Lunar Landers Project Report

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2

Table of Contents

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List of Figures

(The title above is formatted as Heading 3, so that it appears in the table of contents, but was then modified to be centered and include a page break before the paragraph. Likewise for the List of Tables heading on the next page..) ***Note: Remove this instructional paragraph.***

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List of Tables

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the table below and selecting "Update Field". This feature is located in the "Captions" section of the "References" tab in MS Word. ***Note: Remove this instructional paragraph.***

I Project Description

Short Version (SV): Section I of the document provides a clear detailed picture of the product to be produced, why it needs to be produced, who would use it, what they would do with it, and provides other important background information prior to developing detailed requirements or designs.

1 Project Overview

Lunar Landers is a multiplayer extension of the classic arcade game, *Lunar Lander*. The game pits multiple players against each other to see who is able to land their spacecraft on the surface first and prevent their opponents from doing so. The map will look familiar to fans of the original *Lunar Lander* as it is a similarly rocky and dangerous landing site on a moon. However new challenges may face the player during their match, such as lunar wind and worms, in addition to the threat of being blown away by their opponents. This game will challenge the skill and entertain any who choose to pick it up.

2 The Purpose of the Project

2a The User Business or Background of the Project Effort

This product is not catered to businesses, but rather individual gamers. These gamers may not know one another, and only seek to gain entertainment from the product, not profit.

2b Goals of the Project

The goal of this project is to entertain the players, and to offer players a challenge to share with their friends or others they find online. The competitive and simple to understand nature of the game are inherently entertaining for those who play. As the user continues to play with the game, they will hone their skills and become more familiar with new strategies and techniques to play. As the user's skill level increases they will find more value in the product as they best others in challenges and share the game with others.

2c Measurement

We will know that players are entertained by measuring the amount of playtime and matches played, in addition to new users. We can safely assume that players would not play a game that they do not enjoy. We can measure this by observing the amount of matches a user plays over time, and see how long it captures their interest. If a user is playing a consistent amount of matches per week over a period of months, then we can say that we have been successful in entertaining the consumer. In addition looking at sales and new user adoption will help us understand if the multiplayer and party play elements of the game motivate others to play and enjoy it.

3 The Scope of the Work

SV: The "work" is a subset of the "business", and describes the set of activities that will be addressed by the proposed product. For example, if the business is "university level education", then the work addressed by this project might be "the production and delivery of classroom lectures". Obviously the business of running a university encompasses a lot more than just classroom lectures, but this particular project will only concern itself with that particular aspect of the overall business.

This section describes the (business) environment in which the product will

be used. A sentence or two here can briefly state what the "work" is.

The work addressed with this product would be the entertainment of people by challenging one another in video games.

3a The Current Situation

Currently there are many games that allow players to challenge one another, on many types of platforms. However many of these games have a high barrier to entry, either monetarily or due to being difficult to pick up and play.

3b The Context of the Work

8

SV: Define the boundary between what is included in "the work" and what is not. It also defines what external entities "the work" must interact with and what those interactions entail. ***The following example diagram should be replaced with one appropriate to this project.***

13

Content

The work context diagram identifies the work that you need to investigate to be able to build the product. Note that it includes more than the intended product. Unless we understand the work that the product will support, we have little chance of building a product that will fit cleanly into its environment.

The adjacent systems on the context diagram (e.g., Weather Forecasting Service) indicate other subject matter domains (systems, people, and organizations) that need to be understood. The interfaces between the adjacent systems and the work context indicate why we are interested in the adjacent system. In the case of Weather Forecasting Service, we can say that we are interested in the details of when, how, where, who, what, and why it produces the District Weather Forecasts information.

Motivation

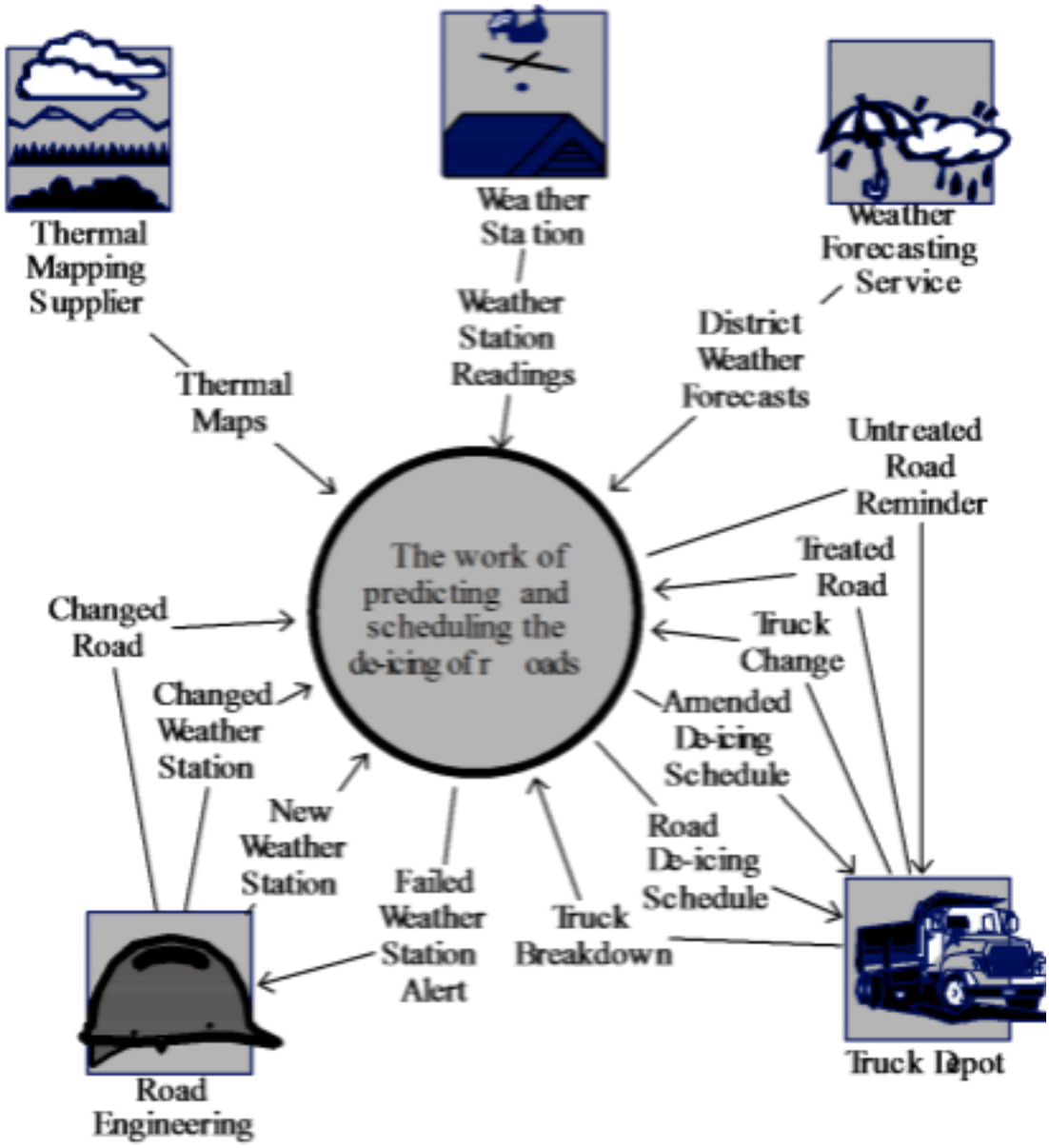
To clearly define the boundaries for the study of the work and requirements effort. Without this definition, we have little chance of building a product that will fit seamlessly into its environment.

9

14

Examples

10



Considerations

The names used on the context diagram should be consistent with the naming conventions and data dictionary definitions presented in section 5. Without these definitions, the context model lacks the required rigor, and it may be misunderstood. Relevant stakeholders must agree to the definitions of the interfaces shown on the context model.

Your diagram and text goes here . . .

3c Work Partitioning

SV: "The work" is often large and complex, with many different activities and

11

concerns. One good way to break this down and organize it for analysis is to identify the different events to which the business must respond. A "business event" is an external stimulus which causes the business to take a series of actions in response.

Content

A list showing all business events to which the work responds. Business events are happenings in the real world that affect the work. They also happen because it is time for the work to do something—for example, produce weekly reports, remind nonpaying customers, check the status of a device, and so on. The response to each event is called a business use case; it represents a discrete partition of work that contributes to the total functionality of the work.

The event list includes the following elements:

- *Event name*
- *Input from adjacent systems (identical with name on context diagram)*
- *Output to adjacent systems (identical with name on context diagram)*
- *Brief summary of the business use case (This is optional, but we have found it is a very useful first step in defining the requirements for the business use case—you can think of it as a mini-scenario.)*

Motivation

To identify logical chunks of the system that can be used as the basis for discovering detailed requirements. These business events also provide the subsystems that can be used as the basis for managing detailed analysis and design.

Example

12

Business Event List

Event Name	*Input and Output*	*Summary*
1. Weather Station transmits reading	*Weather Station Readings (in)*	*Record the readings as belonging to the weather station.*
2. Weather Service forecasts weather	*District Weather Forecast (in)*	*Record the forecast.*
3. Road engineers advise changed roads	*Changed Road (in)*	*Record the (in) new or changed road. Check that all appropriate weather stations are attached.*
4. Road Engineering installs new Weather Station	*Changed Weather Station*	*Determine if any weather*
5. Road Engineering changes Weather Station	*Failed Weather Station Alert (out)*	*Record the changes to the weather station.*
6. Time to test Weather Stations	*Record the weather station and attach it to the appropriate roads.*	*stations have not transmitted for two hours, and inform Road Engineering of any*
	New Weather Station (in)	

failures.

a truck
to the truck.

7. Truck Depot changes
Truck Change (in) Record the changes
8. Time to detect (out) a truck to any roads that
icy roads Predict the ice situation will freeze. Issue the
Road De-icing Schedule for the next two hours. schedule.
Assign

9. Truck treats a road Treated Road (in) Record the road as being in a
safe condition for the
next
three hours.

10 Truck Depot reports problem with Schedule (out)
truck Untreated Road
Reminder (out)
11. Time to monitor road Reassign available trucks to the
treatment previously assigned roads.
Considerations Truck Check that all scheduled roads have
Breakdown (in) been treated in the assigned time, and
Amended Gritting
issue reminders for any untreated roads.

Attempting to list the business events is a way of testing the work context. This activity **13**

uncovers uncertainties and misunderstandings about the project and facilitates precise

communications. When you do an event analysis, it will usually prompt you to make some changes to your work context diagram.

We suggest you gather requirements for discrete sections of the work. This requires you to partition the work, and we have found business events to be the most convenient, consistent, and natural way to break the work into manageable units.

Your text goes here. *A table is recommended . . .*

3d Competing Products

Games that force players to compete with one another in short challenges are not uncommon. Many recent examples of *Battle Royale* games also cater to this audience, by pitting players against each other and allowing them to create challenge by competing with one another.The appeal of this game is that the barrier to entry is very low, as the controls are simple and the objective straightforward. In addition the matches are very short in length, allowing users to quickly play a game instead of having to commit a large amount of time to sitting down and playing the game. The short time obligation and low barrier to entry are what sets this game apart.

4 The Scope of the Product

The work handled by the product would be to create an environment where players can pick up and play the game. As a result, the product would need to have a strong server established

to allow client connections and create matches for players to play. Allowing for an entertaining yet simple UI to allow for players to appreciate the game and its simplicity. **14**

4a Scenario Diagram(s)

15

4b Product Scenario List

1. People that want a casual game to play for highscores.
2. People that want to play a casual but competitive game to play with friends.
3. People that want to play for some fun.
4. People that played Lunar Lander arcade, but want to play a multiplayer version of the game.
5. People who are experienced with the game and want to show that they are the best of the best.

4c Individual Product Scenarios

People playing for fun: Most players will be attracted to the game for its easy controls and will be playing the game for fun and to relax.

People playing competitively: More experienced players will want to compete with other experienced players to be the best.

People playing alone: Some people will not want to play with others, and can play the game alone and give more of an arcade game feel.

5 Stakeholders

Potential stakeholders may include companies that are interested in cross-platform capable games or social media companies.

5a The Client

The developing organization will act as the client since the project will have the same features for every customer. However, when releasing the product for schools or large organizations there may be larger lobbies implemented.

5b The Customer

The customers for this product are expected to be a wide range of individuals such as anyone who is interested in a casual multiplayer video game. The customer base would have no association with any companies or organizations.

5c Hands-On Users of the Product

Companies that are interested in cross-platform games such as Epic Games would have hands-on-users ranging from teenagers to adults. Most of these hands-on-users would be highly experienced with cross-platform games and would be highly competent in learning how to play. Cross-platform video game companies could host tournaments for games which could allow for larger lobbies where multiple individuals compete with each other. Another organization that would be interested would be schools. The hands-on-users would include students which would already be proficient in playing multiplayer games online with their friends. The school could host after school clubs that relate to competitive gaming (such as a competitive gaming club or after school social). The product could be used as a way to bring people together for social activities and entertainment.

5d Maintenance Users and Service Technicians

SV: Describe users that will install, maintain, update, and otherwise service the product as needed. May not apply to all projects.

Content

Maintenance users are a special type of hands-on users who have requirements that are specific to maintaining and changing the product.

Motivation

Many of these requirements will be discovered by considering the various types of maintenance requirements detailed in section 14. However, if we define the characteristics of the people who maintain the product, it will help to trigger requirements that might otherwise be missed.

The consumer will be responsible for installing and updating the product. Similar to how most applications work, there will be an update available for users to download and install via the online store where they downloaded the product from. The user simply has to navigate to the store and update the newest version of the product. The maintenance will be solely delegated to the organization. All server updates, bugs or glitches, and patches will be the organization's responsibility.

5e Other Stakeholders

There would be some stakeholders that may not regard the product as a useful tool for their mission statement. Some stakeholders may include companies that value health and physical activity for their customers. They would see it otherwise as a distraction and setback for customers. K-6 educational institutions may also not value the product as much as they would potentially be a distraction for their young students rather than an enhancement.

5f User Participation

Users will have the ability to aid in development by participating in closed alpha and beta versions of the product where user feedback will be used to fix any shortcomings or bugs. The feedback will be essential to the final release of the product.

5g Priorities Assigned to Users

Key users would include any hands-on-users of cross-platform video game companies. These users are the most important as they comprise a large majority of the products expected user base. Secondary users would include students because while their requirements are valued key users have higher priority. Unimportant users include anyone outside the former user base.

6 Mandated Constraints

SV: Mandated constraints are requirements that are set in stone by the client before the project is really even started, and before the full set of requirements are determined. Note that not all of these sections will apply to every project, and that some constraints could be placed equally well in more than one section (but should not be duplicated.).

This section describes constraints on the eventual design of the product. They are the same as other requirements except that constraints are mandated, usually at the beginning of the project. Constraints have a description, rationale, and fit criterion, and generally are written in the same format as functional and nonfunctional requirements.

6a Solution Constraints

SV: These are general constraints on the product to be developed or the manner in which it is to be developed that are not covered elsewhere.

Content

This specifies constraints on the way that the problem must be solved. Describe the mandated technology or solution. Include any appropriate version numbers. You should also explain the reason for using the technology.

Motivation

To identify constraints that guide the final product. Your client, customer, or user may have design preferences, or only certain solutions may be acceptable. If these constraints are not met, your solution is not acceptable.

Examples

Constraints are written using the same form as other atomic requirements (refer to the requirements shell for the attributes). It is important for each constraint to have a rationale and a fit criterion, as they help to expose false constraints (solutions masquerading as constraints). Also, you will usually find that a constraint affects the entire product rather than one or more product use cases.

Description: The product shall use the current two-way radio system to communicate with the drivers in their trucks.

Rationale: The client will not pay for a new radio system, nor are any other means of communication available to the drivers.

Fit criterion: All signals generated by the product shall be audible and understandable by all drivers via their two-way radio system.

Description: The product shall operate using Windows XP.

Rationale: The client uses XP and does not wish to change.

Fit criterion: The product shall be approved as XP compliant by the MS testing group.

Description: The product shall be a hand-held device.

Rationale: The product is to be marketed to hikers and mountain climbers.

Fit criterion: The product shall weigh no more than 300 grams, no dimension shall be more than 15 centimeters, and there shall be no external power source. **23**

Considerations

We want to define the boundaries within which we can solve the problem. Be careful, because anyone who has experience with or exposure to a piece of technology tends to see requirements in terms of that technology. This tendency leads people to impose solution constraints for the wrong reason, making it very easy for false constraints to creep into a specification. The solution constraints should only be those that are absolutely non-negotiable. In other words, however you solve this problem, you must use this particular technology. Any other solution would be unacceptable.

Your text goes here . . .

6b Implementation Environment of the Current System

SV: This section deals with the physical and technical environment in which the proposed product will operate, such as hardware, operating system, and communications issues.

Content

This describes the technological and physical environment in which the product is to be installed. It includes automated, mechanical, organizational, and other devices, along with the nonhuman adjacent systems.

Motivation

To describe the technological environment into which the product must fit. The environment places design constraints on the product. This part of the specification provides enough information about the environment for the designers to make the product successfully interact with its surrounding technology.

The operational requirements are derived from this description.

Examples

Examples can be shown as a diagram, with some kind of icon to represent each separate device or person (processor). Draw arrows to identify the interfaces between the processors, and annotate them with their form and content.

Considerations

All component parts of the current system, regardless of their type, should be included

in the description of the implementation environment.

If the product is to affect, or be important to, the current organization, then include an organization chart.

Your text goes here . . .

6c Partner or Collaborative Applications

SV: This section documents external applications with which this product must be compatible, such as the ability to read and write Microsoft Excel format data files.

Content

This describes applications that are not part of the product but with which the product will collaborate. They can be external applications, commercial packages, or preexisting in-house applications.

Motivation

To provide information about design constraints caused by using partner applications. By describing or modeling these partner applications, you discover and highlight potential problems of integration.

Examples

This section can be completed by including written descriptions, models, or references to other specifications. The descriptions must include a full specification of all interfaces that have an effect on the product.

Considerations

Examine the work context model to determine whether any of the adjacent systems should be treated as partner applications. It might also be necessary to examine some of the details of the work to discover relevant partner applications.

Your text goes here . . .

6d Off-the-Shelf Software

*SV: This section describes commercial off-the-shelf (COTS) software that **MUST** be included in the final product.*

Content

This describes commercial, open source, or any other off-the-shelf software (OTS)

that must be used to implement some of the requirements for the product. It could also apply to nonsoftware OTS components such as hardware or any other commercial product that is intended as part of the solution.

Motivation

To identify and describe existing commercial, free, open source, or other products to

be incorporated into the eventual product. The characteristics, behavior, and interfaces of the package are design constraints.

Examples

This section can be completed by including written descriptions, models, or references to supplier's specifications.

Considerations

When gathering requirements, you may discover requirements that conflict with the behavior and characteristics of the OTS software. Keep in mind that the use of OTS software was mandated before the full extent of the requirements became known. In light of your discoveries, you must consider whether the OTS product is a viable choice. If the use of the OTS software is not negotiable, then the conflicting requirements must be discarded.

Note that your strategy for discovering requirements is affected by the decision to use OTS software. In this situation you investigate the work context in parallel with making comparisons with the capabilities of the OTS product. Depending on the

comprehensibility of the OTS software, you might be able to discover the matches or mismatches without having to write each of the business requirements in atomic detail. The mismatches are the requirements that you will need to specify so that you can decide whether to satisfy them by either modifying the OTS software or modifying the business requirements.

Given the spate of lawsuits in the software arena, you should consider whether any legal implications might arise from your use of OTS. You can cover this in the section on Legal Requirements.

*Note the subtle difference between this section and section 29 below. This section documents OTS solutions that **must be** included in the final solution, and the latter offers suggestions for OTS that could be included.*

Your text goes here . . .

6e Anticipated Workplace Environment

SV: This section deals with human factors regarding the environment in which the **26**

product will be used, such as noisy environments or mobile applications.

Content

This describes the workplace in which the users are to work and use the product. It should describe any features of the workplace that could have an effect on the design of the product, and the social and culture of the workplace.

Motivation

To identify characteristics of the workplace so that the product is designed to compensate for any difficulties.

Examples

The printer is a considerable distance from the user's desk. This constraint suggests that printed output should be deemphasized.

The workplace is noisy, so audible signals might not work.

The workplace is outside, so the product must be weather resistant, have displays that are visible in sunlight, and allow for the effect of wind on any paper output.

The product is to be used in a library; it must be extra quiet.

The product is a photocopier to be used by an environmentally conscious organization; it must work with recycled paper.

The user will be standing up or working in positions where he must hold the product. This suggests a hand-held product, but only a careful study of the users' work and workplace will provide the necessary input to identifying the operational requirements.

Considerations

The physical work environment constrains the way that work is done. The product should overcome whatever difficulties exist; however, you might consider a redesign of the workplace as an alternative to having the product compensate for it.

Your text goes here . . .

6f Schedule Constraints

*SV: **When** things must be done, or when they may be most/least beneficial.* **27**

Content

Any known deadlines, or windows of opportunity, should be stated here.

Motivation

To identify critical times and dates that have an effect on product requirements. If the deadline is short, then the requirements must be kept to whatever can be built within the time allowed.

Examples

To meet scheduled software releases.

There may be other parts of the business or other software products that are dependent on this product.

Windows of marketing opportunity.

Scheduled changes to the business that will use your product. For example, the organization may be starting up a new factory and your product is needed before production can commence.

Considerations

State deadline limitations by giving the date and describing why it is critical. Also, identify prior dates where parts of your product need to be available for testing.

You should also ask questions about the impact of not meeting the deadline: ●

What happens if we don't build the product by the end of the calendar year?

● What is the financial impact of not having the product by the beginning of the Christmas buying season?

6g Budget Constraints

SV: Limitations on the funds and other resources available for this project. Content

The budget for the project, expressed in money or available resources. Motivation

The requirements must not exceed the budget. This limitation may constrain the number of requirements that can be included in the product.

The intention of this question is to determine whether the product is really wanted. Considerations

Is it realistic to build a product within this budget? If the answer to this question is no,

then either the client is not really committed to building the product or the client does not place enough value on the product. In either case you should consider whether it is worthwhile continuing.

Your text goes here . . .

7 Naming Conventions and Definitions

SV: Define terminology to avoid miscommunications or misunderstandings.

7a Definitions of Key Terms

*SV: Define **words** that may have special or multiple meanings.*

All Terms, Including Acronyms and Abbreviations, Used in the Project must be defined at some point. List the most important ones here, and refer the reader to the glossary on page 90 for a complete list. (Note: that page number is a cross-reference, and will automatically be updated whenever the glossary moves.)

Content

A glossary containing the meanings of all names, acronyms, and abbreviations used within the requirements specification. Select names carefully to avoid giving a different, unintended meaning.

This glossary reflects the terminology in current use within the work area. You might also build on the standard names used within your industry.

For each term, write a succinct definition. The appropriate stakeholders must agree on this definition.

Avoid abbreviations, as they introduce ambiguity, require additional translations, and could potentially lead to misinterpretation in the mind of anyone who is trying to understand your requirements. Ask your requirements analysts to replace all abbreviations with the correct term. This is easily done with word processors. Acronyms are acceptable if they are completely explained by a definition.

Motivation

Names are very important. They invoke meanings that, if carefully defined, can save hours of explanations. Attention to names at this stage of the project helps to highlight misunderstandings.

The glossary produced during requirements is used and extended throughout the project.

Examples

Truck: A vehicle used for spreading de-icing material on roads. "Truck" is not used to refer to goods-carrying vehicles.

BIS: Business Intelligence Service. The department run by Steven Peters to supply business intelligence for the rest of the organization.

Considerations

Make use of existing references and data dictionaries. Obviously, it is best to avoid renaming existing items unless they are so ambiguous that they cause confusion.

From the beginning of the project, emphasize the need to avoid homonyms and synonyms. Explain how they increase the cost of the project.

Your text goes here . . .

7b UML and Other Notation Used in This Document

*SV: Define **symbols**, **diagrams**, and other **notations** used. May refer to a standard reference, such as "UML Distilled" by Fowler. (Include in bibliography.)*

Content

This section should describe the specific meaning of any symbols, punctuation, subscripts, superscripts, etc. used commonly throughout the document. If following published or common standards, then it is acceptable to reference those standards, and list any exceptions.

Motivation
If the distinction between a hollow arrow and a solid arrow is significant, for example, then everyone must know exactly what the distinctions and meanings are.

Considerations

If a particular notation is only used in one place, say on a single diagram or in a single section, then it may be more appropriate to document it in that specific

location.

Example

This document generally follows the Version 2.0 OMG UML standard, as

described by Fowler in [4]. Any exceptions are noted where used.

Your text goes here . . .

7c Data Dictionary for Any Included Models

*SV: Define **data structures** and **data properties** relative to this project, such as the contents of an employee record or the fact that student GPA ranges from 0.0 to 4.0 corresponding to letter grades of F to A. Data file formats may be referenced to documented standards, such as jpg or pdf.*

Content

Dictionary definitions of all information flows and stores used in models. Particular consideration should be given to defining the data attributes of all flows shown the context models (see sections 7 and 8).

This section should also contain any technical specifications for interfaces shown on the context models.

Motivation

The context diagram provides an accurate definition of the scope of the work being studied or the scope of the product to be built. This definition can be completely accurate only if the information flows bordering the scope have their attributes defined.

Examples

Road de-icing schedule = issue number + {road section identifier + treatment start time + critical start time + truck identifier} + depot identifier

As you progress through the requirements specification, define each of the elementary terms in detail.

Considerations

The dictionary provides a link between the requirements analysts and the implementers. The implementers add implementation details to the terms in the dictionary, defining how the data will be implemented. Also, implementers add terms

that are present because of the chosen technology and that are independent of the business requirements.

Your text goes here . . .

8 Relevant Facts and Assumptions

8a Facts

Feedback and data collected from the target users and the strategies players have to give them the best possible advantages will be under review and to understand how players are approaching the game. For example, if the damage dealt by the engine is too high, and can prevent players from competing, there could be scaling on the damage dealt and will be adjusted accordingly to maintain fairness while still keeping the integrity of the game. With this in mind, data and feedback will also adjust the difficulty of the maps, if there are inconsistencies within the difficulties, like if on the hardest difficulty, players always land on the safest area, we could make the safer areas less rewarding, while increasing the reward for landing on the more difficult terrain

8b Assumptions

An assumption will be made that players can play with each other regardless of the platform they play on. This will encourage the multiplayer aspect of the game, while not burdening the consumer to have to restrict themselves to one platform to play with others. With this in consideration, the server hosting the multiplayer connections will need to allow for clients to connect on all platforms.