

**Department of Computer Science and Engineering
The University of Texas at Arlington**

Team Argus

Lynx - PixelSense Secure Transfer

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1 General Organization

1.1 Project Manager

The Project Manager for Team Argus is Seth Skocelas. Selected by Dr. Huber and his fellow teammates, Seth is a Computer Engineering Senior at the University of Texas at Arlington, and has taken coursework dealing with embedded systems, digital logic, object-oriented programming and many more classes pertaining to Computer Science and Engineering. He was selected to be Project Manager due to his past leadership experiences in school, his technical knowledge, and his current experience as a Business Analyst for the IT department of an auto finance company, which currently has him developing requirements for a new software project within the company.

Seth's responsibilities as a Project Manager will include organizing meetings, maintaining the MS Project plan, assisting team members in creating tasks and assigning them, establishing a team structure with team member roles, and making the final decision on any disputed decisions within the group.

1.2 Project Oversight

There will be a set of internal and external controls that the team will adhere to throughout the course of the project. Seth, the Project Manager, will be in charge of the internal controls. Each team member has roles assigned to them and will set up tasks with the Project Manager that are based off the roles assigned to them and the work needed to be done. Team Members will update both the PM and the rest of the team on their progress, as well as any risks or setbacks, on each assigned task at the team status meeting at the end of the week.

All documents (aside from source code) created for the project will be stored on the Google Drive created for our senior design team. Brandon, our document editor, will be responsible for maintaining the files within the drive, and merging any documents together that contained divided work created by different team members.

The MS Project Plan will be maintained by the PM. He will create the tasks for all group activities (meetings, presentations, etc.) and work with the team members to create tasks for any work they will need to do. It will be the individual team member's responsibility to update the amount of hours they work on a task within the project plan file.

In addition to these internal controls, a series of external controls have been implemented by Dr. Huber, the Senior Design instructor to ensure that we are on the right track in successful completion of our project. The following are the external controls we are responsible for delivering in class:

- **Individual Status Reports:** Each team member is required to turn in a document each week stating what progress they have made on the project, what they have planned to do next, lessons they have learned since the last report, as well as any questions or concerns they may have. This will allow Dr. Huber to track each member's progress and provide assistance if needed.
- **Team Status Reports:** The team will give a presentation every two weeks discussing the progress they have made on the project. This will be in the form of a PowerPoint presentation where each member has to discuss something pertaining to the completion of the project.
- **Gate Reviews:** Once a deliverable has been turned in, the instructor and the TA will review it and give feedback on what needs to be improved. Once the feedback is assessed and the team makes the necessary changes, if the instructor and the TA approves, the team will be allowed to move on to the next portion of the presentation.

1.3 Roles and Responsibilities

Member	Role	Description
Seth Skocelas	Project Manager, Hardware Lead	Manages Project Plan Final say in any disputes In charge of hardware implementation
Shamikul Amin	Software Lead, Hardware Engineer	In charge of software implementation Assists in hardware development
Brandon Deen	Risk Management, Document Editor	In charge of the Risk Management Plan Responsible for merging documents and maintaining a consistent style
Brian Hasty	Quality Assurance Lead, Product Design	In charge of our testing efforts Responsible for game design decisions
Keyur Patel	System Architect, Change Management Officer	Takes lead on developing system architecture In charge of maintaining our source control software
Dr. GergelyZaruba	Project Sponsor	Provides requirements for our project
Dr. Manfred Huber	Project Supervisor	Provides consultation on our projects Monitors our progress

In addition to the roles above, all team members (excluding the Sponsor and Supervisor) will be responsible for other common tasks including, but not limited to, attending team meetings, updating tasks and hours in the project plan, document writing, presentation development and presenting, and software programming.

1.4 Project Constraints

Listed below are constraints that could affect the overall outcome of our project:

- **Budget Constraints:** The UTA CSE Department will be providing us with an overall budget of \$800 dollars to work with in creating this project. Any additional features that would require money to be spent may be limited due to this hard cap budget.
- **Technical Knowledge Constraint:** None of our team members have worked with the Microsoft PixelSense before. In addition, only two members of our team have experience developing for hardware and even then, their knowledge is limited. With this in mind, we must spend a lot of our time researching how to develop and create these things as opposed to actually doing it. This will constrain the amount of time spent on implementation
- **Time Constraints:** We have an inflexible timetable of nine months to complete our project, which includes the time we have spent up until this point. In addition to this, our team members have other commitments in place such as other classes, jobs, and family obligations that will hinder the amount of time they can spend on this project.

1.5 Project Assumptions

Listed below are several assumptions we have made at this point that could affect the outcome of our project if they were to change:

- **Team Commitment:** Everyone on our team is committed to putting their best effort forward to complete tasks in a timely manner in order to ensure the successful completion of the project. They will abide by the standards set by the team during the initial team meetings.
- **Member Retention:** We will assume that all five team members will stay on the team throughout Senior Design I and II and not drop either course.
- **Team Meetings:** We will meet consistently every Friday, and have other days of the week if deemed necessary by the group. We will assume each meeting is successful and we will accomplish everything planned out for that meeting as assigned by the PM.

1.6 Preliminary Schedule and Cost Estimates

Preliminary Project Schedule (Phase I)		
Project Milestone	Due Date	Cost (Hours)
SRD Initial Draft	10/09/2014	27
Project Charter Initial Draft	10/16/2014	15
Project Plan Initial Draft	10/16/2014	5
Baseline Project Charter	10/24/2014	10
Baseline SRD	11/06/2014	15
Architecture Design Specification Draft	12/02/2014	60
Baseline Project Plan	12/02/2014	5
Architecture Design Gate Review	TBD	30

Preliminary Project Schedule (Phase II)		
Project Milestone	Due Date	Cost (Hours)
Baseline Architecture Design	TBD	TBD
Detail Design Specification First Draft	TBD	TBD
Detail Design Specification Gate Review	TBD	TBD
Baseline Detail Design Specification	TBD	TBD
System Test Plan First Draft	TBD	TBD
Baseline System Test Plan	TBD	TBD
Implementation	TBD	TBD

2 Scope Statement

2.1 Introduction

The purpose of the PixelSense Secure Transfer is to provide a means of secure optical communication between a device (the Lynx) and the Microsoft PixelSense table, through the application of a casino application, allowing the user to store any chips earned or lost on the Lynx. The user will first check out the Lynx, where an administrator will add user information and chip count to the device. The user will then proceed to the PixelSense table and place the Lynx on it. Next the user begins a game, where they bet chips, and win or lose more or less chips.

2.2 Product Definition

The PixelSense Secure Transfer system is a tablet case with a series of sensors allowing secure transmission between the PixelSense table and the device (the Lynx) connected to the case. The appeal of this transfer comes in the fact that the communication cannot be intercepted due to physical limitation, thus making the connection completely secure. Included with the Lynx will be an SDK that will allow the users to develop their own applications for the both the tablet and the PixelSense table in order to use it however they see fit.

For demonstration purposes, our group will be developing a casino game on the PixelSense table, and our secure transfer system attached to a tablet will serve a poker chip counter, securely storing your chips so you can move from table to table in order to play different casino games.

2.3 Intended Audience

The intended audience of the Lynx is anyone who has the PixelSense table and the need to transfer small amounts of information to and from the table. Using our SDK, they can develop applications on the connected Lynx and the PixelSense table that take advantage of the secure form of transferring data.

The intended audience for the demonstration application we are developing would be any casino interested in using the PixelSense table to play their games as opposed to traditional, non-interactive tables.

3 Cost Management Plan

3.1 Purpose

This cost management plan will make sure that we are within the allotted budget of \$800. This plan will also allow us to plan accordingly and minimize costs as much as possible and not purchase unnecessary items. By following this plan we will also make good on time by purchasing the correct items at the right time and not wait for shipping.

3.2 Project Budget

The team has been given a total of 9 months to complete this project. The team expects to put a significant amount of time into the project, somewhere in the area of 20 hours per week, per person which just happens to be 720 hours over the project work time. With the time budget we also have a cost budget to keep in mind. Aside from the given hardware, from the hardware/software we have to buy ourselves must be within the \$800 amount. Our goal is preferably go with low cost hardware which will give us wiggle room for future upgrades and replacement parts, just in case of malfunctions or parts being damaged during manufacturing. By minimizing cost we also are able to think more outside of the box to possibly add a few more features in addition to our requirements with any leftover budget.

3.3 Cost Breakdown

While researching hardware for the Lynx device, we have come up with a preliminary parts list, with a compile list of prices we have come to a total cost of \$215.63. This amount is subjected to change as this is just a preliminary price total and may add or remove items as well as adjust for price changes. Any excess budget leftover will either go towards a second device or replacement parts. The following chart below is the initial cost breakdown.

Part	Price
Acer A500-10S16u Tablet	\$69.95
Arduino Due	\$47.95
5mm, 940nm IR Emitter	\$11.58/40pcs
5mm, 940nm IR Receiver/Transmitter	\$11.98/40pcs

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2x 5v, 1A 3 Pin Voltage Regulator	\$0.58
5x Red LED	\$0.60
5x Green LED	\$0.50
5x 1/4W, 10KΩ Resistor	\$0.50
4x 1/4W, 180Ω Resistor	\$0.40
4x 10μF, 50V radial capacitor	\$0.48
2x 16MHz low profile Crystal Oscillator	\$1.18
4x 22pF, 50V ceramic Capacitors	\$0.18
2x 0.1μF, 50V ceramic Capacitor	\$0.38
2x Single Push, Single Throw Push Button	\$0.58
2x 6 Male Header pins	\$0.99
2x Low Dropout 3.3v, 1.5A Regulator	\$1.78
4x 10μF, 25V tantalum Capacitors	\$0.59 x4= \$2.36
830 Point Breadboard	\$9.95
5v FTDI USB – Serial Breakout Board	\$19.95
2x Energizer Rechargeable 9V Battery	\$21.98
15F Ethernet Cable	\$5.99
ICS40 – 40 Pin IC Socket for ATmega1284P	\$0.15
Total:	\$215.63

This parts list is preliminary and is subjected to change just in case we decide to take a different direction on some parts, such as a different microcontroller or single board solutions like pre-build Arduinos or Raspberry Pis.

3.4 Labor Management

Over the course of the project the team labor will be measured for overall work times using the earned value management model. By using the budgeted cost of work scheduled (BCWS), actual cost of work performed (AWCP) and the budgeted cost of the work performed (BCWP), an accurate measurement of labor can be calculated which means it can be seen if we went over or under our time and work constraints. Once these are calculated, these are put into Microsoft Project which will give us a very detailed plan and analysis of how we are on track. The calculated BCWS, AWCP and BCWP are all estimates and are subjected to change over time depending on the situation at that time, more than likely they will change from what is stated here and on the Microsoft Project at this point.

4 Earned Value Management

4.1 Purpose

The purpose of earned value management is to compare the amount of work on the project for an individual team member and/or the team is the same as what was planned. Using earned value management, we can determine whether or not we are behind, ahead, or on schedule. By maintaining the MS Project plan, we can identify any issues with individual team members or the whole team, and work alleviate them. We can also use EVM to determine if we need to shift or defer resources to different tasks in order to ensure the completion of the project.

4.2 Earned Value Components

Below are the variables we will use in order to determine the earned value of our work.

Budgeted Cost of Work Scheduled (BCWS), also known as Planned Cost (PC), this is the amount of work in man-hours that is planned for the task.

Actual Cost of Work Performed (ACWP), also known as Actual Cost (AC), this is the amount of work in man-hours that it took to complete the task.

Budgeted Cost of Work Performed (BCWP), also known as Earned Value (EV), this is the value of work in man-hours that was gained from a task, which is equal to the BCSW (PC) value when the task is 100% complete.

4.3 Cost Performance Index and Schedule Performance Index

The Cost Performance Index (CPI) is used to measure the team's efficiency in completing tasks. CPI is ratio between the planned cost and the actual cost. The Schedule Performance Index shows how well the team meets individual deadlines. SPI is the ratio between planned cost and earned value. In both cases, each time these ratios are calculated, you are looking for a result that is greater than or equal to one. Anything less than one means you need to go back and assess your planning in order to determine how you can shift and divert resources in order to get the maximum production out of the team.

Cost Performance Index (CPI)

$$CPI = \frac{BWCP}{ACWP} = \frac{EV}{AC}$$

If $CPI \geq 1.0$, the work is fitting within the budgeted time, which is good.

If $CPI < 1.0$, we can assume the work is taking longer than planned, which is bad.

Schedule Performance Index (SPI)

$$SPI = \frac{BCWP}{BCWS} = \frac{EV}{PV}$$

If $SPI \geq 1.0$, we can assume good performance from the group/individual.

If $SPI < 1.0$, we can assume poor performance from the group/individual.

4.4 Status Reports

Each week, the team will meet to discuss the progress they have made on their tasks. The tasks will be set up by the project manager and the people working on said task. The team members working on the task will be responsible for logging the amount of time they took to complete the task with the MS Project plan.

At each status meeting, we will review the project plan; check the CPI and SPI of individuals and the group in order to determine where we are at on the project. If needed, we will shift or defer resources as needed to different task in order to maximize productivity within the team.

5 Scope Management Plan

5.1 Introduction

This section will discuss the scope management plan, which covers the methods the team will use to manage any changes to the scope of the project and how those changes will then be integrated back into the project plan. Furthermore, the possibility of feature creep and gold plating will be avoided through the scope management plan.

5.2 Definition

Team Argus has determined a list of requirements necessary for the completion of the project. The requirements are listed in the System Requirements document (SRD) and have been ranked according to how critical they are to the project. Due to the difficulty of the project and the lack of experience dealing with some of the technology that is vital to the project, the team must ensure that all work is within the scope of the project. The project will be broken down into 4 stages to assist the team, which can be seen below:

Stage	Software	Hardware
1	Develop application to communicate with Lynx through a tablet via serial port.	Find compatible hardware that will support this transfer.
2	Develop area on PixelSense to receive information from Lynx.	Send information to PixelSense from Lynx.
3	Develop area on PixelSense to send information to Lynx.	Receive information from PixelSense to Lynx.
4	Develop Blackjack game that utilizes Lynx.	Integrate Lynx into blackjack application.

5.3 Management

The team lead will be responsible for keeping the team focused and on track, but all team members are also responsible for maintaining awareness of the tasks and specifications assigned to them. If at any point in time, the team must make any changes to the requirements, the team will discuss the feasibility of the change and risks involved with the change. Any changes made

will be accounted for in the project plan. The team lead has the final say in the case of conflicting opinions amongst the team.

6 Work Breakdown Structure

WBS	Task Name	Start	Finish
1	Senior Design Project	Fri 9/12/14	Fri 5/8/15
1.1	Phase 1 - Design	Fri 9/12/14	Fri 12/12/14
1.1.1	Project Idea Brainstorming Meetings	Fri 9/12/14	Tue 9/23/14
1.1.2	Weekly Team Meetings	Thu 9/18/14	Fri 12/12/14
1.1.3	Team Status Report	Thu 9/18/14	Fri 12/12/14
1.1.3.1	9/19	Thu 9/18/14	Thu 9/18/14
1.1.3.2	10/3	Thu 10/2/14	Thu 10/2/14
1.1.3.3	10/17	Thu 10/16/14	Thu 10/16/14
1.1.3.4	10/31	Thu 10/30/14	Thu 10/30/14
1.1.3.5	11/14	Thu 11/13/14	Thu 11/13/14
1.1.4	SRD	Fri 9/12/14	Fri 11/7/14
1.1.4.1	SRD Draft	Fri 9/12/14	Thu 10/9/14
1.1.4.1.1	Plan Meeting 9/29	Mon 9/29/14	Mon 9/29/14
1.1.4.1.2	Plan Meeting 10/1	Wed 10/1/14	Wed 10/1/14
1.1.4.1.3	Plan Meeting 10/3	Fri 10/3/14	Fri 10/3/14
1.1.4.1.4	Requirements Draft	Fri 10/3/14	Mon 10/6/14
1.1.4.1.5	Drafting Meeting	Mon 10/6/14	Mon 10/6/14
1.1.4.1.6	Draft Meeting Edits	Mon 10/6/14	Thu 10/9/14
1.1.4.1.7	Feedback Meeting	Fri 10/10/14	Fri 10/10/14
1.1.4.1.8	Edits after Feedback	Fri 10/10/14	Fri 11/7/14
1.1.5	Project Charter	Thu 10/9/14	Mon 10/27/14

Senior Design Documentation Library

1.1.5.1	Drafting Meeting	Fri 10/10/14	Fri 10/10/14
1.1.5.2	Project Charter Draft	Fri 10/10/14	Wed 10/15/14
1.1.5.3	Feedback Meeting	Fri 10/17/14	Fri 10/17/14
1.1.5.4	Edits after Feedback	Fri 10/17/14	Mon 10/27/14
1.1.6	System Architecture Design	Fri 11/7/14	Tue 12/2/14
1.1.6.1	Drafting Meeting	Mon 11/10/14	Mon 11/10/14
1.1.6.2	System Architecture Design Draft	Tue 11/11/14	Mon 11/24/14
1.1.6.3	SAD Draft Edits	Tue 11/25/14	Tue 12/2/14
1.1.7	Project Plan	Fri 9/12/14	Tue 12/2/14
1.1.7.1	Initial Setup	Thu 9/18/14	Thu 9/18/14
1.1.7.2	Pre Draft Setup - Adding Project Charter/SAD	Mon 10/13/14	Mon 10/13/14
1.1.7.3	Edits after Feedback	Fri 10/17/14	Tue 12/2/14
1.2	Phase 2 - Development	Mon 12/15/14	Fri 5/8/15

7 Quality Management Plan

Our quality management plan will consist of three core philosophies: Break down our system into unique and discrete modules for testing, construct testing data and criteria only from comments and documentation, and integrate all our software and hardware elements based on a collection of module bases, including any serial additions to them

7.1 Discrete Modules

In order to reduce the amount of code/hardware assets being tested at any one time, the team will agree that the system should be designed in as much of a modular design as possible. By implementing discrete modules, we will be able to begin testing earlier, and be able to create more reliable small components for later integration. Smaller modules should lead to easier debugging, as the amount of errors that can occur should diminish with the relative size of a module.

Items that cannot be split into modules, or items that are built out of many modules should be explicitly identified during the design phase, so testing can be prioritized based on when each component needs to pass testing in order to move on to a different phase of the project.

7.2 Testing From Comments

Since a major requirement for the completion of the project is a well-documented library of functions related to optical communication, well commented and documented design should always be at the forefront of design decisions. To reinforce this throughout the length of this project, the team shall agree to test case design based solely around the available comments and documentation given to the QA lead.

It shall be the job of the QA lead to ascertain the scope, function, and ultimately the test cases for any particular module, without input from the team member who constructed it. If code comments or given documentation does not reasonably clarify the intent or function of a module, the module will fail testing, and the team member will be asked to clarify his documentation.

Test cases constructed from documentation should measure the accuracy of the documentation versus the actual coded output, and its compliance with the projects requirements. On top of that, testing should involve the testing of bounds and breaking conditions (buffer overflows, exception throwing, bad data input, etc.) before a module truly passes testing.

At the end of a successful testing cycle, the QA lead should compile parts of the documentation relevant to calling and using the module for the benefit of using it in other areas of the project

(constructors, public/static methods, library names, etc.), and store any of this documentation in an area where the team has access to it.

7.3 Integration

Integration will be happening throughout the project's lifespan. Integration between two or more modules will follow a similar structure as the individual component testing, but the criteria for comment evaluation comes from the subset of documentation the QA lead set aside as necessary for component usage.

The system integration testing should revolve around a collection of base modules. These bases should be wholly distinct from one-another, and have radically different purposes (hardware base, software base, optic base, diagnostic base, etc). Integration testing will attempt to add on to these bases, one at a time. This is to avoid unnecessary reliance on untested code, and to reduce the size of the potential error-prone areas.

The necessity of multiple bases is to make integration testing more integral to the development process throughout its lifespan, and to make sure components can be added to the "tested core" as soon as it feasibly can be added. Adding it on to a base close to its designed function will ease testing and integration as a whole.

8 Communications Plan

8.1 Internal Communication

Team Argus has decided to use Emails, GroupMe, Google Drive and phones to communicate electronically. As our team has cubicle in Senior Design Lab, team has agreed upon meeting every Friday inside the cubicle. Team also plans to meet virtually via Google+ Hangouts or Skype, in case of emergency or vacation period (Winter break).

8.1.1 Meeting

Team has decided to meet every Friday after lab from 11:00 AM till 12:00 PM in the Senior Design Cubicle for first phase of the project, i.e. December 2014. After December, the second phase of the project is expected to kick-off, where we will do actual implementation of our project and we might need to meet more often. We expect the venue to be the same throughout the project. In Friday's meeting, each team member is expected to discuss their work done throughout the week with other members. Team members are also required to bring in their Engineering notebooks for peer review.

Team also meets Monday or Wednesday evening at 7:00 PM to get the deliverables organized or to practice for the presentations.

8.1.2 Google Drive

Team has Google account which is being shared among team members for sharing documents among each other. Using drive, every member can work together on the same document at the same time, which will increase our work efficiency in the future. The team has been using drive to create team status presentation so far, and it is working out very efficient and simple.

8.1.3 GroupMe

This is a chat client that can be accessed using a smartphone, a tablet or a Computer. The benefit of using GroupMe is that it uses cloud service unlike normal texting. Using GroupMe, we can maintain chat record of our team which can be used in future to trace down the discussion matters. Since GroupMe is free and easy to use, it is one of the major and quickest means of communication for us.

8.1.4 E-mail

The team plans to use Emails to update the status, or to inform other team members about their accomplishment/concerns towards the project. Emails are also useful to send an invite for the meeting.

8.2 External Communication

8.2.1 Meetings

Team plans to meet our sponsor Dr. Zaruba when Team needs clarification in requirements. Generally Dr. Zaruba hangouts in our class, so if needed, we plan to directly contact him for meeting time soon after the class. Our supervisor, Dr. Huber is also our instructor for the class.

8.2.2 E-mail

Primary means of communication with Dr. Zaruba and Dr. Huber is email. Emails will be used to submit deliverables and to communicate about any difficulties that would arise in the project. Team will also use Email to submit status report and status report presentations to professor.

9 Change Management Plan

9.1 Purpose of Integrated Change Management Plan

Change in the requirements at a future stage of the project is unavoidable. While working on 7 months long project, there is high possibility of making changes to the requirements to meet customer's requirements. Due to variations in growing technologies and team schedules, such need of changes is the most significant factor in this project. Well documented change management plan will be used while developing the product, if any changes are needed.

9.2 Roles and Responsibilities

Below are the roles which will be part of the project and will be responsible for approval of any change.

9.2.1 Project Sponsor

Dr. Zaruba is our project sponsor. He is responsible for presenting the details about the change via face-to-face meeting or via email to Project Manager depending on the change priority/significance. Then, the project manager will forward any change request from the sponsor to other team members. The team will have a meeting for the change, and decide whether the change is minor and major and how it can affect the project over all. Whatever the decision is, the project manager will inform back to project sponsor. If the sponsor requires a discussion regarding the decision with any team member, a face-to-face meeting with team member or team will follow that. Once, sponsor and Project Manager approves the change, change will be documented in further project documents.

9.2.2 Project Manager

The Project Manager for Team Argus is Seth. Seth is also our Team Lead and Hardware Lead. He will discuss the change requests with other team member in the meeting and will explain them to the Project Supervisor or the Project Sponsor. He will also be responsible to finalize the change request depending on the quality of the request.

9.2.3 Project Team

Every Team member is part of project team. They are all allowed to submit or suggest a change request to Project Manager. Key of successful project is communication among each other in a team. Every Team member is encouraged to input his opinions as project goes along.

9.2.4 Other Stake Holders

Team Argus' Project Supervisor, Dr. Huber is the only Stake Holder along with Dr. Huber for this project. He shall be informed before approving any Change to the project. He also analyzes every team member's individual status reports every 2 weeks. Project Supervisor shall be informed about moderate changes in every status report. If stakeholder proposes any changes, it will be treated in same manner as Project Sponsor.

9.3 Review and Approval Process

While requesting or proposing a change, every team member, Stake Holders or Supervisor has to fill this form (<http://goo.gl/iRzzak>) in order maintain a record for the change requests. By using Google forms, we can efficiently share the change request among each other. Once the Change Request is submitted, Project Manager is notified via email and he informs other members related to the project. Team will have a meeting for the requested change, and decide whether the change is minor or major and how it can affect the project over all. Whatever the decision is, project manager will inform back to project sponsor. If the sponsor requires to discuss the decision with any team member, face-to-face meeting with team member or team will follow that. Once the Project Sponsor and Project Manager approves the change, change will be documented in further project documents.

9.4 Change Identification, Documentation, Implementation and Reporting

Team plans to use Google forms to keep record of the change requests submitted electronically. Every person has to fill out the change request in order to submit or propose a new change in the project. The form contains several fields related to the change request. The information on the form includes 'Name of the Person requesting Change', 'Change Requested Description', 'Importance of Change' (Why?), 'Project Areas Affected' (Software/Hardware?), 'Change Priority' (Scale 1-5) and other comments if necessary. All these are required fields in Google Forms except Additional comments as they are key components for the change request. Data from the form is well documented in an excel sheet which will be used to discuss further with other team members and stake holders. Below is the snapshot of the form with the link.

Change Request Form - Team Argus

Purpose of this form is to request any change in the project in any stage of the project

* Required

Change Request by: *

Name

Change Description: *

Full Description

Importance of Change:

Project Areas Affected: *

- Hardware
- Software
- Both

Change Priority *

5 is highest priority and 1 is lowest.

Other Comments(if necessary) :

Submit

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10 Risk Management Plan

10.1 Purpose of Risk Management Plan

This section will deal with the risk management of the project, as well as how to deal with and mitigate these risks. Risk management is crucial to this project due to the different technologies being incorporated and the team's lack of experience with those technologies. The team will identify possible risks and create a plan to deal with them accordingly.

10.2 Roles and Responsibilities

- Project Sponsor – The sponsor will be kept up to date with the project and will be primary source to consult when trouble arises.
- Project Manager – The project manager will ensure that the team stays on track. He is also responsible for ensuring that the correct action is taken in the case that one of the identified risks occurs.
- Project Team - The team is responsible for identifying potential risks, creating plans to mitigate risks, and following the proper action in the instance of a risk occurrence.
- Risk Manager – The risk manager is responsible for tracking risks and identifying the possibility that new risks arise. He will also lead the team in the task of identifying risks and their respective mitigation plan.

10.3 Risk Identification

A team meeting will be held with the purpose of identifying any potential risks with the project and creating a risk mitigation plan for those risks. The material that will be the source of the risk management meeting is all high level deliverables, the work breakdown for the team, as well as all other risks identified by the team. As each risk is identified they will be analyzed and the team will determine the probability of the risk and the impact of the risk on the project.

10.4 Risk Triggers

- Lack of experience in C#
- Lack of experience using PixelSense SDK
- Lack of game development experience
- Delay in shipment of an hardware ordered
- Falling behind on scheduled tasks
- Change in requirements
- Loss of teammate for period of time

10.5 Risk Analysis

This section identifies the initial risks associated with the project. The risks have been identified, the probability of their occurrence has been estimated, and the possible impact of the risk has been calculated, those values can be seen below:

Risk	Probability	Time Lost (weeks)	Assessment
Change in Requirements	25%	2	.5
Lack of game development experience	75%	3	2.25
Equipment arrival delays	25%	2	.5
Falling behind on schedule	35%	3	1.05
Overestimating team abilities / Over optimistic planning	20%	2	.4
Loss of team member	10%	2	.2
Integration Issues	50%	4	2

10.6 Risk Severity

This section contains a table showing the severity of the risks, their priority, a containment strategy and triggers for the risk:

Risk	Priority	Containment Strategy	Triggers
Change in Requirements	2	Immediately begin to update current plan to reflect new requirements.	Project sponsor changes requirements before they are finalized.
Lack of game development experience for PixelSense using c#	2	Remove number of casino games available to play or decrease graphic capabilities of game.	Development of PixelSense game application is taking longer than planned.
Equipment arrival delays	3	Work on other areas of the project while waiting on hardware.	Equipment arrival time is delayed.
Falling behind on schedule	3	Remove low priority requirements.	Tasks are not being completed by scheduled timeframe.
Loss of team member	4	Re-allocate workload among remaining team members.	Team member is not able to complete their tasks or contribute anything meaningful for anytime longer than 1 week.
Integration Issues	1	Research alternative hardware options and utilize them instead.	Unable to integrate Lynx device with the PixelSense table.

10.7 Risk Response Planning

The team will account for high priority risks by spending additional time for both research and testing. Sources outside of the team will be utilized to aid the team in making crucial decisions or in the event of a risk arising advise the best course of action.

10.8 Risk Documentation and Reporting

The team will utilize a space on the whiteboard in the Senior Design lab as well as a document on the team's google drive to track all risks. New risks and their mitigation, containment, severity, and impact will be added by the risk manager. If a risk occurs the risk manager and team lead will work together to ensure the risk management plan is followed for that given risk.

10.9 Risk Control

The team will make a continuous effort to discuss any possible risks to ensure that no unidentified risks arise. As new risks are identified a management plan will be discussed by the team and documented once it's finalized. The methods of documentation and reporting stated above will then be updated to reflect the new risk. All team members will be responsible for identifying risks and notify the team if a new risk has been identified.

11 Procurement Management Plan

11.1 Purpose of the Procurement Management Plan

The purpose of the Procurement Management Plan is have some rules and guidelines to follow when purchasing the require hardware/software that have some kind of monetary value. Since there is a budget and no free reign on purchasing these things, all decisions for purchasing modules, components and software must go through a process of approval before they are purchased. Having this procedure will make sure that unnecessary components are not purchased and everything that is purchased contributes to the completion of the project. The procedure also insures that everyone on the team is aware of what is coming in to work with and also under the supervision of the Sponsor and Manager of the team. The plan also specifies who is involved and what their roles are in the procurement process and procedure.

11.2 Roles and Responsibilities

Listed below are the roles and responsibilities.

11.2.1 Project Sponsor

The Project Sponsor is Dr. Gergley Zaruba. Dr. Zaruba has the responsibility of providing the team with suggestions, advice and hard set requirements on what we need to buy and use.

11.2.2 Project Manager

The Project Manager is responsible for making the decisions for purchasing the components and modules required to complete the project. The team will compile a list of required components and give it to the Project Manager, whom will go through them all for a final review. After that, the Project Manager will submit the list to the Project Supervisor. The Project Supervisor is Dr. Manfred Huber.

11.2.3 Project Team

The team is responsible of compiling a list of all the components required. Once a list is made, the team must decide on what to buy and what to avoid. At this point, there should be a clear understanding of how the product should be working. Once a tentative list is made, the list will be sent to the Project Manager who will review the list and make sure there is nothing out of the ordinary being ordered.

11.2.4 Project Supervisor

The Project Supervisor is responsible for approving any order requests or deny them if that seems fit. The Project Supervisor in this case is Dr. Manfred Huber, and we will be reviewing all orders and also ordering the actual items in the case of approvals which will be delivered to our team once they arrive.

11.3 Required Project Procurements and Timing

The procurement stage will begin once the Systems Requirements Specification Gate Review takes place. Since then we will have a very strong idea of what we need and how we are going to do them, it will be very easy to put together a list of items with their source in a well-documented manner. By having this document we can have the items ordered early which would mean we can also prototype earlier. This in turn would keep us on schedule and avoid any possible delay during the implementation of our project.

11.4 Description of Items/ Services to be acquired

The following lists the components and services we will need to complete our products.

- Custom Minimal Arduino Control Board (or a Raspberry Pi)
- Android Tablet with a Master USB Port (Acer A500 has this)
- Array of IR Transmitters and Receivers
- Professional PCB Building Service
- USB-Serial Breakout Board
- Rechargeable 9V Battery with a recharging bay
- Possible outsource or 3D print a case for the device

12 Project Closeout Report

12.1 Purpose of Closeout Report

The purpose of this report is to insure that any issues that have occurred during the course of this project have been resolved, including but not limited to: personnel, contract, administrative, and financial issues. In addition to this, this section will determine how project artifacts will be stored and archived, and any lessons we have learned over the course of the project will be listed and detailed.

12.2 Administrative Closure

12.2.1 Were the objectives of the project met?

This section will be completed towards the end of the project..

12.2.2 Archiving Project Artifacts

Any documentation we have created over the course of the project will be stored in two separate ways:

- **Hard copy:** At the end of the project, we will be turning in a binder that contains any major documentation we produced over the course of the project, including but not limited to: SRD, Project Charter, Project Plan, ADS, Detailed Design, and Test Plan.
- **Soft Copy:** All documentation we create over the course of the project will be stored on our Google Drive, for access to read and modify whenever the need occurs.

12.2.3 Lessons Learned

This section will be completed towards the end of the project.

12.2.4 Plans for Post Implementation Review (PIR)

This plan will be established after consulting with our Project Supervisor during the second phase of Senior Design.

12.2.5 Final Customer Acceptance

This section will be completed towards the end of the project.

12.2.6 Financial Records

As a preliminary measure, we will keep a spreadsheet of expenses on our Google Drive, maintained by the Project Manager. This method may be modified and improved as we actually begin to make purchases.

12.2.7 Final Project Performance Report

This section will be completed towards the end of the project.