EDSGN 100 AT&T IoT
Project 2
Final Report

-Connected Homes (Digital Life)-

Introduction to Engineering Design
EDSGN 100 Section 016

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Executive Summary

Our project choice for the AT&T Project is connected homes, getting the users a sense of how useful digital life can be. We plan to include many high-tech appliances and features in our house. A very important feature would be the automated garage, where the resident sitting in his car can easily access the garage door from a distance from his house and drive straight in, without any delays or problems. Many times we face problems when we look into our fridge while cooking meals and fail to find what we need, which disrupts us. It is always beneficial to have a reminder sent to our phone whenever we are short of anything in our kitchen, it will help keep us organized. The same will be done with paying pending bills, the residents can enter their card details and the application would just ask for confirmation before making the payment itself.

One feature which would save us on the electricity bills and keep our house energy intact would be an auto on/off light system which would detect the location of our phone in the house and automatically switch off all appliances in other rooms. There are multiple times when one forgets to switch off lights while leaving home, they would be able to do it from their car using the application. During random weather conditions, where the temperature varies between cold and hot in a time span of hours, we feel restless and tired in changing the temperature of the houses; automated air conditions and sofas would change according to the body temperature giving us complete relaxation. One of the things that bother us a lot in our daily lives is changing thermostats, as we want them to be, for this we could have a thermostat that will keep track of our readings and manipulations to it. It learns slowly what we need and then starts making changes to our desired needs automatically. Also we could have small devices that we could put in the ground alongside our plants and tells us when we need to water our plants and when they are over-watered. And all of the information is sent to the phone.

Another fascinating feature in our house will be the automated security system. Unlike security systems in our current day, this security system will allow the owner of the house to 'lockdown' his or her house from their phone. This lockdown will include a call to 911, a real-time security feed of the house (so that the owner can determine whether there are actual intruders), and a locking of all closed doors. This will all be able to be controlled from the user's phone, which will have an app for it. Our house will also include automated doors for incoming visitors; this will allow you to open the door without having to come downstairs. This will be done through the phone and the user will be able to determine who is present at the door (from a camera) and whether or not the door opens from their phone.

Introduction

Home automation is a broad term that can apply to many technologies high tech systems. We think of it as easy, all-purpose control that makes life simpler, safer, more fun, and saves energy-all at the same time. A typical home has many systems in it. These can include whole house music, intercom, distributed video, networking, security, lighting control, heating and cooling systems, cameras, pool and spa control, gate control, etc. A home automation system ties all of these systems together so you can interface with them from one point of contact.
That one point of contact we chose is through our phone. Almost every feature built in can be controlled from our cell phone, making it all the more easy for a living in the future. A complete home automation system includes and communicates
Almost everything has application to control from. From the grocery in the refrigerator to a visitor at the door everything can be controlled from our cell phone. The features as mentioned above in the executive summary are further elaborated in the following report. The report focuses on making life simple and smart, after all it is never hard work, and it is always smart work.

Idea behind IoT and M2M

Industry discussions on the industrial Internet of Things (IoT) and its potential benefits have raised numerous questions regarding distinctions between the IoT and its forerunner, machine-to-machine (M2M) communications.

Remote device access is a core common deliverable for both solutions, so questions concerning how to distinguish between the two are understandable.

Differences- between the two solution types largely ends there; they differ in how they achieve remote device access.

For example, traditional **M2M** solutions typically rely on point-to-point communications using embedded hardware modules and either cellular or wireline networks.
In contrast, **IoT** solutions rely on IP-based networks to interface device data to a cloud or middleware platform.

The M2M market's sustained inability to realize its forecast growth potential — and the reasons for that failure — provide telling indicators of the true differences between the IoT vs. M2M.

While M2M solutions offer remote access to machine data, these data are traditionally targeted at point solutions in service management applications. Rarely, if ever, are the data integrated with enterprise applications to help improve overall business performance.

Integration of device and sensor data with Big Data, analytics and other enterprise applications is a core concept behind the emerging IoT. This integration is key to achieving numerous benefits throughout the manufacturing enterprise and, ultimately, growth in the marketplace.

Supplier Characteristic	IoT	M2M
Value Chain/Number of Vendors Involved	Several to Many	One
Supplier Competencies	Device connectivity, networking, system integration, enterprise integration	Device connectivity, embedded modules, SIM card management and telecommunications
Competitive Nature	Coopetition	Competition
Solutions Emphasis	Device connectivity, data analysis, visualization	Embedded point solutions
Pricing Model	Varies: subscription fee per device, # of users, traffic, etc.	Monthly/annual subscription fee per device

Supplier Core Competencies and Value Chains Differ for IoT vs. M2M

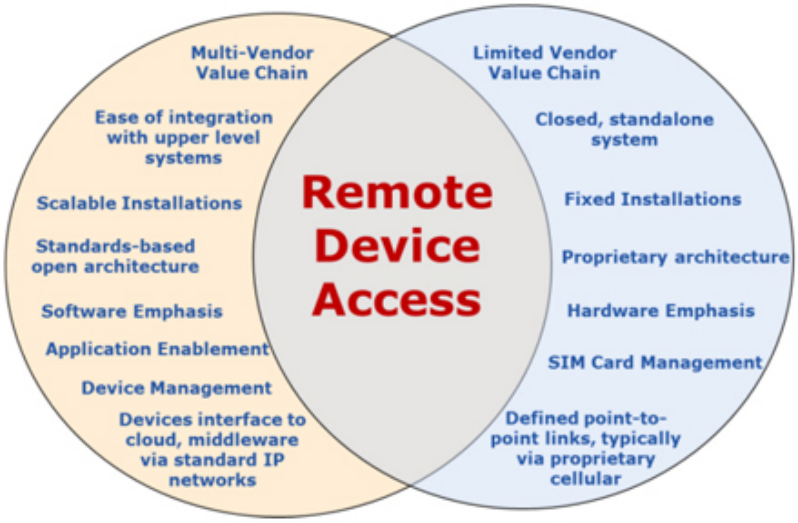
http://www.chemicalprocessing.com/articles/2014/understand-the-difference-between-iot-and-m2m/

Remote Access Device

Access to remote devices, machines, assets and other entities provides a primary value proposition for both M2M and IoT solutions. M2M applications are typically composed of hardware modules embedded in a machine at a customer site that communicate via proprietary cellular or wireline networks to a dedicated software application, often at the supplier's service operation. This capability allows the device/asset/machine supplier to reduce its service management costs through remote diagnostics, troubleshooting, updates, and other remote capabilities that decrease the need to deploy field service personnel.

In industrial IoT solutions, the "what, how and why" of remote device access involves much broader brushstrokes. The IoT accommodates not only the same devices/assets/machines as M2M applications, but also low-power and passive sensors as well as inexpensive devices that may not be able to justify a dedicated M2M hardware module. **IoT devices communicate via standards-based IP networks** and their data are incorporated into enterprise applications to enable not only improved service, but also operational improvement and new business models such as product-as-a-service.

The ability for applications throughout the enterprise to access device data to enable performance improvements, business innovation or other possibilities clearly distinguishes the potential of IoT versus that of M2M. This IoT-based data delivery is usually to a cloud, allowing access by any sanctioned enterprise application. In contrast, M2M typically employs direct point-to-point communication. The cloud-based architecture also makes IoT inherently more scalable, eliminating the need for incremental hard-wired connections and SIM card installations. This is one reason why **M2M is often referred to as "plumbing"**, while the IoT is seen as a universal enabler.



http://www.chemicalprocessing.com/articles/2014/understand-the-difference-between-iot-and-m2m/

Schedule of Project

We first received the project on the nineteenth of March and had about six weeks to complete it. We began by defining the opportunity and producing a reliable mission statement. Time was also spent on defining and researching the Internet of Things in order to ensure that our project ideas would meet the requirements AT&T set forth. Afterwards we chose the home category and proceeded to research different systems that would be intricate to the functioning of our appliances. Then, we came up with specifications for our different ideas which were applied to brainstorm concepts for the house. That step was followed by an evaluation on the ideas that resulted in choosing the final design which was then analyzed and improved after further research and development. Finally we used Solid works to prototype the house and then communicated our design in a presentation**.**

				26-Mar					2-Apr					9-Apr					16-Apr					23-Apr					30-Apr				
				M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
ID	Tasks	Owner(s)	% compl																														
1	**Analysis of Customer Needs**																																
2	Customer Requirements	Aakash	100%						X																								
3	Selecting City/Location	Sahil	100%						X																								
4	Background Information on City/Location	Shaun	100%						X																								
5	Surveys	Aakash	100%						X																								
6	Research of Existing Connected Homes	Sahil	100%						X												X												
7	Research of Present AT&T Technology	Shaun	100%						X																								
8	Needs Statements	Aakash	100%							X																							
9	Review	Sahil	100%								X																						
10	**Establish Target Specifications**		100%								X																						
11	Product Spec Metrics & Matrix	Aakash	100%								X																						
12	Set target specifications	Sahil	100%								X																						
13	**Benchmarking**		100%								X																						
14	a. Existing structures	Aakash	100%								X																						
15	b. Existing renewable energy sources	Sahil	100%								X																						
16	Develop a cost model	Shaun	100%								X																						
17	Review	Aakash	100%									X																					
18	**Concept Generation**		100%										X																				
19	Clarify the problem	Shaun	100%											X																			
20	Develop a functional diagram	Aakash	100%											X																			
21	**External search**	Sahil	100%											X																			
22	a. Literature Review	Shaun	100%												X																		
23	b. Patent Search	Aakash	100%												X																		
24	Brainstorming	Sahil	100%												X																		
25	Review	Shaun	100%													X																	
26	**Concept Selection (Iterate as required)**		100%															X															
27	**Concept screening**	Sahil	100%															X															
28	Prepare the selection matrix	Shaun	100%															X															
29	Rate the concepts	Aakash	100%																X														
30	Rank the concepts	Sahil	100%																X														
31	Combine and improve the concepts	Shaun	100%																X														
32	Select one or more concepts	Aakash	100%																	X													
33	Review	Sahil	100%																	X													
34	**Concept scoring**		**100%**																	X													
35	Prepare the selection matrix	Aakash	100%																		X												
36	Rate the concepts	Sahil	100%																		X												
37	Rank the concepts	Shaun	100%																		X												
38	Combine and improve the concepts	Aakash	100%																			X											
39	Select one or more concepts	Sahil	100%																				X										
40	Review	Shaun	100%																					X									
41	**Establish Final Specifications**		100%																					X									
42	Maintenance Requirements	Sahil	100%																					X									
43	Examination of Manufacturing Processes	Shaun	100%																					X									
44	Update final specifications	Aakash	100%																						X								
45	Review	Sahil	100%																							X							
46	**Design and build**		100%																							X							
47	Detail Design and Model	Aakash	100%																							X							
48	Creation of CAD Design	Sahil	100%																								X						
49	Review	Shaun	100%																								X						
50	**Report Reparation**		100%																								X						
51	Abstract	Sahil	100%																									X					
52	Introduction	Shaun	100%																									X					
53	Mission Statement	Aakash	100%																									X					
54	Customer Needs Analysis	Sahil																											X				
55	External Research	Shaun																											X				
56	Concept Generation	Aakash																											X				
57	Concept Selection	Sahil																												X			
58	Design	Shaun																													X		
59	Conclusions	Aakash																														X	
60	References	Sahil																															X
61	**Creation of Poster**	Shaun																															
62	**Presentation**																																
63	Prepare the presentation	Sahil																															X
64	Present	Everyone																															X
65	**Milestones**																																

AT&T Background Information

AT&T is a premier communications holding company and one of the most honored companies in the world.

Its subsidiaries and affiliates—AT&T operating companies—are the providers of AT&T services in the United States and internationally.

With a powerful array of network resources that includes the nation's fastest and most reliable 4G LTE network, AT&T is a leading provider of wireless, Wi-Fi, high speed Internet, voice and cloud based services.

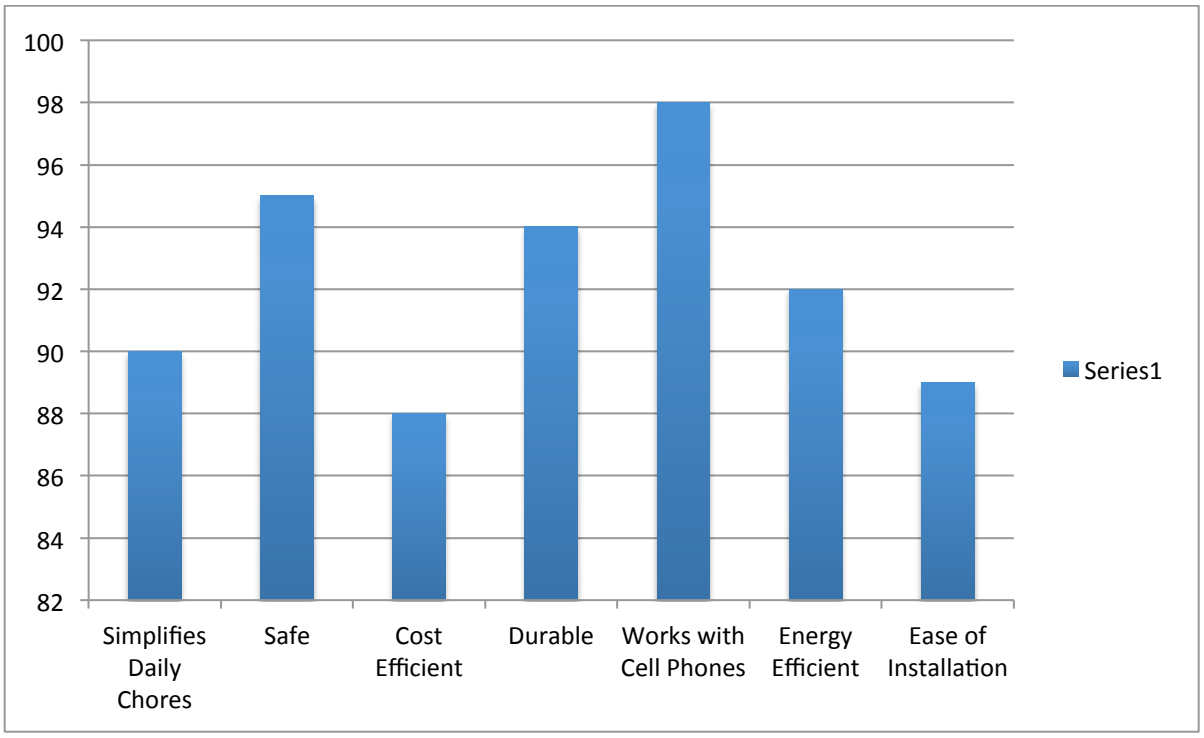
A leader in mobile Internet, AT&T also offers the best wireless coverage worldwide of any U.S. carrier, offering the most wireless phones that work in the most countries. It also offers advanced TV service with the AT&T U-verse® brand.

Rethink Possible®

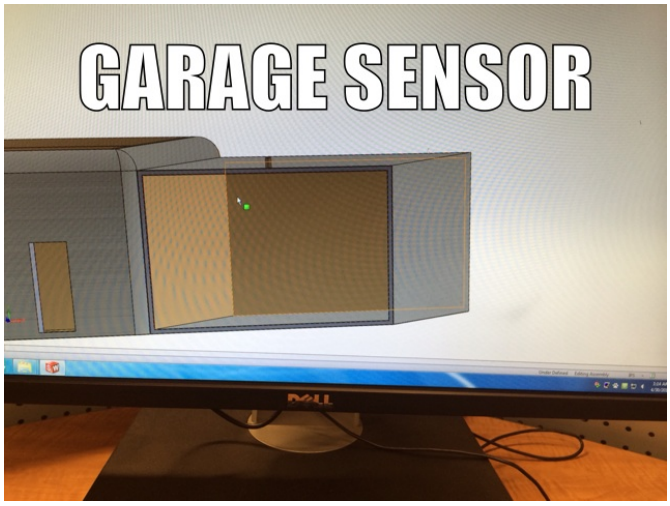
Customer Needs

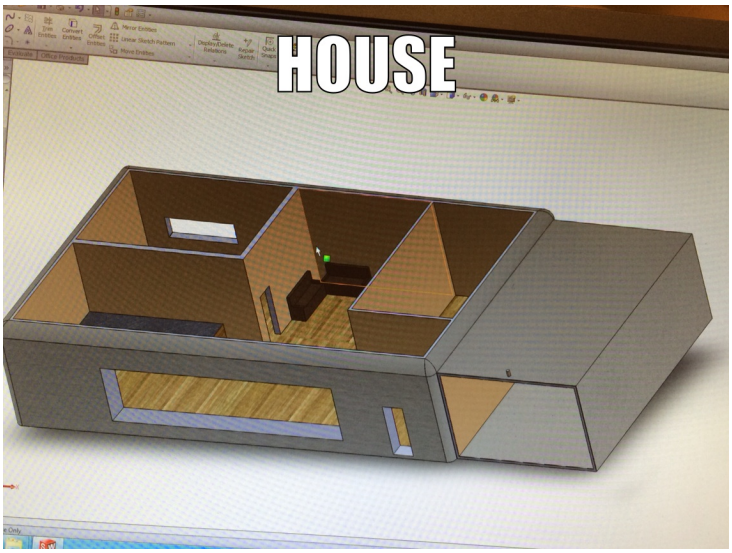
To further develop our idea of the amenities we decided to put in our house, we created a survey that was given out to willing individuals between the age of 20 and 50. The age range was chosen because that age group would most likely own their own home or apartment, and find the IoT useful. We found 50 willing participants that fell in this age range to provide some feedback. The survey that we developed can be seen in the figure. Since these products use the Internet of Things, its application was vital to determining customer needs.

The IoT is defined as a network of "things" that can be individually and uniquely identified and can share information as well as interact with other "things". The goal of the IoT is to allow people to easily access information about any object no matter where it is. When the IoT is applied to anything it should in-turn make things easier for people so it was determined that the major customer need was that this product would make the customers life more simplistic. In order to determine our customer needs we used the results of our survey. These results were used to rank aspects of new technology to see what customers, who were interested in new technology involving the IoT, wanted in a product using the IoT.



Solid Works Prototype





Economic Viability

While our project may outwardly seem like it's very pricey, it actually isn't. Not only would our products only require simple sensors and basic phone interactions with those sensors, but they would also pay off in the long run because they save a lot of time, which is an extremely important resource. Many people think of 'economic viability' only as how costly it is in terms of money, but another crucial factor and resource to consider in terms of time availability.

Needs Metric Matrix

NEEDS \ METRIC	Digital System	Mobile Application	Energy Star Appliances	Motion and body sensor	Innovative design making it look good	No outside exposure
Is comfortable	•	•				
Is safe				•		
Last Long			•			•
Helps avoid delays	•	•				
Is effecient			•			
Is architectually appealing					•	
Reduces cost in long run			•			

Conclusion

During the course of this project, we were able to create a digital home that uses futuristic ideas as well as energy efficient technology like solar energy sources in order to produce a life much better than that present right now.

We utilized all our ideas that we were able to brainstorm and create the best house possible when combining our ideas and creating an automated smart home.

We also implemented an automated garage that would open when it recognizes a certain chip present on the front of the car. The home also uses best appliances available in a great budget to make it possible for the average man to buy.

By implementing new energy efficient technology, we were able to create a comfortable home with all amenities discussed to make an automated future home for the average American, which will save time as well as give comfort to everyone.