**Requirements Specification**

**for**

**TriageTag**

**Version 2.0 approved**

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Revision History

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**1. Introduction**

## **1.1 Purpose**

This document is a requirements specification for the proposed TriageTag© System 1.0. The entire TriageTag system is predicated on the use of passive radio frequency identification (RFID) tags to identify firefighters in medical situations and help facilitate effective and precise treatment/diagnosis.

This system is being designed to bring dog tags into the modern world. The TriageTag system could not only allow medical professionals to identify a patient’s blood type quickly and efficiently like it’s predecessor, but it could also include other pertinent medical information, such as pharmaceutical allergies, prior existing medical conditions, and any other information triage personnel would find useful.

## **1.2 Document Conventions**

1. The underlined terms in this document are defined in Appendix A. Only the first instance of the term in the document is underlined.
2. In this document, the use of RFID tags refers to passive RFID tags. A definition of this technology can be found in section 6, appendix A.
3. Only items with the following numbering convention are requirements, X.X.X.XXX.

## **1.3 Intended Audience and Reading Suggestions**

The intended audience of this Requirements Specification document are Incident Command System (ICS) and National Incident Management System (NIMS) stakeholders. Additionally, the Wright State University faculty for Senior Design I/Team Projects I: Ms. Brandy Foster, Mr. Eric Buck, and Dr. Fred Garber are also part of the intended audience. It is suggested that all audiences read the entire document to get a thorough understanding of what is being proposed and the requirements listed.

## **1.4 Product Scope**

The TriageTag system will be made up of three components: RFID tags that can be fastened to necklaces worn by firefighters, a mobile device equipped with an RFID scanner that can access firefighter’s medical records, and a master database stored on a server at the firehouse. The TriageTag system will only include software running on the server, but not the server itself. Each firefighter will be equipped with a TriageTag RFID tag that will store an identification number unique to each individual firefighter. The TriageTag RFID tag can then be scanned by medical personnel to retrieve and view the firefighter's medical records with the TriageTag mobile device.

The purpose of the TriageTag system is to aid medical personnel in treating injured firefighters. The system allows medical personnel to have quick secure access to a firefighters medical records. The goal of the system is to improve the medical care of firefighters.

*The following are within the scope of the project:*

* Selection of commercial off the shelf (COTS) RFID tags and RFID scanner that are compatible with one another
* Selection of COTS RFID scanner and mobile device that are compatible with one another
* Creation of database that holds medical information for 200 firefighters
* Creation of database that encrypts medical information stored on local and master databases in accordance with Advanced Encryption Standard (AES) specifications [1]
* Ensure local database synchronizes with master database.

*The following are not within the scope of the project:*

* A training course for usage of the TriageTag system
* The creation and distribution of training documentation for the RFID system
* The necklace which the RFID tag will be attached to
* Gathering and inputting firefighter medical information

## **1.5 References**

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**2. Overall Description**

## **2.1 Product Perspective**

The TriageTag system is a new, standalone product, aimed at improving patient care for firefighters. Currently, when firefighters are injured during a mass casualty event, triage personnel must assess injuries as well as access medical information during the triage process. Currently the process of gaining relevant medical history requires verbal communication with the injured firefighter [1]. While effective, it still takes valuable time to obtain required information. The TriageTag system will allow medical personnel to quickly and securely access injured firefighter medical records to help assist their efforts.

## **2.2 Product Functions**

* The TriageTag system will allow the triage personnel to retrieve medical information for firefighters within the TriageTag database regardless of the firefighter’s communicative state.
* The TriageTag system will allow the firefighters to add and modify new/existing personnel records to the TriageTag master database

**2.3 User Classes and Characteristics**

This system will have 2 classes of users. The first class of user is the firefighters. They will be using the system actively by updating their medical information in the TriageTag master database as needed and passively using the system by wearing TriageTag RFID tags. The other class of user will be the triage personnel using the TriageTag scanner and TriageTag mobile device. They will be using the system actively to scan firefighters’ TriageTag RFID tags and then accessing a local copy of the TriageTag master database to view medical information. The most important user class to satisfy will be triage personnel.

## 

## **2.4 Operating Environment**

The TriageTag system has two systems that will operate in different environments. The first system involves the RFID tag itself, which will be worn underneath firefighters’ fire protection gear and clothing on a necklace. These tags will be worn when firefighters are deployed to perform their duties. The tags will need to operate in environments that could potentially be in a state of high humidity, high temperature, or water saturation. The second system is the RFID scanner and mobile device that will be operated by triage personnel in the medical center. This environment will be in a dry, covered area with little to no environmental factors affecting the RFID scanner and mobile device.

**2.5 Design and Implementation Constraints**

Firefighters wearing the RFID tags will experience extreme temperatures and water saturated areas. The tag must also be of a small enough size to fit and be affixed to a firefighter in a secure manner in their personal protective equipment. The size of a fire department varies depending on population and need, but New York City has one of the largest fire departments in the U.S. According to a 2014 vital statistics report their are 10,728 fire personnel distributed over 218 firehouses [2]. On average there are 50 fire fighters stationed at a firehouse of a large department making this a reasonable minimum for our database to manage.

***2.5.1 Design Constraints***

2.5.1.010: RFID tag will maintain full functionality in temperatures ranging from -20ºF to 180ºF [3].

2.5.1.020: RFID tag will have an Ingress Protection Rating (IP) of 55 [4].

2.5.1.030: RFID tag will be passively-energized by RFID scanner.

2.5.1.040: RFID tag will be maximum of 5 centimeters long, 5 centimeters wide, and 2 centimeters thick.

2.5.1.050: The database will be able to manage at least 50 firefighters.

***2.5.2*** ***Implementation Constraints***

2.5.2.010: All aspects of the system will conform to the Health Insurance Portability and Accountability Act (HIPAA) Security Rule 45 C.F.R. §§ 160, 162, and 164 [5] [6] [7].

2.5.2.020: The RFID tag and scanner will conform to all Federal Communications Commission (FCC) radio spectrum allocation regulations for RFID devices [8].

2.5.2.030: The TriageTag application will be deployable on an open source operating system.

2.5.2.040: The TriageTag system will employ commercial off the shelf components (COTS).

2.5.2.050: All medical records will be encrypted according to the Advanced Encrytpion Standard (AES) [9].

## **2.6 User Documentation**

There will be no custom user documentation provided with this system. However, the documentation that accompanies the system’s COTS components will be provided with the system.

## **2.7 Assumptions and Dependencies**

1. All COTS components used in the TriageTag System are constructed according to established safety standards.
2. The master database will be stored on a server provided by the firehouse.
3. The server provided by the firehouse will have a wireless ethernet card.
4. The server provided by the firehouse will meet the software specifications discussed in section 2.4.
5. The firehouse will provide the following peripheral devices: a monitor, keyboard, and mouse.

# **3. External Interface Requirements**

## **3.1 User Interfaces**

3.1.1.010: The TriageTag mobile device shall display a graphical user interface (GUI).

3.1.1.020: The TriaeTag mobile device shall allow authorized medical personnel to retrieve medical information.

3.1.1.050: The user interface shall allow the user to update information for firefighters already within the TriageTag system.

3.1.1.060: The user interface shall allow the triage personnel to retrieve medical records from the local database.

3.1.1.070: The user interface shall allow a user access to features corresponding to their priviledge level.

Note:

Not all users will be able to perform or access all the functionality within the TriageTag application. The extent in which the user can access features will depend on their privileged status within the system, which will be stored within the TriageTag local and master databases.

## **3.2 Hardware Interfaces**

There are no hardware interfaces.

## **3.3 Software Interfaces**

3.3.1.010: The user interface shall allow the operator to initiate the synchronization process

between the local database and master database.

**3.4 Communications Interfaces**

3.4.1.010: The TriageTag RFID system shall conform to ISO/IEC 18000-63:2015 [9].

3.4.1.020: The TriageTag scanner shall communicate with the TriageTag mobile device.

3.4.1.030: The TriageTag scanner shall transmit energy wirelessly to the TriageTag RFID tags using passive RFID technology.

3.4.1.040: The master database shall synchronize information with local databases wirelessly.

3.4.1.050: The TriageTag mobile device shall be electronically compatible with the TriageTag scanner.

**4. System Features**

## **4.1 Unique Identification**

***4.1.1***  ***Description and Priority***

Each firefighter will be equipped with a TriageTag RFID tag. Each TriageTag RFID tag will emit a unique signal that will allow the firefighter to be identified by triage personnel using the TriageTag system. This is a high priority of the TriageTag system.

***4.1.2*** ***Unique Identification Input Use Case***

1. Each TriageTag RFID tag is unique to the system.
2. Each firefighter is issued a single TriageTag RFID tag.

***4.1.3 Functional Requirements***

4.1.3.010: TriageTag RFID tags shall transmit an identification signal unique to the TriageTag system.

4.1.3.020: TriageTag system shall include at least 1 passive RFID tag.

## **4.2 Medical Record Input and Modification**

***4.2.1*** ***Description and Priority***

The TriageTag system allows firefighters and triage personnel to enter and modify personal information pertaining to new or existing firefighters within the TriageTag master database.

***4.2.2***  ***Record/Modification Use Case***

1. If the firefighter is a new user then they will be assigned a TriageTag RFID tag with a unique identification number and username/password.
2. The firefighter will login to the TriageTag application using their unique username and password.
3. The firefighter can input new or modify existing personal information within the TriageTag master database.

***4.2.3 Functional Requirements***

4.2.3.010: The application shall utilize user authentication protocol to access master database.

4.2.3.020: Refer to Software Interfaces 3.3.1.010.

4.2.3.030: TriageTag system shall include a single master database stored on a local server.

4.2.3.040: The master database shall store medical record(s).

4.2.3.050: Medical records shall be modifiable.

## **4.3 Retrieval and Display of Medical Records**

***4.3.1*** ***Description and Priority***

The TriageTag system allows triage personnel operating the TriageTag mobile device to query and retrieve a firefighter’s medical records. The retrieved medical records will also be displayed on the screen of the TriageTag mobile device. The ability to retrieve and display medical records is a high priority, without this feature the goals of the system cannot be achieved.

***4.3.2***  ***Retrieval/Display Use Case***

1. TriageTag mobile device operator will login to the TriageTag application.
2. TriageTag scanner operator will scan the TriageTag RFID tag.
3. Application will retrieve corresponding medical records.
4. TriageTag mobile device screen will display retrieved medical records.

***4.3.3 Functional Requirements***

4.3.2.010: Refer to System Features 4.1.3.010.

4.3.3.020: TriageTag system shall include at least 1 TriageTag RFID scanner.

4.3.3.030: A local copy of the TriageTag master database shall be loaded onto each TriageTag mobile device.

4.3.3.040: TriageTag system shall include at least 1 TriageTag mobile device.

4.3.3.050: The TriageTag mobile device shall run the TriageTag application.

## **4.4 TriageTag System Portability**

***4.4.1*** ***Description and Priority***

The TriageTag system utilizes a portable TriageTag mobile device to retrieve and display medical records and a portable TriageTag scanner to read TriageTag RFID tags. These two components are interoperable and will allow one to retrieve the medical records of a firefighter without the need for internet access or electricity at a particular location. However, the batteries of the TriageTag mobile device and TriageTag scanner must be sufficiently charged.

***4.4.2***  ***Retrieval/Display Use Case***

1. Charge TriageTag mobile device.
2. Charge TriageTag scanner.

***4.4.3 Functional Requirements***

4.4.3.010: The TriageTag TriageTag mobile device shall operate using an internal, rechargeable energy storage device with a minimum capacity of 2500mAh.

4.4.3.020: Refer to Communications Interfaces 3.4.1.010.

4.4.3.030: Refer to System Feature 4.3.3.030.

# **5. Other Nonfunctional Requirements**

## **5.1 Performance Requirements**

5.1.1.010: The TriageTag RFID scanner shall read RFID tags with a maximum separation

distance of no more than 20 meters.

5.1.1.020: Refer to System Features 4.4.3.010.

## **5.2 Safety Requirements**

5.2.1.010: System shall conform to UL 60950-1 [11].

## **5.3 Security Requirements**

5.3.1.010: The TriageTag application shall utilize user authentication to access the master

database.

5.3.1.020: The TriageTag application shall utilize user authentication to access a local

database.

5.3.1.030: Refer to section System Features 4.1.3.010.

## **5.4 Software Quality Attributes**

The TriageTag system will be able to be adapted to organizations beyond fire houses which could include police squadrons, governmental agencies, and the military. The system could also be expanded to hospitals and other emergency medical locations. The TriageTag system will not be interoperable with other RFID or database systems. Maintenance of TriageTag system is beyond the scope of this project.

## **5.5 Business Rules**

Not applicable.

**6. Other Requirements**

**Appendix A: Glossary**

**compatible:** The TriageTag scanner and mobile device will be able to communicate wirelessly.

**medical record:** a list of fields pertaining to one firefighter’s medical information.

**open source operating system**: An operating system whose code is available to be read and modified by the general public free of charge.

**RFID tag (passive)**: an RFID tag that is energized by an RFID scanner to emit a signal to uniquely identify the tag. The use of RFID tag in this document refers to passive RFID technology.

**synchronization**: The process of establishing consistency between the TriageTag local database and TriageTag master database by updating the TriageTag local database with a copy of the TriageTag master database.

**TriageTag application**: The software component of the TriageTag system.

**user authentication:** A security mechanism that allows users to have different levels of privilege, thereby allowing a particular user to only access a defined set of features.

**Appendix B:** **Figures**

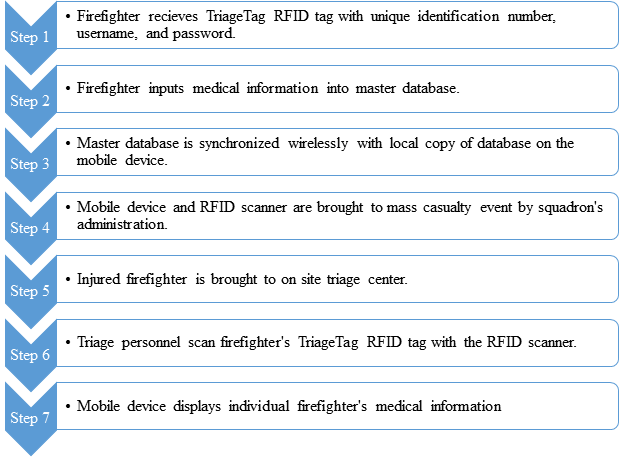


Figure 1: TriageTag System Implementation Flow Chart

Source: Author; Vincent Haenni