Control My Home

PS00042

Artifacts and Deliverables

Presented to
Professor Osama Eljabiri
CIS-491-102

Wednesday, February 23, 2005
Submitted by

Valeria Ceballos
Vincent DiPrenda
Ahsan Chowdhury
Imran Hussain
Masaru Ito
Roy Zacheria

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1. Project Overview

1.1 Project Idea

There has come a point where the technology exists and it is inexpensive enough to develop and deploy “smart home” technology. With soaring fuel prices, the cost savings in fuel alone can justify the cost of smart homes to consumers. The final piece of technology, cable modems, have made it possible to deliver smart home technology to the masses. The ability to control these homes can now be done remotely. With the addition of several new web services, there is also the possibility of smart homes negotiating prices automatically with suppliers such as PSE&G.

When developed and deployed, the ControlMyHome project would deliver remote control capability to anyone with a cable modem or DSL connection. Using emerging Java embedded technology, it’s now possible to deliver the components at a cost effective price, and to provide robust functionality. Some of the items needed to complete the project would include: (1) an embedded Java system to service HTTP requests. It would be written or acquired, and would possibly provide J2EE functionality in the form of either JSP or Servlet constructs. (2) A system that has the capability of working with a lightweight protocol and a mini-network would reside through out the home. (3) Finally, an infrastructure that will be able to house devices that can communicate with common household appliances. Appliances such as lights, etc., will have simple communication capabilities, while more advanced features would be available to set off alarms, like for example, the failure of a critical system such as a sump pump. Finally, the system should be able to communicate with microcontrollers in general.

As the base of our product, a predefined protocol will be examined that can speak to common microcontroller devices, such as the MicroChip PIC16F84. These microcontrollers lend themselves to more intelligent appliances such as thermostats and dishwashers. As a final deliverable, this project would demonstrate the capability of the items described above. A hardware platform will be chosen, acquired, and engineered to specifications. The hardware and software would be married to produce the final project. This project will most likely require moderate to heavy expertise in Java, preferably in J2EE. A good understanding of web-based technologies like XML will also be necessary. In addition, a candidate with a computer engineering background who has the ability to design and prefabricate interface devices will be needed.

1.2 Project Scope

The ControlMyHome project will include the following components:

- A **single board web server**, capable of being controlled remotely from the web. This server will manipulate devices on a proprietary 1-Wire bus. These devices include iButton devices and the Dallas Semiconductor family of 1-Wire devices.
- A **simple web service**, emulating the mechanics of a simple consumer-producer model.
- A **simple microcontroller with a predefined API**, simulating interaction with common microcontroller devices found in household appliances.

The ControlMyHome project will not include:

- **Security** – There will be no logins, security functions, cookies, or history records associated with the application.
- **Logging** – The system will not provide an audit trail of transactions conducted within the system. However, HTTP requests will be captured in a log.
- **Multi-user capability** – The core application will be designed to work with one user and therefore, will not provide capability for multi-sessions, context switching, or the ability to make devices accessible for more than one user.
- **Complicated network topology** – While a Dallas Semiconductor 1-Wire bus can be built with sophisticated functionality, the application will not exploit it. For this project, a simple 1-Wire bus with devices connected in series will be used.

1.3 Project Approval

This project idea was submitted on January 25, 2003 to Professor Osama Eljabiri in the 102 section of the CIS 491 course. Professor Eljabiri granted verbal approved on February 7, 2003.

1.4 Defining Preliminary Resources

1.4.1 Securing Core Resources

Through a formal application process, résumés and project applications were submitted to Professor Eljabiri. The group was officially formed on February 11, 2003. The members are listed in Table 1, and their Certification Forms, as well as their application forms, are included in the following pages.

Name	Position
Vincent DiPrenda	Project Manager
Imran Hussain	Architect
Valeria Ceballos	Analyst
Masaru Ito	Developer
Roy Zacheria	Developer
Ahsan Chowdhury	Front End Designer

Table 1 - Control My Home Staff

1.4.2 Team Certification

Team Certification Form

- **Team/group Name (in WebCT):**
- **Project Code: PS00042**
- **Project Title: ControlMyHome**
- **Number of Members: 6**
- **Semester and Year: Spring, 2003**
- **Date of Submission: 2/11/2003**

Team members:

Member 1: Vinnie DiPrenda Project Manager WebCT login id: vjd2 vdiprenda@comcast.net 973-857-1895	**Member 5:** Roy Zacheria Position (in the team): Programmer Rpz2 Rpz2@njit.edu C: 201-259-0153
Member 2: Valeria Ceballos Analyst WebCT login id: vzc9194 Ceballos95@aol.com 973-458-1454	**Member 6:** Ahsan Chowdhury Front End Designer Azc2 Azc2@njit.edu 732-796-5490
Member 3: Mohammad Imran Hussain Architect WebCT login id: mih2 Imran_1970@hotmail.com 908-231-1495	
Member 4: Masaru Ito Programmer WebCT login id: mxi0842 mxi0842@njit.edu C: 201-218-4891	

Project Manager Signature: (Vincent DiPrenda)

Team Position Application (To become a member)

- **Full Name: VALERIA Z. CEBALLOS**
- **Specialization (CS, IS or IT): CS**
- **Date of Today: February 6, 2003**
- **WebCT ID:**
- **Project Idea (you have chosen get code and name from WebCT):**
- **Project Team you wish to join (get name from WebCT):**
- **Team Project manager Name: VINCENT DiPrenda**
- **General Job Experience (if any): none**
- **Academic Awards / Achievements: "Academic Achievement Awards" by SSSP and PCCC**
- **Research Work (theoretical and/or empirical):**

- **Position you are applying for (check ONLY one)**

(Please Read Syllabus For Detailed Responsibilities and Required Qualifications – Note: For a project manager position, use project manager application form NOT this one):

☒ **P01 System Analyst**
(Knowledge of requirements analysis techniques and modeling (including use cases) is important)

☒ **P0301 Database Designer**

(Knowledge of ERM, SQL, and normalization is important)

☐ **P0302 Network Designer**
(Knowledge of topologies, protocols and web networking is important)
☐ **P0303 Architectural Designer**
(Knowledge of software engineering, architectural models, OO models is important)
☐ **P04 Front-end designer**
(Knowledge of user interface design, GUI components, and cognitive psychology is important)
☐ **P05 Programmer**
(Knowledge of at least one programming language is a must)
☐ **Other, please specify below (*subject to availability*):**
[ ]

- **Indicate in what programming languages/environments/tools/DBMS packages are you more skilful**

(Select all that apply):

☒**C++** ☐**Java** ☐**Visual Basic** ☐ **Delphi** ☐ **Python** ☐ **Cobol** ☐**Pascal** ☐**C** ☐**HTML** ☐**Java Script**

☐**Dream weaver** ☐**Cold Fusion** ☐**XML** ☐**ActiveX** ☐**Oracle** ☐**Access** ☐**Eiffel** ☐**Fortran** ☐ **Prolog**

☐**Java Beans**

☐**Other (Please specify):**

- **Do you master any CASE tool(s) (Please specify ALL THAT APPLY below)?**

☐**MS project management** ☐**MS Visio** ☐**Smart Draw** ☐**Power Designer** ☐**Ms Front Page** ☐ **Designer 2000** ☐**Other (Please specify):**

- **Position-Related mandatory courses achievements (Only A , B+ or B)**

Course No	Course Name	Grade achieved
CIS 114	INTRO TO CS II	A
CIS 435	ADV. DATA STRUC	B
CIS 375	DEV. OF WWW	A
CIS 431	DATABASE SYSTEM	A
MATH 450	CAPSTONE MATH	B

- **Position-Related elective courses and/or practical experience (in school):**

1-
2-
3-

- **Position-Related work experience (in industry)**

1-
2-
3-

- **Please explain why do you think your background/knowledge /skills will suit the position you are applying for and how can you contribute effectively to the overall success of the team you wish to join?**

  If it is for database systems, I can apply all the concepts and knowledge I learned in my cis431 class. I am currently taking cis434 which is the advanced database systems.
  I will apply all the skills I have to make my part on the project. I am willing to learn all the necessary material to finish/do this project.

- **What are your other software development skills in which the team can benefit from in addition to your major position (i.e.: analysis, design, implementation, testing, prototyping, etc.)?**

  I have not much experience in programming, but I am familiar with C++, Java, SQL, VAX Assembly Language. Also Windows 95,98,2000,NT,XP, MS Office.

Applicant Signature: Valeria Ceballos

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Project manager decision: ☐**Approved** ☐**Not Approved**
Reason for rejection:

☐**Team reached maximum limit (6 members)**
☐**Position already filled**
☐**Background insufficient for position**
☐**Other reason(s) , please specify :**
[ ]

Project manager Signature:

Instructor Review:
Instructor Signature:

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Team Position Application (To become a member)

- **Full Name: M Imran Hussain**
- **Specialization (CS, IS or IT): CIS**
- **Date of Today: 2/7/03**
- **WebCT ID: MIH2**
- **Project Idea (you have chosen :get code and name from WebCT): ControlMyHome**
- **Project Team you wish to join (get name from WebCT):**
- **Team Project manager Name : Vincent DiPrenda**
- **General Job Experience (if any): 8 years in the field of Computer Information Science as a Programmer / Analyst and Database Programmer**
- **Academic Awards / Achievements: Remote Utility System (RTU): I designed and implemented for a company in California (Rhodia).**
- **Research Work (theoretical and/or empirical): n/a**

- **Position you are applying for (check ONLY one)**

(Please Read Syllabus For Detailed Responsibilities and Required Qualifications – Note :For a project manager position , use project manager application form NOT this one):

☐ **P01 System Analyst**
(Knowledge of requirements analysis techniques and modeling (including use cases) is important)

☒ **P0301 Database Designer**

(Knowledge of ERM, SQL, and normalization is important)

☐ **P0302 Network Designer**
(Knowledge of topologies, protocols and web networking is important)
☐ **P0303 Architectural Designer**
(Knowledge of software engineering, architectural models, OO models is important)
☐ **P04 Front-end designer**
(Knowledge of user interface design, GUI components, and cognitive psychology is important)
☐ **P05 Programmer**
(Knowledge of at least one programming language is a must)
☐ **Other, please specify below (*subject to availability*):**
[ ]

- **Indicate in what programming languages/environments/tools/DBMS packages are you more skilful**

(Select all that apply):

☐**C++** ☐**Java** ☒**Visual Basic** ☐ **Delphi** ☐ **Python** ☐ **Cobol** ☐**Pascal** ☐**C** ☐**HTML** ☐**Java Script**

☐**Dream weaver** ☐**Cold Fusion** ☐**XML** ☒**ActiveX** ☒**Oracle** ☒**Access** ☐**Eiffel** ☐**Fortran** ☐ **Prolog**

☐**Java Beans**

☒**Other (Please specify): Business Objects, ADA, Crystal Reports, C and SQL**

- **Do you master any CASE tool(s) (Please specify ALL THAT APPLY below)?**

☐MS project management ☒MS Visio ☐Smart Draw ☐Power Designer ☐Ms Front Page

☐Designer 2000 ☐Other (Please specify):

- **Position-Related mandatory courses achievements (Only A , B+ or B)**

Course No	Course Name	Grade achieved
CIS 113	Introduction to Computer Science I	**A**
CIS 280	Programming Language Concepts	**A**
CIS 431	Database System Design and Management	**B+**

- **Position-Related elective courses and/or practical experience (in school):**

1-
2-
3-

- **Position-Related work experience (in industry)**

1- **Inventory Software for internal Use (2000, International Technidyne Corporation)**
2- **RTU (for Commercial Use ,1997 Monitoring Solutions, Inc)**
3- **Internet hit documentation (for Internal use, 1998 Internal Technidyne Corporation)**
4- **R&D Timesheet (for internal use, 2001 International Technidyne Corporation)**
5- **Data Collection Reports (1998-1999 for commercial use, Monitoring Solutions, Inc)**
6- **Data-Substitution, Part75 (1999 Monitoring Solutions, Inc for commercial use)**
7- **Business Objects Universes using Oracle 8i**

- **Please explain why do you think your background/knowledge /skills will suit the position you are applying for and how can you contribute effectively to the overall success of the team you wish to join ?**

Currently, I have been working as a database programmer for New Jersey Department of Environmental Protection. I am fluent in SQL and Entity-Relation models. Prior to DEP, I have worked for several years as a Visual Basic and ADA programmer. Overall, I have had eight years of experience in this field.

- **What are your other software development skills in which the team can benefit from in addition to your major position (i.e.: analysis, design, implementation, testing, prototyping, etc.)?**

I know fairly well Crystal Reports and Infomaker, if we decide to use report with this software. I have written Functional Specification and User Guides documents for ITC.

Applicant Signature:

Imran Hussain

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Project manager decision: ☐**Approved** ☐**Not Approved**
Reason for rejection:

☐**Team reached maximum limit (6 members)**
☐**Position already filled**
☐**Background insufficient for position**
☐**Other reason(s) , please specify :**
[ ]

Project manager Signature:

Instructor Review:
Instructor Signature:

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Team Position Application (To become a member)

- Full Name: **Masaru Ito**
- Specialization (CS, IS or IT): **Computer Science**
- Date of Today: **2003/02/06**
- WebCT ID: **mxi0842**
- Project Idea (you have chosen :get code and name from WebCT): **ControlMyHome**
- Project Team you wish to join (get name from WebCT):
- Team Project manager Name : **Vincent DiPrenda**
- General Job Experience (if any):
- Academic Awards / Achievements: A+ Certified (2002)
- Research Work (theoretical and/or empirical):

- **Position you are applying for (check ONLY one)**

(Please Read Syllabus For Detailed Responsibilities and Required Qualifications – Note :For a project manager position , use project manager application form NOT this one):

☐ P01 System Analyst
(Knowledge of requirements analysis techniques and modeling (including use cases) is important)

☐ P0301 Database Designer

(Knowledge of ERM, SQL, and normalization is important)

☐ P0302 Network Designer
(Knowledge of topologies, protocols and web networking is important)
☐ P0303 Architectural Designer
(Knowledge of software engineering, architectural models, OO models is important)
☐ P04 Front-end designer
(Knowledge of user interface design, GUI components, and cognitive psychology is important)
☒ **P05 Programmer**
(Knowledge of at least one programming language is a must)
☐ Other, please specify below (*subject to availability*):
[ ]

- **Indicate in what programming languages/environments/tools/DBMS packages are you more skilful**

(Select all that apply):

☒**C++** ☒**Java** ☒**Visual Basic** ☐ Delphi ☐ Python ☐ Cobol ☐Pascal ☒**C** ☒**HTML** ☒**Java Script**

☐Dream weaver ☐Cold Fusion ☒**XML** ☐ActiveX ☐Oracle ☐Access ☐Eiffel ☐Fortran ☐Prolog

☐Java Beans

☐Other (Please specify):

- **Do you master any CASE tool(s) (Please specify ALL THAT APPLY below)?**

☐MS project management ☐MS Visio ☐Smart Draw ☐Power Designer ☐Ms Front Page

☐Designer 2000 ☐Other (Please specify):

- **Position-Related mandatory courses achievements (Only A , B+ or B)**

Course No	Course Name	Grade achieved
CIS-113	Intro Computer Science I	B+
CIS-280	Programming Language Concepts	B+
CIS-333	Intro Unix Operating System	B

- **Position-Related elective courses and/or practical experience (in school):**

1- CIS-490 (Design in Software Engr)
2- CIS-375 (Applicatn Developmnt WWW)
3- CIS-251 (Computer Organization)

- **Position-Related work experience (in industry)**

1-
2-
3-

- **Please explain why do you think your background/knowledge/skills will suit the position you are applying for and how can you contribute effectively to the overall success of the team you wish to join ?**

As I am applying for a programming position, I have good knowledge of the programming languages noted above, so given a good design, I can probably be able to implement the project effectively.

- **What are your other software development skills in which the team can benefit from in addition to your major position (i.e.: analysis, design, implementation, testing, prototyping, etc.)?**

As I'm not too sure of the details of the other development stages, I am not sure how much of a benefit I can be, but I can probably help with the design and testing stages, besides the implementation stage.

Applicant Signature: *Masaru Ito*

Don't write below this line

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Project manager decision: ☐**Approved** ☐**Not Approved**
Reason for rejection:

☐**Team reached maximum limit (6 members)**
☐**Position already filled**
☐**Background insufficient for position**
☐**Other reason(s) , please specify :**
[ ]

Project manager Signature:

Instructor Review:
Instructor Signature:

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Team Position Application (To become a member)

- **Full Name:Roy Zachariah**
- **Specialization (CS, IS or IT): IT**
- **Date of Today:02-04-03**
- **WebCT ID:rpz2**
- **Project Idea (you have chosen :get code and name from WebCT):**
- **Project Team you wish to join (get name from WebCT):**
- **Team Project manager Name : Vincent DiPrenda**
- **General Job Experience (if any):**
- **Academic Awards / Achievements:**
- **Research Work (theoretical and/or empirical):**

- **Position you are applying for (check ONLY one)**

(Please Read Syllabus For Detailed Responsibilities and Required Qualifications – Note :For a project manager position , use project manager application form NOT this one):

☐ **P01 System Analyst**
(Knowledge of requirements analysis techniques and modeling (including use cases) is important)

☐ **P0301 Database Designer**

(Knowledge of ERM, SQL, and normalization is important)

☒ **P0302 Network Designer**
(Knowledge of topologies, protocols and web networking is important)
☒ **P0303 Architectural Designer**
(Knowledge of software engineering, architectural models, OO models is important)
☐ **P04 Front-end designer**
(Knowledge of user interface design, GUI components, and cognitive psychology is important)
☐ **P05 Programmer**
(Knowledge of at least one programming language is a must)
☐ **Other, please specify below (*subject to availability*):**
[ ]

- **Indicate in what programming languages/environments/tools/DBMS packages are you more skilful**

(Select all that apply):

☒C++ ☐Java ☐Visual Basic ☐ Delphi ☐ Python ☐ Cobol ☐Pascal ☐C ☒HTML ☐Java Script

☐Dream weaver ☐Cold Fusion ☐XML ☐ActiveX ☐Oracle ☐Access ☐Eiffel ☐Fortran ☐ Prolog

☐Java Beans

☐Other (Please specify):

- **Do you master any CASE tool(s) (Please specify ALL THAT APPLY below)?**

☐MS project management ☒MS Visio ☒Smart Draw ☐Power Designer ☒Ms Front Page

☐Designer 2000 ☐Other (Please specify):

- **Position-Related mandatory courses achievements (Only A , B+ or B)**

Course No	Course Name	Grade achieved
CIS 390	Analysis And System Design	B+
IT 420	Computer systems And Network	C
CIS 451	Data Comm And Networks	A

- **Position-Related elective courses and/or practical experience (in school):**

1-Worked in analyzing and designing part of the 390 project.(ONLINE BANKING SYSTEM)
2-Design a Palm Wireless Internet Kit for my IT 420 Project.
3-

- **Position-Related work experience (in industry)**

1-
2-
3-

- **Please explain why do you think your background/knowledge /skills will suit the position you are applying for and how can you contribute effectively to the overall success of the team you wish to join ?**
- **I am an IT major Student so I would like to work as Network Engg or Architectural Designer.**

- **What are your other software development skills in which the team can benefit from in addition to your major position (i.e.: analysis, design, implementation, testing, prototyping, etc.)?**
-

Analysis, Design

- **Applicant Signature: Roy Zachariah**

Don't write below this line

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Project manager decision: ☐**Approved** ☐**Not Approved**
Reason for rejection:

☐**Team reached maximum limit (6 members)**
☐**Position already filled**
☐**Background insufficient for position**
☐**Other reason(s) , please specify :**
[ ]

Project manager Signature:

Instructor Review:
Instructor Signature:

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/Copy to Instructor File

Team Position Application (To become a member)

- **Full Name: Ahsan Zafar Chowdhury**
- **Specialization (CS, IS or IT): CS**
- **Date of Today: 2/4/03**
- **WebCT ID:azc2**
- **Project Idea (you have chosen :get code and name from WebCT):** PS00042
- **Project Team you wish to join (get name from WebCT):**
- **Team Project manager Name :** Vinnie DiPrenda
- **General Job Experience (if any):**
- **Academic Awards / Achievements: Dean's list Fall 2002**
- **Research Work (theoretical and/or empirical):**

- **Position you are applying for (check ONLY one)**

(Please Read Syllabus For Detailed Responsibilities and Required Qualifications – Note :For a project manager position , use project manager application form NOT this one):

☒ **P01 System Analyst**
(Knowledge of requirements analysis techniques and modeling (including use cases) is important)

☐ **P0301 Database Designer**

(Knowledge of ERM, SQL, and normalization is important)

☐ **P0302 Network Designer**
(Knowledge of topologies, protocols and web networking is important)
☐ **P0303 Architectural Designer**
(Knowledge of software engineering, architectural models, OO models is important)
☐ **P04 Front-end designer**
(Knowledge of user interface design, GUI components, and cognitive psychology is important)
☐ **P05 Programmer**
(Knowledge of at least one programming language is a must)
☐ **Other, please specify below (*subject to availability*):**
[ ]

- **Indicate in what programming languages/environments/tools/DBMS packages are you more skilful**

(Select all that apply):

☒C++ ☒Java ☐Visual Basic ☐ Delphi ☐ Python ☐ Cobol ☒Pascal ☒C ☐HTML ☐Java Script

☒Dream weaver ☐Cold Fusion ☐XML ☐ActiveX ☐Oracle ☐Access ☐Eiffel ☐Fortran ☐ Prolog

☐Java Beans

☐Other (Please specify): Software Automation Tools(Winrunner and LoadRunner), Unix Shell Scripting

- **Do you master any CASE tool(s) (Please specify ALL THAT APPLY below)?**

☐MS project management ☒MS Visio ☐Smart Draw ☐Power Designer ☒Ms Front Page ☐ Designer 2000 ☐Other (Please specify):

- **Position-Related mandatory courses achievements (Only A , B+ or B)**

Course No	Course Name	Grade achieved
Cis 125	Intro to CS PASCAL(Transferred)	B+
CSC134	C++ programming (Transferred)	B
CIS 250	Computer Architecture (Transferred)	B+
Cis 251	Computer Architecture 2(Transferred)	A-
CSC211	Programming in Java(Transferred)	B
CIS280	Programming Language Concepts	A
CIS231	Machine & Assembly Language	B
CIS332	Principles of Operating System	B+
CIS333	Intro to Unix Operating System	B+
CIS 341	Intro to Logic and Automata	B+
CIS 435	Adv Data Structure and Algorithms	B+

- **Position-Related elective courses and/or practical experience (in school):**

1-
2-
3-

- **Position-Related work experience (in industry)**

Work Experience in IT:
Six months as administrator.
Responsibilities: Installing the the network cables,patch panels,hub,switch. Installing different OS Win95,Win98,WinNT,SCO Unix, Linux, Solaris. Used Compaq proliant Servers, Sun Ultra 10/60 etc. Implemented Raid 5. Setup and test the backup software. Setup DHCP servers and test the connectivity of all the Computers.

Two year as a Software Tester:
Responsibilities: Different type of testing mostly system test and back end data testing. Install and configure the testing environment for the test team. Worked as a test lead. Install and configure the backend servers Running on Sun Solaris. Install and configure PC anywhere, Exceed. Install the front-end applications. Provided information to Technical Writer to Write Installation documents for packages installed in Sun Solaris servers. Configure the group and user for the specific software to be installed in Solaris servers. Writing testcases, testplan from the user requirements. Automate the backend testing process using Unix Shell scripting. This was heavily used in backend testing process. Worked on **Hammer Testing Tool** to automate and create virtual calls to telephony servers using T1 lines. This was also used to perform load and stress testing on the system. Automated front end Gui testing using **Mercury Winrruner**. Automated tests were used to do Regression testing. Automaed Load and stress test using **Mercury Loadrunner.** Created Virtual User using Loadrunner using different types of protocol. Used Loadrunner controller to created different types of scenario. Analyzing the data graphs after testing. For defect tacking system we used **DDTS system**. For version management we used **Clear Case tool**. Used **Visio** to develop Network Design.

- **Please explain why do you think your background/knowledge /skills will suit the position you are applying for and how can you contribute effectively to the overall success of the team you wish to join ?**

I had the opportunity to work with some experienced people in the IT world. I was a part of Test team. I have seen and used different tools manage the projects. As a test team lead I had to write the testplan and testcases. Most of the test cases were automated using WinRunner and LoadRunner and Unix Shell Scripting. I have worked with defect tacking (DDTS) and version Manager Systems (Claear Case). As a part of the team I had to analyze and make sure all the requirements are met properly. I had to work with different team members of SDLC. As a team member in this team I will be able to share my

experience of the real IT world. We can also automate the testcases using testing tools Mercury WinRunner and LoadRunner.

- **What are your other software development skills in which the team can benefit from in addition to your major position (i.e.: analysis, design, implementation, testing, prototyping, etc.)?**

I understand and be able to code in C++, Java, Pascal etc. As a group I can work with the developer to solve the problem. I have work experience as a system administrator. I can help the team to solve the network issues with different OS.

Applicant Signature:
Ahsan Chowdhury

Don't write below this line

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Project manager decision: ☐**Approved** ☐**Not Approved**
Reason for rejection:

☐**Team reached maximum limit (6 members)**
☐**Position already filled**
☐**Background insufficient for position**
☐**Other reason(s) , please specify :**
[ ]

Project manager Signature:

Instructor Review:
Instructor Signature:

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/Copy to Instructor File

2. Project Introduction

2.1 Abstract

These days the necessary technology exists and it is inexpensive enough to develop and deploy “smart home” technology. The goal of this project is to allow anyone with access to the Internet through a cable modem or DSL connection to control appliances remotely. Users will be able to, with a browser, monitor and control web-enabled appliances within their home. This project will begin by analyzing the current technology that is available.

A microchip will be acquired that can run a Java Virtual Machine. We will use a network protocol called 1-Wire that will be compatible with our desired chip. This network will ultimately connect the devices that will control the home appliances. These home appliances can be lights, doors, temperature sensors, critical systems, and thermostats connected to a furnace.

A web service will also be simulated. This service will emulate services offered by local power companies such as PSE&G. By using such web services, the smart home could potentially negotiate prices automatically with the supplier. They will be able to see when the best hours are to run home appliances such as dishwashers and other energy unfriendly devices.

2.2 Background

Life is becoming faster every day. The ability to control the home all the time is becoming harder, as no one stays at home all the time. Sometimes there are kids at home, so we want to provide safety. Security becomes another issue.

With the advancement of technology we need to able to control our home, it can be very convenient for us to be able to control the lights, thermostat, critical devices (such as a sump pump), doors, and windows from the web.

When it comes to monitoring the home from the outside, the developing technology has not been implemented with security and control yet. This project will let a user go to the World Wide Web to check the status of lights, doors, windows, thermostat, and critical systems, and to control them. The user will be able to open a door with a valid iButton, which is as small as a ring.

When we are out of the house, it's out of our control. But with this system, we can control our electrical equipment remotely. Most of the time people work a ½ an hour to a 1-hour's drive away from their home. By accident, if we forgot to turn off a light or another electrical device, then we may need to come back home to turn it off. With our system, we will be able to control it over the web from work. Another important issue is conservation of energy; if we can control electrical devices remotely, then we can better conserve energy and use it properly. For example, we can run the dishwasher at off-peak hours or we can turn on the heat/AC just before returning home.

Imagine sitting at your PC and with a click of the mouse, getting your coffeepot brewing. Or imagine getting rid of that glare on your screen by turning off that pesky floor lamp, without ever getting up! Consider these scenarios:

Before I drive home, I access the house from my browser at work and I turn on the lights and I activate the heater. This way, the porch and entryway lights will be on and the heater will warm the house so I'm not entering a cold, dark house. Energy Saver will turn off a group of lights that I have defined to be non-essential and will set back my thermostat.

Salvation for the absent minded – If I forgot to reset my thermostat before leaving for work, turn it off over the Web. Gone on vacation and remember leaving the thermostat on? I can turn it off from my laptop right in my hotel room.

Freedom from guilt – Suppose I'm working late one day and I'm worried that I haven't left a light on for my two miniature schnauzers. I can turn the lights on from my browser, relieving me of some guilt and making the dogs less hyper when I get home.

If such scenarios sound appealing, then the ControlMyHome project can do these things for you.

2.3 Problem Statement

The intention of developing a web-based "smart home technology" is to facilitate someone to control his or her home appliances using a remote control via cable modem or DSL connection. Energy vendors, such as PSE&G, provide a variety of services to the public and typically value energy partnerships. With the ability to dynamically monitor rates, "smart homes" will have the ability to schedule appliance usage, so it can run at optimum energy efficiency. These energy partnerships on the customer side, provides customers direct savings on energy usage. On the vendor side, the partnerships offer the capability of managing resources, especially during peak times like hot summer days.

Right now there is no product on the market like "ControlMyHome," which is an all-in-one product. There is no product available that automates all the lights and appliances in your home to match your lifestyle. Available products are not able to control anything like landscape lighting that turns on at dusk and off at bedtime, thermostats that only heat/cool when we are at home to enjoy it, and mood lighting that you can apply to the entire house with a single switch.

These are some of the limitations available products are facing now, and we hope that all these limitations can be solved after we have developed the “ControlMyHome” system.

2.4 Previous Work

The “smart home” concept is not totally new. A number of companies have developed some software and hardware to control home electrical devices remotely. We have analyzed some of the solutions available on the market and we plan to develop a more advanced system that is more flexible, functional, and secure, that can control our home more efficiently.

SmartHome, Control your home by phone from X10

The first home control application that we analyzed is SmartHome. This device gives you control of ten X10 devices from any touchtone telephone. When you call in to your home phone, the responder picks up after 30 seconds. You will then hear 3 beeps. At this point you can press a number (0 – 9) that corresponds to one of the 10 devices followed by a * for on and a # for off. If desired, a 3-digit security code can be set before access is allowed. The responder can also be set to flash X10-controlled lights or activate chime modules when the phone rings. This is great for when you are outside or for the vision/hearing impaired.

There is a hidden keypad under the flip-up lid that works as a manual controller for eight X10 devices with ON/OFF, DIM/BRIGHT and ALL LIGHTS ON/ALL OFF functions. The responder does not affect the phone line when you are at home since it automatically turns off when you pick up the phone. In answering machine mode, the responder will activate even after your answering machine has picked up the line, ignoring your answering machine and letting

you enter the responder commands you want. It is easy to install, since it simply plugs into an 110V wall outlet and a standard phone jack.

Turning devices ON/OFF by phone is simple with X10 technology. Simply plug in your choice of Telephone Transponder or Responder into a telephone jack and into an 110V AC outlet. Any X10 compatible receivers in the house can now be controlled by telephone. Thermostats can be controlled by using the 3000 X10 Thermostat Setback Unit, by using a 2010 Universal Module to interrupt the connection to your existing thermostat, or by replacing your thermostat with an X10-controllable thermostat.

HAL, by Home Automated Living

The second application is HAL. HAL's vision is to provide consumers with the freedom to control their homes remotely by using voice or through the Internet. HAL's software taps the power of your existing PC or PC device to control your home. Once HAL is installed on your PC, it can send commands all over your house using the existing network of electrical wires inside your home walls.

HAL's voice interface makes it easy to use. The user may pick up any phone in the home, press the # key, and then tell HAL to dim the dining room lights or close the garage door. It's a two-way conversation with HAL confirming that it has, indeed, performed the requested action.

HAL turns your PC into a personal Voice Portal. What else can be an easier way to turn on the front door lights when you're returning home late at night than to call ahead and tell HAL, "Turn on the front door lights?" With HAL, any phone anywhere in the world enables you to step inside your house and control it as if you were there. Home Technology, Networking, and Control are a rapidly developing field. HAL is moving forward within the industry, developing

compatibility for new standards of communication like Universal Plug and Play (UPnP). HAL will soon introduce a Web-based interface.

iButton and TINI by Dallas Semiconductors

The third application and hardware is from Dallas Semiconductors. The iButton is a computer chip enclosed in a 16mm stainless steel can. Because of this unique and durable stainless steel can, up-to-date information can travel with a person or object anywhere they go. This steel button can be mounted virtually anywhere because it is rugged enough to withstand harsh environments whether indoors or outdoors. It is durable enough to attach to a key fob, ring, watch, or other personal items and to be used daily for applications such as access control to buildings and computers since Java code can be loaded onto these iButtons. These buttons can be used to control access to the home.

Tiny InterNet Interface (TINI) is a platform developed by Dallas Semiconductor to provide system designers and software developers with a simple, flexible, and cost effective means to design a wide variety of hardware devices that are able to connect directly to corporate and home networks. This platform is a combination of a small but powerful chipset and a Java-programmable runtime environment. The chipset provides processing, control, device-level communication, and networking capabilities. The features of the underlying hardware are exposed to the software developer through a set of Java application programming interfaces (APIs). The APIs allow the devices to be monitored, controlled and managed remotely using Java. TINI's networking capability extends the connectivity of any attached device by allowing interaction with remote systems and users through standard network applications such as Web browsers.

Because TINI has a built-in web server, it can be controlled from the web, so we are going to use this for our web server. The primary target of our project is to control and monitor the home from the web. iButtons will provide us with the security features that we need to secure access to our home. TINI uses a networking protocol called 1-Wire that will connect and control our electrical devices.

2.5 Methodology

Methodology Evaluation Matrix

	Methodologies	Time	Cost	User Requirement	Familiarity	System-Complexity	Schedule Visibility	Maintenance	Reliability
	Waterfall	D	B	D	D	B	D	B	B
	Parallel Development	D	B	D	D	B	D	B	B
RAD METHODOLOGIES*	Phased Development	A	B	B	B	B	A	C	B
	Prototyping	A	B	A	D	D	A	C	D
	Throwaway Prototyping	B	C	A	A	A	B	A	A
	Evolutionary Prototyping	B	B	C	B	A	B	B	A
	Extreme Programming	A	B	A	C	B	B	B	B
	Object-Oriented	B	B	A	A	A	A	B	B

* RAD = Rapid Application Development

Legend

- A = Excellent
- B = Good
- C = Satisfactory
- D= Poor

Waterfall

Analyst and the users proceed in sequence from one phase to the next. The key deliverables for each phase are typically produced on paper and presented for approval as the project moves from one phase to the next. The key advantages of waterfall development are that it identifies system requirements long before programming begins, and that it minimizes changes to the software. The disadvantage is that a long period may elapse before a phase is approved.

Parallel Development

The parallel development methodology attempts to address the problem of long delays between the analysis phase and the delivery of the system that is found in the waterfall method. This methodology reduces the schedule time but suffers from problems caused by paper documents.

Phased Development

This methodology breaks the overall system into a series of versions that are developed sequentially. This has the advantage of getting a useful system into the hands of users. The major drawback is that the users are working with an incomplete system. The system has to be improved while keeping the feedback from the users in mind.

Prototyping

This methodology performs the analysis, design, and implementation phase concurrently, and all three phases are performed repeatedly in a cycle until the system is completed.

Throwaway Prototyping

In this method, a design prototype is constructed. This only represents a part of the system that needs additional refinement and it may only contain enough details to enable users to understand the issues under consideration. Once the design issues are resolved, the design prototypes are thrown away, and the project moves into the implementation phase.

Evolutionary Prototyping

In this method, the prototypes are not discarded but kept. You start with the parts of the system that are most difficult. From the initial concept, design and implementation follows. After that, the system is refined as needed until it is acceptable. Once the process is complete, the prototype is released.

Extreme Programming

In this method, software development occurs with the customer present on site. The method utilizes short cycles, incremental planning, and puts a focus on automated tests written by programmers and customers to monitor the process of development. It relies on the evolutionary approach to development that lasts until the life cycle of the software comes to an end.

Object-Oriented Methodology

This method consists of progressively developing an object representation through the three phases of analysis, design, and implementation. Unlike the waterfall method, the core and the early part of the system is an abstract concept, focusing on external qualities of the application system. As the model evolves, it becomes more and more detailed, shifting the focus to how the system will be built to how it should function in terms of architecture, data structures, and algorithms.

2.6 Glossary

iButton®: The iButton is a computer chip enclosed in a 16mm stainless steel can that can be mounted virtually anywhere due to its rugged nature. It is durable enough to attach to a key fob, ring, watch, or other personal items for use in daily applications such as access to buildings and computers, since it can carry up-to-date information that can travel with a person or object anywhere they go.

JVM™: Acronym for Java Virtual Machine that interprets and executes Java byte-codes (programs) on a particular platform.

J2EE™: Acronym for Java 2 Platform Enterprise Edition that is a platform-independent, Java-centric environment from Sun Microsystems for developing, building, and deploying Web-based enterprise applications online. The J2EE platform consists of a set of services such as APIs and protocols that provide the functionality for developing multi-tiered Web-based applications.

JSP™: Acronym for Java Server Pages that provide similar capabilities of Java Servlet technology to create static and dynamic Web content.

1-Wire® Protocol: The 1-Wire protocol is a bus-based networking protocol for communication between a master and one or more slaves. To achieve a good performance, a complete set of hardware configurations must be defined.

Protocol: Computers can't just throw data at each other any old way. Because so many different types of computers and operating systems connect via modems or other connections, they have to follow communications rules called protocols. The Internet is a very heterogeneous

collection of networked computers and is full of different protocols, including PPP, TCP/IP, SLIP, and FTP.

Smart home: A home that uses the services of a web server and home automation equipment to control household appliances.

TINI®: Acronym for Tiny InterNet Interface, which is a platform developed by Dallas Semiconductor to provide system designers and software developers with a simple, flexible, and cost effective means to directly connect a wide variety of hardware devices to corporate and home networks. It is a combination of a small but powerful chipset providing processing, control, device-level communication, and networking capabilities and a Java-programmable runtime environment. The features of the underlying hardware are exposed to the software developer through a set of Java application programming interfaces (APIs).

WAN: Acronym for Wide Area Network. This is a computer network that spans a relatively large geographical area. Typically WANs consist of two or more local area networks (LANs). Computers connected to a wide area network are often connected through public networks, such as the telephone system. They can also be connected through leased lines or satellites. The largest WAN in existence is the Internet.

Web: Short for World Wide Web, it is a gigantic set of computer documents on the Internet that are connected together through hypertext links.

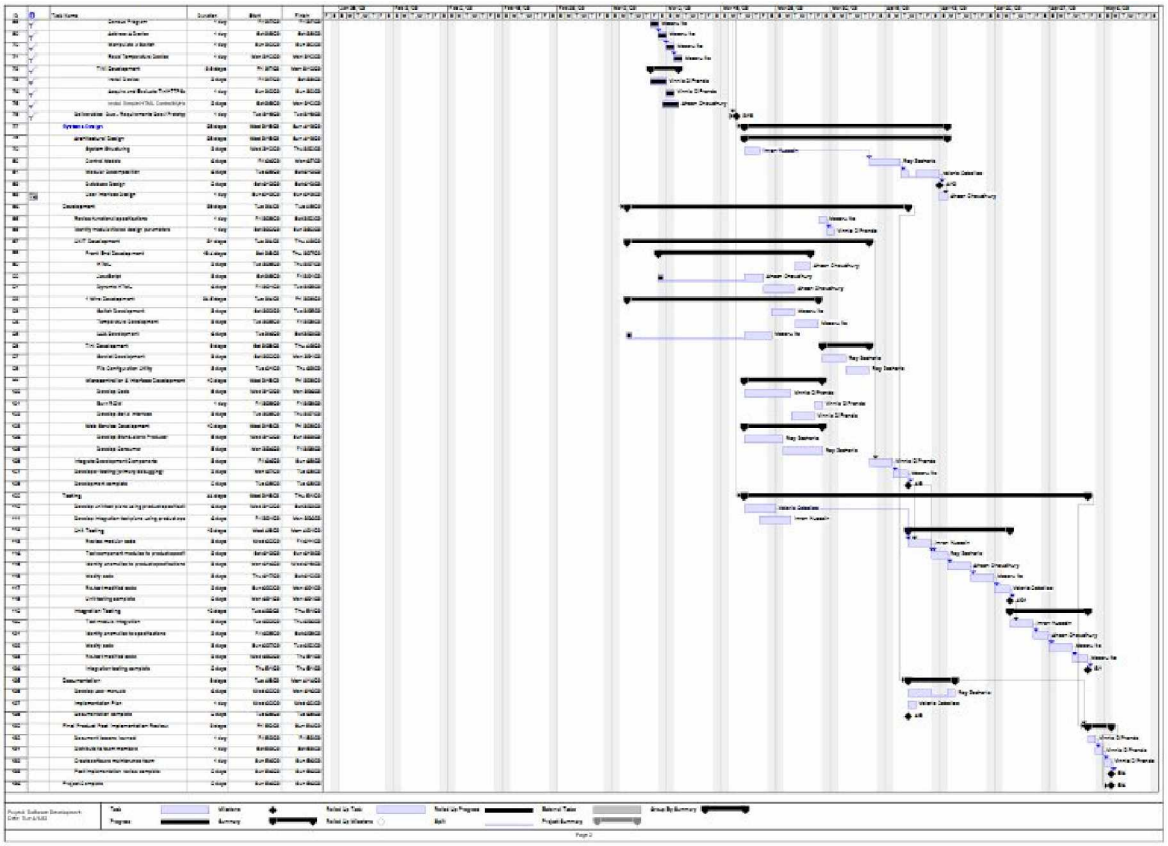
Web Server: A program that accepts requests for information framed according to the Hyper Text Transfer Protocol (HTTP). The server processes these requests and sends the requested document(s).

XML: Acronym for Extensible Markup Language. It is a W3C-endorced standard for creating computer documents that uses human-readable tags to mark up data.

3. Project Planning

3.1 Scheduling

3.1.1 Gantt



3.1.2 Responsibilities

Resources and Assignments	Start	Finish	Work
Unassigned	Sun 2/23/03	Sat 4/19/03	16 hrs
Software Prototype	Sun 2/23/03	Mon 2/24/03	16 hrs
Deliverables Due - Requirements Doc / Prototype	Mon 3/3/03	Mon 3/3/03	0 hrs
Development complete	Mon 3/24/03	Mon 3/24/03	0 hrs
Unit testing complete	Sun 4/6/03	Sun 4/6/03	0 hrs
Integration testing complete	Wed 4/16/03	Wed 4/16/03	0 hrs
Documentation complete	Mon 3/24/03	Mon 3/24/03	0 hrs
Post implementation review complete	Sat 4/19/03	Sat 4/19/03	0 hrs
Project Complete	Sat 4/19/03	Sat 4/19/03	0 hrs
Vinnie DiPrenda	Sun 1/26/03	Sat 4/19/03	280 hrs
Submit Project Idea	Sun 1/26/03	Sun 1/26/03	8 hrs
Determine project scope	Mon 1/27/03	Wed 1/29/03	24 hrs
Secure project approval	Tue 2/4/03	Tue 2/4/03	8 hrs
Define preliminary resources	Wed 2/5/03	Wed 2/5/03	8 hrs
Secure core resources	Tue 2/11/03	Tue 2/11/03	8 hrs
Deliver Project Abstract	Tue 2/11/03	Tue 2/11/03	0 hrs
Create Project WBS, Milestones & Responsibilities	Wed 2/12/03	Sat 2/15/03	32 hrs
Create Project Schedule	Sun 2/16/03	Mon 2/17/03	16 hrs
Planning Phase Complete - Submit Artifacts & Deliverables	Thu 2/20/03	Thu 2/20/03	0 hrs
Acquire Hardware Prototype Board (STEP, 8x1)	Mon 2/24/03	Mon 2/24/03	8 hrs
Install Device	Fri 2/21/03	Sun 2/23/03	24 hrs
Acquire and Evaluate TiniHTTPServer	Tue 2/25/03	Tue 2/25/03	8 hrs
Identify modular/tiered design parameters	Fri 3/14/03	Fri 3/14/03	8 hrs
Develop Code	Tue 3/4/03	Sun 3/9/03	48 hrs
Burn ROM	Thu 3/13/03	Thu 3/13/03	8 hrs
Develop Serial Interface	Mon 3/10/03	Wed 3/12/03	24 hrs
Integrate Development Components	Thu 3/20/03	Sat 3/22/03	24 hrs
Document lessons learned	Thu 4/17/03	Thu 4/17/03	8 hrs
Distribute to team members	Fri 4/18/03	Fri 4/18/03	8 hrs
Create software maintenance team	Sat 4/19/03	Sat 4/19/03	8 hrs
Valeria Ceballos	Tue 2/11/03	Sun 4/6/03	216 hrs
Deliver Project Abstract	Tue 2/11/03	Tue 2/11/03	0 hrs
Create Abstract	Wed 2/12/03	Thu 2/13/03	16 hrs
Create Glossary	Fri 2/14/03	Sat 2/15/03	16 hrs

Conduct Cost Estimation	Sun 2/16/03	Wed 2/19/03	32 hrs
Conduct Risk Management	Thu 2/20/03	Thu 2/20/03	8 hrs
Planning Phase Complete - Submit Artifacts & Deliverables	Thu 2/20/03	Thu 2/20/03	0 hrs
Stakeholder Identification	Mon 2/24/03	Tue 2/25/03	16 hrs
Requirements Report	Fri 2/21/03	Sun 2/23/03	24 hrs
Data Dictionary	Wed 2/26/03	Thu 2/27/03	16 hrs
Modular Decomposition	Mon 3/24/03	Fri 3/28/03	32 hrs
Develop unit test plans using product specifications	Tue 3/4/03	Fri 3/7/03	32 hrs
Re-test modified code	Sat 4/5/03	Sun 4/6/03	16 hrs
Implementation Plan	Tue 3/25/03	Tue 3/25/03	8 hrs
Masaru Ito	Tue 2/11/03	Wed 4/16/03	248 hrs
Deliver Project Abstract	Tue 2/11/03	Tue 2/11/03	0 hrs
Create Hardware / Software Prototype	Mon 2/17/03	Wed 2/19/03	24 hrs
Planning Phase Complete - Submit Artifacts & Deliverables	Thu 2/20/03	Thu 2/20/03	0 hrs
Census Program	Fri 2/21/03	Sat 2/22/03	16 hrs
Address A Device	Sun 2/23/03	Mon 2/24/03	16 hrs
Manipulate a Switch	Tue 2/25/03	Wed 2/26/03	16 hrs
Read Temperature Device	Thu 2/27/03	Fri 2/28/03	16 hrs
Database Design	Fri 3/28/03	Fri 3/28/03	0 hrs
Review functional specifications	Thu 3/13/03	Thu 3/13/03	8 hrs
Switch Development	Sun 3/9/03	Mon 3/10/03	16 hrs
Temperature Development	Tue 3/11/03	Wed 3/12/03	16 hrs
LUX Development	Tue 3/4/03	Sat 3/8/03	40 hrs
Developer testing (primary debugging)	Sun 3/23/03	Mon 3/24/03	16 hrs
Modify code	Wed 4/2/03	Fri 4/4/03	24 hrs
Modify code	Sat 4/12/03	Mon 4/14/03	24 hrs
Re-test modified code	Tue 4/15/03	Wed 4/16/03	16 hrs
Imran Hussain	Tue 2/11/03	Wed 4/9/03	232 hrs
Deliver Project Abstract	Tue 2/11/03	Tue 2/11/03	0 hrs
Establish Methodology	Wed 2/12/03	Sat 2/15/03	32 hrs
Create High Level Architecture Prototype Diagrams	Mon 2/17/03	Wed 2/19/03	24 hrs
Planning Phase Complete - Submit Artifacts & Deliverables	Thu 2/20/03	Thu 2/20/03	0 hrs
Requirements Gathering	Tue 2/25/03	Thu 2/27/03	24 hrs
Data Flow Diagrams	Fri 2/21/03	Mon 2/24/03	32 hrs
Process Specification	Fri 2/28/03	Sun 3/2/03	24 hrs
System Structuring	Tue 3/4/03	Wed 3/5/03	16 hrs
Develop integration test plans using product specifications	Thu 3/6/03	Sun 3/9/03	32 hrs
Review modular code	Tue 3/25/03	Thu 3/27/03	24 hrs

Test module integration	Mon 4/7/03	Wed 4/9/03	24 hrs
Ahsan Chowdhury	Tue 2/11/03	Fri 4/11/03	240 hrs
Deliver Project Abstract	Tue 2/11/03	Tue 2/11/03	0 hrs
Deliver First Prototype	Tue 2/11/03	Sun 2/16/03	16 hrs
Document Background	Wed 2/12/03	Thu 2/13/03	16 hrs
Describe Previous Work	Fri 2/14/03	Sat 2/15/03	16 hrs
Create Interactive Screen with enhancements	Mon 2/17/03	Wed 2/19/03	24 hrs
Planning Phase Complete - Submit Artifacts & Deliverables	Thu 2/20/03	Thu 2/20/03	0 hrs
Problem Statement	Fri 2/21/03	Sat 2/22/03	16 hrs
Interactive HTML Screens	Sun 2/23/03	Mon 2/24/03	16 hrs
Install Simple HTML ControlMyHome Prototype	Tue 2/25/03	Wed 2/26/03	16 hrs
User Interface Design	Wed 4/2/03	Wed 4/2/03	8 hrs
HTML	Tue 3/11/03	Wed 3/12/03	16 hrs
JavaScript	Sat 3/8/03	Mon 3/10/03	24 hrs
Dynamic HTML	Tue 3/4/03	Fri 3/7/03	32 hrs
Identify anomalies to product specifications	Sun 3/30/03	Tue 4/1/03	24 hrs
Identify anomalies to specifications	Thu 4/10/03	Fri 4/11/03	16 hrs
Roy Zacheria	Tue 2/11/03	Sun 3/30/03	344 hrs
Deliver Project Abstract	Tue 2/11/03	Tue 2/11/03	0 hrs
Create Problem Statement	Wed 2/12/03	Thu 2/13/03	16 hrs
Conduct Feasibility Study	Sun 2/16/03	Thu 2/20/03	40 hrs
Planning Phase Complete - Submit Artifacts & Deliverables	Thu 2/20/03	Thu 2/20/03	0 hrs
Business Models	Tue 2/25/03	Thu 2/27/03	24 hrs
Documentation & Modeling Requirements	Fri 2/21/03	Mon 2/24/03	32 hrs
AsIs-ToBe Model	Fri 2/28/03	Sun 3/2/03	24 hrs
Control Models	Thu 3/20/03	Sun 3/23/03	32 hrs
Servlet Development	Fri 3/14/03	Sun 3/16/03	24 hrs
File Configuration Utility	Mon 3/17/03	Wed 3/19/03	24 hrs
Develop Stand-alone Producer	Tue 3/4/03	Sat 3/8/03	40 hrs
Develop Consumer	Sun 3/9/03	Thu 3/13/03	40 hrs
Test component modules to product specifications	Fri 3/28/03	Sat 3/29/03	16 hrs
Develop user manuals	Tue 3/25/03	Sun 3/30/03	32 hrs

3.1.3 WBS

WBS	ID	Name
1	1	**Initiation**
1.1	2	**Project Declaration**
1.1.1	3	**Project Overview**
1.1.1.1	4	Submit Project Idea
1.1.1.2	5	Determine project scope
1.1.1.3	6	Secure project approval
1.1.1.4	7	Define preliminary resources
1.1.1.5	8	Secure core resources
1.1.2	9	Deliver Project Abstract
1.2	10	**First Prototype**
1.2.1	11	Deliver First Prototype
1.3	12	**Project Introduction**
1.3.1	13	Create Abstract
1.3.2	14	Document Background
1.3.3	15	Create Problem Statement
1.3.4	16	Describe Previous Work
1.3.5	17	Establish Methodology
1.3.6	18	Create Glossary
1.4	19	**Project Planning**
1.4.1	20	**Project Logistics**
1.4.1.1	21	Create Project WBS, Milestones & Responsibilities
1.4.1.2	22	**Planning Components**
1.4.1.2.1	23	Conduct Feasibility Study
1.4.1.2.2	24	Conduct Cost Estimation
1.4.1.2.3	25	Create Project Schedule
1.4.1.2.4	26	Conduct Risk Management
1.4.2	27	**Second Prototype**
1.4.2.1	28	Create Interactive Screen with enhancements
1.4.2.2	29	Create High Level Architecture Prototype Diagrams
1.4.2.3	30	Create Hardware / Software Prototype
1.4.3	31	Planning Phase Complete - Submit Artifacts & Deliverables
2	32	**Analysis/Software Requirements**
2.1	33	**Requirements Engineering**
2.1.1	34	Business Models

2.1.2	35	Stakeholder Identification
2.1.3	36	Requirements Gathering
2.1.4	37	Documentation & Modeling Requirements
2.1.5	38	AsIs-ToBe Model
2.1.6	39	Requirements Report
2.1.7	40	Problem Statement
2.1.8	41	Data Flow Diagrams
2.1.9	42	Data Dictionary
2.1.10	43	Process Specification
2.2	44	**Prototypes**
2.2.1	45	**Software Prototype**
2.2.1.1	46	Interactive HTML Screens
2.2.2	47	**Hardware Prototypes**
2.2.2.1	48	**Stand-Alone Proof Of Concepts**
2.2.2.1.1	49	Acquire Hardware Prototype Board (STEP, 8x1)
2.2.2.1.2	50	Census Program
2.2.2.1.3	51	Address A Device
2.2.2.1.4	52	Manipulate a Switch
2.2.2.1.5	53	Read Temperature Device
2.2.2.2	54	**TINI Development**
2.2.2.2.1	55	Install Device
2.2.2.2.2	56	Acquire and Evaluate TiniHTTPServer
2.2.2.2.3	57	Install Simple HTML ControlMyHome Prototype
2.3	58	Deliverables Due - Requirements Doc / Prototype
3	59	**Systems Design**
3.1	60	**Architectural Design**
3.1.1	61	System Structuring
3.1.2	62	Control Models
3.1.3	63	Modular Decomposition
3.1.4	64	Database Design
3.1.5	65	User Interface Design
4	66	**Development**
4.1	67	Review functional specifications
4.2	68	Identify modular/tiered design parameters
4.3	69	**UNIT Development**
4.3.1	70	**Front End Development**
4.3.1.1	71	HTML
4.3.1.2	72	JavaScript

4.3.1.3	73	Dynamic HTML
4.3.2	74	**1-Wire Development**
4.3.2.1	75	Switch Development
4.3.2.2	76	Temperature Development
4.3.2.3	77	LUX Development
4.3.3	78	**TINI Development**
4.3.3.1	79	Servlet Development
4.3.3.2	80	File Configuration Utility
4.3.4	81	**Microcontroller & Interface Development**
4.3.4.1	82	Develop Code
4.3.4.2	83	Burn ROM
4.3.4.3	84	Develop Serial Interface
4.3.5	85	**Web Service Development**
4.3.5.1	86	Develop Stand-alone Producer
4.3.5.2	87	Develop Consumer
4.4	88	Integrate Development Components
4.5	89	Developer testing (primary debugging)
4.6	90	Development complete
5	91	**Testing**
5.1	92	Develop unit test plans using product specifications
5.2	93	Develop integration test plans using product specifications
5.3	94	**Unit Testing**
5.3.1	95	Review modular code
5.3.2	96	Test component modules to product specifications
5.3.3	97	Identify anomalies to product specifications
5.3.4	98	Modify code
5.3.5	99	Re-test modified code
5.3.6	100	Unit testing complete
5.4	101	**Integration Testing**
5.4.1	102	Test module integration
5.4.2	103	Identify anomalies to specifications
5.4.3	104	Modify code
5.4.4	105	Re-test modified code
5.4.5	106	Integration testing complete
6	107	**Documentation**
6.1	108	Develop user manuals
6.2	109	Implementation Plan
6.3	110	Documentation complete

7	111	**Final Product Post Implementation Review**
7.1	112	Document lessons learned
7.2	113	Distribute to team members
7.3	114	Create software maintenance team
7.4	115	Post implementation review complete
8	116	Project Complete

3.2 Economic Feasibility

Feasibility: The measure of how beneficial the development of a new information system will be to an organization.

System Costs: They are grouped into two categories. The first are the costs associated with developing a system, and the second are the operating costs. Development costs are one time costs.

ONE TIME COSTS (HRS)	
Building (Rent)	$10,000.00
Computers & Development Stations	$10,000.00
Computer Network	$10,000.00
Telephones	$3,000.00
Inventory of Parts	$10,000.00
Advertising (includes Web)	$10,000.00
Total	**$53,000.00**

Operating costs are recurring costs that are incurred throughout the lifetime of the system.

RECURRING COSTS (HRS)	
Application Software Maintenance	$30,000
Incremental Data Storage	$3,000
Incremental Communication	$10000
Supplies	$3,000
Total	**$36,000**

Benefits: They can be divided into *Tangible Benefits* and *Intangible Benefits.* Tangible Benefits are those that can be measured.

TANGIBLE BENEFITS (HRS)	
Increased Flexibility	$17,000
Increased Speed of Activity	$5,000
Improvement in Management Planning	$14,000
Other	$6,000
Total	**$42,000**

3.3 Cost-Benefit Analysis

Cost-benefit analysis is a technique for comparatively assessing the costs and benefits of an activity or project over a relevant time period. The technique has its origins in economic feasibility studies of public infrastructure projects such as dams and levees. Its use has grown concurrently since the 1970s, with the increase in laws and regulations to promote health, safety, and environmental values. To use cost-benefit analysis in evaluating the merits of public actions requires translation of positive and negative effects to a common measure, normally dollars. The methods and assumptions needed to measure positive and negative effects and to translate such effects to dollars can make cost-benefit analysis a complex and controversial undertaking.

3.3.1 Return On Investment

Return On Investment (ROI) is a way of constructing a business scenario. ROI boils down to a business appraising the investment prospective by comparing the level and result of expected benefits on costs. A rudimentary ROI can be easily calculated by taking the Net-Benefits and dividing that number by Net-Cost. This type of calculation works well when the gains and the costs of an investment are well known and plainly concludes from an action of say, selling **x** number systems over **y** period. However, in complex ventures where the outcome is often conditional on many variables, ROI would not necessarily emit accurate results when calculating benefits divided by costs. Business investments characteristically involve costs stretching over several years. In those circumstances, the “benefits/cost” formula has real significance over a short and well-defined period where **x** (benefits) and **y** (costs) are clearly understood and other unpredicted external factors have negligible effects. On the other hand,

longer time periods may produce quite dissimilar ROI statistics for the same investment over that duration. When financial impacts extend across over several years with different factors coming into the equations, the analyst typically utilizes Net Present Value figures.

3.3.2 Net Present Value

The Net Present Value (NPV) calculates the present value of a series of future payments (negative values) and income (positive values) using a discount rate. The NPV helps to consider the time value of money, by comparing the NPV to the amount of money needed to implement a project.

3.4 Breakeven Analysis

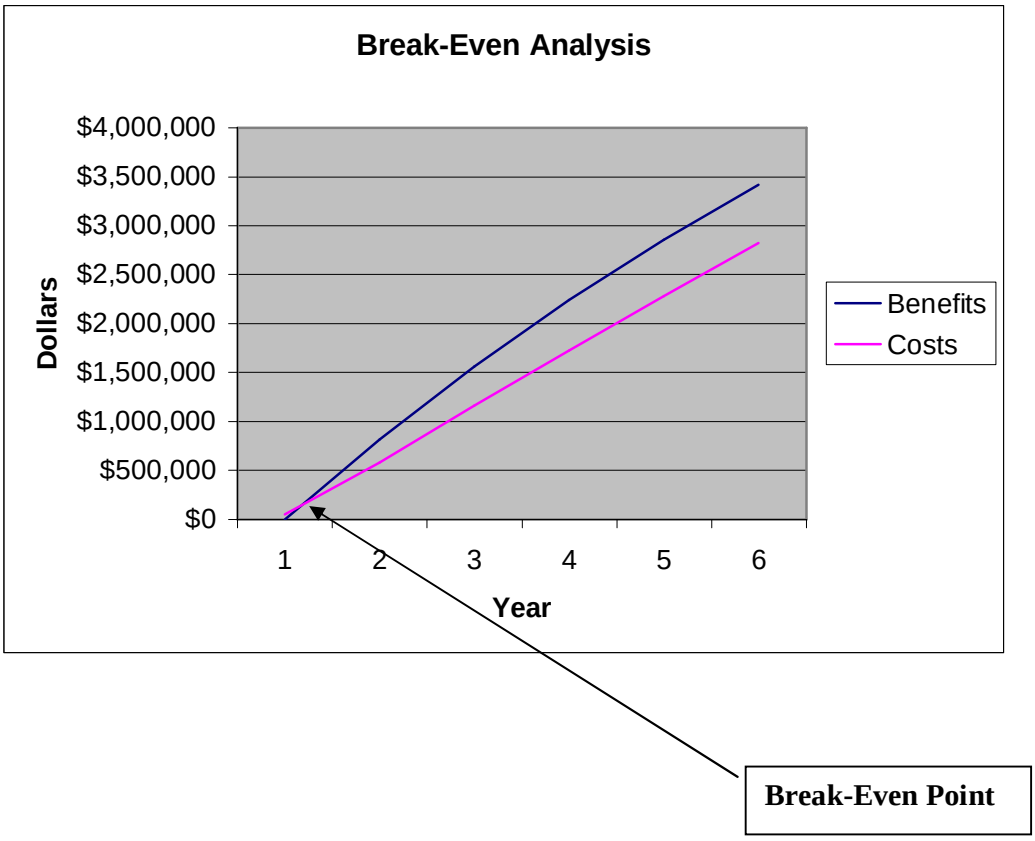
The following is a sample economic feasibility analysis for the ControlMyHome project:

Control My Home Economic Feasibility Analysis ROI and BEA							
Benefits	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**TOTALS**
Charge to Customer (* 1500 system sold per year)	$900,000	$900,000	$900,000	$900,000	$900,000	$900,000	$5,400,000
Discount Rate (10%)	1	0.9091	0.8264	0.7513	0.683	0.6209	
PV of Chg. To Customer	$0	$818,182	$743,802	$676,183	$614,712	$558,829	
NP of Chg. To Customer	**$0**	**$818,182**	**$1,561,984**	**$2,238,167**	**$2,852,879**	**$3,411,708**	**$3,411,708**
Yearly support cost to customer (10 service contract)	$500	$500	$500	$500	$500	$500	$3,000
Discount Rate (10%)	1	0.91	0.826	0.752	0.684	0.62	
PV of Customer support	$0	$455	$413	$376	$342	$310	
NP of Customer Support	**$0**	**$455**	**$868**	**$1,244**	**$1,586**	**$1,896**	**$1,896**
NPV of all Benefits:	**$0**	**$818,637**	**$1,562,852**	**$2,239,411**	**$2,854,465**	**$3,413,604**	**$3,413,604**
PV of all	**$0**	**$818,637**	**$744,215**	**$676,559**	**$615,054**	**$559,139**	

Benefits							
One-time Costs							
Building (Rent)	$10,000	$0	$0	$0	$0	$0	$10,000
Computers & Development Stations	$10,000	$0	$0	$0	$0	$0	$10,000
Computer Network	$10,000	$0	$0	$0	$0	$0	$10,000
Telephones	$3,000	$0	$0	$0	$0	$0	$3,000
Inventory of Parts	$10,000	$0	$0	$0	$0	$0	$10,000
Advertising (includes Web)	$10,000	$0	$0	$0	$0	$0	$10,000
Total (TOTC)	**$53,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$53,000**
Recurring Costs							
Rent of Building	$36,000	$36,000	$36,000	$36,000	$36,000	$36,000	$216,000
Discount Rate for Rent (2%)	1	0.9804	0.9612	0.9423	0.9238	0.9057	
PV of Rent of building	$0	$35,294	$34,602	$33,924	$33,258	$32,606	
NPV of Rent of Building	**$0**	**$35,294**	**$69,896**	**$103,820**	**$137,078**	**$169,684**	**$169,684**
Phones Charges	$6,000	$6,000	$6,000	$6,000	$6,000	$6,000	$36,000
Discount Rate for Phone (0.5%)	1	0.995	0.995	0.995	0.995	0.995	
PV of Phone Charges	$0	$5,970	$5,970	$5,970	$5,970	$5,970	
NPV of Phones	**$0**	**$5,970**	**$11,940**	**$17,910**	**$23,880**	**$29,850**	**$29,850**
Utilities	$6,000	$6,000	$6,000	$6,000	$6,000	$6,000	$36,000
Discount Rate for Utilities (0.5%)	1	0.995	0.995	0.995	0.995	0.995	

PV of Utilities Charges	$0	$5,970	$5,970	$5,970	$5,970	$5,970	
NPV of Utilities	**$0**	**$5,970**	**$11,940**	**$17,910**	**$23,880**	**$29,850**	**$29,850**
Business Insurance	$3,600	$3,600	$3,600	$3,600	$3,600	$3,600	$21,600
Discount Rate for Insurance (2%)	1	0.9803	0.9611	0.9422	0.9239	0.9058	
PV of Bus. Insurance Charges	$0	$3,529	$3,460	$3,392	$3,326	$3,261	
NPV of Business Insurance	**$0**	**$3,529**	**$6,989**	**$10,381**	**$13,707**	**$16,968**	**$16,968**
Salary ($70k * 6)	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$2,520,000
Discount Rate for Salary (2%)	1	0.9804	0.9612	0.9423	0.9238	0.9057	
PV of Salary	$0	$411,765	$403,691	$395,775	$388,015	$380,407	
NPV of Salary	**$0**	**$411,765**	**$815,456**	**$1,211,231**	**$1,599,246**	**$1,979,653**	**$1,979,653**
Employee Benefits	$126,000	$126,000	$126,000	$126,000	$126,000	$126,000	$756,000
Disct. Rate for Empl. Benefits (2%)	1	0.9804	0.9612	0.9423	0.9238	0.9057	
PV of Empl. Benefits	$0	$123,529	$121,107	$118,733	$116,405	$114,122	
NPV of Empl. Benefits	**$0**	**$123,529**	**$244,636**	**$363,369**	**$479,774**	**$593,896**	**$593,896**
NPV of all COSTS	**$53,000**	**$586,057**	**$1,160,857**	**$1,724,621**	**$2,277,565**	**$2,819,901**	**$2,819,901**
PV of all COSTS	**$0**	**$586,057**	**$574,800**	**$563,764**	**$552,944**	**$542,336**	
Overall NPV (Total NPV Benefits - NPV of all COSTS)						**$591,807**	

Overall ROI (Overall NPV / NPV of all COSTS						**0.2099**	
Break-even Analysis							
Yearly NPV Cash Flow	**$53,000**	**$232,580**	**$169,415**	**$112,795**	**$62,110**	**$16,803**	
Overall NPV Cash Flow	**$53,000**	**$232,580**	**$401,995**	**$514,790**	**$576,900**	**$593,703**	



3.5 Cost Estimation

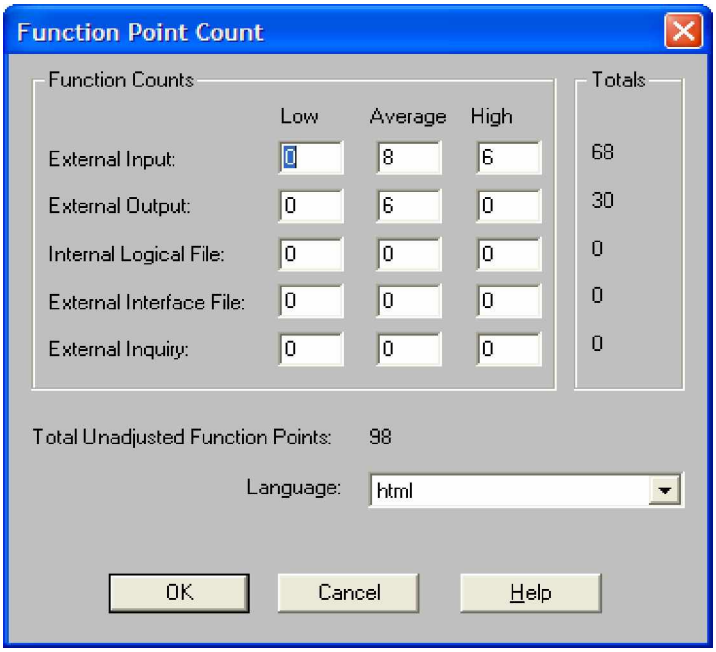
Cost estimation is one of the most important steps in project management. Cost estimation establishes the base line of the project cost at different stages of development of the project. A cost estimation at a given stage of project development represents a prediction provided by the cost engineer or estimator on the basis of available data. According to the American Association of Cost Engineers, cost engineering is defined as that area of engineering practice where engineering judgment and experience are utilized in the application of scientific principles and techniques to the problem of cost estimation, cost control and profitability.

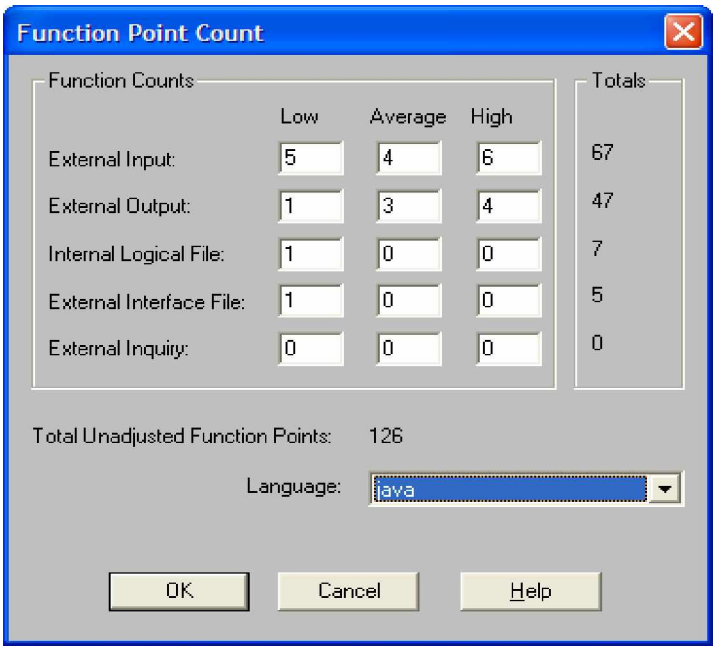
3.5.1 Function Point Analysis

It is very difficult to estimate software projects. We need a lot of experience to be precise in what we are doing and in how long we will do a certain project. We need help from the available software that is in the market today to give us an idea of how much effort and time a project will take to develop.

This is why Function Point Analysis has been proven to be a reliable method for measuring the size of computer software. In addition to measuring output, Function Point Analysis is extremely useful to projects by managing change of scope, measuring productivity, and communicating functional requirements.

The programming languages that we will use to develop our software are Java and HTML. Here is their respective Function Point Count:

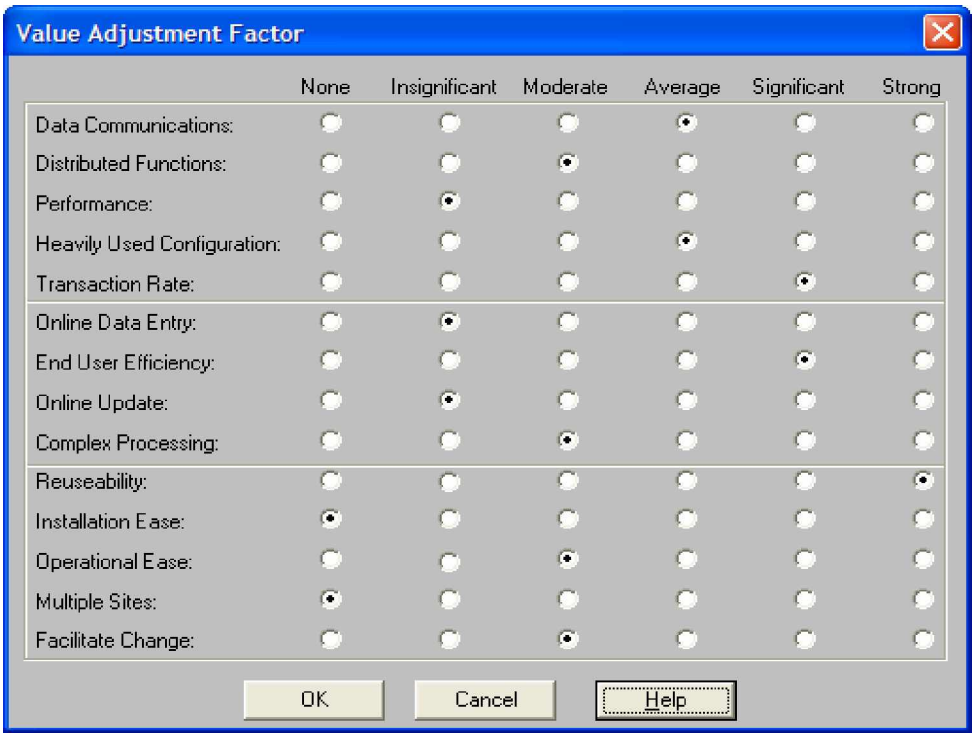




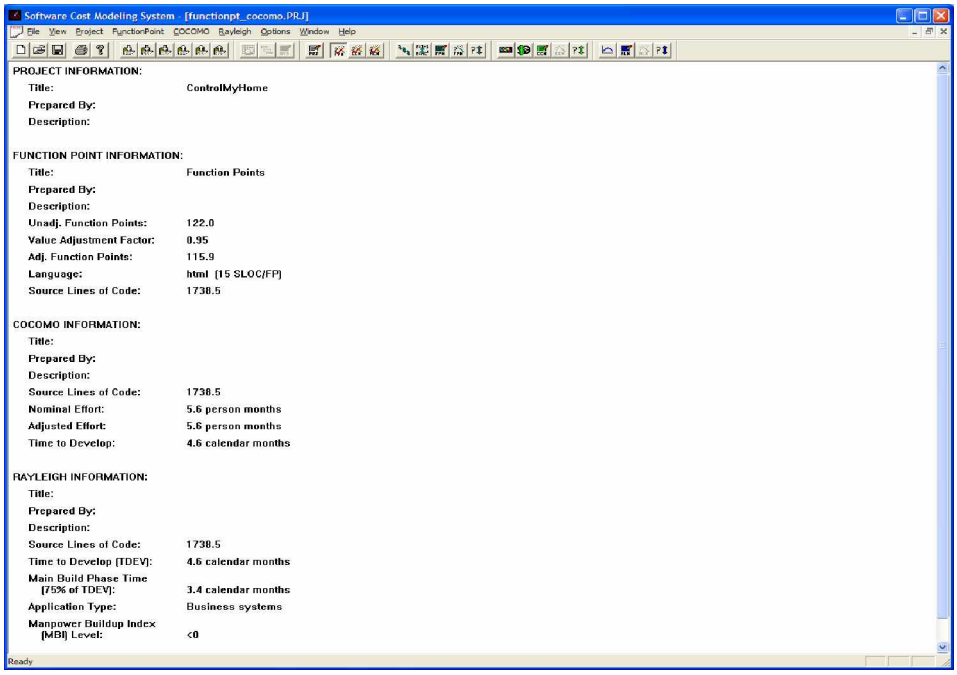
Value Adjustment Factor

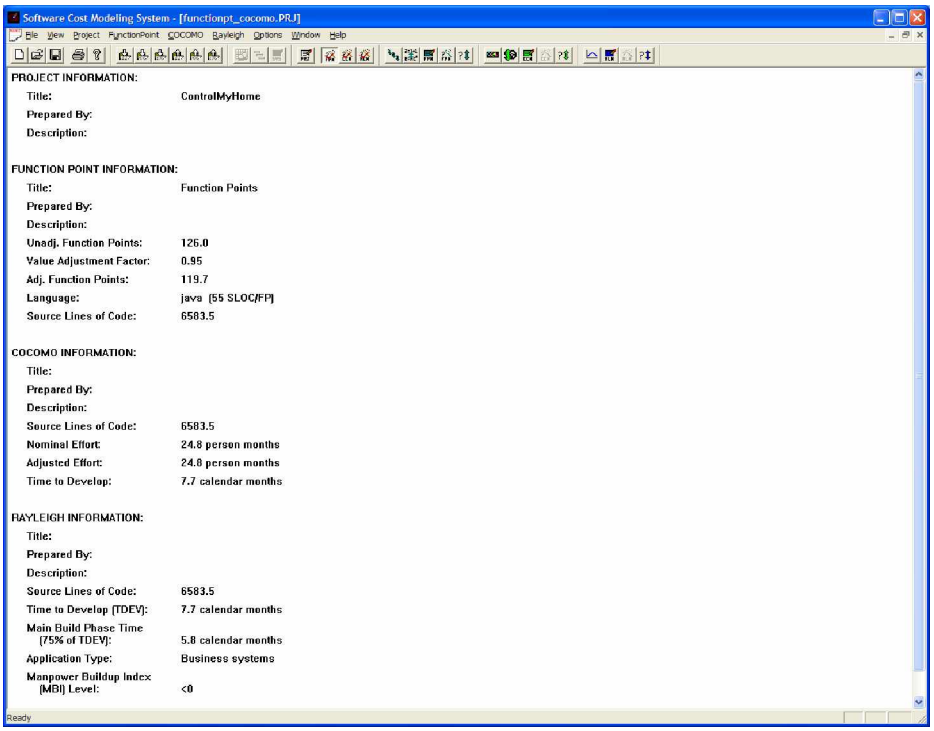
0 = None (No effect on Process Complexity)

5 = Strong (Great effect on process complexity)



Using the COSMOS software, the following results were calculated for our project:





3.5.2 COCOMO (Cost Construction Model)

COCOMO is an algorithm that figures out project completion estimates from the number of lines of code. It ties in the complexity, the language used, the schedule, and the number of stuff working on the project.

For a small to moderate-sized business software project (100,000 lines of code and 10 or fewer programmers), the COCOMO cost estimation model is used by thousands of software project managers, as it is based on the studies of hundreds of software projects. Unlike other cost estimation models, COCOMO is an open model, so all of the details are published, including:

- Underlying cost estimation equations.
- Every assumption made in the model.
- Every definition.

- Explicit statement of the costs included in an estimate.

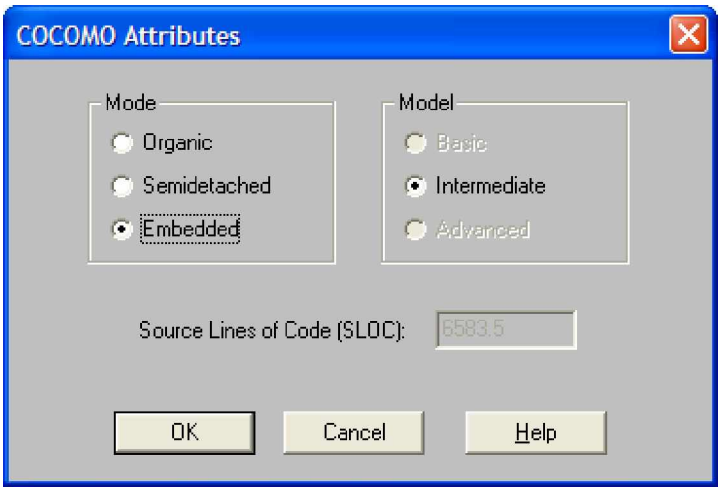
The most fundamental calculation in the COCOMO model is the use of the Effort Equation to estimate the number of Person-Months required in developing a project. Most of the other COCOMO results, including the estimates for Requirements and Maintenance, are derived from this quantity.

3.5.3 Source Lines of Code

The COCOMO calculations are based on estimates of a project's size in source lines of code (SLOC). The SLOC is defined as:

- Only source lines that are delivered as part of the product is included – test drivers and other support software are excluded.
- Source lines are created by the project staff – code generated by applications are excluded.
- One SLOC is one logical line of code.
- Declarations are counted as SLOC.
- Comments are *not* counted as SLOC.

3.5.4 COCOMO Attributes



3.5.5 Results

Total Unadjusted Function Point (TUFP) Count:

Java = 98, HTML = 126 è TUFP = 224

Project Complexity (PC) = 29

Adjusted Project Complexity (PCA) = (0.65 + (0.01 * PC))

= (0.65 + (0.01 * 29)

= 0.94

Total Adjusted Function Points (TAFP) = (PCA * TUFP)

= (0.94 * 224)

= 210.56

```
Lines of Code (LOC) = (Java LOC + HTML LOC)
                    = (1738.5 + 6583.5)
                    = 8322

KLOC = (LOC/1000) = 8.322

EFFORT = (1.4 * (KLOC)) = 11.6508 Person-Months

DEVELOPMENT TIME = (3 * (EFFORT)^1/3) = 6.801 Months
```

If it takes11.6508 months for one person to develop the software, then it takes 5.8254 months for two people and 2.9127 months for four people, and with 3 people it will take 3.8836 months, which is a good amount of time since this project has a time limitation of only 4 months.

The software calculations tell us that using Java will take 24.8 Person-Months and for HTML will take 5.6 Person-Months. Adding these to up gives us 30.4 Person-Months. So 4 people can do the work in 7.6 months, and 8 people can do the same work in 3.8 months. Although this seems like we will not have enough time to develop our software, the calculations assume that we will build everything from scratch. This is not true in our case, since we will be extending code that has already been written, which will save us time and work.

3.6 Risk Management

Project risk analysis is a formal process to identify and evaluate the technology, the schedule, and the cost uncertainties associated with the design and implementation of large and/or complex projects. The primary aim of the risk management program is to identify and mitigate events that may adversely affect project performance.

3.6.1 Project Size

There are 6 team members in our group. We are all mostly Computer Science Majors and Information System Majors. Although the system development seems to be very complex and difficult to implement, we are trying to work ahead of schedule in order to meet our weekly deliverables.

3.6.2 Project Structure

A web service will be created to simulate the PSE&G Company. This service will be in charge of providing its customers with current information about their energy rates. It will be user friendly so that people with access to a cable modem or DSL service can go to the web and see what the best hours to run their appliances are. The system will need some maintenance in order to keep providing current information to their customers.

3.6.3 Familiarity with Technology or Application Area

Fortunately, the team members in charge of developing the specific lines of code to create the system are very knowledgeable in their respective areas. They will use their knowledge in Java, HTML, XML, and other applications to develop the system. A chip will be acquired that will run a Java Virtual Machine. Then we will implement it in our web server using the appropriate protocol.

3.6.4 Time Constraints

Based on our busy schedules at work and in school, this is a big issue that we have to work hard on. Sometimes it is very difficult for the 6 of us to meet, but we will try our best to do so. Our system will be very complex to develop, so we need a lot of information and communication from each other. Therefore, e-mail and WebCT are a big help in order for us to keep in touch and exchange ideas with each other.

3.6.5 System Interdependence

The web server will have to be maintained once in a while for updates. For example, current energy rates may change.

4. System Analysis

4.1 Business Models

As the world at large becomes increasingly high-tech and web oriented, it is essential that we should be able to operate home equipment through the Web. It is essential that all companies make a variety of services available online. This is especially true for the ControlMyHome system. This system will enable users to communicate with home appliances remotely and control them through the web. Anyone with access to a cable modem or a DSL connection can make use of this system. A 1-Wire network will ultimately connect the devices that will control the home appliances. These home appliances can be lights, doors, temperature sensors, critical systems, and thermostats connected to a furnace.

The major stakeholders for this system are Dallas Semiconductors, the New Jersey Institute of Technology, PSE&G, the project team, Fujitsu Consulting, Internet Service Providers, ControlMyHome users, LUX, and Underwriters Laboratories. In this system, we will be using products from some of the above-mentioned companies. For example, we will be using iButtons and the TINI, which are produced by Dallas semiconductors.

The system will also emulate services from providers like PSE&G. Our users will be able to make use of a website, maintained by PSE&G, through web services to potentially negotiate prices automatically with the supplier. They will be able to see when the best hours to run home appliances such as dishwashers and other energy unfriendly devices are.

Internet Service Providers also have an important role in this system, as they are the providers of the connection between customers and our product. This system will make use of a thermostat produced by LUX that can help save money in energy bills. Underwriter Laboratories

will certify our product according to U.S. law. To sum up, this system is a combined product of software and hardware. To implement this system we will be using hardware devices like microcontrollers, such as the Microchip PIC16F84. Our product will become a useful resource for the public and small business owners.

4.1.1 AS-IS Model

The AS-IS model today of home automation exists in several hybrid forms. Some solutions are relatively simple, while others are extremely elegant. The elegant solutions however, come at a high price. The simplest model of the AS-IS state is a series of timers that can be programmed to turn on and off appliances, sprinklers, etc. Furthermore, thermostats can be installed to program heat and central air conditioning units for up to seven days. However, these simple solutions don't give a homeowner the ability to preempt the programming for the home. Even more importantly, the ability to monitor what's happening in the home doesn't exist.

At the high end of the spectrum, systems can be controlled, by phone, by computer, and from stimuli, in reaction to external events. For example, there are several window manufacturers that now have rain sensors to skylight windows that automatically cause them to close when it starts to rain.

While the AS-IS model certainly encompasses the full range of automation, a niche is open for systems that provide high-end functionality for an affordable price. High-end systems begin at the $3,000 price range, and grow quickly with additional features. Other systems, while providing wireless functionality, have limitations to the number of nodes or devices that can be attached.

The void to the AS-IS model today could be identified as the lack of a system that provides monitoring, manipulation, extensibility, and customization from remote locations.

4.2 Stakeholder Identification

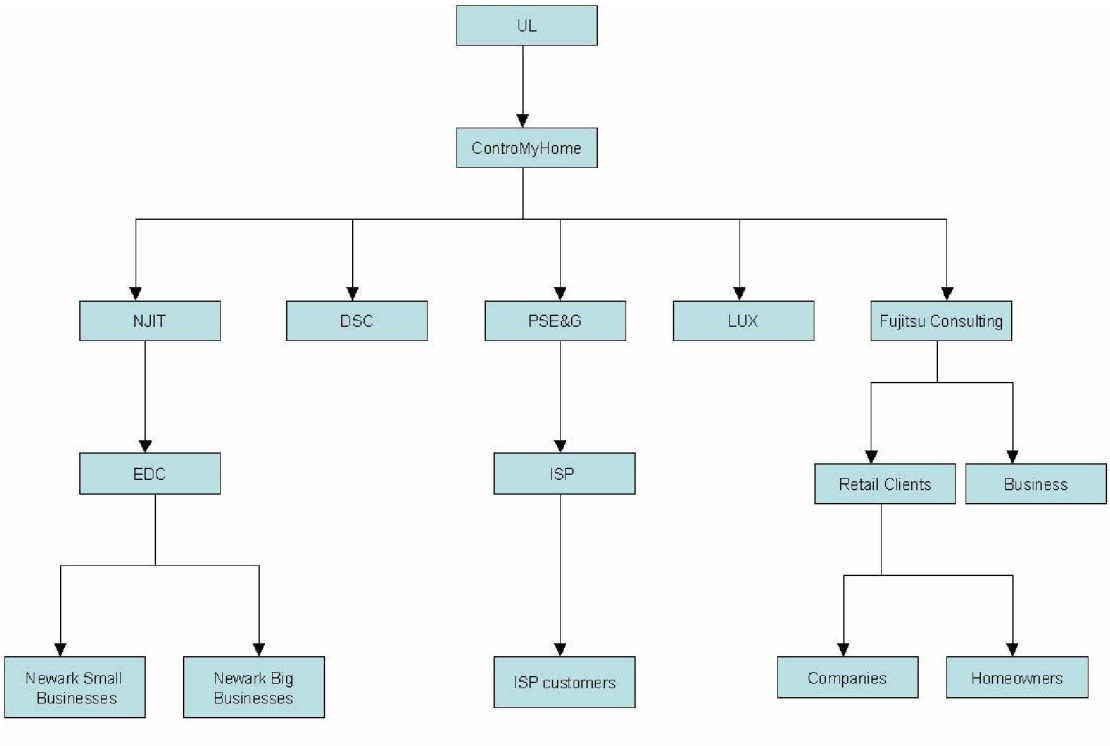


Figure 1 - Stakeholder Hierarchy

Dallas Semiconductor: Without their products our project would have taken more time to develop. We are using the TINI and iButton products from this company. Dallas Semiconductors could be one of our stakeholders. They might increase their revenue if we start selling the products with the company's parts. But, by being stakeholders it will also mean that if anything goes happens or goes wrong with their products that they will take responsibilities for the products failure. Therefore, Dallas Semiconductors is a stakeholder.

New Jersey Institute of Technology: NJIT is a key stakeholder in the ControlMyHome Project. Primarily, by fostering excellence, NJIT stands to maintain its reputation by attracting talent and becoming known as an institution that attracts “The Best of the Best.” Secondly, the school’s EDC (Educational Development Center) helps fledgling business in the Newark area. Through the development of projects, including business plans, design and vision, the school recognizes that certain projects have potential, and subsequently, the opportunity to participate in The Educational Development Center. While not grant, the EDC makes it possible to “incubate” new business that will grow and have positive influence on New Jersey, Newark and Science Park.

PSE&G: This Company would be an important stakeholder. The company will provide all the energy rate information to their customers, which means that the company’s client will save energy and money because they will get the information of when is best to use their appliances. Not to mention that it will also mean that PSE&G will save a lot of energy. People using our product would have the opportunity to manage and check some of their home appliances while they are at work or somewhere else. PSE&G would have a website where all these information will be available for all their customers.

The Project Team: We the team members are the developers of this whole project. We play an important role as stakeholders. We are the people who have to make sure the product satisfies the customer’s conditions and needs. We are developing a product that will help homeowners, business, and many customers to have access and information about some of their energy savings and security. After the product is in the market, we can see its results and if the revenues are well as expected we might even modify it for a better customer’s satisfaction.

Fujitsu Consulting: This Company is our possible sponsor. They as stakeholders would make sure the project is being developed in a proper and professional way. The company could

be our stakeholder. They could sponsor us to grow our business and to get new clients. Fujitsu Consulting could be the chain between future clients of our business. They would help us to know who to sell and for how much to sell.

Internet Service Providers: They would be the link between PSE&G and the company's customers. With the cable modems, users would be able to access and check their home lights, doors, and even thermostats. But if everyone uses the ControlMyHome package, it will mean that there will be a lot of traffic to handle. This will be a negative consequence in the ISP infrastructure, which will force them to upgrade the infrastructure to handle all the traffic. By doing this upgrade the costs will be higher and the ones who will suffer will be the clients.

ControlMyHome Users: They are the most important stakeholders. They would be the ones that would be using our product. With the help of iButtons and sensors that will be set up in their homes, users would have easy access to some of the home appliances. Like turning on the lights, opening the doors, lacking the doors, and some other home appliances. The ControlMyHome users could be any homeowner, a small business, a big company, or anyone that would like to have this product in his or her home or business. Also the ControlMyHome package will teach the users how to save energy and money because they will use their appliances in a proper way.

LUX: This Company is another important stakeholder for our project. The company sells thermostats like the LUX9000, which has certain features that will make it amenable for our application. One of these features is that these thermostats can save energy and money on utility bills because according to the US Department of Energy, a programmable thermostat can reduce heating costs by up to 35% and cooling costs by up to 25%. Therefore the thermostats will be used to save energy to the ControlMyHome customers, and if we use this company as the only vendor for the thermostats, then it will make LUX a key stakeholder of ControlMyHome. The

LUX offers also programmable thermostats. These thermostats will give us everything we look for in an electronic and energy saving thermostat.

Underwriters Laboratories: They are a very important stakeholder to our project. In the US, every electrical product needs the Underwriters Laboratories certification or approval. This is why our product must achieve this certification. It will help us get into the market in an easier way because it would mean that ControlMyHome has met the engineering standards of UL.

Regulatory Bodies: In an attempt to reconcile organizations that overlap certain parts of the hierarchy, we try to name them as auxiliary stakeholders. In a horizontal view, we recognize the fact that organizations like NJ Division of Taxation may span EDC, NJIT, Fujitsu Consulting, ControlMyHome (if looked at as an entrepreneurial endeavor), so they are intentionally left off the high level diagram. We acknowledge the fact, however, that these stakeholders can have a direct influence on success or failure of a business by the incurrence of fees that affect the company bottom line.

Other Stakeholders: Some of the other stakeholders that appear in vertical as well as horizontal slices of the view are insurance (liability, employee, unemployment, etc). Associations that may benefit us as a company (minority organizations, woman owned companies, etc) may be thought of as stakeholders in terms of opening business opportunities that otherwise might not be available. These stakeholders have been reconciled, and we acknowledge the fact that they are substantial, and deserve mention here. They have also been reconciled in our stakeholder evaluation.

4.3 Requirements Gathering

4.3.1 System Questionnaire/Survey

1. There should be a need to know the status of house appliances and the ability to turn them on/off:

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

2. You feel apprehensive about controlling your household appliances through the Internet:

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

3. You consider your self an amateur when using the Internet or a personnel computer.

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

4. You would likely be interested in knowing the optimum time to turn your thermostat on.

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

5. You would be willing to spend up a thousand dollars in controlling your household appliances.

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

6. If you are a corporate organization, you have a strong need to monitor and/or control the lights, computers, servers, central-air-conditioning and heating of your workplace:

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

7. For a corporate workplace, an appropriate and acceptable pricing would be $700 per a node.

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

8. If you decide to purchase “ControlMyHome” product, you will be willing to purchase a service-contract:

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

9. You agree that the number of the node points should dedicate the service-contract amount:

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

10. You feel that the product should be installed by you and it should be relatively simple to operate:

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

11. You feel that you should be able to configure the chips that would control the different items in the house or corporate place.

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

12. You feel that the system needs to be extremely reliable and guarantee associated with it.

Agree	Somewhat Agree	Strongly Agree	Disagree	Some what disagree	Strongly disagree

4.3.2 Brainstorming

4.3.3 Interview Outline

Interviewee:	**Interviewer:**
Location/Medium	**Appointment Date:** **Start Time:** **End Time:**
Objectives: To gather the user's wants and desires pertaining to the system specification	**Reminders** (i.e. Background/experiences of interviewee, know opinions of interviewee):
Agenda: To ask the interviewee certain question and to get a sense of what he/she expects out of the system	**Approximate Time (if applicable)**
Introduction:	
Background on Project:	
Overview on interview	
Topics to covered: **Topic1:** Usability of the system **Topic2:** Cost to the client **Topic3:** Reliability	
Permission to Tape Record	
Summary:	
General Observations:	
Unresolved Issues, Topics not Covered:	

Topic 1 Questions (Usability of the System)

1. **How do feel about having the ability to control your household appliances for anywhere in the world (open ended question?**
2. **What are some of your concern in using this product?**
3. **Do you think other household that you know will be interested in acquiring this system?**

Topic 2 Questions (System Cost)

1. **What type of price will you are willing to pay for such a system?**
2. **Will you be willing to purchase a service contract?**
3. **Do you feel that the system is too expensive?**

Topic 3 Questions (Reliability)

1. **What do you expect out of this system?**
2. **Do you feel that a guarantee of failure-free operation should be included?**
3. **How long in terms of years or months do you feel that this guarantee should last?**

4.3.4 Use Cases

Actor: Home User

1) Control Home: Home user able to control the electronic devices from the website.
2) Controlling Lights/Switches: Home user able to check the status of the lights and switches and control them from the Web.
3) Temperature Status: Can check the temperature of all the rooms.
4) Thermostat: Can check the status of the thermostat and turn it on or of specifying the desired temperature.
5) Doors: Can check the status of all the doors and able to close it if proper hardware is installed with the door. Such as garage door if it has a power motor connected to it then user can close or open the garage door from the Web.
6) Windows: Can check the status of the Windows and control it if the proper hardware is installed.
7) Critical Systems: User can control the critical systems such as sump pump in the basement from the Web.
8) Intelligent devices: User can control the intelligent devices and use it at off peak time checking the off peak hour from the energy company. Will be able to schedule the intelligent devices.
9) Configuration: user will be able to add, modify and delete devices those are connected to the 1-wire protocol.
10) Security: iButton is used to access at home. User will be able to check the log to see who entered the house at what time. Only configured users will be able to access the home.

Actor: Hardware installer

1) Hardware installer will able to install the hardware on the 1-wire protocol.

Actor: Web Designer

1) Web designer able change the webpage design.

Actor: Web Programmer

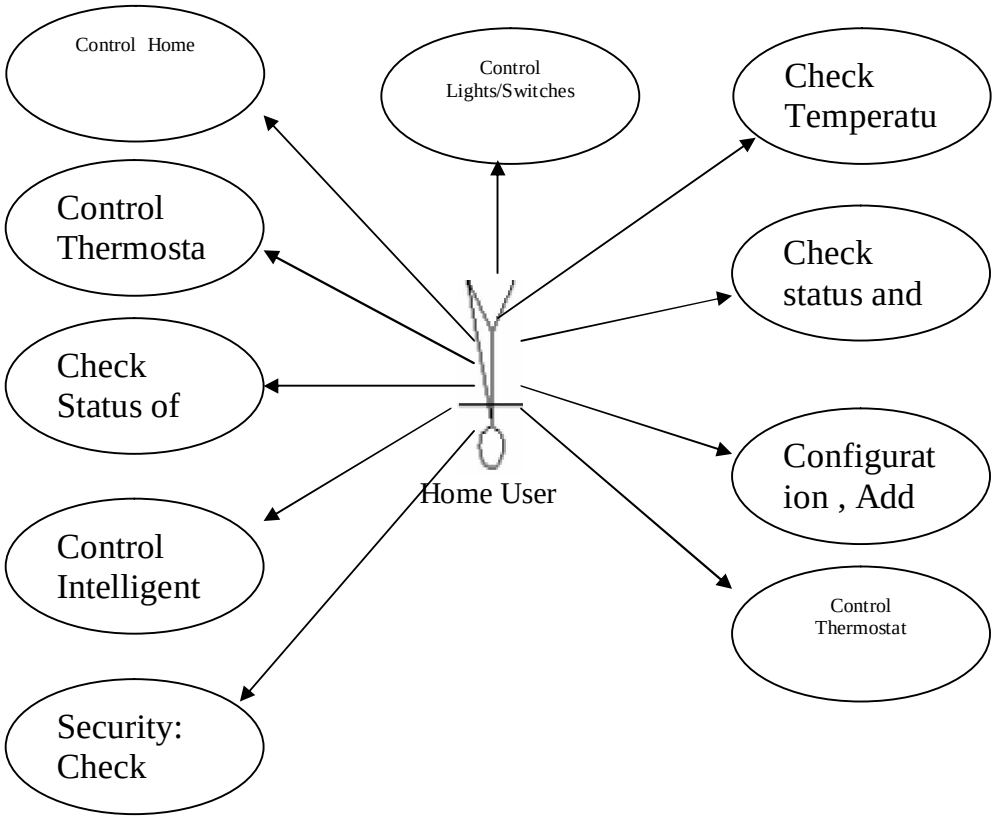
1) Web Programmer will create the configuration pages to created dynamic pages for the user.

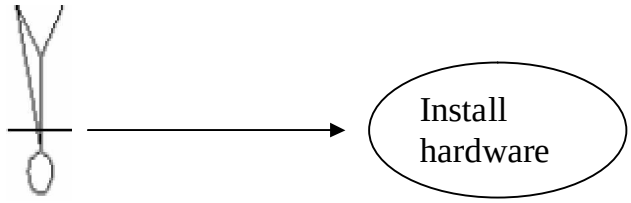
Actor: Backend Programmer

1) Backend programmer will be able to communicate with devices according to user specification.

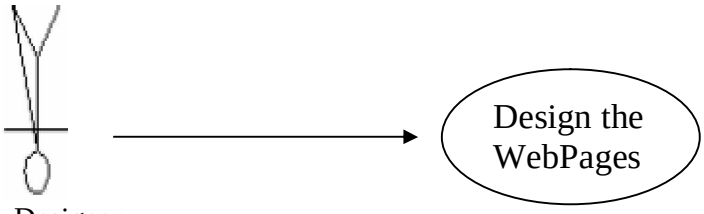
Use Cases Diagram

Light/Switches

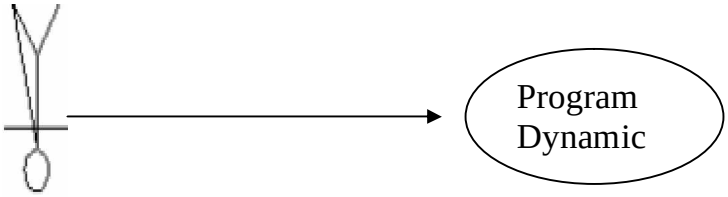




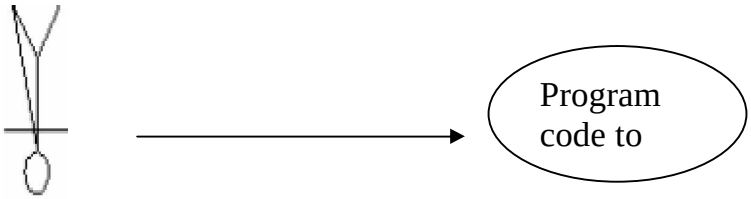
Hardware Installer



Web Designer



Web Programmer



Backend Programmer

4.3.5 Prototyping

One of the methodologies we used for requirements gathering was prototyping. To achieve a quick response to factors that worked and didn't work, prototyping was probably the best technique. The prototype descriptions follow:

Prototype 1:

In the first prototype, we didn't use any forms for the web pages. There were individual pages. We had pages for lights, doors, windows and critical system.

Prototype2:

In the second prototype, we introduced the pages in form format. On the left side of the main form there were links to all the pages. The page background for every page was changed.

Ptototype3:

In the third prototype, we had the pages in forms. This time all the pages contained tables. JavaScript was used for the links on the left. The image of the link changes on mouse over. The user would be able to browse though the pages and see the status of lights, doors, windows, thermostat, temperature and critical systems.

Prototype4:

In this prototype, we added additional pages into the system. One of the major enhancements was the configuration page. From this page the user would be able to configure

lights/switches, iButtons, doors, windows and critical systems. Another enhancement was the web services page. For this page, JavaScript was used to develop a graph that plots the cost of electricity and gas.

As the project grows, the prototype will evolve and change according to user requirements.

4.4 Requirements Definition

4.4.1 Functional Requirements

1) **User verification through iButtons.**

   The user of the system will not identified by logins or passwords, but through the use of their unique iButton.

2) **Unobtrusive and transparent to the user.**

   Once the system is set up, the need for user intervention should be kept to a minimum, since the system should be invisible to the user as much as possible.

3) **Single-user system.**

   The system will support only one user at a time.

4) **Add/remove appliances easily.**

   It should be easy as possible to connect new appliances to the system, as well as remove connected appliances from the system.

5) **Software should be updateable.**

   There should be a way to update the Java software running the system, so that the system can incorporate future appliances, iButton and 1-Wire devices and microcontrollers.

6) **Simple web server.**

   The TINI web server should be a simple web server that provides web services. In addition, this server will keep a history log of HTTP requests.

7) **Communicates with PSE&G.**

   A web service offered by the TINI server will communicate with PSE&G in order to efficiently schedule when appliances should be run so as to optimize energy usage.

8) **Simple web interface.**

   As the user will access the TINI server through the web, the web user interface should be simple and intuitive as possible.

4.4.2 Non-Functional Requirements

1) Reliability is a high priority for the ControlMyHome system.
2) ControlMyHome system must be user friendly, reliable, and secure on the net.
3) ControlMyHome system should be interactive, informative, and simple for users to operate.
4) Any modification to the ControlMyHome system should be done without any difficulties.
5) The ControlMyHome system database should be exportable/importable or have interchangeability so that other applications may use the data.
6) The ControlMyHome system should respond to the user in a reasonable response time.
7) The system down time must be cut down to the minimum possible.

8) The ControlMyHome system has to be cost effective. No hidden costs should be involved.
9) It should have a good user interface.
10) It should have the latest security technologies.
11) The ControlMyHome system should be easy to maintain. Any changes made should be effortless.
12) The ControlMyHome system should be compatible to future information system modules that may be integrated into it.

4.5 Requirements Specification

The ControlMyHome Project gives homeowners or business owners the ability to manage resources remotely. The resources can involve any number of electrical components. These components fall into several categories. While several components involve direct manipulation of the components and the devices attached to the components, others include simple monitoring of the devices.

1. Users will have direct access to the ControlMyHome application from anywhere on the web.
    1.1. With a browser, users will be able to create a session, and access full functionality to the ControlMyHome application.
    1.2. Any compliant web browser will be able to access the ControlMyHome application.
    1.3. Through a secure login, users will be able to monitor, manipulate and configure various parts of the system.
2. A system log will be available to monitor HTTP requests into the system.
    2.1. The log will store the time, date, and IP address of the machine that performed the request.
    2.2. An audit trail will represent all actions taken within the system.
    2.3. A configuration file will store the custom configuration of that customers home or business. The system will dynamically display the devices based on the configuration file.
    2.4. The configuration file will be directly controlled through the configuration option of the ControlMyHome application. The user will have the ability to add, change or delete various components of the configuration.

3. The system will have a set of specifications describing the network, and the physical characteristics needed for any device to communicate with the network protocol.
    3.1. The physical wiring of the network will be specified in terms of signals, required electrical characteristics, color-coding, and orientation of wires and connectors.
    3.2. All devices that become part of the topology will have specifications as well as schematics illustrating the usage of the device
    3.3. Each classification of a device will be fully described, and specifications will be available on how to bridge the physical device with the configuration file.
4. The layout and flow of the application should be logical, and the navigation should always be available for users to immediately get to other parts of the application.
    4.1. Similar controls should be part of the same page within an application.
    4.2. Devices that have the ability to trigger alarms should be accessible from their respective pages or from a common area.
5. The system will contain a quick start guide. The purpose of the guide will be:
    5.1. To let new product owners get access to the system in the shortest amount of time.
    5.2. To help configure the system and eliminate the possibility of fundamental mistakes.
6. The system should be divided into modules.
    6.1. From a physical aspect, each module is an optional component that users can purchase and configure on the system.
    6.2. The modules should have common connections.
    6.3. The connections should guarantee that modules could only be plugged in one way.
    6.4. The connections should guarantee that modules could be arranged in any order.

5. Process Specification

5.1 Structured English

For all sessions created by the homeowner

1. Access login page and enter Account Name and password
2. Access the help screen and understand concepts described in “Navigation”
3. Verify that the entry point is the ControlMyHome Home Page
4. Navigation
    a. To configure the devices for the first time
        i. Proceed to “Configuration” hyperlink
        ii. Enter
            1. The DeviceID (Found on the CMH Hardware Module)
            2. The classification of the device (Light, switch, etc)
            3. A descriptive name of the device
            4. Accept the changes, and the configuration will be stored
    b. To manipulate lights
        i. Proceed to the “Lights” Hyperlink
        ii. Verify that all the lights contained on this page reflect what was entered on the “Configuration” page
        iii. To manipulate a light, or a series of lights
            1. Toggle the Checkbox labeled “State” next to the description of the light
                a. A check will indicate that the light will be turned on

b. Unchecked boxes will indicate lights will be turned off

c. To view temperatures
    i. Proceed to the “Temperature” Hyperlink
    ii. Verify that all temperature sensors contained on this page reflect what was entered on the “Configuration” page
    iii. Verify the temperature sensors are working, and observe the temperatures reported by each of the sensors

d. LUX Thermostat
    i. Proceed to the “Thermostat” Hyperlink
    ii. Verify the LUX has the correct configuration for serial.in, serial.out and status
    iii. Verify the Thermostat screen comes up, and compare the settings on the LUX thermostat with those on the LUX page
    iv. Verify
        1. The time
        2. The target temperature
        3. The actual temperature
        4. Whether the furnace is running

e. Critical Systems
    i. Proceed to “Critical Systems” hyperlink
    ii. Verify that all configured components are on this page and accurately represented
    iii. Force the failure of a system, such as closing the connection on the sump pump, and verify the alarm notification

f. Web Services
    i. Proceed to Web Services hyperlink
    ii. Verify that the “Live Connection” indication is on
    iii. Observe the time and rate table distributed from the simulated web service
g. Intelligent devices
    i. Proceed to Intelligent Devices
    ii. Verify there is one connection to a microcontroller device
    iii. Follow the directions on the page to cycle the device and verify communication with it
h. Schedule
    i. Proceed to the Schedule page
    ii. Place one or more components into the schedule grid
    iii. Verify the devices turn on / off based on the indication and the scheduled time
i. Logout

Configuration

```
////////////////////////////////////////////////////////////////////////////////////////////////////
// The Initialize Method is used to Initialize objects and variables of the configuration section //
////////////////////////////////////////////////////////////////////////////////////////////////////

Initialize
  If LOAD_DESCRIPTION_In_Category_ListBox = 'Success' then
    Load Hard-Coded-Category into ADD, DELETE and MODIFY Sections
    Listen for Events
    Call Display-Tabular-Config-Form
  end if
End Initialize
```

```
////////////////////////////////////////////////////////////////////////////////////////////////////////////////
// This Method displays the tabular form which contains the tab sections for add, //  //
delete and modify.                                                                  //
////////////////////////////////////////////////////////////////////////////////////////////////////////////////

Display-Tabular-Config-Form
  If Add-Section-Is-Clicked then
    Call Add-Section
  else if Modify-Section-Is-Clicked
    Call Modify-Section
  else if Delete-Section-Is-Clicked
    Call Delete-Section
  End if
  Call Terminate
End

////////////////////////////////////////////////////////////////////////////////////////////////////////////////
// The Add section of the tabular form can be used to add new records in the  // //
database. It is described here.                                                 //
////////////////////////////////////////////////////////////////////////////////////////////////////////////////

Add-Section
  IF Add-Section-Is-Displayed then
    blnStatus = Check-Status-of-the-Chip
    Call Validate-Input-Entry
    If Incorrect-User-Input then
      Display "Invalid Description or Serial#"
      Exit
    End if
    If blnStatus then
      If Add-Button-Is-Clicked then
        blnSUCCESS = Add-New-Record
        if Not blnSUCCESS then
          Display Msg "Unable to add the new Record" & Error-
Message-No
        Else
          Display Msg "Record Added Successfully"
          Exit
        End if
      End if
    else
      Display MSG "Unable to Read Status of Chip"
    End if
    If Add-Cancel-Button-Is-clicked then
      Exit
    end if
  end if
End Add-Section
```

```
////////////////////////////////////////////////////////////////////////////////////////////////////////////
// The Modify section of the tabular form can be used to modify existing records // // in
the database. It is described here.                                                    //
////////////////////////////////////////////////////////////////////////////////////////////////////////////

Modify-Section
  IF Modify-Section-Is-Displayed then
    blnStatus = Check-Status-of-the-Chip
    If blnStatus then
      blnSUCCESS = Read-Config-Info
      If blnSuccess then
        Call View-for-Display-The-First-Record
        If MNext-Button-Is-Clicked then
          Call Display-the-following-Record
          If End-of-file then
            Call View-for-Display-The-First-Record
          end if
        end if
        If MPrevious-Button-Is-Clicked then
          Call Display-the-Previous-Record
          If End-of-file then
            Call View-for-Display-The-First-Record
          end if
        end if
        If MFirst-Button-Is-Clicked then
          Call View-for-Display-The-First-Record
        end if
        If MLast-Button-Is-Clicked then
         Call View-for-Display-The-Last-Record
        end if
      else
        Display Msg "Unable to Read"
      end if
      If Modify-Command-Button-Is-CLICKED then
        Call Validate-Input-Entry
        If Incorrect-User-Input then
          Display "Invalid Description or Serial#"
        Else
          ADD MODIFIED RECORD
          If error then
            Displays "Unable to Modify"
          Else
            Displays "Record Modified successfully"
          end if
        End if
      end if
    end if
```

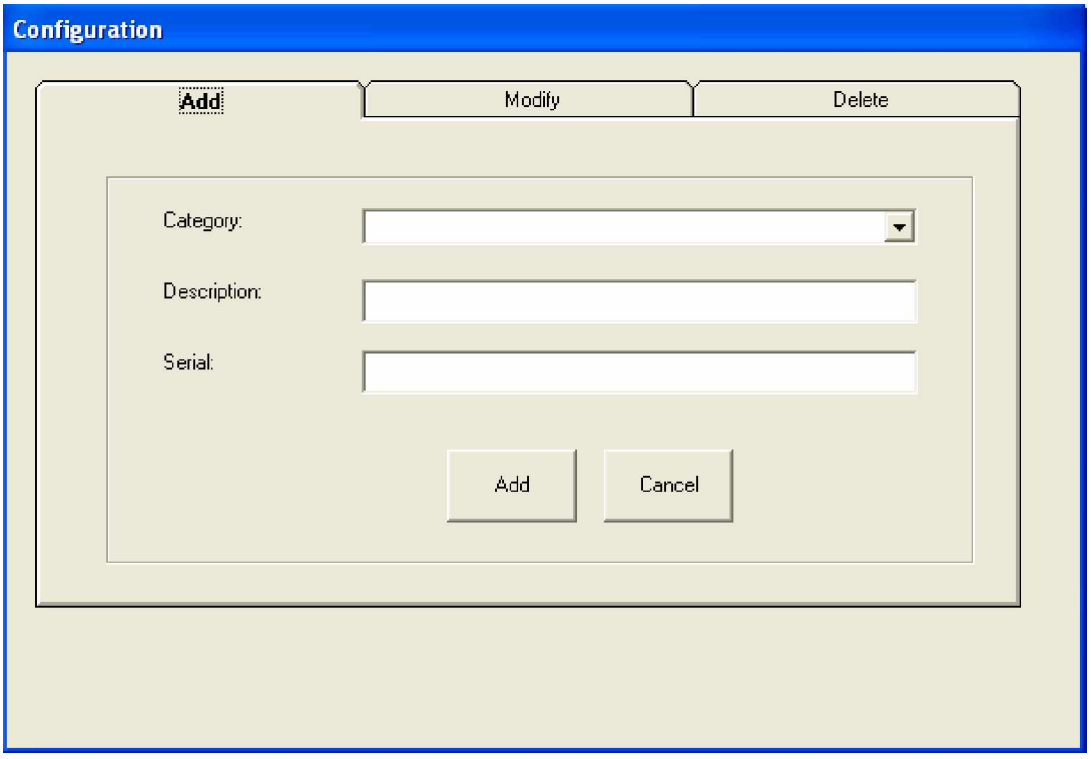
```
  end if
End Modify-Section

////////////////////////////////////////////////////////////////////////////////////////////////////////////////
// The Delete section of the tabular form can be used to delete existing records // // in
the database. It is described here. //
////////////////////////////////////////////////////////////////////////////////////////////////////////////////

Delete-Section
  IF Delete-Section-Is-Displayed then
    blnStatus = Check-Status-of-the-Chip
    If blnStatus then
      blnSUCCESS = Read-Config-Info
      If blnSuccess then
        Call View-for-Display-The-First-Record
        If MNext-Button-Is-Clicked then
          Call Display-the-following-Record
          If End-of-file then
            Call View-for-Display-The-First-Record
          end if
        end if
        If MPrevious-Button-Is-Clicked then
          Call Display-the-Previous-Record
          If End-of-file then
            Call View-for-Display-The-First-Record
          end if
        end if

       If MFirst-Button-Is-Clicked then
         Call View-for-Display-The-First-Record
       end if

       If MLast-Button-Is-Clicked then
         Call View-for-Display-The-Last-Record
       end if
     else
        Display Msg "Unable to Read"
     end if
     If Delete-Command-Button-Is-CLICKED then
       Call Validate-Input-Entry
       If Incorrect-User-Input then
         Display "Invalid Description or Serial#"
       Else
         Delete RECORD
         If error then
           Displays "Unable to Delete"
         Else
           Displays "Record deleted successfully"
```

```
          end if
        End if
      end if
    end if
  end if
End Delete-Section

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
//  The Terminate Section Closes all objects and DB connection before ending.       //
////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

Terminate
  Close all Objects
  Close DB-Connection
End Terminate

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
//  Access Login page and enter account name and password                                  //
////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

Initialized
     If login_name = First_Name + Last_Name
                     And Password = "************"
     Then
          Let access to page and account
          Else
               Access denied
     End If
End Initialized

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
```

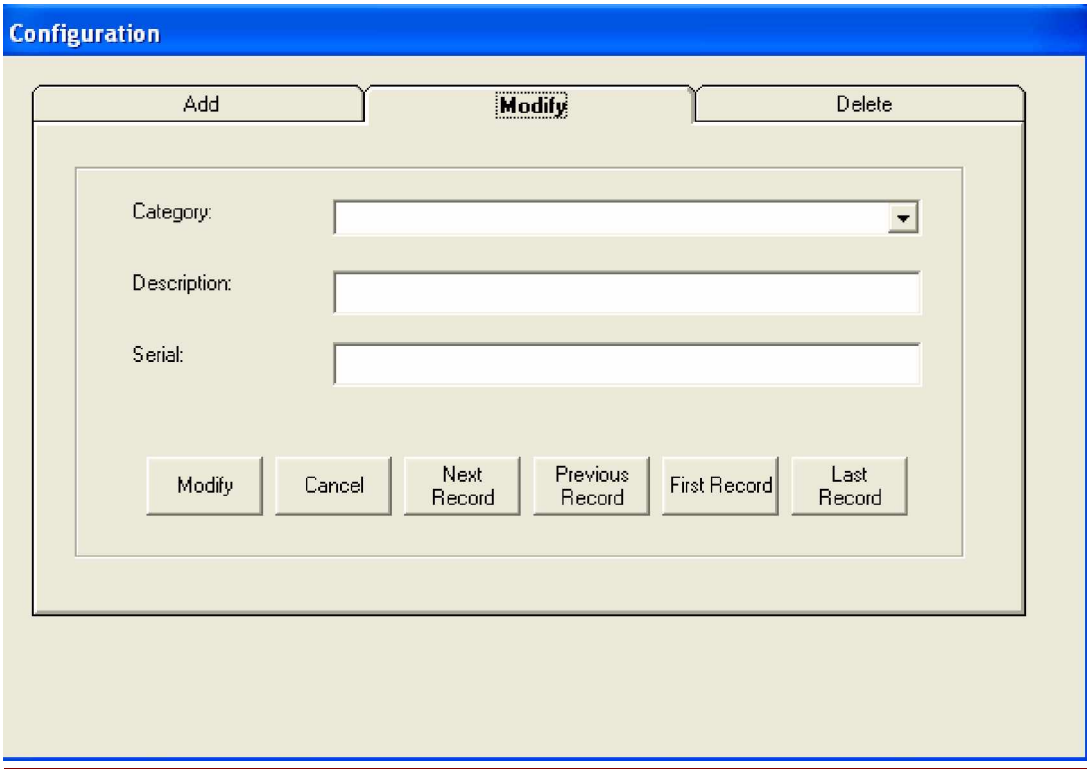
Front End

This is how I envision the Front-End of the Configuration slice to be:

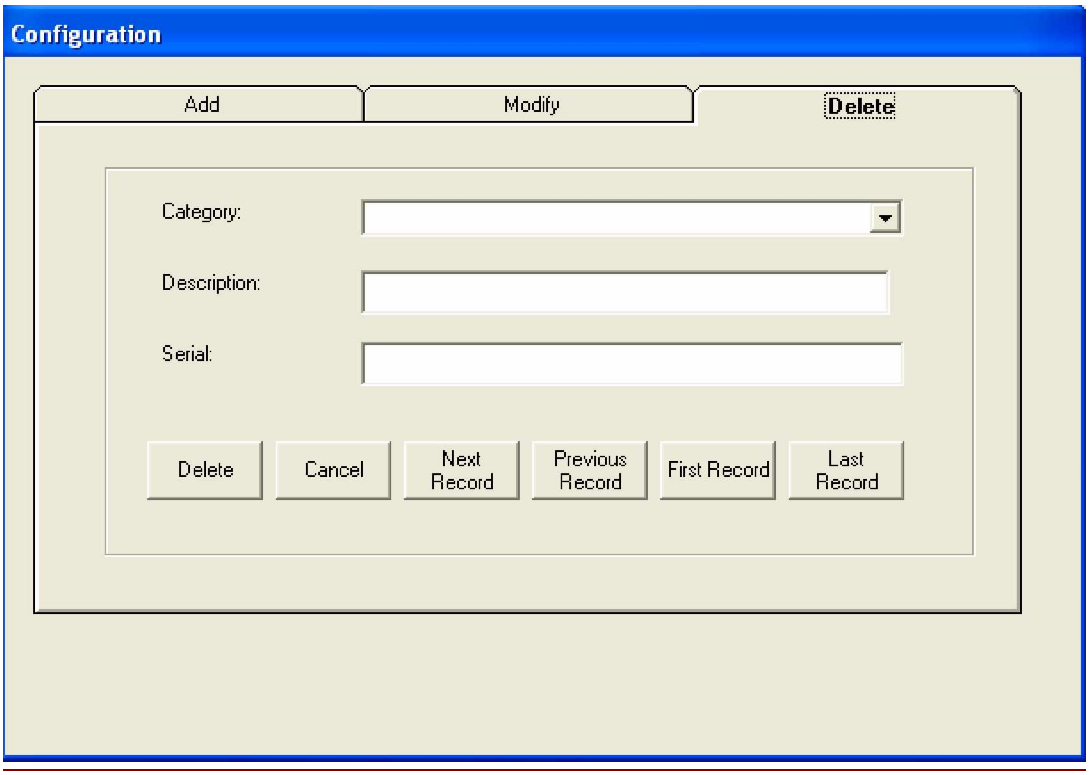
Add Section


Configuration
Add
Modify
Delete
Category:
Description:
Serial:
Add
Cancel

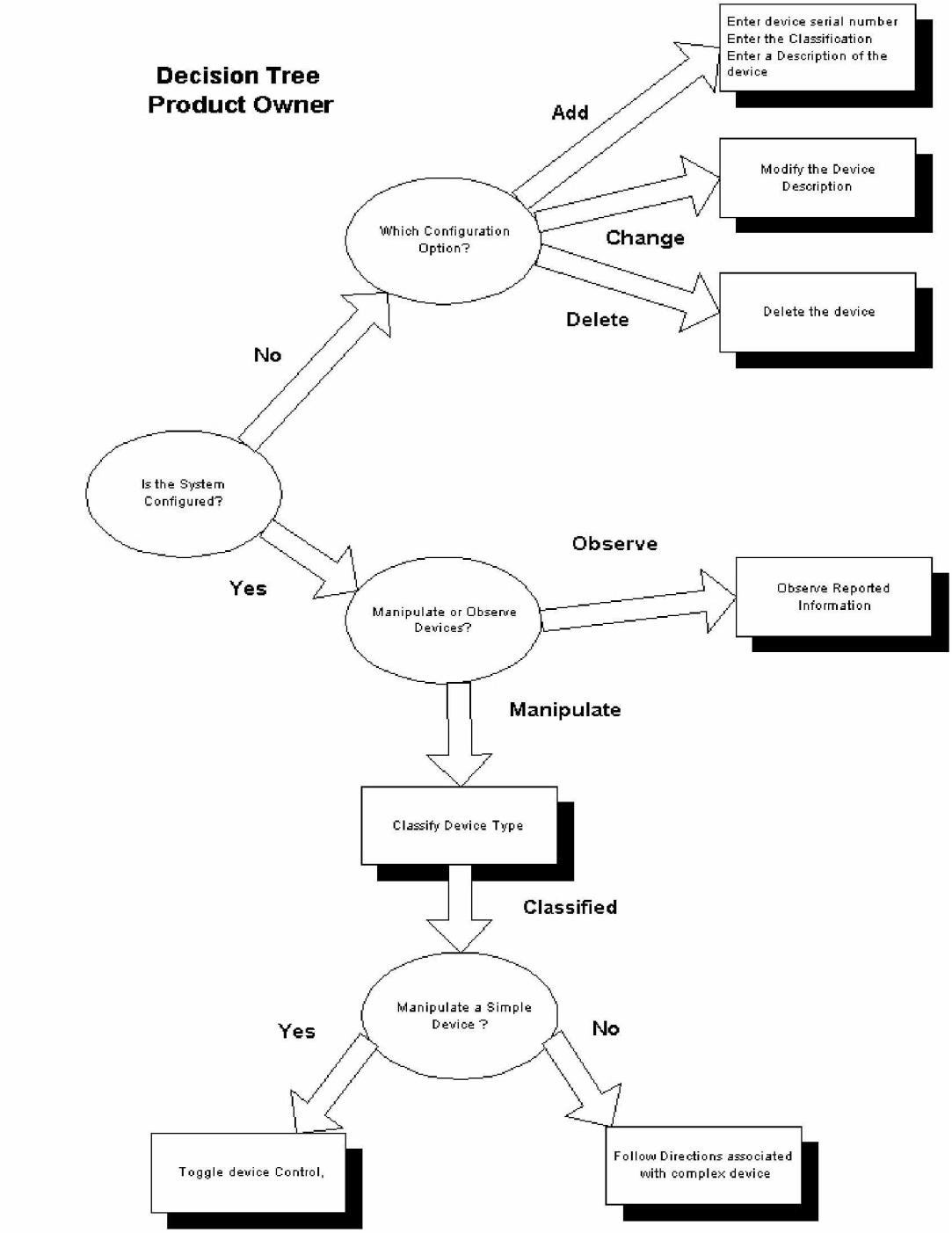
Modify Section



Delete Section



5.2 Decision Tree



5.3 Decision Table

Conditions	1	2	3	4	5	6
Is the system configured?	N	N	N	Y	Y	Y
Which Configuration Option?	Add	Change	Delete			
Manipulate or Observe Devices?				Manipulate	Manipulate	Observe
Manipulate a simple device?				Y	N	Observe
Actions						
Enter Device Info	X					
Modify Device Desc		X				
Delete Device			X			
Classify Device Type				X	X	
Observe Reported Info						X
Toggle Device Control				X		
Follow Directions associated with complex device					X	

5.4 Data Dictionary

5.4.1 ControlMyHome User

```
PersonalAccount = AccountNumber + ControlMyHomeUserName +
ControlMyHomeID

ControlMyHomeUserName = FirstName + (MiddleInitial) + LastName

ControlMyHomeID = IButtonSerialNumber + Password

Password =   [Letters] + [Numbers]

[Letters] = [{A|B|C|D|…|a|b|c|d|…}]
[Numbers] = [0|1|2|3|…|9]
```

5.4.2 Front-End Modification

AddSection = Category + Description + SerialNumber

ModifySection = Category + Description + SerialNumber

DeleteSection = Category + Description + SerialNumber

Category = [Letters]

Description = [Letters]

SerialNumber = [Letters] + [Numbers]

[Letters] = [{A|B|C|D|…|a|b|c|d|…}]

[Numbers] = [0|1|2|3|…|9]

5.4.3 ControlMyHome Appliances Information

RequestApplianceInformation = Login + SpecificHomeAppliance

SpecificHomeAppliance = Doors | Lights | CriticalSystem | Thermostat

5.4.4 ControlMyHome User's Login

Login = FirstName + (MiddleInitial) + LastName + AccountNumber + Password

FirstName = [Letters]

MiddleName = [Letters]

LastName = [Letters]

AccountNumber = [Numbers]

Password = [Letters] + [Numbers]

[Letters] = [{A|B|C|D|…|a|b|c|d|…}]

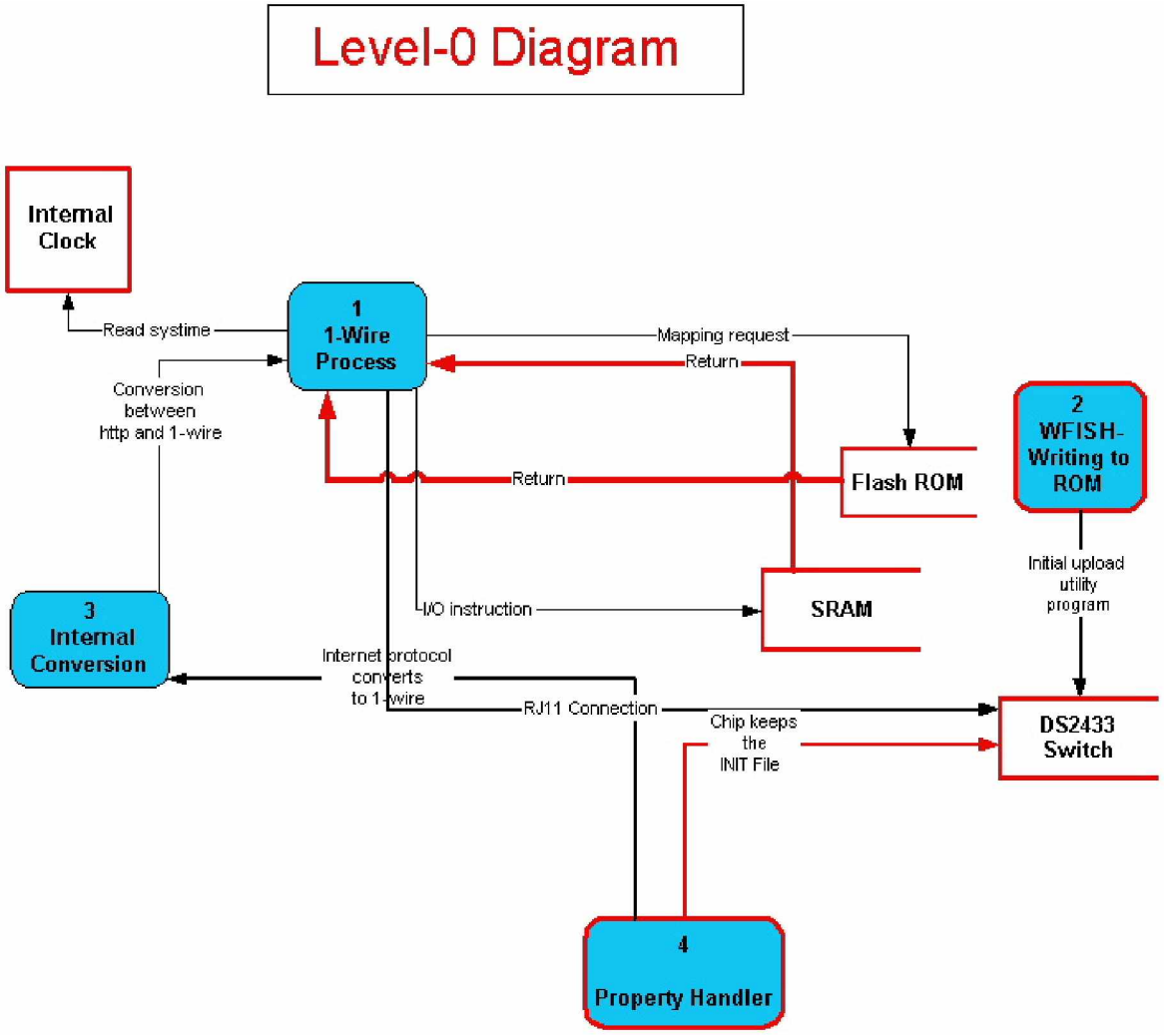
[Numbers] = [0|1|2|3|…|9]

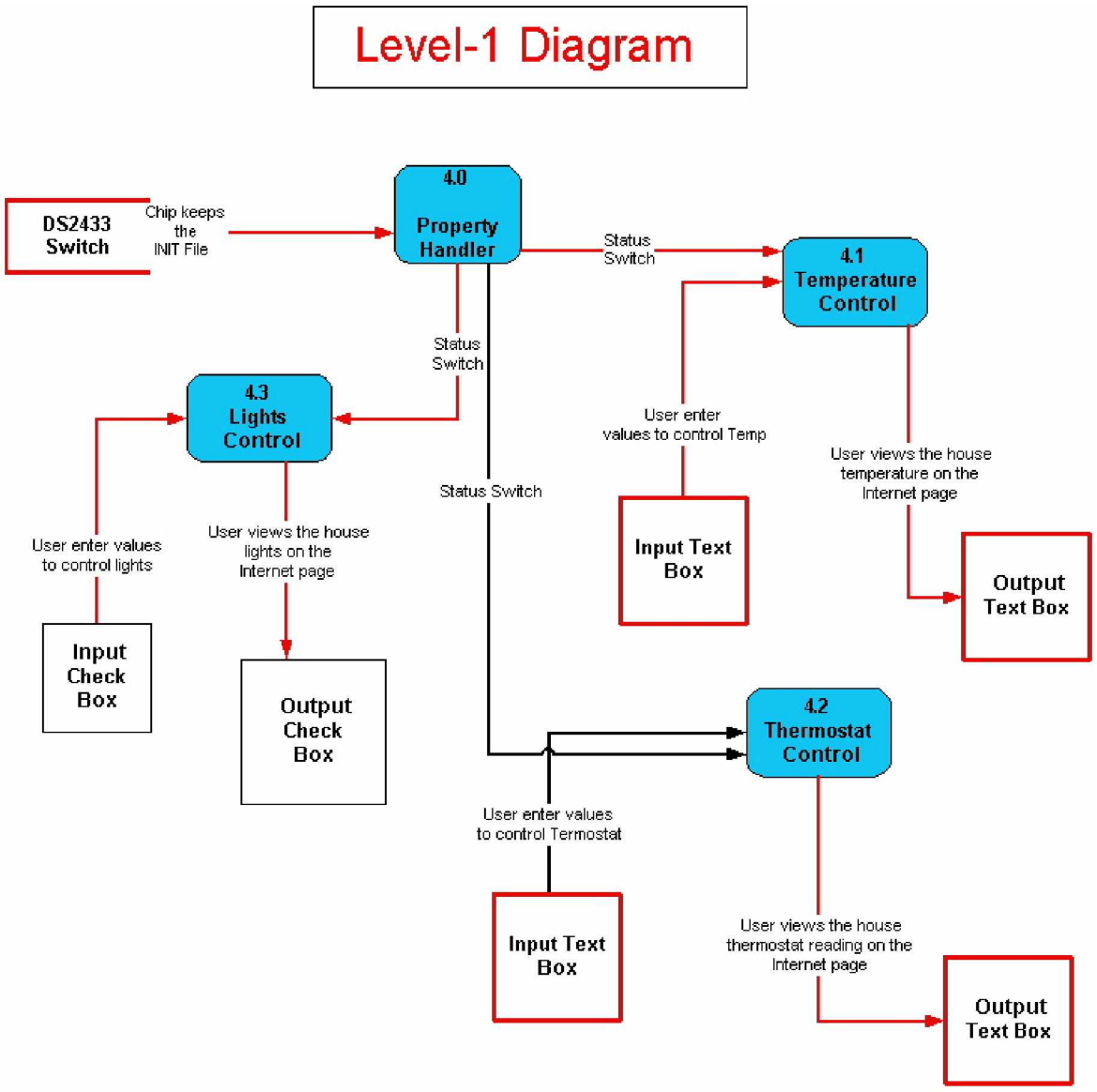
[Letters] + [Numbers] = [{A|B|C|D|…|0|1|2|3|…|a|b|c|d|…|0|1|2|3|…}]

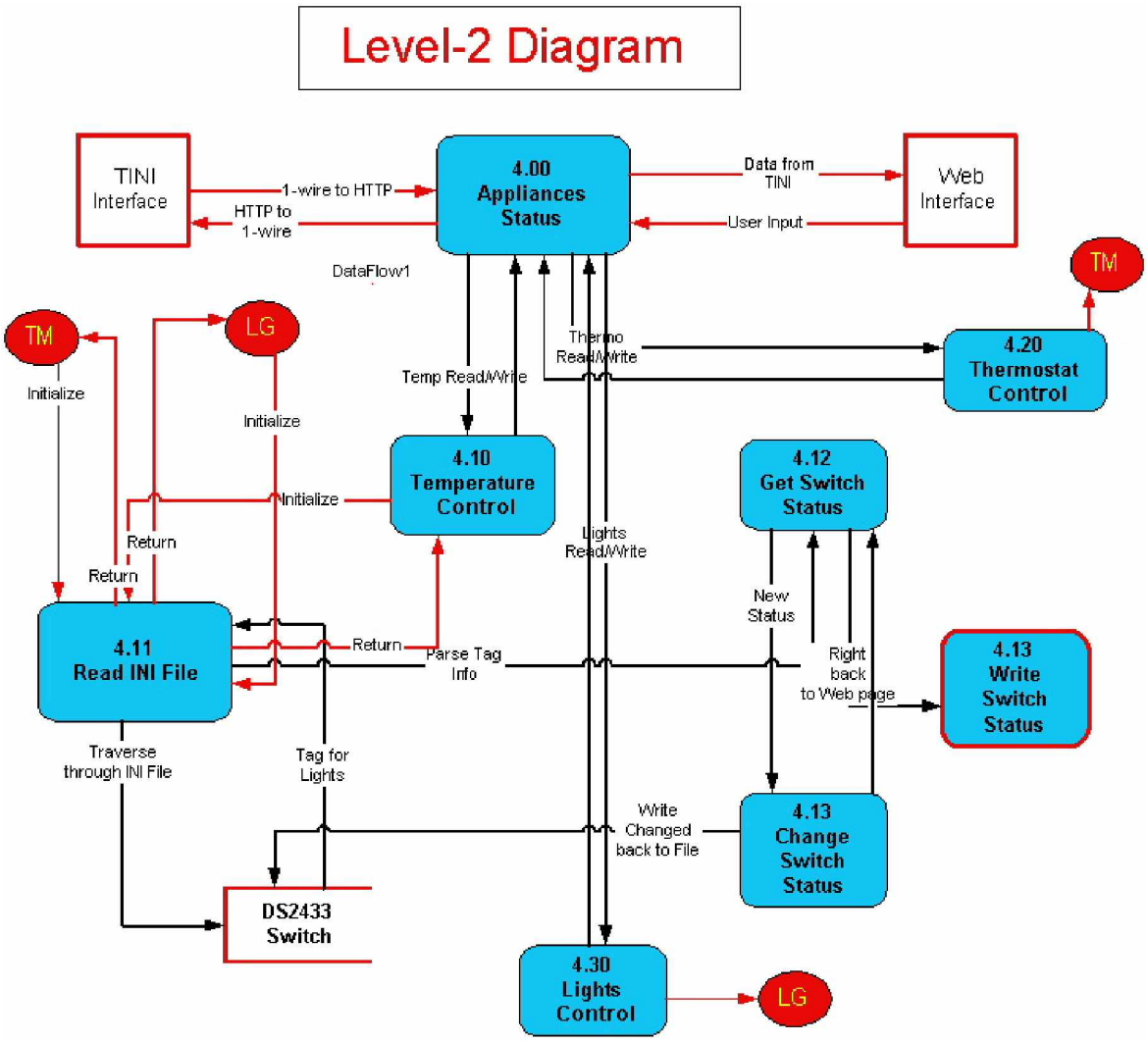
6. System Design

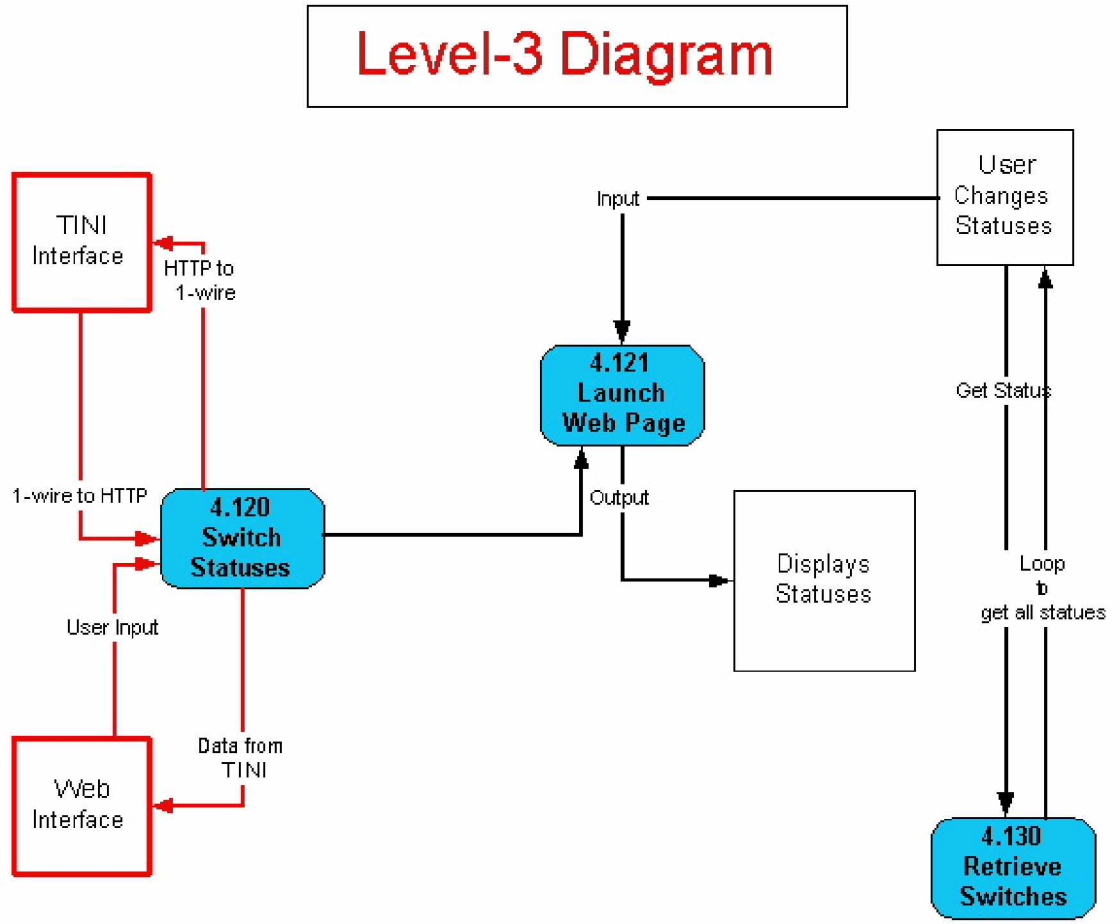
6.1 Modular Decomposition

6.1.1 Data Flow Diagrams




Level-1 Diagram
DS2433 Switch
Chip keeps the INIT File
4.0 Property Handler
Status Switch
4.1 Temperature Control
Status Switch
4.3 Lights Control
User enter values to control Temp
User views the house temperature on the Internet page
Status Switch
User enter values to control lights
User views the house lights on the Internet page
Input Text Box
Output Text Box
Input Check Box
Output Check Box
4.2 Thermostat Control
User enter values to control Termostat
Input Text Box
User views the house thermostat reading on the Internet page
Output Text Box

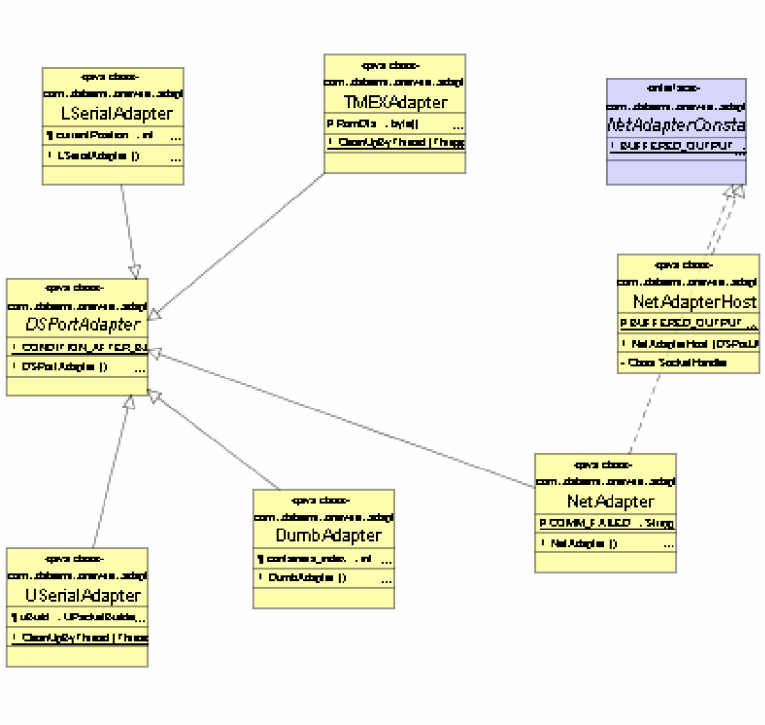

Level-2 Diagram
TINI Interface
1-wire to HTTP
HTTP to 1-wire
4.00 Appliances Status
Data from TINI
User Input
Web Interface
DataFlow1
TM
LG
Initialize
Temp Read/Write
Thermo Read/Write
4.20 Thermostat Control
4.10 Temperature Control
4.12 Get Switch Status
Lights Read/Write
Return
4.11 Read INI File
Parse Tag Info
New Status
Right back to Web page
4.13 Write Switch Status
Traverse through INI File
Tag for Lights
Write Changed back to File
4.13 Change Switch Status
DS2433 Switch
4.30 Lights Control


Level-3 Diagram
TINI Interface
HTTP to 1-wire
1-wire to HTTP
4.120 Switch Statuses
User Input
Web Interface
Data from TINI
Input
4.121 Launch Web Page
Output
Displays Statuses
User Changes Statuses
Get Status
Loop to get all statues
4.130 Retrieve Switches

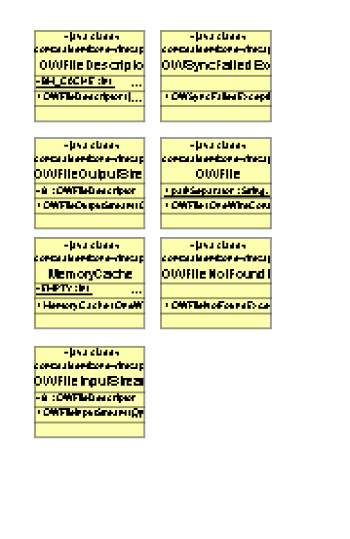
6.2 Object-Oriented Design

6.2.1 Static Object Model – UML

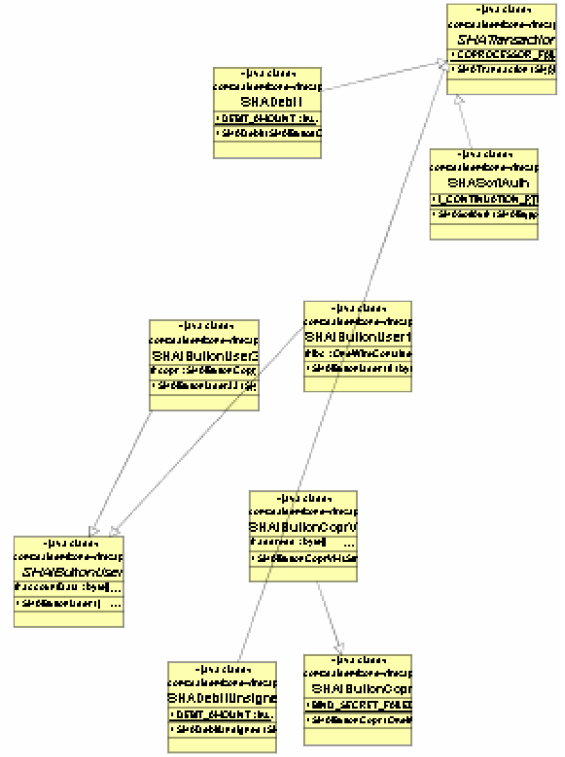
1-Wire Adapter



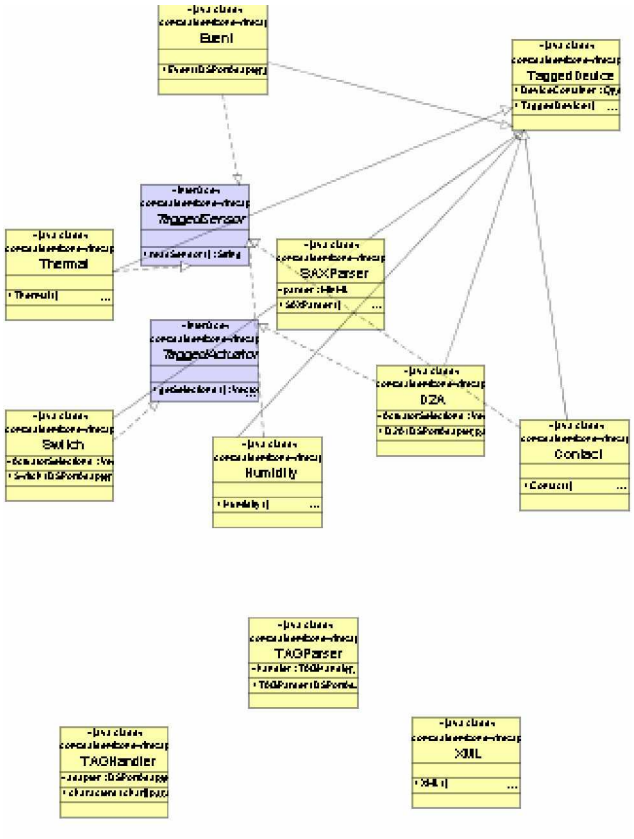
Application File



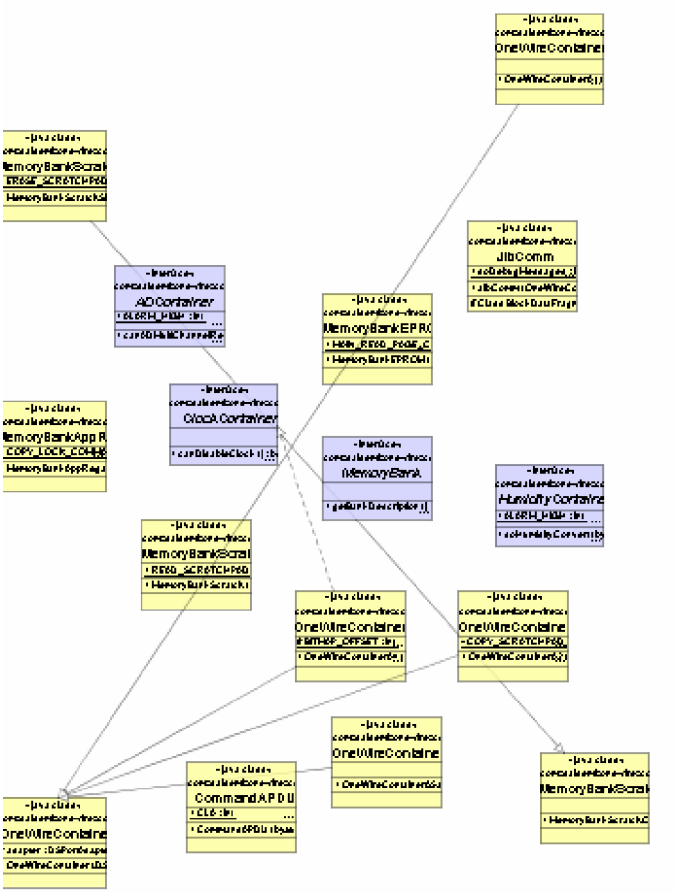
Application SHA



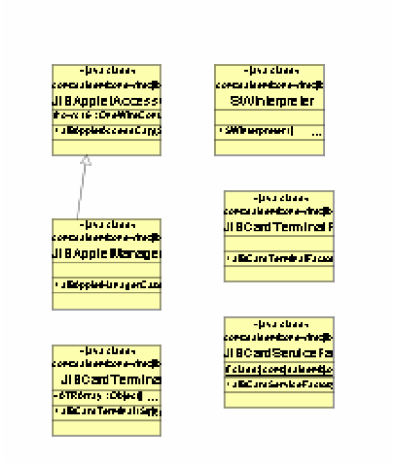
Application – Tag



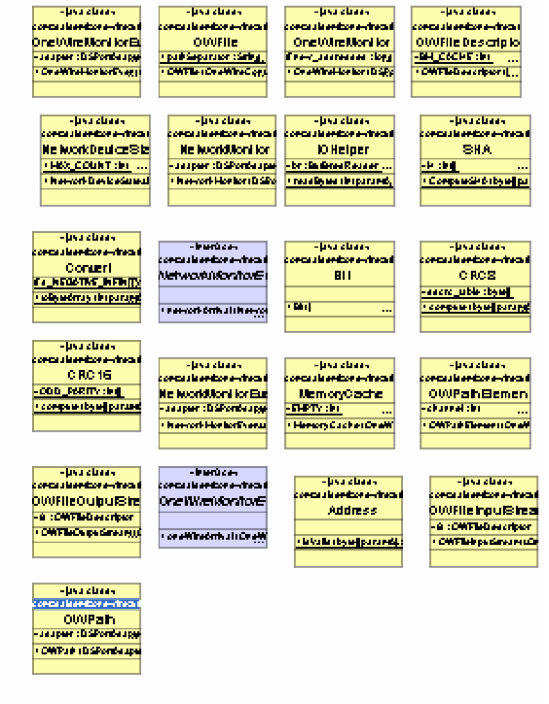
Container (Similar objects not shown)



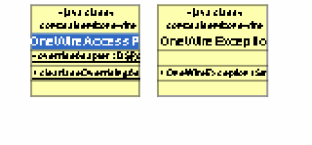
JIB



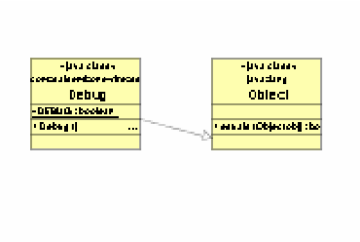
Utilities



1-Wire Service Provider and Exception Handling

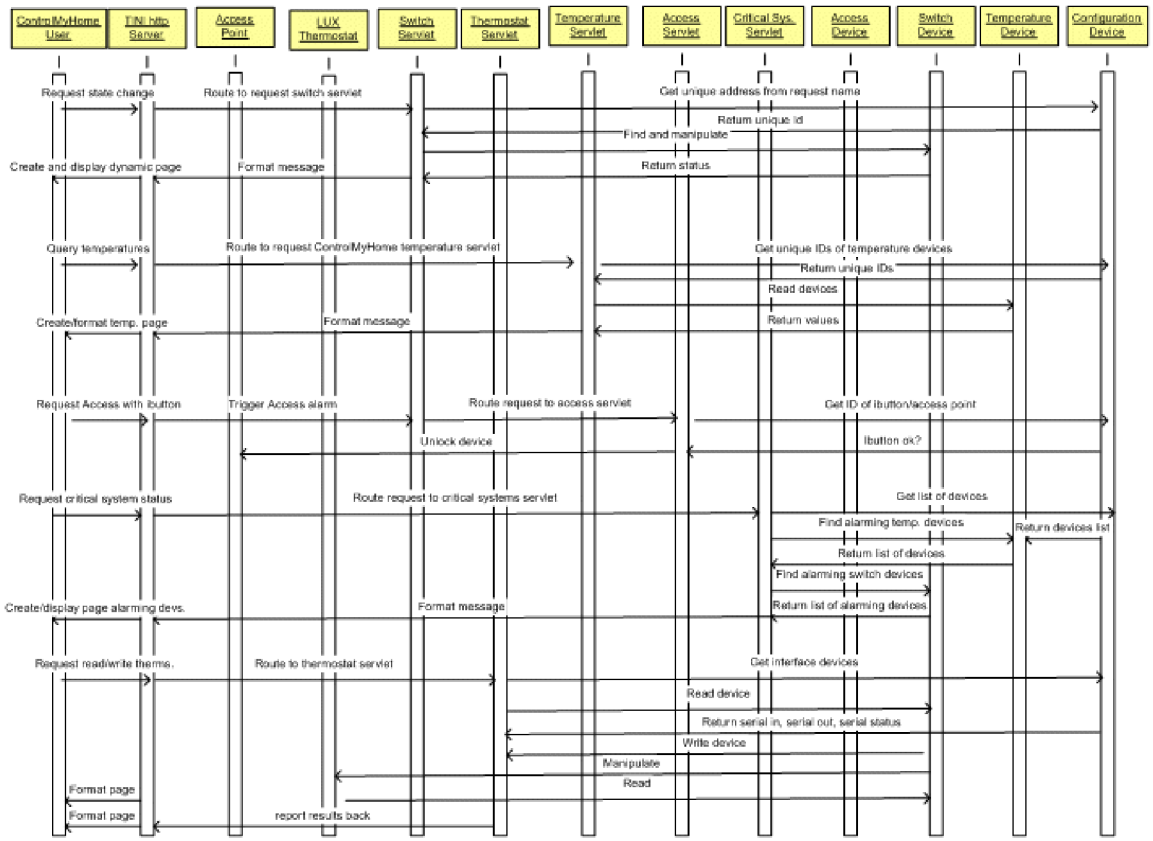


Debug

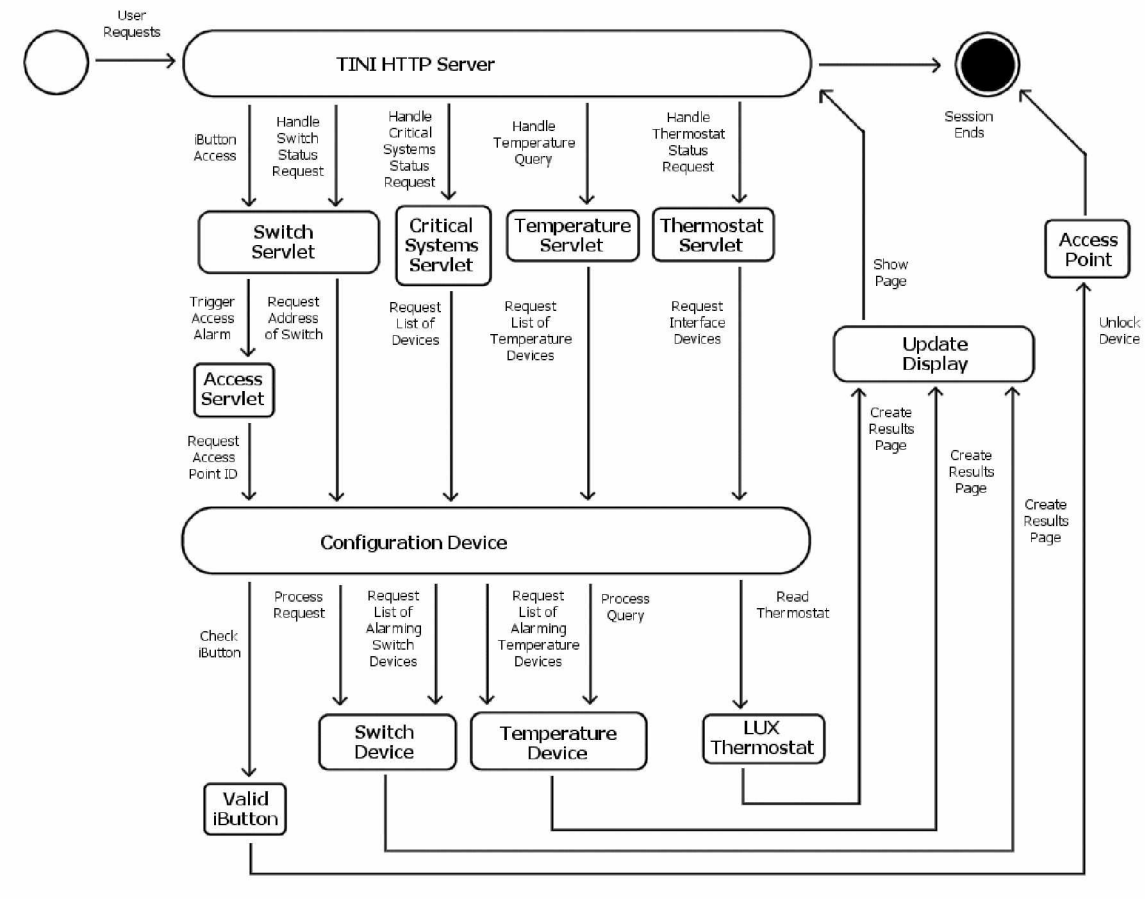


6.2.2 Dynamic Modeling

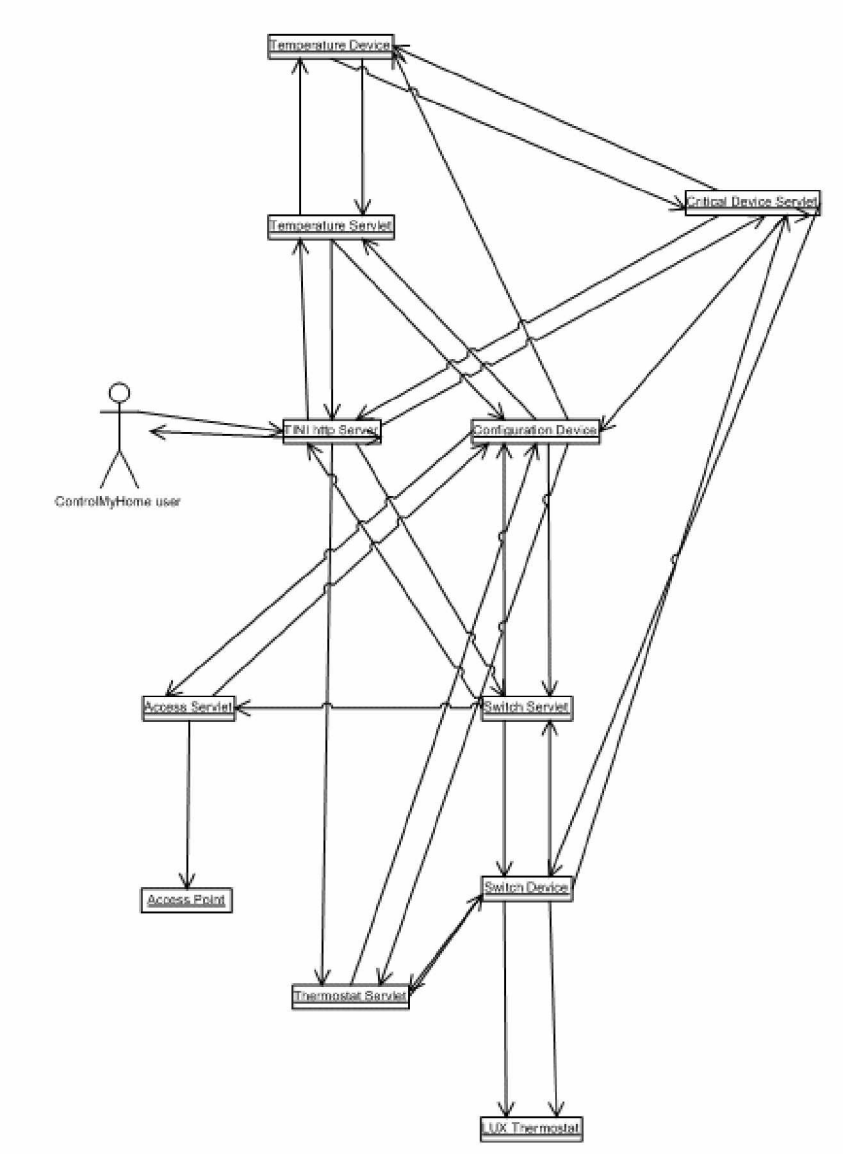
6.2.2.1 Sequence Diagram



6.2.2.2 State Transition Diagram



6.2.2.3 Collaboration Diagram



6.3 User Interface Design

6.3.1 Metaphor

The main idea of our project is to control the home from the web. According to this idea it is quite clear that we are using web pages as our front-end design. The primary plan is to build a web site, from which user is going to control the home. The web pages have to be user friendly and easy to use. User should be able to control lights/switches, doors, windows, thermostat, temperature, critical systems and intelligent devices. User should be able to configure the system by adding and deleting devices from the system and will be able to name the particular device. User will be able to check the status of the devices and control accordingly. User would be able the check the rates of the electricity and gas form the web-services. He will be able to schedule the intelligent devices and save the energy.

6.3.2 Mental Model

The mental model on the designer was to build some individual pages, which will have the links to other pages. All the pages should be colorful and will contain the information of each category in different pages. The color for lights page should be different from the color of doors pages. There will be individual page for each category as follows: a) lights/switches b) doors c) window d) thermostat e) temperature f) critical system g) configuration h) intelligent devices i) web-services.

Description of the pages should be as follows.

a) Lights/Switches: User will be able to see the status of the lights/switches in this page and will be able to control those from this page. User will see all the lights and switches added to the system. There will be a table in this page. On the left column, the user will see the devices configured such as Bedroom, Living room etc. On the right column there will be check boxes. If the checkbox is checked then that particular light or switch is on otherwise it's off. There should be a status button on the bottom of the columns, which would show the actual status of the lights and switches. There should be another button for submit. User will be able to check the checkbox to turn on and click submit. User will be able to uncheck the checkbox to turn off and click submit.

b) Doors: User will be able to see the status of the doors in this page and will be able to control those from this page. User will see all the doors added to the system. There will be a table in this page. On the left column the user will see the doors configured, such as Front Door, Garage etc. On the right column there will be check boxes. If the checkbox is checked then that particular door is closed otherwise it's open. There should be a status button on the bottom of the columns, which would show the actual status of the doors. There should be another button for submit. User will be able to check the checkbox to close and click submit. User will be able to uncheck the checkbox to open and click submit. In the case of door the controlling depends on proper hardware installed. For example there should an electric motor installed to control the garage door.

c) Windows: User will be able to see the status of the Windows in this page and will be able to control those from this page. User will see all the doors added to the system. There will be a table in this page. On the left column the user will see the windows configured, such as Bedroom, Living room etc. On the right column there will be check boxes. If the checkbox is checked then that particular door is closed otherwise it's open. There should be a status button

on the bottom of the columns, which would show the actual status of the doors. There should be another button for submit. User will be able to check the checkbox to close and click submit. User will be able to uncheck the checkbox to open and click submit. In the case of door the controlling depends on proper hardware installed.

d) Thermostat: User will be able to see the status of the thermostat in this page and will be able to control those from this page. User will see the actual temperature. User will be able to set the target temperature and control the thermostat. There will be a table on this page. On the left column user will see the actual and target. On the right column there will be text-boxes. There should be a status button on the bottom of the columns, which would show the actual status of the thermostat. There should be a button for turn it on and a button to turn it off. User will be able to set the target temperature in the target text-box and then turn the thermostat on.

e) Temperature: User will be able to see the actual temperature of all the rooms in this page. User will see the actual temperature. There will be a table on this page. On the left column user will see the rooms those are added to the system with a temperature sensor. On the right column there will be text-boxes. There should be a status button on the bottom of the columns, which would show the actual temperature of all the rooms. When user clicks this status button, user will see the actual temperature of all the rooms.

f) Critical Systems: User will be able to see the status of the critical systems in this page and will be able to control those from this page. User will see the actual status of the critical systems. There will be a table on this page. On the left column user will see the devices. On the right column there will be text-boxes. There should be a status button on the bottom of the columns, which would show the actual status of the critical systems. There should be a button for turn it on and a button to turn it off. User will be able to turn the critical systems on and off.

g) Configuration: User will be able to configure the devices from this page. This page will have links other pages to add, remove, and delete devices from the system. User will have links to lights/switches, doors, windows, temperature sensors, critical system, intelligent devices and iButton.

When user clicks the link to lights/windows user will see a page with all the lights/switches configured to the system. There will be three buttons in this page add, delete and cancel. Clicking cancel will take the user to the configuration page. There will be a table in this page with three columns. Left column will have a check box, 2nd column will have device name and the last column will have the device unique number. When user checks an item and click delete that device will be deleted from light/switches page. When user clicks add it will take the user to another page add light/switch. In this page there will be two columns. Left column will have Name and Device, and second column will have text-boxes. There will be two buttons in this page. Buttons are 'Submit' and 'Cancel.' Clicking cancel will take the user to configuration page. User will specify the device name and the unique device number in the second column. By clicking submit will add the device to light/switches page.

When user clicks the link to doors user will see a page with all the doors configured to the system. There will be three buttons in this page add, delete and cancel. Clicking cancel will take the user to the configuration page. There will be a table in this page with three columns. Left column will have a check box, 2nd column will have device name and the last column will have the device unique number. When user checks an item and click delete that device will be deleted from doors page. When user clicks add it will take the user to another page add doors. In this page there will be two columns. Left column will have Name and Device, and second column will have text-boxes. There will be two buttons in this page. Buttons are 'Submit' and 'Cancel.' Clicking cancel will take the user to configuration page. User will specify the device

name and the unique device number in the second column. By clicking submit will add the device to doors page.

When user clicks the link to windows user will see a page with all the windows configured to the system. There will be three buttons in this page add, delete and cancel. Clicking cancel will take the user to the configuration page. There will be a table in this page with three columns. Left column will have a check box, 2nd column will have device name and the last column will have the device unique number. When user checks an item and click delete that device will be deleted from windows page. When user clicks add it will take the user to another page add windows. In this page there will be two columns. Left column will have Name and Device, and second column will have text-boxes. There will be two buttons in this page. Buttons are 'Submit' and 'Cancel.' Clicking cancel will take the user to configuration page. User will specify the device name and the unique device number in the second column. By clicking submit will add the device to windows page.

When user clicks the link to temperature sensor user will see a page with all the temperature sensors configured to the system. There will be three buttons in this page add, delete and cancel. Clicking cancel will take the user to the configuration page. There will be a table in this page with three columns. Left column will have a check box, 2nd column will have device name and the last column will have the device unique number. When user checks an item and click delete that device will be deleted from temperature sensor page. When user clicks add it will take the user to another page add temperature sensor. In this page there will be two columns. Left column will have Name and Device, and second column will have text-boxes. There will be two buttons in this page. Buttons are 'Submit' and 'Cancel.' Clicking cancel will take the user to configuration page. User will specify the device name and the unique device number in the second column. By clicking submit will add the device to temperature sensor page.

When user clicks the link to critical system user will see a page with all the critical system configured to the system. There will be three buttons in this page add, delete and cancel. Clicking cancel will take the user to the configuration page. There will be a table in this page with three columns. Left column will have a check box, 2nd column will have device name and the last column will have the device unique number. When user checks an item and click delete that device will be deleted from critical system page. When user clicks add it will take the user to another page add critical system. In this page there will be two columns. Left column will have Name and Device, and second column will have text-boxes. There will be two buttons in this page. Buttons are 'Submit' and 'Cancel.' Clicking cancel will take the user to configuration page. User will specify the device name and the unique device number in the second column. By clicking submit will add the device to critical system page.

When user clicks the link to intelligent devices user will see a page with all the intelligent devices configured to the system. There will be three buttons in this page add, delete and cancel. Clicking cancel will take the user to the configuration page. There will be a table in this page with three columns. Left column will have a check box, 2nd column will have device name and the last column will have the device unique number. When user checks an item and click delete that device will be deleted from intelligent devices page. When user clicks add it will take the user to another page add intelligent devices. In this page there will be two columns. Left column will have Name and Device, and second column will have text-boxes. There will be two buttons in this page. Buttons are 'Submit' and 'Cancel.' Clicking cancel will take the user to configuration page. User will specify the device name and the unique device number in the second column. By clicking submit will add the device to intelligent devices page.

When user clicks the link to iButton user will see a page with all the iButton configured to the system. There will be three buttons in this page add, delete and cancel. Clicking cancel

will take the user to the configuration page. There will be a table in this page with three columns. Left column will have a check box, 2nd column will have device name and the last column will have the device unique number. When user checks an item and click delete that device will be deleted from iButton page. When user clicks add it will take the user to another page add iButton. In this page there will be two columns. Left column will have Name and Device, and second column will have text-boxes. There will be two buttons in this page. Buttons are 'Submit' and 'Cancel.' Clicking cancel will take the user to configuration page. User will specify the device name and the unique device number in the second column. By clicking submit will add the device to iButton page.

h) Intelligent devices: User will be able to see the status of the intelligent in this page and will be able to schedule those from this page. User will see all the intelligent devices added to the system. There will be a table in this page. On the left column user will see the devices configured, such as dishwasher, microwave etc. On the right column there will be check boxes. If the checkbox is checked then that particular light or switch is on otherwise it's off. There will be a button for schedule the device. User will be able to check the checkbox to turn on and click schedule. This will take the user to another page from where user will be able to schedule that intelligent device.

i) Web Services: This page will have link to two pages. One page is for gas and another for electricity. Clicking on gas will show the graph of the gas rate for that day in hourly structure. Clicking on electricity will show the graph of the electricity rate for that day in hourly structure. The graph will show the time and cost of the electricity and gas.

6.3.3 Navigation

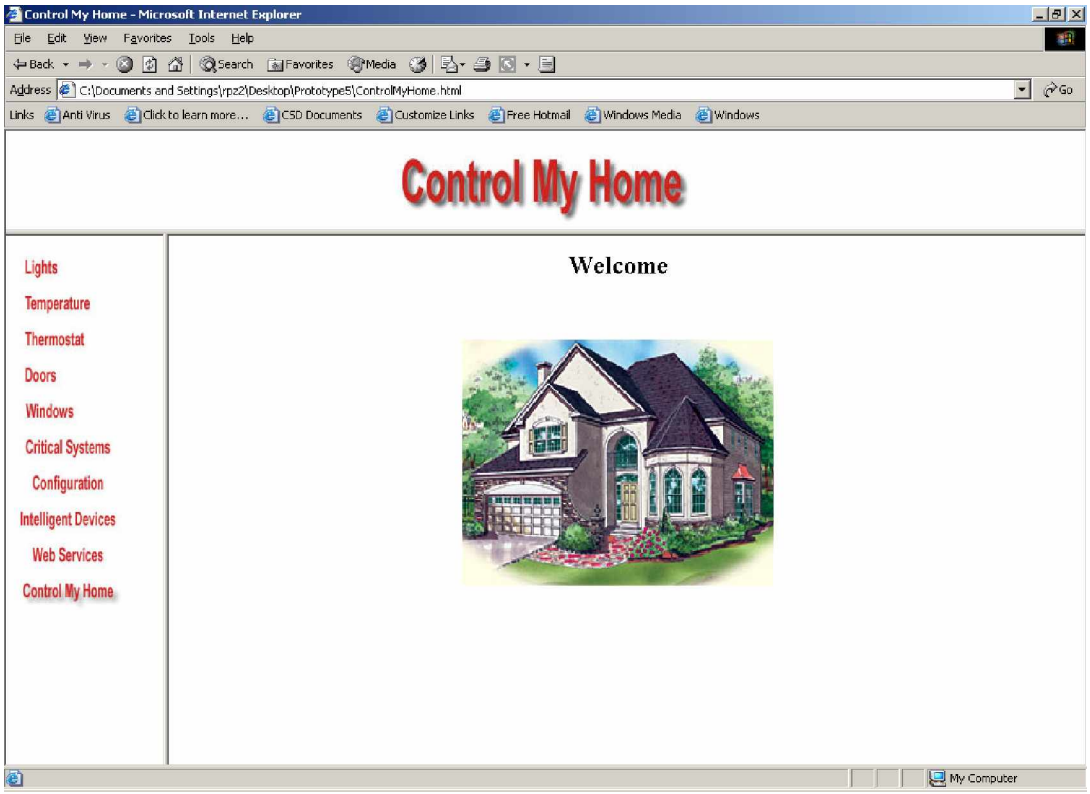
Navigation will play and important role in our project. There are a lot of web pages in our system. So the best way for us is to build our pages in forms. There will be three forms in our page. The top frame will have the logo of control my home. The frame on left will have links to all the main pages. The right frame will be the target frame where it will display the pages. On the left frame there will be links to lights, temperature, thermostat, doors, windows, intelligent devices, critical system, web-services, configuration and control my home.

Clicking on control my home the target page will control my home homepage. Clicking on lights the target page will be lights. Clicking on doors the target page will be doors. Clicking on thermostat the target page will be thermostat. Clicking on temperature the target page will be temperature. Clicking on critical system the target page will be critical system. Clicking on intelligent devices the target page will be intelligent devices. Clicking on web-services the target page will be web-services. Clicking on configuration the target page will be configuration.

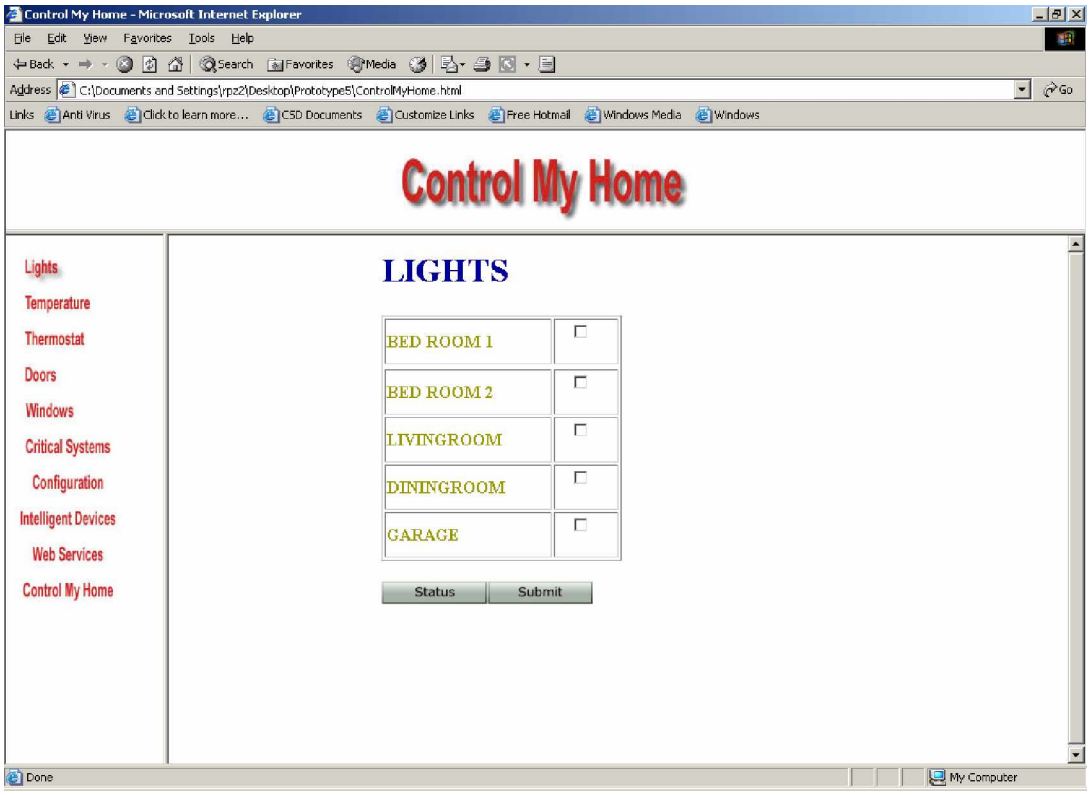
6.3.4 Look and Feel

In our initial design we had pages with different color. We thought that coloring the pages would make it look better. It looked like too much color does not look good at all. It’s better if you have all the pages with the same color and same look. We made our background as simple as possible. We made all the pages alike. The links for navigation didn’t look good with simple links. So, with used some logos for the links. We used the functionality of the mouse over to change the color of the logo when mouse is over the link. It looked much better using logos. We made the pages simple and easy to navigate.

6.3.5 Screen Shots



Main Screen


Control My Home - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
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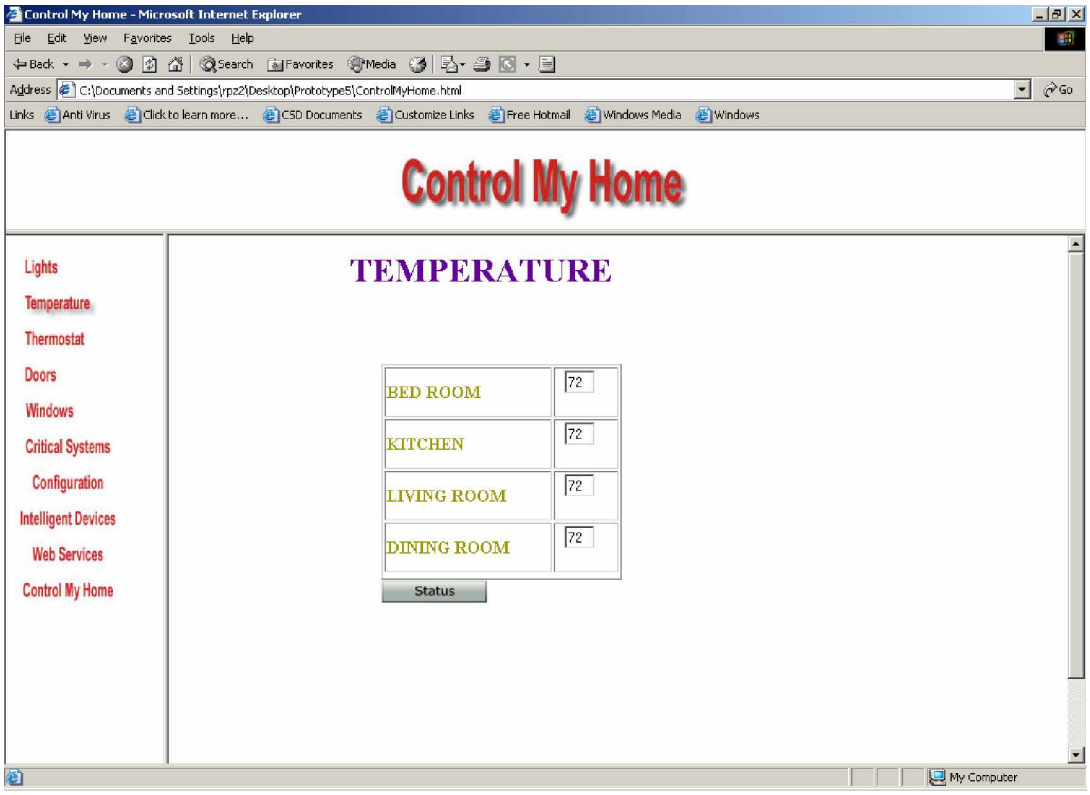
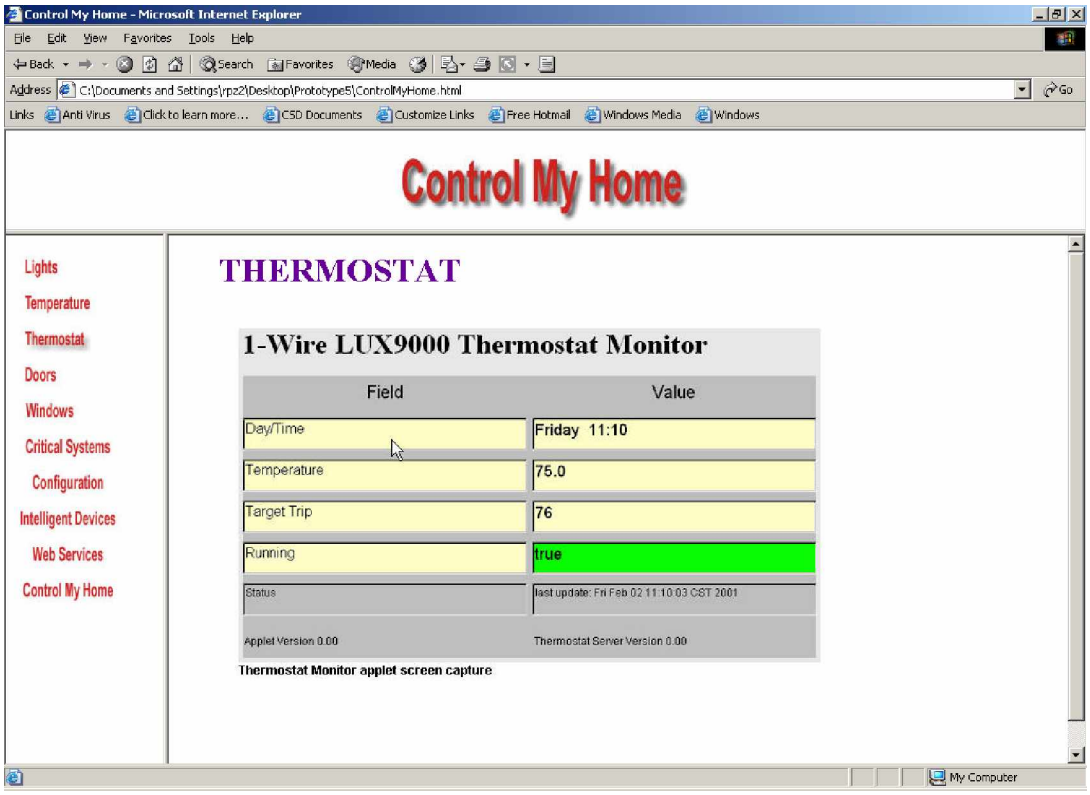
Go
Links Anti Virus Click to learn more... CSD Documents Customize Links Free Hotmail Windows Media Windows
Control My Home
Lights
Temperature
Thermostat
Doors
Windows
Critical Systems
Configuration
Intelligent Devices
Web Services
Control My Home
LIGHTS
BED ROOM 1
BED ROOM 2
LIVINGROOM
DININGROOM
GARAGE
Status
Submit
Done
My Computer

Lights



Temperature


Control My Home - Microsoft Internet Explorer
File Edit View Favorites Tools Help
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Links Anti Virus Click to learn more... CSD Documents Customize Links Free Hotmail Windows Media Windows
Control My Home
Lights
Temperature
Thermostat
Doors
Windows
Critical Systems
Configuration
Intelligent Devices
Web Services
Control My Home
THERMOSTAT
1-Wire LUX9000 Thermostat Monitor
Field
Value
Day/Time
Friday 11:10
Temperature
75.0
Target Trip
76
Running
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Status
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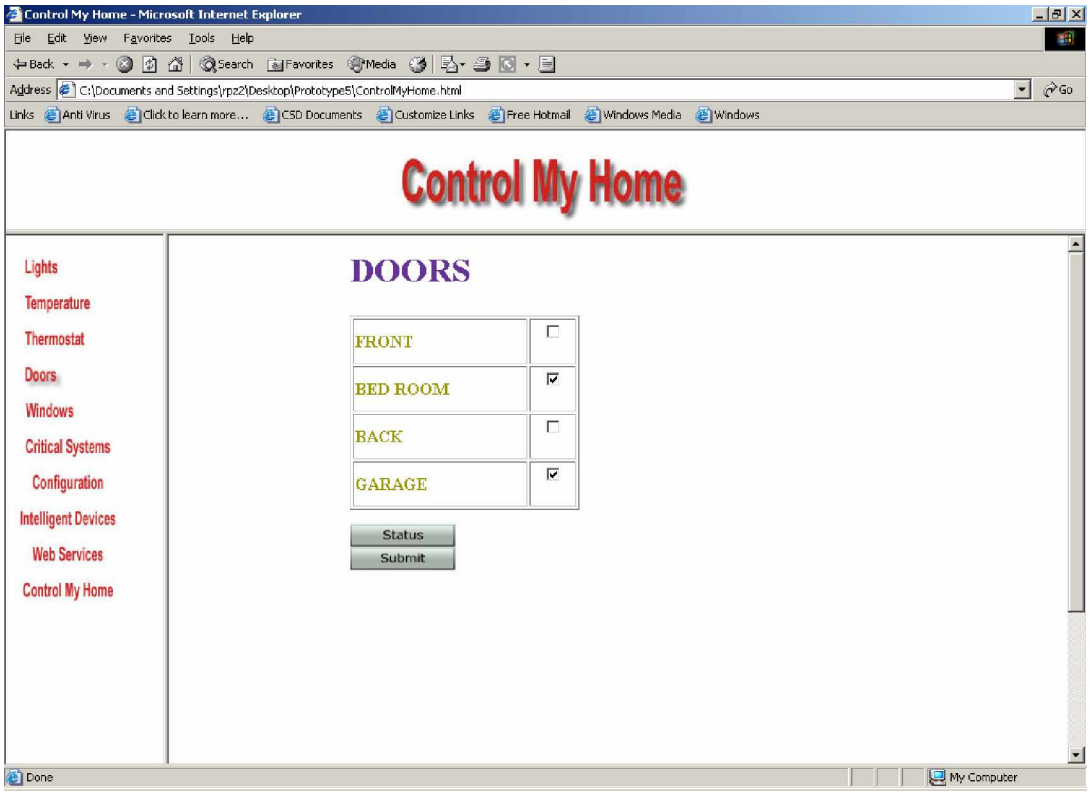
Applet Version 0.00
Thermostat Server Version 0.00
Thermostat Monitor applet screen capture
My Computer

Thermostat


Control My Home - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
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Control My Home
Lights
Temperature
Thermostat
Doors
Windows
Critical Systems
Configuration
Intelligent Devices
Web Services
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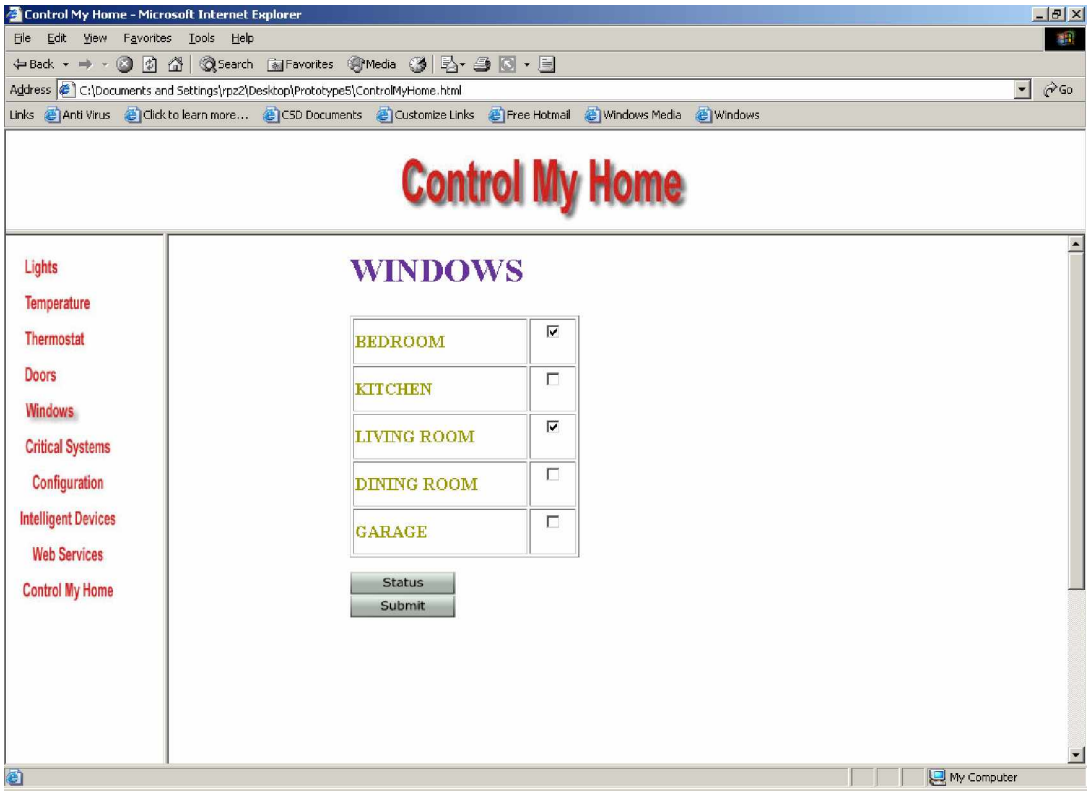
FRONT
BED ROOM
BACK
GARAGE
Status
Submit
Done
My Computer

Doors


Control My Home - Microsoft Internet Explorer
File Edit View Favorites Tools Help
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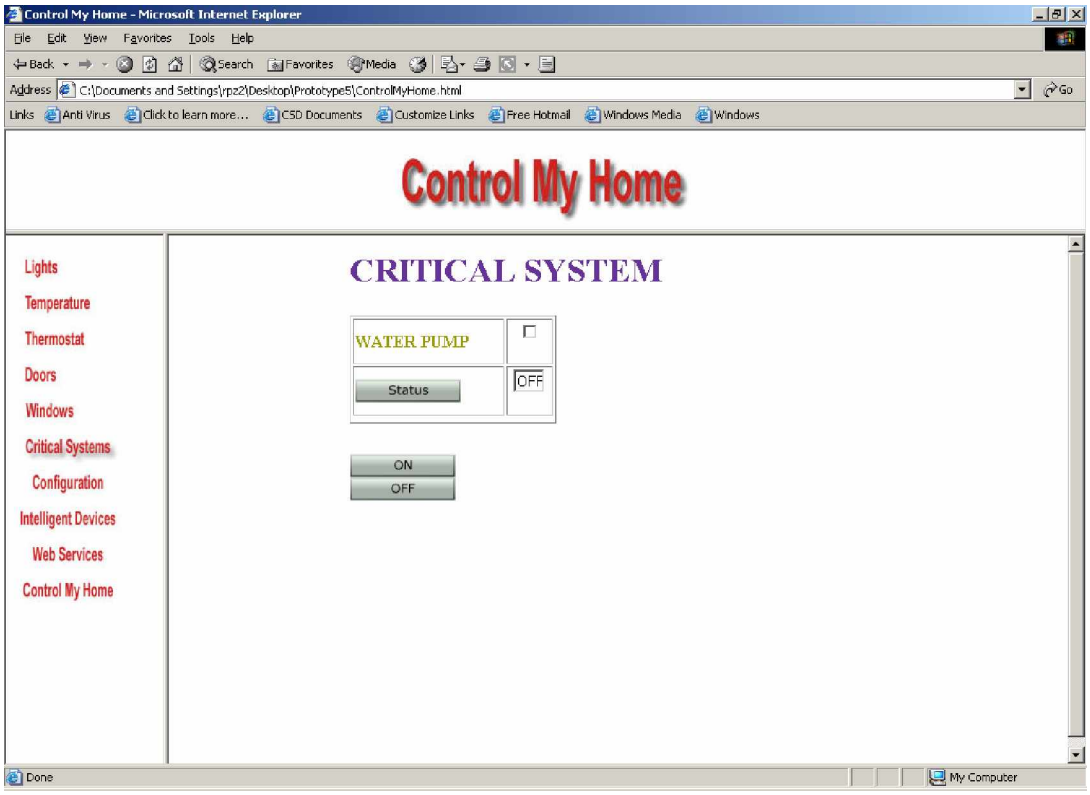
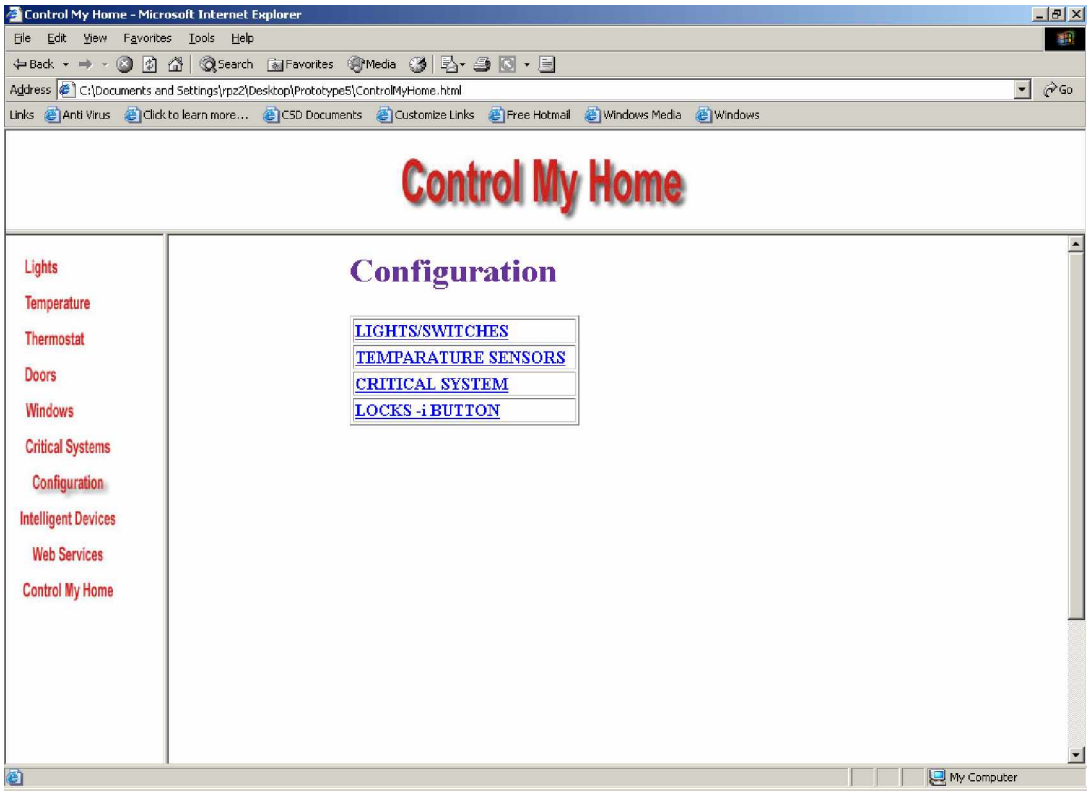
Go
Links Anti Virus Click to learn more... CSD Documents Customize Links Free Hotmail Windows Media Windows
Control My Home
Lights
Temperature
Thermostat
Doors
Windows
Critical Systems
Configuration
Intelligent Devices
Web Services
Control My Home
WINDOWS
BEDROOM
KITCHEN
LIVING ROOM
DINING ROOM
GARAGE
Status
Submit
My Computer

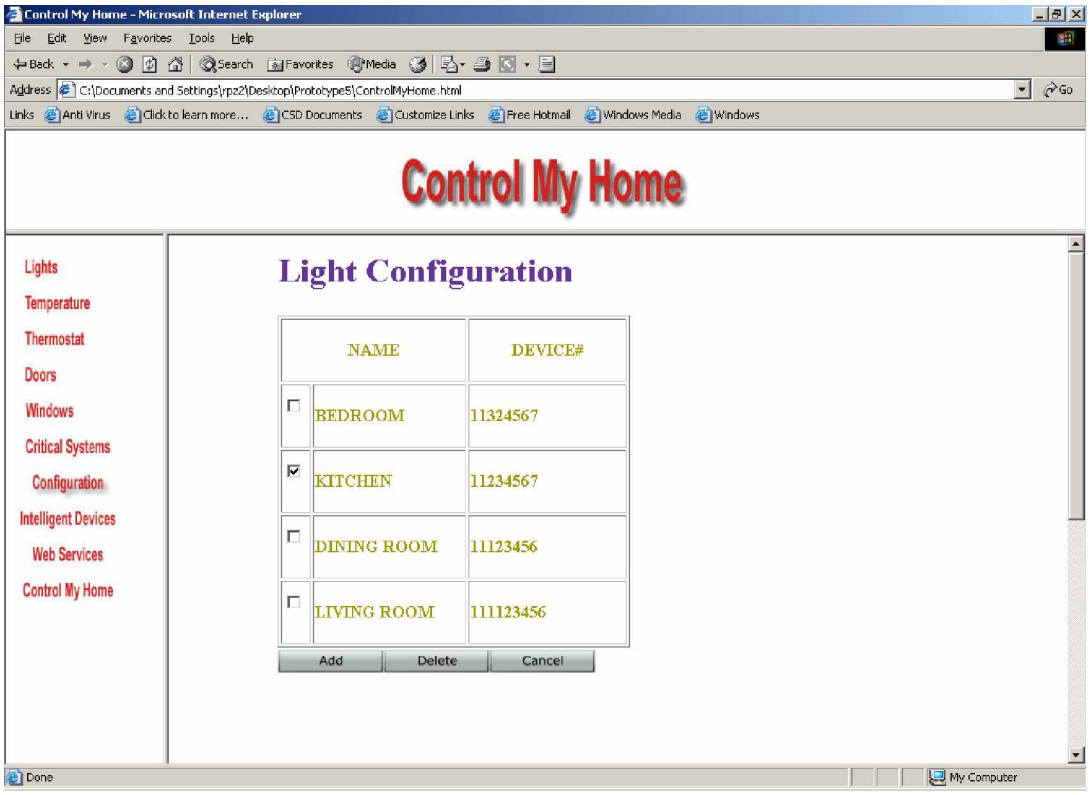
Windows



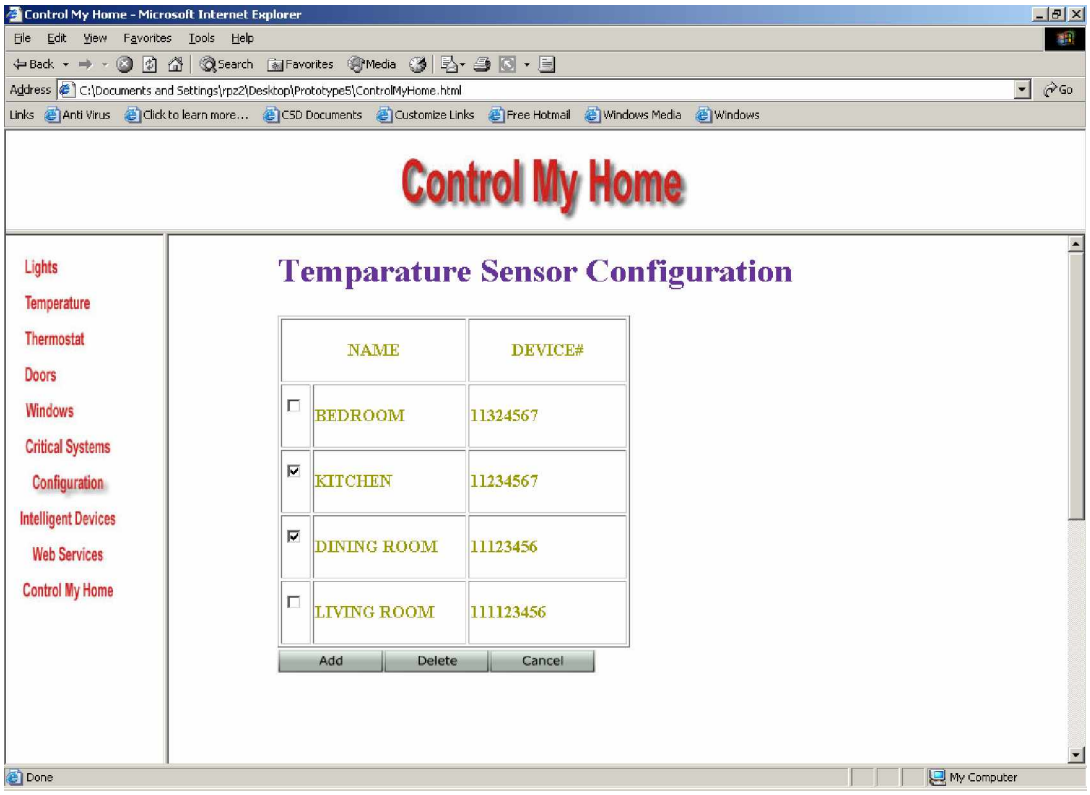
Critical Systems



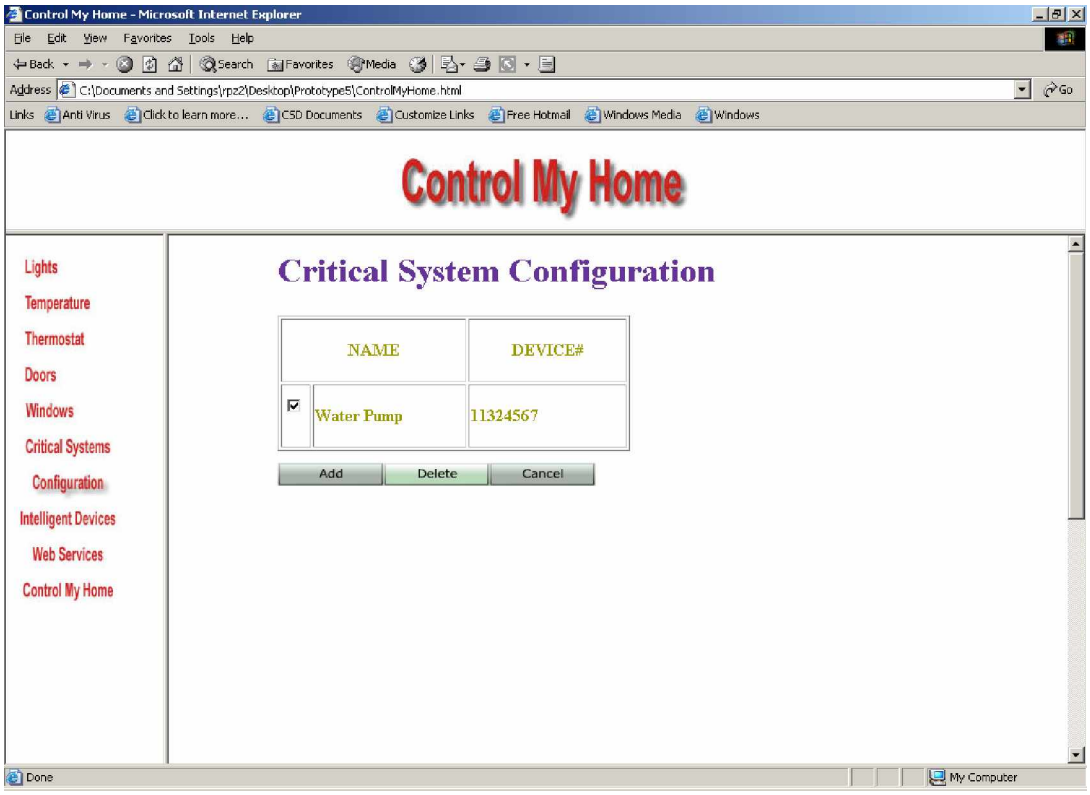
Configuration (Top)



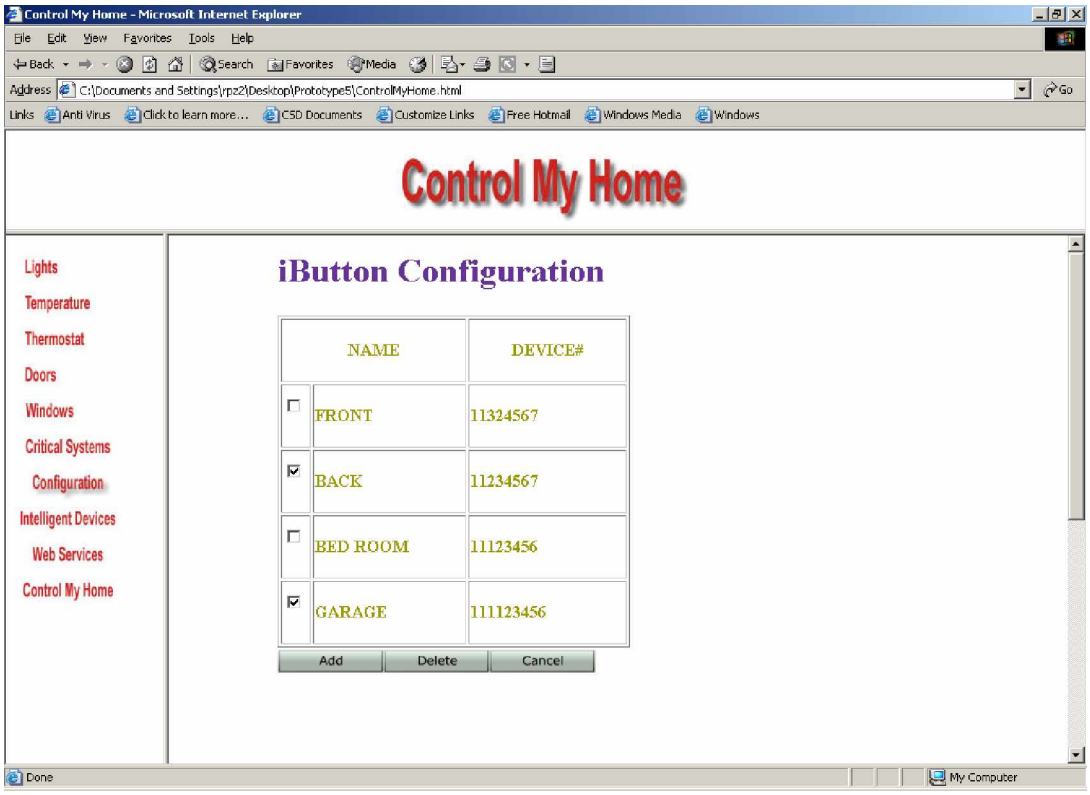
Configuration (Lights)



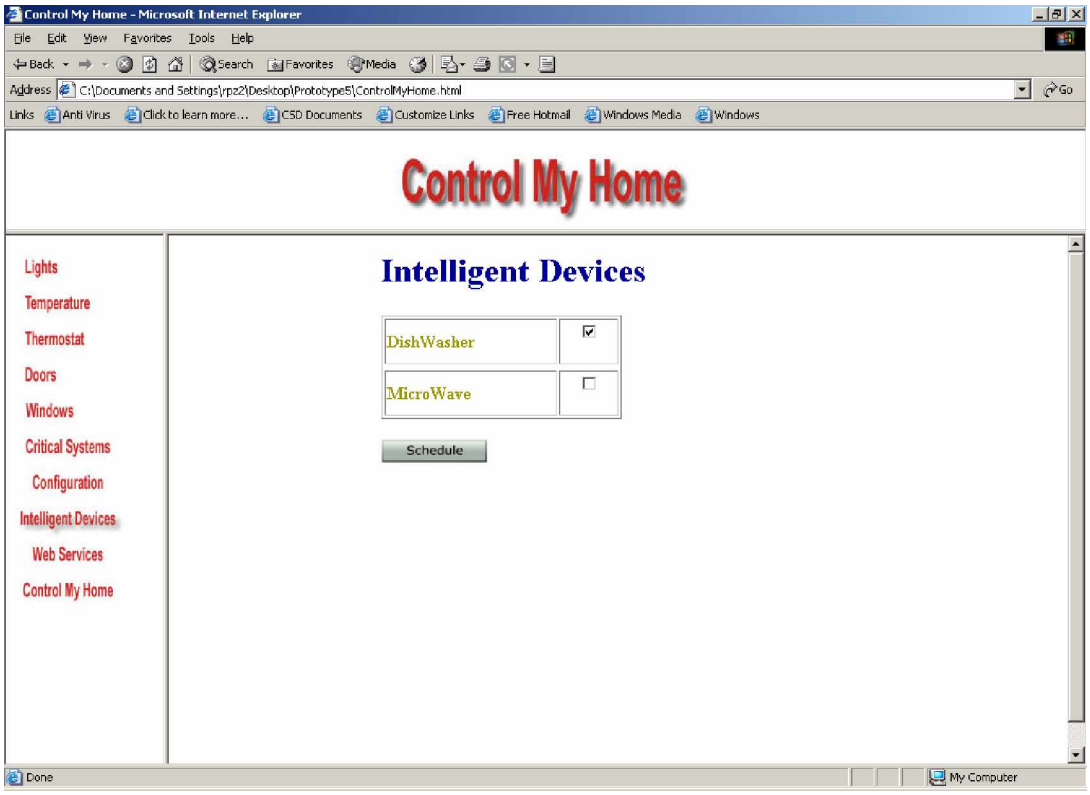
Configuration (Temperature Sensors)



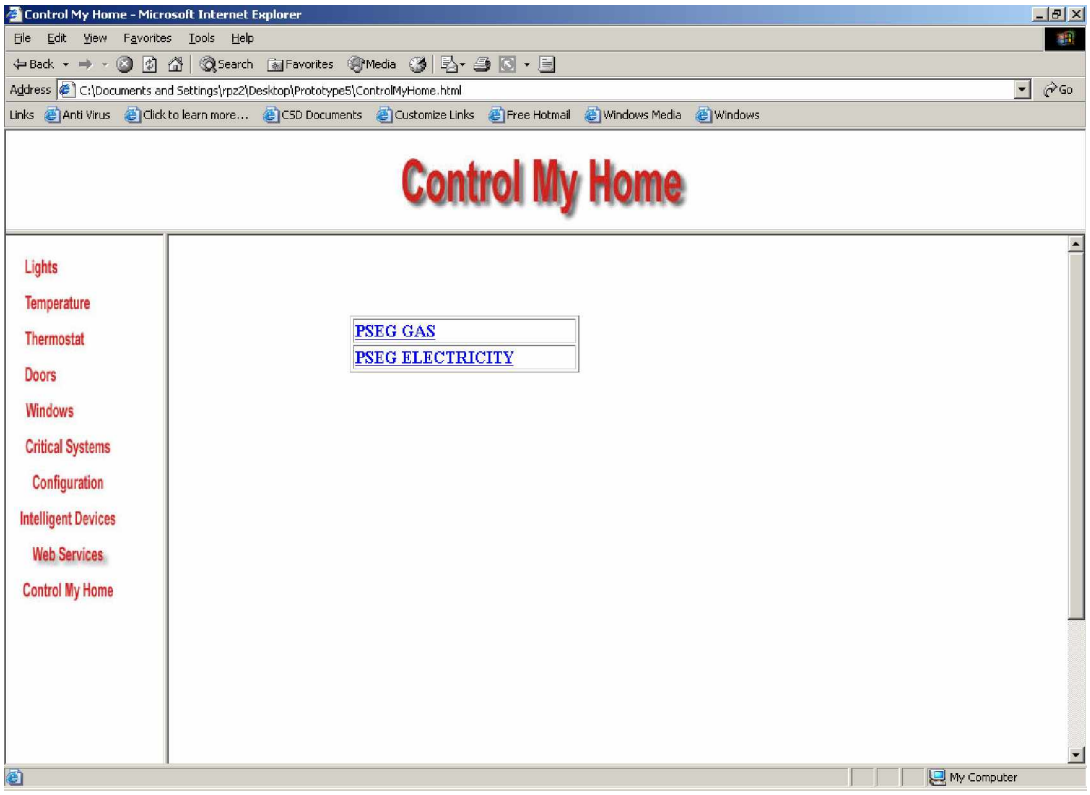
Configuration (Critical Systems)



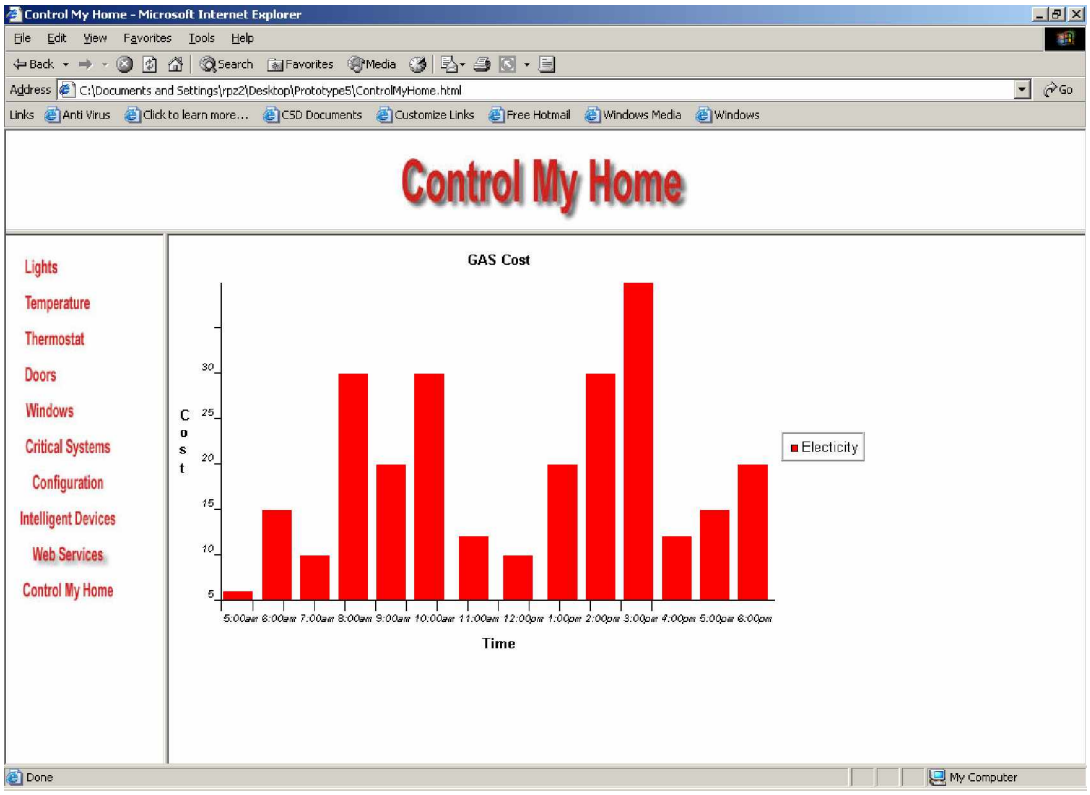
Configuration (iButtons)



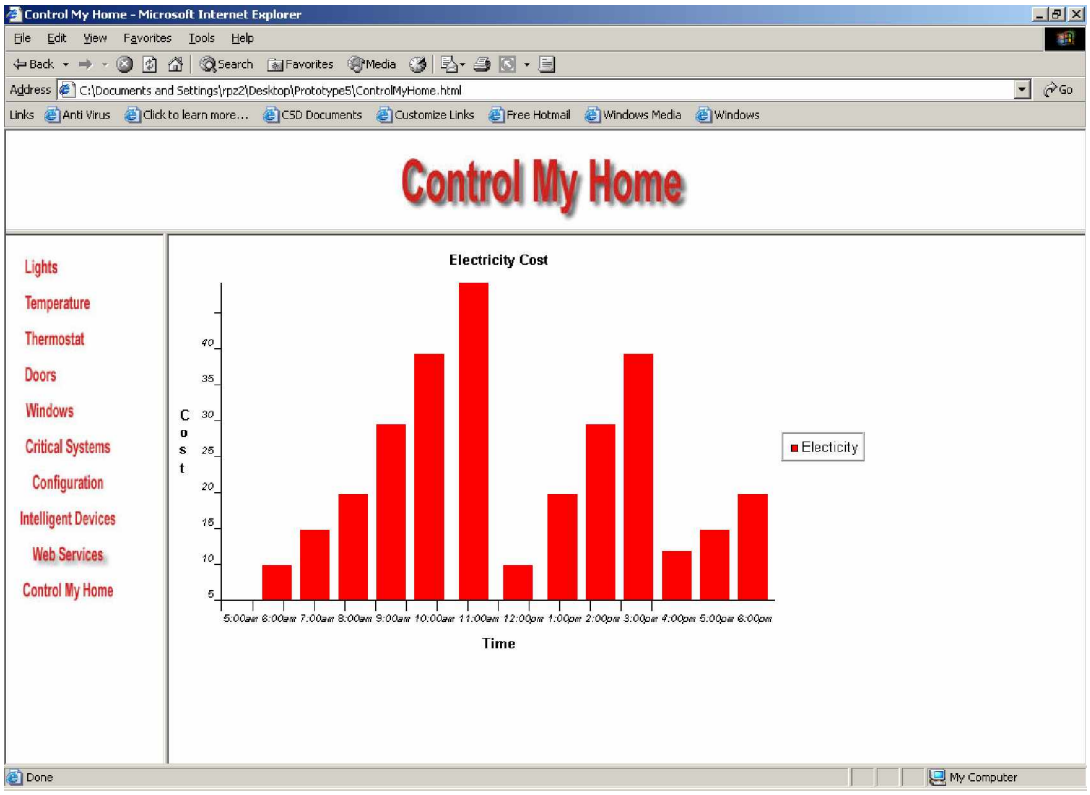
Intelligent Devices



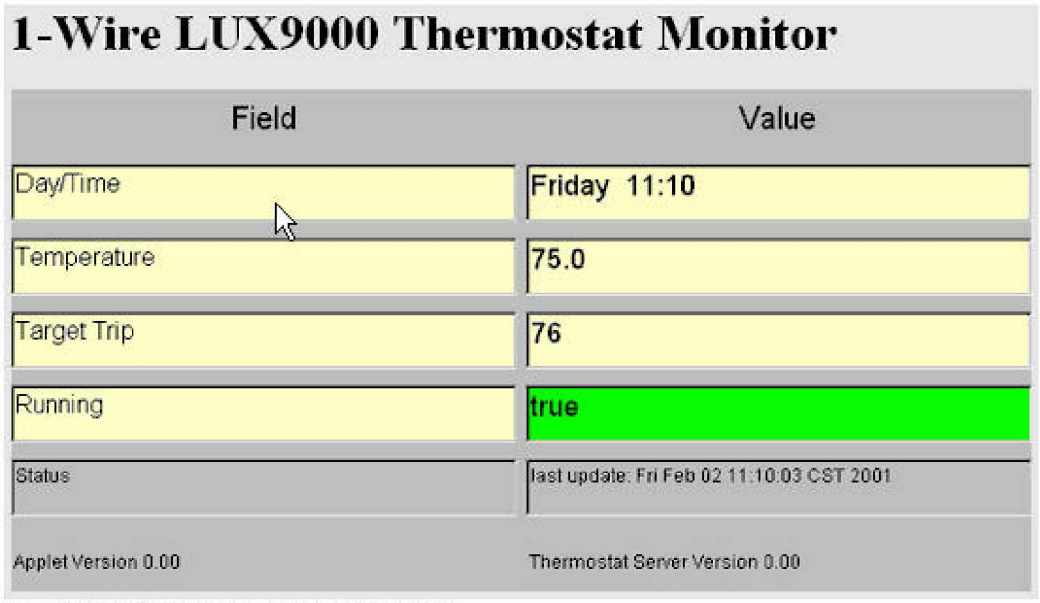
Web Services (Top)



Web Services (Gas)



Web Services (Electricity)

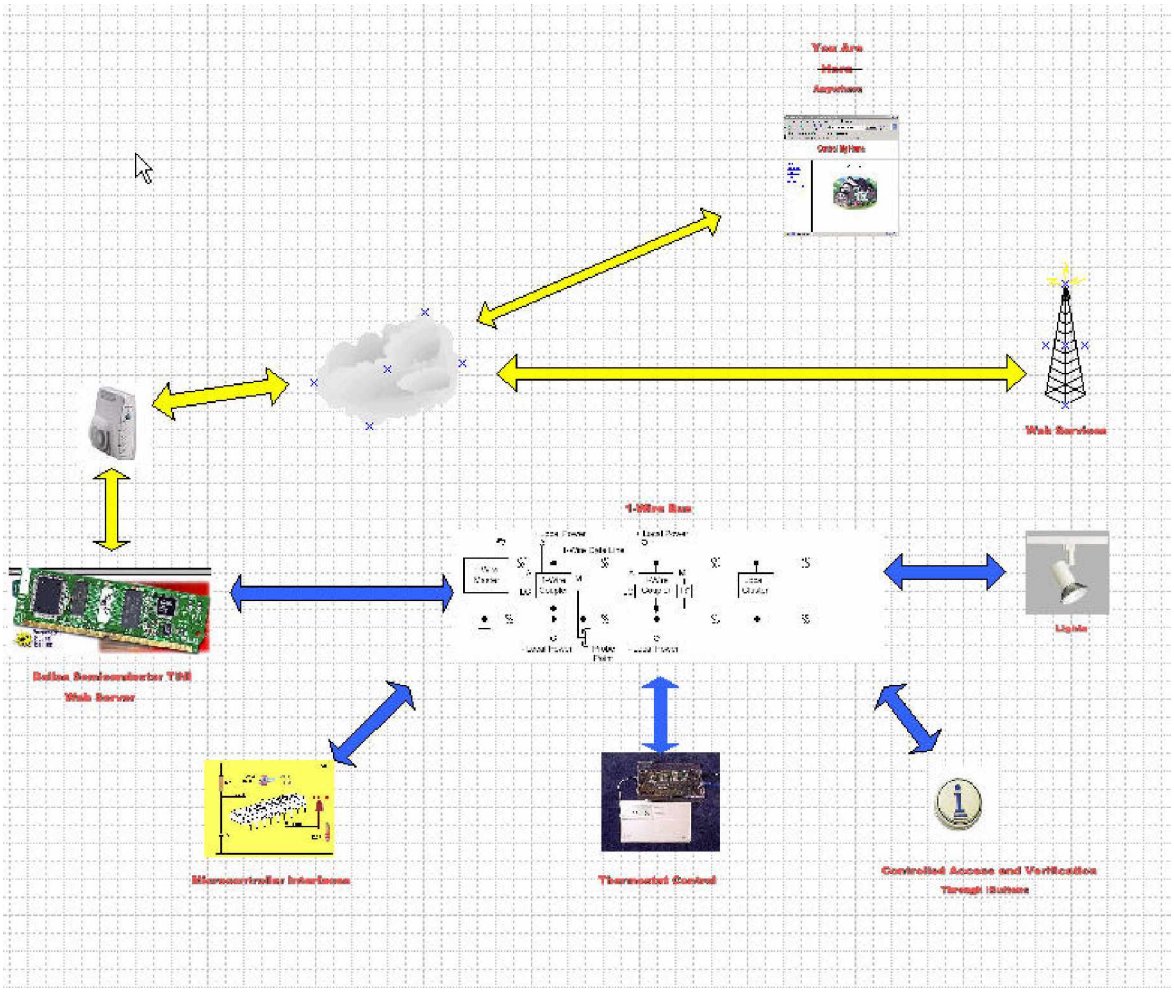


Thermostat Monitor applet screen capture

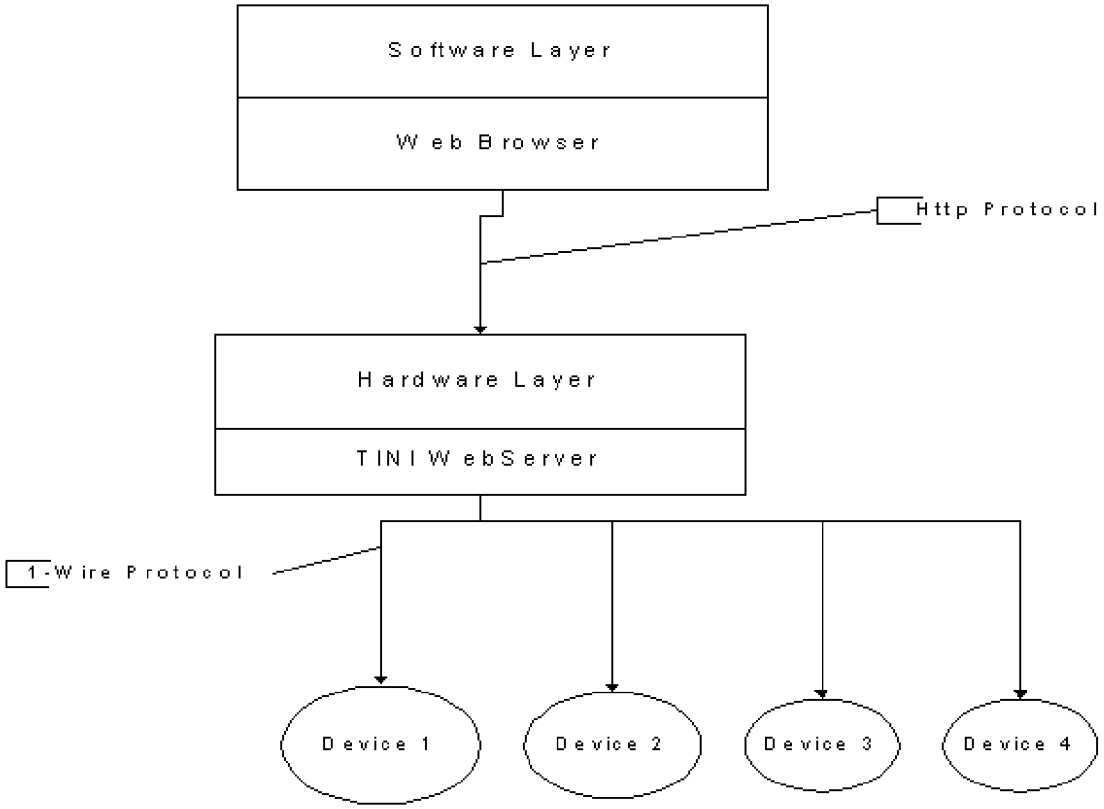
LUX screen (Printed with permission from Dave Scemenic)

6.4 Architectural Design

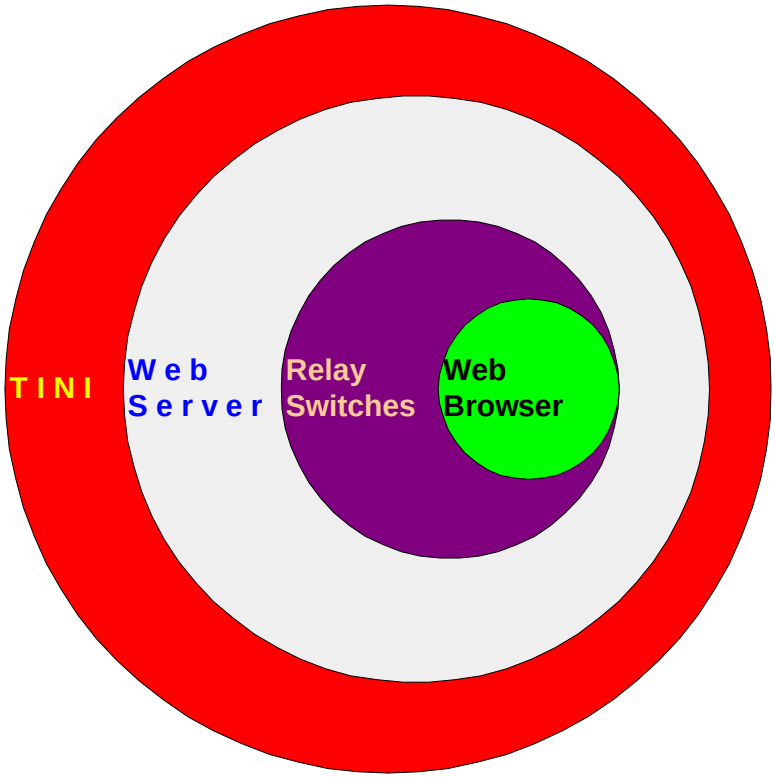
6.4.1 System Structure



6.4.2 N-Tier Architecture



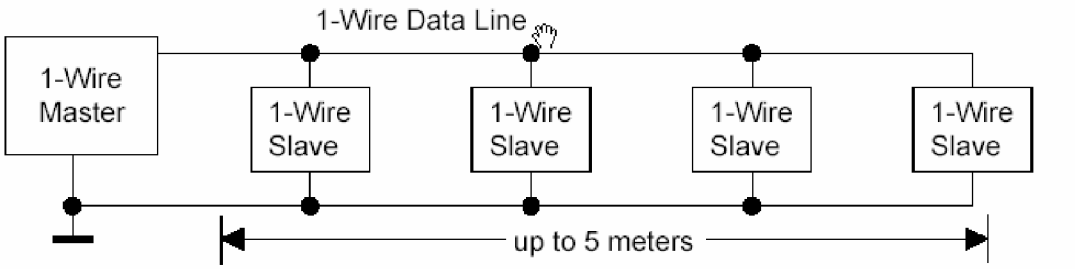
6.4.3 State Machine Model (Layered Model)



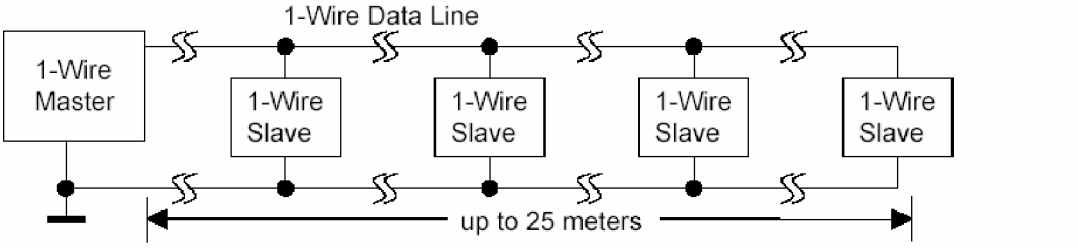
6.4.4 Project Topology

A 1-Wire network can considerably vary in size and topology. For 1-Wire, there exist four types of topology: miniature, simple, typical, and complex. The larger the network, the more serious the interface becomes between the master, the 1-Wire network and the cabling.

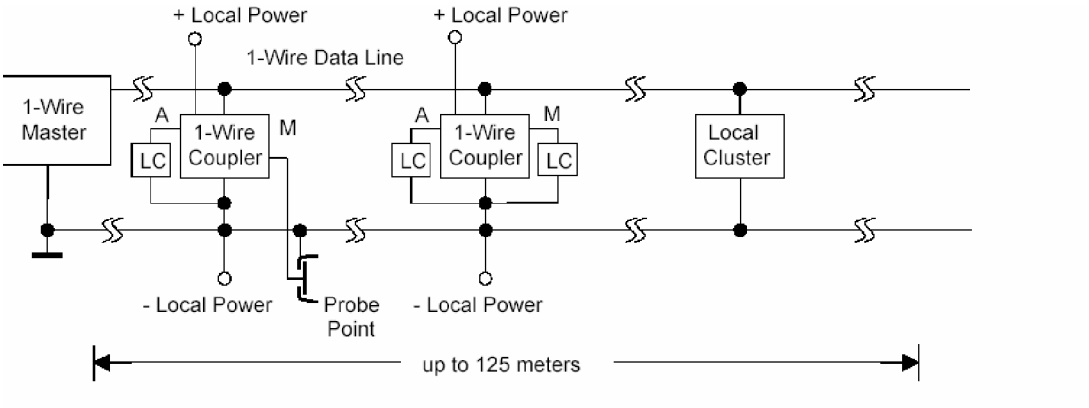
MINIATURE: Trunk with several slave devices sitting on a motherboard and plug-in boards. The size of this is up to five meters and can use any interface. Cabling is non-critical.



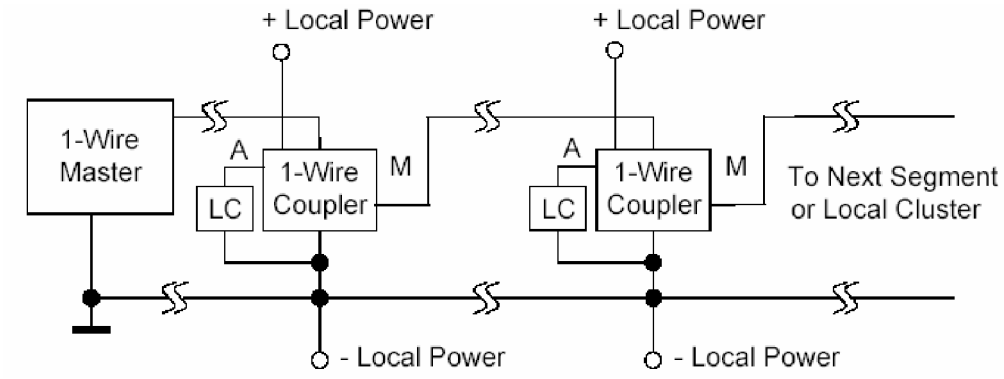
SIMPLE: Trunk with several slave devices scattered along a cable as shown below. They can go up to twenty-five meters. The recommended type of cabling is the unshielded twisted pair (UTP) cable and the interface is any, except for the parallel port adapter.



TYPICAL: Trunk with couplers that create access points for buttons or hard-wired local clusters (LC) of slaves. This typical network can go up to 125 meters and can uses unshielded twisted pair (UTP) cable, CAT 5. The interface is enhanced serial port adapters.

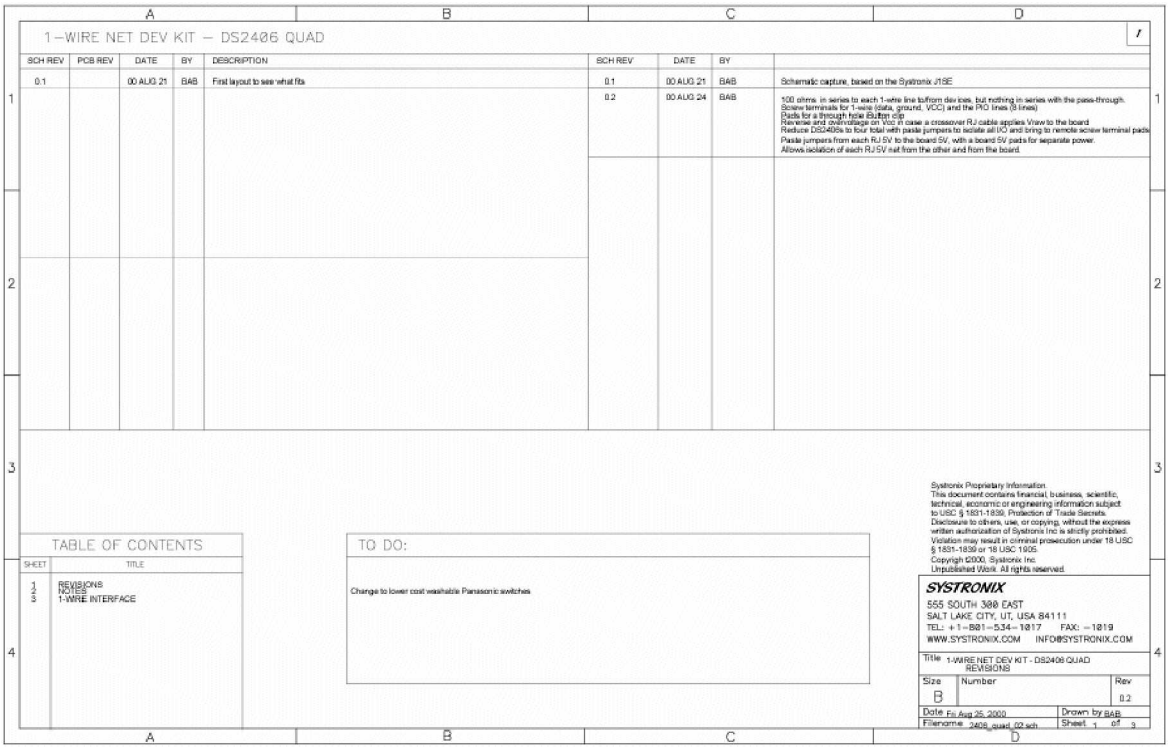


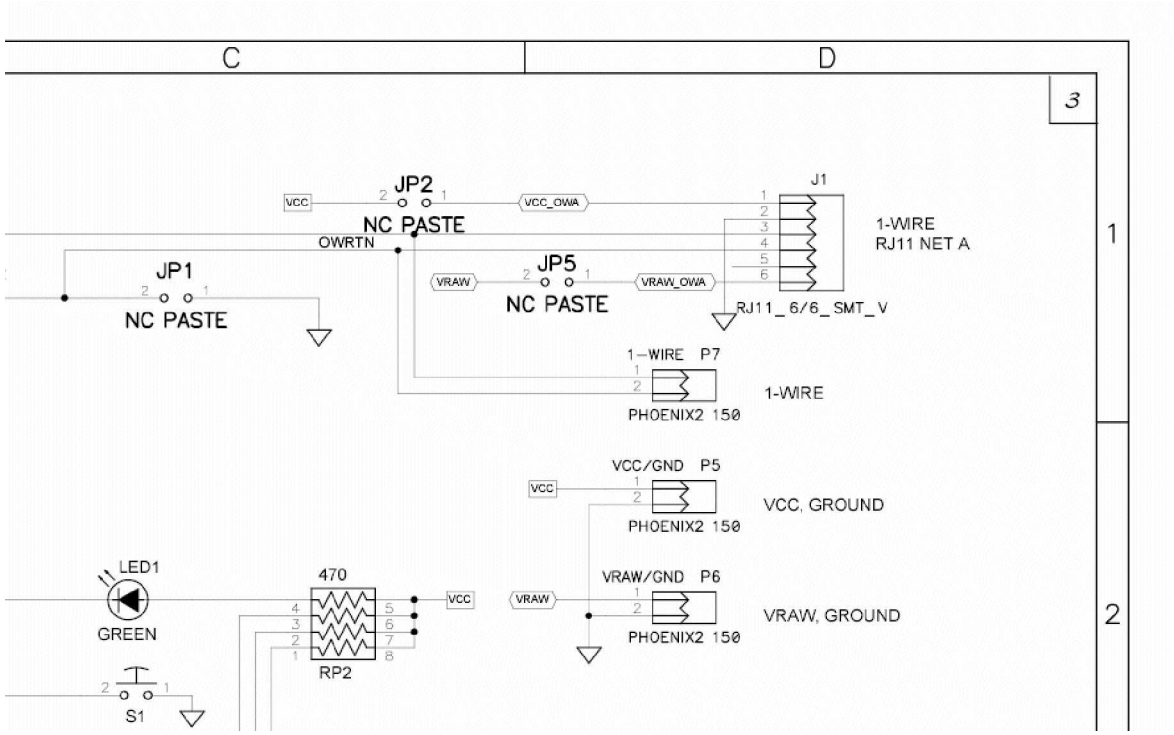
COMPLEX: Segmented trunk with a local cluster of slaves at the end of each trunk segment. The size for this is more than 125 meters, and can go up to 300 meters. For the interface, it uses enhanced serial port adapters.



7. Hardware Schematics

7.1 8x1 Schematics




C
D
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2
JP2
VCC
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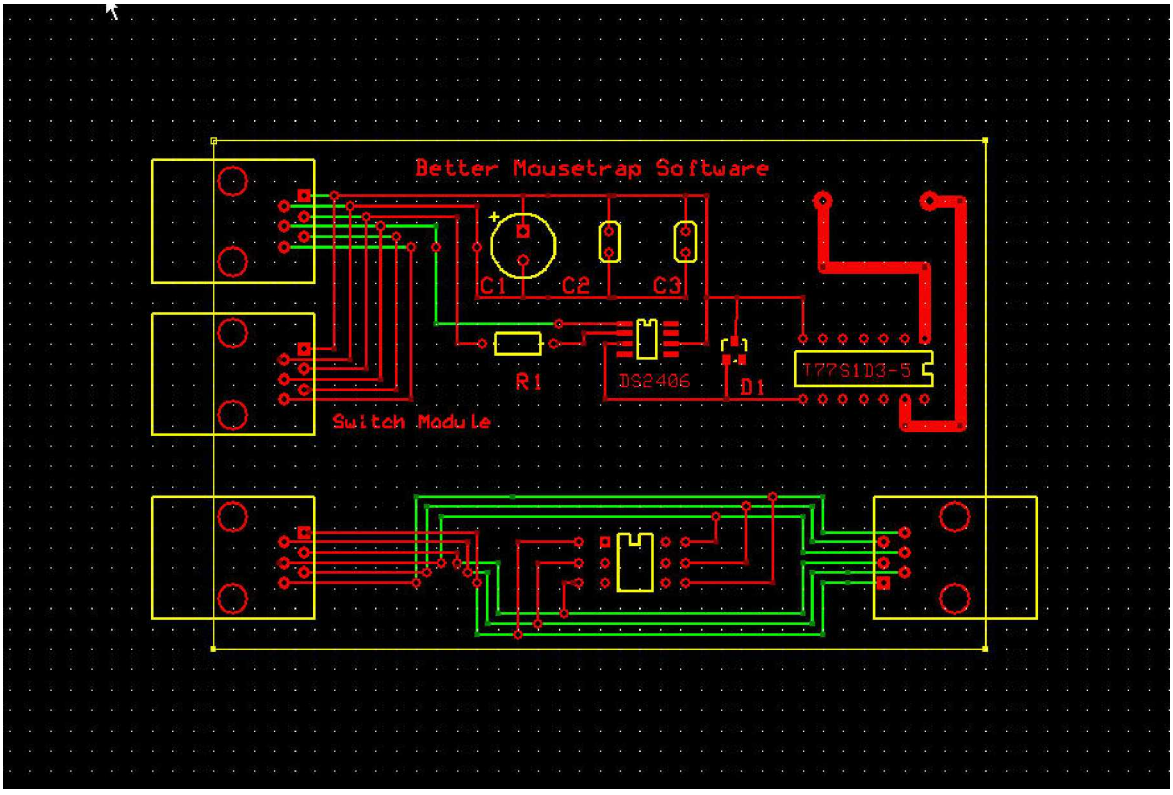
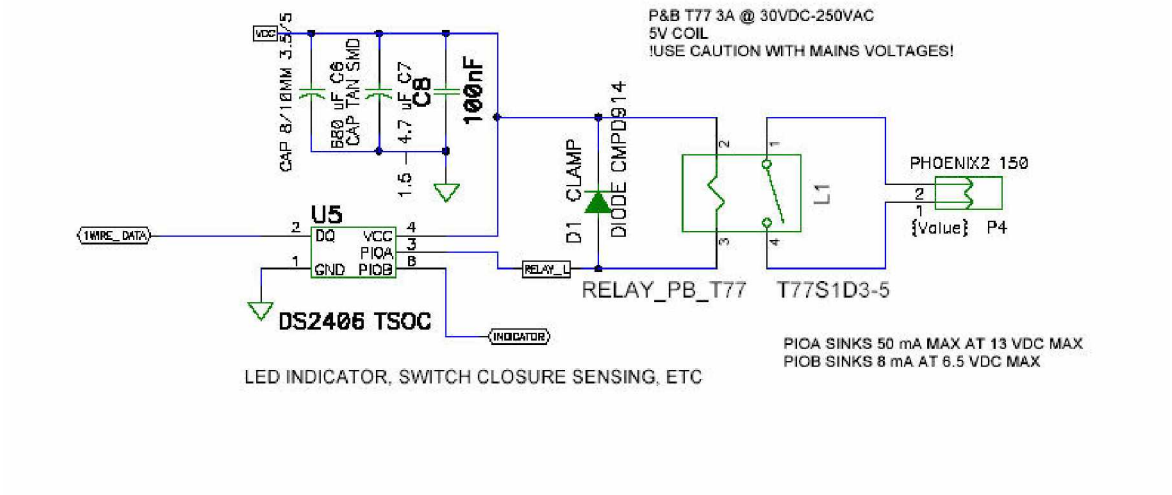
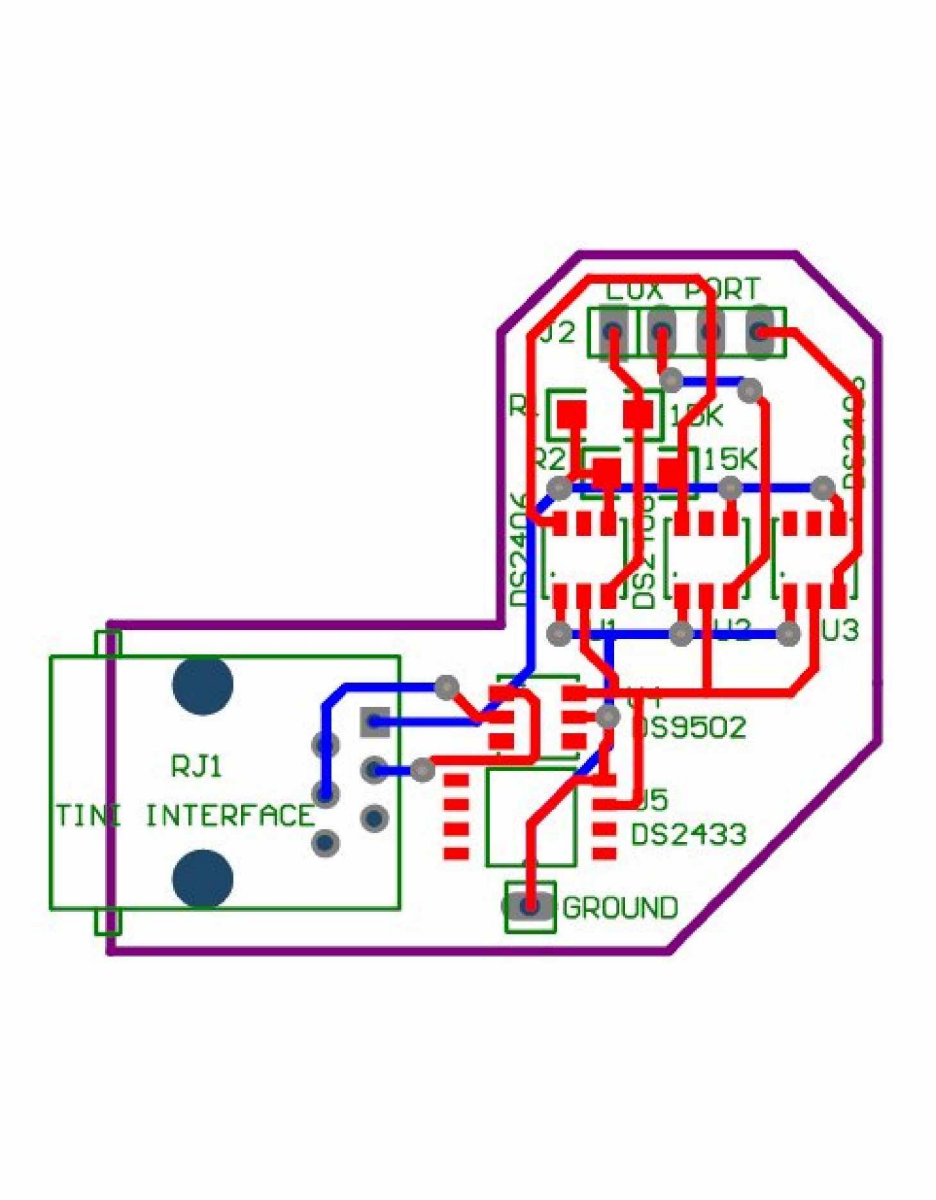
NC PASTE
OWRTN
J1
1-WIRE
RJ11 NET A
JP1
NC PASTE
VRAW
JP5
VRAW_OWA
NC PASTE
RJ11_6/6_SMT_V
1-WIRE P7
1-WIRE
PHOENIX2 150
VCC/GND P5
VCC, GROUND
PHOENIX2 150
LED1
GREEN
470
RP2
VCC
VRAW
VRAW/GND P6
VRAW, GROUND
PHOENIX2 150
S1

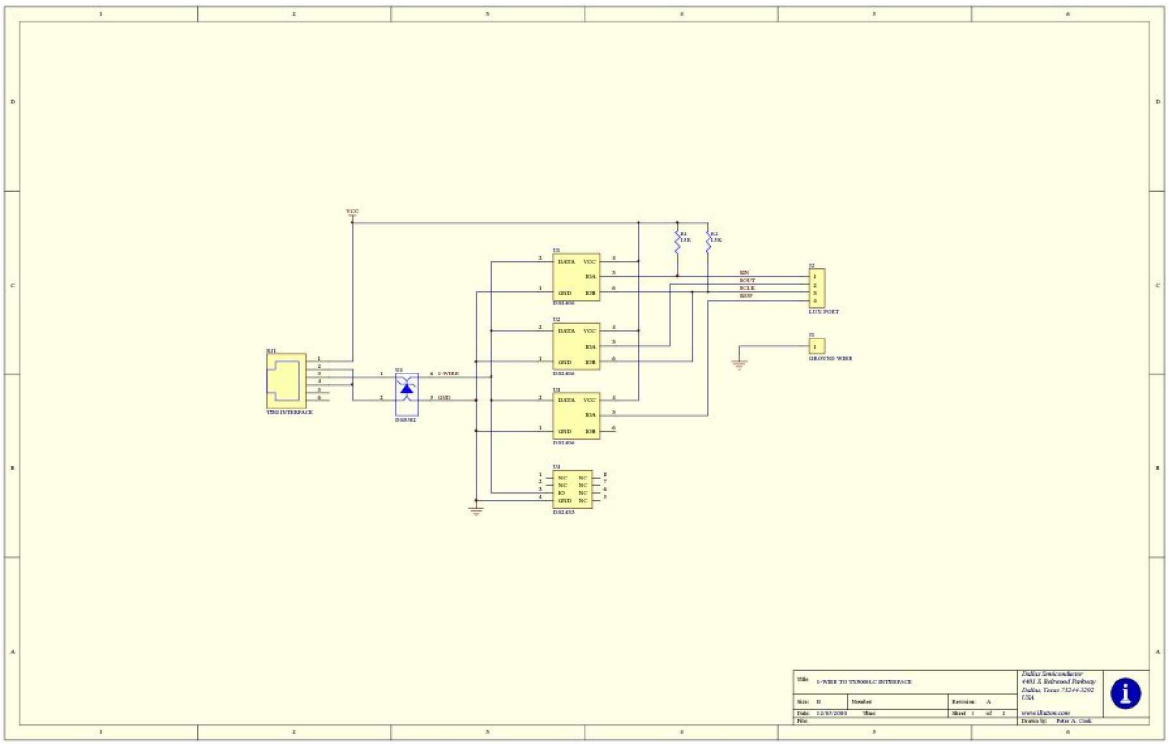
7.2 DS2406 Relay Schematics





7.3 LUX Schematics





8. Testing

8.1 Test Procedure

One of the preliminary requirements of the development was an expected way of iterating the system compilation process. There were several components that needed to be built at different times of the development cycle. For instance, every time a new *Servlet* was developed, it was essential to fabricate it, along with any subordinate classes that depended on it. However, there were times when classes needed to be built that spanned through all the *Servlets*. In this case, the dependency list wasn't so obvious.

One of the more accepted modus operandi in building Java code is a tool called ANT. It's open source and disseminated by the Apache Foundation. We adopted ANT early in the development process, and continued on through the entire lifecycle.

Once we determined on the *TiniHTTPServer Webserver*, the course became even more complicated. The fact of the matter was that S*ervlets* are physical extensions of the web server itself, so compilation needed to include it in the builds.

In a typical J2EE implementation, *Servlets* are just added to a directory, and mapped within configuration files. In this case, everything needed reconstruction. As yet another extension, we discovered a product called TINIANT on SourceForge.net. It comprised of external tasks software called ANT, which incorporate builds for TINI executables.

In the final analysis, our selection of tools was correct. The concept of building all the components within one JVM was not only a luxury, but also a necessity. The extensibility of the tools gave us the opportunity to map and build components on many tiers, and finally deploy them to the targeted architecture.

The following are the test procedure tables that we have outlined to measure competency of the system:

1.1 Turn Lights on or Off through the Control My Home Web Site

Abstract: To verify that client user is able to read status of the light of his home and turn them on or off. .

Expected Results: Once the web page is launched, Check box form should appear. The User is able to check the light check box to turn on and off. The check box must correct correspond to the appropriate light switches.

Test Procedures:

Step 1: Launch Web Page
Step 2: Verify the returned output

Status: **Test Date: __/__/__ Passed:____ Failed:____**

1.2 Adding a new Serial Number address for a relay switch

Abstract: To verify that client user can configure the Control My Home system by adding switches address corresponding to the appropriate appliance.

Expected Results: Client user is able to load information concerning serial number information about the chips into the system. He is able afterwards to verify this by running test 1.1.

Test Procedures:

Step 1: Open Web Page
Step 2: Write to the INI-File
Step 3: Run Test 1.1 to verify the newly added switch address

Status: **Test Date: __/__/__ Passed:____ Failed:____**

1.3 Control the Temperature Level

Abstract: Verify that the user is able to read the temperature through the Control My Home web site and is able to set the temperature.

Expected Results: Once the web page is launched, the user is able to see the home temperature level. He is hence able to change it.

Test Procedures:

Step 1: Launch Web Site
Step 2: Able to view home temperature.
Step 3: Able to change temperature level
Step 4: Verify the temperature changed by observation

Status: **Test Date: __/__/__ Passed:____ Failed:____**

1.4 Test Census Software for Standalone Capability

Abstract: Verify that we can test devices using Census.tini, not requiring web-server

Expected Results: Execute the Standalone software. Check to see if device is responding with program

Test Procedures:

Step 1: Start Census.tini
Step 2: Check to see if the appliance such as lights are responding to the software.

Status: **Test Date: __/__/__** **Passed:____ Failed:____**

1.5 200 MS Response Time

Abstract: Verify that the user is able to get a response from the Control My Home Software within 200 Milliseconds, when trying to interface with any device(s).

Expected Results: When trying to read or set temperature or turn home lights on or off, the user should be able to perform these operations within 200 ms.

Test Procedures:

Step 1: Launch Web Site
Step 2: Able to view and set statuses of various device with 200 MS.

Status: **Test Date:** 04/26/03 **Passed:____ Failed:**√

1.6 System Compiles – a preliminary Requirement Test

Abstract: Verify that the "Control My Home System" compiles in terms of servlets building and an executable is made.

Expected Results: ANT software was adopted to simulate "Make File" operation that is done in Unix environment. Verify that the build procedure is working correctly.

Test Procedures:

Step 1: Run the TINI-ANT procedure
Step 2: Run and observe if the servlets are functioning properly

Status: **Test Date:** 04/26/03 **Passed:____ Failed:**

9. References

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Appendix 1. Statistical Analysis

Factors Influencing Affordable ControlMyHome Application: An Empirical Study

Table of Contents

Abstract

The purpose of this research is to investigate the factors influencing affordable Control My Home application. The dependent variable is Affordable Control My Home Application and the independent variables are Control, Monitor, Safety-Security, Energy Saving-Convenience and User-Interface .The survey collection method comprised of a 25-item questionnaire. This comprehensive study included students of your senior projects class and some other classes. Respondents were 95.0% of the population size. The statistical analysis of these results included the following: reliability analysis (variables and questions), Pearson correlation matrix (VIF test), linear regression analysis (independent variables as a whole and each independent variable individually), and a step-wise regression analysis. The results showed that 60.9% of the variance in Control My Home application was explained by the five independent variables, and Control and the Safety-Security was the most significant predictor of affordable Control My Home application at 49.3 % and 53.3%.

1 Introduction

Control My Home application can be used by different users in different levels to Control and Monitor the Electronic Devices, Temperature, Thermostat, Critical and Intelligent Devices. It is difficult to measure the user willingness of this application with an affordable price.

Customer willingness of this product can be dependent on the available features of our product. To measure the factors or the features we need to check the user willingness to certain features.

Background Information

Life is changing with the evaluation of technology. People are becoming busy every day. It's becoming important to us to be able to control, monitor, and manipulate the electronic devices remotely. Safety and Security of our home is another important part. Using the energy in conservative way is also becoming important to us.

Looking at all these we came up with the idea of Control My Home Application. We aimed to make a better application with better features than those are available in the market.

Importance of this Study

The importance of this study is to ascertain that the user will be willing to user our Control My Home application with and affordable price. It is also important to ascertain that certain features will be diving factors to user our system.

Study Objectives

The objective of this study is to investigate the user wiliness to use our Control My Home application. The goal of which is to identify the significant factors in Control My Home application, such as Control, Monitor, Safety-Security, Energy Saving-Convenience and User-Interface that have a direct, positive or negative, impact on the Control My Home application.

Problem Statement

To what extent does the Control, Monitor, Safety-Security, Energy Saving-Convenience and User-Interface affect the Affordable Control My Home application?

Literature Review

Control is important in home automation. “In what seems straight out of a *Jetsons* episode, consumers will this spring see new appliances that allow them to control their home security, thermostat, and room lighting through their home PCs.” [3]

“The first of the new devices will start popping up in stores by March 1, even before a group of home-appliance makers and computer-industry stalwarts complete the specs designed to wire household appliances--controlling temperature, lights, security and more--into the singular source of the home PC.” [3]

Type of control is important to user. “You're driving home after the movies and you're ready to create the ultimate romantic mood. This time you use your exciting, new technology. From your keychain remote control, you push a button and activate your ActiveHome Romance Macro; the lights in your living room come on at a dimmed setting, your incense burner starts, the romantic music starts, and the hot tub starts to bubble.”[1]

Safety and Security is important for user. “Home Security: Your family decides to go camping for the weekend. When you leave, you activate your ActiveHome Security Macro, which turns on lights, radio, and television at your normal "lived-in" times and waters the lawn. For example, your living room lights automatically turn on from 6PM - 9PM, then the bedroom lights turn on from 9PM - 10PM. At 10 PM the lights start to dim and finally turn off. You can also program a Macro to turn on lights at random times.”[1]

Home Technology, Networking, and Control are a rapidly developing field. HAL is moving forward with the industry, developing compatibility for new standards of communication like Universal Plug and Play (UPnP). HAL will soon introduce a Web-based interface. HAL's Web Portal will enable users to control and interact with their homes over the Internet.[4]

Theoretical Framework

The variable of primary interest to this research is the dependent variable of affordable Control My Home application. Five independent variables are used in an attempt to explain the variance in the affordable Control My home application. These five variables are: Control, Monitor, Safety-Security, Energy Saving-Convenience and User-Interface.

As inferred from the literature, "consumers will this spring see new appliances that allow them to control their home security, thermostat, and room lighting through their home PCs." Seems to be customers are motivated to control home remotely.

Study Model

Following, in Figure 1, is the representation of the theoretical framework in the form of a study model. The five independent variables are used in an attempt to explain the variance for the Affordable Control My Home Application.

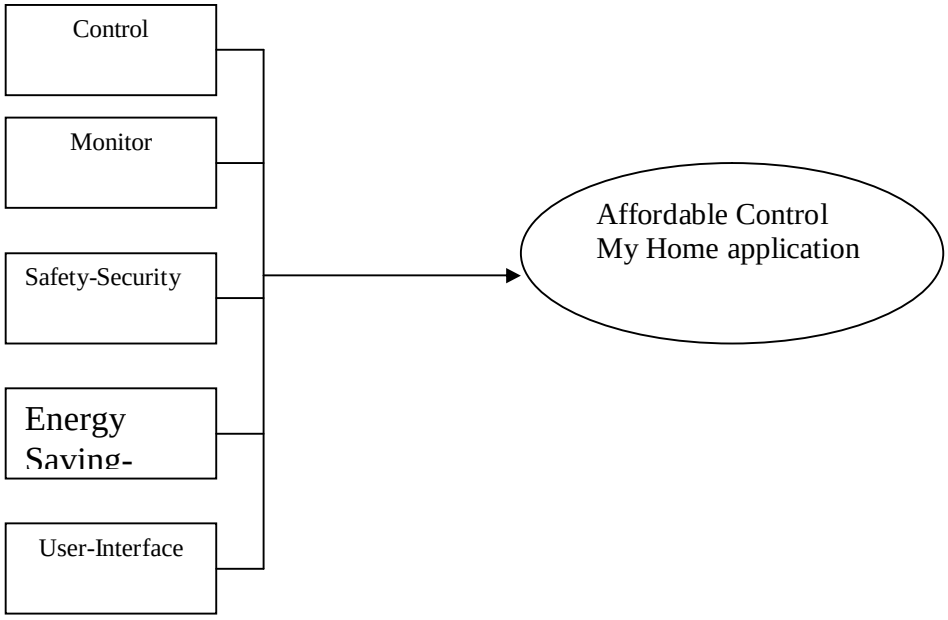


Figure 1. Representation of the theoretical framework as a study model.

Dependent Variable Definition

The dependent Variable for our analysis is affordable controls my home application. Affordability is important part for this application.

Independent Variables Definitions

Control

Type of control is an important part for your application. The devices users are willing to control from a web based application. The preferences of the devices are also important.

Monitor

Type of monitoring system that are available in our application. The preferences of the user about the monitoring system.

Safety-Security

The safety -security features in our application. Such as secure access in our home, notification in case of failure of critical system.

Energy Saving-Convenience

The level of energy saving-convenience features in our application. Such as turning on the intelligent devices remotely, saving money using the energy in conservative way.

User-Interface

The User-interface of control my home application.

Hypothesis

General Hypothesis

H0: There is no relation between the independent variables as a whole and the dependent variable.

H1: There is a relation between the independent variables as a whole and the dependent variable.

Subsidiary Hypotheses

Control

H0: There is no significant relationship between type of control features and Control My Home application.

H1: There is a significant relationship between type of control features and Control My Home application.

Monitor

H0: There is no significant relationship between type of monitoring features and Control My Home application.

H1: There is a significant relationship between type of monitoring features and Control My Home application.

Safety-Security

H0: There is no significant relationship between type of Safety-Security features and Control My Home application.

H1: There is a significant relationship between type of Safety-Security features and Control My Home application.

Energy Saving-Convenience

H0: There is no significant relationship between type of Energy Saving-Convenience features and Control My Home application.

H1: There is a significant relationship between type of Energy Saving-Convenience features and Control My Home application.

User-Interface

H0: There is no significant relationship between type of User-Interface features and Control My Home application.

H1: There is a significant relationship between type of User-Interface features and Control My Home application.

Method Section

Study Population

The population of this study is drawn from the students of different classes of New Jersey Institute of Technology.

Study Sample

The researcher has adopted the comprehensive survey approach where the entire population from the classes became the sample. 46 students answered the survey.

Data Collection Methods

Primary data collection methods have been used and adopted. A special 25 items questionnaire was developed to cover all dimensions of the study variables. All the questions were measured by 6 point Likert-type scale. Some general information was also obtained for future reference. The questionnaires were administered different classes of the group members. Our research team assured the participants that their responses would be anonymous and confidential.

Sample Characteristics

The total number of the population was 46. All the participants responded. The sample comprised 73.9 percent male and 23.7 percent was female. Most of the respondent is from age group 20-30. 35.7 percent rent a house and 38.1 percent own a house.

Survey Questionnaire

1. There is a value to being able to monitor your home remotely
   - q Strongly Agree
   - q Agree
   - q Disagree
   - q Strongly Disagree
   - q Don't know

2. On a scale of 1-10 (10 is the highest), please rate the importance of monitoring these devices.
   - ___ Furnace / Air Conditioning
   - ___ Windows / Doors & Locks
   - ___ Critical systems such as sump pumps
   - ___ Humidity
   - ___ Temperature
   - ___ Kitchen Appliances such as dishwasher, oven, microwave
   - ____ Lighting Systems

3. It is important to be able to monitor as well as manipulate electronic devices remotely.
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

4. If given the opportunity, you would make use of a system that lets you manipulate home devices remotely
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

5. Please rank the order of usefulness in being able to access your remote home management system.
- ___ From a browser on your desktop at work
- ___ From a WAP enabled cell phone
- ___ Using voice commands over a telephone line
- ___ From a PDA such as IPAQ or Palm

6. The ability to monitor your home would be a driving factor in purchasing a cable modem, and getting an online account with a cable ISP.
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

7. Do you feel a $1000 purchase price of a home monitoring product would yield an investment payback in 24 months through utility savings?
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

8. The ability to monitor critical systems such as a failed water heater or sump pump, are things you would consider emergency situations. You would want to be notified and react if you found one of these systems failed..
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

9. It is important for us to use the energy in conservative way
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

10. You would take the time to schedule devices to run at off-peak hours if you knew you would receive a 5% savings on your energy bill. (assume the time to schedule is .5 hours per month)
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

11. What kind of inconvenience will you suffer, if you were to schedule appliances such as dishwashers to run between 2:00 and 5:00 am?
- q Absolutely no inconvenience
- q Mild inconvenience
- q Moderate inconvenience
- q Major inconvenience
- q I would never do it

12.It is helpful to be able to close the garage door form the web while you left it open accidentally.
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

13. You would purchase a home management system instead of a traditional security system if similarly priced
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

14. An intelligent key that unlocks a door and grants access by the home security system, is much more valuable and convenient than conventional methods. (Instead of using a key, and pressing your code into the security system)
- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

15. A single intelligent key that unlocks doors, grants access to computers, grants access to PPV cable access, etc would be of interest to you.

- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

16.It is important to be able to monitor the temperature home heating zones remotely from the web.

- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

17. You would make use of a feature that sets appropriate lighting, heat and oven pre-heat when you arrive home from work

- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

18. It is important to be able to configure your automated home by easily removing, adding, and reconfiguring your electronic devices.

- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree

19. It is important to have a user-friendly web-interface to control your home electronic devices over the web.

- q Strongly Agree
- q Agree
- q Disagree
- q Strongly Disagree
- q Don't know

20. Your yearly income
a. <2,000 b. 21,000 – 30,000 c.31,000-40,000 d. 41,000 – 60,000 e. 61,000 – 80,000 f. 81,000>

21. Rental Status: a. Rent a house. b. Own House c. other (Specify)

22. Sex a. Male b Female

23. Your marital status: a. Married. b. Single c. Divorced

24. Your age a. <20 b. 20-30 c. 30-40 d. 40-50 e. 50+

Statistical Methods Used

- Cronbach's Alpha test for reliability.
- Simple and multiple regression testing on the assumption of normal distribution.
- Step-wise regression test to examine the power of the model. In other words the ability of the independent variables to explain the dependent variable.
- Pearson Correlation Matrix tests.
- Variance Inflation Factor.

Results And Analysis

Reliability of Measurement Tools

The Cronbach's alpha coefficient was obtained for the six variables. The result indicates that Cronbach's alpha for the six variable items was 79.85%. Cronbach's alpha for the 26 questionnaire items was 83.72%.

Reliabilities less than 60% are generally considered to be poor, those in the 70% range, to be acceptable, and those over 80% to be good. The closer the reliability coefficient gets to 1.0 (i.e.: 100%), the better. Therefore, the internal consistency reliability of the measures used in this study can be considered to be very good [5].

General Hypothesis Testing

The calculated value for *F* regarding this hypothesis was 4.24

The SPSS calculated values of F were compared to tabulated values with a confidence level of 95%, where **a=.05; df1=5; df2=36; Ftab=2.48; Fcalc=4.24**

F(calculated) > F(tabulated).

Thus we reject H0. This implies that there *is a relation that has a statistical significance* between the independent variables as a whole and the dependent variable.

Subsidiary Hypotheses Testing

Control and Affordable Control My Home Application

The calculated value for this hypothesis was as follows:

F	R Square	Correlation
13.470	**.243**	**.493**

The SPSS calculated values of F were compared to tabulated values with a confidence level of 95%, where **a=.05; df1=1; df2=42; Ftab=4.07;**

F(calculated) > F(tabulated)

Thus we reject H0. This implies there is a statistical significance between the independent variable and the dependent. The result is clear because the R Square is equal to .243.

The positive correlation .493 between the dependent and the independent variable shows that they are positively correlated.

Monitor and Affordable Control My Home Application

The calculated value for this hypothesis was as follows:

F	R Square	Correlation
10.972	**.211**	**.459**

The SPSS calculated values of F were compared to tabulated values with a confidence level of 95%, where **a=.05; df1=1; df2=41; Ftab=4.08;**

F(calculated) > F(tabulated)

Thus we reject H0. This implies there is a statistical significance between the independent variable and the dependent. The result is clear because the R Square is equal to .211.

The positive correlation .459 between the dependent and the independent variable shows that they are positively correlated.

Safety-Security and Affordable Control My Home Application

The calculated value for this hypothesis was as follows:

F	R Square	Correlation
16.260	**.284**	**.533**

The SPSS calculated values of F were compared to tabulated values with a confidence level of 95%, where **a=.05; df1=1; df2=41; Ftab=4.08;**

F(calculated) > F(tabulated)

Thus we reject H0. This implies there is a statistical significance between the independent variable and the dependent. The result is clear because the R Square is equal to .284.

The positive correlation .533 between the dependent and the independent variable shows that they are positively correlated.

Energy Saving-Convenience and Affordable Control My Home Application

The calculated value for this hypothesis was as follows:

F	R Square	Correlation
5.329	**.113**	**.336**

The SPSS calculated values of F were compared to tabulated values with a confidence level of 95%, where **a=.05; df1=1; df2=42; Ftab=4.07;**

F(calculated) > F(tabulated)

Thus we reject H0. This implies there is a statistical significance between the independent variable and the dependent. The result is clear because the R Square is equal to .113.

The positive correlation .336 between the dependent and the independent variable shows that they are positively correlated.

User-Interface and Affordable Control My Home Application

The calculated value for this hypothesis was as follows:

F	R Square	Correlation
4.208	**.093**	**.305**

The SPSS calculated values of F were compared to tabulated values with a confidence level of 95%, where **a=.05; df1=1; df2=41; Ftab=4.08;**

F(calculated) > F(tabulated)

Thus we reject H0. This implies there is a statistical significance between the independent variable and the dependent. The result is clear because the R Square is equal to .093.

The positive correlation .305 between the dependent and the independent variable shows that they are positively correlated.

Stepwise Regression Analysis

To test the power of the model we have used stepwise regression method where the rank of the interpretation coefficients (R^2) was as follows:

Rank	Independent Variables	R^2
1	Safety-Security	.284
2	Control	.243
3	Monitor	.211
4	Energy Saving-Convenience	.113
5	User-Interface	.093

This implies that safety-security resources is the most explanatory variable in affordable control my home application.

As a result giving the variables with higher R^2 more concern should have a positive impact on affordable control my home application. The independent variables as a whole explain 0.609 of the affordable control my home application. This high degree of explanation is enough to judge the power of the independent variables in their degree of impact on the dependent variable. Clearly, by simply considering the factors the levels or degrees of the independent variables one can significantly anticipate an increase in willingness of user for affordable control my home application.

Pearson Correlation Matrix

The Pearson Correlation Matrix enables us to identify the correlations between the variables in this study. Focusing first on the correlations between the dependent variable, *affordable control my home application*, and each independent variable, we can see that there is a high positive correlation with *safety-security* and also with *monitor*. There is a lower positive correlation with *Energy Saving-Convenience* and with *User-Interface*.

The Pearson Correlation Matrix can also be used to verify that all independent variables are truly independent by testing their mutual exclusiveness. This can be done by taking the highest correlation between two independent variables, and using it to calculate the variance inflation factor (VIF). The VIF = 1/(1-r 2), where r is the highest correlation between any two independent variables. VIF values of ten or greater indicate a high degree of multi-collinearity between the independent variables. Since the highest correlation between any two independent variables in the matrix is .587, we will use this as our r: VIF = 1/(1-r 2) = 1/(1-(.587)2) = 1.52. We can therefore state that the independent variables of this study are mutually exclusive.

Conclusions and Recommendations

Conclusion

The main conclusions of this study can be summarized as follows:

1. There were many relations that have statistical significance between the independent variables and design quality due to regression.

2. All independent variables showed positive correlation with affordable control my home application. This implies that each of the factors in our theoretical framework has a positive impact on affordable control my home application. However, these correlations varied widely between these variables.

3. Safety-Security had the highest correlation with control my home application and control was the second. This indicates that when these factors receive more concern, in control my home application is expected to be significantly and positively affected.

4. Because Safe-Security, Control and Monitor explain the highest percentage control my home application, and have the highest positive correlation with it, concentrating on them is extremely critical to improve the for Control My Home software products.

5. The independent variables as a whole explain 0.609 of the willingness of user for Control My Home application. This degree of explanation is sufficient to judge the power of the independent variables in their degree of impact on the dependent variable. Consequently, the combined effect of all the independent variables is as important as the effect of each one of them separately.

6. VIF values 1.52, which is less then five. We can therefore state that the independent variables of this study are mutually exclusive.

Recommendations

1.Studies can be done using the comparison with other products and our application.

2.Stuies can vary depending on target audience. Different studies should be done depending on target audience.

3. More studies should be conducted to determine other factors that may also have a significant influence on control my home application.

4. Since most of the measurements of this study are student-oriented, we can perform better survey using homeowners.

References

[1]http://www.x10.com/products/x10_ck11a.htm
[2].http://www.smarthomepro.com/300601.html
[3]. PCs to control your home By Christine MacDonald January 10, 1997, http://news.com.com/2100-1001-260913.html?legacy=cnet
[4.] http://www.automatedliving.com/products.shtml
[5] Sekaran, Uma., "Research Methods For Business ", John Wiley and Sons Inc.,2nd edition, N.Y, 1992, p 287..C. Valdaliso Page 24 4/24/02

Computer Outputs

8.1 Reliability

8.1.1 Questions

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Reliability Coefficients

N of Cases = 27.0 N of Items = 25

Alpha = .8372

Variables

****** Method 1 (space saver) will be used for this analysis ******

R E L I A B I L I T Y A N A L Y S I S - S C A L E (A L P H A)

Reliability Coefficients

N of Cases = 42.0 N of Items = 6

Alpha = .7985

Frequencies

Frequencies

Statistics

		Control My Home	Control	Monitor	Safety and Security	Energy Saving and Convenience	User - Interface
N	Valid	44	46	45	45	46	45
	Missing	2	0	1	1	0	1

Affordable Control My Home Application

Frequency Table

Control My Home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.33	1	2.2	2.3	2.3
	2.50	2	4.3	4.5	6.8
	3.00	4	8.7	9.1	15.9
	3.33	2	4.3	4.5	20.5
	3.67	7	15.2	15.9	36.4
	4.00	4	8.7	9.1	45.5
	4.33	6	13.0	13.6	59.1
	4.50	1	2.2	2.3	61.4
	4.67	2	4.3	4.5	65.9
	5.00	8	17.4	18.2	84.1
	5.33	3	6.5	6.8	90.9
	5.67	2	4.3	4.5	95.5
	6.00	2	4.3	4.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Control

Control					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.63	1	2.2	2.2	2.2
	2.30	1	2.2	2.2	4.3
	3.10	1	2.2	2.2	6.5
	3.30	2	4.3	4.3	10.9
	3.40	2	4.3	4.3	15.2
	3.50	2	4.3	4.3	19.6
	3.60	1	2.2	2.2	21.7
	3.70	3	6.5	6.5	28.3
	3.90	3	6.5	6.5	34.8
	4.00	2	4.3	4.3	39.1
	4.10	3	6.5	6.5	45.7
	4.11	1	2.2	2.2	47.8
	4.20	4	8.7	8.7	56.5
	4.30	3	6.5	6.5	63.0
	4.40	1	2.2	2.2	65.2
	4.50	2	4.3	4.3	69.6
	4.60	2	4.3	4.3	73.9
	4.70	3	6.5	6.5	80.4
	4.80	1	2.2	2.2	82.6
	4.88	1	2.2	2.2	84.8
	5.00	1	2.2	2.2	87.0
	5.10	1	2.2	2.2	89.1
	5.20	2	4.3	4.3	93.5
	5.40	2	4.3	4.3	97.8
	6.00	1	2.2	2.2	100.0
	Total	46	100.0	100.0	

Monitor

Monitor					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**2.50**	1	2.2	2.2	2.2
	3.00	7	15.2	15.6	17.8
	3.50	1	2.2	2.2	20.0
	4.00	10	21.7	22.2	42.2
	4.50	1	2.2	2.2	44.4
	5.00	17	37.0	37.8	82.2
	5.50	6	13.0	13.3	95.6
	6.00	2	4.3	4.4	100.0
	Total	45	97.8	100.0	
Missing	**System**	1	2.2		
Total		46	100.0		

Safety-Security

Safety and Security					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**2.00**	1	2.2	2.2	2.2
	4.00	4	8.7	8.9	11.1
	4.25	1	2.2	2.2	13.3
	4.33	1	2.2	2.2	15.6
	4.50	9	19.6	20.0	35.6
	4.67	1	2.2	2.2	37.8
	4.75	5	10.9	11.1	48.9
	5.00	9	19.6	20.0	68.9
	5.25	4	8.7	8.9	77.8
	5.50	7	15.2	15.6	93.3
	5.67	1	2.2	2.2	95.6
	6.00	2	4.3	4.4	100.0
	Total	45	97.8	100.0	
Missing	**System**	1	2.2		
Total		46	100.0		

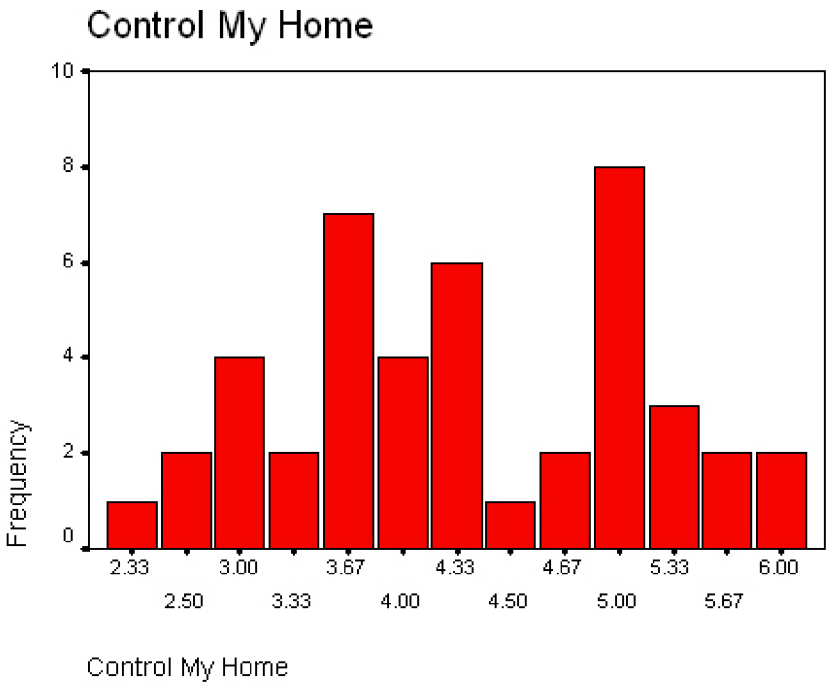
Energy Saving-Convenience

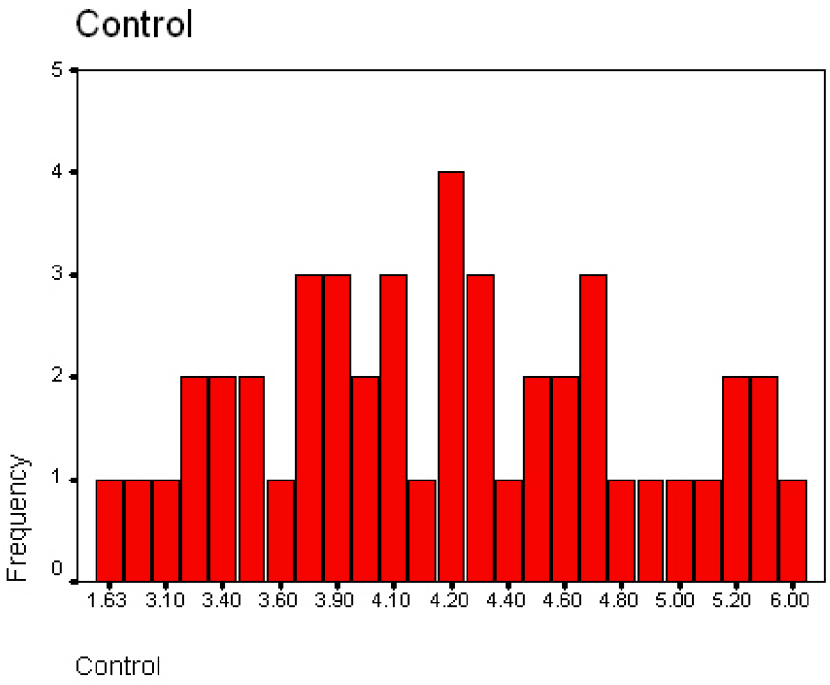
Energy Saving and Convenience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	2.2	2.2	2.2
	3.50	2	4.3	4.3	6.5
	3.75	3	6.5	6.5	13.0
	4.00	3	6.5	6.5	19.6
	4.25	4	8.7	8.7	28.3
	4.50	5	10.9	10.9	39.1
	4.75	6	13.0	13.0	52.2
	5.00	13	28.3	28.3	80.4
	5.25	4	8.7	8.7	89.1
	5.33	2	4.3	4.3	93.5
	5.50	3	6.5	6.5	100.0
	Total	46	100.0	100.0	

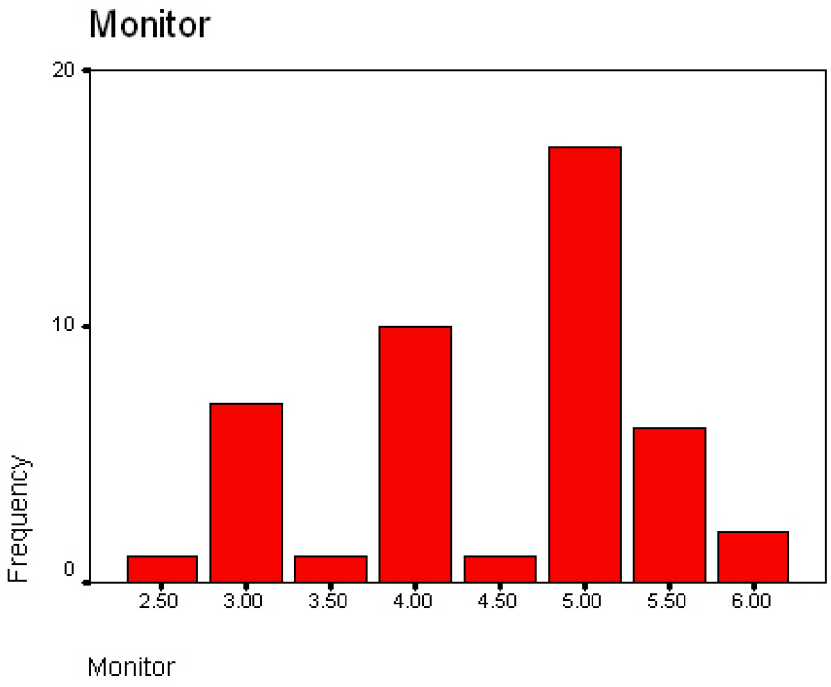
User-Interface

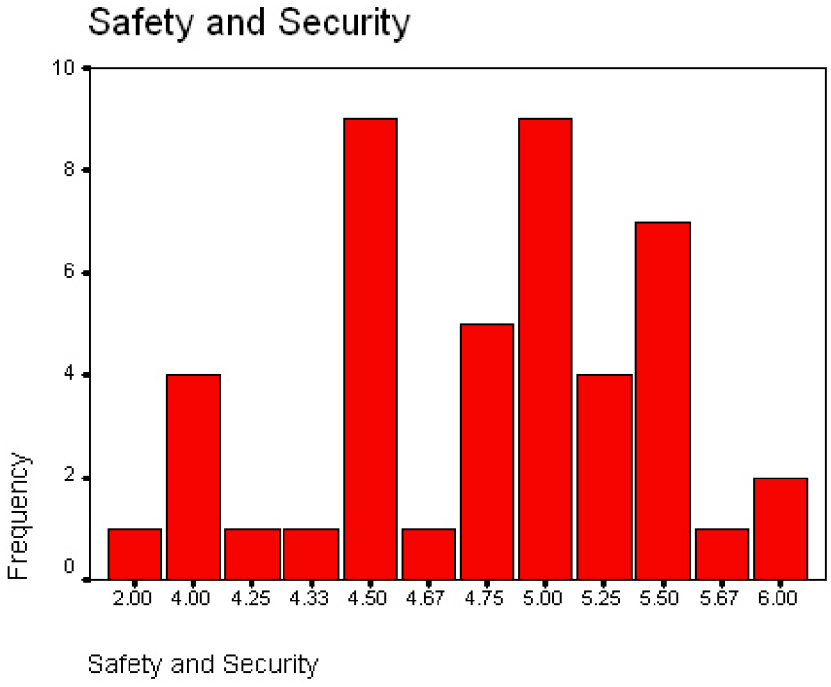
User - Interface					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.00	1	2.2	2.2	2.2
	4.00	5	10.9	11.1	13.3
	4.50	2	4.3	4.4	17.8
	5.00	13	28.3	28.9	46.7
	5.50	17	37.0	37.8	84.4
	6.00	7	15.2	15.6	100.0
	Total	45	97.8	100.0	
Missing	System	1	2.2		
Total		46	100.0		

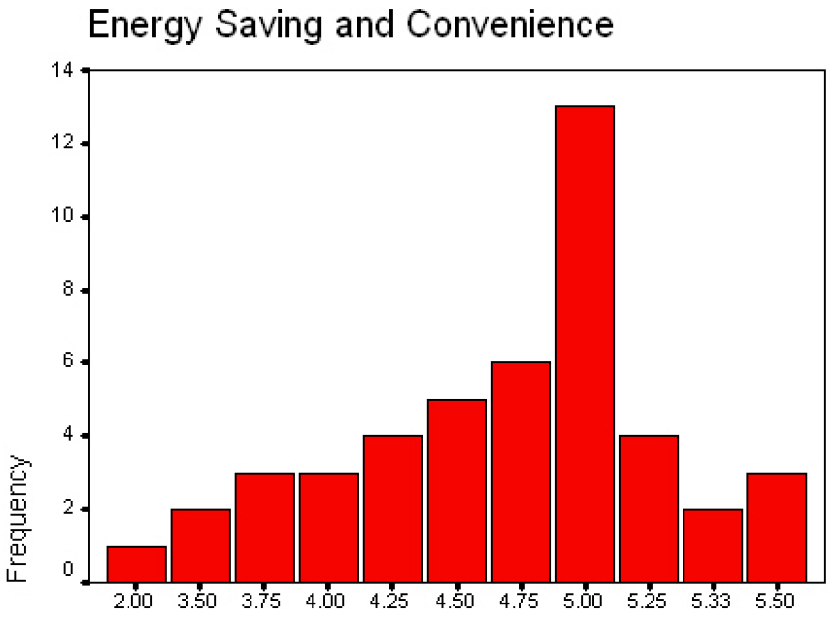
Bar Charts of Frequencies



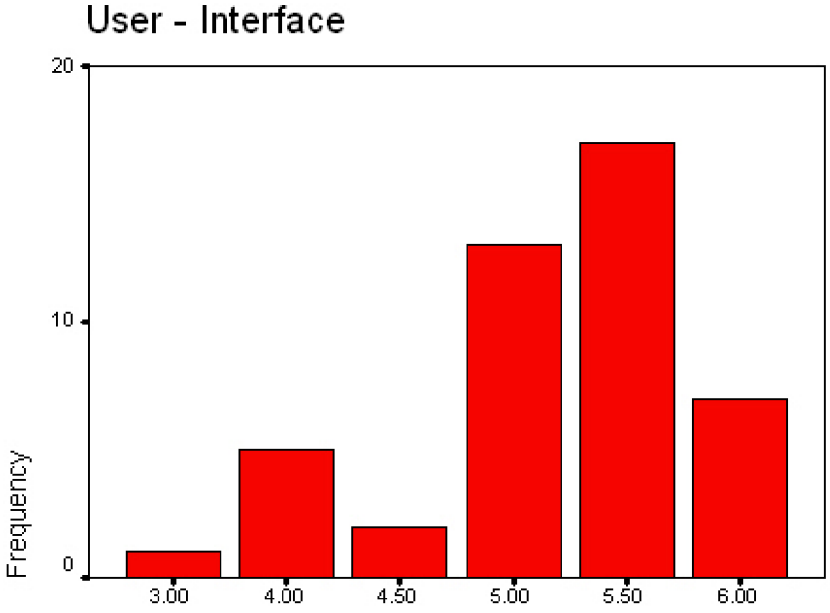



Monitor
20
10
0
Frequency
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
Monitor


Safety and Security
10
8
6
4
2
0
Frequency
2.00
4.00
4.25
4.33
4.50
4.67
4.75
5.00
5.25
5.50
5.67
6.00
Safety and Security



Energy Saving and Convenience



User - Interface

Regression

Control

Regression

Variables Entered/Removed(b)			
Model	**Variables Entered**	**Variables Removed**	**Method**
1	Control(a)	.	Enter
a All requested variables entered.			
b Dependent Variable: Control My Home			

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.493(a)	.243	.225	.83819
A Predictors: (Constant), Control				

ANOVA(b)						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	9.464	1	9.464	13.470	.001(a)
	Residual	29.508	42	.703		
	Total	38.972	43			
a Predictors: (Constant), Control						
b Dependent Variable: Control My Home						

Coefficients(a)						
		Un-standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
Model		**B**	**Std. Error**	**Beta**		
1	**(Constant)**	1.773	.686		2.586	.013
	Control	.589	.161	.493	3.670	.001
a Dependent Variable: Control My Home						

Monitor

Regression

Variables Entered/Removed(b)			
Model	**Variables Entered**	**Variables Removed**	**Method**
1	Monitor(a)	.	Enter
A All requested variables entered.			
B Dependent Variable: Control My Home			

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.459(a)	.211	.192	.84810
a Predictors: (Constant), Monitor				

ANOVA(b)						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	7.892	1	7.892	10.972	.002(a)
	Residual	29.490	41	.719		
	Total	37.382	42			
a Predictors: (Constant), Monitor						
b Dependent Variable: Control My Home						

Coefficients(a)						
		Un-standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
Model		**B**	**Std. Error**	**Beta**		
1	**(Constant)**	2.184	.644		3.390	.002
	Monitor	.463	.140	.459	3.312	.002
a Dependent Variable: Control My Home						

Safety-Security

Variables Entered/Removed(b)			
Model	**Variables Entered**	**Variables Removed**	**Method**
1	Safety and Security(a)	.	Enter
A All requested variables entered.			
B Dependent Variable: Control My Home			

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.533(a)	.284	.266	.80800
a Predictors: (Constant), Safety and Security				

ANOVA(b)						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	10.615	1	10.615	16.260	.000(a)
	Residual	26.767	41	.653		
	Total	37.382	42			
a Predictors: (Constant), Safety and Security						
b Dependent Variable: Control My Home						

Coefficients(a)						
		Un-standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
Model		**B**	**Std. Error**	**Beta**		
1	**(Constant)**	.743	.885		.840	.406
	Safety and Security	.730	.181	.533	4.032	.000
a Dependent Variable: Control My Home						

Energy Saving-Convenience

Variables Entered/Removed(b)			
Model	**Variables Entered**	**Variables Removed**	**Method**
1	Energy Saving and Convenience(a)	.	Enter
a All requested variables entered.			
b Dependent Variable: Control My Home			

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.336(a)	.113	.091	.90743
A Predictors: (Constant), Energy Saving and Convenience				

ANOVA(b)						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	4.388	1	4.388	5.329	.026(a)
	Residual	34.584	42	.823		
	Total	38.972	43			
a Predictors: (Constant), Energy Saving and Convenience						
b Dependent Variable: Control My Home						

Coefficients(a)						
		Un-standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
Model		**B**	**Std. Error**	**Beta**		
1	**(Constant)**	2.066	.954		2.165	.036
	Energy Saving and Convenience	.472	.205	.336	2.308	.026
a Dependent Variable: Control My Home						

User-Interface

Variables Entered/Removed(b)			
Model	**Variables Entered**	**Variables Removed**	**Method**
1	User - Interface(a)	.	Enter
a All requested variables entered.			
b Dependent Variable: Control My Home			

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.305(a)	.093	.071	.92436
A Predictors: (Constant), User - Interface				

ANOVA(b)						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	3.596	1	3.596	4.208	.047(a)
	Residual	35.032	41	.854		
	Total	38.628	42			
a Predictors: (Constant), User - Interface						
b Dependent Variable: Control My Home						

Coefficients(a)						
		Un-standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
Model		**B**	**Std. Error**	**Beta**		
1	**(Constant)**	2.004	1.109		1.807	.078
	User - Interface	.439	.214	.305	2.051	.047
a Dependent Variable: Control My Home						

All independent Variables

Variables Entered/Removed(b)			
Model	**Variables Entered**	**Variables Removed**	**Method**
1	User - Interface, Energy Saving and Convenience, Control, Safety and Security, Monitor(a)	.	Enter
a All requested variables entered.			
b Dependent Variable: Control My Home			

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.609(a)	.371	.284	.80398
a Predictors: (Constant), User - Interface, Energy Saving and Convenience, Control, Safety and Security, Monitor				

ANOVA(b)						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	13.733	5	2.747	4.249	.004(a)
	Residual	23.270	36	.646		
	Total	37.003	41			
a Predictors: (Constant), User - Interface, Energy Saving and Convenience, Control, Safety and Security, Monitor						
b Dependent Variable: Control My Home						

Coefficients(a)						
		Un-standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
Model		**B**	**Std. Error**	**Beta**		
1	**(Constant)**	-.377	1.421		-.265	.792
	Control	.316	.225	.233	1.408	.168
	Monitor	.122	.185	.121	.659	.514
	Safety and Security	.487	.246	.357	1.979	.056
	Energy Saving and Convenience	-3.464E-02	.227	-.024	-.152	.880
	User - Interface	.113	.231	.069	.487	.629

a Dependent Variable: Control My Home

Correlation

Correlations							
		Control My Home	**Control**	**Monitor**	**Safety and Security**	**Energy Saving and Convenience**	**User - Interface**
Control My Home	**Pearson Correlation**	1	.493(**)	.459(**)	.533(**)	.336(*)	.305(*)
	Sig. (2-tailed)	.	.001	.002	.000	.026	.047
	N	44	44	43	43	44	43
Control	**Pearson Correlation**	.493(**)	1	.587(**)	.471(**)	.370(*)	.389(**)
	Sig. (2-tailed)	.001	.	.000	.001	.011	.008
	N	44	46	45	45	46	45
Monitor	**Pearson Correlation**	.459(**)	.587(**)	1	.562(**)	.372(*)	.322(*)
	Sig. (2-tailed)	.002	.000	.	.000	.012	.033
	N	43	45	45	45	45	44
Safety and Security	**Pearson Correlation**	.533(**)	.471(**)	.562(**)	1	.537(**)	.205
	Sig. (2-tailed)	.000	.001	.000	.	.000	.183
	N	43	45	45	45	45	44
Energy Saving and Convenience	**Pearson Correlation**	.336(*)	.370(*)	.372(*)	.537(**)	1	.276
	Sig. (2-tailed)	.026	.011	.012	.000	.	.067
	N	44	46	45	45	46	45
User – Interface	**Pearson Correlation**	.305(*)	.389(**)	.322(*)	.205	.276	1
	Sig. (2-tailed)	.047	.008	.033	.183	.067	.
	N	43	45	44	44	45	45

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Appendix 2. User Manual

Control My Home

Senior Project

User Manual

CIS 491-102
Professor Osama Eljabiri

(Members)

Vincent DiPrenda

Roy Zachariah

M. Imran Hussain

Masaru Ito

Ahsan Chowdhury

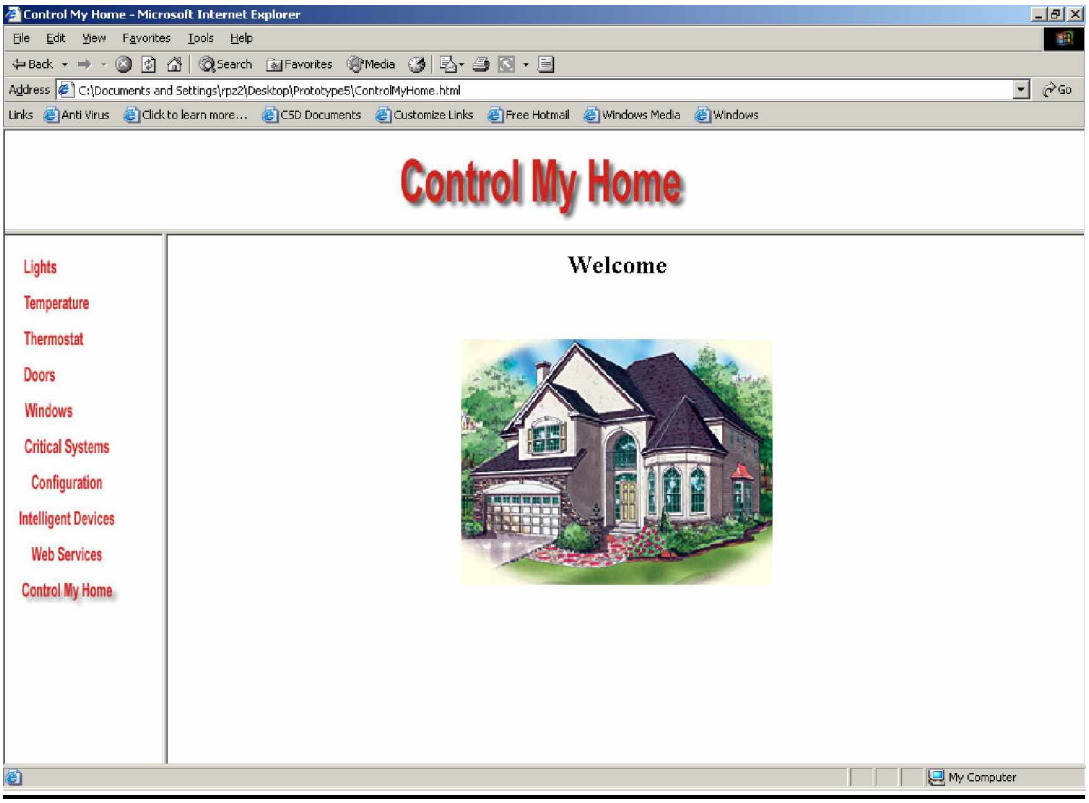
Valeria Ceballos

Table of Contents

1. ControlMyHome Main Page

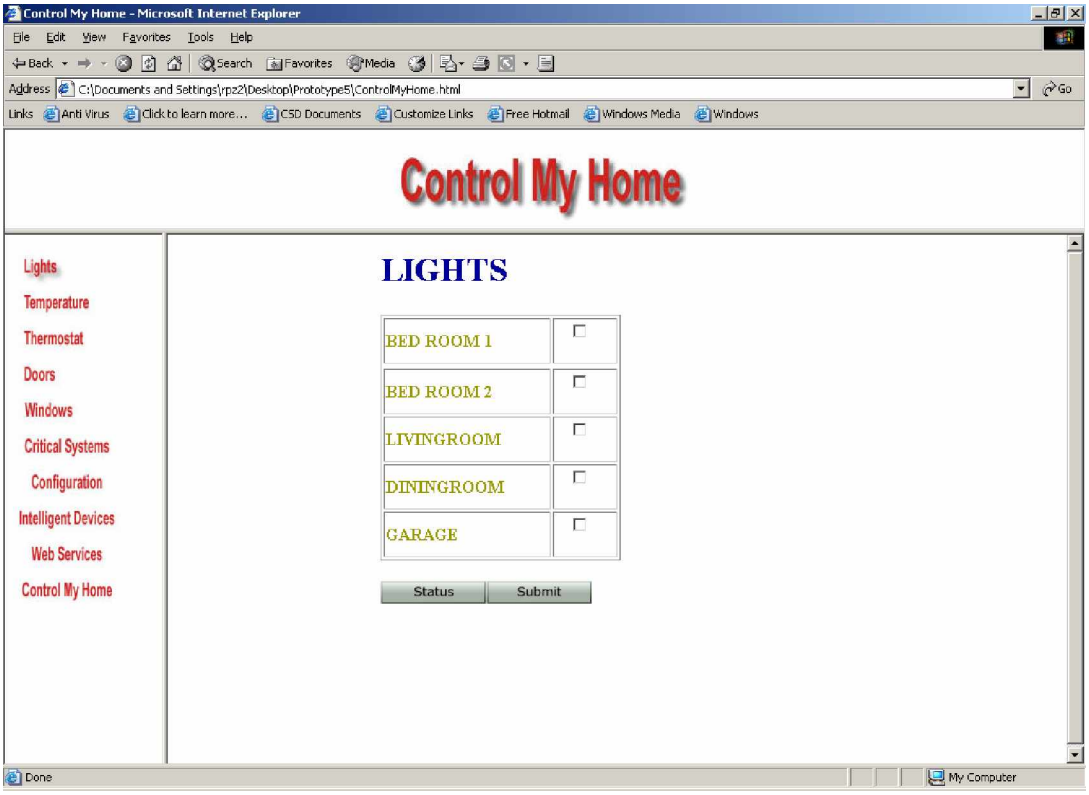
This will be the first window that the ControlMyHome user will see when he visits our website.

There are 10 options (links) that will be available for the user.



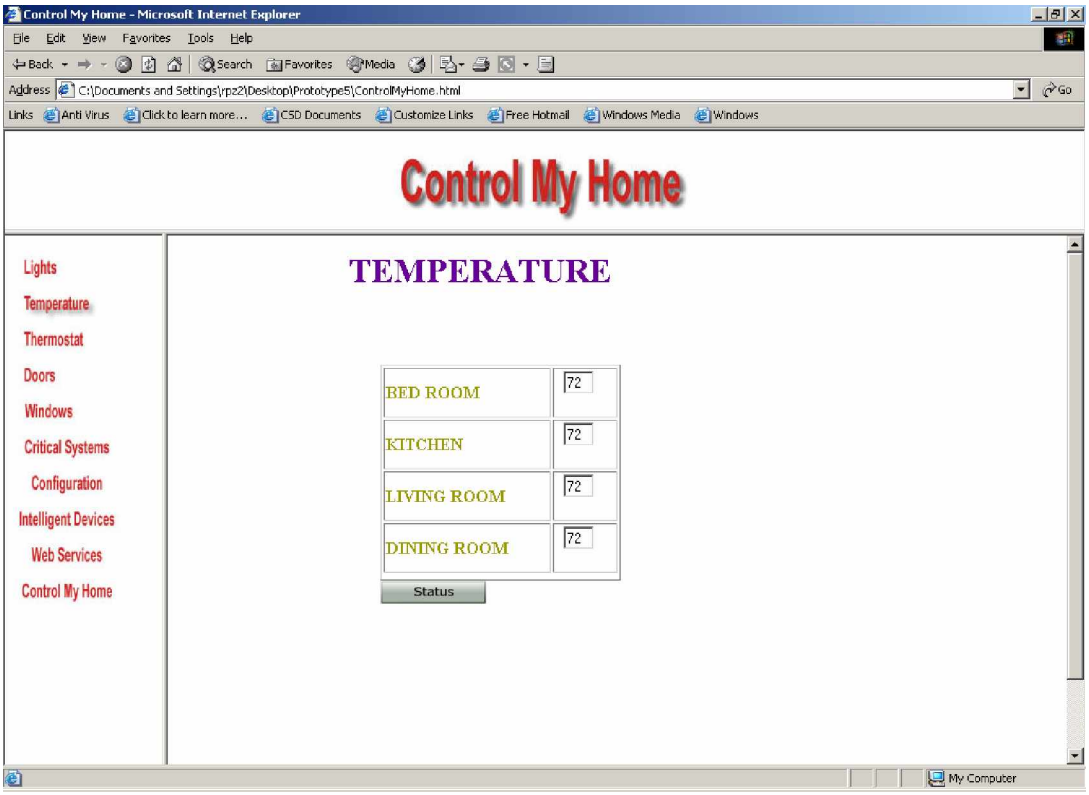
2. OPTION 1: LIGHTS

This option will help the user see what are the statuses of his home lights by clicking on the appropriate button. By clicking on this option, the user can manipulate the light status by just clicking on the box and submit the submit button. There are five lights on this window.



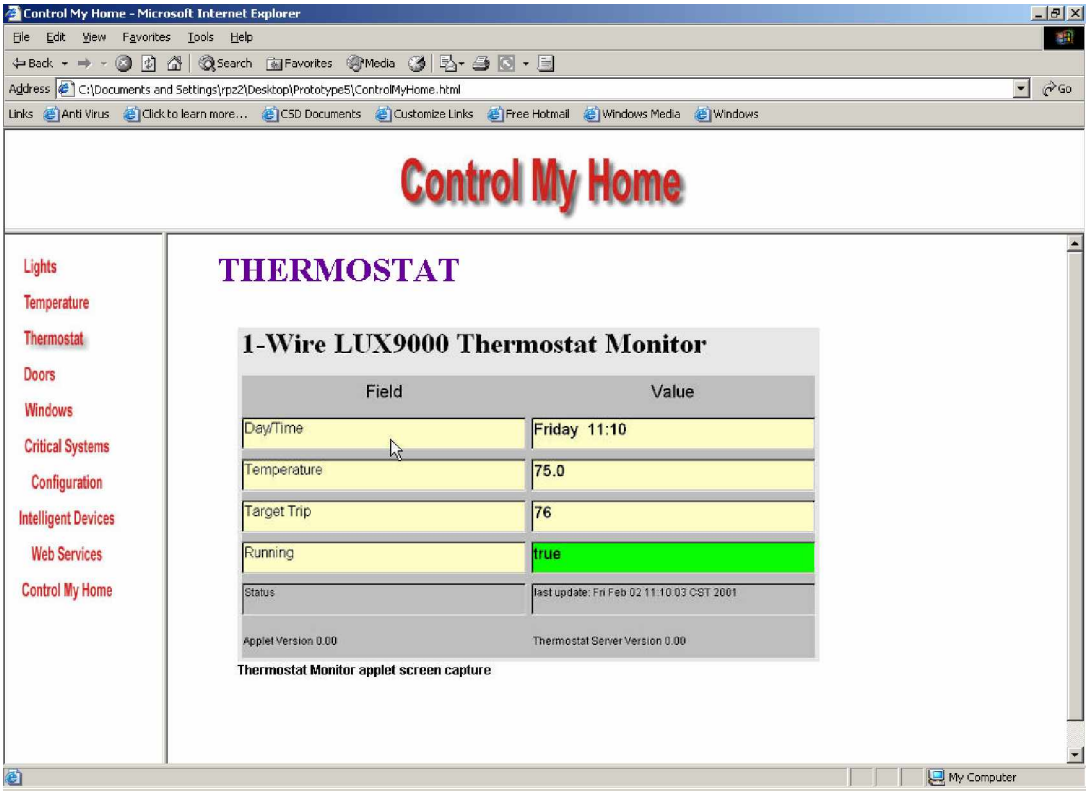
3. OPTION 2: TEMPERATURE

This option will help the user see what are the statuses of his home temperature by clicking on the appropriate button. By clicking on this option, the user can manipulate the temperature status by just clicking on the box and submit the submit button



4. OPTION 3: THERMOSTAT

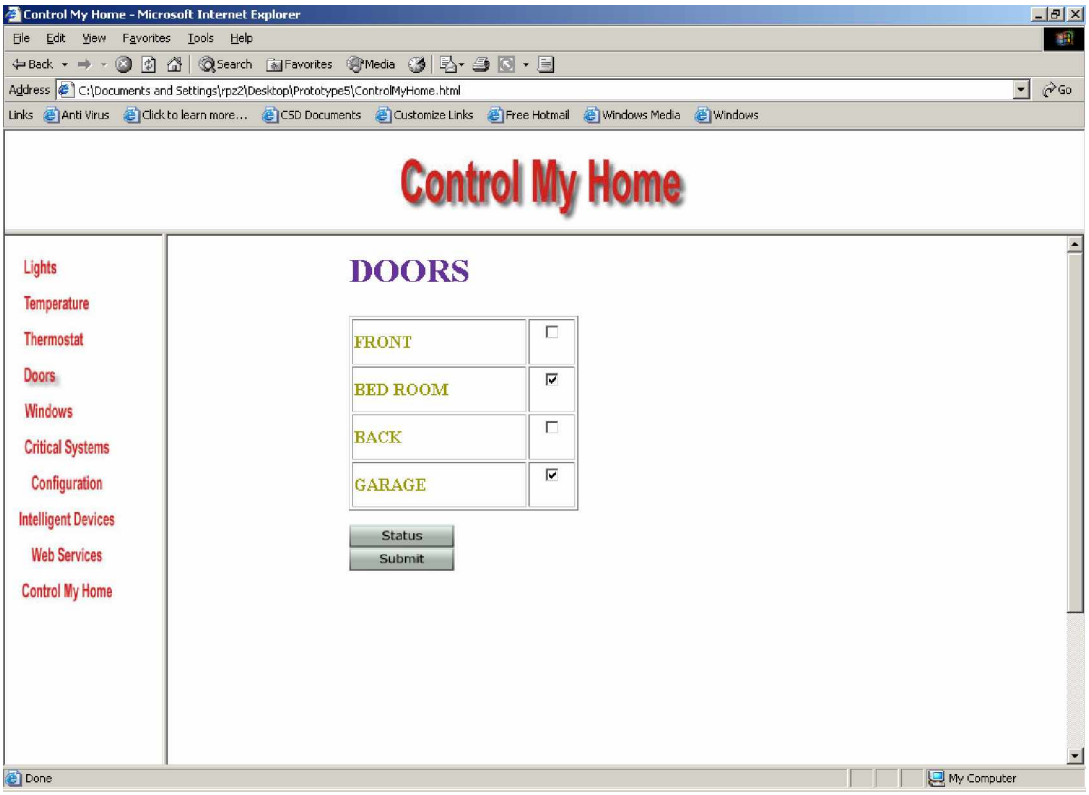
This option allows us to view LUX9000 Thermostat. From here, we can update the setting of the thermostat.



Thermostat Monitor applet screen capture

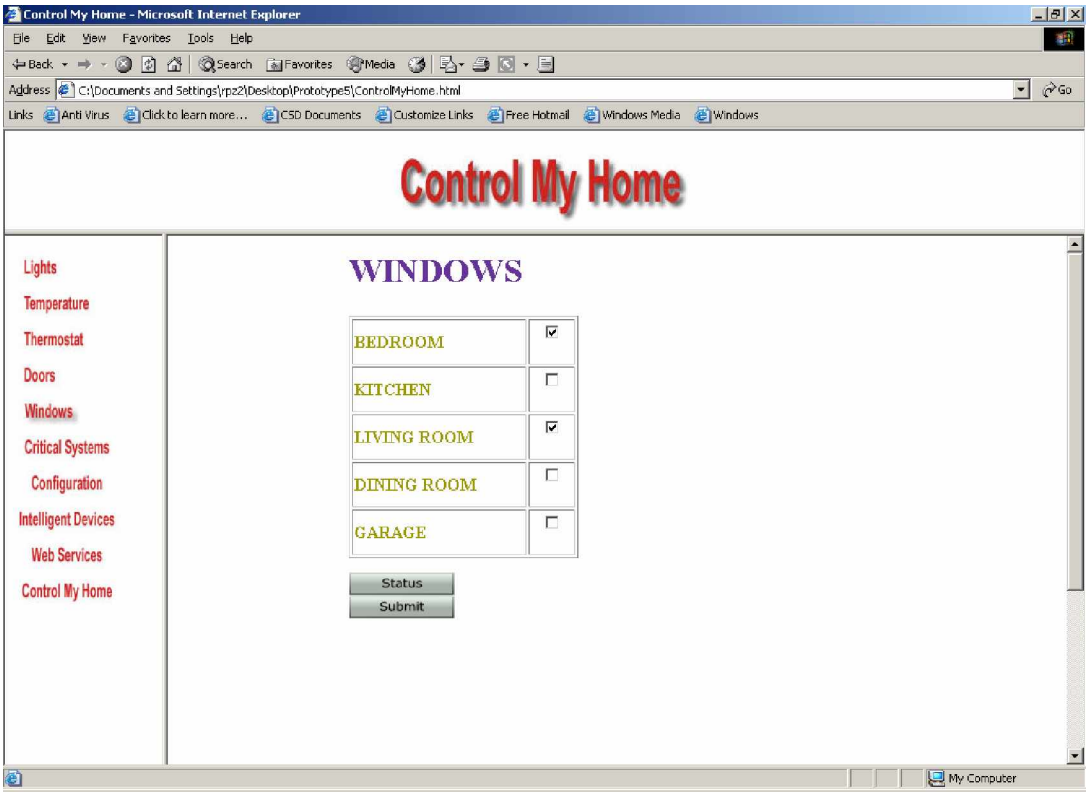
5. OPTION 4:Doors

This option allows us to lock and unlock the door of our home.



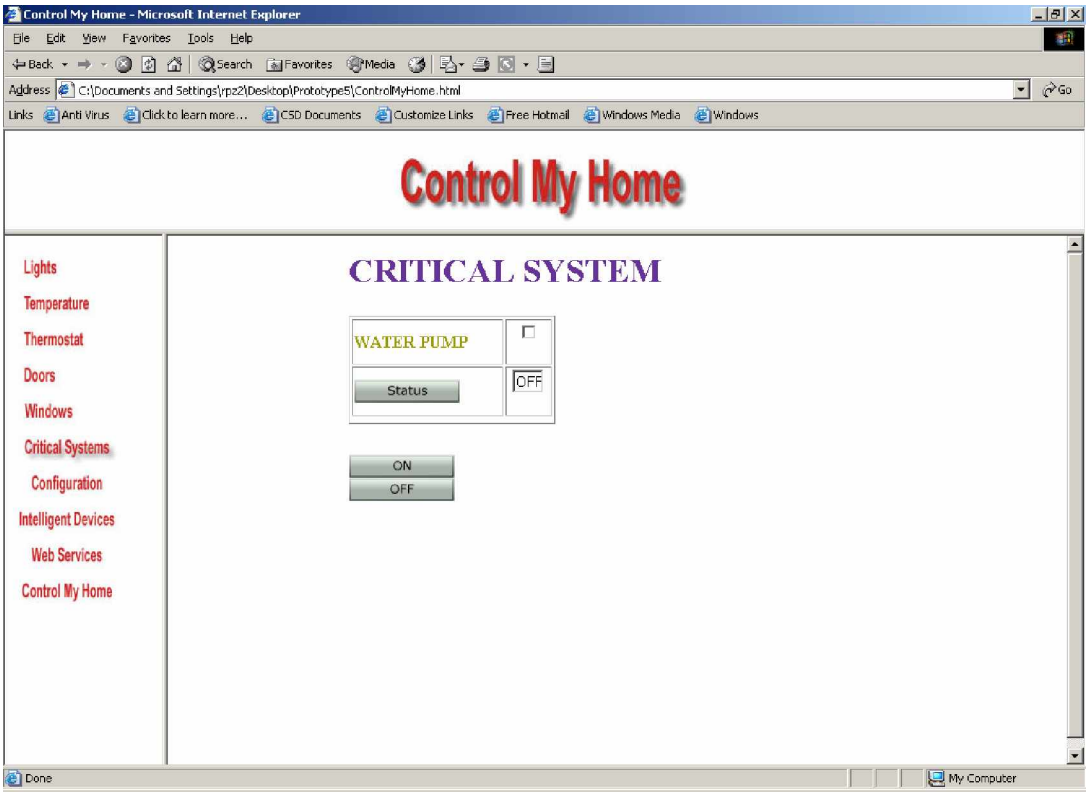
6. OPTION 5:Windows

This option may used to option or shut windows.



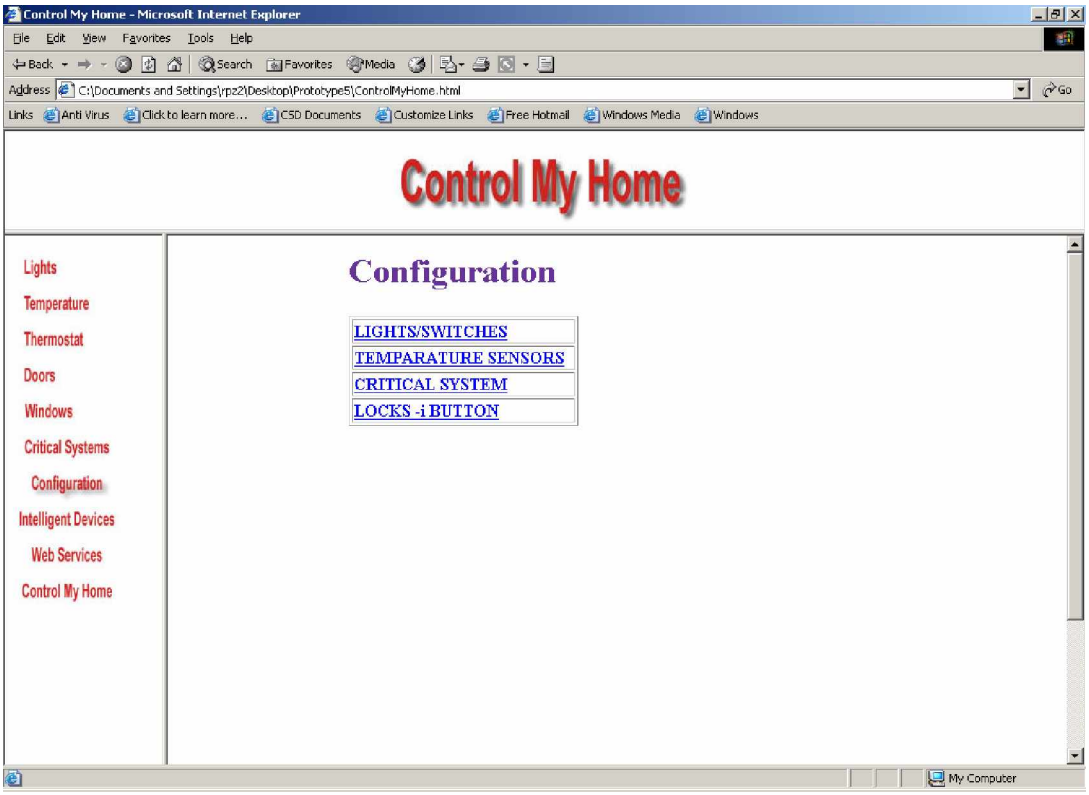
7. OPTION 6: Critical System

From this option we can monitor such critical devices as water-pump.



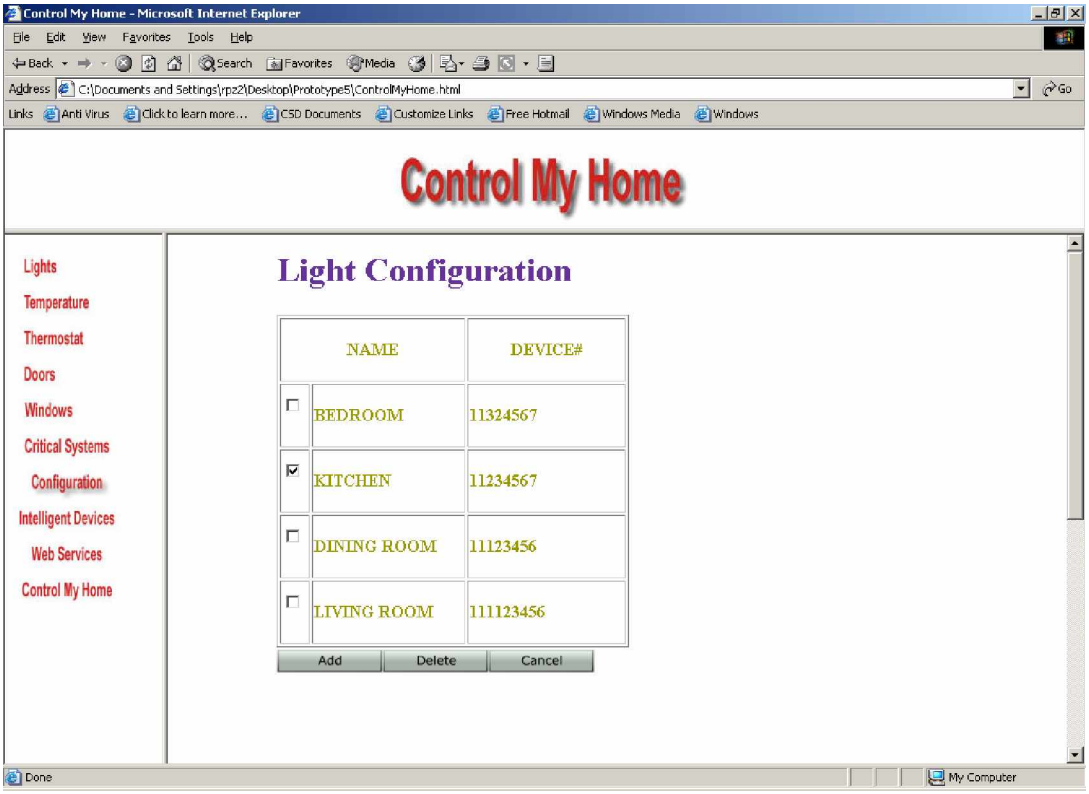
8. OPTION 7: Configuration

The configuration option allows us to configure the software at various level. Currently the system is capable of configuring Lights, Temperature, Critical System option and Lock I-button option.



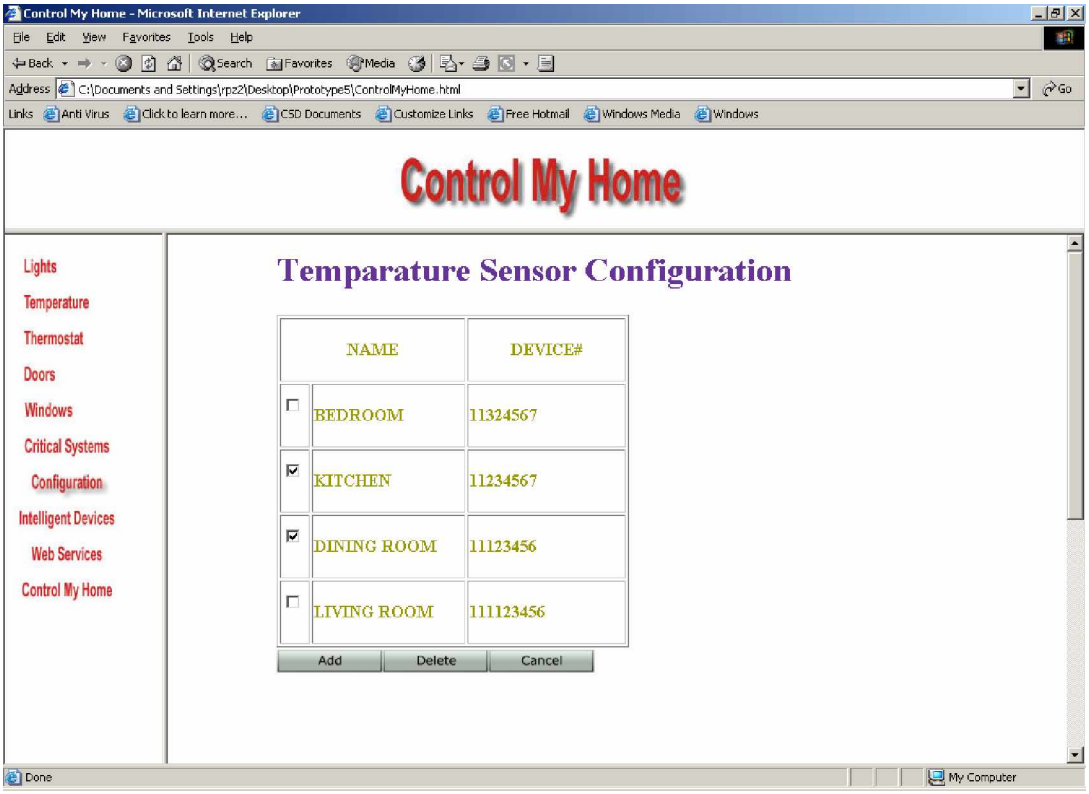
8.1 Lights/Switches

When you click on lights sensor: the following screen appears:



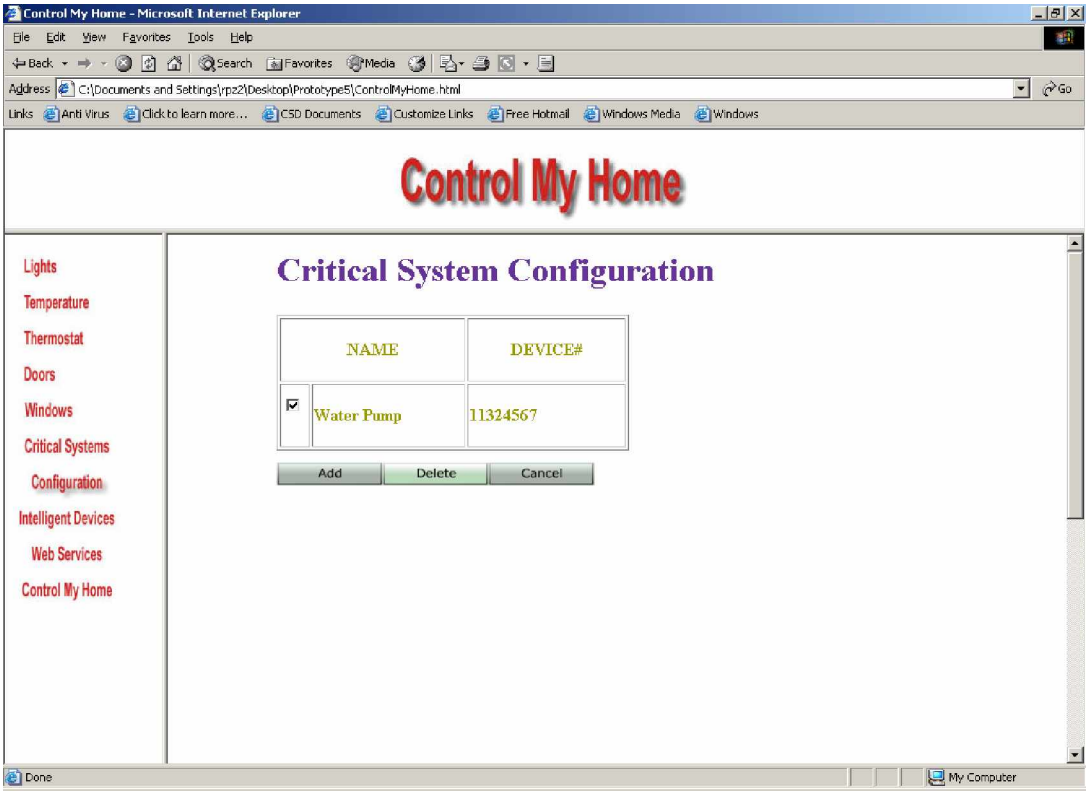
8.2 Temperature Sensors

When you click on temperature sensor: the following screen appears:



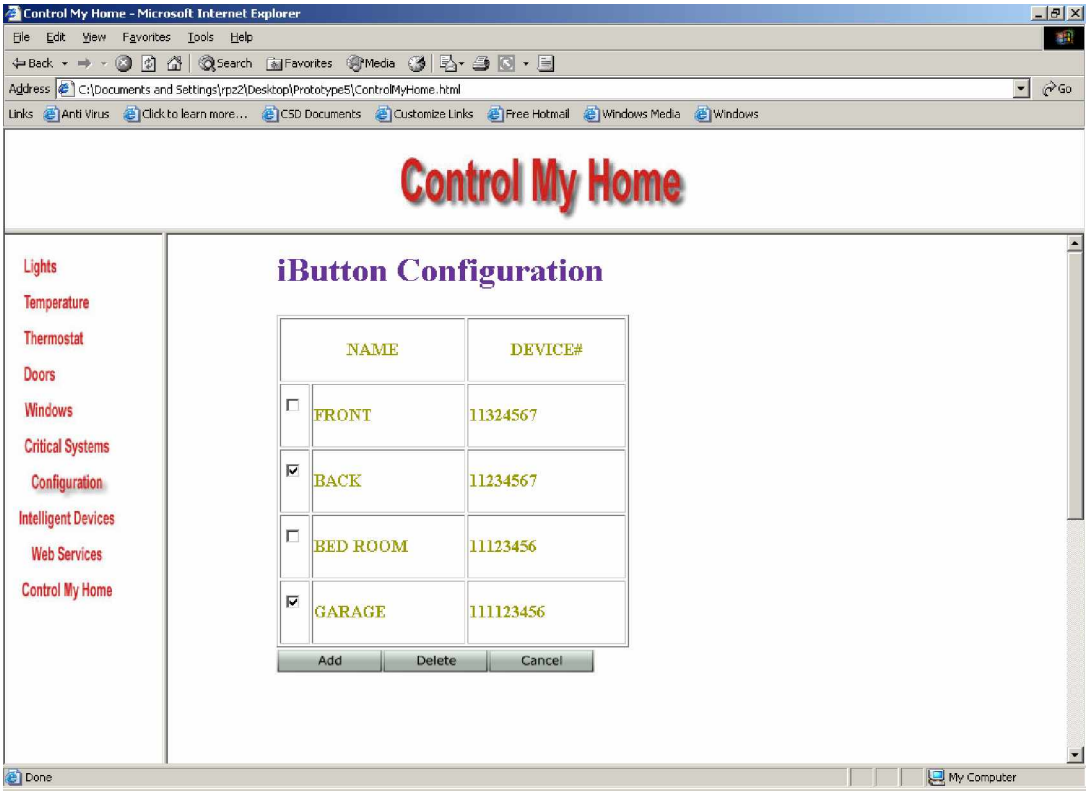
8.3 Critical System (Configuration Section)

When you click on Critical System hyperlink: the following screen appears:



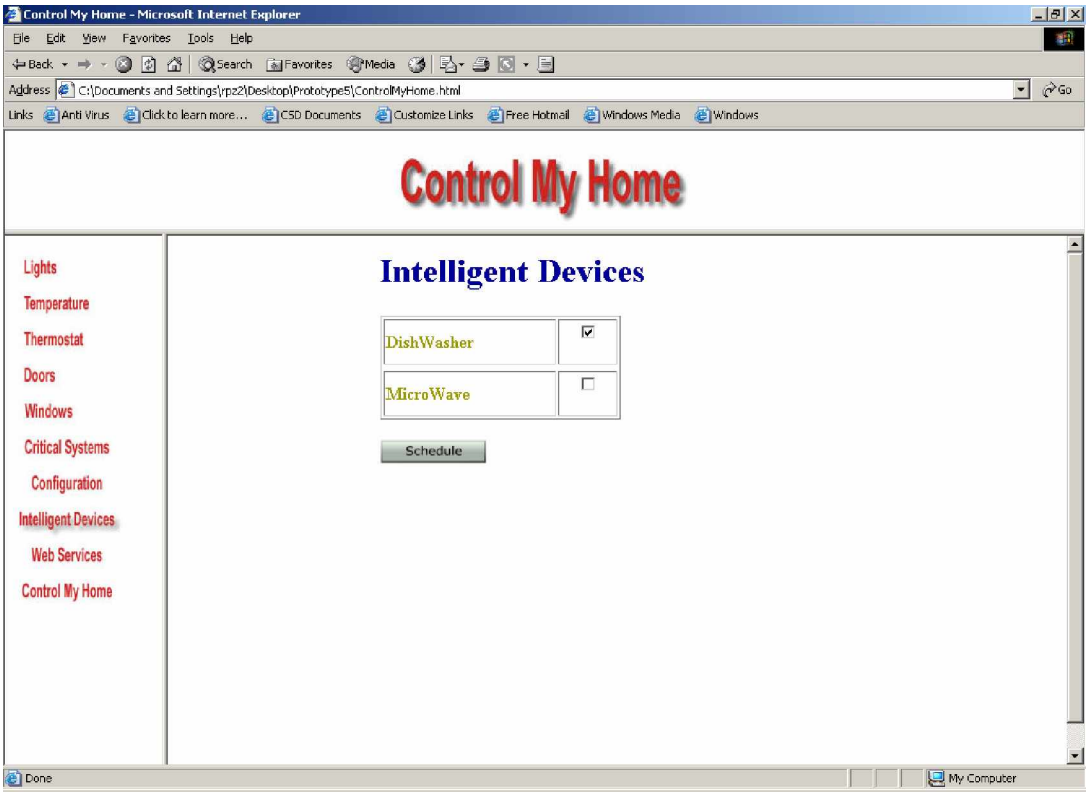
8.4 Locks – iButton

When you click on I-Button hyperlink: the following screen appears:



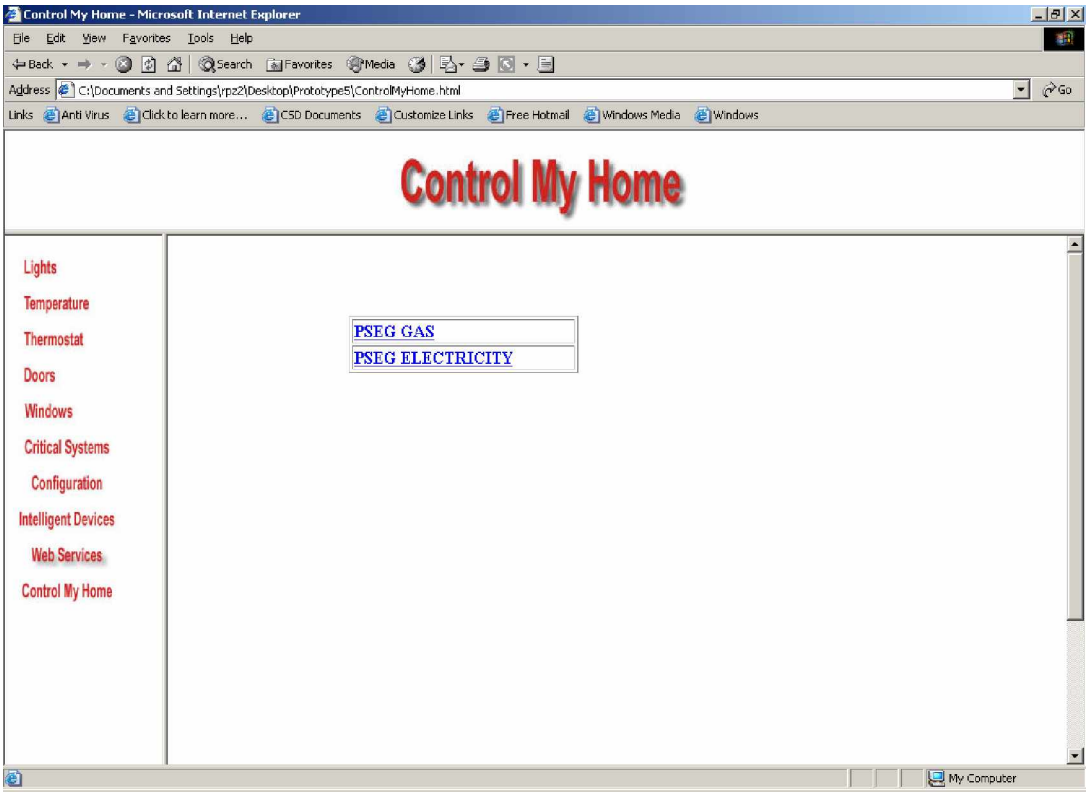
9. Intelligence Devices

When we click on the Intelligence Devices link the following occurs:



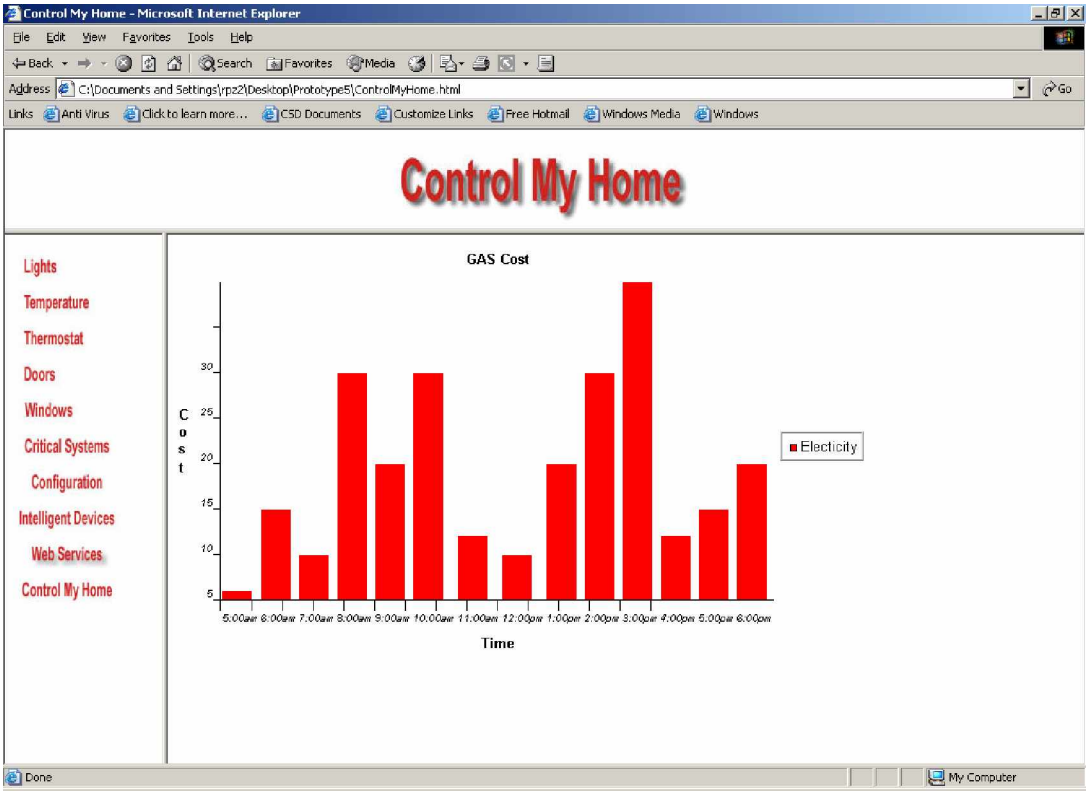
10. Web Services

This is the site of the PSE&G. shows the energy and gas rates.



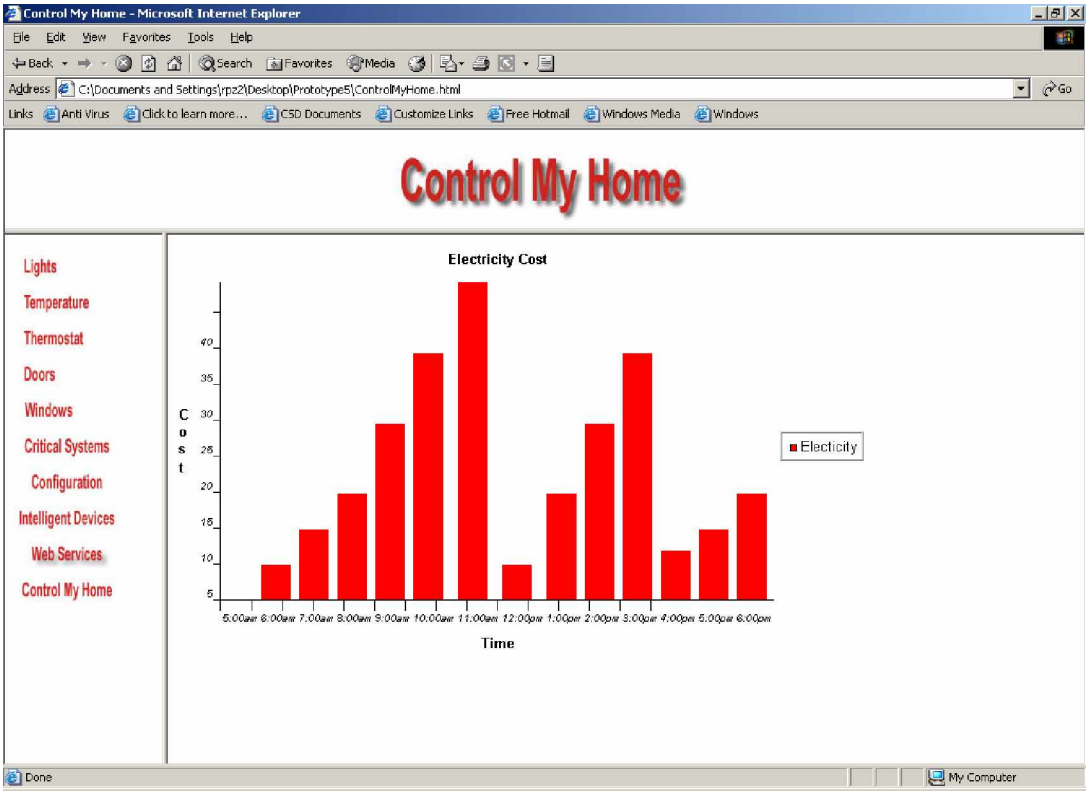
10.1 PSE&G Gas

When we click on this link the following may appear:



10.2 PSE&G Electricity

When we click on this link the following may appear:



11. Back to main page

When we click on this link, the user is taken back to the main starting page of the website.