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Managing Software Requirements: A Use Case Approach, Second Edition By Don Widrig, Dean Leffingwell ISBN: 0-321-12247-X Publisher: Addison Wesley Professional
Print Publication Date: 5/5/2003

Appendix A. HOLIS Artifacts

Note
This case study, including the names of the company, the participants, and the invented product, is entirely fictional.

Background for the Case Study

Lumenations, Ltd.

Lumenations, Ltd. has been a worldwide supplier of commercial lighting systems for use in professional theater and amateur stage productions for more than 40 years. In 2002, its annual revenues peaked at approximately $120 million, and sales are flat. Lumenations is a public company, and the lack of growth in sales—no, worse, the lack of any reasonable prospect for improving growth in sales—is taking its toll on the company and its shareholders. The last annual meeting was quite uncomfortable since there was little new to report regarding the company's prospects for growth. The stock climbed briefly to $25 per share last spring on a spate of new orders but has since crept back down to around $15 per share.

The theater equipment industry as a whole is flat, and there is little new development. The industry is mature and already well consolidated, and since Lumenations' stock is in the tank and its capitalization is only modest, acquisition is not an option for the company.

What's needed is a *new* marketplace, not too remote from what the company does best, but one in which there is substantial opportunity for growth in revenue and profits. After conducting a thorough market research project and spending many dollars on marketing consultants, the company has decided to enter a new market, that of *lighting automation for high-end residential systems*. This market is apparently growing at 25 percent to 35 percent each year. Even better, the market is immature, and none of the established players has a dominant market position. Lumenations' strong worldwide distribution channel will be a real asset in the marketplace, and the distributors are hungry for new products. Looks like a great opportunity.

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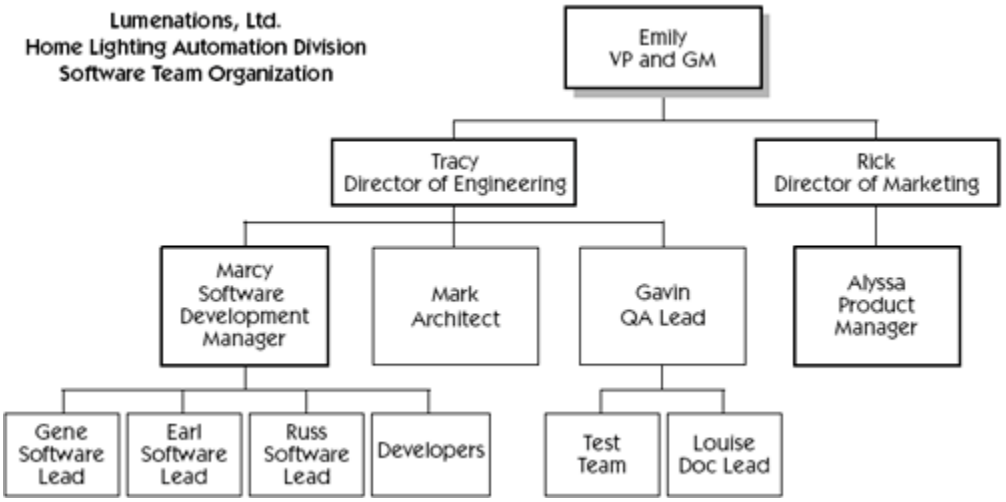
The HOLIS Software Development Team

The project for the case study is the development of HOLIS, our code name for an innovative new HOme LIghting automation System to be marketed by Lumenations. The HOLIS team is typical in terms of its size and scope. For the purposes of our case study, we've made it a fairly small team, only 15 team members, but it's large enough that all of the necessary skills can be fairly represented by individuals with some degree of specialization in their roles. It's the structure of the team that's most important, and by adding more developers and testers, the structure of the HOLIS team scales well to a size of 30–50 people and commensurately larger software applications than HOLIS will require.

To address the new marketplace, Lumenations has set up a new division, the Home Lighting Automation Division. Since the division and the technology are mostly new to Lumenations, the HOLIS team has been assembled mostly from new hires, although a few team members have been transferred from the Commercial Lighting Division. Figure A-1 is an organization chart showing the development team and the relationships among the team members.

Figure A-1. The HOLIS software development team



Team Skill 1: Analyzing the Problem

Lumenations Problem Statement

In analyzing the problem, the team discovered that there are actually three different groups of stakeholders, each of whom sees the problem differently. Thus the team decided to develop three problem statements, the first of which seemed to state the obvious problem from the company's perspective (Table A-1).

Table A-1. Problem Statement for Lumenations

Element	Description
The problem of . . .	Slowing growth in the company's core professional theater marketplaces.
Affects . . .	The company, its employees, and its shareholders.
And results in . . .	Unacceptable business performance and lack of substantive opportunities for growth in revenue and profitability.
Benefits of a solution . . .	Involving new products and a potential new marketplace for the company's products and services include • Revitalization of the company and its employees • Increased loyalty and retention of the company's distributors • Higher revenue growth and profitability • Upturn in the company's stock price

Next, the team also decided to see whether it could understand the "problem" from the perspectives of a future customer (end user) and potential distributors/builders (Lumenations' customers). The team developed the problem statements shown in Tables A-2 and A-3, respectively.

Table A-2. Problem Statement for the Homeowner

Element	Description
The problem of . . .	The lack of product choices, limited functionality, and the high cost of existing home lighting automation systems.
Affects . . .	The homeowners of high-end residential systems.
And results in . . .	Unacceptable performance of the purchased systems or, more often than not, a decision not to automate.

Element	Description
Benefits of a solution . . .	That comprised the "right" lighting automation solution could include • Higher homeowner satisfaction and pride of ownership • Increased flexibility and usability of the residence • Improved safety, comfort, and convenience

Table A-3. Problem Statement for the Distributor

Element	Description
The problem of . . .	The lack of product choices, limited functionality, and the high cost of existing home lighting automation systems.
Affects . . .	The distributors and builders of high-end residential systems.
And results in . . .	Few opportunities for marketplace differentiation and no new opportunities for higher-margin products.
Benefits of a solution . . .	That comprised the "right" lighting automation solution could include • Differentiation • Higher revenues and higher profitability • Increased market share

System Block Diagram with Actors Identified

Figure A-2 identifies the actors in this case study. Figures A-3, A-4, and A-5 show the subsystem block diagrams.

Figure A-2. HOLIS with subsystems and actors

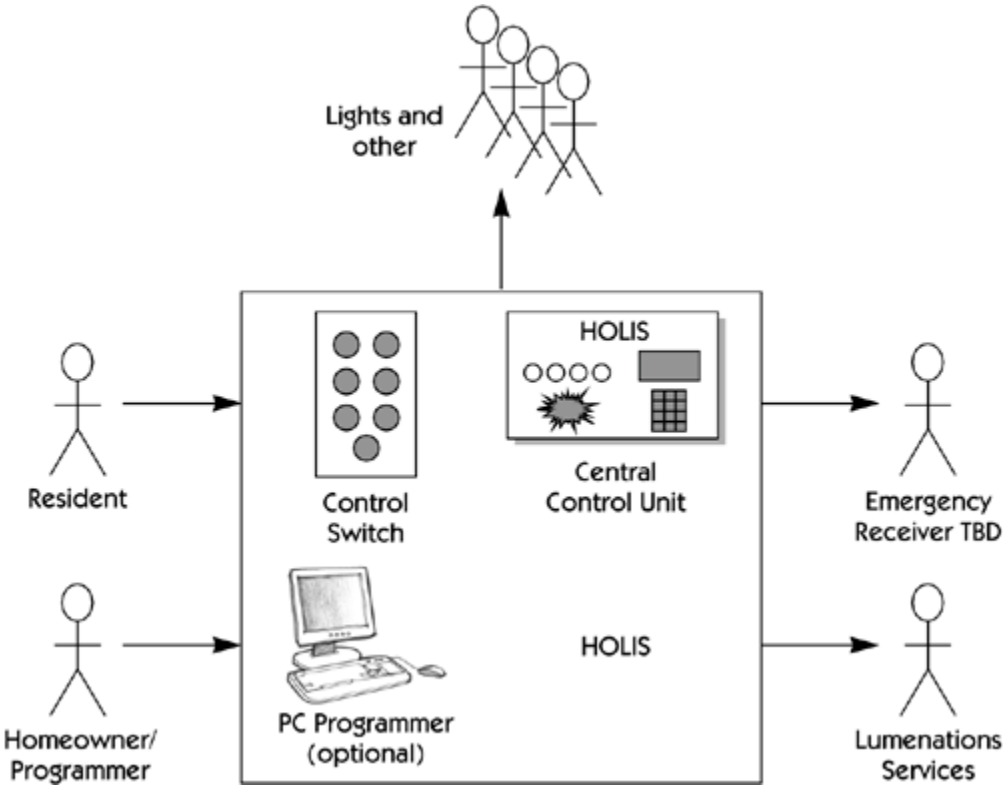


Figure A-3. Control Switch subsystem with actors

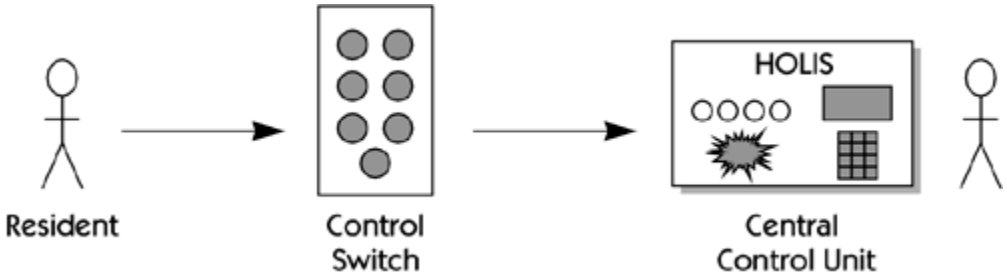


Figure A-4. PC Programmer subsystem with actors

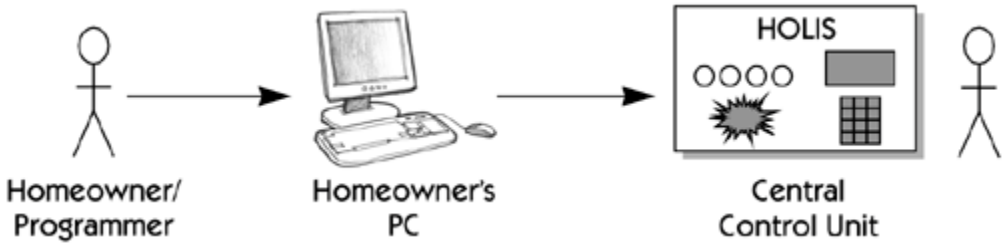
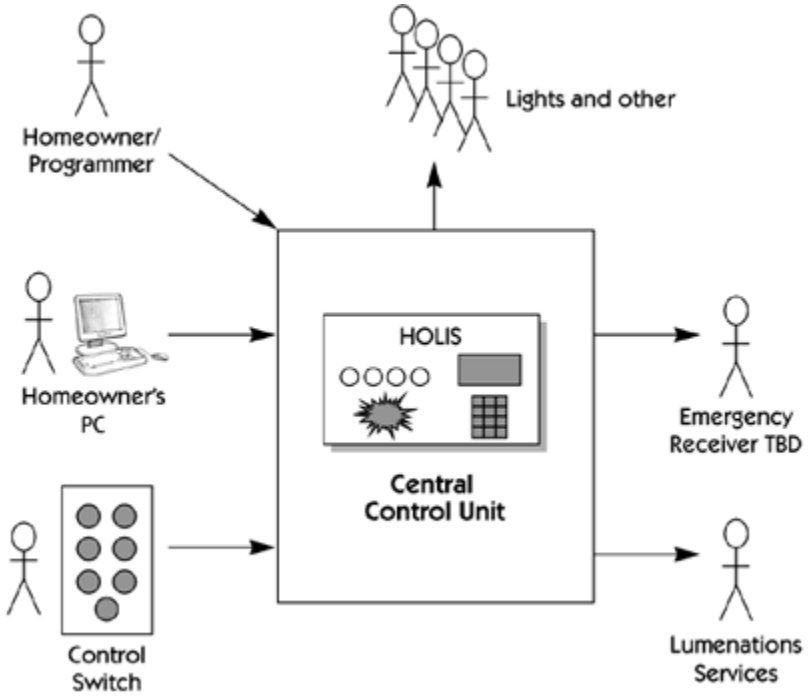


Figure A-5. Central Control Unit subsystem with actors



Actor Survey

A number of actors will interact with HOLIS (Table A-4).

Table A-4. Actors for HOLIS

Actor	Comments
Lights and other	Output devices, lights and dimmer controls, others to be determined
Homeowner/ Programmer	Homeowner programs direct to Central Control Unit or through programmer PC
Emergency Receiver	Unknown; under investigation
Resident	Homeowner using Control Switch to change lighting
Lumenations Services	Lumenations employees supporting remote programming and maintenance activities

Stakeholder Survey

HOLIS has a number of nonactor stakeholders, both external and internal (Table A-5).

Table A-5. Nonactor Stakeholders for HOLIS

Stakeholder	Comments
External	Lumenations' direct customer
Distributors	
Builders	Lumenations' customer's customer: the general contractor responsible to the homeowner for the end result
Electrical contractors	Responsible for installation and support
Internal	Lumenations' team
Development team	
Marketing/product management	Will be represented by Alyssa, product manager
Lumenations' general management	Funding and outcome accountability

Constraints Imposed on the Solution

Over a period of 45 days at the beginning of the product development effort, the HOLIS development team and Lumenations management identified, discussed, and agreed on the constraints listed in Table A-6.

Table A-6. Constraints for the HOLIS project

ID #	Description	Rationale
1	Version 1.0 will be released to manufacturing by January 5.	This is the only product launch opportunity this year.

2	The team will adopt UML modeling, OO-based methodologies, and the Unified Software Development Process.	We believe these technologies will provide increased productivity and more robust systems.
3	The software for the Central Control Unit and PC Programmer will be written in Java. Assembly language will be used for the Control Switch.	These choices provide consistency and maintainability; also, the team knows these languages.
4	A prototype system *must* be displayed at the December Home Automation trade show.	We want to take distributors' orders for the first quarter of the fiscal year.
5	The microprocessor subsystem for the Central Control Unit will be copied from the professional division's advanced lighting system project (ALSP).	We can use an existing design and an inventoried part.
6	The only PC Programmer configuration supported will be compatible with Windows 2000 and Windows XP.	This way we can better manage the scope for release 1.0.
7	The team will be allowed to hire two new full-time employees, after a successful inception phase, with whatever skill set is determined to be necessary.	The maximum allowable budget expansion limits us to two new hires.
8	The KCH5444 single-chip microprocessor will be used in the Control Switch.	The company already uses this microprocessor.
9	Purchased software components will be permitted as long as there is no continuing royalty obligation to the company.	We want to avoid any long-term cost of goods sold impact for software.

Team Skill 2: Understanding User and Stakeholder Needs

Summary of User Needs as Collected from Interviews

A number of homeowners, two distributors, and one electrical contractor were interviewed.

From the homeowner's perspective:

- Flexible and modifiable lighting control for entire house
- "Futureproof" ("As technology changes, I'd like compatibility with new technologies that might emerge.")
- Attractive, unobtrusive, ergonomic
- Fully independent and programmable or (reconfigurable) switches for each room in the house
- Additional security and peace of mind
- Intuitive operation ("I'd like to be able to explain it to my 'technophobic' mother.")
- A reasonable system cost, with low switch costs
- Easy and inexpensive to fix
- Flexible switch configurations (from one to seven "buttons" per switch)
- Out of sight, out of mind
- 100 percent reliability
- Vacation security settings
- Ability to create scenes, such as special housewide lighting settings for a party
- No increase in electrical or fire hazards in the home
- Ability, after a power failure, to restore the lights the way they were
- Programmable by the homeowner, using an existing PC
- Dimmers wherever the homeowner wants them
- Programmable by the homeowner, without using a PC
- Programmable by somebody else, so the homeowner doesn't have to do it
- Ability to turn on some lights manually if the system fails
- Interfaces to the home security system
- Interfaces to other home automation (HVAC, audio/video, and so on)

From the distributor's perspective:

- A competitive product offering
- Some strong product differentiation
- An easy way to train salespeople
- Ability to demonstrate the system in the shop
- High gross margins

The Requirements Workshop

While the interviewing process was under way, the development team met with marketing and decided to hold a requirements workshop for the HOLIS project. They invited the attendees listed in Table A-7.

Table A-7. Attendees of the HOLIS Requirements Workshop

Name	Role	Title	Comments
Rick	Facilitator	Director of marketing	
Alyssa	Participant	HOLIS product manager	Project champion
Marcy	Participant	Software development manager	Development responsibility for HOLIS
Lucy	Participant		Prospective homeowner
Elmer	Participant		Prospective homeowner
E.C.	Participant	CEO, Automation Equip	Lumenations' largest distributor
Raquel	Participant	GM, EuroControls	Lumenations' European distributor
Betty	Participant	President, Krystel Electric	Local electrical contractor
Rusty	Participant	President, Rosewind Construction	Custom homebuilder
Emily	Observer	VP and GM, Lumenations	
Various members	Observer	Development team	All team members who were available

The Workshop

Prior to the workshop, the team put together a warm-up package consisting of:

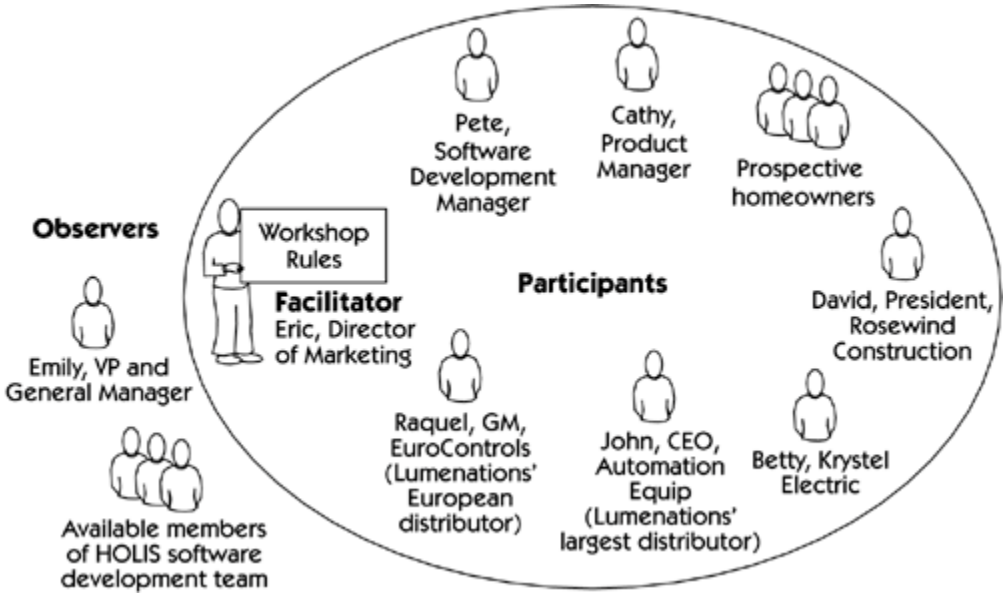
- A few recent magazines articles highlighting the trends in home automation
- Copies of selective interviews that had been conducted
- A summarized list of the needs that had been identified to date

Rick brushed up on his facilitation skills, and Alyssa handled the logistics for the workshop.

The Session

The session was held at a hotel near the airport and began promptly at 8 A.M. Rick introduced the agenda for the day and the rules for the workshop, including the workshop tickets. Figure A-6 provides a perspective on the workshop.

Figure A-6. HOLIS requirements workshop structure



In general, the workshop went very well, and all participants were able to have their input heard. Rick did a fine job of facilitating, but one awkward period occurred when Rick got into an argument with Alyssa about priorities for a couple of features. (The team members decided that for any future workshop, they would bring in an outside facilitator.) Rick led a brainstorming session on potential features for HOLIS, and the team used cumulative voting to decide on relative priorities. Table A-8 shows the results.

The Analysis of Results

The results of the process turned out as expected, except for two significant items.

1. "Built-in security" appeared very high on the priority list. This feature had been mentioned in previous interviews but had not made it to the top of anyone's priority list. After a quick offline review, Alyssa noted that built-in security, such as the ability to flash lights, an optional horn, and optional emergency call-out system, was apparently not offered by any competitive system. The distributors commented that although they were surprised by this input, they felt that it *would* be a competitive differentiation and agreed that this should be a high-priority feature. Betty and Rusty agreed. Based on this conclusion, marketing decided to include this functionality and to position it as a unique, competitive differentiator in the marketplace. This became one of the *defining features* for HOLIS.

Table A-8. Features from the HOLIS Workshop, Sorted by Priority

ID	Features	Votes
23	Custom lighting scenes	121
16	Automatic timing settings for lights and so on	107
4	Built-in security features: lights, alarms, and bells	105
6	100 percent reliability	90
8	Easy-to-program, non-PC control unit	88
1	Easy-to-program control stations	77
5	Vacation settings	77
13	Any light can be dimmed	74
9	Uses my own PC for programming	73
14	Entertain feature	66
20	Close garage doors	66
19	Automatically turn on closet lights when door opened	55
3	Interface to home security system	52
2	Easy to install	50
18	Turn on lights automatically when someone approaches a door	50
7	Instant lighting on/off	44
11	Can drive drapes, shades, pumps, and motors	44
15	Control lighting and so on via phone	44

ID	Features	Votes
10	Interfaces to home automation system	43
22	Gradual mode: slowly increase/decrease illumination	34
26	Master control stations	31
12	Easily expanded when remodeling	25
25	Internationalized user interface	24
21	Interface to audio/video system	23
24	Restore after power fail	23
17	Controls HVAC	22
28	Voice activation	7
27	Web site–like user presentation	4

2. In addition, feature 25, "Internationalized user interface," did not get a lot of votes. (This seemed to make sense to the team because the U.S.-based homeowners could not have cared less about how well the product sold in Europe!) The distributor, however, stated flatly that if the product was not internationalized at version 1.0, it would *not* be introduced in Europe. The team noted this position and agreed to explore the level of effort necessary to achieve internationalization in the 1.0 release.

HOLIS System-Level Use-Case Model Survey

Table A-9 lists some of the use cases for the HOLIS project. Note that the remainder of the use cases are deleted for brevity; a total of 20 system-level use cases are defined for v1.0 release.

Table A-9. HOLIS Use Cases

Name	Description	Actor(s)
Create Custom Lighting Scene	Resident creates a custom lighting scene.	Resident, Lights
Initiate Emergency Receiver	Resident initiates emergency action.	Resident

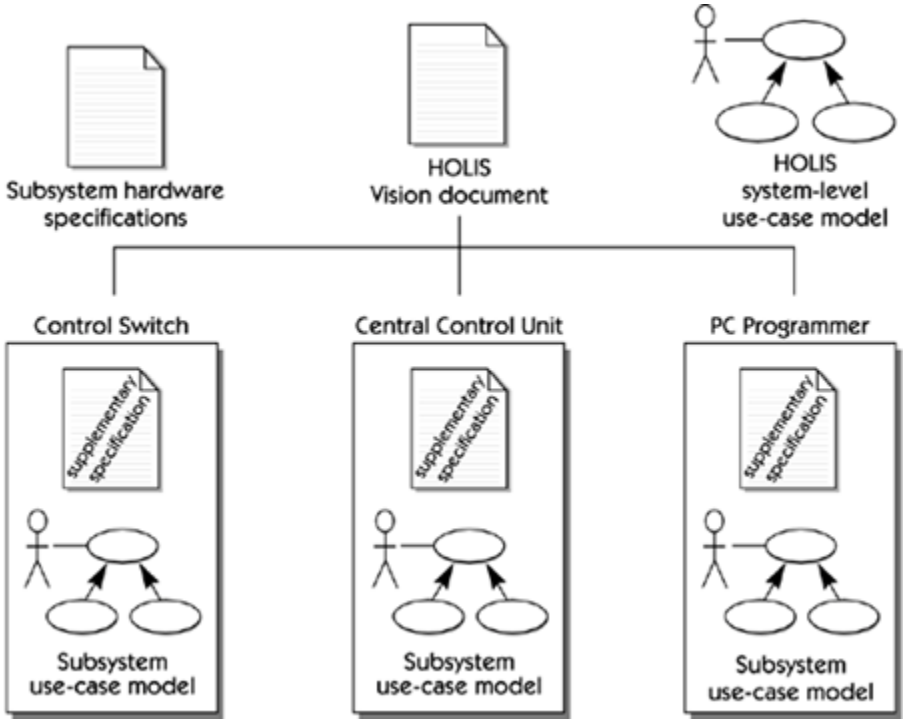
Name	Description	Actor(s)
Control Light	Resident turns light(s) on or off or sets desired dim effect.	Resident, Lights
Program Switch	Homeowner/Programmer changes or sets the actions for a particular button/switch.	Homeowner/ Programmer
Remote Programming	Lumenations service provider does remote programming based on request from Resident.	Lumenations Services
On Vacation	Homeowner/Programmer sets vacation setting for extended away period.	Homeowner/ Programmer
Set Timing Sequence	Homeowner/Programmer sets time-based automated lighting sequence.	Homeowner/ Programmer

Team Skill 3: Defining the System

HOLIS Requirements Organization

Figure A-7 shows the HOLIS requirements organization.

Figure A-7. Organization of HOLIS requirements information



HOLIS Vision Document

We present an abbreviated form of the HOLIS Vision document here, with many sections omitted. A full, generic Vision document template, which you might wish to adapt for your purposes, appears in Appendix B.

Lumenations, Ltd.

HOLIS Vision Document

REVISION HISTORY			
Date	**Revision**	**Description**	**Author**
1/21/03	1.0	Initial version	Alyssa
2/11/03	1.1	Updated after requirements workshop	E. Green

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- A reasonable system cost, with low switch costs
- Easy and inexpensive to fix
- Flexible switch configurations (from one to seven “buttons” per switch)
- Out of sight, out of mind
- 100 percent reliability
- Vacation security settings
- Ability to create scenes, such as special housewide lighting settings for a party
- No increase in electrical or fire hazards in the home
- Ability, after a power failure, to restore the lights the way they were
- Programmable by the homeowner, using an existing PC
- Dimmers wherever the homeowner wants them
- Programmable by the homeowner, without using a PC
- Programmable by somebody else, so the homeowner doesn't have to do it
- Ability to turn on some lights manually if the system fails
- Interfaces to the home security system
- Interfaces to other home automation (HVAC, audio/video, and so on)

2.4.2 From the Distributor's Perspective

- A competitive product offering
- Some strong product differentiation
- An easy way to train salespeople
- Ability to demonstrate the system in the shop
- High gross margins

2.5 Alternatives and Competition

3 Product Overview

3.1 Product Perspective
3.2 HOLIS Product Position Statement

For	homeowners building new, high-end homes
Who	would like to enhance their residence and their convenience, comfort, and safety
HOLIS	is a home lighting automation system
That	brings unprecedented, state-of-the-art lighting automation functionality, with ease of use and a reasonable price.
Unlike	the Lightomation Systems series from Skowron's Industrial Controls
Our product	combines the very latest in home automation functionality with built-in security features, and costs less to install and to maintain.

3.3 Summary of Capabilities
3.4 Assumptions and Dependencies

3.5 Cost and Pricing

4 Feature Attributes

4.1 Status
4.2 Priority
Apply a *critical, important*, *useful* prioritization scheme.
4.3 Effort
Low, medium, and *high* as set by the development team.
4.4 Risk
Set by development team.
4.5 Stability
4.6 Target Release
4.7 Assigned to
4.8 Reason

5 Product Features

5.1 Critical Features for v1.0

- Fea23: Custom lighting scenes. The system gives the homeowner the ability to create up to TBD custom lighting scenes. Each scene provides a preset level of illumination for each lighting bank throughout the residence. Scenes may be activated from either the Control Switch or the Central Control Unit.
- Fea16: Automatic lighting settings. The homeowner can create preset, time-based schedules for certain lighting events to happen.
- Fea4: Security sequence. The system has a built-in security feature that provides a one-button, panic alarm emergency sequence activation from any control switch in the house. The security sequence sets the lights to a predetermined scene setting and will also (optionally for each) flash the lights, activate an alarm, make a dial-up call to a predetermined number, and deliver a voice-based preprogrammed message. The system also closes a relay contact, which homeowners can use to control devices of their choice.
- Fea6: Reliability. Our homeowners have repeatedly stressed that the system be as close to 100 percent reliable as possible. This is a particular concern with the security sequence.

(Remainder of features deleted for brevity.)
5.2 Important Features for v1.0

- Fea20: Garage door control. The system supports the garage door as one of the controlled output devices. The software must manage the control of the output accordingly and will need to provide a garage door metaphor/ icon and support for programming the feature.
- Fea2: Smart install. Ease of installation has been a key concern of our distributor/customers and will be a key differentiator for us with our channels organization. The software should support this need by whatever

means are determined to be reasonable and viable. This could include online help for an installer's guide and instruction manual, a troubleshooting guide, in-process status assessment indication, automated fault detection, and so on.

(Remainder of optional features deleted for brevity.)

5.3 Future Features

Appendix A in the Vision document lists features that have been identified for possible future versions of the system. Although we agree that no significant investment is to be made in these in v1.0, we do ask that the marketing and engineering teams review this list and, wherever possible, keep these needs in mind as the design and development of the v1.0 system proceeds.

7 Other Product Requirements

7.1 Applicable Standards
7.2 System Requirements
7.3 Licensing, Security, and Installation
7.4 Performance Requirements

8 Documentation Requirements

8.1 User Manual
8.2 Online Help
8.3 Installation Guides, Configuration, Read Me File
8.4 Labeling and Packaging

9 Glossary

Appendix A Future Features Identified in Requirements Workshop
Appendix B Storyboard as Presented to Workshop Attendees
Appendix C Exemplary Use Cases

Team Skill 4: Managing Scope

After the requirements workshop, the team was chartered with the responsibility to assess the level of effort for each feature and to come up with a first draft of the v1.0 baseline. It was necessary to apply rigorous scope management because of the constraints on the team, including the “drop dead” date of having a prototype available at the trade show in December and the (even tougher) date of a release to manufacturing in January. The team used the high-medium-low heuristic to estimate the level of effort for each feature and then added the risk assessment for each feature. The team went on to perform the suggested scope management activities, with the results shown in Tables A-10 and A-11.

Table A-10. Prioritized HOLIS Features List with Effort and Risk Estimates

ID	Feature	Votes	Effort	Risk
23	Custom lighting scenes	121	Med	Low
16	Automatic timing settings for lights and so on	107	Low	Low
4	Built-in security features: lights, alarms, and bells	105	Low	High
6	100 percent reliability	90	High	High
8	Easy-to-program, non-PC control unit	88	High	Med
1	Easy-to-program control stations	77	Med	Med
5	Vacation settings	77	Low	Med
13	Any light can be dimmed	74	Low	Low
9	Uses my own PC for programming	73	High	Med
14	Entertain feature	66	Low	Low
20	Close garage doors	66	Low	Low
19	Automatically turn on closet lights when door opened	55	Low	High
3	Interface to home security system	52	High	High
2	Easy to install	50	Med	Med
18	Turn on lights automatically when someone approaches a door	50	Med	Med
7	Instant lighting on/off	44	High	High
11	Can drive drapes, shades, pumps, and motors	44	Low	Low
15	Control lighting and so on via phone	44	High	High

ID	Feature	Votes	Effort	Risk
10	Interfaces to home automation system	43	High	High
22	Gradual mode: slowly increase/decrease illumination	34	Med	Low
26	Master control stations	31	High	High
12	Easily expanded when remodeling	25	Med	Med
25	Internationalized user interface	24	Med	High
21	Interface to audio/video system	23	High	High
24	Restore after power fail	23	N/A	N/A
17	Controls HVAC	22	High	High
28	Voice activation	7	High	High
27	Web site–like user presentation	4	Med	Low

Table A-11. Baseline for HOLIS v1.0 Features

ID	Feature	Votes	Effort	Risk	Marketing Comments
23	Custom lighting scenes	121	Med	Low	As flexible as possible
16	Automatic timing settings for lights and so on	107	Low	Low	As flexible as possible
4	Built-in security features: lights, alarms, and bells	105	Low	High	Marketing to do more research
6	100 percent reliability	90	High	High	Get as close to 100 percent as possible
8	Easy-to-program, non-PC control unit	88	High	Med	Provide dedicated controller

ID	Feature	Votes	Effort	Risk	Marketing Comments
1	Easy-to-program control stations	77	Med	Med	As easy as feasible with measured effort
5	Vacation settings	77	Low	Med	
13	Any light can be dimmed	74	Low	Low	
9	Uses my own PC for programming	73	High	Med	Only one configuration supported in v1.0
25	**Internationalized CCU user interface**	24	Med	Med	Per agreement with European distributor
14	~~Entertain feature~~	~~66~~	~~Low~~	~~Low~~	(Not applicable, included in 23)
7	Instant lighting on/off	44	High	High	Make intelligent investments
	v1.0 Mandatory Baseline: Everything above the line must be included or we will delay release.				
20	Close garage doors	66	Low	Low	May be little impact on software
2	Easy to install	50	Med	Med	Level of effort basis
11	Can drive drapes, shades, pumps, and motors	44	Low	Low	May be little impact on software
22	Gradual mode: slowly increase/ decrease illumination	34	Med	Low	Nice if we can get it
	v1.0 Optional: Do as many of the preceding as you can. (Alyssa)				
	Future Features: Below this line, no current development.				
29	**Internationalized PC Programmer interface**	**N/A**	**High**	**Med**	**Will become mandatory for version 2.0**

ID	Feature	Votes	Effort	Risk	Marketing Comments
3	Interface to home security system	52	High	High	Can we at least provide a hardware interface? (Rick)
19	Automatically turn on closet lights when door opened	55	Low	High	
19	Automatically turn on closet lights when door opened	55	Low	High	
18	Turn on lights automatically when someone approaches a door	50	Med	Med	
15	Control lighting and so on via phone	44	High	High	
10	Interfaces to home automation system	43	High	High	
26	Master control stations	31	High	High	
12	Easily expanded when remodeling	25	Med	Med	
21	Interface to audio/video system	23	High	High	
24	Restore after power fail	23	N/A	N/A	
17	Controls HVAC	22	High	High	
28	Voice activation	7	High	High	
27	Web site–like user presentation	4	Med	Low	

Team Skill 5: Refining the System Definition

HOLIS Sample Use Case: Control Light

Revision History			
Date	**Issue**	**Description**	**Author**
4/14/03	1.0	Initial creation of Control Light use case	Mark
4/15/03	1.1	Added second pre-condition to clarify operation	Gavin, QA lead

Brief Description

This use case prescribes the way in which lights are turned on and off and also how they are dimmed and brightened in accordance with how long the user presses a button on the Control Switch.

Basic Flow

Basic flow begins when the Resident presses the On/Off/Dim button on the Control Switch. When the Resident removes pressure on the On/Off/Dim button within the timer period, the system "toggles" the state of the light as follows.

- If the light is On, the light is then turned Off, and there is no illumination.
- If the light is Off, the light is then turned On to the last remembered brightness level.

End of basic flow.

Alternative Flow of Events

When the Resident holds down the On/Off/Dim button for more than 1 second, the system initiates a brightening/dimming activity for the room's Light Bank.

While the Resident continues to press the On/Off/Dim button:

1. The brightness of the controlled light is smoothly increased to a system-wide maximum value at a rate of 10 percent per second.
2. When the brightness reaches its maximum value, the brightness of the controlled light is then smoothly decreased to a system-wide minimum value at a rate of 10 percent per second.
3. When the brightness reaches its minimum value, the use case continues at subflow step 1.

When the Resident releases the On/Off/Dim button:

1. The use case terminates and the brightness stays at the current level.

Pre-conditions for Control Light Use Case

- The selected On/Off/Dim button must be Dim Enabled.
- The selected On/Off/Dim button must be preprogrammed to control a Light Bank.

Post-condition for Control Light Use Case

On leaving this use case, the system remembers the current brightness level for the selected On/Off/Dim button.

Extension Points

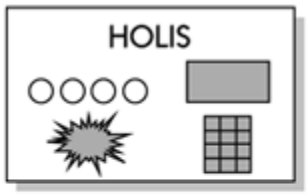
None.

Special Requirements

Performance: For any action that is perceptible to the Resident, the response time from a control panel action to system response must be less than 50 milliseconds.

HOLIS Central Control Unit Supplementary Specification

For brevity, we present excerpts from the HOLIS supplementary specification here. Appendix D in this book contains a generic, annotated supplementary specification template you might wish to adopt.



Central
Control Unit

1 Introduction

1.1 Purpose
This is the supplementary specification for the v1.0 release of the HOLIS Central Control Unit (CCU) subsystem.
1.2 Scope
This specification is for the CCU only
1.3 References

- HOLIS Vision Document
- HOLIS System Level Hardware Specification
- HOLIS System-Level Use-Case Model
- HOLIS Control Switch Use-Case Model and Supplementary Specification
- HOLIS PC Programmer Use-Case Model and Supplementary Specification

1.4 Assumptions and Dependencies

2 Functionality

SR1. OnLevel illumination parameter. Each controlled lighting bank that is Dim Enabled is controlled by the parameter OnLevel, which controls the percent of illumination to the light. The nine possible OnLevel settings are 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, and 90%.
SR2. The system supports up to 255 event-time schedules. The allowable programming precision of an event-time schedule shall be 1 minute.
SR3. Event-time schedules can be programmed on either a 12-hour or a 24-hour clock. The user shall enter the data in the following format:

```
Event number (1–256), Time of day (in 24-hour HH:MM format)
```

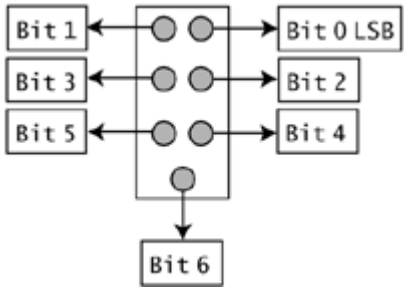
SR4. Message protocol from Control Switch. Each button press on the control initiates a single 4-byte message to the CCU. The message protocol is as follows.

Address of sending device	Message number	Data	Checksum

The data fields in the message are mapped as follows.

SR4.1. **Address** 0–254, the logical address of the specific control switch sending the message
SR4.2. **Message Number** 0–255. Message numbers supported are

1. Normal key press
2. Emergency
3. Held down for the last 0.5 second



SR4.3. **Data**, each bit corresponding to a specific button on the key switch.

SR4.4. Message Acknowledgment. In reply to the message from the Control Switch, the CCU shall respond with the following message.

[55]	[FF]	Received data	Checksum

where `55` (hex) is the dedicated address of the CCU, `FF` (hex) is the Acknowledge Message code, `Received data` returns the data byte received from the CCU, and `Checksum` is the calculated checksum for the returned message.

3 Usability

4 Reliability

SR9. System availability must be greater than or equal to 99.99%.

SR10. The CCU shall have no defects that can interfere with normal operation of the homeowner's residence.

5 Performance

SR11. HOLIS shall execute event-time schedules with an accuracy of 1 minute ±5 seconds as measured by the system clock.

6 Supportability

7 Design Constraints

DC1. Control subsystem design is based on the controller module from the ALSP product line. BIOS should not be modified unless absolutely necessary.

DC2. The use case and supporting infrastructure for the emergency sequence must be validated to the highest reasonable commercial reliability standards.

8 Documentation Requirements

SR27. HOLIS ships with a Product Guide. The Product Guide contains all application guides, process guides, installation guides, tutorials, and glossary. The Product Guide is created as an HTML online guide. All applications needing to reference help link to the Product Guide. Microsoft Word copies of each of the guide sections are also shipped with the product.

SR29. The Installation Guide found in the Product Guide is also printed and shipped with the CD-ROM.

9 Purchased Components

10 Interfaces

10.1 User Interfaces

10.2 Hardware Interfaces
10.3 Software Interfaces
10.4 Communications Interfaces

11 Licensing, Security, and Installation Requirements

11.1 CCU Licensing Requirements

SR53. CCU software is factory installed and there are no user licensing or installation requirements.

11.2 Sublicensing Requirements

SR54. The Datamatch Java Library from the Oxford Foundation is incorporated in the application. The end user documentation included with the redistribution must include the following acknowledgment.

> *This product includes software developed by the Oxford Software Foundation (*http://www.Oxfordxfound.org/*).*

Alternately, this acknowledgment may appear in the software itself, if and wherever such third-party acknowledgments normally appear.

12 Legal, Copyright, and Other Notices

SR72. All code, product documents, online help, user interfaces, and About dialogs must contain the following copyright message.

> *Copyright © 2003-2004 Lumenations, Ltd. All rights reserved.*

SR75. Flash the standard corporate copyright notice, corporate logo, and HOLIS product logo for a minimum of 5 seconds during startup mode.
SR76. In idle mode, (when no programming is active), the display shall show the HOLIS logo.

13 Applicable Standards
14 Internationalization and Localization

SR89. All data processing components support UTF-8 character encoding.
SR90. All output text files must be ISO-8859-1 and –2 encoded. This supports all Latin-1 and Cyrillic languages.
SR97. The following are acceptable input content text file encodings: ASCII, Latin-1&2 (ISO-8859-1&2), UTF-8.

15 Physical Deliverables
16 Installation and Deployment
Appendix A Glossary

Team Skill 6: Building the Right System

HOLIS Sample Test Case 01: Test Control Light

REVISION HISTORY			
Date	**Revision**	**Description**	**Author**
4/14/03	1.0	First draft	Luis R.
4/15/03	1.1	Correction to increase/decrease rate	Bob S.

Description

This test case, used to test instances of the use case Control Light, is used only to test dim-enabled Control Switch buttons that have been preassigned to a light bank.

Note
Run the test case multiple times and with different lengths of hold-button time to verify that the system is restoring OnLevel properly.

Test Case ID	Scenario	Description	Condition: Button Pressed < Timer Period	Condition: Button Pressed > Timer Period	Condition: Button Released After Being Held	Condition	Expected Result
1	1	Basic flow: Resident releases button before timer period ends	< 1 sec. in .1-sec. intervals	I	N/A	Light on	Light goes off

Test Case ID	Scenario	Description	Condition: Button Pressed < Timer Period	Condition: Button Pressed > Timer Period	Condition: Button Released After Being Held	Condition	Expected Result
2	1	Basic flow: Resident releases button before timer period ends	< 1 sec. in .1-sec. intervals	I	N/A	Light off	Light goes on
3	2	Alternate flow: Resident continuously presses button for longer than timer period	I	1–60 sec.	N/A	N/A	Light level goes up and down continuously
4	3	Resident releases switch after continuously pressing button	I	I	V	N/A	Light stays at last brightness

HOLIS Sample Test Case 02: Test Round-Trip Message Protocol

REVISION HISTORY			
Date	**Revision**	**Description**	**Author**
4/14/03	1.0	First draft	Adrienne

Description

This test case tests the round-trip message protocol between the CCU and the Control Switch according to the requirements defined in the CCU Supplementary Specification. This test case tests the following requirements from the CCU and Control Switch Supplementary Specifications.

CCU Supplementary Specs	Control Switch Supplementary Specs
SR4, SR4.1, SR4.2, SR4.3, SR4.4	CSSR88, CSSR91–97, CSSR100–107 [*]

[*] Note to file: The table above can be deleted after the traceability matrix is established. To minimize maintenance, the trace matrix is the only place we will maintain these links.

Events

Test Case ID	Event Description	Input 1	Input 2	Expected Result
5300	Press switch button 0 on Control Switch 1 and initiate message from CS to CCU.	Button only		CCU message-received indicator is lit, and CS message-received indicator is lit.
5301	Examine received message in diagnostic line of CCU display.			[01][01][01][5A]
5302	Examine sent message in CCU display.			[55][FF][01][F7]
5303	Press Control Switch buttons 0–5 simultaneously and hold for 3 seconds.	All buttons depressed 3+ seconds		CCU message-received indicator is lit. Three messages should be in the message display buffer.
	Examine message 1.			[01][01][3F][3C]
	(Remainder of test case deleted for brevity.)			