Department of Veterans Affairs

**Automated Surgical Risk Calculator (ASRC)**

Technical Manual



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# Introduction

This Technical Manual details the Automated Surgical Risk Calculator (ASRC) Tool technical solution as built. It documents the solution from a physical, logical, business workflow, and software architectural perspective depicting the various models and layers of the solution and methodologies used. It describes how the solution works in parts as well as a whole.

Please see the project README for background on the application.

## Identification

The Tool includes both a Java Web Application and a supporting VistA patch for VistA integration. This document is meant to accompany version 0.7 of both components.

## Scope

This Manual documents the technical solution from the following perspectives:

* Physical: the devices, possibly virtual, on which components run
* Logical: the components of the system
* Business Workflow: how the components fit in to the business workflow
* Software Architectural: the software frameworks and design of the components

Network design is out of the scope of this manual and must be designed externally to the Automated Surgical Risk Calculator Tool.

## User Characteristics

There are two main groups of users of the tool: clinical users and administrative users.

Clinical users use the Tool to perform risk calculations. They are not necessarily familiar with databases, configuration of software systems, or software components.

Administrative users modify the Tool configuration primarily to update the risk models year by year. They are familiar with SQL databases, configuration of software systems, and the basics of software components. They are not, however, familiar with the detailed design and implementation of software systems.

## Definitions, Acronyms, and Abbreviations

## References

# Background

## Overview of the System

The Automated Surgical Risk Calculator Tool (“the Tool”) can be used at the time the patient is considered for surgical referral by a primary care provider and at the time a surgeon is requesting a surgery. This Tool will support clinical decision-making regarding perioperative risk (includes preoperative, intraoperative, and postoperative). Providers will verify patient-specific data that is automatically pulled from available data sources, enter remaining fields, and be provided with a real-time individual risk calculation of perioperative surgical mortality based on historic Veterans Affairs Surgical Quality Improvement Program (VASQIP) data and current VASQIP risk-adjusted models that are specialty-specific. The data entered and the calculated results will be available for viewing in the Computerized Patient Record System (CPRS) as a progress note. The data will also be transferred and stored as discrete fields in Veterans Health Systems and Technology Architecture (VistA) and a Structured Query Language (SQL) database for use by the National Surgery Office (NSO).

## Overview of the Business Process

## Business Benefits

There is an existing Risk Calculator tool provided by the NSO, but it is not widely used due to the fact that it is not accessible from within Computerized Patient Record System (CPRS) and that its current location is not well known to most surgical providers.

The Automated Surgical Risk Calculator Tool provides the following benefits:

* It integrates the Tool into the Electronic Health Record (EHR) environment for easy access by VA providers.
* It eliminates reentry of information already available within the EHR.
* When the risk calculation is performed, it saves the data entered and calculation results to the EHR for others to view or to be used for quality assessment.
* It permits calculation of risks other than 30-day mortality, to include longer term mortality related to frailty or associated co-morbidities.
* It permits updating the statistical risk models by administrative staff without software development effort.

## Assumptions and Constraints

This section describes the assumptions and constraints that impacted the design of the system.

### Design Assumptions

The development team made the following assumptions which influenced the design of the Tool:

All data that the Tool must retrieve from VistA can be retrieved via new or existing Remote Procedure Calls (RPCs).

A Clinical Context Object Workgroup (CCOW) implementation will be available to support operation of the Tool.

### Design Constraints

The following constraints (e.g., schedule, cost, and technical) impacted the design of the Tool:

The Tool is a prototype that must be completed over a 12-month period. Further development and testing required for VA national release may be performed as a separate effort.

There exists no widely used and easily augmented method of exposing VistA data via Web Services. (MDWS is widely used but cannot easily be augmented.)

The Tool development team is more familiar with Java development than .NET development and therefore prefers Java-based solutions.

The Tool must be testable in the VA’s Future Technology Lab (FTL).

### Design Trade-offs

## Overview of the Significant Requirements

### Overview of Significant Functional Requirements

The following functional requirements impacted the software design.

Table - Significant Functional Requirements

| ID | Requirement |
| --- | --- |
| ASRC-16 | Launch the Tool from CPRS, sharing user and patient context |
| ASRC-152 | Search for Procedure from thousands of possible Procedures |
| ASRC-161 | Populate calculation variables from patient’s EHR in VistA |
| ASRC-91 | Allow manual entry and VistA override for all calculation variables |
| ASRC-139 | Derive calculation variables from other variables |
| ASRC-100 | Allow updating risk models without development effort |
| ASRC-156 | Allow provider to sign the calculation and save results to VistA and a national SQL database |
| ASRC-153 | Modify VistA Request for Surgery Workflow |
| ASRC-103 | Generate 3 reports in the Tool |

### Overview of Functional Workload / Performance Requirements

No functional workflow requirements were identified as part of this prototype.

### Overview of Operational Requirements

No operational requirements were identified as part of this prototype.

### Overview of the Technical Requirements

The following technical requirements impacted the software design.

Table - Technical Requirements

| ID | Requirement |
| --- | --- |
| ASRC-161 | Populate calculation variables from patient’s EHR in VistA |
| ASRC-156 | Allow provider to sign the calculation and save results to VistA and a national SQL database |

### Overview of the Security or Privacy Requirements

The following significant security and privacy requirements impacted the software design.

Table - Security or Privacy Requirements

| ID | Requirement |
| --- | --- |
| ASRC-100 | Allow updating risk models without development effort |
| ASRC-49 | Provider signs risk calculation via electronic signature code |

As the Tool was developed as a Prototype that will only handle test patient data, no PII/PHI requirements were identified.

### Overview of System Criticality and High Availability Requirements

No System Criticality or High Availability requirements were identified as part of this prototype.

# Conceptual Design

This section depicts the broad design of the solution, particularly in the context of user and external system interfaces. Throughout this section, VistA is regarded as an external system though ASRC includes a VistA integration patch. Section 6.2.3 documents the VistA patch design.

## Conceptual Application Design

### Application Context



Figure - Application Context Diagram

Table - External System Interfaces

| Name | Input Messages | Output Messages | Owner |
| --- | --- | --- | --- |
| Site VistAs | Retrieve Patient Data for calculation inputs | Store results from each calculation | Each VA Site |

Table - Externally Shared Data Stores

| Name | Data Stored | Owner | Access |
| --- | --- | --- | --- |
| National ASRC Results Database | Calculation inputs and results from each calculation. Configuration data (e.g., risk model definitions) is also stored in this database for simplicity. | This System | Create, Read, Update, and Delete |

### High-Level Application Design

The below High-Level Application Design Diagram expands the application to show its major components. Since the design is conceptual, it does not identify specific technologies or software libraries with the exception of VistALink. VistALink is identified because it is the only VistA integration technology that satisfies the Design Constraints.



Figure 2 - High-Level Application Design

Table - Objects in the High Level Application Design

| Name | Description | External Interfaces |
| --- | --- | --- |
| Domain Model | An Object-Oriented Model of the Risk Calculation Domain, including calculation input variables, the models themselves, and the calculation results. | None |
| VistALink | VistA-interfacing technology that allows making Remote Procedure Calls (RPCs) to VistA from Java. | Site VistAs |
| Web Application Frontend | Presents a Web user interface to the application. | The application’s users |
| Persistence Layer | Persists Domain Model objects to the relational database. | The National ASRC Results Database |

## Conceptual Data Design

### Project Conceptual Data Model

The following diagram is a conceptual data model showing the high-level data entities and their relationships. It is intended to depict the application’s data in a generic fashion, not as a table structure or an object class hierarchy.



Figure 3 - Conceptual Data Model

As shown, the data divides naturally into two subject areas: the model definition and the calculation results.

The primary entity within the Model Definition subject area is the risk model. A risk model has multiple input variables, each multiplied by a model-specific coefficient to calculate the final risk result. Multiple models may use the same variable but with different coefficients. Each surgical specialty has one or more risk models.

The primary entity within the Calculation Results subject area is the Risk Calculation. A Calculation represents a single risk calculation performed by a user. It records the patient, input variables, results, whether the results were signed or not, and other attributes associated with the calculation.

### User Interface Data Mapping

Users retrieve and modify application data through three user interfaces: the calculation pages, the administrative pages, and the administrative reports.

Note that all screenshots included in this manual are for illustrative purposes and may include contents different from what is show in the actual application.

#### Calculation Pages

Clinical users (see User Characteristics above) retrieve and modify application data only through the Calculation Pages. These pages use (but do not modify) data in the Model Definition subject area and store data in the Calculation Results subject area.

These pages provide the following workflow:



Figure 4 - Application Clinical Workflow

Each individual page of the Clinical Pages is summarized in the following sub-sections.

##### New Calculation Page

The New Calculation page begins a new risk calculation with having the user select the Surgical Specialty for the surgery to be performed.

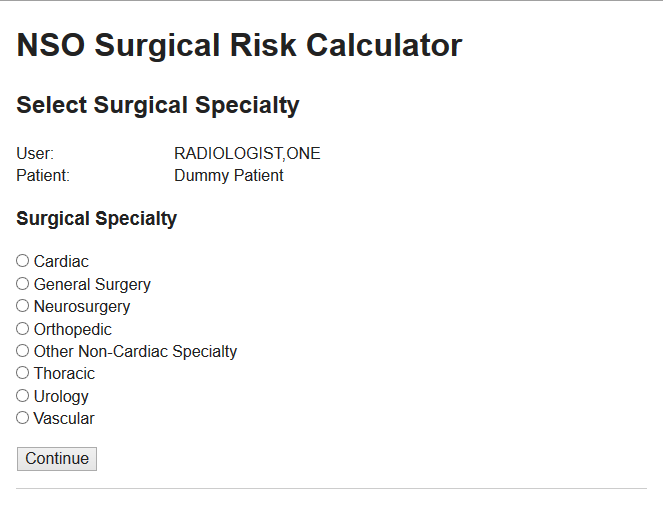


Figure 5 - Notional New Calculation Page

Note that this page is just one step of the calculation workflow and no data is saved to the database yet when the user completes the page.

##### Enter Risk Variables Page

The Enter Variables page allows the user to manually enter values for the risk calculation’s input variables, including overriding values that the application automatically retrieved from VistA/CPRS.

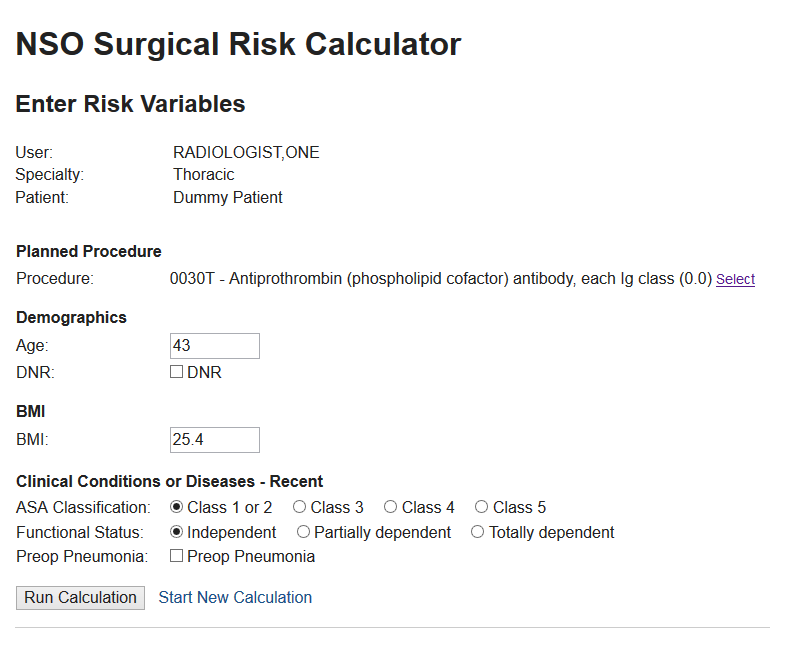


Figure 6 - Notional Enter Risk Variables Page

When the user clicks Run Calculation, the application performs the calculation and saves selected calculation data to the database for reporting purposes. The calculation results themselves are not yet saved.

##### Calculation Results Page

The Calculation Results page displays the calculated risk results as well as a read-only table of calculation inputs. It allows the user to sign the calculation.

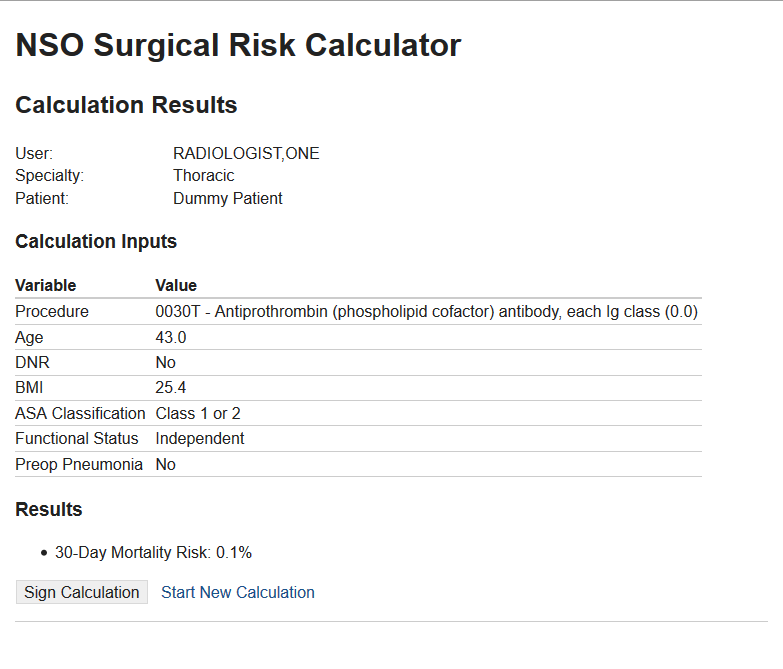


Figure - Notional Calculation Results Page

Upon signature, the application saves all input values and output results to the database. It also stores a textual copy of the results page in VistA TIU for display on the CPRS Notes Tab and stores selected calculation data, including the results, in VistA Surgery to support the VistA workflow changes described elsewhere in this document.

#### Administrative Pages

Administrative users (see User Characteristics above) retrieve and modify data through the Administrative Pages. The primary purpose of these pages is to update the risk models used in calculations. These pages thus update data in the Model Definition subject area.

The ASRC User Guide covers the actual Model Administration workflow. This manual includes a representative sample of the Administrative Pages to explain the data mapping.

##### Administration Home

The Administration Home page gives the user a summary view of the current model configuration and contains links to other administrative pages.

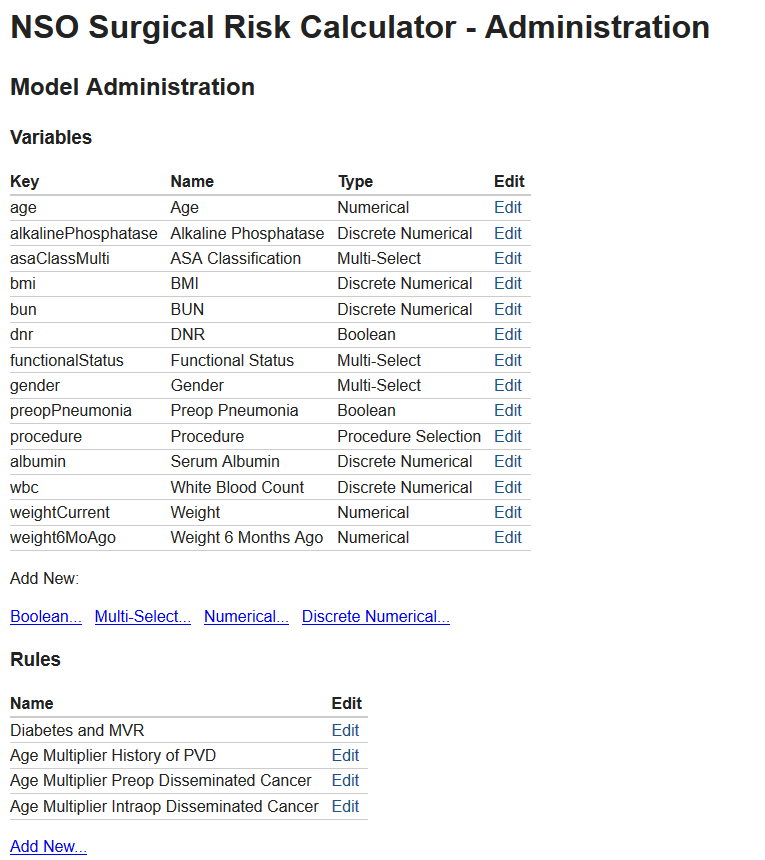


Figure - Notional Administration Home, Partial

The above notional screen design for the Administration Home depicts the summary information and add/edit links for Variables and Rules. The implemented screen will also include Models and Specialties. The application only reads the Model Definition data on this page. The user may navigate to the Add and Edit pages to modify the data. Below sections, depict a representative sample of the Edit pages. The Add pages are very similar, but add new entities as opposed to editing existing ones.

##### Edit Variable Pages

The Edit Variable pages allow users to edit the attributes of the variables. Each variable type (i.e. Boolean, Numerical, Multi-Select, etc.) has a slightly different screen design since each type has a different set of attributes. See the ASRC User Guide for an explanation of the different variable types.

A notional Edit Discrete Numerical Variable page is included below as a representative example:

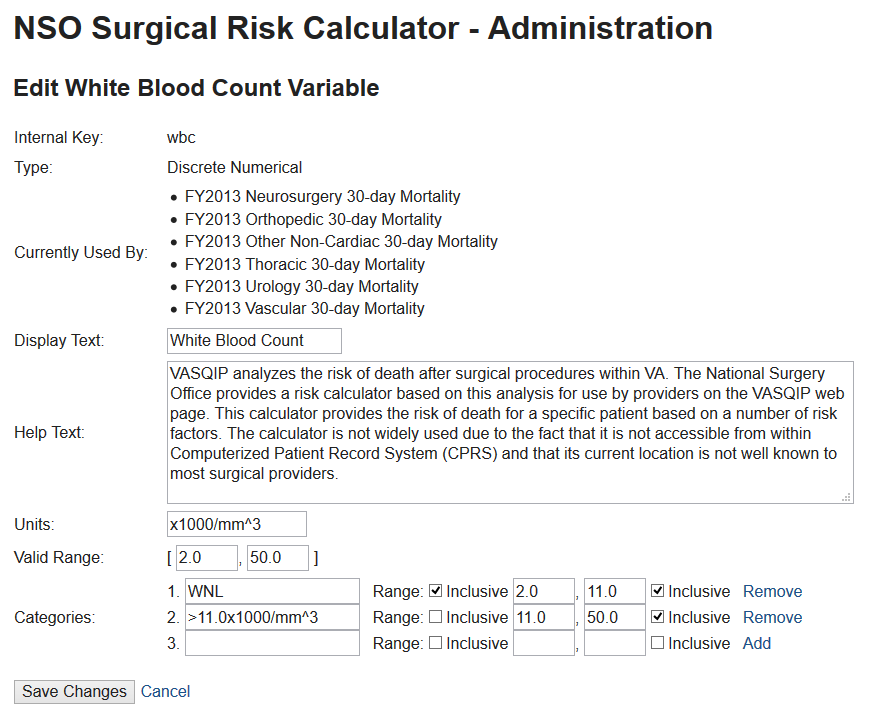


Figure - Notional Edit Discrete Numerical Variable

As shown, the page includes some read-only reference information (such as the variable type and the models that currently use it) and other writable attributes. All writable attributes are of the Variable entity (see Section 3.2.1); some read-only data are of other Model Definition entities.

##### Edit Rule Page

The Edit Rule page allows the user to edit Rule entities.

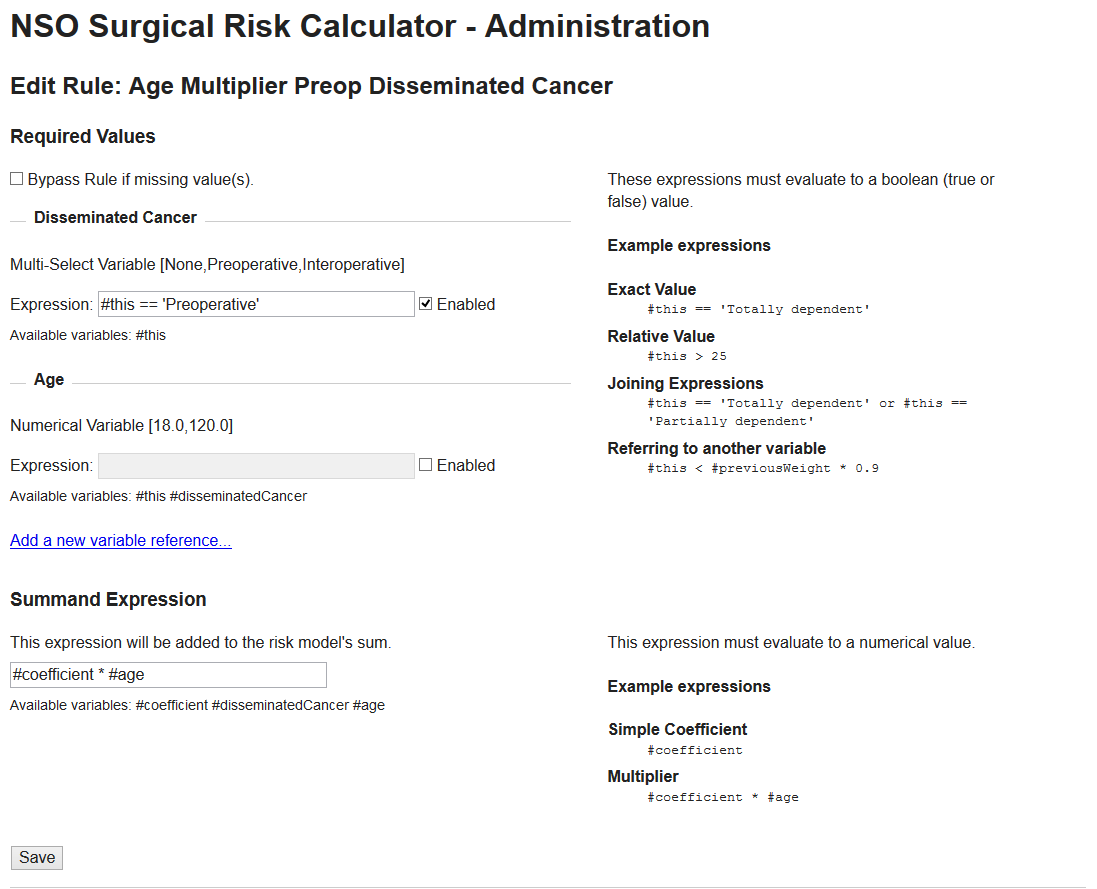


Figure - Notional Edit Rule Page

##### Edit Model Page

The Edit Model page allows the user to edit Model entities.

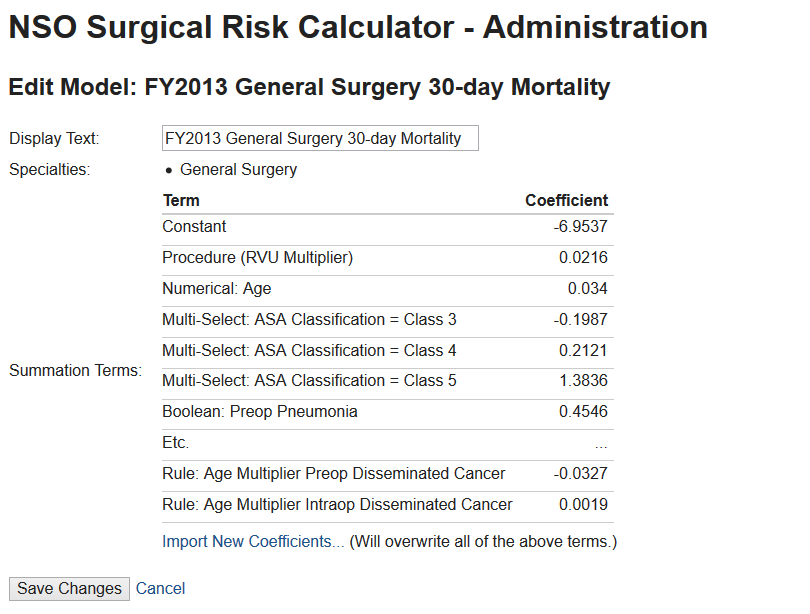


Figure - Notional Edit Model Page

As shown, the page presents mostly read-only summary information for the current model. The user will bulk upload a new set of terms in tabular format via the shown *Import New Coefficients...* link.

#### Administrative Reports

The Administrative Reports are to be designed but will include, at minimum:

* A Utilization Report, including the number of users of the tool, whether each calculation was signed or not, and the time it took the user to complete the calculation.
* A Summary Report, including individual calculation outcomes grouped by CPT Code, Surgical Specialty, Facility, and User Type.

#### Unmapped Data Element

All persistent application data is mapped to one or more of the above pages and/or reports. There is no unmapped data.

# System Architecture

This section describes the system architecture for the project.

## Hardware Architecture

As a prototype project, the hardware architecture is loosely defined to include two servers: the VistA server and the Java Application Server. Any number of client workstations may access these servers. The following diagram depicts the interconnections between the hardware components. The direction of the arrows indicates which component initiates communication.



Figure - ASRC Hardware Components

In a production deployment of the system, the hardware architecture may be adjusted to support the desired system capacity. For example, the RDBMS may be separated from the Web Application.

## Software Architecture

This section describes the overall software architecture of the system. Previous sections described the interface to external components, the SQL Database and Site VistAs, so this section concentrates on the architecture of the Web Application. For the purposes of this section, the ASRC VistA patch is considered part of VistA and is not described.

The diagram below illustrates the software architecture of the Web Application.



Figure - Software Architecture

As with any web application, parts of the application run on the server and parts run on the client. The server-side components run exclusively in a Java application server, while the client-side components are a mixture of HTML5, CSS3, and JavaScript. The below sections detail these components.

### The Server-Side Components

The server-side components run exclusively in a Java application server. The prototype application runs in the GlassFish Server, Open Source Edition, provided by Oracle, but does not rely on any GlassFish-specific components and therefore is portable to other application servers.

The Java application running on the server contains four layers as shown above: the Presentation Layer, the Service Layer, the Domain Model, and the Data Layer. A summary of these layers follows, but the detailed design documentation resides in the Java source code (mostly in package Javadocs) to avoid becoming outdated.

The Domain Model is the core of the application and represents the application entities (calculations, variables, terms, etc.) as Java objects, incorporating both behavior and data. For more detail, see the Javadoc on the package gov.va.med.srcalc.domain[[1]](#footnote-2).

The Service Layer serves as a high-level, business-operation-oriented interface from the outside world to the Domain Model. For more detail, see the Javadoc on the package gov.va.med.srcalc.service[[2]](#footnote-3).

The Presentation Layer presents the application data to users (whether humans or machines) and, as appropriate, allows those users to modify the data. For more detail, see the Javadoc on the package gov.va.med.srcalc.web[[3]](#footnote-4).

The Data Layer maps between objects in the Domain Model and data stores. The application, as shown above, has two data stores: the SQL database and the site VistAs. For more detail former, see the Javadoc on the packages gov.va.med.srcalc.db[[4]](#footnote-5) and gov.va.med.srcalc.vista[[5]](#footnote-6).

### The Client-Side Components

The client-side components run exclusively in a user’s web browser. Unlike the Java Application Server, many different users—and therefore many different browser instances—may run the client-side code concurrently.

As with many web applications, server provides content to the browser primarily via HTML. This HTML simply defines page content, not the appearance. The HTML pages link to Cascading Style Sheets (CSS) in order to define the appearance. For example, the HTML may contain a table of values, but the CSS determines the size of the table, what borders will be shown between cells, etc.

Some, but not all, pages also include dynamic content such as dialog boxes. The HTML pages include either the inline JavaScript or link to JavaScript files to implement this dynamic content. The application performs all Document Object Model (DOM) manipulation via the ubiquitous jQuery library.

Although many browsers can run the application, the target browser for the prototype is Internet Explorer 9. The prototype also supports Internet Explorer 8, albeit with reduced functionality, to enable testing in the VA Future Technology Lab.

## Service Oriented Architecture / ESS

ASRC does not provide or consume any services.

## Enterprise Architecture

As a prototype, the tool is not required to adhere to the VA Technical Reference Model (TRM). The development team, however, has attempted to adhere to it. The below table captures the various technologies used and their status in the TRM.

Table - TRM Status

| Technology | Version | TRM Status | TRM Version | Comment |
| --- | --- | --- | --- | --- |
| Data Tables | 1.10 | No | v15.1 |  |
| Equals Verifier | 1.5 | No | v14.10 | Only used for automated tests. |
| Glassfish | 3.1.2.2 | Deprecated | v15.1 |  |
| Gradle | 1.12 | Approved | v15.1 |  |
| Hibernate | 4.2 | No | v15.1 | v4.3 is Approved |
| HSQLDB | 2.3.2 | No | v14.10 | Only used for automated tests. |
| Jackson (JSON) | 2.3 | Approved | v15.1 |  |
| Java EE | 7 | Approved | v15.1 |  |
| Java SE | 7 | Approved | v15.1 |  |
| Joda Time | 2.3 | Approved | v15.1 |  |
| jQuery | 1.11 | Approved w/ Constraints | v15.1 |  |
| jQuery UI | 1.11 | No | v15.1 |  |
| Junit | 4.12 | Approved | v15.3 |  |
| Log4j | 1.2.17 | Deprecated | v15.1 | Only used for automated tests. |
| Mockito | 1.9.5 | Approved | v15.1 |  |
| MySQL Database | 5.6 | Approved w/ Constraints | v15.1 |  |
| Selctivizr | 1.0.2 | No | V15.3 | Only for IE8 support. May be dropped for VA release. |
| SLF4J | 1.7 | Approved w/ Constraints | v15.1 |  |
| Spring Framework | 4.0.7 | Approved w/ Constraints | v15.1 | Will be deprecated soon. |
| Spring Security | 3.2.5 | No | v15.1 | Only version 3.1 is approved. We use version 3.2 for Spring 4 compatibility. |

# Data Design

## DBMS Files

## Non-DBMS Files

# Detailed Design

## Hardware Detailed Design

## Software Detailed Design

### Database Repository

### Java Web Application Detailed Design

### VistA Patch Detailed Design

#### Routines (Entry Points)

Table - Routines (Instructions)

| Routines | Instructions |
| --- | --- |
| Routine Name | List the routine affected by the functionality being designed. |
| Enhancement Category | Check the appropriate box: New, Modify, Delete, or No Change. |
| RTM | List the RSD item number within the SDD (i.e., If the RSD has a requirement of 3.3.1, add Support for a new API, then in this column list RSD Requirement 3.3.1) |
| Related Options | List options that directly call or are called by the routine. |
| Related Routines | List routines that directly call or are called by the routine. |
| Data Dictionary (DD) References | List files that reference the routine through input transforms, cross reference logic, etc. |
| Related Protocols | List protocols that reference or are referenced by the routine. |
| Related Integration Control Registrations (ICRs) | List proposed new ICRs and subscribed ICRs. Also, list any obscure Supported ICRs. |
| Data Passing | Check the appropriate box. Also a short description of what invokes the new/changed routine should be included in this section. An example of such a description would be a note that the new/changed routine will be invoked as part of a function call or it would be invoked through user menu-driven options, system protocols, HL7 Logical Links, etc. This section refers specifically to the change implemented with the design. |
| Input Attribute Name and Definition | List the Input Attributes passed into the new or changed routine logic. Each attribute should be defined. |
| Output Attribute Name and Definition | List the Output Attributes returned from the new or changed routine logic. Each attribute should be defined. |
| Current Logic | Define the current logic in the routine that the design will modify. If this is new code, enter "N/A". |
| Modified Logic (Changes are in bold) | Define the logic in the routine that the design will implement. |

Table - Routines (Grouping)

| Routines | Activities |
| --- | --- |
| Routine Name | SRASRC |
| Enhancement Category | New |
| RTM | N/A |
| Related Options | SR ASRC PATIENT (RPC), SR ASRC USER (RPC) |
| Related Routines | $$GET1^DIQ (Called by), DEM^VADPT (Called by) |
| Data Dictionary (DD) References | File 200 |
| Related Protocols | N/A |
| Related Integration Control Registrations (ICRs) | List proposed new ICRs and subscribed ICRs. Also, list any obscure Supported ICRs. |
| Data Passing | This routine is used as an RPC to pass data to a web application via the RPC Broker and VistALink. |
| Input Attribute Name and Definition | The patient "DFN" will be passed into the PAT tag (for SR ASRC PATIENT) as an input parameter. |
| Output Attribute Name and Definition | For both RPCs, there is a "RETURN" variable that will contain the single string of data being passed to the web application. |
| Current Logic | N/A |
| Modified Logic (Changes are in bold) | N/A |

| Routines | Activities |
| --- | --- |
| Routine Name | SRASRC2 |
| Enhancement Category | New |
| RTM | N/A |
| Related Options | SR ASRC PROGRESS NOTE (RPC) |
| Related Routines | This routine calls the following APIs: DUZ^XUP, MAKE^TIUSRVP, SIGN^TIUSRVP2, $$DECRYP^XUSRB1, HASH^XUSHSHP, $$GET1^DIQ |
| Data Dictionary (DD) References | Files 2 and 8925.1 |
| Related Protocols | N/A |
| Related Integration Control Registrations (ICRs) | Supported ICRs: 2240, 3535, and 4409. |
| Data Passing | This routine is used as an RPC that receives data from a web application via the RPC Broker and VistALink and stores it into VistA. The RPC then returns status indication back to the web application. |
| Input Attribute Name and Definition | DUZ, SRESIG, DFN, and SRTIUX are all input parameters for the RPC. |
| Output Attribute Name and Definition | SRSTAT, which is the status indicator returned to the calling web application. |
| Current Logic | N/A |
| Modified Logic (Changes are in bold) | N/A |

| Routines | Activities |
| --- | --- |
| Routine Name | SRASRC3 |
| Enhancement Category | New |
| RTM | N/A |
| Related Options | SR ASRC RISK SAVE (RPC) |
| Related Routines | This routine calls the following: ^%DT and FILE^DICN |
| Data Dictionary (DD) References | Files 2, 81, 200, and 136.1 |
| Related Protocols | N/A |
| Related Integration Control Registrations (ICRs) | N/A |
| Data Passing | This routine is used as an RPC that receives data from a web application via the RPC Broker and VistALink and stores it into VistA. The RPC then returns status indication back to the web application. |
| Input Attribute Name and Definition | DFN, SRCPT, SRDTTM, and SRTIUX are all input parameters for the RPC. |
| Output Attribute Name and Definition | SRSTAT, which is the status indicator returned to the calling web application. |
| Current Logic | N/A |
| Modified Logic (Changes are in bold) | N/A |

| Routines | Activities |
| --- | --- |
| Routine Name | SRASRC4 |
| Enhancement Category | New |
| RTM | N/A |
| Related Options | SR ASRC LAB RESULTS (RPC) |
| Related Routines | This routine calls the following: RESULTS^LRPXAPI, $$TESTNM^LRPXAPIU, H^%DTC |
| Data Dictionary (DD) References | N/A |
| Related Protocols | N/A |
| Related Integration Control Registrations (ICRs) | N/A |
| Data Passing | This routine is used as an RPC to pass data to a web application via the RPC Broker and VistALink. |
| Input Attribute Name and Definition | DFN and SRLABNS are input parameters for the RPC. |
| Output Attribute Name and Definition | SRRET, which is the data field returned to the calling web application. |
| Current Logic | N/A |
| Modified Logic (Changes are in bold) | N/A |

| Routines | Activities |
| --- | --- |
| Routine Name | SRSRQST1 |
| Enhancement Category | Modify |
| RTM | N/A |
| Related Options | Make Operation Requests |
| Related Routines | This routine calls the following: ^DIC and ^DIE |
| Data Dictionary (DD) References | Files 81, 130 and 136.1 |
| Related Protocols | N/A |
| Related Integration Control Registrations (ICRs) | N/A |
| Data Passing | N/A |
| Input Attribute Name and Definition | N/A |
| Output Attribute Name and Definition | N/A |
| Current Logic | K DR S DR="" I '$D(SREQ(27)) S DR="27T;" |
| Modified Logic (Changes are in bold) | ; JAS - 06/04/15 - ASRC PROJECT  ;K DR S DR="" I '$D(SREQ(27)) S DR="27T;"  K DR S DR=""  I '$D(SREQ(27)) D I SRASRCQ G SS  . K SRASRCQ,SRASRCC,SRASRCD,SRASRCX,SRASRCDT,SRASRCR,SRASRCF,SRASRCRM  . S SRASRCQ=0,SRASRCX=0  . K DIC S DIC=81,DIC(0)="QEAMZ",DIC("A")="Principal Procedure Code (CPT): "  . D ^DIC K DIC I Y<0,X="^" S SRASRCQ=1 Q  . I Y<0 S Y=""  . S SRASRCC=$P(Y,"^"),SRASRCD=$P(Y,"^",2)  . ; DO ASRC CHECK  . I SRASRCC'="" D  . . I '$D(^SRO(136.1,"C",DFN,SRASRCC)) S SRASRCX=1  . . S SRASRCDT="",SRASRCF=0  . . F S SRASRCDT=$ZP(^SRO(136.1,"C",DFN,SRASRCC,SRASRCDT)) Q:SRASRCDT=""!(SRASRCX)!(SRASRCF) I $D(^SRO(136.1,"C",DFN,SRASRCC,SRASRCDT)) D  . . . S X1=DT,X2=SRASRCDT D ^%DTC I X>60 S SRASRCX=1 Q  . . . S SRASRCR=""  . . . F S SRASRCR=$ZP(^SRO(136.1,"C",DFN,SRASRCC,SRASRCDT,SRASRCR)) Q:SRASRCR=""!(SRASRCF) I $D(^SRO(136.1,SRASRCR,1,0)) D  . . . . S SRASRCF=1  . . . . W !!!,SRLINE,!!,?12,"PATIENT'S MORTALITY RISK ASSOCIATED WITH CPT "\_SRASRCD  . . . . W !,?12,"--------------------------------------------------"  . . . . S SRASRCRM=""  . . . . F S SRASRCRM=$O(^SRO(136.1,SRASRCR,1,SRASRCRM)) Q:SRASRCRM="" I $D(^SRO(136.1,SRASRCR,1,SRASRCRM,0)) D  . . . . . W !,?5,$E($P(^SRO(136.1,SRASRCR,1,SRASRCRM,0),"^"),1,50)  . . . . . W ?65,$P(^SRO(136.1,SRASRCR,1,SRASRCRM,0),"^",2)\_" %"  . . . . W !!,SRLINE,!!  . I SRASRCX D  . . ;W !!!,SRLINE,!!,?12,"\*\* NO MORTALITY RISK FOUND FOR "\_SRASRCD\_" IN PAST 60 DAYS \*\*"  . . ;W !!,"It is recommended that you login to the Automated Surgical Risk Calculator tool"  . . ;W !,"from CPRS to create a new mortality risk record for this pati  ent and CPT code.",!!,SRLINE  . . ;W !!,"Press RETURN to continue " R X:DTIME  . . ;W !!!  . S DR="27T///^S X=SRASRCC;"  . Q  ; End ASRC |

| Routines | Activities | | | |
| --- | --- | --- | --- | --- |
| Routine Name |  | | | |
| Enhancement Category | New | Modify | Delete | No Change |
| RTM |  | | | |
| Related Options |  | | | |

| Related Routines | Routines “Called By” | Routines “Called” |
| --- | --- | --- |
|  |  |  |

| Routines | Activities | | | | |
| --- | --- | --- | --- | --- | --- |
| Data Dictionary (DD) References |  | | | | |
| Related Protocols |  | | | | |
| Related Integration Control Registrations (ICRs) |  | | | | |
| Data Passing | Input | Output Reference | Both | Global Reference | Local |
| Input Attribute Name and Definition | Name:  Definition: | | | | |
| Output Attribute Name and Definition | Name:  Definition: | | | | |

| Current Logic |
| --- |
|  |

| Modified Logic (Changes are in bold) |
| --- |
|  |

#### Templates

Table - Templates (Instructions)

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

Table - Templates

| Templates | Description | | | |
| --- | --- | --- | --- | --- |
| Template Name |  | | | |
| Enhancement Category | New | Modify | Delete | No Change |
| RSD |  | | | |
| Template Type | Sort | Input | Print | Other |
| Related Options |  | | | |

| Related Routines | Routines “Called By” | Routines “Called” |
| --- | --- | --- |
|  |  |  |

| Routines | Description |
| --- | --- |
| Data Dictionary (DD) References |  |
| Global References |  |

#### Data Entries Affected by the Design

Table - Data Entries Affected by the Design

| Field Name | Current Value | New Value |
| --- | --- | --- |
| PATIENT  136.01,.01 | NA | Patient ID from the Patient File (#2) |
| DATE/TIMESTAMP  136.01,1 | NA | Date and Time that the surgical risk calculation was run. |
| CPT CODE  136.01,2 | NA | CPT Code from the CPT File (#81) |
| AUTHOR  136.01,3 | NA | User from the New Person file (#200) who is running the surgical risk calculation. |
| RISK CALCULATION MODEL  136.01,4 | NA | This multiple field contains all surgical risk model names and calculated probabilities for a given surgical specialty. |
| RISK MODEL  136.014,.01 | NA | A free text field containing the surgical risk model name |
| RISK PROBABILITY  136.014,1 | NA | The risk probability (percentage) for a given surgical risk model |

The following is a complete FileMan listing of the new file:

STANDARD DATA DICTIONARY #136.1 -- SURGICAL RISK CALCULATIONS FILE

MAY 14,2015@12:40:12 PAGE 1

STORED IN ^SRO(136.1, (15 ENTRIES) SITE: VEHU MASTER UCI: GOLD,ROU

DATA NAME GLOBAL DATA

ELEMENT TITLE LOCATION TYPE

-------------------------------------------------------------------------------

DD ACCESS: @

RD ACCESS: @

WR ACCESS: @

DEL ACCESS: @

LAYGO ACCESS: @

AUDIT ACCESS: @

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

IDENTIFIED BY: DATE/TIMESTAMP (#1)

CROSS

REFERENCED BY: PATIENT(B)

INDEXED BY: PATIENT & DATE/TIMESTAMP (C)

CREATED ON: APR 21,2015 by PROGRAMMER,ONE

136.1,.01 PATIENT 0;1 POINTER TO PATIENT FILE (#2)

(Required)

LAST EDITED: MAY 13, 2015

HELP-PROMPT: NAME MUST BE 3-30 CHARACTERS, NOT NUMERIC OR

STARTING WITH PUNCTUATION

DESCRIPTION:

Patient ID from the Patient File (#2)

CROSS-REFERENCE: 136.1^B

1)= S ^SRO(136.1,"B",$E(X,1,30),DA)=""

2)= K ^SRO(136.1,"B",$E(X,1,30),DA)

RECORD INDEXES: C (#816)

136.1,1 DATE/TIMESTAMP 0;2 DATE

INPUT TRANSFORM: S %DT="E" D ^%DT S X=Y K:X<1 X

LAST EDITED: MAY 13, 2015

HELP-PROMPT: (No range limit on date)

DESCRIPTION: Date and Time that the surgical risk

calculation was run.

RECORD INDEXES: C (#816)

136.1,2 CPT CODE 0;3 POINTER TO CPT FILE (#81)

LAST EDITED: MAY 12, 2015

HELP-PROMPT: Enter a valid CPT Code

DESCRIPTION:

CPT Code from the CPT File (#81)

136.1,3 AUTHOR 0;4 POINTER TO NEW PERSON FILE (#200)

LAST EDITED: MAY 12, 2015

HELP-PROMPT: Enter name of the user running risk calculation

DESCRIPTION: User from the New Person file (#200) who is

running the surgical risk calculation.

136.1,4 RISK CALCULATION MODEL 1;0 Multiple #136.14

(Add New Entry without Asking)

LAST EDITED: APR 23, 2015

DESCRIPTION: This multiple field contains all surgical risk

model names and calculated probabilities for a

given surgical specialty.

136.14,.01 RISK MODEL 0;1 FREE TEXT

INPUT TRANSFORM: K:$L(X)>99!($L(X)<1) X

LAST EDITED: MAY 12, 2015

HELP-PROMPT: Answer must be 1-99 characters in length.

DESCRIPTION: A free text field containing the surgical

risk model name

CROSS-REFERENCE: 136.14^B

1)= S ^SRO(136.1,DA(1),1,"B",$E(X,1,30),DA)=""

2)= K ^SRO(136.1,DA(1),1,"B",$E(X,1,30),DA)

136.14,1 RISK PROBABILITY 0;2 NUMBER

INPUT TRANSFORM: K:+X'=X!(X>100)!(X<0)!(X?.E1"."7.N) X

LAST EDITED: MAY 12, 2015

HELP-PROMPT: Type a number between 0 and 100, 1 decimal

digit.

DESCRIPTION: The risk probability (percentage) for a given

surgical risk model

FILES POINTED TO FIELDS

CPT (#81) CPT CODE (#2)

NEW PERSON (#200) AUTHOR (#3)

PATIENT (#2) PATIENT (#.01)

File #136.1

Record Indexes:

C (#816) RECORD REGULAR IR LOOKUP & SORTING

Short Descr: INDEX BY PAT & DT/TM

Set Logic: S ^SRO(136.1,"C",X(1),X(2),DA)=""

Kill Logic: K ^SRO(136.1,"C",X(1),X(2),DA)

Whole Kill: K ^SRO(136.1,"C")

X(1): PATIENT (136.1,.01) (Subscr 1) (forwards)

X(2): DATE/TIMESTAMP (136.1,1) (Subscr 2) (forwards)

INPUT TEMPLATE(S):

PRINT TEMPLATE(S):

SORT TEMPLATE(S):

FORM(S)/BLOCK(S):

#### Unique Record(s)

Table - Unique Record ID

| Field Name(s) | Current Value | New Value |
| --- | --- | --- |
|  |  |  |

#### File or Global Size Changes

Table - File or Global Size Changes

| File/Global Name(s) | Estimated Increase | Estimated Decrease |
| --- | --- | --- |
|  |  |  |

#### Mail Groups

Table - Mail Groups (Instructions)

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

Table - Mail Groups

| Mail Groups | Activities | | | |
| --- | --- | --- | --- | --- |
| Mail Group Name |  | | | |
| Enhancement Category | New | Modify | Delete | No Change |
| Related Options |  | | | |

| Related Routines | Routines “Called By” | Routines “Called” |
| --- | --- | --- |
|  |  |  |

| Mail Groups | Instructions | |
| --- | --- | --- |
| Data Dictionary (DD) References |  | |
| Related Protocols |  | |
| Mail Group Description |  | |
| Self-Enrollment Allowed | Yes | No |
| Type | Public | Private |

#### Security Keys

Table - Security Keys (Instructions)

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

Table - Security Keys

| Security Keys | Activities | | | |
| --- | --- | --- | --- | --- |
| Security Key Name |  | | | |
| Enhancement Category | New | Modify | Delete | No Change |
| Related Options |  | | | |

| Related Routines | Routines “Called By” | Routines “Called” |
| --- | --- | --- |
|  |  |  |

| Security Keys | Activities | | | | |
| --- | --- | --- | --- | --- | --- |
| Data Passing | Input | Output | Both | Global Reference | Local Reference |
| Security Key Description |  | | | | |
| Subordinate Keys |  | | | | |
| Mutually Exclusive Keys |  | | | | |
| Granting Condition Logic |  | | | | |

| Current Logic |
| --- |
|  |

| Modified Logic (Changes are in bold) |
| --- |
|  |

| Security Keys | Activities |
| --- | --- |
| Hierarchical Precedence |  |

#### Options

Table - Options (Instructions)

| Options | Instructions |
| --- | --- |
| **Option Name  (MENU TEXT field)** |  |
| **Enhancement Category** | *Check the appropriate box.* |
| **Associated Menu Options that will invoke this reference** | Specify any associated menu options that will call this option name. |
| **Data Passing** |  |
| **Menu Text Description** |  |
| **Option Type** |  |
| **Option Definition** | Provide all the information necessary to fully define the option. Include options that are included in the menu, if applicable. |
| **Current Entry Action Logic** | Define the current logic for the entry action of the option affected by the functionality being designed. If the entry action did not exist before, indicate that there is currently no entry action. |
| **Modified Entry Action Logic (Changes are in bold)** | Define the entry action that the design will implement. If the entry action is new to the field, define the logic here. |
| **Current Exit Action Logic** | Define the current logic for the exit action of the option affected by the functionality being designed. If the exit action did not exist before, indicate that there is currently no exit action. |
| **Modified Exit Action Logic  (Changes are in bold)** | *Define the exit action that the design will implement. If the exit action is new to the field, define the logic here.* |

Table - Options

| Options | Instructions |
| --- | --- |
| Option Name  (MENU TEXT field) | SR ASRC |
| Enhancement Category | New |
| Associated Menu Options that will invoke this reference | N/A |
| Data Passing | The purpose of this menu option is for RPC Context setting in a VistA web application that uses VistALink to communicate with VistA. |
| Menu Text Description | ASRC RPC MENU |
| Option Type | Broker (Client/Server) |
| Option Definition | The following options (RPCs) will be contained within this option: GMV EXTRACT REC, GMV LATEST VM, SR ASRC USER, SR ASRC PATIENT, SR ASRC PROGRESS NOTE, SR ASRC RISK SAVE |
| Current Entry Action Logic | N/A |
| Modified Entry Action Logic (Changes are in bold) | N/A |
| Current Exit Action Logic | N/A |
| Modified Exit Action Logic  (Changes are in bold) | N/A |

| Options | Activities | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Option Name |  | | | | | | | | | | |
| Enhancement Category | New | Modify | | | | Delete | | | No Change | | |
| Associated Menu Options that will invoke this reference |  | | | | | | | | | | |
| Data Passing | Input | | Output | | Both | | | Global Reference | | | Local Reference |
| Menu Text Description |  | | | | | | | | | | |
| Option Type | Edit | | | Print | | | Menu | | | Inquire | |
| Action | | | Run Routine | | | Other | | |  | |
| Associated Routine |  | | | | | | | | | | |
| Option Definition |  | | | | | | | | | | |

| Current Entry Action Logic |
| --- |
|  |

| Modified Entry Action Logic (Changes are in bold) |
| --- |
|  |

| Current Exit Action Logic |
| --- |
|  |

| Modified Exit Action Logic (Changes are in bold) |
| --- |
|  |

#### Protocols

Table - Protocols (Instructions)

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

Table - Protocols

| Protocols | Activities | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Protocol Name |  | | | | | | | | | | |
| Enhancement Category | New | | Modify | | | | Delete | | No Change | | |
| Associated Protocols |  | | | | | | | | | | |
| Data Passing | Input | Output | | | Both | | | Global Reference | | | Local Reference |
| Item Text Description | N/A | | | | | | | | | | |
| Protocol Type | Action | | | Menu | | Protocol | | | | Protocol Menu | |
| Limited Protocol | | | | | Extended Action | | | | Dialog | |
| Other | | | | | | | | | | |
| Associated Routine |  | | | | | | | | | | |

| Current Entry Action Logic |
| --- |
|  |

| Modified Entry Action Logic (Changes are in bold) |
| --- |
|  |

| Current Exit Action Logic |
| --- |
|  |

| Modified Exit Action Logic (Changes are in bold) |
| --- |
|  |

#### Remote Procedure Call (RPC)

Table - RPCs (Instructions)

| RPCs | Instructions |
| --- | --- |
| Name |  |
| TAG^RTN | List the tag (label) and routine. |
| Input Parameters | This field is used to identify an input parameter for the API. |
| Results Array | This field tells the RPC Broker how to process the resulting data from the call. |
| Description | Provide a brief description of the RPC affected. |

Table - RPCs

| RPCs | Activities |
| --- | --- |
| **Name** | SR ASRC PATIENT |
| **TAG^RTN** | PAT^SRASRC |
| **Input Parameters** | DFN |
| **Results Array** | RETURN($J) = "Patient Name from Patient file (#2)" ^ "Patient's Age" ^ "Patient's Gender (M or F)" |
| **Description** | Based on the DFN sent as the input parameter, this RPC returns the name of the patient, along with age and gender. |

| RPCs | Activities |
| --- | --- |
| Name | SR ASRC PROGRESS NOTE |
| TAG^RTN | ENTER^SRASRC2 |
| Input Parameters | DFN, DUZ, SRESIG, SRTIUX |
| Results Array | SRSTAT = "1 for successful or 0 for unsuccessful" ^ "Success message or error message" |
| Description | This RPC has two functions. First, it checks to see if a valid electronic signature code was entered by the user. If the signature was successful, it will attempt to create a new Progress Notes record for the Surgical Risk Calculations data. |

| RPCs | Activities |
| --- | --- |
| Name | SR ASRC RISK SAVE |
| TAG^RTN | ENTER^SRASRC3 |
| Input Parameters | DFN, SRCPT, SRDTTM, SRTIUX |
| Results Array | SRSTAT = "1 for successful or 0 for unsuccessful" ^ "Success message or error message" |
| Description | This RPC attempts to store Surgical Risk Calculation data for a given patient into the Surgical Risk Calculations file (#136.1) in VistA. |

| RPCs | Activities |
| --- | --- |
| Name | SR ASRC USER |
| TAG^RTN | USER^SRASRC |
| Input Parameters | N/A |
| Results Array | RETURN($J) = "User name from New Person file (#200)" |
| Description | Based on the DUZ of the current VistALink session, this RPC returns the name of the user. |

| RPCs | Activities |
| --- | --- |
| Name | SR ASRC LAB RESULTS |
| TAG^RTN | ENTER^SRASRC4 |
| Input Parameters | DFN, SRLABNS |
| Results Array | SRRET = Lab Name ^ Lab Result ^ Lab Date ^ Lab Units of Measure |
| Description | Based on the DFN and Lab strings passed in, this RPC will return the most recent lab match, or a null value if no matches are found. |

| RPCs | Activities | | |
| --- | --- | --- | --- |
| Name |  | | |
| TAG^RTN |  | | |
| Input Parameters |  | | |
| Results Array | Single Value | Array | Word Processing |
| Global Array | Global Instance |  |
| Description |  | | |

## Service Oriented Architecture / ESS Detailed Design

### Service Description for <Consumed Service Name>

### Service Design for <Provided Service Name>

# External System Interface Design

## Interface Architecture

## Interface Detailed Design

# Security and Privacy

## Security

## Privacy

1. Additional Information
   1. RTM
   2. Packaging and Installation
   3. Design Metrics
   4. Acronym List and Glossary

Table - Glossary

| Term | Meaning |
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See TOGAF® 9.1, Part III: ADM Guidelines & Techniques, Gap Analysis on TOGAF website at <http://pubs.opengroup.org/architecture/togaf9-doc/arch/chap27.html>

1. Available online at: <http://vhainnovations.github.io/ASRCM/srcalc/javadoc/gov/va/med/srcalc/domain/package-summary.html> [↑](#footnote-ref-2)
2. Available online at: <http://vhainnovations.github.io/ASRCM/srcalc/javadoc/gov/va/med/srcalc/service/package-summary.html> [↑](#footnote-ref-3)
3. Available online at: <http://vhainnovations.github.io/ASRCM/srcalc/javadoc/gov/va/med/srcalc/web/package-summary.html> [↑](#footnote-ref-4)
4. Available online at: <http://vhainnovations.github.io/ASRCM/srcalc/javadoc/gov/va/med/srcalc/db/package-summary.html> [↑](#footnote-ref-5)
5. Available online at: <http://vhainnovations.github.io/ASRCM/srcalc/javadoc/gov/va/med/srcalc/vista/package-summary.html> [↑](#footnote-ref-6)