Prevent, Mitigate, and Recover (PMR) Insight Collective Knowledge System (PICK)

Software Requirements Specification

Version 1.7

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Document Control

Approval

The Guidance Team and the customers shall approve this document.

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Change Summary

The following table details changes made between versions of this document

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# Introduction

## Purpose and Intended Audience

The purpose of the Software Requirements Specification (SRS) is to give the customer a clear and precise description of the functionality of the Prevent, Mitigate, and Recover (PMR) Insight Collective Knowledge System (PICK). The SRS divides the system requirements into two parts, behavioral and non-behavioral requirements. The behavioral requirements describe the interaction between the system and its environment. Non-behavioral requirements relate to the definition of the attributes of the product as it performs its functions. This includes performance requirements of the product. The intended audience of the SRS is Dr. Oscar Perez, Mr. Vincent Fonseca, Ms. Herandy Vazquez, Mr. Baltazar Santaella, Ms. Florencia Larsen, and the Software Engineering teams. This document serves as an agreement between both parties regarding the product to be developed.

## Scope of Product

The Lethality, Survivability, and HSI Directorate (LSH) recognizes the complexity and the time it takes to analyze the applicable logs, observation notes, and other artifacts gathered from an adversarial assessment from the red, blue, and white teams and generate a report that presents the events that took place during the adversarial assessment. They want a system that would aid their analysts in correlating red team’s activities to blue team’s responses and represent the events that took place during an adversarial assessment graphically.

The University of Texas at El Paso (UTEP) and LSH are collaborating to develop Prevent, Mitigate, and Recover (PMR) Insight Collective Knowledge System (PICK) that will provide the ability to correlate red team’s activities to blue team’s responses and graphically represent the events that took place during an adversarial assessment.

## Definitions, Acronyms, and Abbreviations

### Definitions

The definitions in this section are given in the context of the product being developed. This intention is to assist the user in their understanding of the document.

Table 1: Definition of terms used in the report

|  |  |
| --- | --- |
| **TERM** | **DEFINITION** |
| Actor | A representation in the use case diagram denoting external entities that interact with a system being modeled, e.g., the testbed management system. |
| Extend Relationship | Denotes insertion of optional behavior of another use case into the primary use case. |
| Generalization Relationship | Denotes a relationship between a general use case and a specific use case. |
| Include Relationship | Denotes the inclusion of behavior of another use case into the primary use case. |
| Use Case | A modeling technique that presents the basic functionality of a system and the actors that interact with each function. |
| Data Cleansing | Data cleansing is the removal of unwanted characters from uncleansed TMUX log file; removal of blank rows from uncleansed excel log file; and removal of blank lines from uncleansed log file. |
| Data Validation | Data validation is the process of inspecting data in the cleansed log files based on predefined data validation rules. |
| Log Entry | Splunk takes the validated log files and convert them into normalized data.  The normalized data are called log entries.  Users of the system can filter and edit log entries. |
| Significant Log Entry | A log entry selected by the user and associated with a vector. The attributes are the same as for a log entry. The system stores significant log entries. Splunk stores log entries in the normalized data files. |
| Timestamp | Denotes time in hours:minutes, date in month:date:year, and section in am/pm. |
| Text Label | Denotes a component that displays a single line of read-only, non-selectable text [2]. |
| Text Field | Denotes a component that implements a single line of text [2]. |
| Text Area | Denotes a component that displays multiple lines of text. |
| Significant log entry | Denotes a log entry that is associated to at least one vector. |

### Acronyms

This section lists the acronyms used in this document and their associated definitions.

Table 2: Acronyms

|  |  |
| --- | --- |
| **TERM** | **DEFINITION** |
| SRS | Software Requirements Specification |
| UTEP | The University of Texas at El Paso |
| PICK | Prevent, Mitigate, and Recover (PMR) Insight Collective Knowledge System |
| LSH | Lethality, Survivability, and HSI Directorate |
| PMR | Prevent, Mitigate, and Recover |
| IP | Internet Address |
| AA | Adversarial Assessment |

### Abbreviations

This section provides a list of used abbreviations and their associated definitions.

Table 3: Abbreviations

|  |  |
| --- | --- |
| **TERM** | **DEFINITION** |
| e.g. | For example |
| i.e. | That is |
| TBD | To be determined |

## Overview

The SRS is divided into three major sections: Introduction (Section 1), General Description (Section 2), and Specific Requirements (Section 3).

Section 1 includes five subsections. Section 1.1 provides the purpose and intended audience of the document. Section 1.2 describes the scope of the product. Section 1.3 provides the definitions, acronyms and abbreviations. Section 1.4 provides the organization of the document. Section 1.5 lists the references used in this document.

Section 2 includes five subsections. Section 2.1 contains a description of the product, its overall structure, and its functionality. Section 2.2 summarizes the main features of the system. Section 2.3 identifies each type of users of the system. This is accomplished through a summary of actors and use-cases. Section 2.4 states existing general constraints. Section 2.5 gives the assumptions and dependencies of the system.

Section 3 includes four major subsections. Section 3.1 contains requirements that are related to the external interface. Section 3.2 contains the functional requirements that are organized in the following categories: same class of user, related real-world objects, stimulus, related features, and limits and default settings. Section 3.3 contains non-behavioral requirements.

## References

[1] O. Perez et al, Requirements Definition Document, Lethality, Survivability and HSI Directorate, 2019.

[2] “Components and Containers in AWT”. Internet: [https://www.cs.utexas.edu/~mitra/csSpring2009/cs313/lectures/GUIComponents.html](about:blank), 2009 [Jan. 28, 2019]

# General Description

## Product Perspective

Prevent, Mitigate, and Recover (PMR) Insight Collective Knowledge System (PICK) is an interactive system that facilitates correlations between red team’s activities and blue team’s responses and generates graphical representation of events that took place during an adversarial assessment.

## Product Features

Figure 1 presents a level 1 use case diagram that provides an overview of the main functionalities provided by PICK and the interactions between actors and PICK. Figure 2 presents the notations used in a use case diagram. The actors, represented by stick figures, are external entities that interact with PICK. The use case, represented by ovals, elucidates the actors’ interactions with PICK. Figure 3 presents a level 2 use case diagram that provides extensions of the functionalities, in particular the include, extend, and generalization interactions between the actors and the system. The include relationship denotes the inclusion of behavior of another use case into the primary use case. The extend relationship denotes insertion of optional behavior of another use case into the primary use case. The generalization relationship denotes a relationship between a general use case and a specific use case. These components are described next.



Figure 1: Level 1 Use Case Diagram



Figure 2: Use Case Diagram Notation



Figure 3: Level 2 Use Case Diagram

### Actors Descriptions

PICK classifies the actors into the following groups:

* Analyst: The principal user of the system
* Lead: A user with all the privileges of an Analyst, but can also verify
* Maltego: A third party graphing tool
* OCR: An optical character recognition software tool (specific software not specified)
* Transcription Tool: A voice-to-text transcription software tool (specific software not specified)
* Splunk: A software tool for transforming log files into normalized log entries

### Use Case Descriptions

PICK supports the following primary use cases:

* Generate Graph: Create a visual representation of a vector by allowing the user to establish relationships between nodes and create new nodes to capture activities that are not associated with significant log entries.
* Correlate Activity to Response: Create vector and establish relationship between log entries and vectors,
* Ingest Log: Convert log files to normalized data.
* Manage Vector DB Version: Create and maintain vectors and graphs.
* Verify Sync: Approve or reject graphs submitted by users.

PICK supports the following secondary use cases:

* Filter: Display log entries, nodes, or relationships that match the filter criteria.
* Convert Image to Text: Convert images of typed text and scanned document into machine-encoded text.
* Transcribe: Convert audio to text.
* Push Vector DB: Send recent commit history from the user’s repository to lead’s repository.
* Pull Vector DB: Grab changes from lead’s repository into the user’s local repository.

## User Characteristics

The users of the system have a variety of computer usage skills and are immersed in the area of cybersecurity and network.

## General Constraints

The general constraints on the development of PICK are as follows:

* The system will be completed by the end of Spring 2020.
* The system will be developed in Python3.
* Any software the system is interfacing with will need to be air-gap.

## Assumptions and Dependencies

The assumptions and dependencies of PICK are as follows:

* The clients will provide the unwanted character removal script.

# Specific Requirements

## External Interface Requirements

This section contains the specification of requirements for interfaces among different components and their external capabilities.

### User Interfaces

This section describes the characteristics of each interface of PICK. The interfaces listed below will be described in the following sections:

* Team Configuration
* Event Configuration
* Directory Configuration
* Vector Configuration
* Log File Configuration
* Filter Configuration
* Log Entry Configuration
* Export Configuration
* Change Configuration
* Vector DB Configuration
* Icon Configuration
* Graph Builder Configuration
* Nodes Configuration in Tabular Format
* Nodes Configuration in Graphical Format
* Relationship Configuration

#### Team Configuration

1. The team configuration shall have the following components:
   1. A label labeled as “Team configuration”
   2. A check box labeled as “Lead”
   3. A text field labeled as “Lead IP address”
   4. A label labeled as “No. of established connections to the lead’s IP address”
   5. A label labeled with the number of connections to the lead’s IP address.
   6. A button labeled as “Connect”.

#### Event Configuration

1. The event configuration shall have the following components:
2. A label labeled as “Event configuration”
3. A text field labeled as “Event name”
4. A text field labeled as “Event description”
5. A text field labeled as “Event start timestamp”
6. A text field labeled as “Event end timestamp”.
7. A button labeled as “Save event”.

#### Directory Configuration

1. The directory configuration shall have the following components:
2. A label labeled as “Directory configuration”
3. A text field labeled as “Root directory”
4. A text field labeled as “Red team folder”
5. A text field labeled as “Blue team folder”
6. A text field labeled as “White team folder”
7. A button labeled as “Start data ingestion”.

#### Vector Configuration

1. The vector configuration shall have the following components:
   1. A label labeled as “Vector configuration”
   2. A vector table
   3. A button labeled as “Add vector”
   4. A button labeled as “Delete vector”
   5. A button labeled as “Edit vector”.
2. The vector table in the vector configuration shall include the following components:
   1. A column of check boxes
   2. A column of text fields with the column header labeled as “Vector name”
   3. An upward/downward arrow within the column header labeled as “Vector name”
   4. A column of text fields with the column header labeled as “Vector description”
   5. An upward/downward arrow within the column header labeled as “Vector description”.

#### Log File Configuration

1. The log file configuration shall have the following components:
   1. A label labeled as “Log file configuration”
   2. A log file table
   3. An enforcement action report table.
2. The log file table in the log file configuration shall include the following components:
   1. A column of labels with the column header labeled as “File name”
   2. An upward/downward arrow within the column header labeled as “File name”
   3. A column of labels with the column header labeled as “Source”
   4. An upward/downward arrow within the column header labeled as “Source”
   5. A column of labels with the column header labeled as “Cleansing status”
   6. An upward/downward arrow within the column header labeled as “Cleansing status”
   7. A column of labels with the column header labeled as “Validation status”
   8. An upward/downward arrow within the column header labeled as “Validation status”
   9. A column of labels with the column header labeled as “Ingestion status”
   10. An upward/downward arrow within the column header labeled as “Ingestion status”
   11. A column of buttons with the column header labeled as “View enforcement action report”.
3. The enforcement action report table in the log file configuration shall include the following components:
   1. A label labeled as “File name:”
   2. A label labeled with the name of the selected log file
   3. A column of labels with the column header “Line number”
   4. An upward/downward arrow within the column header labeled as “Line number”
   5. A column of labels with the column header labeled as “Error message”
   6. An upward/downward arrow within the column header labeled as “Error message”
   7. A button labeled as “Validate”
   8. A button labeled as “Cancel”.

#### Filter Configuration

1. The filter configuration shall have the following components:
   1. A label labeled as “Filter configuration”
   2. A text field labeled as “Keyword search”
   3. A label labeled as “Creator”
   4. A check box labeled as “Red”
   5. A check box labeled as “White”
   6. A check box labeled as “Blue”
   7. A label labeled as “Event type”
   8. A check box labeled as “Red”
   9. A check box labeled as “White”
   10. A check box labeled as “Blue”
   11. A text field labeled as “Start timestamp”
   12. A text field labeled as “End timestamp”
   13. A button labeled as “Apply Filter”.

#### Log Entry Configuration

1. The log entry configuration shall have the following components:
   1. Label labeled as “Log entry configuration”
   2. A Log entry table.
2. The log entry table in the log entry configuration shall include the following components:
   1. A column of check boxes
   2. A column of text fields with the column header labeled as “List number”
   3. An upward/downward arrow within the column header labeled as “List number”
   4. A column of text fields with the column header labeled as “Log entry timestamp”
   5. An upward/downward arrow within the column header labeled as “Log entry timestamp”
   6. A column of text fields with the column header labeled as “Log entry event (including Log entry content, host, source, sourcetype)”
   7. An upward/downward arrow within the column header labeled as “Log entry event”
   8. A column of dropdown boxes with the column header labeled as “Vector”.

#### Export Configuration

1. The export configuration shall have the following components:
   1. A dropdown box labeled as “Export format”
   2. A button labeled as “Export”.

#### Change Configuration

1. The change configuration shall have the following components:
   1. A text area labeled as “Change list”
   2. A button labeled as “Undo”
   3. A button labeled as “Commit”.

#### Vector DB Configuration

1. The vector DB configuration for analyst shall have the following components:
   1. A label labeled as “Connection status to lead:”
   2. A label labeled with the connection status
   3. A label labeled as “Pulled vector DB table (Analyst)”
   4. A pulled vector DB table
   5. A button labeled as “Pull”
   6. A label labeled as “Pushed vector DB table (Analyst)”
   7. A pushed vector DB table
   8. A button labeled as “Push”.
2. The pulled vector DB table (analyst) in the vector DB configuration shall include the following components:
   1. A column of check boxes
   2. A column of text fields with the column header labeled as “Vector”
   3. An upward/downward arrow within the column header labeled as “Vector”
   4. A column of text fields with the column header labeled as “Description”
   5. An upward/downward arrow within the column header labeled as “Description”
   6. A column of graphs with the column header labeled as “Graph”.
3. The pushed vector DB table (analyst) in the vector DB configuration shall include the following components:
   1. A column of check boxes
   2. A column of text fields with the column header labeled as “Vector”
   3. An upward/downward arrow within the column header labeled as “Vector”
   4. A column of text fields with the column header labeled as “Description”
   5. An upward/downward arrow within the column header labeled as “Description”.
   6. A column of graphs with the column header labeled as “Graph”.
4. The vector DB configuration for lead shall have the following components:
   1. A label labeled as “Approval sync:”
   2. An approval vector DB sync table
   3. A button labeled as “Commit”.
5. The approval vector DB sync table in the vector DB configuration shall include the following components:
   1. A column of check boxes
   2. A column of text fields with the column header labeled as “Source IP”
   3. An upward/downward arrow within the column header labeled as “Source IP”
   4. A column of text fields with the column header labeled as “Request timestamp”
   5. An upward/downward arrow within the column header labeled as “Request timestamp”
   6. A column of text fields with the column header labeled as “Vector”
   7. An upward/downward arrow within the column header labeled as “Vector”
   8. A column of text fields with the column header labeled as “Description”
   9. An upward/downward arrow within the column header labeled as “Description”
   10. A column of graphs with the column header labeled as “Graph”
   11. A column of text fields with the column header labeled as “Change summary”
   12. An upward/downward arrow within the column header labeled as “Change summary”
   13. A column of dropdowns with the column header labeled as “Sync status”
   14. An upward/downward arrow within the column header labeled as “Sync status”.

#### Icon Configuration

1. The icon configuration shall have the following components:
   1. A label labeled as “Icon configuration”
   2. An icon table
   3. A button labeled as “Add Icon”
   4. A button labeled as “Delete Icon”
   5. A button labeled as “Edit Icon”.
2. The icon table in the icon configuration shall include the following components:
   1. A column of check boxes
   2. A column of text fields with the column header labeled as “Icon name”
   3. An upward/downward arrow within the column header labeled as “Icon name”
   4. A column of text fields with the column header labeled as “Icon source”
   5. An upward/downward arrow within the column header labeled as “Icon source”
   6. A column of images with the column header labeled as “Image preview”
   7. An upward/downward arrow within the column header labeled as “Image preview”

#### Graph Builder Configuration

1. The graph builder configuration shall have the following components:
2. A dropdown box labeled as “Vector”
3. A label labeled as “Description:”
4. A label labeled with the description of the selected vector
5. A button labeled as “Add node”
6. A button labeled as “Add relationship”
7. A button labeled as “Delete node”
8. A button labeled as “Delete relationship
9. A button labeled as “Edit node”
10. A button labeled as “Edit relationship.

#### Nodes Configuration in Tabular Format

1. The nodes configuration in tabular format shall have the following components:
   1. A label labeled as “Nodes configuration in tabular format”
   2. A node table.
2. The node table in the nodes configuration in tabular format configuration shall include the following components:
   1. A column of check boxes
   2. A row of toggles with the row header labeled as “Node property visibility”
   3. A column of labels with the column header labeled as “Node ID”
   4. An upward/downward arrow within the column header labeled as “Node ID”
   5. A column of text fields with the column header labeled as “Node name”
   6. An upward/downward arrow within the column header labeled as “Node name”
   7. A column of text fields with the column header labeled as “Node timestamp”
   8. An upward/downward arrow within the column header labeled as “Node timestamp”
   9. A column of text fields with the column header labeled as “Node description”
   10. An upward/downward arrow within the column header labeled as “Node description”
   11. A column of text fields with the column header labeled as “Log entry reference”
   12. An upward/downward arrow within the column header labeled as “Log entry reference”
   13. A column of dropdown boxes with the column header labeled as “Log creator”
   14. An upward/downward arrow within the column header labeled as “Log creator”
   15. A column of dropdown boxes with the column header labeled as “Event type”
   16. An upward/downward arrow within the column header labeled as “Event type”
   17. A column of dropdown boxes with the column header labeled as “Icon type”
   18. An upward/downward arrow within the column header labeled as “Icon type”
   19. A column of text fields with the column header labeled as “Source”
   20. An upward/downward arrow within the column header labeled as “Source”
   21. A column of toggles with the column header labeled as “Node visibility”
   22. An upward/downward arrow within the column header labeled as “Node visibility”.

#### Nodes Configuration in Graphical Format

1. The nodes configuration in graphical format shall have the following components:
   1. A label labeled as “Nodes configuration in graphical format”
   2. A dropdown box labeled as “Timeline orientation”
   3. A dropdown box labeled as “Interval units”
   4. A text field labeled as “Interval”
   5. A timeline
   6. A set of nodes with node properties
   7. A set of relationships with their associated label
   8. A button labeled as “Zoom in”
   9. A button labeled as “Zoom out”.
2. The system shall display the nodes configuration in tabular format and graphical format simultaneously.

#### Relationship Configuration

1. The relationship configuration shall have the following components:
   1. A label labeled as “relationship configuration”
   2. A relationship table.
2. The relationship table in the relationship configuration shall include the following components:
   1. A column of check boxes
   2. A column of labels with the column header labeled as “Relationship ID”
   3. An upward/downward arrow within the column header labeled as “Relationship ID”
   4. A column of text fields with the column header labeled as “Parent”
   5. An upward/downward arrow within the column header labeled as “Parent”
   6. A column of images with the column header labeled as “Child”
   7. An upward/downward arrow within the column header labeled as “Child”
   8. A column of images with the column header labeled as “Label”
   9. An upward/downward arrow within the column header labeled as “Label”.

### Hardware Interfaces

There are no hardware interface requirements specified at this time.

### Software Interfaces

This section describes the characteristics of each interface between other application systems and the system.

1. The system shall interface with Splunk to transform a log file into normalized log entries.
2. The system shall interface with Maltego to create graphs with nodes and relationships between nodes.
3. The system shall interface with a transcription software to transcribe audio file to text.
4. The system shall interface with an optical character recognition software to perform conversion of images of typed text and scanned document into machine-encoded text.

### Communications Interfaces

There are no communication interface requirements specified at this time.

## Behavioral Requirements

This section describes the behavioral requirements of the system.

### Same Class of User

This section describes requirements associated with a particular class of user.

1. The system shall have two levels of access privileges: Analyst and Lead.
2. A user who has Lead access privilege shall be able to perform all functionalities of the system.
3. A user who has Analyst access privilege shall be able to perform all functionalities of the system except verify sync from analysts.

### Related Real-world Objects

This section describes related real-world object requirements of the system.

#### Event Configuration

1. The system shall store the attributes as defined in Table 4 for an event configuration.

Table 4: Event configuration

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Event Name | String | Required; Editable | Name of the AA event. |
| Event Description | String | Required; Editable | Description of the AA event. |
| Event Start Timestamp | Date Time | Required; Editable; Must be in Zulu Time; Format: HH:MM MM/DD/YY AM/PM | Start date and time of the AA event. |
| Event End Timestamp | Date Time | Required; Editable; Must be in Zulu Time; Format: HH:MM MM/DD/YY AM/PM | End date and time of the AA event. |
| Root Directory | String | Required; Not editable after structure validation | Path to where the log files are stored. |
| Red Team Folder | String | Required; Not editable after structure validation | Name of the folder where all the red team log files are stored. |
| White Team Folder | String | Required; Not editable after structure validation | Name of the folder where all the white team log files are stored. |
| Blue Team Folder | String | Required; Not editable after structure validation | Name of the folder where all the blue team log files are stored. |
| Lead | Boolean | Required; Editable; {Lead, Analyst} | Indictor of the host machine where the master vector DB is stored. |
| Lead’s IP Address | String | Required; Editable | Identifier of the host machine where the master vector DB is stored. |
| Connection Established | Integer | Required; Not editable; Max value: 20 | Number of established connections to the host machine. |

#### Log File

1. The system shall store the attributes as defined in Table 5 for a log file.

Table 5: Log File

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Log File Name | String | Required; Not editable | Name of the log file. |
| Cleansing Status | Boolean | Required; {Cleansed, Uncleansed}; Not editable | Indicator whether the unwanted characters, blank rows and lines are removed.  Cleansed refers to the all unwanted characters, black rows and lines are removed.  Uncleansed refers to the process of cleansing has not begun. |
| Validation Status | String | Required; {Validated, Not-validated, Invalid}; Not editable | Indicator whether the log file passes the data validation test.  Validated refers to the log file passing all the data validation tests.  Not-validated refers to the process of validation has not begun.  Invalid refers to the log file fails in one or more data validation tests. |
| Ingestion Status | Boolean | Required; {Ingested, Not Ingested; Not editable | Indicator whether the log file has been converted into log entries.  Ingested refers to Splunk successfully ingests the log file and turn it into log entries.  Not ingested refers to the process of ingestion has not begun. |
| Acknowledgement Status | Boolean | Optional; {Accept, Reject}; Editable | Indicator whether the system should accept the log file as validated log file.  Accept refers to confirmation from the analyst that the log file will be certified as validated log file regardless of the validation status.  Reject refers to the analyst not certifying the log file as validated log file. |

1. The system shall store the cleansed log files in permanent storage.
2. The system shall store significant log entries in permanent storage.

#### Enforcement Action Report

1. The system shall store the attributes as defined in Table 6 for an enforcement action report.

Table 6: Enforcement Action Report

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Line Number | Integer | Required; Not editable | Location of where the error occurs in a log file. |
| Error Message | String | Required; Not editable | Explanation of why a specific line in the log file fails validation test. |

#### Vector

1. The system shall store the attributes as defined in Table 7 for a vector.

Table 7: Vector

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Vector Name | String | Required; Editable | Series of activities or steps an adversary executes or attempts to execute that are necessary to achieve an object. |
| Vector Description | String | Required; Editable | Description of the vector. |

1. A vector shall comprise of at least one significant log entry.

#### Significant Log Entry

1. The system shall store the attributes as defined in Table 8 for a significant log entry.

Table 8: Log Entry

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Log Entry Number | Integer | Required | Unique identifier of a log entry. |
| Log Entry Timestamp | Data Time | Required; Editable; Must be in Zulu Time; Format: HH:MM MM/DD/YY AM/PM | Time and date of when the activity described by the log entry took place. |
| Log Entry Content | String | Required; Editable | Description of the activity. |
| Host | String | Required; Editable | IP address |
| Source | String | Required; Not Editable | Name and location of the log file from which a particular activity originates. |
| Source Type | String | Required; Not Editable | It refers to how Splunk software processes the incoming data stream into individual activities according to the nature of the data. |

1. A significant log entry shall be part of at least one vector.

#### Node

1. The system shall store the attributes as defined in Table 9 for a node.

Table 9: Node

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Node ID | String | Required; Not editable | Unique identifier of a node. |
| Node Name | String | Required; Editable | Unique name of a node. |
| Node Timestamp | Date Time | Required; Editable; Must be in Zulu Time; Format: HH:MM MM/DD/YY AM/PM | Time and date of when the activity described by the significant log entry took place. Initially these are the same as for Significant Log Entry. |
| Node Description | String | Required; Editable; Initial value: Description of the log entry | Description of the activity. Initially these are the same as for Significant Log Entry. |
| Log Entry Reference | String | Optional; Editable | Link to the significant log entry. |
| Log Creator | String | Required; Editable; {White, blue, red} | Team who created the log. |
| Event Type | String | Required; Editable; {White, blue, red} | Team who executed the activity. |
| Icon Type | String | Required; Editable; Default: Circle | Path to an image used to reflect the nature of the activity. |
| Source | String | Optional; Editable | Name and location of the log file from which a particular activity originates. |
| Node Visibility | Boolean | Required; Editable | Indicator whether the node will be visible on a graph. |

1. A node shall be part of at least one graph.
2. The system shall store the attributes as defined in Table 10 for the visibility of a node’s attribute as defined in Table 10.

Table 10: Visibility of a Node’s Attribute

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Node ID Visibility | Boolean | Required; Not editable; The visibility of Node ID is on by default; The impact of the node ID visibility affects all nodes in a graph. |  |
| Node Name Visibility | Boolean | Required; Editable; {On, Off}; The impact of the node name visibility affects all nodes in a graph. |  |
| Node Timestamp Visibility | Boolean | Required; Editable; {On, Off}; Initial value: On; The impact of the node timestamp visibility affects all nodes in a graph. |  |
| Node Description Visibility | Boolean | Required; Editable; {On, Off}; Initial value: On; The impact of the node description visibility affects all nodes in a graph. |  |
| Log Entry Reference Visibility | Boolean | Required; Editable; {On, Off}; The impact of the log entry reference visibility affects all nodes in a graph. |  |
| Log Creator Visibility | Boolean | Required; Editable; {On, Off}; The impact of the log creator visibility affects all nodes in a graph. |  |
| Event Type Visibility | Boolean | Required; Editable; {On, Off}; The impact of the event type visibility affects all nodes in a graph. |  |
| Icon Type Visibility | Boolean | Required; Editable; {On, Off}; The impact of the icon type visibility affects all nodes in a graph. |  |
| Source Visibility | Boolean | Required; Editable; {On, Off}; The impact of the source visibility affects all nodes in a graph. |  |
| Node Visibility | Boolean | Required; Not editable; The visibility of node visibility is off. |  |

1. The system shall store the attributes as defined in Table 11 for relationship.

Table 11: Relationship

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Relationship ID | String | Required; Not editable | Unique ID |
| Parent ID | String | Required; Editable; Parent node cannot be the same as the child node. | Source node of the relationship. |
| Child ID | String | Required; Editable; Child node cannot be the same as the parent node. | Destination node of the relationship. |
| Label | String | Required; Editable | Description of the relationship between the source and destination nodes. |

1. A relationship shall associate a parent and a child node.

#### Icon

1. The system shall store the attributes as defined in Table 12 for icon.

Table 12: Icon

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Icon Name | String | Required; Editable | Name of the icon |
| File Path | String | Required; Editable; | Location of the file |

#### Graph

1. The system shall store the attributes as defined in Table 13 for graph.

Table 13: Graph

|  |  |  |  |
| --- | --- | --- | --- |
| **Attribute** | **Data Type** | **Values and Constraints** | **Description** |
| Export Format | String | Required; Editable; {PNG, JPG} |  |
| Orientation | Boolean | Required; {Horizontal, Vertical} |  |
| Interval Units | String | Required; {Second, Minute, Hour, Day, Week} |  |
| Interval | Integer | Required; Value has to be greater than 0. |  |
| Position of Nodes | Set | Required; Editable; Initial Value: Chronological Order based on the node’s timestamp. |  |
| Position of Relationships | Set | Required; Editable; Initial Value: Null. |  |

1. A graph shall comprise of at least one node.

### Stimulus

This section describes the stimulus requirements of the PICK.

#### General

1. When the user presses the “OK” button on the overlay, the system shall close the overlay.
2. When the user presses the “X” button on the overlay, the system shall dismiss the overlay.
3. When the user presses the “downward arrow” at the column header, the system shall display the content of the column in descending order.
4. When the user presses the “upward arrow” at the column header, the system shall display the content of the column in ascending order.

#### Team

1. When the user selects the “connect” operationand the following conditions are true, the system shall establish the connection to the lead’s machine:
   1. Lead check box is unchecked
   2. Lead’s IP address is not empty
   3. The IP address of the local machine is not the same as the lead’s IP address.
2. If the IP address of the local machine is the same as the lead’s IP address, the system shall display an error message.
3. If the user selects the “connect” operationwithout providing the Lead’s IP address, the system shall display an error message.
4. If the user selects the “connect” operationwith the lead check box selected, the system shall display an error message.
5. If the number of established connections to the Lead’s IP exceeds 20 connections, the system shall display an error message.

#### Directory

1. When the user selects the “start data ingestion” operation, the system shall perform the structure check.
2. When the structural check operation is complete, the following properties pertaining of the root directory shall be true:
   1. The root directory shall contain three folders.
   2. The names of the three folders shall match the red team folder name, blue team folder name, and white team folder name specified in the event configuration.
   3. The name of the root directory shall not be editable once the event is saved.
3. If the root directory fails to contain three folders, the system shall generate a root directory structure error.
4. If the folders contain in the root directory fails to match the folder names specified in the event configuration, the system shall generate a root directory structure error.
5. When the structure check is complete, the system shall perform the data cleansing operation.

#### Log File

1. When the data transformation operation of a log file is complete, the following properties of the log file shall be true:
   1. The log file shall contain transcription of the audio clip with timestamps in one minute interval if the log file is of type “audio”.
   2. The log file shall contain transcription of the audio clip from a video log file with timestamps in one minute interval if the log file is of type “video”.
   3. The log file shall contain extracted text with the image if the log file is of type “image”.
   4. The log file shall contain extracted text with the scanned image if the log file is of type “pdf”.
2. When the data cleansing operation of a log file is complete, the following properties of the log file shall be true:
   1. The log file shall contain no blank lines.
   2. The log file shall contain no unwanted character if the log file is of type TMUX.
   3. The log file shall contain no blank rows if the log file is of type CVS.
   4. The log file shall be certified as cleansed log file.
   5. The cleansed log file shall be saved.
   6. The cleansing status of the log file shall be marked as “cleansed”.
3. When the data cleansing operation of a log file is complete, the system shall perform the data validation operation.

1. When the data validation operation is complete, the following properties of the log file shall be true:
   1. The log file shall contain a timestamp per line.
   2. The log file shall contain timestamps that are bounded by the start data, end date, start time, and end time specified in the event configuration.
   3. If the log file is of type CVS and the originator of the log file is from the white team, the following addition properties of the log file shall be true:
   4. The log file shall contain timestamps that are within the following range:
   5. Lower limit of the range: (average of the start and end timestamps in the CSV file) minus 23 hours and 59 mins.
   6. Upper limit of the range: (average of the start and end timestamps in the CSV file) plus 23 hours and 59 mins.
   7. The log file shall be certified as validated log file.
   8. The validation status of the log file shall be “pass”.
2. If the data validation operation is incomplete, the system shall generate an enforcement action report and set the validation status of the log file to “fail”.
3. When the verification action confirmation is received, the system shall certify the cleansed log file as validated log file.
4. When the data validation operation is complete, the system shall perform the data ingestion operation.
5. When the data ingestion operation is complete, the system shall set the ingestion status of a log file to “pass”.
6. When the user selects the “view enforcement action report” operation, the system shall display the line numbers and error messages pertaining to the selected log file in the enforcement action table.
7. When an ingested log file has been updated, the following shall be true:
   1. The system shall treat the updated ingested log file as an uncleansed log file.
   2. If the log file is ingested, the following properties of its log entries shall be true:
      1. A duplicate log entry shall be deleted.
      2. An updated log entry shall be saved as a new log entry.
      3. A new log entry shall be saved.
8. If a folder in the root directory has sub folders, the system shall traverse through the sub folders and perform data cleansing operation on the log files that are in the sub folders.
9. When a timestamp property of a previously saved event is changed, the impact of the change shall be restricted to the “not-validated” log files.

#### Search and Filter

1. When a search operation is complete, the system shall return result that matches the searched keyword with the searched keyword highlighted in the search result.
2. When the user is performed a search, the following search mechanism shall be supported:
   1. Logical searching
   2. Wildcard searching.

#### Vector

1. When changes are made to a vector, the system shall auto save the changes to permanent storage.
2. When the user presses on the “edit” button in the log entry table, the system shall enable the user to edit the selected log entry.

#### Vector DB

1. When the connection between the lead and the user is established, the following properties of the vector database shall be true:
   1. Differences between the corresponding records (vector and its associated graph) in the lead’s vector DB and the user’s vector DB shall be flagged.
   2. Any record that exists in the lead’s vector DB and not in the user’s vector DB shall be visible to the user.
2. When the user activates the “pull” operation, the system shall download the selected vector and its associated graph from the lead’s vector DB and add it to the user’s vector DB.
3. When the user activates the “push” operation with a record selected, the system shall do the following:
   1. The lead shall receive a push notification with the selected record.
   2. The lead shall be able to view the selected record.
   3. The selected record shall be stored in the lead’s vector DB if the lead approves the pushed record.

#### Graph

1. At the completion of the “add node” operation, the following shall be true:
   1. A new row shall be added to the node table.
   2. A new node shall be added to the nodes configuration in graphical format section.
2. At the completion of the “add relationship” operation, the following shall be true:
   1. A new row shall be added to the relationship table.
   2. A new relationship shall be added to the nodes configuration in graphical format section.
3. At the completion of the “delete relationship” operationwith a relationship selected, the following shall be true:
   1. The selected row in the relationship table shall be removed.
   2. The corresponding relationship in the nodes configuration in graphical format section shall be removed.
4. When the user attempts the “delete relationship” operationwithout selecting a relationship, the system shall generate an error.
5. At the completion of the “delete node” operationwith a node selected, the following shall be true:
   1. The selected node in the node table shall be removed.
   2. The selected node in the nodes configuration in graphical format section shall be removed.
6. When the user attemptsthe “delete node” operationwithout selected a node, the system shall generate an error.
7. When the filter operation is complete, the following shall be true:
   1. The node table shall display nodes that meet the filter criteria.
   2. The relationship table shall display relationship that meet the filter criteria.
   3. The nodes configuration in graphical format section shall display nodes that meet the filter criteria.
8. When the user selects the “edit node” operationwith a node selected, the system shall enable the user to edit the selected node.
9. When the user selectsthe “edit node” operationwithout selecting a node, the system shall generate an error.
10. When the user selectsthe “edit relationship” operationwith a relationship selected, the system shall enable the user to edit the selected node.
11. When the user selectsthe “edit node” operationwithout selecting a relationship, the system shall generate an error.
12. When the user selectsthe “export” operationwith an export format selected, the system shall generate an image of the graph in the selected format.
13. When the user selectsthe “undo” operation, the system shall undo the changes to a graph since the last commit.
14. When the user selectsthe “commit” operation, the system shall save the changes to permanent storage.
15. When a change is made to a graph, the following shall be true:
    1. The change shall be saved to temporary storage.
    2. The change shall be logged in the change list.
16. When a change is made to the icon configuration, the impact of change shall be applied to nodes with the changed icon as the icon type.
17. When the user selectsthe “add icon” operation, the system shall add a new row in the icon table.
18. When the user selectsthe “delete icon” operationwith a selected row in the icon table, the following shall be true:
    1. The selected row shall be removed from the icon table.
    2. Node with the deleted icon as the icon type shall use the default as the icon type.
19. If nodes in a graph have not been repositioned by the user, the following properties of the positioning of the nodes shall be true:
    1. The ordering of the nodes shall be in a chronological order determined by the timestamp of each node.
    2. The orientation of the nodes shall adhere to the timeline orientation.
    3. The proximity of the nodes shall be determined by the interval units and interval.
20. When the repositioning of a node in a graph is complete, the node shall be positioned in a user-selected coordinates.

## Non-behavioral Requirements

This section describes performance, availability, and usability requirements of the system.

TBD

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