Los Alamos NATIONAL LABORATORY

Nuclear Nonproliferation (N) Division

Title: **Source Tracker Custodian's Manual**

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Example

History of Revisions

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Revision 1.0	10/1/07	ALL	Original Draft
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Example

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1. Introduction

1.1 System Design Document Objectives

The main objective of this design document is to provide detailed specifications on how each item under § 3.2 *Functional Requirements*, § 3.3 *Performance Requirements,* § 3.4 *Logical Database Requirements* and § 3.5 *System and Communication Requirements* of the Source Tracker Software Requirements Specification [N-ST-SRS] are programmatically accomplished.

1.2 System Description and Objectives

This Source Tracker software is designed for tracking of certain classes of radioactive source items by authorized users in the N1 group and N division. Users include authorized custodians and N division researchers.

A typical installation has multiple remote stations or clients, all synchronized to a master database server.

The basic hardware architecture for a remote station, or client, is shown in Figure 1. A computer with a bar code reader, a touch screen, a CPU and a hard drive receives input from users, executes the Source Tracker software in response to user operation. The computer is also connected via Ethernet/WINS network to a central server machine. See §§ 2.1.1 and 3.9 of [N-ST-SRS].

Example

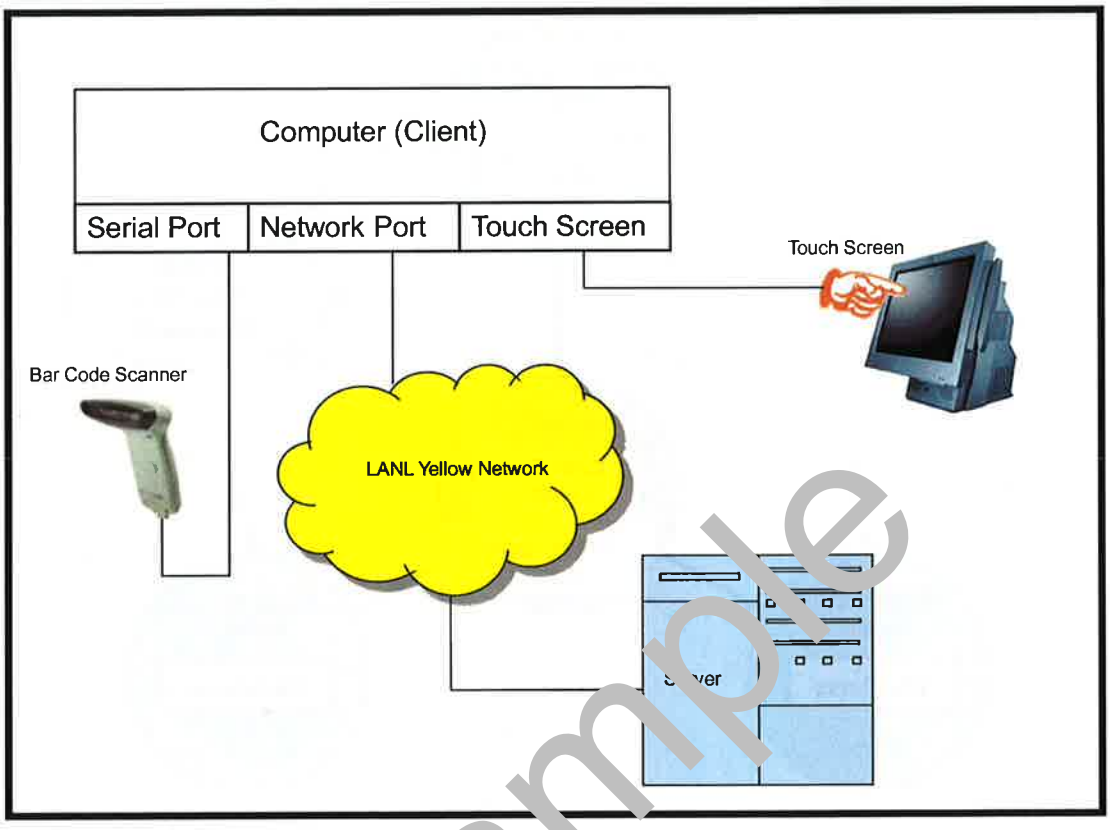


Figure 1 System Hardware Architecture

The basic system software architecture is shown in Figure 2. The Source Tracker software is a Windows application that interacts with the user through the touch screen display, reads input from the bar code reader and touch screen, and writes results to a local database and local text files. Each Source Tracker station (client) hosts a copy of the Source Tracker and maintains a local database. Current deployments use up to seven such clients. A change made to a local database by a Source Tracker client is propagated to all other copies of the database on all other Source Tracker client machines, thought the Replication Manager application running on the single central Server machine. More Source Tracker application details appear later in this document.

The organizing foundation of Source Tracker client software is the database design. All data representation for source items, users, and source events is defined in the database, using tables, fields and relationships. The database is a Microsoft Access 2000 compatible database, implemented in a single Access .mdb file. The database structure supports source description and characterization, and tracking of the location and controlling user for each time. All events involving sources are recorded as database transactions. The local database file is routinely examined and changes made locally to the database by Source Tracker are propagated to the central Server database, and also to all other client databases on the network. See §§ 3.2-3.4 of [N-ST-SRS].

Example

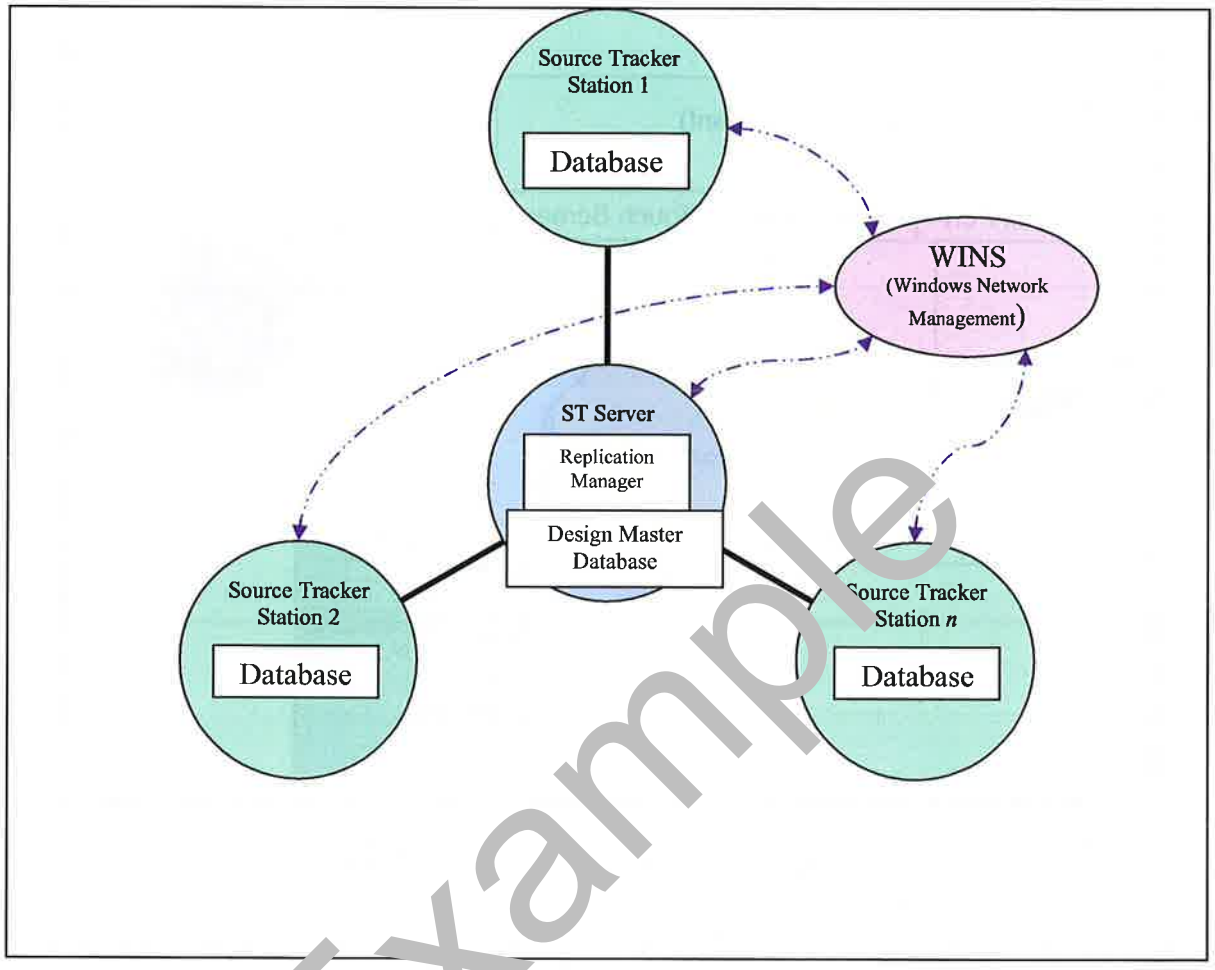


Figure 2 System Software Architecture

Example

1.3 Definitions, Acronyms, and Abbreviations

Accountable RSS	An RSS with a half-life equal to or greater than 30 days and an isotopic activity equal to or greater than the corresponding value provided in Appendix 16A, ISD 121-1.0. Also known as Registered RSS.
CAT 3	Category 3 – based on hazard safety. A facility is classified as either Hazard Category 1, 2, or 3, or Radiological Facility depending only on the quantities of radioactive Material at Risk (MAR) in the facility. Only facilities which fall below the Category 3 threshold are exempt from the requirements of DOE Order 5480.23. MAR limits are defined in DOE-STD-1027-92 and the supplement table LA-12981-MS.
CAT IV	Category IV – based on security. Nuclear material is designated as

	Category I, II, III, or IV as determined by quantity and attractiveness level of the material. Category and attractiveness levels are defined in DOE M 470.4-6 and DOE M 470.4-7, respectively
COTS	Commercial off The Shelf – software purchased from an outside vendor
Custodian	A person who is assigned by the Group Leader and authorized to use the ***Source Tracker*** to perform administrative tasks and to meet regulatory compliance requirements. Also known as Source Custodian.
Exempt	A source that is within an ANSI certified container. An exempt source does not count against MAR totals and thus has a MAR value of 0.
Home Repository	The resident location of a source when it has not been checked out and moved by a user. Also known as storage location.
MAPI	Messaging Application Programming Interface, a messaging architecture API for Microsoft Windows. Used to access local email services from within Source Tracker.
MAR	Material at Risk – MAR sources are radioactive material used in terms of hazard safety (e.g. CAT 3).
MASS	Material Accountability Safeguards System – Official system used for tracking nuclear materials based on security (e.g. CAT IV).
MASS Location	Nuclear materials held only in defined, identified and approved locations that appear on MASS and that are considered valid locations for nuclear materials.
MBA	Material Balance Area – each MBA is authorized to contain a category level (security) of nuclear material based on the quantity of nuclear material needed for operations and the implementation of requisite security systems and procedures as defined by DOE orders and vulnerability analysis.
NISC	Nonproliferation and International Security Center
Non-Accountable RSS	An RSS whose current isotopic activity is less than the corresponding value listed in Appendix 16A, ISD 121-1.0 or whose radioactive half-life is less than 30 days
RSS	Radioactive Sealed Source
SPP	Software Project Plan
SRS	Software Requirements Specification
User	A person who is authorized to use the ***Source Tracker*** program in order to perform work tasks involving the use of sealed sources.

Example

1.4 References

The following documents are referenced within this document:

[DOE-STD-1027-92]	*Hazard Categorization and Accidental Analysis Techniques for Compliance with DOE O 5480.23, Nuclear Safety Analysis Reports*, Change Notice No.1, September 1997
[LA-12981-MS]	*Table of DOE-STD-1027-92 Hazard Category 3 Threshold Quantities for the ICRP-30 List of 757 Radionuclides*, Rev 1, 10/16/02.
[DOE M 470.4-6]	*Nuclear Material Control and Accountability, Change 1 08/14/06.*
[DOE M 470.4-7]	*Safeguards and Security Program References, Change 1 08/26/07.*
[ISD 121-1.1]	LANL Implementation Support Document *Radiation Protection, 11/18.*
[N-ST-SRS]	*Source Tracker Software Requirements Specification*, found in the "Source Tracker" SourceForge project.
[N-ST-UM]	*Source Tracker User's Manual*, found in the "Source Tracker" SourceForge project.
[N-ST-CM]	*Source Tracker Custodian's Manual*, found in the "Source Tracker" SourceForge project.
[N-ST-ML]	*Source Tracker Materials List,* found in the "Source Tracker" SourceForge project.
[N-ST-RTM]	*Source Tracker Requirements Traceability Matrix*, found in the "Source Tracker" SourceForge project.

Example

2 System Design

2.1 System Architecture

The overall architecture is already described by Figure 2, above. A more detailed description of the architecture of the program is provided here.

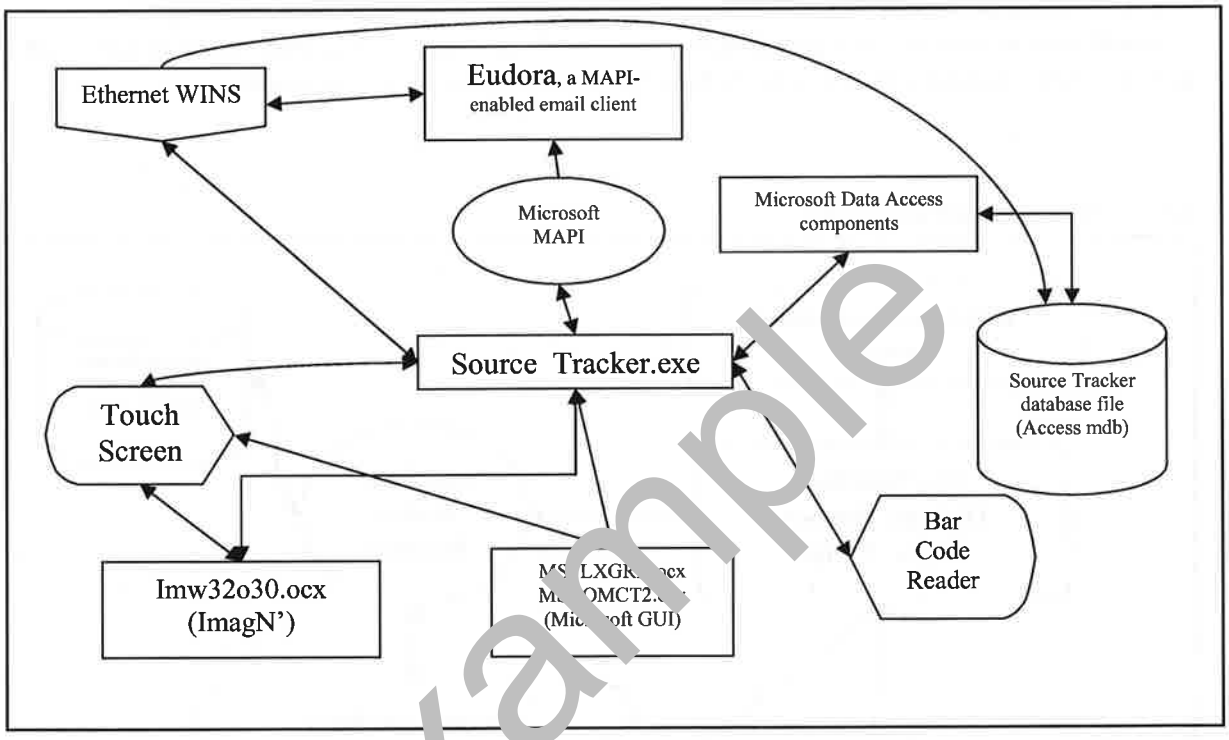


Figure 3 Deployed Component Architecture

Example

2.2 Hardware

The software runs on a server PC with an installed Ethernet port, serial port, touch screen, and keyboard and mouse inputs.

2.3 Data Communications

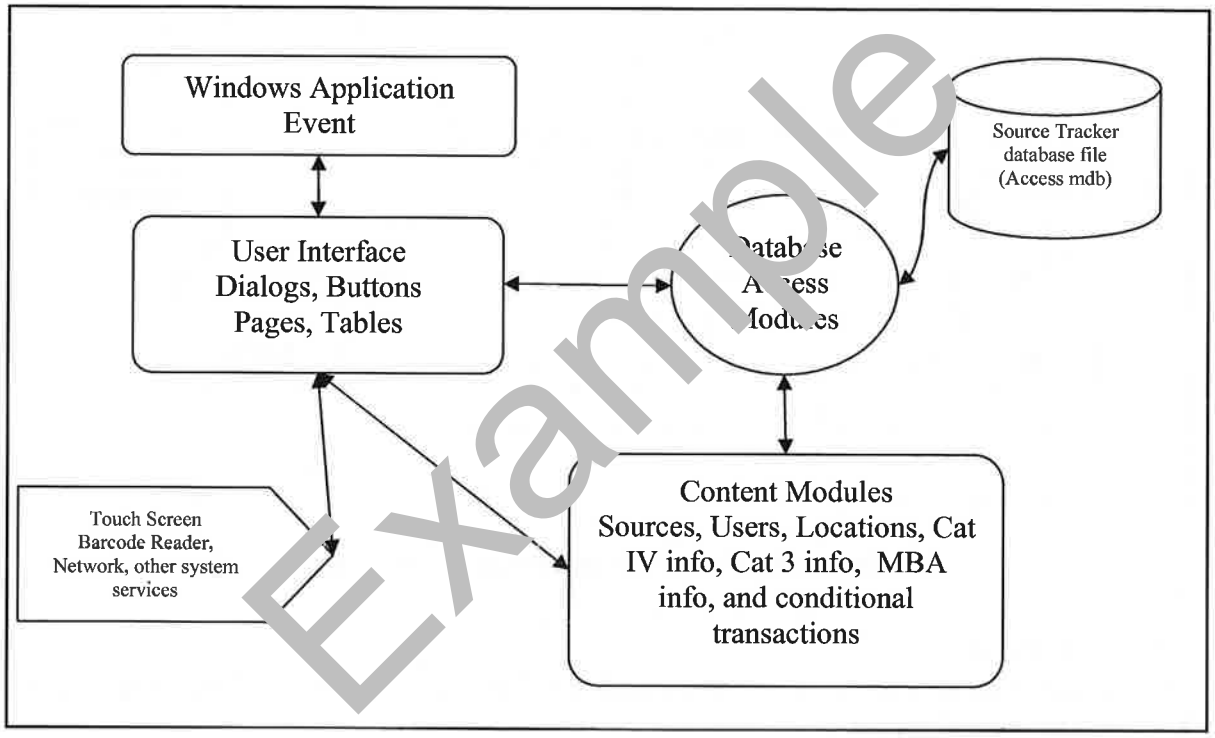
A user inputs data to Source Tracker, and generally controls Source Tracker, using the bar code reader, and touch screen. Additional data communication occurs across the network when a user logs in to a client, causing authorization requests to occur over the network with the Windows network domain controller and WINS network services, and also when the central Server accesses the local Access database file during synchronization events. Source Tracker sends emails to certain email addresses using an external MAPI-compliant email client, such as Eudora.

2.4 Software

The Source Tracker software consists of a single Windows executable coupled to an Access database. Also installed with Source Tracker are supporting software components, for source image display, touch screen grid (table) display support, Microsoft Access database program support, and email processing.

During execution, Source Tracker typically reads and writes to the local Access database, responds to user commands through dialogs and fields displayed to the user on the touch screen, and receives input from the bar code reader when identifying users and sources.

2.5 Architecture Diagram



Example

Figure 4 Top Level Architecture

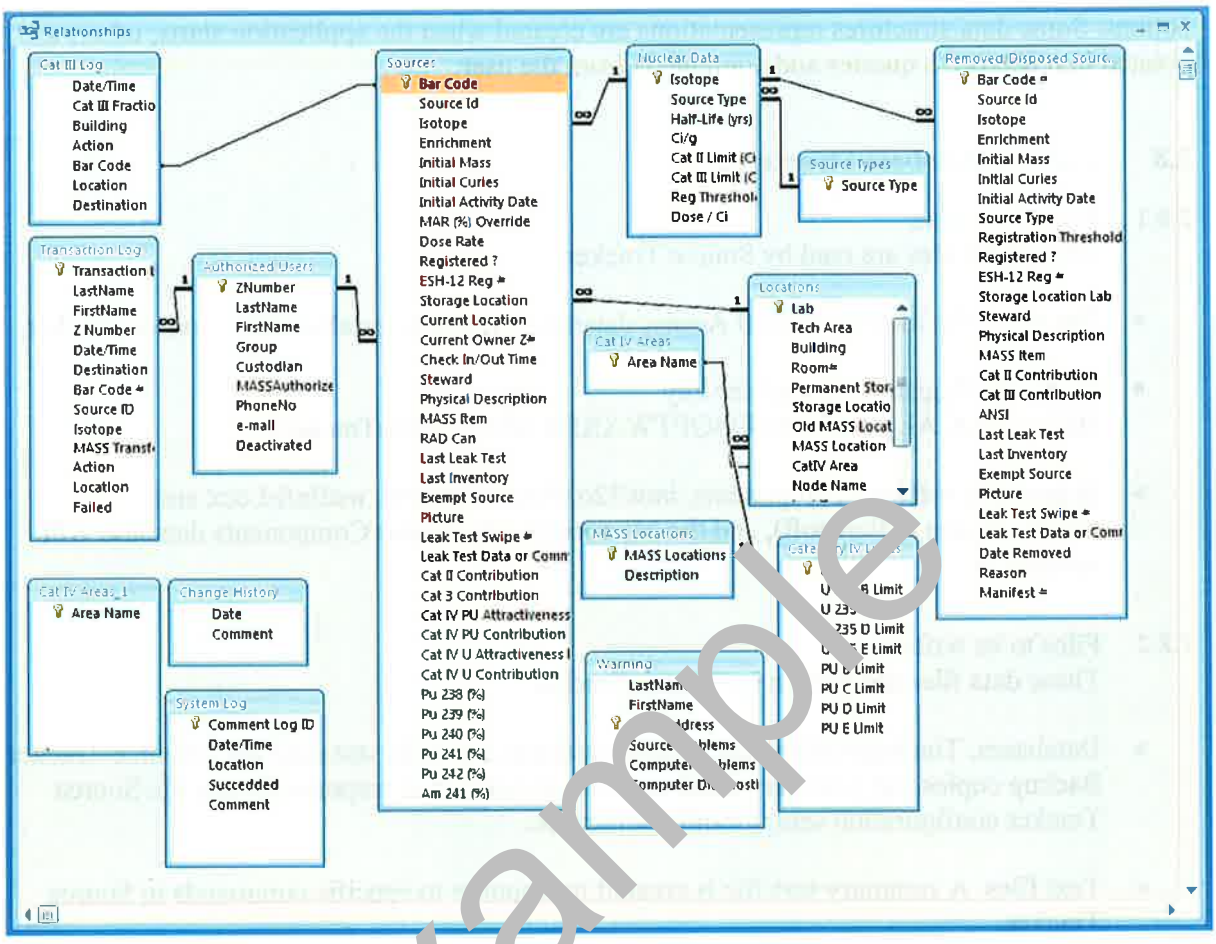


Figure 5 Database Tables, Relationships and Fields

Example

2.6 Data Design

The data design is the database itself. See Figure 5 (above) and the detailed description of each database table in appendix A (below). Sources are described by several attributes. Multiple sources may be inserted into a single database. Similarly for Authorized Users, Nuclear Data (isotopes), and Locations.

2.7 Data Objects and Resultant Data Structures

At run time, Source Tracker creates builds internal C++ class representations of the database tables into the immediate memory space of the application, using database support API components from Microsoft, and specialized structures for the type of data represented by the database tables. For example, a list of CUser objects is constructed from each Authorized Users table entry. The software then uses this in-memory copy of the database state to respond to user

actions. Some data structures representations are created when the application starts, others are created in response to queries and commands from the user.

2.8 File and Database Structures

2.8.1 Files to be read
These data files are read by Source Tracker:

- Database; the local Microsoft Access database, typically installed at C:\Source Tracker.
- Windows Registry; the registry key HKEY_LOCAL_MACHINE\SOFTWARE\LANL\SourceTracker.
- Supporting software components, imw32o30.ocx (ImagN), msflxfrd.ocx and mscomct2.ocx (Microsoft), and the Microsoft Data Access Components database API subsystem.

2.8.2 Files to be written
These data files are written by Source Tracker:

- Databases. The local Microsoft Access database, typically installed at C:\Source Tracker. Backup copies and summary database files are written in response to specific Source Tracker configuration settings and commands.
- Text files. A summary text file is created in response to specific commands in Source Tracker.
- Windows Registry; the registry key HKEY_LOCAL_MACHINE\SOFTWARE\LANL\SourceTracker is modified when certain parameters, such as the bar code scanner serial port number, are changed by the Source Tracker software.

Example

3 Modular Design

3.1 Modules

SourceTracker.exe is the single main application program, written in C++. The application uses the Microsoft Foundation Classes window and messaging technology as the basis for interaction with the user and input devices. The modular decomposition falls into five groups,

1. general database access and control,
2. external device and resource access,
3. Windows user interface building block classes,
4. Source Tracker user interface and presentation, including dialogs, tables and related user presentation items, and

5. the central modules for the software, the Source Tracker database content and conditional evaluation classes.

Database Access Classes

C_Recordset	Database record access and control, supplied by Microsoft
CProperty	Database Recordset data item, supplied by Microsoft
CProperties	Set of database Recordset data (CProperty), by Microsoft
CAdoDb	Database access and control API, by Microsoft
CTrackerDb	A general database utility abstraction, by N1
CSrcDatabase	The overall Source Tracker database, by N1

Source Tracker System Support Classes

CmagN_Dispatch	Image display interface component (ImagN', from Pegasus Imaging)
CIMapi	Interface to Windows MAPI email API
CRegistryData	Windows Registry access
CMyPerformanceTimer	Tracks time
CSerialInputSimulator	Test support for serial port code
CSerialPort	Supports the Windows Serial Port API

Windows Application User Interface Foundation Classes

CMainFrame	Windows application container
CMDIApp	Main Windows application control loop
CSrcTrackerCommandLineInfo	Command line info used by application
CChildFrame	Secondary Windows application container
CMdiBackground	Display background rendering
COleFont	Windows font abstraction for table or grid
CCustomBtn	Large button for touch screen use
CCustomLabel	Large label for touch screen use
CPicture	Image container for table or grid cell
CRowCursor	Control point for user interaction with table or grid
CMSFlexGrid	Table or grid display
TomsFlexGrid	Source Tracker enhancement of table or grid display (uses CMSFlexGrid)

User Interface Dialogs, Tables and Support Classes

Example

Classes supporting unique dialogs and tabbed dialog sheets for all Source Tracker functions.

CBarcodeScanParms	CTabbedBrowserDlg
CBrowserDlgParms	CTabbedCat3Page
CCustodianChoicesDlg	CTabbedCurrentOwnerPage
CEditRegistryDlg	CTabbedIsotopePage
CAboutDlg	CTabbedListSortPage
CCat3SummaryDlg	CTabbedLocationPage
CCatIVSummaryDlg	CTabbedSrcBrowserPropsheet
CLocationPageBase	CTabbedSrcTypePage
CLocationSheet	CTimedMsgBox
CLocationBldg2	CVerifyRemovalDlg
CLocationBldg27	LocConfirmation
CLocationBldgOther	CSrcTransactionDlg
CProgressBarAndMsgDlg	CStatusIndicator
CMultipleDbErrorsDlg	CStatusIndicatorState
CScanBadgeAndSource	CTrySerialPortOpen

Source Tracker database content classes

CSrc	Source details from the database
CSrcList	List of sources
CCat3BldgInfo	Cat 3 information for a building
CCat3TransactionValue	Cat 3 database transaction content
CCatIV_AreaInfo	Cat IV information for an area
CCatIV_OverallInfo	Total Cat IV information for all areas
CCatIVTransactionValues	Cat IV database transaction content
CConfigParms	Source Tracker configuration settings
CGlobalMbaInfo	Material Balance Area info
CLoc	Location details from database
CLocList	List of locations
CTransaction	Transaction database abstraction
CUser	User details from database
CUserList	List of users

Example

3.2 Processing Narrative

The Source Tracker software starts when a client system is booted. The software takes control of the entire touch screen display, hiding the Windows desktop from the user. At startup, Source Tracker optionally makes a copy of the underlying access database in a predetermined location.

The backup location and other system settings such as the active serial port for the bar code reader, the name and location of the primary local database and more are stored in a specific location in the Windows registry.

The Source Tracker application continuously waits for input events from the touch screen, bar code reader. Based on the contextual state of the application, the software responds to user interaction by performing the context dependent touch screen display steps, database queries and email notifications. See [N-ST-UM] and [N-ST-CM].

Perhaps the most notable feature of Source Tracker is the rule-based transaction processing. Internal rules and conditions apply to operations that impact a source and any safety and hazard calculations. For example, an attempt to move a source to a new location invokes internal checks comparing source attributes such as isotopics, current location and proposed new location status, against specific hazard and safety limits. These rules for comparison rules are encoded in the software application itself, the data driving the rules is present in both the application and the external database.

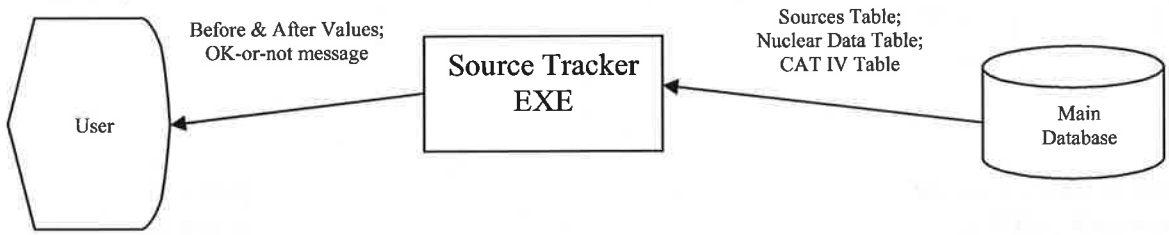
3.3 Data Structures

The runtime data structures generally reflect individual tables in the database. See Figure 5 and Appendix A.

4 Detailed Design

This section presents the detailed design for the Source Tracker software structure and processing algorithms satisfying the software requirements in *Source Tracker Software Requirements Specification* [N-ST-SRS]. Algorithms are described using pseudo-code with sequential, branch and loop statements and boolean operators. Software structure supporting the algorithm is diagrammed for clarity. For each primary Software Requirement (SR), the related SR section is referenced on the right-hand side of the algorithm statements.

4.1 SR 1 - Verify MAC and Physical Security Limits

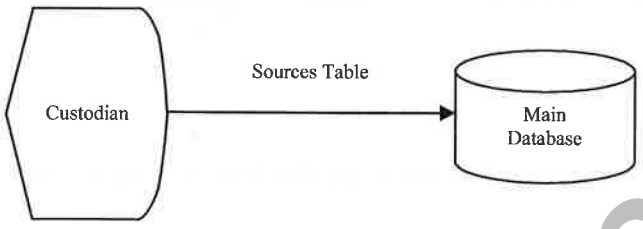


For each building/MBA
  For each Source
    If not ANSI certified container, Then [SR 1.2]

Example

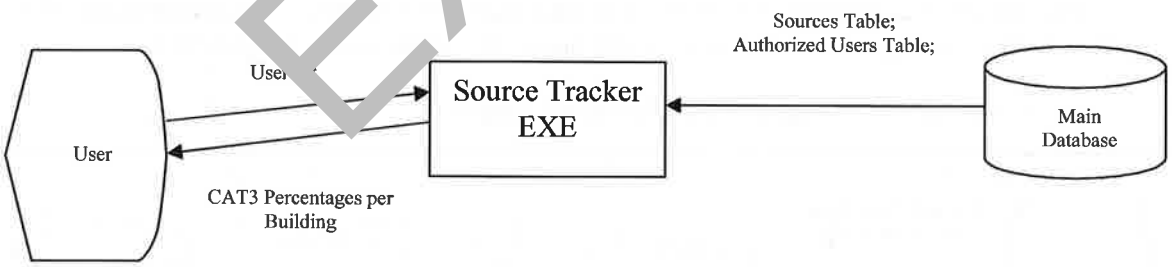
If Source has a MAR Percentage Override value
Then add it to CAT3 Total Percentage
Else add CAT3 Contribution Value to the CAT3 Total Percentage
Add Source CAT IV Contribution Value to the CAT IV Total
Show User Before Transfer and After Transfer Values [SR 1.1]
Compare Totals (CAT3 and CAT IV) to Limits
If Exceed Limits [SR 1.3 & 1.4]
Then display "Not OK to Transfer" message
Else display "OK to Transfer" message

4.2 SR 21 – Manually input MAR (CAT 3) contribution value for a source



Manually enter MAR Percentage Override values for specific sources into the Main Database Sources Table

4.3 SR 8 - Display Category 3 MAR Status for each of the Radiation Facilities

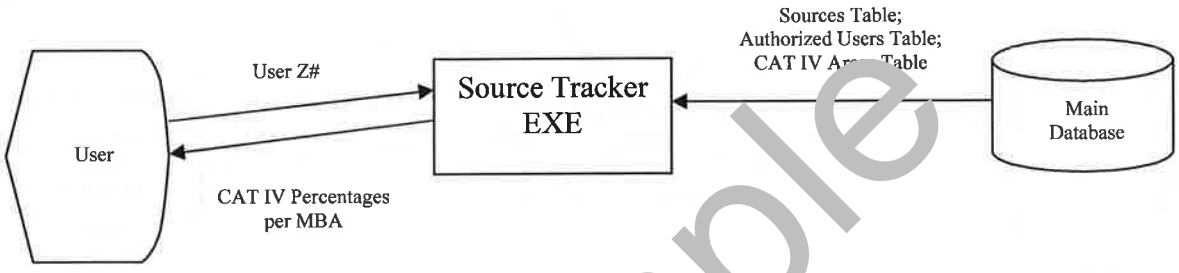


Get & verify User Z# [SR 8.1]
For each building [SR 8.2]
For each Source
If not ANSI certified container, Then
If Source is a checked out Radiation Canister (RAD Can)
Then Add it to the appropriate CAT3 Building RAD Can Percentage
(If Source has a MAR Percentage Override value, then use the MAR

Example

Percentage Override value, else use the CAT3 Contribution Value)
Else add it to the appropriate CAT3 Building Base Percentage
(If Source has a MAR Percentage Override value, then use the MAR
Percentage Override value, else use the CAT3 Contribution Value)
Display the CAT3 Percentages per building (display the RAD Can Percentage, Base Percentage, and the total of those values)

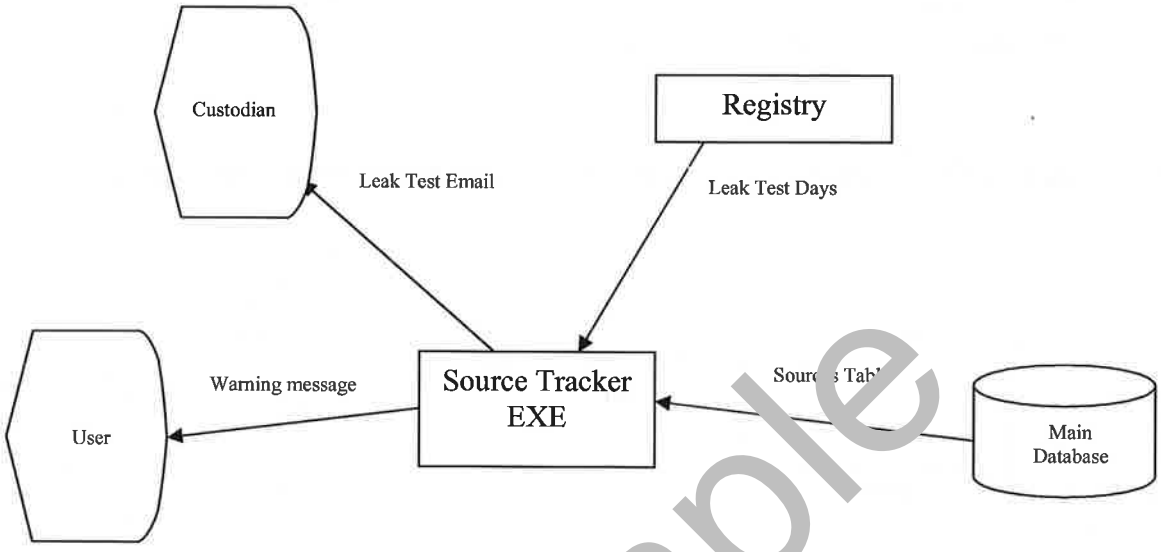
4.4 SR 9 - Display Category IV Physical Security Status for each of the MBAs



Get & verify User Z# [SR 9.1]
For each MBA Area [SR 9.2]
For each Source
Add the CAT IV PU Contribution value to the appropriate MBA and attractiveness level (B, C, D, & E) plutonium sub-total
Add the CAT IV U Contribution value to the appropriate MBA and attractiveness level (B, C, D, & E) uranium sub-total
Display the CAT IV sub-totals per MBA Area (display by attractiveness levels and isotope type)

Example

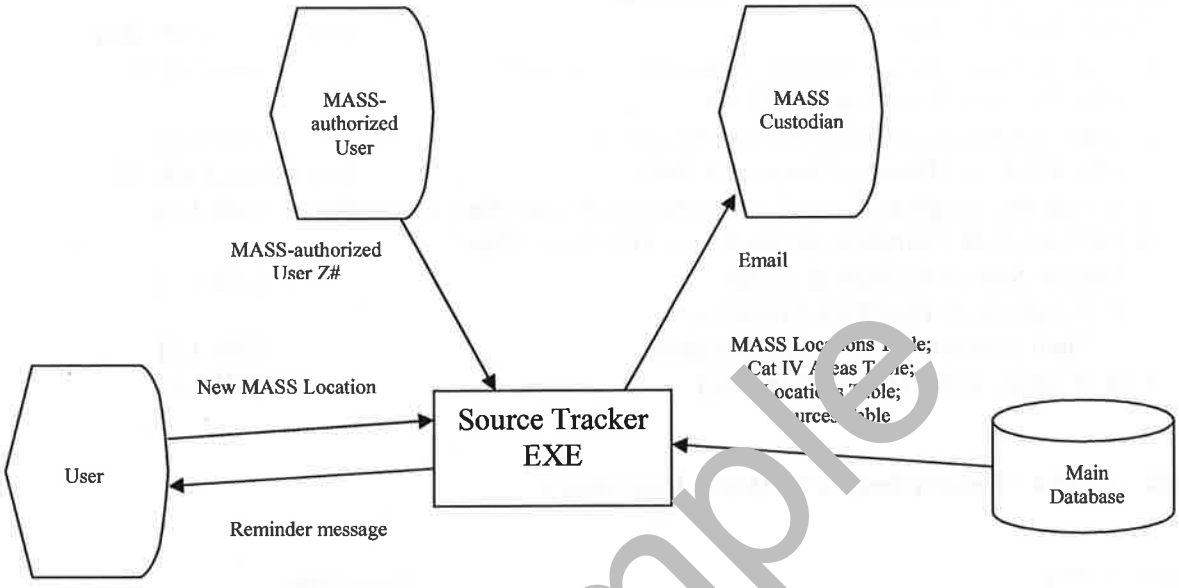
4.5 SR 18 - Verify leak testing



Compare source's time since last leak test to appropriate leak test parameter days allowed
If Leak Testing is past due, Then
  If grace period has already passed, Then
    Don't allow the transfer
  Else (grace period has not passed) [SR 18.1]
    Display the last leak test date
    Display warning message
    Allow the transfer
    Email Custodian that a source was transfer with an expired leak test date, including a date by which leak testing must be performed (grace period date parameter added to the current date)

Example

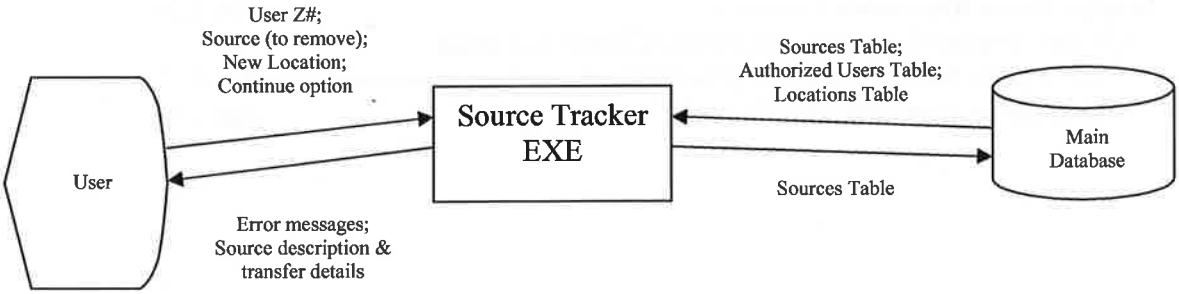
4.6 SR 2 - Transferring MASS sources



If Source to transfer is a MASS Source, Then
- User selects new MASS location (to transfer to) [SR 2]
- If transfer is to another MBA, Then
  - Get and verify MASS-authorized user Z# [SR 2.2]
  - Remind User to notify MASS Custodian [SR 2.3]
- Else (not to another MBA)
  - Email MASS Custodian about the transfer [SR 2.1]

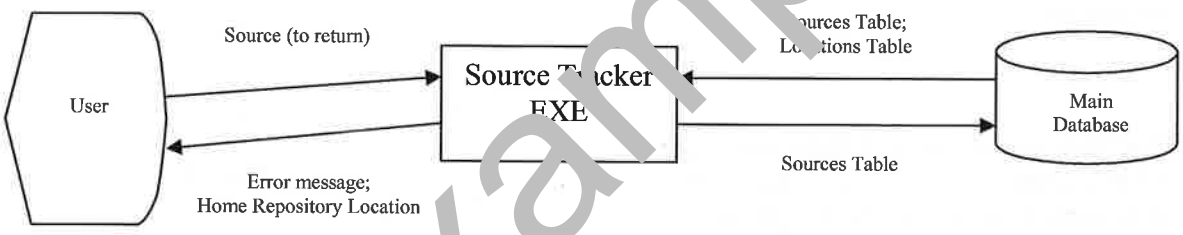
Example

4.7 SR 3 - Remove source from home repository



Get & verify User Z#; Get Source (to remove) from User [SR 3.1]
If Source Location is NOT = its Home Repository, Then [SR 3.2]
  Display error message (& exit)
Else (Source is currently in its Home Repository)
  Verify Leak Testing [SR 3.7 (see SR 18)]
  If Transferring a MASS Source, Then (do extra stuff) [see SR 2]
    Else Get New Location from User
  Display Source description and transfer details [SR 3.3]
  Verify MAR and Physical Security Limits [SR 1.5 (see SR 1)]
  Ask User to Complete, Cancel, or Complete-&-Do-More-Transfers? [SR 3.4]
  If Complete OR Complete-&-Do-More-Transfers, Then
    Update Source location & owner [SR 3.5]
    If Complete-&-Do-More-Transfers
      Then continue doing more transfers [SR 3.4]
  Else (Cancel, so no Database update) [SR 3.6]

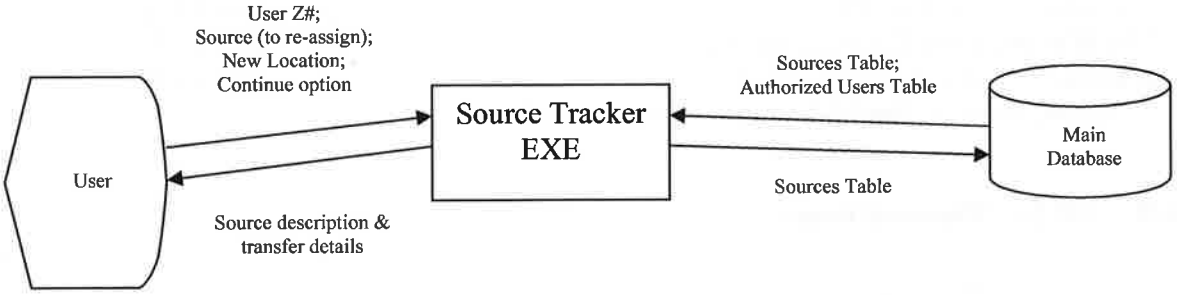
4.8 SR 4 - Return Source to Home Repository



Get Source (to return) from User [SR 4.1]
If Source Location = its Home Repository, Then [SR 4.2]
  Display error message (& exit)
Else (Source is currently checked-out)
  Verify MAR and Physical Security Limits [SR 1.5 (see SR 1)]
  Display Home Repository Location [SR 4.3]
  If Client Computer Location = Home Repository Location
    Then Update Source Location to its Home Repository Location [SR 4.5]
    Else Display error message (& exit) [SR 4.4]

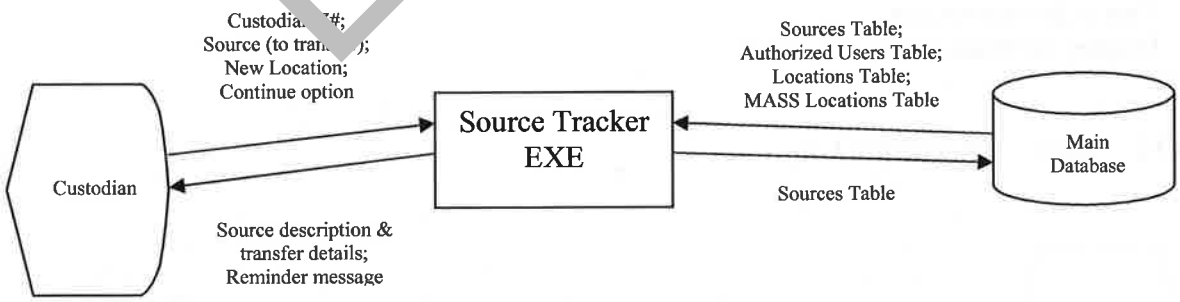
Example

4.9 SR 5 - Re-Assign Source's Current Location and/or Owner



Get & verify User Z#; Get Source (to re-assign) from User [SR 5.1]
If Transferring a MASS Source, Then (do extra stuff) [see SR 2]
  Else Get New Location from User [SR 5.2]
Display Source description and transfer details [SR 5.3]
Verify MAR and Physical Security Limits [SR 1.5 (see SR 1)]
Ask User to Complete, Cancel, or Complete-&-Do-More-Transfers? [SR 5.4]
If Complete OR Complete-&-Do-More-Transfers, Then
  Update Source location & owner [SR 5.5]
  If Complete-&-Do-More-Transfers
    Then continue doing more transfers [SR 5.4]
Else (Cancel, so no Database update)

4.10 SR 11 - Transfer a source permanently from one location to another

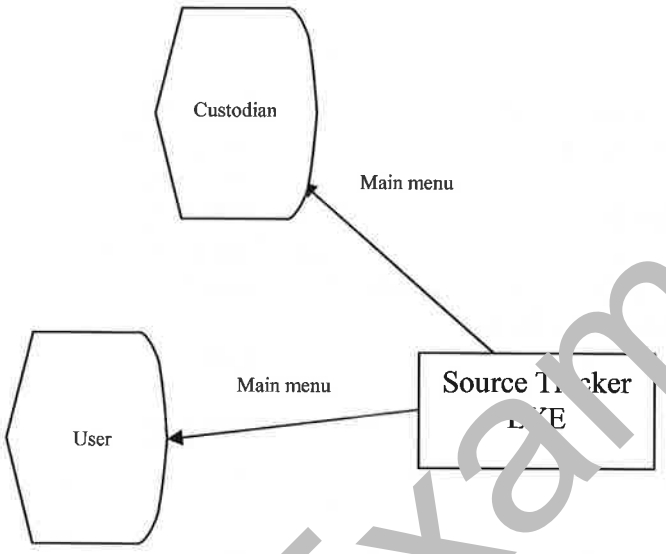


Get & verify Custodian Z# [SR 11.1]
Get scanned source (to transfer) from Custodian [SR 11.2]
Get new permanent location (home repository) from Custodian [SR 11.3]
If a valid permanent location, Then [SR 11.3]

Example

Display Source description and transfer details	[SR 11.4]
Verify MAR and Physical Security Limits	[SR 1.5 (see SR 1)]
Ask Custodian to Complete or Cancel?	[SR 11.5]
If Complete, Then	
Update Source location	[SR 11.6]
Else (Cancel, so no Database update)	[SR 11.7]
If source is a MASS source, Then	[SR 11.8]
Display message that MASS system must be updated	

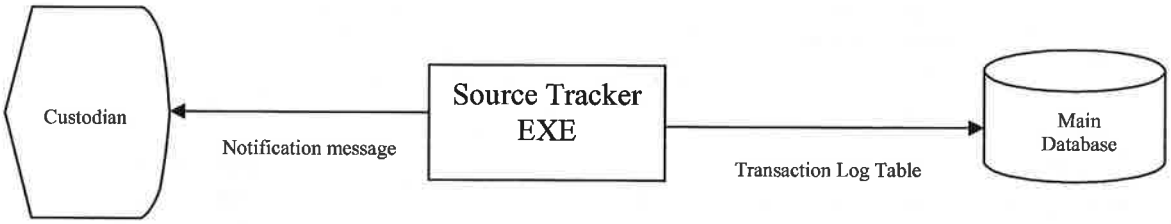
4.11 SR 22 – Time-out timers



Example

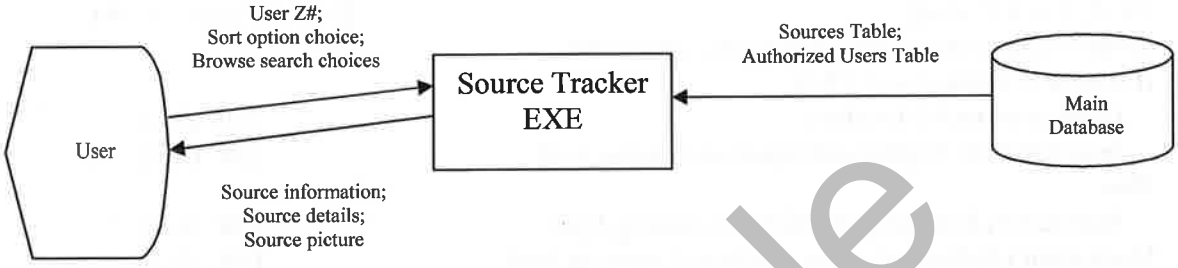
If a User or a Custodian starts a transaction (using their Z#) and does not complete the transaction within a time limit, Then
Cancel the transaction
Display the main menu

4.12 SR 6 - Transaction Log



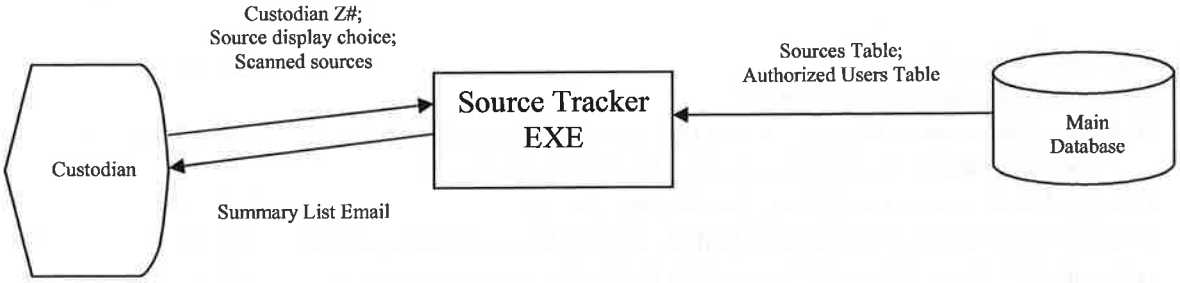
For every transaction performed by a User or a Custodian
Add transaction information into the Transaction Log Table (refer to Appendix A for Transaction Log Table details) [SR 6]

4.13 SR 7 - Browse Sources



Get & verify User Z# [SR 7.1]
Get User Sort option choice (bar code number, source ID, activity value, or MASS value) [SR 7.3]
Get User Browse search choices (source type, isotope, location, owner, or CAT3 sources) [SR 7.4 (7.4.1-7.4.5)]
Display Source information (bar code number, source ID, isotope type, activity level, current owner, location, and MASS value) for each source selected, [SR 7.2]
sorted by user sort option choice [SR 7.4]
[SR 7.3]
If CAT3 sources is one of the Browse search choices, Then [SR 7.4.5]
Also display CAT3 Contribution Factor for each source selected
If User chooses to display source details about a source, [SR 7.5]
Then display many details (from Sources Table)
If User chooses to display the picture of a source and a picture is available, [SR 7.6]
Then display the source picture

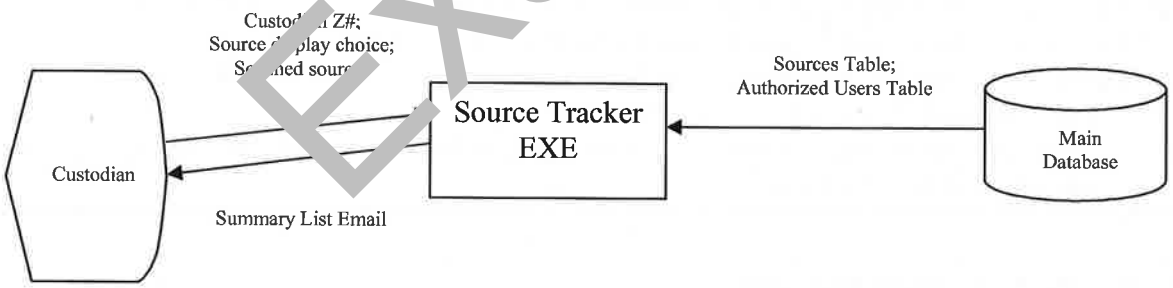
4.14 SR 10 - Confirm inventory



Example

Get & verify Custodian Z# [SR 10.1]
Loop until Custodian selects Cancel
  Get Custodian source display choice (all sources, selected sources, only checked-out sources, or only checked-in sources) [SR 10.2]
  Display list of sources matching the display choice [SR 10.2]
  Display running totals (to be confirmed, confirmed, and unexpected) [SR 10.3]
  Get scanned source barcode (to confirm inventory) from Custodian [SR 10.4]
  Update the source's last inventory date (to the current date) [SR 10.4]
  Verify Leak Testing [SR 10.5 (see SR 18)]
  Remove the scanned source from the source list
  If source is unexpected, Then
    Display expected location [SR 10.6]
    Increment (& display) unexpected running total [SR 10.3]
  Else
    Increment (& display) confirmed running total [SR 10.3]
  Decrement (& display) to be confirmed running total [SR 10.3]
End Loop
If sources still in source list (still need to be confirmed), Then
  Display warning message & [SR 10.7]
    a summarized list of confirmed sources [SR 10.8]
Send summarized list of confirmed sources via email to Custodian [SR 10.8]
    (including unexpected sources)

4.15 SR 17 – Record Leak Testing

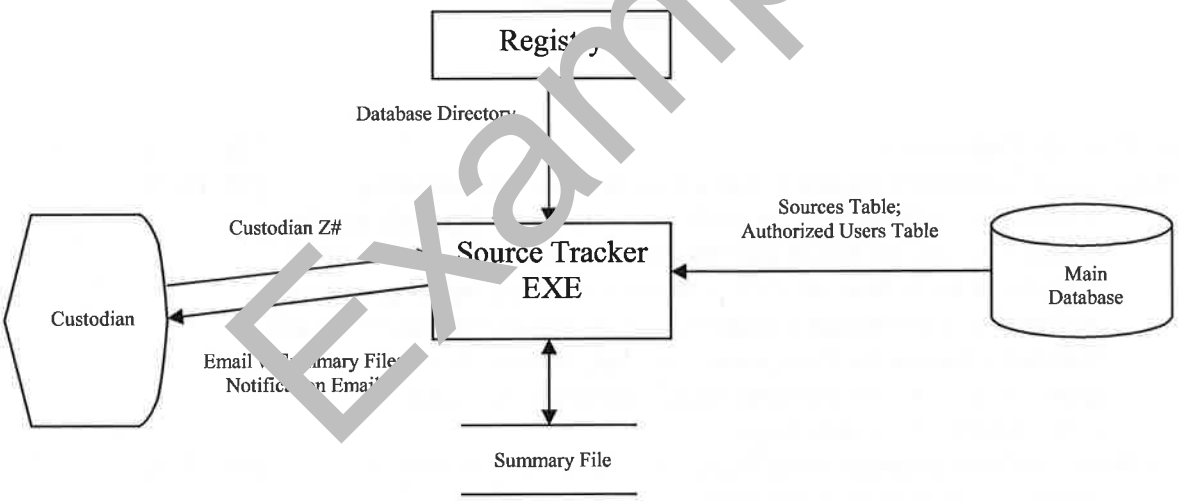


Get & verify Custodian Z# [SR 17.1]
Loop until Custodian selects Cancel
  Get Custodian source display choice (all sources, selected sources, only checked-out sources, or only checked-in sources) [SR 17.2]
  Display list of sources matching the display choice [SR 17.2]
  Display running totals (to be leak tested, leak tested, and unexpected) [SR 17.3]
  Get scanned source barcode (to confirm inventory) from Custodian [SR 17.4]
  Update the source's last leak tested date (to the current date) [SR 17.4]

Example

If Custodian also wants to confirm inventory, Then [SR 17.5]
Update the source's last inventory date (to the current date)
Remove the scanned source from the source list
If source is unexpected, Then
Display expected location [SR 17.6]
Increment (& display) unexpected running total [SR 17.3]
Else
Increment (& display) leak tested running total [SR 17.3]
Decrement (& display) to be leak tested running total [SR 17.3]
End Loop
If sources still in source list (still need to be leak tested), Then
Display warning message & [SR 17.7]
a summarized list of leak tested sources [SR 17.8]
Send summarized list of leak tested sources via email to Custodian [SR 17.8]
(including unexpected sources and all sources still needing leak testing)

4.16 SR 12 - Create a summary text file of all sources

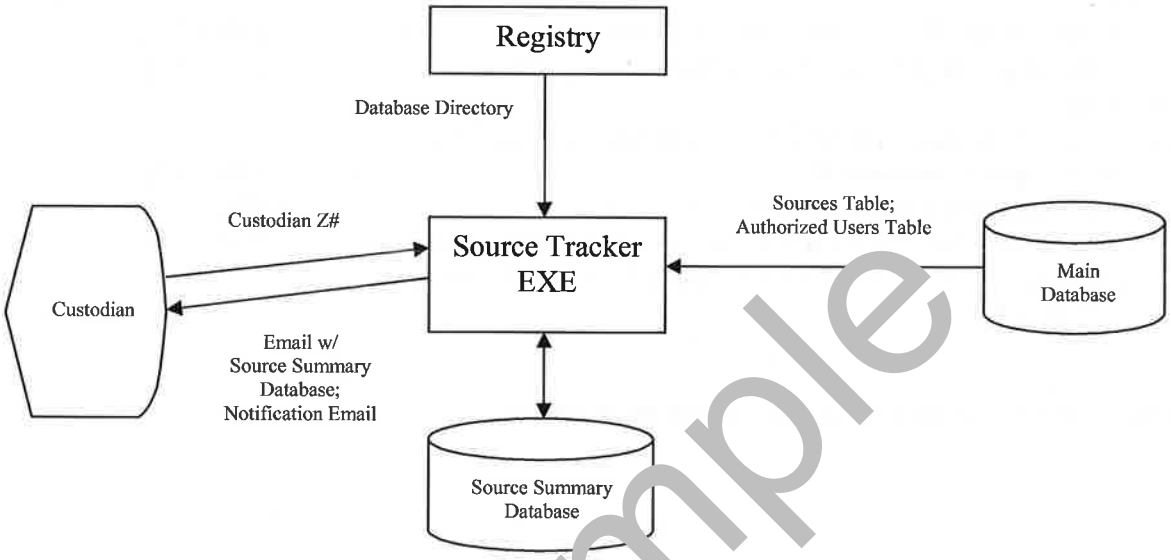


Get & verify Custodian Z# [SR 12.1]
Create Summary File (list of sources) containing all sources- [SR 12.3]
information for each source includes bar code number, source ID, isotope, initial activity date, initial MASS value, initial activity, activity from MASS, difference between initial and current activity (as a percentage), current activity, home repository (storage location), current location, current owner, last leak test (last swipe) (date and time), last inventory (date and time), and CAT 3 contribution (as a percentage)
Get Main Database directory from Registry & write Summary File to that directory [SR 12.2]

Example

Email Summary File to Custodian & display message that email was sent [SR 12.4]

4.17 SR 13 - Create a summary database table of all sources



Get & verify Custodian Z# [SR 13.1]

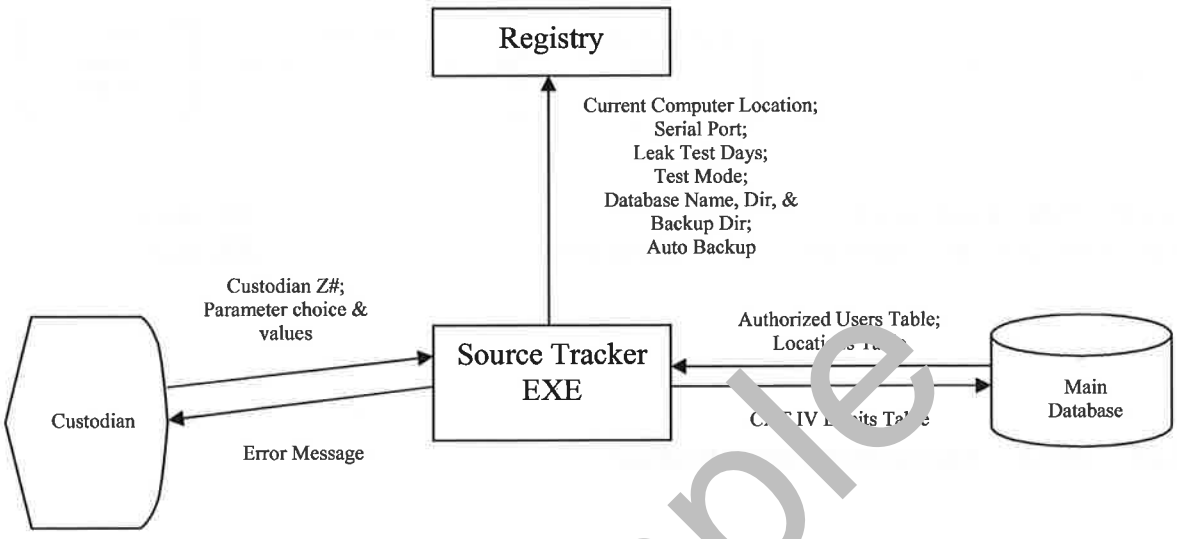
Create Source Summary Database Table (list of sources) containing all sources - information for each source includes bar code number, source ID, isotope, initial activity date, initial MASS value, initial activity, activity from MASS, difference between initial and current activity (as a percentage), current activity, home repository (storage location), current location, current owner, last leak test (last swipe) (date and time), last inventory (date and time), and CAT 3 contribution (as a percentage) [SR 13.3]

Get Main Database directory from Registry & write Source Summary Database Table to that directory [SR 13.2]

Email Source Summary Database Table to Custodian & display message that email was sent [SR13.4]

Example

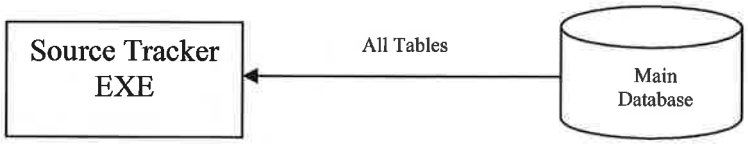
4.18 SR 15 – Edit Program Parameters



Get & verify Custodian Z# [SR 15.1]
Get Custodian Parameter choice
If Parameter is client computer location, Then [SR 15.2]
  Set client computer current location registry entry
If Parameter is serial port, Then [SR 15.3]
  If valid serial port
    Then Set serial port registry entry
    Else display error message
If Parameter is leak test days, Then [SR 15.4]
  Set leak test days registry entries (unaccountable sources days,
    and registered/MAOS sources days, and extra days)
If Parameter is test mode, Then [SR 15.5]
  Set test mode registry entry
If Parameter is CAT IV Limits, Then [SR 15.6]
  Set values (B, C, & D for both Plutonium and Uranium) in the
    CAT IV Limits Table
If Parameter is database file name, Then [SR 15.7]
  Set database file name registry entry
If Parameter is main database directory, Then [SR 15.7]
  Set main database directory registry entry
If Parameter is database backup directory, Then [SR 15.8]
  Set database backup directory registry entry
If Parameter is automatic database backup, Then [SR 15.9]
  Set automatic database backup registry entry

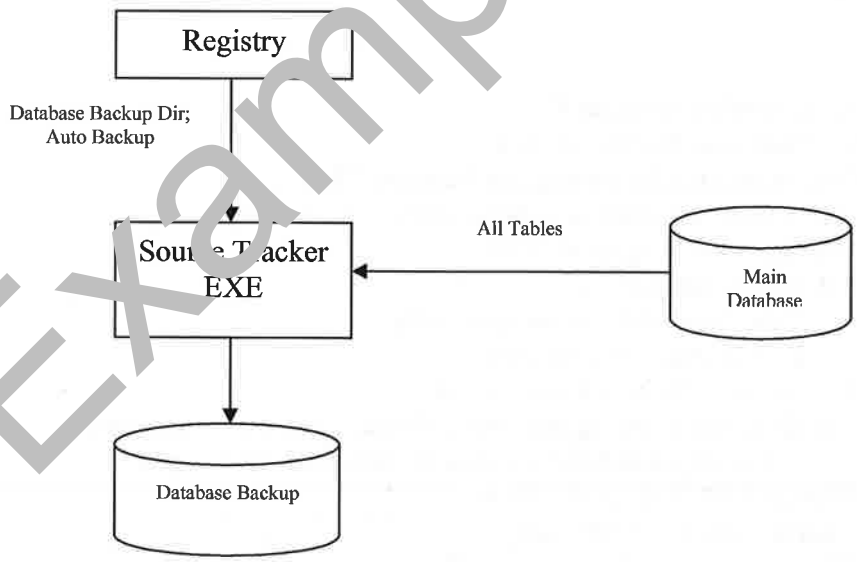
Example

4.19 SR 14 - Force Database Read



Get & verify Custodian Z# [SR 14.1]
Read Main Database information into EXE memory [SR 14.2]

4.20 SR 19 – Automatic database backups

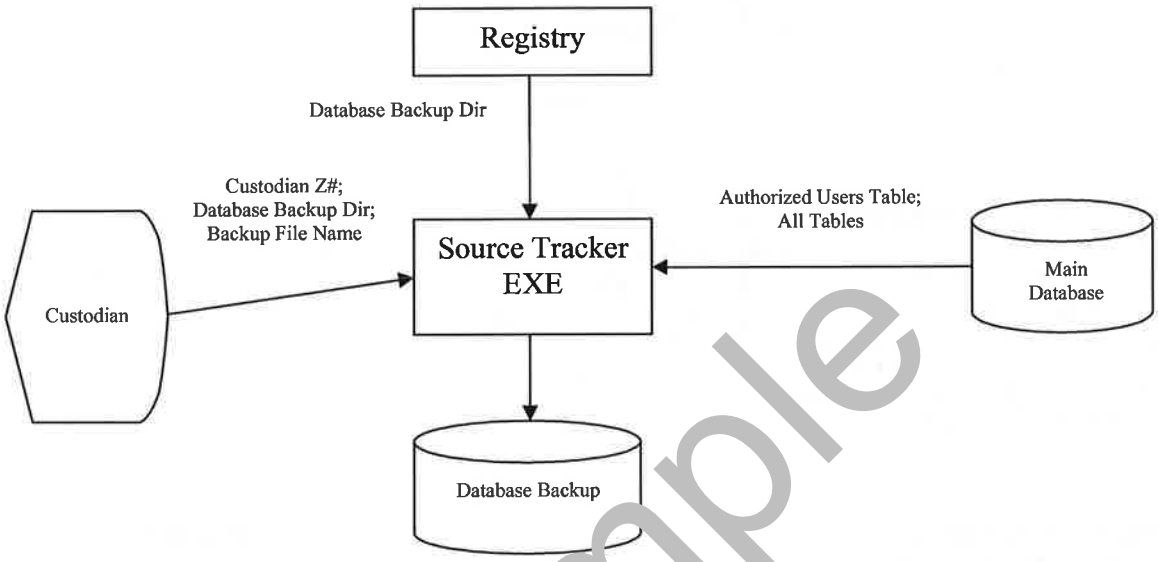


When system starts up [SR 19.2]
If Auto Backup parameter set AND no daily backup yet, Then
Copy the Main Database to the Backup Directory with a file name that includes the date [SR 19.1]

When the date changes to a new day [SR 19]
If Auto Backup parameter set, Then
Copy the Main Database to the Backup Directory with a file name that includes the date [SR 19.1]

Example

4.21 SR 20 – Manually backup database



Get & verify Custodian Z# [SR 20.1]
Get the Database Backup Directory (default is in the Database Backup Dir parameter) & Backup File Name (default includes the current date) from the Custodian [SR 20.2]
Copy the Main Database to the specified directory using the specified file name

4.22 SR 23 – Synchronize Databases

Refer to Figure 2 (System Software Architecture).

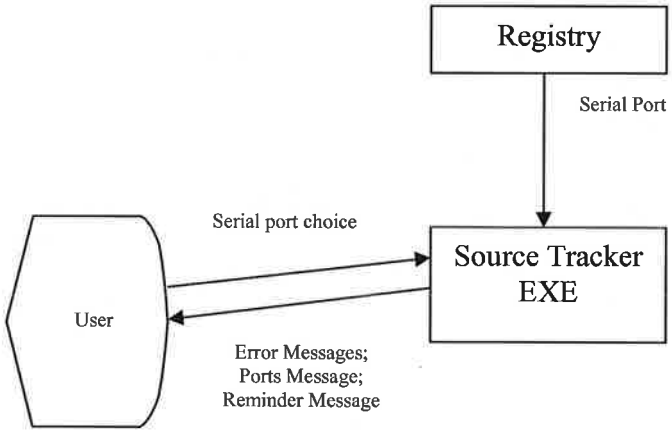
Every 15 minutes
Synchronize each Main Database (on each client computer) to the master database (on the Server computer)

4.23 SR 24 –Database Content

Appendix A (Database Table Description) details the fields of each database table (one table for each of the required types of information).

Example

4.24 SR 16 – Set serial port upon system startup



When system starts up [SR 16]
  Loop while Serial Port Registry entry is invalid
    Display error message
    Get serial port from User
    If Serial Port Registry entry is valid, Then [SR 16.2]
      Set EXE Serial Port value
      Display failed port and port that succeeded [SR 16.3]
      Display message that EXE Program Parameters must be used to [SR 16.4]
        permanently set the serial port
    Else (still not a valid port)
      If User aborts [SR 16.1]
        Then display error message (& exit)
  End Loop

Example

5 Implementation Language

The SourceTracker.exe application is written in C++ and compiled with the Microsoft Visual Studio C++ compiler, version 6.0, service pack 6.

6 Traceability

Requirements found in [N-ST-SRS] as satisfied by the software design are shown in the design details section above. See also [N-ST-RTM], the Requirements Traceability Matrix.

7 Appendix A: Database Table Description

Note: Replication Manager processing adds three unique fields to every Access database table, s_Generation, s_GUID, s_Lineage.

Table: Authorized Users

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
ZNumber	Long Integer	4
LastName	Text	50
FirstName	Text	50
Group	Text	50
Custodian	Yes/No	1
MASSAuthorized	Yes/No	1
PhoneNo	Text	50
e-mail	Text	50
Deactivated	Yes/No	1

Table: Cat III Log

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Date/Time	Date/Time	8
Cat III Fraction	Single	4
Building	Text	50
Action	Text	50
Bar Code	Text	50
Location	Text	50
Destination	Text	50

Table: Cat IV Areas

Name	Type	Size
Area Name	Text	30
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-

Table: Category IV Limits

Name	Type	Size
ID	Long Integer	4
U 235 B Limit	Double	8
U 235 C Limit	Double	8
U 235 D Limit	Double	8
U 235 E Limit	Double	8
PU B Limit	Double	8
PU C Limit	Double	8
PU D Limit	Double	8
PU E Limit	Double	8
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-

Table: Change History

Example

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Date	Date/Time	8
Comment	Text	255

Table: Locations

Name	Type	Size
Lab	Text	30
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Tech Area	Text	10
Building	Text	10
Room#	Text	10
Permanent Storage	Yes/No	1
Storage Location Index	Integer	2
Old MASS Location	Integer	2
MASS Location	Text	50
CatIV Area	Text	30
Node Name	Text	20
Last Transaction	Date/Time	8
Current Program Version	Text	50
Last Synch	Date/Time	8

Table: MASS Locations

Name	Type	Size
MASS Locations	Text	50
Description	Text	255
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-

Table: Nuclear Data

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Isotope	Text	25
Source Type	Text	25
Half-Life (yrs)	Single	4
Ci/g	Single	4
Cat II Limit (Ci)	Single	4
Cat III Limit (Ci)	Single	4
Reg Threshold (Ci)	Single	4
Dose / Ci	Single	4

Table: Removed/Disposed Sources

Name	Type	Size
Gen_Picture	Long Integer	4
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Bar Code #	Text	10
Source Id	Text	20
Isotope	Text	50
Enrichment	Single	4

Example

Initial Mass	Single	4
Initial Curies	Single	4
Initial Activity Date	Date/Time	8
Source Type	Text	50
Registration Threshold	Single	4
Registered ?	Yes/No	1
ESH-12 Reg #	Text	50
Storage Location Lab	Text	30
Steward	Text	50
Physical Description	Text	200
MASS Item	Yes/No	1
Cat II Contribution	Single	4
Cat III Contribution	Single	4
ANSI	Yes/No	1
Last Leak Test	Date/Time	8
Last Inventory	Date/Time	8
Exempt Source	Yes/No	1
Picture	OLE Object	-
Leak Test Swipe #	Long Integer	4
Leak Test Data or Comments	Text	50
Date Removed	Date/Time	8
Reason	Text	200
Manifest #	Text	50

Table: Source Types

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Source Type	Text	25

Table: Sources

Name	Type	Size
Bar Code	Text	10
Gen_Picture	Long Integer	4
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Source Id	Text	20
Isotope	Text	50
Enrichment	Single	4
Initial Mass	Single	4
Initial Curies	Single	4
Initial Activity Date	Date/Time	8
MAR (%) Override	Single	4
Dose Rate	Single	4
Registered ?	Double	8
ESH-12 Reg #	Text	50
Storage Location	Text	30
Current Location	Text	30
Current Owner Z#	Long Integer	4
Check In/Out Time	Date/Time	8
Steward	Text	50
Physical Description	Text	200
MASS Item	Yes/No	1
RAD Can	Yes/No	1
Last Leak Test	Date/Time	8
Last Inventory	Date/Time	8
Exempt Source	Yes/No	1
Picture	OLE Object	-
Leak Test Swipe #	Long Integer	4
Leak Test Data or Comments	Text	50

Example

Cat II Contribution	Single	4
Cat 3 Contribution	Single	4
Cat IV PU Attractiveness Level	Text	50
Cat IV PU Contribution	Double	8
Cat IV U Attractiveness Level	Text	50
Cat IV U Contribution	Double	8
Pu 238 (%)	Single	4
Pu 239 (%)	Single	4
Pu 240 (%)	Single	4
Pu 241 (%)	Single	4
Pu 242 (%)	Single	4
Am 241 (%)	Single	4

Table: System Log

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Comment Log ID	Long Integer	4
Date/Time	Date/Time	8
Location	Text	30
Succedded	Yes/No	1
Comment	Text	250

Table: Transaction Log

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
Transaction LogID	Long Integer	4
LastName	Text	15
FirstName	Text	15
Z Number	Long Integer	4
Date/Time	Date/Time	8
Destination	Text	50
Bar Code #	Text	10
Source ID	Text	20
Isotope	Text	25
MASS Transfer	Yes/No	1
Action	Text	50
Location	Text	30
Failed	Yes/No	1

Table: Warning

Name	Type	Size
s_Generation	Long Integer	4
s_GUID	Replication ID	16
s_Lineage	OLE Object	-
LastName	Text	50
FirstName	Text	50
EmailAddress	Text	50
Source Problems	Yes/No	1
Computer Problems	Yes/No	1
Computer Diagnostics	Yes/No	1

Example