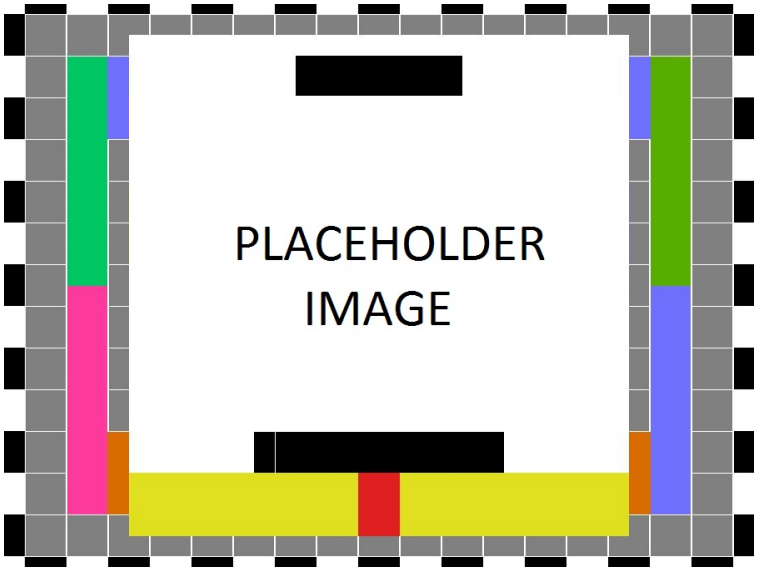
Department of Computer Science & Engineering
The University of Texas at Arlington

System Requirements Specification
CSE 4316: Senior Design I
Fall 2023



TheatreOps
SETS

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Revision History

Revision	Date	Author(s)	Description
0.1	10.05.2023	GH	document creation
0.2	10.14.2023	AT, GH	complete draft

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1 Product Concept

This section describes the purpose, use and the intended user audience for the Surgical Equipment Tracking System.

1.1 Purpose and Use

Use: The project aims to develop a "Surgical Equipment Tracking System" aka SETS, to improve the management and tracking of surgical equipment within healthcare facilities.The main purpose of SETS is to streamline and optimize hospital operations.

Purpose:

Streamline Surgical Processes: The primary purpose of the project is to streamline surgical processes by addressing the unpredictability of surgical equipment availability. Surgical teams often face delays and safety risks due to misplaced or inaccessible equipment. The system aims to mitigate these issues by ensuring that essential tools are readily available, leading to more efficient and timely surgical procedures.

Enhance Patient Safety: By ensuring the availability and proper tracking of surgical equipment, the project seeks to enhance patient safety. Timely access to the necessary tools can prevent potential complications during surgery.

Improve Hospital Efficiency: The project aims to optimize hospital operations by providing a faster and more efficient way to locate and manage surgical equipment. This can result in quicker surgeries and fewer delays, allowing hospitals to handle more procedures in a day.

Cost Savings: The system is designed to reduce the loss or misplacement of valuable surgical equipment. By tracking the usage of each item, hospitals can better maintain and extend the life of their equipment, leading to cost savings.

Enhance Patient Satisfaction: Quicker surgeries and reduced waiting times can lead to increased patient satisfaction, ultimately benefiting the hospital's reputation.

Provide Real-Time Data: The system offers real-time data for regulatory bodies and enables hospitals to showcase their improved efficiency and commitment to high-quality healthcare delivery.

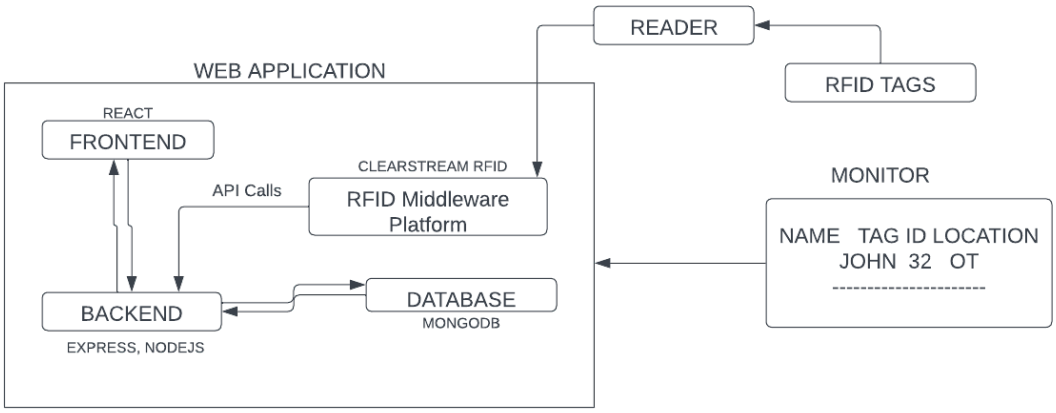
1.2 Intended Audience

Healthcare Providers and Hospitals: These are primary stakeholders who are directly involved in the delivery of healthcare services. They would benefit from the improved efficiency, reduced surgical delays, enhanced patient safety, and cost savings achieved through the system. Healthcare providers and hospital administrators would likely be interested in adopting this system.

Patients: Patients undergoing surgical procedures are also an important audience. They benefit from reduced waiting times, potentially shorter hospital stays, and the increased focus on patient safety and satisfaction facilitated by the system.

Regulatory Bodies: Regulatory bodies that oversee healthcare standards and practices would be interested in the real-time data provided by the system, as it can help them assess and verify the hospitals' commitment to delivering high-quality healthcare services.

In essence, the Surgical Equipment Tracking System is designed to benefit a wide range of stakeholders, from healthcare professionals to patients. Its value proposition extends to improving the healthcare system, reducing costs, and enhancing patient care and safety, making it an appealing solution for a diverse audience.



2 Product Description

Our Smart Surgical Equipment Management System is seamlessly integrated with cutting-edge features to optimize the tracking and management of surgical equipment. These features are engineered with precision to streamline operations, enhance equipment visibility, and ultimately bolster patient safety and operational efficiency. Here is an in-depth look at the essential functionalities:

2.1 Features & Functions

- **RFID Tags and Readers Integration**: Central to our system's technological arsenal is the integration of RFID technology, a transformative feature that underpins the system's capability for precise and real-time equipment tracking.
  - **RFID Tags**: Infused with unique identifiers, RFID tags are affixed to each piece of surgical equipment. These tags act as beacons, broadcasting crucial data that is instrumental for real-time location tracking and meticulous equipment management.
  - **RFID Readers**: Embedded within the operational ecosystem, RFID readers are strategically positioned to ensure a continuous flow of data from the RFID tags. They are finely tuned to capture and process location information in real-time, acting as pivotal nodes in the network that illuminate the whereabouts and movement of each piece of equipment.
- **The symphony between the RFID tags and readers** crafts a detailed and dynamic landscape of information, where the location of each equipment piece is meticulously mapped and monitored. This ensures a high visibility level and accessibility of surgical tools, mitigating risks associated with equipment misplacement or unavailability.
- **Communication System: Raspberry Pi or ClearStream Middleware Option**: Our system encapsulates a flexible communication paradigm, inclined towards utilizing either Raspberry Pi or ClearStream middleware options to bolster the overall communication process.

2.2 EXTERNAL INPUTS & OUTPUTS

INPUTS:

Name	Description	Use
Surgical Equipment Data	Comprehensive details of each equipment unit	Employs for meticulous tracking and management
Operational Status	Real-time data reflecting equipment availability & location	Fuels the system's real-time tracking capabilities

OUTPUTS:

Name	Description	Use
Equipment Location	Immediate location data of each equipment piece	Assists in swift and efficient equipment localization
Operational Reports	Strategic analytics on operational efficacy and equipment usage	Facilitates performance evaluation and enhancement strategies

2.2 PRODUCT INTERFACES

The interface realm of our system is a mosaic of user-friendliness and operational precision, tailored distinctively for varied user categories such as end-users, administrators, and maintainers.

- **For End-Users (Healthcare Providers):** A user-optimized dashboard manifesting real-time data on equipment statuses and locations, fortified with robust search and filter capabilities.
- **For Administrators:** A comprehensive administrative panel facilitating essential system configurations, user management protocols, and access to crucial performance analytical insights.
- **For Maintainers:** A specialized interface fostering quick and seamless access to equipment statuses, ensuring the maintenance paradigms echo the rhythms of efficiency and reliability.

In culmination, the strategic integration of either Raspberry Pi or ClearStream middleware, paired with other innovative features, serves as the cornerstone in realizing our vision of a revolutionary Smart Surgical Equipment Management System, engineered to redefine operational excellence and patient safety within surgical environments.

3 Customer Requirements

The customers for our web application and system prototype are Chris Conly, our senior design professor, and the Arlington Memorial Hospital. The requirements listed in this document are based on team discussions. They are classified as Functional, Usability, Reliability and Performance, and Maintenance and Support.

3.1 Real Time Tracking

3.1.1 Description

This is a functional requirement. The system should provide real-time data on the location and status of every piece of surgical equipment. The equipment will be tracked based on RFID tags, therefore the exact location of any surgical equipment will be the room it is expected to be in i.e the room it last entered. If the surgical equipment leaves a room and has not entered in another room yet, it will be marked as "in transit".

3.1.2 Source

The source of the requirement is Adrian from Arlington Memorial Hospital.

3.1.3 Constraints

If an equipment is lost during transit, it might be difficult to track it. Another constraint is that we need to find RFID tags that can undergo sterilization process without any damages.

3.1.4 Standards

1)Wireless Communication: Wi-Fi standards, such as IEEE 802.11ax (Wi-Fi 6), include features for real-time tracking and communication. The specific IEEE 802.11 standard would depend on the technology used.

3.1.5 Priority

The priority of this requirement relative to other specified requirements is critical.

3.2 Equipment Inventory

3.2.1 Description

This is a functional requirement. We will create a comprehensive list of all surgical equipment, including details such as equipment name, type, purchase date, last service date, location, and status.

3.2.2 Source

The source of the requirement is Adrian from Arlington Memorial Hospital.

3.2.3 Constraints

There are no constraints for this requirement as of now.

3.2.4 Standards

1) HL7 Standards: Health Level Seven (HL7) standards are commonly used in healthcare for the exchange of information, including inventory data. HL7 standards can be beneficial for interoperability with healthcare information systems.

2) GS1 Standards: GS1 is a global standards organization that provides a comprehensive set of standards for the identification and management of items, including healthcare products and equipment. GS1 standards, such as the Global Trade Item Number (GTIN) and Global Location Number (GLN), are widely used for inventory management in healthcare.

3) ISO 13485: ISO 13485 is an international standard for quality management systems for medical devices. While it primarily focuses on quality management, it can also be relevant to the inventory management of medical equipment.

3.2.5 Priority

The priority of this requirement relative to other specified requirements is critical.

3.3 Search Capability

3.3.1 Description

This is a functional requirement. The users should be able to quickly search for any specific piece of equipment by filtering on the web application.

3.3.2 Source

Source of this requirement is the whole team.

3.3.3 Constraints

There are no constraints for this requirement.

3.3.4 Standards

1) IHE (Integrating the Healthcare Enterprise): IHE profiles and integration profiles offer standards for interoperability in healthcare systems. These profiles often include specifications for querying and retrieving specific data. For search capabilities that span different healthcare information systems, adherence to IHE standards may be beneficial.

2) W3C Standards: For search functionality within web applications, adherence to World Wide Web Consortium (W3C) standards, such as HTML and JavaScript standards, is important to ensure compatibility with web browsers and accessibility.

3) NoSQL Database Standards: The search capability will adhere to best practices for database querying and indexing as recommended for MongoDB. This ensures optimized search speeds and accurate results. The implementation will follow MongoDB's standard query operators and utilize its built-in text search features.

3.3.5 Priority

The priority of this requirement relative to other specified requirements is critical.

3.4 Multi-level User Access

3.4.1 Description

This is a functional requirement. Different user roles like administrators, surgeons, nurses, and technicians should have appropriate levels of access.

3.4.2 Source

Source of this requirement is the whole team.

3.4.3 Constraints

We are still unsure of what user roles to add to a prototype.

3.4.4 Standards

1) User Authentication Standards: Strong user authentication standards, including multi-factor authentication (MFA), should be implemented to verify user identities. This helps ensure that only authorized individuals can access the system.

2) LDAP (Lightweight Directory Access Protocol): LDAP is a protocol and directory service standard for managing user information in a directory. It is often used for centralized user management and authentication in organizations.

3.4.5 Priority

The priority of this requirement relative to other specified requirements is Moderate.

3.5 Notifications

3.5.1 Description

This is a functional requirement. The system should provide notifications or alerts for misplaced or unreturned equipment.

3.5.2 Source

Source of this requirement is the whole team.

3.5.3 Constraints

The exact location of where the item is misplaced might be difficult to track. An approximate location can be given.

3.5.4 Standards

1) HL7 Messaging Standards: Health Level Seven (HL7) has messaging standards for healthcare information exchange. These standards can be used for structured notifications related to equipment availability, status, and events.

2)Web Notifications Standards: When implementing web-based notifications, follow W3C standards for web notifications in modern web browsers.

3.5.5 Priority

The priority of this requirement relative to other specified requirements is High.

3.6 User-friendly Interface

3.6.1 Description

This is a Usability requirement. The interface will adopt a minimalist approach, displaying only the most important information. Any additional details will be available upon deeper inspection, ensuring the main dashboard remains decluttered. Every design element will be placed with intentionality, emphasizing common user flows and actions. Navigational elements will be consistently positioned, ensuring users instinctively know where to find what they need.

3.6.2 Source

Source of this requirement is Mujaddad Fazeel.

3.6.3 Constraints

The interface must adhere to the guidelines of the class and the hospital, which may limit the choice of colors, logos, and other design elements.

3.6.4 Standards

1)User Feedback: Incorporate user feedback mechanisms, such as forms for reporting issues or providing suggestions, to continuously improve the user experience.

2) Feedback and Notifications: Use feedback and notifications effectively to keep users informed about system events, updates, and actions taken.

3.6.5 Priority

The priority of this requirement relative to other specified requirements is Critical.

3.7 Quick Training

3.7.1 Description

This is a usability requirement. Upon the first login, users will be presented with an interactive walk-through, highlighting the core functionalities of the system and guiding them through the primary tasks they will undertake. Hovering over interface elements will bring up brief explanations about their function or purpose. This aids in real-time learning as users familiarize themselves with the system.

3.7.2 Source

Source of the requirement is Rachana Pandey.

3.7.3 Constraints

Producing high-quality training materials, especially videos or animations, may be constrained by budget or expertise available.

3.7.4 Standards

The quick training and onboarding process will adhere to best practices for user experience (UX) design and e-learning standards. All materials and interface hints will be clear, concise, and consistent in presentation, ensuring that users of varied tech proficiency can comprehend and utilize the system effectively.

3.7.5 Priority

The priority of this requirement relative to other specified requirements is High.

3.8 Help and Support

3.8.1 Description

This is a Usability requirement. Comprehensive but easy-to-navigate digital manuals will be embedded, detailing every feature and function of the system. They'll be categorized by modules and searchable, ensuring users can quickly find the information they seek.A frequently asked questions (FAQ) section will address the common queries and challenges users might face. This section will evolve over time, based on actual user interactions and feedback.

3.8.2 Source

Source of this requirement is Rachana Pandey.

3.8.3 Constraints

The built-in manuals, FAQ, and video guides will consume storage space. Depending on the hosting solution, there might be constraints regarding the amount of data that can be stored or streamed.

3.8.4 Standards

All provided support materials will adhere to clarity, accuracy, and ease of access. The content will be written in simple language, ensuring it's understandable for all users

3.8.5 Priority

The priority of this requirement relative to other specified requirements is Moderate.

3.9 High Uptime

3.9.1 Description

This is a Reliability and Performance requirement. Given the critical nature of tracking surgical equipment, any downtime could disrupt surgical procedures and patient care. Implement real-time system monitoring tools that can quickly detect and notify of any performance issues or potential downtime threats. We are planning to have no more than 10 hours of unplanned downtime in a year.

3.9.2 Source

Source of this requirement is Hanumath Ponnaluri.

3.9.3 Constraints

Maintaining a high uptime, especially close to 99 percent, often requires redundant systems and specialized infrastructure, which can be expensive. The budget allocated may limit the extent of redundancy and sophisticated uptime solutions.

3.9.4 Standards

The system will aim for industry-standard uptime levels, ensuring regular maintenance checks and swift issue resolutions to minimize disruptions

3.9.5 Priority

The priority of this requirement relative to other specified requirements is Moderate.

3.10 Backup and Recovery

3.10.1 Description

This is a Reliability and Performance requirement. Backups should be stored in multiple locations, including an off-site location, to protect against site-specific catastrophes like fires or floods. Given the criticality, an Recovery Point Objective of just a few minutes might be necessary, meaning only a few minutes' worth of data would be lost in a disaster scenario.

3.10.2 Source

Source of this requirement is Sonum.

3.10.3 Constraints

Effective backup solutions, especially those with frequent incremental backups, can require significant storage space. The cost and availability of secure and accessible storage can become a constraint.

3.10.4 Standards

All backup and recovery procedures will align with best practices for data protection and disaster recovery to ensure data integrity and availability.

3.10.5 Priority

The priority of this requirement relative to other specified requirements is Moderate.

3.11 Scalability

3.11.1 Description

This is a Reliability and Performance requirement. The system should be designed with a modular approach, allowing components to be added, modified, or upgraded without affecting the system's overall performance. As the primary repository of equipment data, the database should be designed for efficient querying, with periodic optimizations to handle increased data loads.

3.11.2 Source

Source of this requirement is Ammar Baig.

3.11.3 Constraints

If the system is to be integrated with other software as it scales, there might be limitations or incompatibilities that arise with third-party applications or platforms.

3.11.4 Standards

The system's scalability measures will adhere to industry benchmarks, ensuring smooth transitions during expansions or integrations

3.11.5 Priority

The priority of this requirement relative to other specified requirements is Moderate.

3.12 Bug Fixes

3.12.1 Description

Ensuring a bug-free experience is paramount for user satisfaction. We will implement a simple, yet effective mechanism for users to report bugs and for the team to address them in a timely manner.

3.12.2 Source

Source of the requirement is Wasif Swapnil.

3.12.3 Constraints

Due to resource limitations, while major bugs affecting system functionality will be addressed urgently, some non-critical bugs may have a slightly extended resolution timeline.

3.12.4 Standards

Bugs will be tracked using a shared document or a basic bug tracking tool where team members can view, update, and mark bugs as resolved. This ensures transparency and keeps everyone informed of ongoing issues.

3.12.5 Priority

Ensuring a smooth user experience is of utmost importance, making timely bug fixes a high priority task.

3.13 Feedback Mechanism

3.13.1 Description

To foster continuous improvement and promptly address user concerns, the system will incorporate a feedback mechanism. Through this feature, users can provide comments, report issues, or suggest system enhancements, all while remaining anonymous. This ensures that user feedback remains unbiased and genuine. All feedback will be strictly anonymous, ensuring user privacy. There will be no provision to attach personal data, and any attempts to include identifiable information in feedback will be discouraged. To prevent misuse, the system will implement rate limits to deter excessive submissions or spam.

3.13.2 Source

The source of this requirement is the whole team.

3.13.3 Constraints

If the system promises timely responses or actions based on the feedback provided, the constraint might be in dedicating resources to ensure that feedback is analyzed and acted upon promptly.

3.13.4 Standards

The feedback collection will align with best practices for anonymous data collection, ensuring user inputs remain untraceable. As there's no personal data collection, concerns related to data protection regulations like GDPR are inherently addressed.

3.13.5 Priority

Given the project's commitment to enhancing user experience and the invaluable nature of direct user insights, the feedback mechanism holds a high priority.

4 Packaging Requirements

The context of this project is this is going to be made as a web application integrated with RFID. This web application, built using ExpressJs and NodeJs on the backend and React on the frontend, demands a well-thought-out packaging approach to ensure a smooth and efficient user experience. The packaging requirement encompasses various aspects, including software delivery, hardware packaging, branding and documentation, and support materials. The customer will be provided with a bag of RFID tags to attach on to the medical equipment that is going to be tracked. The bag will include multiple RFID readers for the customer with instructions for the installation process. The software part will be available to the customer via digital download with a ReadMe file for setting it up.

4.1 Software Packaging

4.1.1 Description

The software application must be available through multiple distribution channels, accommodating the diverse needs of end-users. The application through either pre-loading the app on a designated computer that will be provided for testing or via digital download. An additional means of delivery will be through a flash drive with all the code inside designated folders with setup instructions.

4.1.2 Source

Senior Design Team - Theatre Ops

4.1.3 Constraints

The software must adhere to the regulatory requirements for healthcare applications, data security, and compatibility with the target system that is used for the app

4.1.4 Standards

This should be in accordance with ISO, HIPAA, and other relevant healthcare and data security standards

4.1.5 Priority

High

4.2 Hardware component Packaging

4.2.1 Description

All hardware components required for the RFID-based tracking system including RFID readers, RFID tags should be securely packaged together in a single package. In situations where components are not pre-assembled, packaging with clear labeling must be provided for easy setup by the customer.

4.2.2 Source

Senior Design Team - Theatre Ops

4.2.3 Constraints

The packaging should ensure the protection of components during transportation and storage.

4.2.4 Standards

This should be in accordance with ISO for quality assurance and must adhere to industry-specific packaging standards

4.2.5 Priority

Medium

4.3 Branding and Documentation

4.3.1 Description

The packaging should display the logo and branding of the project. It should include detailed user manuals to facilitate a smooth and informed user experience.

4.3.2 Source

Senior Design Team - Theatre Ops

4.3.3 Constraints

The branding should align with the project's logo and conform to the regulatory requirements of the hospital to which the application is being delivered.

4.3.4 Standards

should comply with ISO 13485 for medical device documentation standards

4.3.5 Priority

High

5 Performance Requirements

The performance of the Surgical Equipment Tracking System is critical for its optimal functioning within a hospital environment. As this system is designed to track surgical equipment in real time, it must operate swiftly and without hitches to ensure patient safety and efficient hospital operations.

5.1 Real-time Tracking Latency

5.1.1 Description

The system must update the location of equipment within a maximum latency of 5 seconds from the time of movement.

5.1.2 Source

Hospital Operational Standards

5.1.3 Constraints

Network speed, RFID reader efficiency, and middleware processing speed.

5.1.4 Standards

ISO/IEC 18000-7:2014 Information technology â Radio frequency identification for item management

5.1.5 Priority

High

5.2 System Boot-up Time

5.2.1 Description

Upon starting, the system should be fully operational within a maximum of 1 minute.

5.2.2 Source

Hospital IT and Administrative Departments

5.2.3 Constraints

Hardware specifications, software optimizations.

5.2.4 Standards

IEEE 14764-2006 Software Engineering â Software Life Cycle Processes â Maintenance

5.2.5 Priority

Medium

5.3 RFID Tag Read Time

5.3.1 Description

RFID tags must be read within 2 seconds of coming within the range of an RFID reader.

5.3.2 Source

RFID Manufacturer Specifications

5.3.3 Constraints

RFID reader efficiency, potential physical obstructions.

5.3.4 Standards

ISO/IEC 18000-3:2010 Information technology â Radio frequency identification for item management

5.3.5 Priority

High

5.4 Database Query Time

5.4.1 Description

Any query made to the system's database, whether it's a location lookup or equipment status check, should return results within 3 seconds.

5.4.2 Source

Hospital IT Department Standards

5.4.3 Constraints

Database optimization, network speed.

5.4.4 Standards

ISO/IEC 9075-1:2016 Information technology â Database languages â SQL â Part 1: Framework (SQL/Framework)

5.4.5 Priority

Medium

6 Safety Requirements

In the development and deployment of our Surgical Equipment Tracking System leveraging RFID technology, paramount importance is given to safety, especially considering the healthcare environment it will be utilized in. The system, while primarily software-driven, interfaces with RFID components that need to adhere to strict safety standards. All RFID tags and related components are ensured to be free from any toxic materials to eliminate risks of contamination or adverse reactions in clinical settings. The design of RFID tags and readers emphasizes user safety, eliminating sharp edges or protruding components that might be hazardous during daily hospital operations. Moreover, the electrical safety of RFID readers is crucial; all their electrical connections are meticulously insulated and grounded to prevent risks of electrical shocks or potential system malfunctions. Our commitment to these safety standards ensures the protection of hospital staff and patients and the reliable functionality of the Surgical Equipment Tracking System.

6.1 Laboratory equipment lockout/tagout (LOTO) procedures

6.1.1 Description

To ensure the safety and proper handling of fabrication equipment used in the project's development, adherence to the OSHA standard LOTO procedures is mandatory. Equipment presenting usage hazards will have locks and tags installed. Only the course instructor or specific teaching assistants are authorized to remove these locks. Once the equipment is no longer in use, the locks are to be promptly reinstalled.

6.1.2 Source

CSE Senior Design laboratory policy

6.1.3 Constraints

The utilization of equipment is contingent upon the availability of the course instructor or designated teaching assistants, given their exclusive authority to remove locks.

6.1.4 Standards

In compliance with Occupational Safety and Health Standards 1910.147 - The control of hazardous energy (lockout/tagout).

6.1.5 Priority

High. Ensuring the safety and proper usage of laboratory equipment is paramount to the project's success and the well-being of all participants.

6.2 National Electric Code (NEC) wiring compliance

6.2.1 Description

Electrical wiring forms a crucial component of our project, and it's imperative that every aspect of it adheres to the stringent guidelines laid out in the National Electric Code (NEC). This encompasses a variety of factors, from the way wire runs are organized to the nature of insulation, grounding methods, the choice of enclosures, ensuring over-current protection, and meeting all other associated specifications.

6.2.2 Source

CSE Senior Design laboratory policy

6.2.3 Constraints

To prioritize safety and minimize risks, the usage of high voltage power sources, as detailed in NFPA 70, will be limited. The goal is to reduce potential hazards by circumventing situations that could lead to electrical mishaps.

6.2.4 Standards

Our commitment to electrical safety and excellence is benchmarked against the NFPA 70 standards. This ensures that our practices align with nationally recognized guidelines.

6.2.5 Priority

Given the potential risks associated with electrical systems and the foundational role they play in our project, adherence to NEC guidelines is deemed critical. Ensuring this compliance is a top priority to guarantee both the safety and success of the project.

6.3 RIA robotic manipulator safety standards

6.3.1 Description

Robotic manipulators, if used, will either housed in a compliant lockout cell with all required safety interlocks, or certified as a "collaborative" unit from the manufacturer.

6.3.2 Source

CSE Senior Design laboratory policy

6.3.3 Constraints

Collaborative robotic manipulators will be preferred over non-collaborative units in order to minimize potential hazards. Sourcing and use of any required safety interlock mechanisms will be the responsibility of the engineering team.

6.3.4 Standards

ANSI/RIA R15.06-2012 American National Standard for Industrial Robots and Robot Systems, RIA TR15.606-2016 Collaborative Robots

6.3.5 Priority

Critical

7 Maintenance & Support Requirements

Maintenance and support requirements for the Surgical Equipment Tracking System are pivotal to ensure the uninterrupted operation of the system post-deployment, especially in a healthcare setting. As the developers and initial implementers of this solution, we envision the following needs and provisions for continued system efficacy:

7.1 On-site Technical Training

7.1.1 Description

The hospital's on-site technical department will undergo training sessions to understand the software's functionalities, system nuances, and basic troubleshooting techniques. This hands-on training ensures that the on-site team can independently handle daily operational challenges.

7.1.2 Source

Surgical Equipment Tracking System Development Team

7.1.3 Constraints

Training schedules must align with the availability of the technical department staff and must be conducted in a conducive environment.

7.1.4 Standards

Training modules will adhere to the best practices established during the system's development phase.

7.1.5 Priority

Future

7.2 Documentation and Source Code

7.2.1 Description

A comprehensive user manual will be provided detailing the system's operations, common troubleshooting steps, and best practices. Additionally, the complete system source code will be handed over for any potential future modifications or integrations.

7.2.2 Source

Surgical Equipment Tracking System Development Team

7.2.3 Constraints

The source code and documentation must be stored securely by the hospital's IT department to prevent unauthorized access.

7.2.4 Standards

Documentation will adhere to the industry standards for technical manuals. Source code will follow the best coding practices established during the development phase.

7.2.5 Priority

High

7.3 Spare RFID Components

7.3.1 Description

To account for wear and tear or malfunctions, a set of spare RFID tags and readers will be provided. This ensures the system's continuous operation even in the face of hardware failures.

7.3.2 Source

Surgical Equipment Tracking System Development Team

7.3.3 Constraints

The spares should be stored in a location with controlled temperature and humidity to ensure their longevity.

7.3.4 Standards

RFID tags and readers will adhere to the industry standards for healthcare equipment.

7.3.5 Priority

Medium

7.4 Dedicated Technical Support

7.4.1 Description

For issues beyond the purview of the on-site technical team, a dedicated support line will be available to address complex challenges and provide solutions.

7.4.2 Source

Surgical Equipment Tracking System Development Team

7.4.3 Constraints

The support line will have operational hours and might not be available 24/7.

7.4.4 Standards

Support will be provided in line with the service level agreements established during the system's deployment phase.

7.4.5 Priority

High

8 Other Requirements

The Surgical Equipment Tracking System's other requirements aim to capture additional aspects critical to the system's successful implementation and operation. These requirements ensure that the product is complete, adaptable, and prepared for future expansions and challenges.

8.1 User Training

8.1.1 Description

Hospital staff, especially those in the technical department, will need adequate training on the system's functionalities, maintenance, and troubleshooting.

8.1.2 Source

Hospital IT and Administrative Departments

8.1.3 Constraints

Time constraints and staff availability.

8.1.4 Standards

ISO 29993:2017 Learning services outside formal education â Service requirements

8.1.5 Priority

High

8.2 System Scalability

8.2.1 Description

The system should be designed in a way that allows for future expansions, such as integrating more RFID readers or adding additional features.

8.2.2 Source

Project foresight and growth projections

8.2.3 Constraints

Current system architecture and budget constraints.

8.2.4 Standards

ISO/IEC 9126 Software engineering â Product quality

8.2.5 Priority

Future

8.3 Environmental Impact

8.3.1 Description

The system should have minimal environmental impact, both in terms of energy consumption and electronic waste.

8.3.2 Source

Hospital Environmental and Sustainability Policy

8.3.3 Constraints

Trade-offs between performance and energy efficiency.

8.3.4 Standards

ISO 14001:2015 Environmental management systems â Requirements with guidance for use

8.3.5 Priority

Future

8.4 Software Licensing

8.4.1 Description

Any third-party software components or libraries used should have clear licensing that allows for commercial use without infringements.

8.4.2 Source

Legal and Compliance Department

8.4.3 Constraints

Potential costs associated with commercial licenses.

8.4.4 Standards

Open Source Initiative (OSI) Licensing Standards

8.4.5 Priority

High

9 Future Items

9.1 On-site technical Training

9.1.1 Description

The hospitalâs on-site technical department will undergo training sessions to understand the softwareâs functionalities, system nuances, and basic troubleshooting techniques. This hands-on training ensures that the on-site team can independently handle daily operational challenges. Detailed requirement description...

9.1.2 Source

Surgical Equipment Tracking System Development Team

9.1.3 Constraints

Training Schedules must align with the availability of the technical department staff and must be conducted in a conducive environment..

9.1.4 Standards

Training modules will adhere to the best practices established during the system's development phase

9.1.5 Priority

future

9.2 System Scalability

9.2.1 Description

The hospitalâs on-site technical department will undergo training sessions to understand the softwareâs functionalities, system nuances, and basic troubleshooting techniques. This hands-on training ensures that the on-site team can independently handle daily operational challenges.

9.2.2 Source

Project foresight and growth projections

9.2.3 Constraints

Current system architecture and budget constraints

9.2.4 Standards

ISO/IEC 9126 Software engineering Ã¢ Product quality

9.2.5 Priority

Future

9.3 Environmental Impact

9.3.1 Description

The system should have minimal environmental impact, both in terms of energy consumption and electronic waste

9.3.2 Source

Hospital Environmental and Sustainability Policy

9.3.3 Constraints

Trade-offs between performance and energy efficiency

9.3.4 Standards

ISO 14001:2015 Environmental management systems Ã¢ Requirements with guidance for us

9.3.5 Priority

Future

References