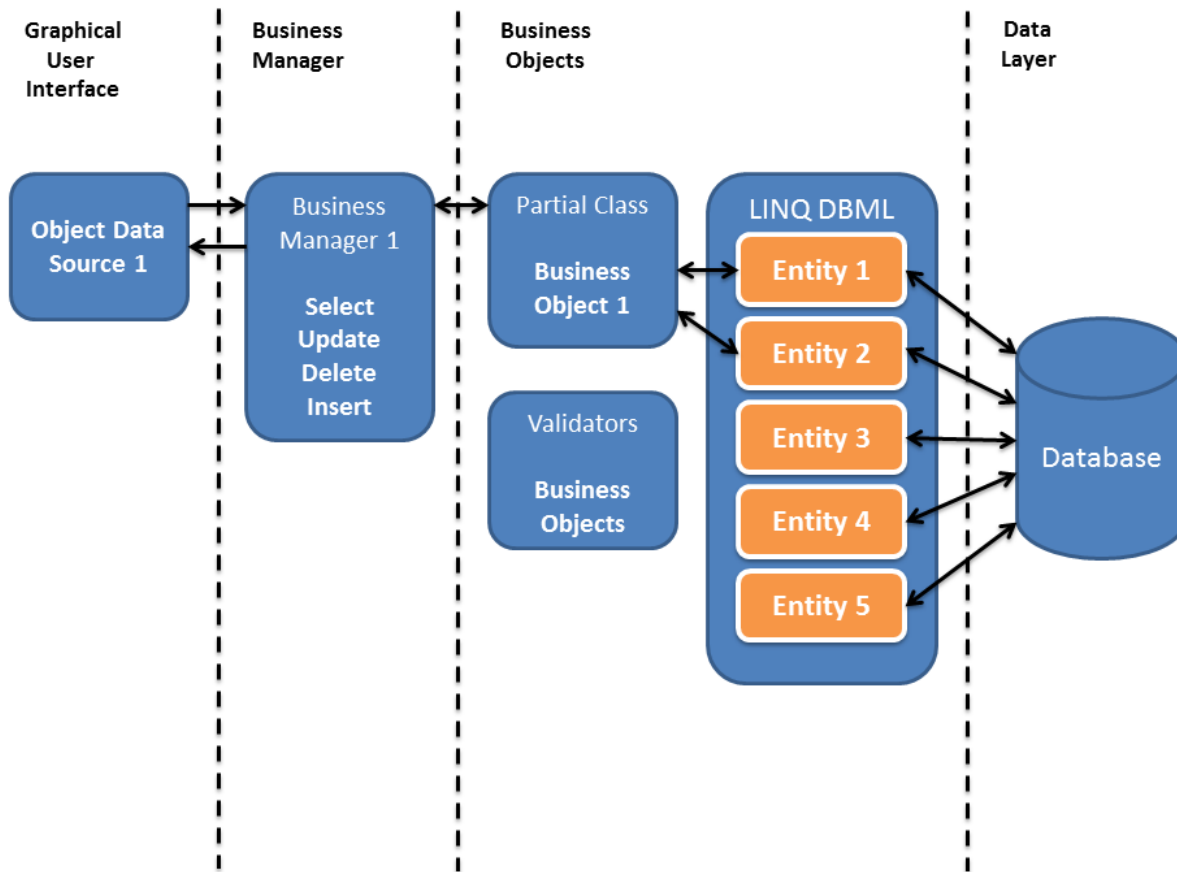


Figure 17: MSSR System Architecture (Conceptual)

4.1. Hardware Architecture

The MSSR application server is centralized. The data tier is distributed between principal and mirror, and is monitored by a witness server, which can relay between the two servers if any technical difficulties arise.

The system uses MDWS to import patient and examination data. AITC provides an interim architecture using VMWARE™ virtual servers to support the MSSR project. All servers shown in Figure 19 below are located within the same network segment, located at AITC in Austin, TX.

AITC provides the following interim hardware architecture to support the Registries database:

- Continuity of Operations Plan/Disaster Recovery (COOP/DR) services that will acquire a replacement processing capacity for the recovery of an application name after 72 hours of a Corporate Data Center Operations (CDCO) disaster declaration and the application name will be operational no later than 30 days following the declaration. Data will be restored from the last backup).
- Residing on the existing AITC VMware (Windows 2008) environment are:
 - 2 – 50 GB each VMs on GSS (small)

- Virtual Windows 2008 Web Server on GSS (small)– Production
 - Virtual Windows 2008 Web Server on GSS (small)– Preproduction
- 1 – 50 GB VM on ICL (Small)
 - Virtual Windows 2008 Web Server on ICL (Small) – Development.

The development and production database will remain where it is now in CDW (A01 and A02) until physical hardware is acquired.

The Health Data System Program Office is preparing a long-term architecture solicitation that will replace the virtual servers with dedicated servers performing the same functions. All servers shown in Figure 6 are located within the same network segment, located at the CDW in Austin, TX.

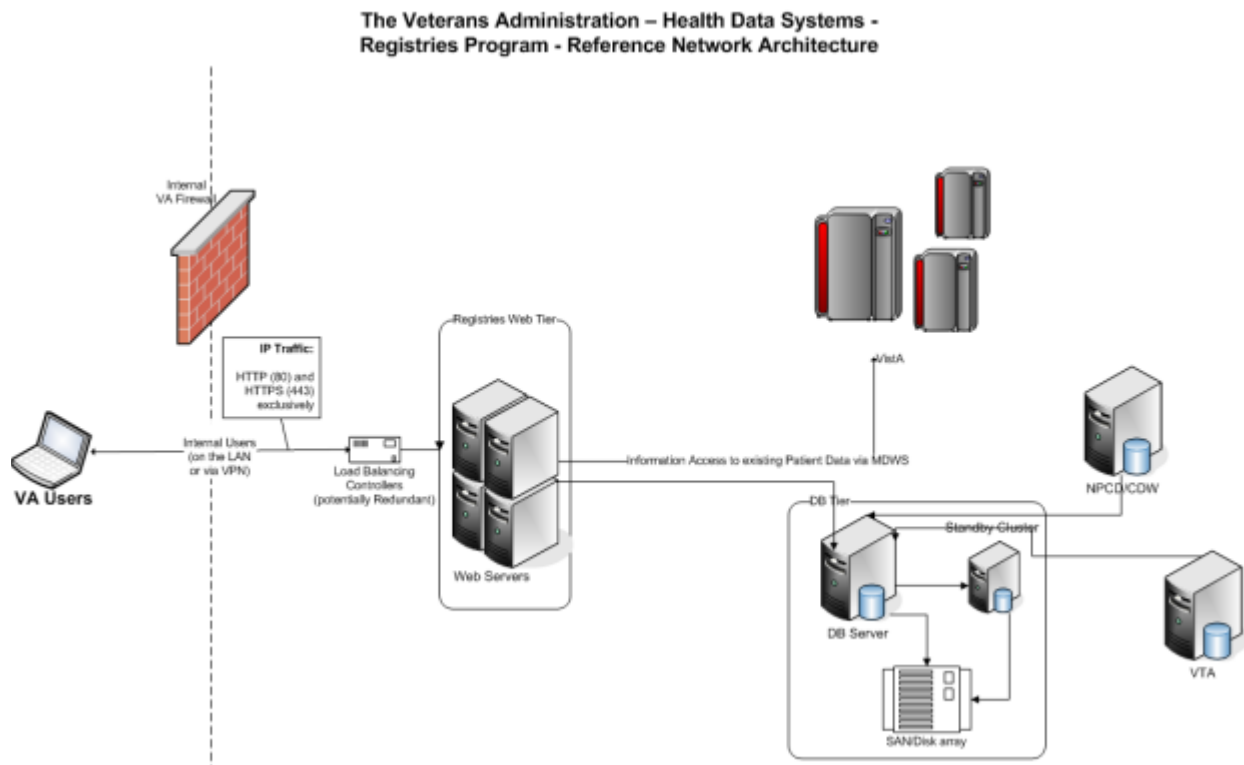


Figure 18: VA Network Architecture

MSSR operates within the following hardware environments,

- 1) Two (2) VA supplied/licensed 50GB each VMs on GSS;
 - a. Virtual Microsoft Windows 2008 Web Server on GSS for the Production Application (VACRSWEB20)
 - b. Virtual Microsoft Windows 2008 Web Server on GSS for the Preproduction Application (VACRSWEB40)
- 2) One (1) VA supplied/licensed 50GB VM on ICL
 - a. Virtual Microsoft Windows 2008 Web Server on ICL for the Development Application and database (VACRSWEB70)

- 3) One (1) VA supplied/licensed Microsoft SQL Server 2008 for the Production Database (VACRSSQL20)
- 4) One (1) VA supplied/licensed Microsoft SQL Server 2008 for the PreProduction Database (VACRSSQL40)

Table 13 identifies the hardware and system software that needs to be deployed in order to run the application.

Table 13: Hardware and Software Specifications

Functional Server Name	Operating System	32 or 64 bit	Processor (# x 500Mhz)	RAM (GB)	Storage (MB)	Virtual Machine?	Backup Frequency
Production Web Server	Windows Server 2008 R2 Enterprise	64	2 x 2.4Ghz Quad Core Equivalent	32	163840 (OS Drive)	No	Nightly
Production SQL Server	Windows Server 2008 R2 Enterprise	64	2 x 2.4Ghz Quad Core Equivalent	32	163840 (OS Drive)	No	Nightly

4.2. Software Architecture

The MSSR is a web-based application to be written in ASP.NET/C# using Microsoft Visual Studio 2008 SP1. The application is running under Microsoft .Net Framework 3.5. The system uses a three-tier client/server design (refer to Figure 19 below).

1. First Tier – Database: The application uses Microsoft SQL 2008. The application does not access the application directly, but via a LINQ to SQL data context.
2. Second Tier – Business Layer: The business layer represents all objects used in the application. The business layer retrieves its data from the LINQ data context, which in turn queries the SQL database. Most of the standard functions of each Web site are processed in a master page, which provides authorization and security related functionality.
3. Third Tier – GUI: The GUI has been developed in ASP.NET. The GUI consists of only standard Microsoft controls. The GUI never communicates with the data directly, but retrieves all its objects through the business layer. The application also provides a reporting module. The reporting module utilizes ASP.NET as well, for security and selection criteria, but the report itself is rendered by Microsoft Report Viewer (bundled within Visual Studio 2008), using SQL Server Reporting Services.

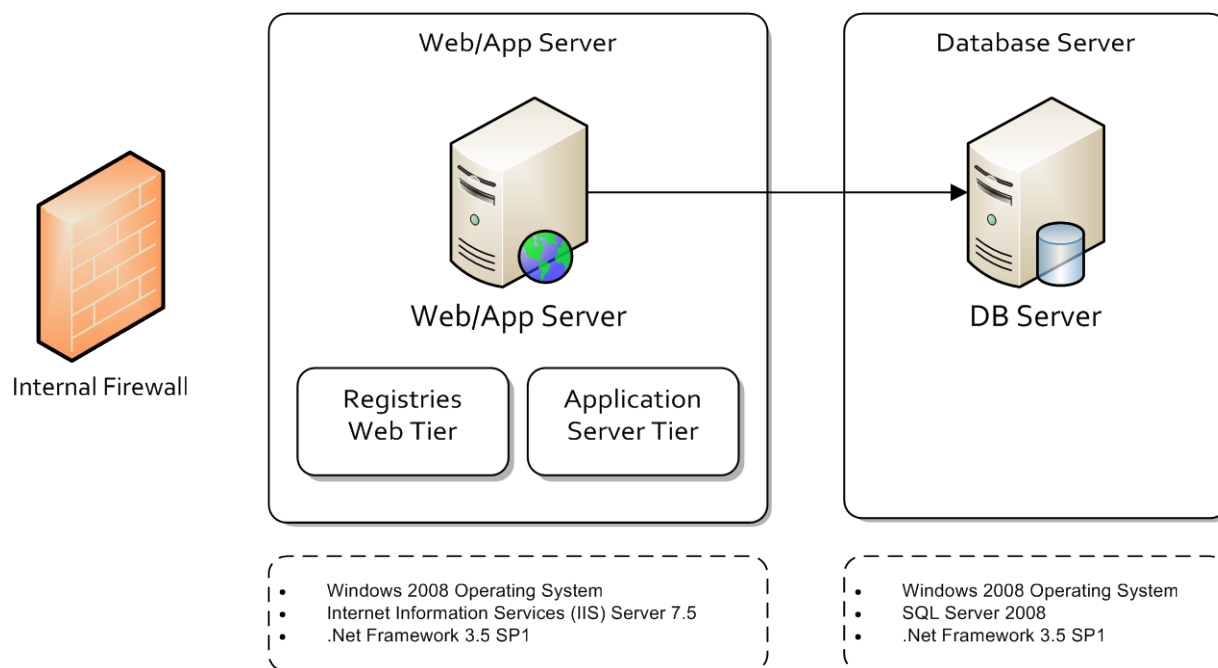


Figure 19: Three-Tier Client / Server Design

In order to deploy MSSR, Table 14 below identifies the software that needs to be deployed.

Table 14: Software List for MSSR

Software	Version	Production Environment	
		Qty	License Provided By
Microsoft® Windows Server®	Microsoft Windows Server 2008 R2 Enterprise 64-bit	2	VA
Microsoft® IIS	7.5	2	VA
Microsoft SQL Server® with installed: <ul style="list-style-type: none"> SQL Server Integration Services (SSIS) SQL Server Analysis Services (SSAS) SQL Server Reporting Services (SSRS) 	Microsoft SQL Server 2008 Enterprise R2	2	VA
.NET Framework	3.5, SP 1	2	VA
MSSR Application	MSSR v1	1	VA Custom

4.2.1. Development (Dev) Environment

The developers run Visual Studio 2008 on their local machine. The database is located on a development server provided by the VA. Each developer runs his or her own development instance, using the Web server packaged with Visual Studio 2008. The code is synchronized between the developers using Rational Team Concert source control. In other words, the only server components used in the development environment are SQL server and Rational Team Concert source control; all other development is performed locally.

4.2.2. Pre-Production (Pre-Prod) / Software Quality Assurance (SQA) Environment

The Pre-Production or SQA environment is located on one physical server, running two virtual instances (that is, application server and database server). The database server runs SQL, and the application server runs Internet Information Server (IIS). The application communicates to the database via a domain service account and impersonation, which is configured inside IIS. The LINQ data context connects using connection string information located within the Web.config, also located on the database server.

4.2.3. Production (Prod) Environment

The Production environment uses the same separation between the database server and Web application server as the Pre-Prod environment, but the hardware architecture is more complex, to facilitate redundancy, performance, and high availability. A detailed diagram of the production environment is depicted in Figure 19.

Table 15 below contains the locations to download trial versions of the appropriate tools.

Table 15: Development Tools

Tool	Download Trial Version
<u>Visual Studio 2008 Professional</u>	http://orcas.dlservice.microsoft.com/download/8/1/d/81d3f35e-fa03-485b-953b-ff952e402520/VS2008ProEdition90dayTrialENUX1435622.iso?lcid=1033
<u>SQL Server 2008 Developer Edition</u>	http://msdn.microsoft.com/en-us/sqlserver/default.aspx
<u>Windows 2008 Server</u> <u>Subversion (server) and Tortoise SVN (client)</u>	

4.3. Communications Architecture

The communications architecture for MSSR utilizes the VA Wide Area Network (WAN) for access to MSSR and local Vista system. The MSSR application is developed, with a

communications interface to transfer records as appropriate. The One VA Enterprise WAN is depicted in Figure 20 below.

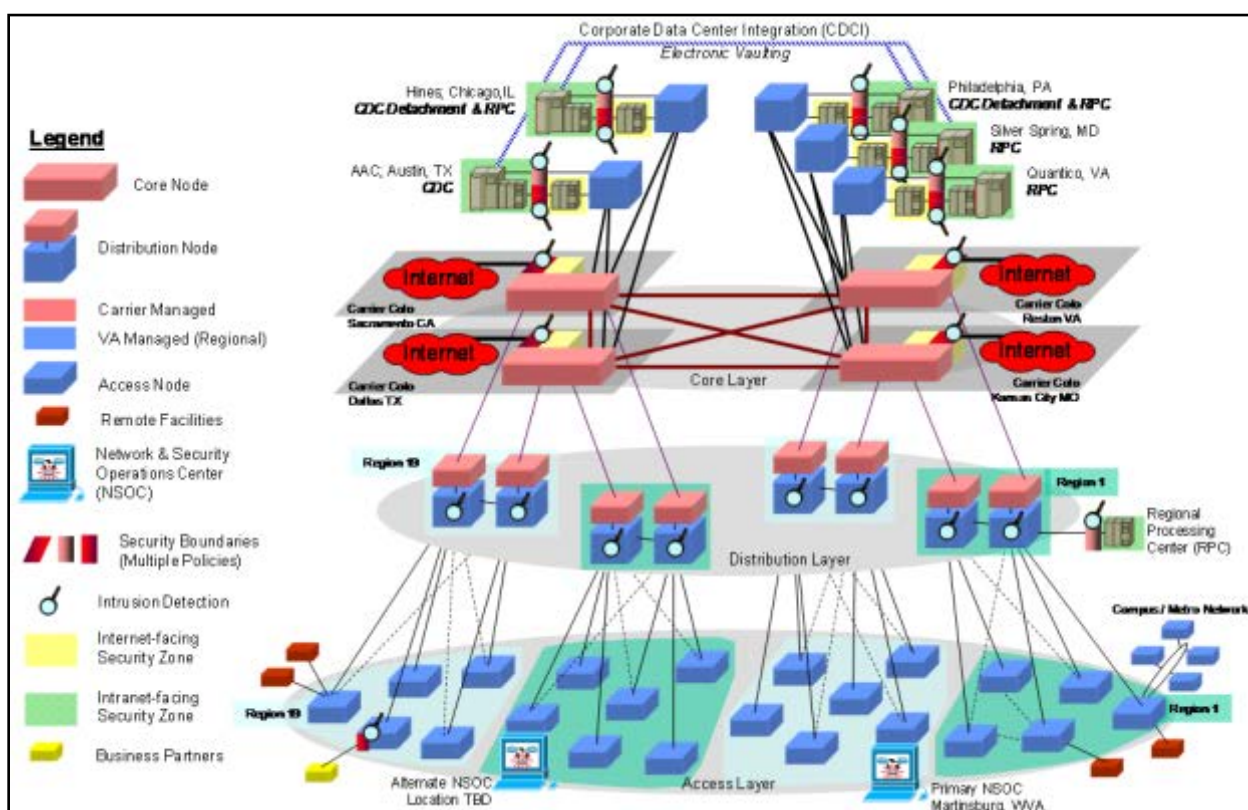


Figure 20: One VA Enterprise WAN

5. Data Design

MSSR plans to use the common database, the CRS DB. The database was built using the following elements:

Base Entities: The CRS database is a patient-centric database: almost all entities exist entirely in relation to a base “Patient” entity. Most of the base entities are always populated and updated by external data source through the ETL process. An example for a base entity is PATIENT, which is centric to the model and contains only basic identity-establishing attributes for a person. Note that the CRS database is only a consumer of identity and demographic data. It exists “downstream” of the enterprise identity and demographic management services. Registry receives patient data from National Data Systems (NDS) through monthly ETL data extracts and data loads. Some base entities, such as work-flow-case entity, only store data entered by users through various registry applications.

Detail Entities: Though some of the detail entities also receive data from the ETL, most of the time the detail entities store data from users’ input. An example for a detail entity is the CONTACT LOG, which represents contacts with a VA hospital or patient using standard

enterprise methods of contact (such as phone, fax, email, mail, etc.), and logs details of the contact such as: person(s) spoken with, information exchanged, standard methods of follow-up (such as call back scheduled, Kit dispatched, specimen awaited, etc.). The SHIPMENT DETAIL entity tracks details of the follow-up actions (such as when contact results in kits being sent out or specimens/fragments being received for analysis). SPECIMEN ANALYSIS and FRAGMENT ANALYSIS entities track the details surrounding these processes. Both specimens and fragments may be received and then re-sent to other labs for further analysis, in the event of which, the case is reopened in CONTACT_LOG. Additionally, specimens/fragments undergo laboratory analyses, the details for which are captured in the ANALYTE entity.

Second and Third Normal Form Design: Applied throughout the CRS database, this ensures maximum performance and scalable throughput. Design performance of 1,000 transactions per hour is the norm for databases designed using these design principles.

History Tables: Storage and versioning of historical data within the Registry's database (for tables whose content is authored by the Registry's application), is provided by means of individual history tables that "shadow" each transactional table. The structure of a history table mirrors its corresponding transactional table, in other words all columns present in the transactional table are present in the history table, and are of the same size and data-type. In addition to the original columns from the transactional table, each history table contains its own primary key column and also a "transaction type code" column, used to mark the type of transaction that caused the record to be written into the history table, and also a datetime type field to capture the date and time of the record being logged. Note: history tables "stand alone" i.e., there are no foreign key constraints between a historical table and any other table in the database. A history table is given the same name as its corresponding transactional table, with the suffix '_H' appended.

Triggers: The history tables are populated by means of database triggers that will fire after an insert, update, or delete action, occurring upon the corresponding base table. Thus, upon the occurrence of a triggering action, prior state of each record in a base table is versioned-off into the history table, with the "transaction type code" detailing the exact operation that was performed, in order to cause creation of the versioned record.

Enterprise Standard Reference Tables: Store reference data that is standardized across the Enterprise. Within the VA, the Standard Reference Service (SDS) has defined reference structures and the data values for several entities such as INSTITUTION, CITY, STATE, RACE, GENDER, MARITAL_STATUS etc. The CRS database will function as an offline consumer of the standard reference data from the SDS. In other words, while the Registry's program manages its own reference structures, they will follow the structure and content of the SDS database. The Registry may author new, unique, and reference entities. However, a request will be sent to the SDS team in order for them to incorporate the new entity as part of the enterprise standard.

Application Parameter Tables: While still under the category of "reference" the data in these tables may be modified by front-end administration screens. These tables store reference data that is required for the front-end application to perform.

Internal Audit Fields: The purpose of "Internal" fields in all Registry tables is to capture who (which user) is adding (insert) or changing (update) records, the date and time the record is created / modified, and also a count of how many times the record has been modified. This information is essential for a database administrator (DBA) to maintain control of the data and serves as an audit check.

Identity Column: Each and every table within the CRS database contains a primary key column that is both mandatory and unique. The primary key of each table may function as a "foreign key" or as a "candidate key" while participating in "joins" with other tables in the database. This primary key column is vital for maintaining the relational integrity of the database. A database "sequence generator" is used for generating the primary key values.

5.1.1. Database Domains

CRS is an integrated database solution which supports different registry applications. In order to effectively manage the database, data tables are grouped into multiple domains based on the applications. Below are MSSR and the common shared database domain.

- DBO Domain: the commonly shared entities.
- MSSR Domain: MSSR-specific entities.

5.1.2. DBO Domain

CRS contains a domain to host all of the common data to be utilized by MSSR. This domain is called DBO, and is considered part of CRS.

Some of the DBO's entities are of particular interest, because they define how users interact with patient data and process business functions via registry specific workflows. Table 16 illustrates those important entities.

Table 16: Important Entities of DBO Domain

Entity Name	Description
Patient	The base table for everything. All registries contain data for patients. This entity stores a list of all applicable VA patients.
Referral	Data sets in the registries are not filed by patient, but by referral. A patient needs to be referred to a registry, which will create a record in this entity. The referral binds a patient from the master patient list to its registry. A patient can have multiple referrals, and be referred to multiple registries.
Registry Demographics	Stores alternate patient information that is added in a registry and does not alter the content of its master patient record. For instance, if the patient's address is outdated in the patient master record, an alternate address can be defined here
Role Permissions	Define which user roles can access which physical web page in a registry.
User Login	Logs all user logins

Entity Name	Description
Detail	
User Registries	Define which users have access to which registries
User Roles	Define which roles are assigned to each user
Users	Application users for the registries. Contain NT logon name, full name and other information identifying the user
Workflow Case	Contains all workflows in the registries. Workflows are assigned to a referral and have a status
Workflow Case Activity	<p>Workflows can go to a number of activities before there cycle concludes, for instance the EFR workflows have 5 activities that they go through sequentially. Once the workflow finishes all 5 activities, or is voided prematurely, the workflow is considered closed.</p> <p>Conceptually, a patient can have multiple referrals, which can have multiple workflows, which go through multiple activities. Each of the entities referral, workflow case and workflow case activity have a status which indicates state of the item. This workflow module represents the foundation of most registry functionality.</p>

5.2. DBMS Files

The Converged Registries Solution (CRS) database is the baseline for the MSSR database. The database design is shown in Figure 21 and Figure 22. CRS uses SQL Server 2008 R2 is the DBMS for CRS. SQL Server 2008 & 2012 is the DBMS for the Corporate Data Warehouse (CDW).

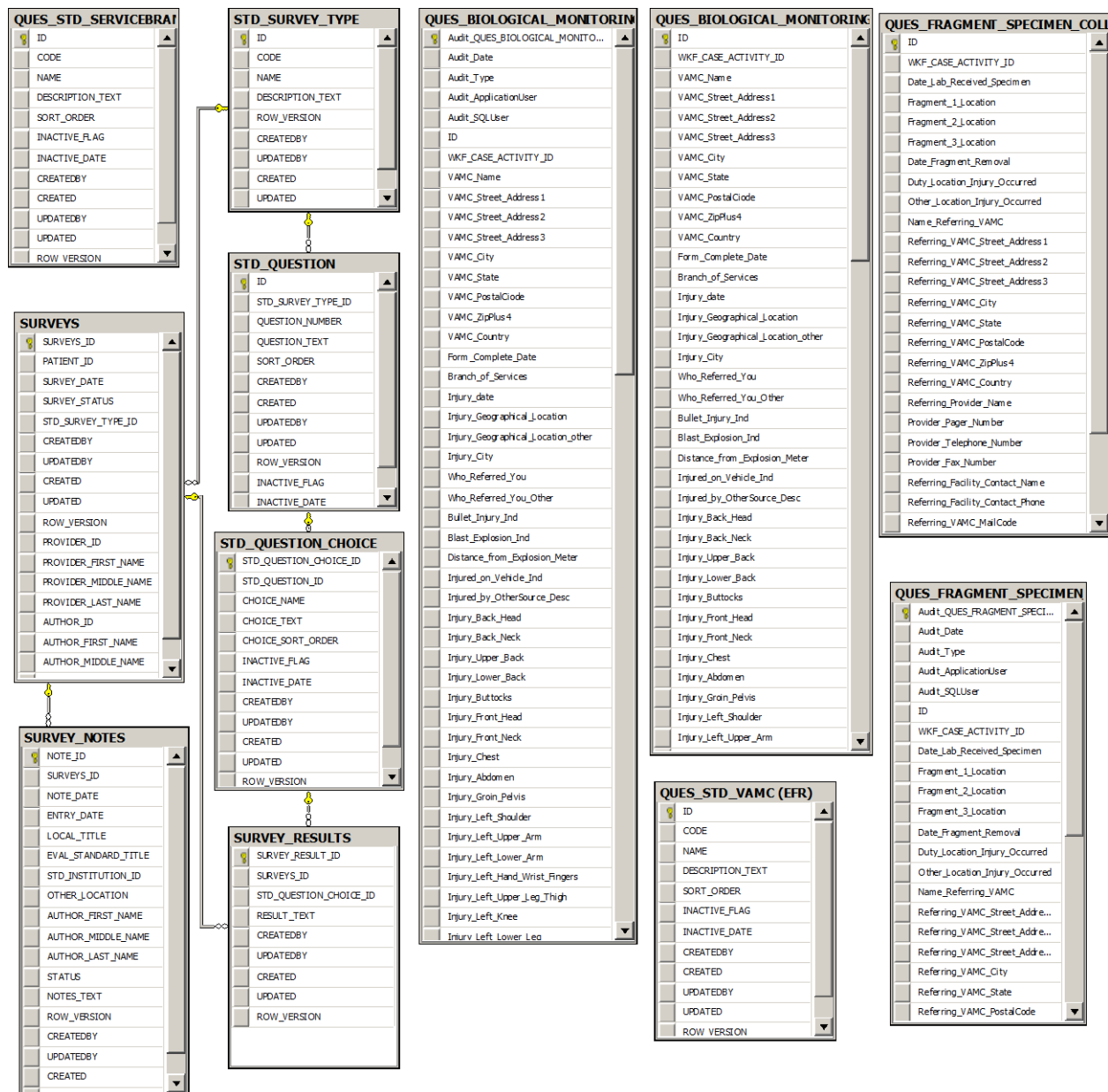


Figure 22: DBO Domain (2 of 2)

5.3. Non-DBMS Files

The Non-DBMS files for the new MSSR have not been fully developed yet, but once fully developed, this section will be updated.

6. Detailed Design

The MSSR application uses a three-tier architecture as shown in Figure 23.

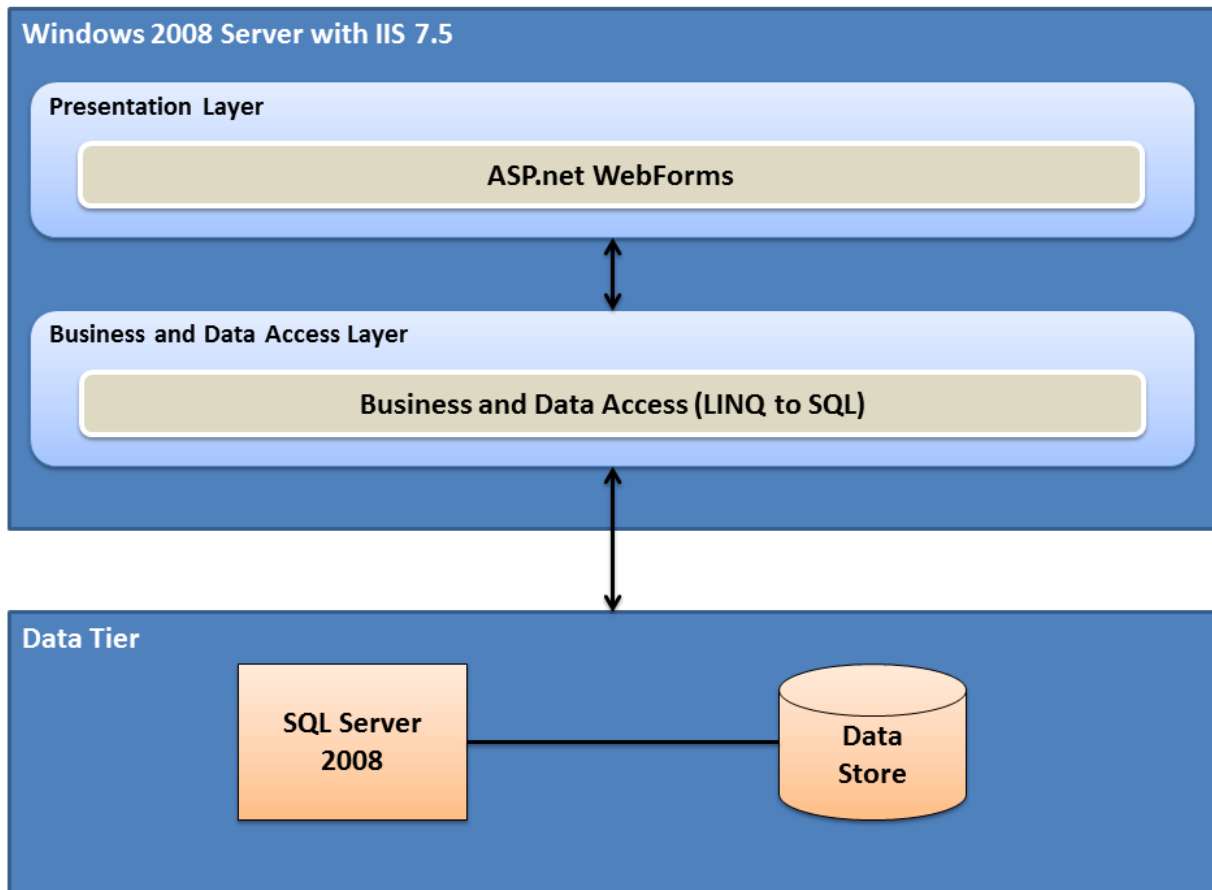


Figure 23: MSSR Three-Tier Architecture

1. **Presentation Layer:** This layer contains a web-based user interface implemented using a Microsoft ASP.NET framework. This interface manages the user interaction with the core MSSR functionality and user administration. This layer contains user interface components such as ASP.net master pages, Web forms and user controls. It performs functions such as configuring the visual appearance of controls, accepting and validating user input, and acquiring and rendering data from business components or data access logic components. The MSSR user interface provides rich features like paging, sorting, displaying data in multiple tabbed controls, and for consistent look and feel it uses skin and common Cascading Style Sheets (CSS) styles. Refer to Section 7 for a detailed explanation of the presentation layer.
2. **Data Access Layer:** The business layer uses LINQ to SQL as a data access layer that interacts with the data tier. The data tier contains a SQL Server 2008 database running on a Windows 2008 server.
3. **Business Layer:** This layer encapsulates the business and data access logic for MSSR. This layer consists of two logical components, the business manager and business objects developed using Microsoft.Net LINQ to SQL technology. The business manager objects hold all data related queries (CRUD) and holds the data context object. All the business and query

logic is managed by the business manager component and it uses LINQ to SQL as a Data Access Layer.

6.1. Hardware Detailed Design

The VA provides the hardware as part of its support for the Registries program. There are no requirements to provide the hardware in this SDD. Refer to Section 4.1 for details of the provided hardware architecture.

6.2. Software Detailed Design

The software detailed design for MSSR has not been finalized yet, but once finalized, this section will be updated. See section 6.2.1 below for the conceptual design.

6.2.1. Conceptual Design

Business Managers: The most important point of interest in the software design is the business managers, which are described below in detail.

The application contains three business managers that retrieve and store MSSR data. Those three business managers are specific to MSSR and are not used by the other registries:

1. MSAT Entries Manager
2. MSAT Patient Manager
3. MSAT Assessment Manager

In addition to MSSR-specific business managers, the application also contains several business managers that are being used across all registries. The following six are of interest for MSSR:

1. Patient Manager
2. Registry Manager
3. User Account Manager
4. User Manager
5. Role Manager
6. Role Permission Manager

Business Manager Select Pattern: A certain pattern is defined to retrieve data from a business object. All business managers follow that pattern.

- LinqAll – Retrieves a list of all business objects a user has access to see
- LinqFilter – Filters down this list to whatever is desired by a selection criteria
- Select – Retrieves all or a specific portion of that filtered list, needed by Grid View paging
- SelectCount – Retrieves how many items are matching the filter criteria

Business Objects: The MSSR application uses an object relational mapper called LINQ-to-SQL. This technology maps each table into the database and creates a physical business object for each table.

Each table has a corresponding business object. Most of the business objects purely represent a datastore without any business logic. The database diagram and object schema are identical, except for three of the business objects.

There are three partial classes, which provide an add-on of business rules and additional attributes to the existing Linq-to-SQL business objects. These add-ons are realized using the concept of partial classes, which means they extend functionality of the already existing LINQ-to-SQL business classes. The two business objects are:

1. MSAT Assessments
2. MSSR Tracking

Security: MSSR is an intranet application and all of its user accounts are maintained within a Microsoft windows active directory. Hence, windows authentication is chosen to perform user authentication. ASP.NET is configured for windows authentication coupled with IIS authentication, where IIS authenticates application's users by using integrated windows authentication.

MSSR uses a custom role based authorization in which database roles are configured to give access to the authenticated users. Security checks at screen level and parts of a screen are maintained using roles.

6.2.1.1. Product Perspective

In perspective to the other national registries, the MSSR is independently operated and functionally self-contained. However, it is structured within the CRS relational database framework and thus, common requirements like the shared common patient data for CRS impact the MSSR functionalities.

6.2.1.1.1. User Interfaces

The user interfaces for the new MSSR may be found in 3.2.3 User Interface Data Mapping for MSSR.

6.2.1.1.2. Hardware Interfaces

The new MSSR requires no new changes to the hardware interfaces, and as such, this section is not applicable.

6.2.1.1.3. Software Interfaces

The new MSSR requires no new changes to the software interfaces, and as such, this section is not applicable.

6.2.1.1.4. Communications Interfaces

The new MSSR requires no new changes to the communication interfaces, and as such, this section is not applicable.

6.2.1.1.5. Memory Constraints

There are no memory constraints for MSSR.

6.2.1.1.6. Special Operations

There are no special operations for MSSR.

6.2.1.2. Product Features

The product features for the new Multiple Sclerosis Surveillance Registry (MSSR) provides four (4) main features:

- MSAT for Clinical Data Entry of MS Assessments
- MSSR Patient Query and comprehensive Clinical Data Query
- MSSR Standard Reporting, including Charts
- MSSR Cube Reporting for dynamic Ad Hoc reports (if possible)

6.2.1.3. User Characteristics

For the user characteristics, see section 1.9 User Characteristics.

6.2.1.4. Dependencies and Constraints

- The registry application shall be web-based, without installing any client plug-ins in the internet browser.
- The activities of this SDD are constrained by the schedule requirements outlined in the Performance Work Statement (PWS) for MSSR.
- The technical constraints imposed upon this design and development include the following VA supplied and licensed products:
 - Microsoft ASP.NET for development platform
 - Microsoft Windows Server 2008 R2 Enterprise 64-bit
 - Microsoft IIS 7.5
 - Microsoft .Net Framework 3.5, SP1

- Microsoft SQL Server® 2008 Enterprise R2 with:
 - SQL Server Integration Services (SSIS)
 - SQL Server Analysis Services (SSAS)
 - SQL Server Reporting Services (SSRS)
 - Open Source Mirth® Connect, 2.x
- Converged Registries Solution (CRS) framework and architecture imposes database and GUI design and development
- VA mandate for *Section 508 of the Rehabilitation Act of 1973*, as amended (29 U.S.C. 794d). Section 508 Compliance Requirements are listed on the VA Section 508 Office website at [REDACTED]
- Unavailability of Cube reporting feature

6.2.2. Specific Requirements

Below you will find the system features to be designed in MSSR, but for the most current and up-to-date requirements, please refer to the MSSR RSD and MSSR Scratchpad.

- Ability, within VHA, to track and monitor the MS patient population by creating a national software system wherein all clinicians can enter MS data for their patients
 - The MS Registry will incorporate data from the CDS Tool (MSAT), along with other relevant clinical databases for clinical monitoring
 - The MS Registry will provide data for longitudinal analyses of the MS population.
 - The CDS tool (MSAT) is the portal for entry of data into the MS Registry by clinicians at the point of care.
 - The MSSR will securely receive data from source databases and provide an indicator of how current the data is – e.g., date/time stamps.
- Business Need 2: Provide tools and utilities to retrieve, extract, analyze, and report data from the MS Registry.
 - Tools will be provided to retrieve, analyze, and display data within a user interface.
 - The reporting tools will provide capability to generate standard and ad hoc individual and aggregated reports.
- Business Need 3: The MS system must be able to display data from VistA.
 - The MS Registry must be able to display clinical and administrative data.
 - The MS Registry shall have storage capacity from other relevant VHA data sources.

6.2.2.1. Database Repository

The new MSSR in Increment 2 requires no new changes to the database repository, and as such, this section is not applicable.

6.2.2.2. System Features

The system features for the new MSSR in Increment 2 are described in 6.2.1.2 Product Features.

6.2.2.3. Design Element Tables

The new MSSR in Increment 2 requires no new changes to the design element tables, and as such, this section is not applicable.

6.2.2.3.1. Routines (Entry Points)

The new MSSR in Increment 2 requires no new changes to the routines (entry points), and as such, this section will be updated.

6.2.2.3.2. Templates

The new MSSR in Increment 2 requires no new changes to the templates, and as such, this section is not applicable.

6.2.2.3.3. Bulletins

There are no bulletins planned to be developed for the new MSSR.

6.2.2.3.4. Data Entries Affected by the Design

There are no data entries affected by the design of the new MSSR.

6.2.2.3.5. Unique Record(s)

There are no unique records that will be affected by the design of the new MSSR.

6.2.2.3.6. File or Global Size Changes

The new MSSR has not been fully developed yet, but once developed, this section will be updated.

6.2.2.3.7. Mail Groups

The MSSR does not use mail groups.

6.2.2.3.8. Security Keys

The new MSSR in Increment 2 requires no new changes to the security keys, and as such, this section is not applicable.

6.2.2.3.9. Options

The new MSSR in Increment 2 requires no new changes to the options, and as such, this section is not applicable.

6.2.2.3.10. Protocols

The new MSSR in Increment 2 requires no new changes to the protocols, and as such, this section is not applicable.

6.2.2.3.11. Remote Procedure Call (RPC)

The new MSSR in Increment 2 requires no new changes to remote procedure calls (RPCs), and as such, this section is not applicable.

6.2.2.3.12. Constants Defined in Interface

The new MSSR in Increment 2 requires no new changes to the constants defined in the interface, and as such, this section is not applicable.

6.2.2.3.13. Variables Defined in Interface

The new MSSR in Increment 2 requires no new changes to the variables defined in the interface, and as such, this section is not applicable.

6.2.2.3.14. Types Defined in Interface

The new MSSR in Increment 2 requires no new changes to the types defined in the interface, and as such, this section is not applicable.

6.2.2.3.15. GUI

For the new MSSR GUIs, refer to section 3.2.3 User Interface Data Mapping for MSSR.

6.2.2.3.16. GUI Classes

For the new MSSR GUI classes, refer to section 3.2.3 User Interface Data Mapping for MSSR.

6.2.2.3.17. Current Form

For the new MSSR current form, refer to section 3.2.3 User Interface Data Mapping for MSSR.

6.2.2.3.18. Modified Form

There will be no modified layout form, as MSSR is a new system yet to be fully developed.

6.2.2.3.19. Components on Form

For the new MSSR components on the form, refer to section 3.2.3 User Interface Data Mapping for MSSR.

6.2.2.3.20. Events

The new MSSR in Increment 2 requires no new changes to the events, and as such, this section is not applicable.

6.2.2.3.21. Methods

The new MSSR in Increment 2 requires no new changes to the methods, and as such, this section is not applicable.

6.2.2.3.22. Special References

The new MSSR in Increment 2 requires no new changes to the special references, and as such, this section is not applicable.

6.2.2.3.23. Class Events

The new MSSR in Increment 2 requires no new changes to the class events, and as such, this section is not applicable.

6.2.2.3.24. Class Methods

The new MSSR in Increment 2 requires no new changes to the class methods, and as such, this section is not applicable.

6.2.2.3.25. Class Properties

The new MSSR in Increment 2 requires no new changes to the class properties, and as such, this section is not applicable.

6.2.2.3.26. Uses Clause

For the Uses Clause diagram, refer to Figure 1: MSSR Data Flow and System Diagram (Conceptual).

6.2.2.3.27. Forms

For the new MSSR forms, refer to section 3.2.3 User Interface Data Mapping for MSSR.

6.2.2.3.28. Functions

For the new MSSR functions, refer to section 3.2.3 User Interface Data Mapping for MSSR.

6.2.2.3.29. Dialog

The new MSSR in Increment 2 requires no new changes to the dialog, and as such, this section is not applicable.

6.2.2.3.30. Help Frame

The new MSSR has not been fully developed yet, but once developed, this section will be updated.

6.2.2.3.31. HL7 Application Parameter

The new MSSR has not been fully developed yet, but once developed, this section will be updated.

6.2.2.3.32. HL7 Logical Link

The new MSSR has not been fully developed yet, but once developed, this section will be updated.

6.2.2.3.33. COTS Interface

The new MSSR design does not include an interface to any COTS.

6.3. Communications Detailed Design

Communications components are provided by the VA to support the development of MSSR. There are no requirements for the procurement of any additional communications technology.

7. External Interface Design

The CRS connector design and framework is used to interface with internal and external systems. This framework contains components that are common to CRS and components that are specific to MSSR. See Figure 24: CRS Connector Design.

CRS Connector Design

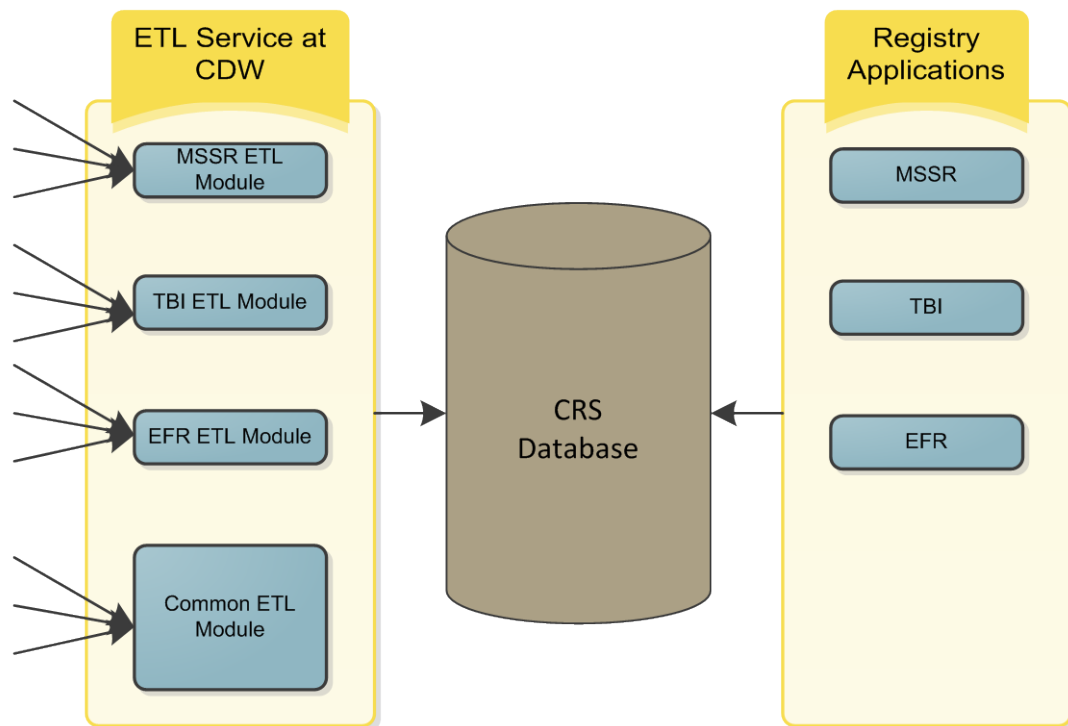


Figure 24: CRS Connector Design

7.1. Interface Architecture

7.1.1. Corporate Data Warehouse

The Corporate Data Warehouse (CDW) is an organizational entity rather than a system or application. CDW servers gather the appropriate information from all VistA instances around the country. The SSIS processes related to MSSR data transfer runs on CDW team Personal Computer (PC) desktops. See Table 17: CDW Summary below.

Table 17: CDW Summary

System	Details
Identification number	1
Title	Corporate Data Warehouse
Abbreviation	CDW
Version number	
Release number	
Point of Contact	
Vendor/Owner	Department of Veterans Affairs

7.1.2. MSSR Database

The specific modules affected within the CRS database include MSSR.

Table 18: MSSR Database Summary

System	Details
Identification number	TBD
Title	Multiple Sclerosis Surveillance Registry
Abbreviation	MSSR
Version number	TBD
Release number	TBD
Point of Contact	Health Registries
Vendor/Owner	Department of Veterans Affairs

7.1.3. MDWS Web Services System

Medical Domain Web Services (MDWS) design is specific to MDWS. Please refer to the MDWS design documents for further information.

Table 19: MDWS System Summary

System	Details
Identification number	3
Title	Medical Domain Web Services
Abbreviation	MDWS
Version number	TBD
Release number	TBD
Point of Contact	MDWS Administrator

System	Details
Vendor	Department of Veterans Affairs

7.1.4. Operational Agreement

The service level agreement (SLA) between System 1 - CDW and System 2 - MSSR, VA Office of Product Development was signed September 4, 2013 and can be found in the CRS TSPR notebook

at:

[REDACTED]

. Other operational agreements are to be identified and will be processed appropriately.

7.2. Interface Detailed Design

In order to produce the Patient Seed table for the Registry team, National Data Systems (NDS) receives and loads the Patient Roster File into the NDS Workspace in the Corporate Data Warehouse (CDW) on a regular basis as the roster file is updated. NDS combines the data from the CDW Patient Table with the data in the roster file to determine unique patients determined by patientICN but omitting patients that are not veterans, older than 75 years of age, and test patients. Additionally NDS marks patients that may be duplicate patients because they have the same Social Security Number (SSN) but have different patient ICNs.

- NDS will load patient data into the RegEyeStaging.PatientSeed table.
- NDS will identify the suspect/ duplicate ICNs: the field labeled “Duplicate” will be populated with a “Y” in case of duplicate records and it will be left “NULL” otherwise. An example for a duplicate ICN would be a patient with the same Social Security Number (SSN) but different ICN listed for different sites.
- NDS will refresh the RegEyeStaging.PatientSeed table on a monthly basis, after the HDR extract runs.

7.2.1.1 Registries Application

Registries ETL will match the dataset provided by CDW with patient data in the CDW data warehouse, using the real SSN in order to lookup the Patient ICN. The patient data provided by CDW comes directly from CDW. If duplicate ICNs are encountered, the IEN and STA3N will be used as a secondary key. Duplicates are flagged within the CDW dataset. As new patient records are added at Veterans Affairs Medical Centers (VAMC) they are sent to the MPI and if the record matches an existing record on the MPI, it is linked under that national ICN. Patient records that are considered to be a potential match receive a new national ICN and an exception is generated for the national Healthcare Identity Management (HC IdM) Team to manually review and resolve.

- Registry ETL uses the PatientSeed table for initial creation of patient records in Patient table
- Registry ETL creates new patient records as they become available from CDW, also update patient data on ongoing basis

- Registry ETL filters out potential suspect/duplicate ICNs which have been identified in PatientSeed.

7.3.1 Interface Detailed Design for Health Factor Data and MSAT ResultsTransfer

MSSR health factor data and MSAT results are transferred from the Medical Domain Web Services (MDWS) to the Registry by automated ETL. Currently, both health factors and MSAT results are stored in the VistA system. MDWS will be replaced by the VistA Integrated Adapter (VIA), but it is a suite of SOAP Web services that expose the functionality of Medical Domain Objects (which is the data access layer). MDWS gets data directly from VistA and pushes the data into MDWS web services functions. Then, via ETL, transfers the data into the Registry.

Figure 25 shows the basic concept of data flow in and transfer process between MDWS and MSAT, and Figure 26 and Figure 27 depict the specific data flow for MSAT via MDWS.

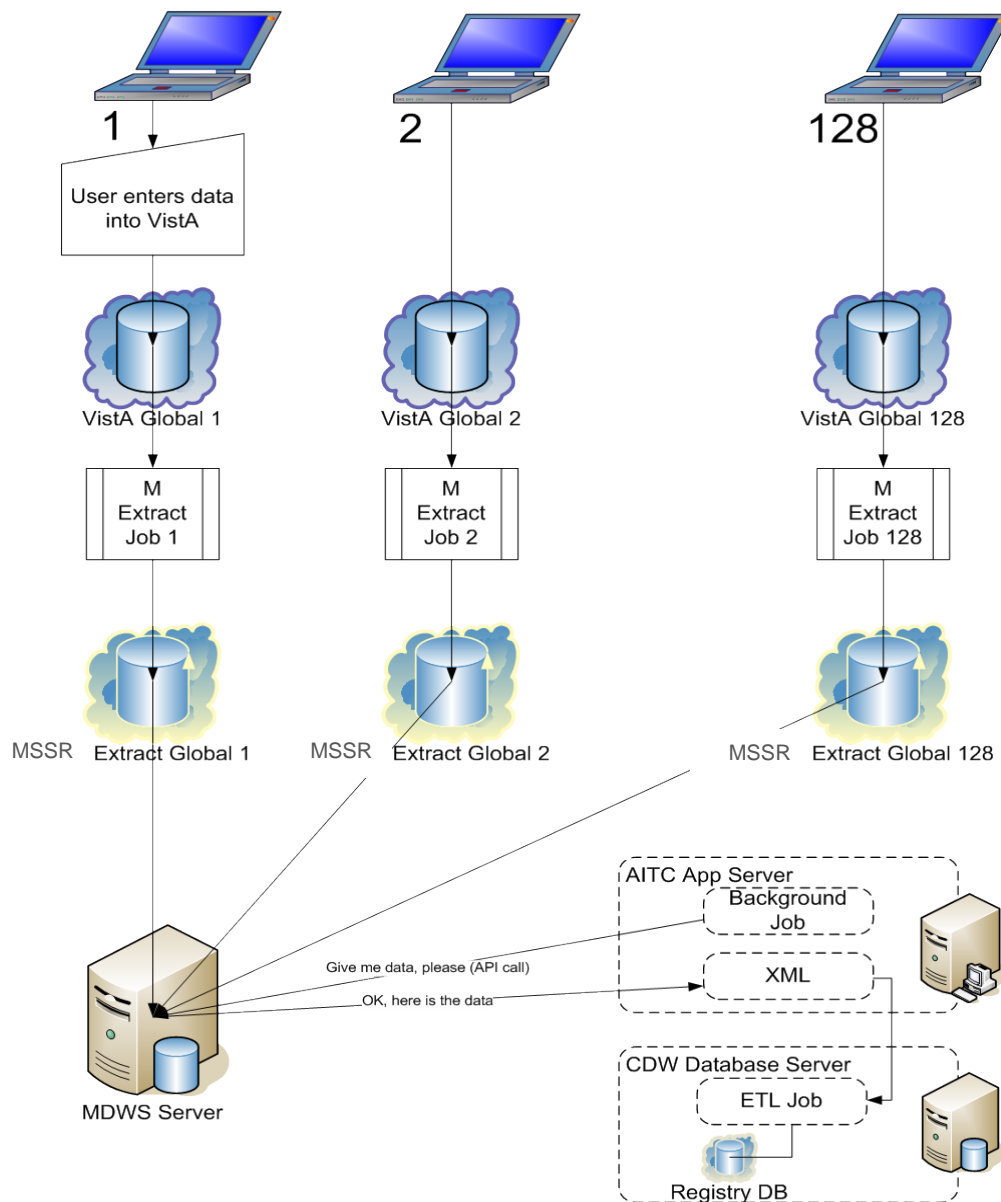


Figure 25: MDWS Interaction with Data Store

MSAT Entry Workflow (CPRS Entry)

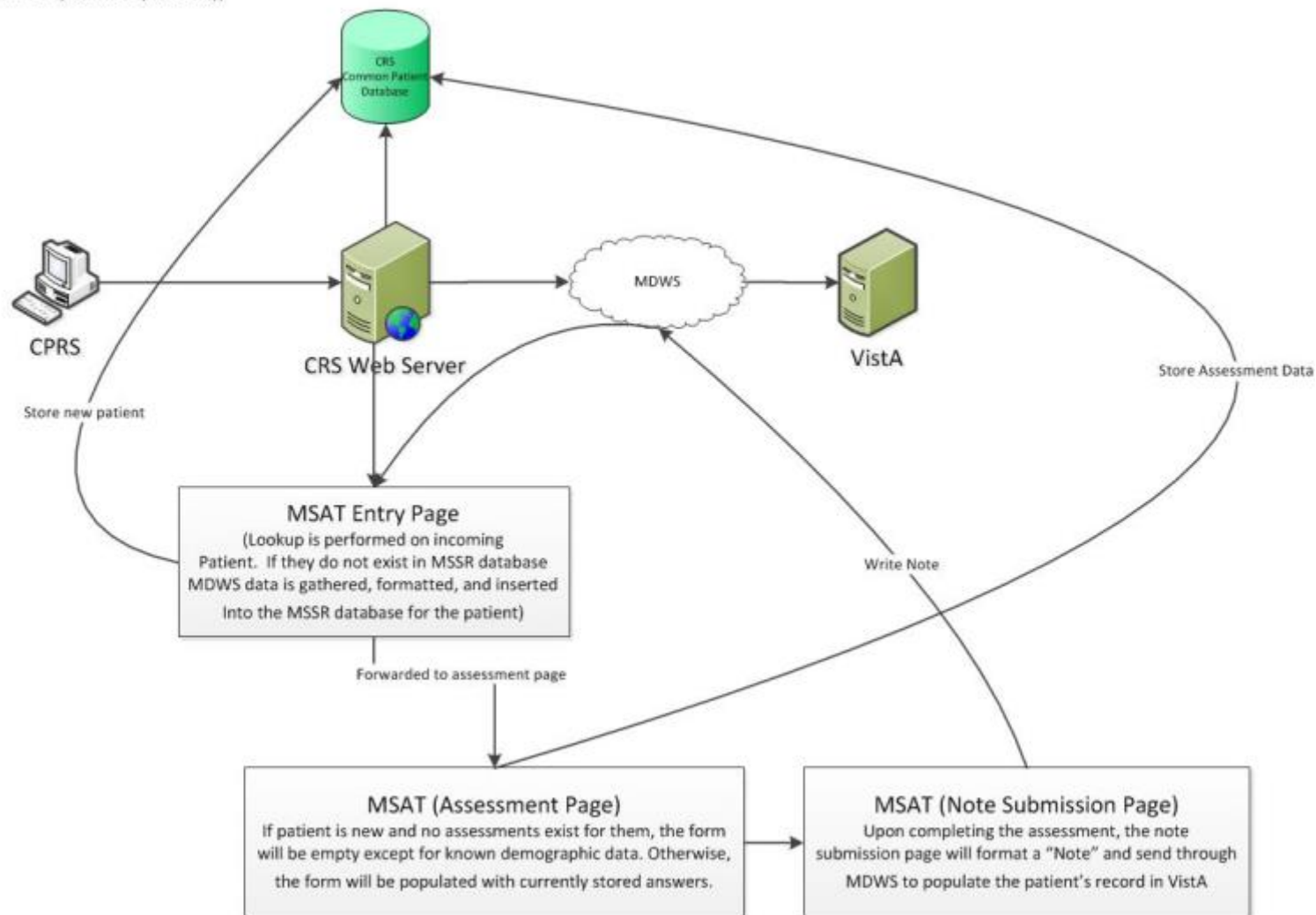


Figure 26: MSAT Data Flow using MDWS (High Level)

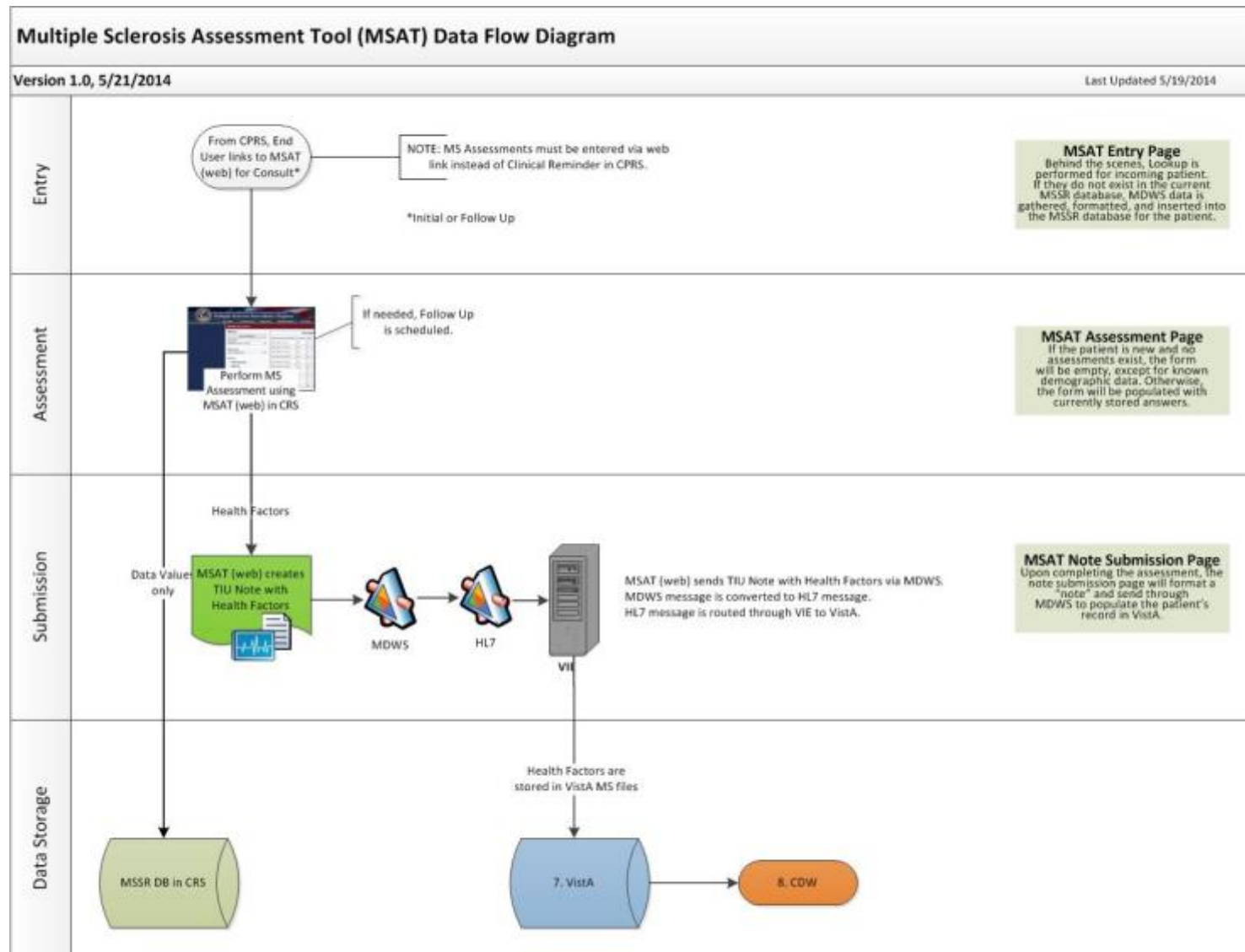


Figure 27: MSAT Data Flow using MDWS (Detailed)

8. Human-Machine Interface

MSSR application users will use a web browser to connect to the application. Simultaneously, the users will login to a local VistA CPRS session and select corresponding patient records. Refer to Figure 1: MSSR Data Flow and System Diagram (Conceptual).

Depending on 508 compliance, not all of the Design Controls listed below will be utilized by the application. These decisions will be made by the Development Team during the development cycle.

8.1. Interface Design Rules

8.1.1. Web Pages

In a web-based application, a “page” is the specific area on your computer screen used by a program. You might start on a launch page, for example, and use the menus available to you to move to another, more specific task-oriented page. If you have more than one browser window running at the same time, you can go from one window to another by clicking in each of those windows.

8.1.2. Pop-up Windows

These are “miniature” windows that pop up within (or on top of) a window to provide or request information. Ordinarily, they require some action before they will disappear. Clicking on buttons with the words **[OK]**, **[Cancel]**, **[Exit]**, or something similar usually closes these windows. Sometimes, they can be dismissed by pressing the **< Esc >** key.

8.1.3. Web-Based Application Elements

The following sections describe typical WBA elements

8.1.3.1. Text Box

SAMPLE:

Type the desired characters into the text (edit) box. The selected entry will not be effective until you tab away from or otherwise exit from the text box. Sometimes (as with date fields) there may also be a “date picker” next to the field.

8.1.3.2. Checkbox

SAMPLE: ☐ Work Related

A checkbox “toggles” (changes) between a YES / NO, ON / OFF setting. It is typically a square box which can contain a check mark ☒ or an “X” ☐ and is usually accompanied by text.

Clicking the box or tabbing to the field and pressing the spacebar toggles the checkbox setting.

In some instances, checkboxes may be used to provide more than one choice; in such cases, more than one box can be selected. Sometimes, a pre-determined “default” entry will be made for you in a checkbox; you can change the default if needed.

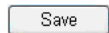
8.1.3.3. Radio button

SAMPLE: Living Arrangement: ☐ Alone ☐ Family ☐ Friend ☐ Facility ☐ Other

A radio button, also known as an option button, is a small, hollow circle adjacent to text. Radio buttons usually appear in sets, with each button representing a single choice; normally, only one button in the set may be selected at any one time. Clicking on the radio button places a solid dot in the circle, selecting the option. Clicking a selected radio button de-selects it, removing the dot. As one radio button is selected, others within the category switch off. For example, Male or Female may be offered as choices through two radio buttons, but you can only select one of the choices.

8.1.3.4. Command buttons

SAMPLES



A command button initiates an action. It is a rectangular “3-dimensional” shape with a label that specifies what action will be performed when the button is clicked. Common examples are shown at left. Command buttons that end with three dots indicate that selecting the command may evoke a subsidiary window.

In the text of this document, command button names appear inside square brackets. *Examples:* **[Search]**, **[Save]**.

8.1.3.5. Date field

The date field is identified by “__/__/__” or a date format like “mm/dd/yyyy” and will usually have an associated popup. The month and day components of the date must consist of two digits and the year must consist of four digits (*e.g.*, 02/02/1996). The selected entry will not be effective until you tab away from or otherwise exit the date field.

8.1.3.6. Drop-Down List

SAMPLE:

A drop-down list (sometimes called a “pull-down” list) is displayed as a box with an arrow button on the right side. Such a list allows you to select one item from the list. The current choice (or a prompt) is visible in a small rectangle; when you click on the arrow, a list of items is revealed. Click on one of the entries to make it your choice; the list disappears.

To select multiple items from a drop-down list, first pick one item or a value from the drop-down list and click the **[Add]** button. To add an additional item from the drop-down list, choose that item from the drop-down and again click **[Add]**.

Imaging Methodology	Test Date (optional)	
Fundus Photography	9/1/2009	Delete
Corneal topography	8/1/2009	Delete
Keratometers	8/15/2009	Delete
<input type="text" value="-- Select a Value --"/>	<input type="text" value="(mm/dd/yyyy)"/>	Add

8.1.3.7. List Box

The list box shows a list of items. If more items exist than can be seen in the box, a scroll bar appears on the side of the box. Click the desired entry to select it from the list.

8.1.3.8. Faded (“Grayed Out”) Choices

Fields, choices, buttons, etc., that appear with faded letters (“grayed out”) are currently unavailable, meaning they cannot be selected. This may be because of the permissions associated with your assigned role, or it may depend upon other choices you have made.

8.1.3.9. Keyboard Commands



Keyboard keys and onscreen buttons are shown in different style brackets throughout this manual to differentiate them from on-screen buttons or menu options: **< Ctrl >** and **< Enter >** are on the keyboard, **[Close]** is a command button on the screen.

8.1.3.10. Fields with Non-White Background

Items in fields that appear with a non-white background can be selected but cannot be modified directly in that field.

^	Type of Tests	Most Recent	Date	Lowest	Date
	HepC Ab	POSITIVE	04/19/2006	09:47	

8.1.3.11. Tab Key

Use the **< Tab >** key or the mouse to move between fields. Do *not* use the **< Enter >** or **< Return >** key, which is usually reserved for the default command button or action.

8.1.3.12. Changing (Resizing) a Browser Window

Windows and columns displayed within DSSA cannot be resized, although the size of the browser window can be changed. To change the size of a browser window, position the mouse pointer over the right edge of the column or the outside edge of the window, left click, and while holding the mouse button down, move the mouse and “drag” to change the size of the window or column. Position the mouse pointer over one corner and drag diagonally to increase the size of the entire window.

8.1.3.13. Cancel

SAMPLE:

When used in a prompt, **Cancel** allows you to cancel the action about to be taken. For example, when closing an application, you may be prompted to validate the action to close. If you click the **[Cancel]** button, the application will not close and you will resume from the point at which the close action was initiated. Or, in a data tab, you may use the **[Cancel]** button to discard any changes you may have made to the data and close the tab.

8.1.3.14. Edit (Select)

SAMPLE:

This command is used to select records for editing.

8.1.3.15. Search

SAMPLE:


This command is used to find one or more records. When at least one character is typed in a lookup dialog box, clicking the **[Search]** button will bring up matching entries. In many cases, leaving the lookup box blank will find all such records. Enter the search string and click **[Search]**. Searches are case-insensitive and use “contains” logic.

8.1.3.16. Help

SAMPLE: 

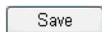
Provides generalized help on the application, or specialized help for the area in which you are currently working. The DSSA application has an online help file; while running the application, click the help icon to access help.

8.1.3.17. OK

SAMPLE: 

Confirms the input and initiates the action defined by the window. Also indicates that you agree with the default choice shown in the window.


8.1.3.18. Save

SAMPLE: 

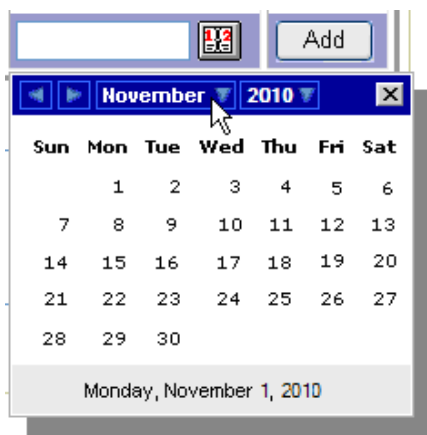
Saves all changes made since the last save action. If you attempt to save and all required fields have not yet been completed, you will receive notification that the required fields must be completed before saving.

8.1.3.19. Pop-up Calendars

SAMPLE: 

Pop-up calendars are used throughout the system. Click the calendar icon  next to the entry box to open the “date picker”.

Example:



You can select or change the date displayed on the calendar using the methods described in the following table.

To Select / Change	Do this:
Month	To change the month, click on the down arrow [▼] next to the month at the top of the calendar.
Day	Click the actual day of the week on the calendar. Or, use the left and right arrows to move through the days of the month.
Year	Click on the down arrow next to the year.

8.1.4. System Timeout

A timeout function is automatically enforced by the system. When you open the application, your activity is programmatically monitored. If there is no activity for 20 minutes, the application will begin to shut itself down.

The “Application Time Out” message window displays for 30 seconds. If there is still no activity within 30 seconds, the application automatically closes; a countdown of seconds remaining is displayed.

8.1.1 Internet Explorer Web-Based Application Elements

The following web-based application controls are Microsoft standard web-page controls used within the application. Some or all of these could be employed.

Table 20: IE Web-based Elements

To do this	Press this key
Display Internet Explorer Help or to display context Help about an item in a dialog box.	F1
Toggle between full-screen and other views in the browser.	F11
Move forward through the items on a Web page, the Address box, or the Links box.	TAB
Move through the items on a Web page, the Address box, or the Links box.	SHIFT+TAB
Go to your Home page.	ALT+HOME
Go to the next page.	ALT+RIGHT ARROW
Go to the previous page.	ALT+LEFT ARROW or BACKSPACE
Display a shortcut menu for a link.	SHIFT+F10

To do this	Press this key
Move forward between frames.	CTRL+TAB or F6
Move back between frames.	SHIFT+CTRL+TAB
Scroll toward the beginning of a document.	UP ARROW
Scroll toward the end of a document.	DOWN ARROW
Scroll toward the beginning of a document in larger increments	PAGE UP
Scroll toward the end of a document in larger increments.	PAGE DOWN
Move to the beginning of a document.	HOME
Move to the end of a document.	END
Find on this page.	CTRL+F
Refresh the current Web page.	F5 or CTRL+R
Refresh the current Web page, even if the time stamp for the Web version and your locally stored version are the same.	CTRL+F5
Activate a selected link.	ENTER

8.2. Inputs

The data input for MSSR and MSAT will be performed by Clinicians, specifically Neurologists and MS Specialists, within the VA Medical Centers. The staff will utilize VA approved workstations with access to CPRS and MSAT. An assessment is presented to the Clinician for capture of pertinent clinical information. The CPRS application will provide access to the specific patient where MS is suspected. The user will select the patient from the Tools menu (in CPRS) and select the MSAT link to complete an assessment.

Access to the Registry and VistA will be provided by VA according to the Security guidelines for Access to Protected Health Information. The staff will follow all Security rules and regulations set forth by VA and signed by the staff prior to working on the system.

8.3. Outputs

All output information developed by this SDD is described in detail in Section 8.4 Navigation Hierarchy.

8.4. Navigation Hierarchy

Refer to the Figure 1: MSSR Data Flow and System Diagram (Conceptual) for the data flow by the user.

8.4.1. Global Navigation

The CRS framework includes global navigation for all of the registries, including MSSR. Each registry comes with five common components, accessible via the primary navigation bar:

My Tasks: Task Oriented View, which provides queues to all workflows in the application, grouped by work areas. This will primarily be used by administrators with defined tasks.

Patients: Patient Oriented View provides capability to search for a patient using search parameters. This will be primarily used by management

Reporting: Standard Registry reporting capability with security, selection criteria and multiple file format export capability; powered by SQL Server Reporting Services.

Administration: Capability to create user accounts and manage their roles.

Help: Online Help with context sensitivity.

The CRS framework uses standard VA style sheets that provide the screen layout, color scheme, fonts and navigation behavior. In addition to that, the registries applications provide access to paper-based templates in very specific formats. Each form on the web site follows a standard layout as defined in a master page. This master page provides banner area, primary navigation, secondary navigation, breadcrumb trail and the content area.

9. System Integrity Controls

The CRS relational database framework has built-in integrity controls to restrict the loss, misuse, modification of, or unauthorized access to patient data in any registry application residing on the CRS architectural platform including, but not limited to:

- Providing audit information by user and network terminal identification; date, time, and data accessed or changed
- Providing audit procedures for control, reporting, and retention periods
- Restricting access of critical data items
- Verifying additions, deletions, or updates of critical data

9.1. Audit Process

Audit information is defined to be those elements that can be used to track the “who” (Event Producer) and “when” (Event Time) aspects of record evolution.

9.1.1. Event Producer

This is the “who” of the audit information. The Application will populate the Event Producer with relevant data within the context of the change. These columns are present in every table in the database.

CREATEDBY

This is the user, entity, or process which created the record. Each HealtheVet application can populate as they see fit. It is not recommended (at least long-term) to depend on any certain format in this column. Examples of this are:



**MIGRATION
UPDATEDBY**

This is the user, entity, or process which made the change. Each HealtheVet application can populate as they see fit. It is not recommended to depend on any certain format in this column. Examples of this are:



9.1.2. Event Time

This is the “when” of the audit information.

For tracking what changes were grouped together (helpful in displaying discrete historical changes across tables), there needs to be a consistent “key” that binds updates together (also keeping in mind that certain technology implementations such as Hibernate can flush multiple times during the course of an application transaction). In the absence of a separate “key”, the Event Time should be identical across an atomic (transactional) update to the Registries. In other words, within a single application transaction, every Event Time should be identical. The Registries Application will populate the Event Time with the “current” time the event occurred. Column is present in every table in the Registries database.

CREATED (The timestamp for the event which created the data)
UPDATED (The timestamp for the event which modified the data)

9.1.3. Row Version

This is the “version” of the record in the database.

9.2. Audit Tables

Storage of historical data within the Registries database is provided by means of individual History tables which “shadow” each transactional table in the Registries schema. The structure of a History table mirrors its corresponding Transactional table. In other words, all columns present in the transactional table are present in the History table, and are of the same size and data-type. In addition to the original columns from the Transactional table, each history table contains its own PRIMARY KEY column and also a column called TRANSACTION_TYPE_CODE which is used to mark the type of transaction that caused the record to be written to the History table.

NOTE: History tables “stand alone” (i.e., there are no foreign key constraints between a Historical table and any other table in the database).

A History table in Registries is given the same name as its corresponding Transactional Table, with the suffix “_H” appended. A single database trigger—present on each base table in the database that is being shadowed by a history table—will fire upon an "Insert," "Update," or "Delete" event occurring in the base table. This will cause the existing state of the entire record in the base table to be copied into the History table, and the TRANSACTION_TYPE_CODE field present in the history table will be stamped with the type of event that caused the record to be versioned off and preserved into history.

9.2.1. The User Login Table

USER_LOGIN is a detail to the USERS table in the database. Application will insert a record into this table each time a predefined application event occurs (such as clicking a menu item in order to open a particular screen). This table contains a free format text field that may be populated with the screen name and the date and time that the screen was accessed.

10. Approval Signatures

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

Signed: _____
_____, IPT Chair / IT Program Manager Date

Signed: _____
_____, MSSR Business Sponsor Date

Signed: _____
_____, MSSR Business Sponsor Date

Signed: _____
_____, Project Manager Date

Signed: _____
_____ Contracting Officer Representative Date

Signed: _____/es/_____05/21/2014
_____ Program Manager Date

Signed: _____/es/_____05/21/2014
_____ Project Manager Date

Signed: _____
Enterprise Architecture Date

Signed: _____
Service Delivery and Engineering Date

A. Additional Information

Additional information that supplements this design specification is as follows:

A.1. RTM

For the RTM, please refer to TSPR at: <PMO, please enter TSPR link to RTM here>.

A.2. Packaging and Installation

MSSR has no special considerations for software packaging and installation.

A.3. Design Metrics

There are no design metrics to be used during the design activity.

A.4. Acronym List and Glossary

Table 21: Glossary

Term	Meaning
ADR	Administrative Data Repository
AITC	Austin Information Technology Center
CCR	Clinical Case Registry
CPRS	Computerized Patient Record System
CRS	Converged Registries Solution
CDW	Corporate Data Warehouse
DB	Database
DACA	Days After Contract Award
DVEIR	Defense and Veterans Eye Injury Registry
EFR	Embedded Fragment Registry
ETL	Extract Transform and Load
HDR	Health Data Repository
IT	Information Technology
ITIL	Information Technology Infrastructure Library
MDWS	Medical Domain Web Services
MSSR	Multiple Sclerosis Surveillance Registry
MSAT	Multiple Sclerosis Assessment Tool
MVI	Master Veteran Index
OEF/OIF/OND	Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn
PWS	Performance Work Statement
PMAS	Program Management Accountability System
PjM	Project Manager
RSD	Requirements Specification Document
RTM	Requirements Traceability Matrix
SQA	Software Quality Assurance
SSRS	SQL Server Reporting Services

Term	Meaning
SQL	Structured Query Language
SDD	System Design Document
TEFSC	Toxic Embedded Fragment Surveillance Center
T4	Transformation Twenty-one Total Technology
TBI	Traumatic Brain Injury
TSPR	Technical Services Project Repository
UI	User Interface
VA	Veterans Affairs
VERA	Veterans Equitable Resource Allocation
VHA	Veterans Health Administration
VistA	Veterans Health Information System and Technology Architecture
VISN	Veterans Integrated Service Network
VTA	Veterans Tracking Application
VIE	VistA Interface Engine

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