

EDSGN 100 AT&T Design Project Final Design Report

Automated Cellular Emergency Service Notification System (ACES Notification System)

EDSGN Section 004

Team NJSB

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Executive Summary:

After being presented with the opportunity to better the condition of the users of mobile devices connected to the internet, Team NJSB began work to understand the stakeholders desires. After knowing the desired outcome for stakeholders, the team constructed specifications and brainstormed. From the brainstormed ideas, research commenced and decision matrices helped to produce what would become the working idea. The final idea and system is similar to that of OnStar but which utilizes the drivers phone to attempt to initiate contact to Emergency Services Dispatchers in the event of an airbag deploying incident. It also provides automatic optional rerouting for drivers with the system who are not involved with the accident. By rerouting some of the traffic, emergency crews will face fewer obstacles getting to the scene and administering aid.

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1.0 Introduction

AT&T, a multinational telecommunications and innovations company, proposed to the students of Engineering Design 100 the challenge of utilizing the Internet of Things and or Machine to Machine communication to take advantage of real-time connectivity and its role in society. As the cloud is constantly expanding and is becoming more and more integrated into everyday life, our connectivity to it is also increasing. Tasked with finding a way to benefit society using the internet of things or machine to machine communication, AT&T described the three areas of life where they want a new technology to be integrated. Digital life, sometimes referred to as having a “Connected home”, the “Connected Car,” and the concept of wearable technology more colloquially referred to as wearables.

The incredible popularity of smart phones and devices gives 58% of US adults (according to PEW Research) access to the internet, and any network that is connected to it. This connectivity takes advantage of the ease associated with these devices. Any owner of a smart phone or internet equipped device can remotely control the equipment they have on their networks. In a connected home one can set the thermostat lower to save energy from the other side of the nation, feed the dog, or turn on the sprinklers to keep the flowers beautiful. With a connected car the owner can remotely start the car from their phone to have it warmed up and ready in the winter, already with a de-iced windshield thanks to the defroster. Lastly,

wearables allow runners to track progress, monitor heart rate and give feedback on performance, or in the case of “Google Glass,” track every aspect of life and save it. This is merely the tip of the iceberg of what can be done through connectivity.

As a team, NJSB decided the aspect of a connected life to focus on was the connection between vehicle and operator. A connected car brings the driver and the car one step closer together. Potential systems derived from our brainstorming process include an app that the operator updates weekly with pertinent information such as miles driven, when an oil change occurs, when the tires were last rotated and more. The app would tell drivers when their car was due for regular maintenance, such as oil changes, tire rotation and balancing, etc. An alternative to this idea or one that would have worked in conjunction with it is an app that gathers driving data based on the driver of the vehicle and gives a weekly report of motor vehicle habits, including total distance traveled, approximated fuel consumption, and more. Traffic lights and intersections are a major area of concern when it comes to driver safety and thus it was an issue considered by the group. A system in cars and traffic lights that communicates speed and weather conditions which then computes intention to run a red light was considered in our brainstorming process. The final alternative to our selected design is an app that disables the texting and calling capabilities of the device when travelling over a predetermined speed, reducing distraction while driving and improving roadway safety.

With many areas to pull from in the realm of safety, accident response is where the project was focused. By considering the initial introduction by AT&T about the project, the survey responses accumulated, and the decision matrices produced, the brainstorming ideas were narrowed down. Deciding to focus on accident response times as well as giving the most accurate information possible, we came up with a system similar to that of OnStar but containing a few key differences. The ACES Notification System draws on the data collected by the airbag deployment system to give a measure of the severity of the accident when airbags are deployed. That information is sent to the drivers phone and the phone autodial the non-emergency number for the nearest police dispatch center. If the driver or another passenger is unable to make contact with the dispatcher, they are assumed to be incapacitated and dispatch will send emergency response vehicles to the site of the incident following their regulated procedure.

2.0 Project Background

This project is centered around the idea of “The Internet of Things” and “Machine to Machine” communication. Machine to Machine communication is simply the cooperation of individual machines, or other electronic devices. As our society continues to advance technologically, individual systems are starting to work together in more advanced ways in order to achieve larger goals. In this broader scope, information is transferred automatically from computer to computer, with each individual component having a unique identifier. “The Internet of Things” (IoT) emerged as the result of the convergence of wireless technology, microelectromechanical systems

(MEMS), as well as the internet. The IoT gives the possibility to improve a variety of things in our lives: everything from healthcare, to our homes, to the cars that we use and the roads that we drive on.

With the Internet of Things there is the potential to make a major improvement to everyday life. In order to get a better idea of how we would specifically enact our ACES Notification System idea we began with benchmarking. First off, we looked into a system that is already in place, similar to what we would like to do in our project. OnStar is a service which allows drivers to communicate directly with representatives in case of any sort of emergency, car problems, or if there is a need for directions. This system is equipped with both GPS, as well as a feature called “Advanced Automatic Collision Notification”. This feature, triggered by the deployment of an airbag and various other sensors, automatically alerts the call center that an accident has occurred. Along with alerting the call center, OnStar also sends out information about the cars condition, as well as the GPS location. This very similar to what we were thinking about doing for our project.

Further benchmarking showed that some apps are already available for purchase from the Google Play Store which would perform similar functions to those originally brainstormed by the team. aCar PRO is an application which tracks fuel economy, vehicle location, logs maintenance trips and more. SpeedView Pro is another app which boasts a GPS based speedometer more accurate than the gauge already built into the vehicle.

One concern that many people have when it comes to the Internet of Things is the security that they may be sacrificing by participating in this larger network. Once we were confronted with this concern we tried to find out the risk that many people are already accepting with the current level of the internet. Many apps that people use on a daily basis, such as Instagram and Angry Birds, use something called “geotagging”. Geotagging is when information such as location is tied to individual photos such as in the case of Instagram, or just tracked, which is done by the Angry Birds app. After looking into many of these applications, that a large number of people already use, we realized that they are already taking the type of risk that would be associated with our project design. We came to the conclusion that there would be no added risk than that which people are already willing to take.

The ACES Notification System, that was decided on as a result of the design process, has many different parts that play vital roles in the network of all of those involved. In order to maximize the efficiency and reliability of the system as a whole, we had to conduct research in order to gain a better understanding of all of the parts that will be incorporated into the system. Consequently, we researched the GPS system, airbag deployment, wireless communication, the emergency services dispatching process, sensors, as well as unique identifiers.

GPS

GPS (Global Positioning System) relies on the communication of satellites, the GPS device, and the software that supplies the maps of the surrounding area. In order to identify the location of

the inquiring individual, each GPS device must have access to at least 4 different satellites. Each GPS device is able to calculate the distance that it is from each satellite by measuring how long it takes for a signal to reach the device from a specified point in space with the use of the distance equation: $d=vt$. In order to get an accurate distance, each satellite has an atomic clock in it, that must be adjusted due to the speed that the satellite is moving at, and the lower gravity that it experiences. In the end, the atomic clocks on the satellites must be slowed down by 38 milliseconds a day. Three of these satellites are able to roughly approximate the location of the GPS, but since these devices do not have atomic clocks in them like the satellites, another satellite, called a “false satellite”, must be used. This “false satellite” supplies the GPS with an accurate time so that it is accurately able to calculate the change in time from when the signal was sent from the satellite, until when it was received.

Airbag Deployment

Airbag deployment systems rely on MEMs of varying kinds, most importantly solid state accelerometers, to gather information about the impact the vehicle is experiencing. Depending on the nature of the impact as determined by the sensors placed around the vehicle, all airbags may not necessarily deploy. The window allowed by the system to determine whether or not each airbag is deployed is only .05 seconds from the detection of impact. The United States standard for frontal impact airbag deployment is a 14 mph head on collision with rigid barrier. However, because not all impacts in the real world will be frontal with a barrier, the sensors are required to determine much more information. Curtain airbags are only deployed in the instance of a jarring side impact and shattering of window glass. The ongoing development of Variable Force Deployment Airbags will allow for a system such as the one proposed to gather and disperse more information relevant to the accident than current systems and the two could be simultaneously developed.

Wireless Communication

Wireless communication in its simplest form is the relaying of electrical information from one point to another without the use of wires. For our ideas, we would be making use of satellite communication, bluetooth technology, as well as cell phone signals. Satellite communication makes use of microwave radio relay in order to communicate to a variety of vehicles and individuals. For alternate systems, radio waves are the most common form of information transmission. At 5GHz more data is able to be sent than the previously more common 2.4GHz and the data transfer interference is reduced. Currently, the most common form of wireless data transfer is 802.11n which is the standard for wireless networking which employs multiple antennae.

Emergency Services Dispatching Process

Public safety dispatchers are responsible for answering phone calls made to emergency services (police and fire departments) as well as to the 9-1-1 Emergency Phone System.

Dispatchers collect vital information from callers and provide pre-arrival medical instructions. The dispatcher then uses radio systems to contact and dispatch the necessary first responder services based on the situation and department policy. After emergency services are notified, additional resources like accident cleanup and towing companies are notified as needed. Detailed records are kept, including the nature of the incident, the name of the caller, and the caller's location.

Sensors (MEMS)

There are a wide variety of sensors in which we have the capability of working with. However, there were a few which we decided would be very useful to understand, such as accelerometers, speed sensors, proximity sensors, as well as voltmeter. Accelerometers measure the displacement of a damped spring or the change in the capacitance in most cases with MEMS. Since the spring constant is known, and the displacement of the spring can be measured as can the change in capacitance, the acceleration of the system can also be determined. A sensor to determine speed can work by measuring the electric potential produced as a magnet, which is attached to the wheel axle moves within an electric field. A proximity sensor works by measuring the time that it takes for a signal to travel from the emission point, until it reaches the receiver. Once the time is known along with the speed that the signal travels at, the distance can be determined. A voltmeter works by measuring the amount of rotational force that is applied to a galvanometer, compressing a spring. The angular rotation is proportional to the current applied, and as a result of calculating the amount of rotation of the spring, the voltage can be determined.

3.0 Project Objectives

For our concepts, we wanted to ensure that our designs will be incorporated into as many American lives as we could reach. We live in a society where nearly six out of ten Americans own a smartphone, which is why our project will bridge the gap between one's car and specific emergency systems.

From April 4th to April 9th 2014, we both constructed and ran a survey for our stakeholders to analyze further what is wanted most out of our car-to-phone communication application. On the survey, we gathered information regarding basic questions such as gender, age, whether or not they owned a smartphone, and whether or not they would benefit from having their phones be in constant connection with their vehicles. We also asked our stakeholders which ideas they thought were most important out of any car-to-phone communication, and asked them for other ideas or ways to improve the project objective. Approximately 85% of stakeholders that participated in our survey were from ages 16 to 24, and approximated 80% currently own a smartphone. Almost all of our stakeholders concurrently agree that the worst attribute about their vehicle was related to a performance issue, or other physical aspects of the car. Many of the stakeholders agreed on having a system to automatically send emergency dispatch, depending on the severity of the accident, that would

be installed into their vehicle and through their phone. They also heavily agreed on implementing any applications to help them further take care of their vehicles.

We have constructed several specifications that our concepts will meet to ensure a successful and useful project. We identified a number of stakeholders in which we geared our initial specifications towards:

- AT&T
- Car Manufacturers
- Users

After researching AT&T, we took into account that AT&T wants a product that is profitable, takes advantage of real time connectivity, is easily usable, includes vehicle alerts, and benefits the lives of the users. Car manufacturers would simply like to increase the sellability of the vehicles which they create. Users, as questioned in our survey, want a product that is user-friendly, reliable, increases safety, and increases reliability.

After identifying our stakeholders, we then created various specifications regarding each entity:

- AT&T
 - Connectivity
 - Social Acceptability
 - Increases Safety
 - Low Cost
- Car Manufacturers
 - Low Cost of Integration
 - Social Acceptability
 - Increases Safety
 - Low Cost
- Users
 - Ease of Use
 - Increases Safety
 - Low Cost

Applications installed on the smartphone itself will require minimal maintenance; updating the actual application itself will be the only thing users of the application will be required to do. We desire our concepts to be user-friendly as well, and aid in the convenience of drivers who do all different types of driving on our road systems. We wanted to make sure that everyone would be okay with their product being fully installed into a vehicle that one operates on a daily basis, and that it would not make them feel any less comfortable to drive their vehicle. We also wanted to make sure that actually integrating these systems into cars and road systems would not be difficult or cost-inefficient. Our overall goal for this project is to ensure efficiency in not only production but also customer enjoyment, and cost efficiency.

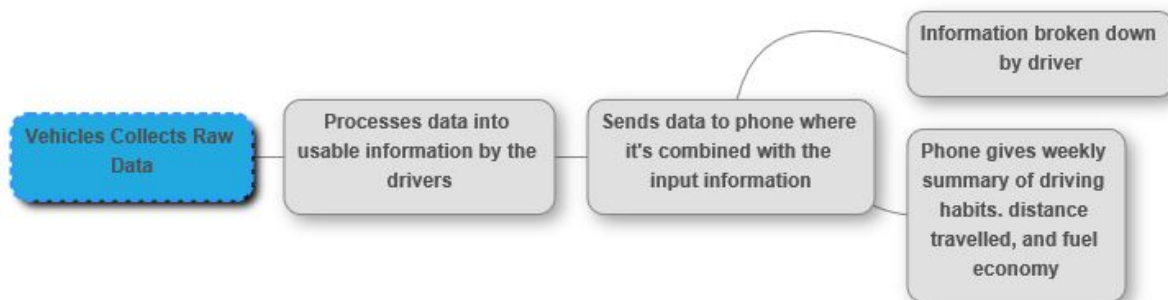
4.0 Conceptual Designs

Through the brainstorming process we generated a number of ideas. Such products consisted of a weekly summary app, a maintenance app, a traffic light alert system, a cell phone disabling system, as well as a rerouting accident system.

4.1 Descriptions

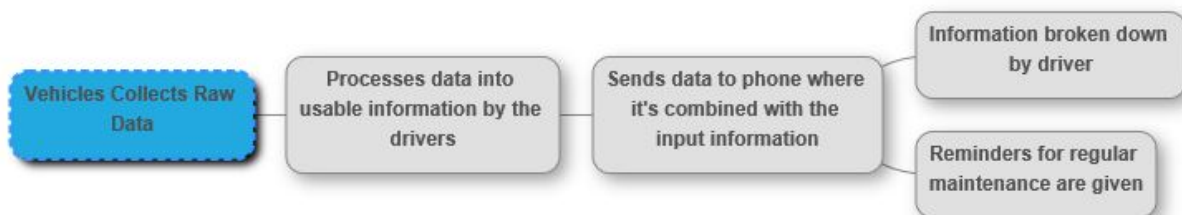
Weekly Summary App

During the brainstorming process our group identified the need to keep track of your personal driving habits, as well as those of other individuals that use a certain vehicle. This app would notify the users of the app of the number of miles driven, approximate gas mileage, total usage, along with many other aspects. The aim of this app is to allow car owners to better manage how their vehicle is being used, and allow the user to take appropriate actions in order to maximize the efficiency associated with their car. This idea requires the users to own a smartphone, as well as have the appropriate sensors incorporated into their vehicle.



Maintenance Reminder App

Similar to the “Weekly Summary App”, this idea was intended to assist an owner in the upkeep of their vehicle. This app would specifically notify the users of a vehicle of upcoming maintenance that is required for the automobile. This would include reminders to change the oil, replace the battery, or inflate the tires. We hope that this app will increase efficiency and reliability of the vehicle.



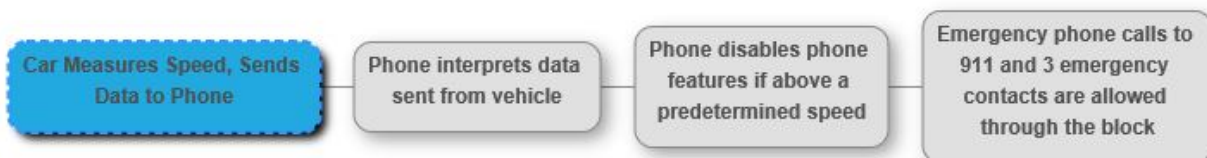
Traffic Light Alert System

During the brainstorming process we identified that there is potential to improve safety when it comes to traffic lights. Our idea was to incorporate sensors in cars that would measure the speed of a vehicle which is approaching a traffic light. By incorporating sensors that can measure the distance between an approaching vehicle and a traffic light, calculating the current vehicle speed, and taking into consideration the stopping distance needed for the particular vehicle involved, a program will be able to determine if the driver will be able to stop before the traffic light. If it was determined that the vehicle would not be able to stop, then the other drivers on the perpendicular roads would be warned via their cell phones, in addition to the traffic light being switched to red both ways. A drawback of this system is that it may encourage irresponsible drivers to attempt to run red lights.



Cellphone Disabling System

One of our original ideas was to construct an application to be installed on smartphones that limits the usage of the phone while driving. This device will use information relayed from the vehicle's accelerometer to lock texting on a phone while the vehicle is traveling over a specific speed. This will ensure the safety of others driving on the road and will help prevent distractions while driving. The application will not lock the entire smartphone, however. It will only selectively lock applications and features that will cause hazards while driving. Drivers will still be able to access certain emergency contacts, and will be able to access vital functions of the phone while driving.

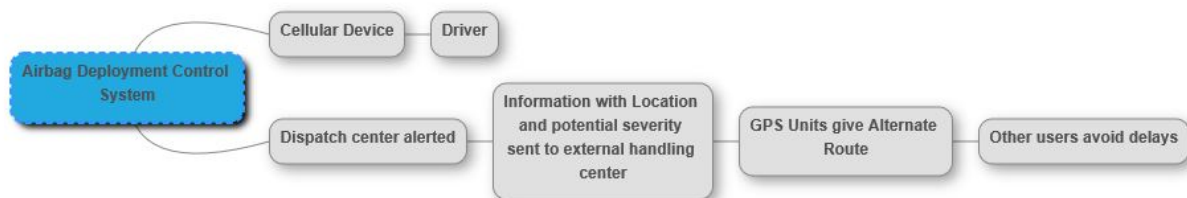


Rerouting Accident System (ACES Notification System)

The incorporation of ACES Notification Systems into the cars of American citizens will dramatically improve response time of emergency vehicles, and will use proper re-routing technology to avoid blocking any ongoing or incoming emergency dispatches. ACES will be able

to take important information from a vehicle's sensors, accelerometers, tire pressures, and other components and relay the information to an interconnected system through an access point (either a smartphone with the proper applications installed, or specific receptors designed for dispatch vehicles). This information will be key for calculating accident severity, traffic flow, and several other attributes that will improve the safety of the roads in the country.

By using positioning systems and internet connectivity ability on a smartphone, we are successfully avoiding having to majorly alter the actual systems in a modern vehicle. In a situation where a vehicle on the road is in any accident, information from the sensors and other components of a car will be relayed to one's smartphone and will contact specific emergency dispatches accordingly. By using GPS-based systems, ACES Notification System will also be able to re-route vehicles based on local accidents that are relayed into the communication systems. In this aspect, we will improve traffic flow and overall safety by making sure that citizens driving on heavily populated roads are alerted and properly re-routed based on an always running, interconnected system.



4.2 Research & Analysis

After spending a lot of time discussing different advantages and disadvantages for each innovation, we had decided to go forth and further analyze the benefits for three, and decided to discontinue research with the other two. Through further analysis, we found it that implementing a phone locking device and implementing an automated traffic light system were disadvantageous and would be to socially unfeasible.

After our initial survey we found it clear that people would not want to implement a phone-locking device into their vehicular systems. They felt as if they were in less control of their car, and felt like their car was limiting what a driver could do in a vehicle. Most would rather have a system implemented that could help a driver more than limit him. This system would also not increase driver convenience in any way, which was one of this project's important specifics.

Also, doing more research on our Traffic Light Alert System, we saw that there would be little to no ease in integrating these systems. Not only would there be many major roads that would have to be shut down to install these systems, but the process of doing also is extremely cost-inefficient. We wanted to insure that this project would satisfy as many of our specifications as possible, and unfortunately, although an innovative thought, was not a feasible solution to improve our roads.

Although we did continue researching both having an application to show a weekly summary of driving habits and one to notify of any maintenance required on the vehicle, both had downfalls as well. We did not find that creating a weekly summary app or a maintenance app will help stop driver distraction, or prevent accidents on the road. And although a small amount of stakeholders enjoyed the concepts, most were indifferent towards them.

When we analyzed our ACES Notification System to implement, we found it to be extremely advantageous over many of the other concepts. Integration and implementation of a system like this at a manufacturing level would not be difficult, nor developing the application to communicate with the vehicle and emergency dispatches. We also discovered in the survey that many people would enjoy having a vehicle to notify the driver when there is an accident in front of them on their given route. It would also increase safety with accidents that happen on more major roads.

4.3 Concept Selection

Concept Variants					
Selection Criteria	Accident Rerouting	Maintenance App	Phone Locking	Weekly Summary	Traffic Light
Ease of Integration	+	+	+	+	-
Ease of Maintenance	+	+	+	+	-
Social Acceptance	+	0	-	0	0
Increase in Driver Convenience	0	0	-	0	0
Increase in Safety	+	-	+	0	+
Cost of Integration	0	+	+	+	-
Pluses	4	3	4	3	1
Sames	2	2	0	3	2
Minuses	0	1	2	0	3
Net	4	2	2	3	-2
Rank	1	3	4	2	5
Continue?	yes	yes	no	yes	no

Pairwise Comparisons								
	Increase in Safety	Ease of Integration	Cost of Integration	Ease of Maintenance	Social Acceptance	Increase in Driver Convenience	Row Totals	Row total/total
Increase in Safety	1.00	2.00	3.00	5.00	6.00	8.00	25.00	0.43
Ease of Integration	0.50	1.00	1.50	2.50	2.94	3.84	12.28	0.21
Cost of Integration	0.33	0.67	1.00	1.65	1.94	2.54	8.13	0.14
Ease of Maintenance	0.20	0.40	0.61	1.00	1.18	1.54	4.93	0.09
Social Acceptance	0.17	0.34	0.51	0.85	1.00	1.31	4.18	0.07
Increase in Driver Convenience	0.13	0.26	0.39	0.65	0.76	1.00	3.19	0.06
Total:							57.71	

Concept Selection

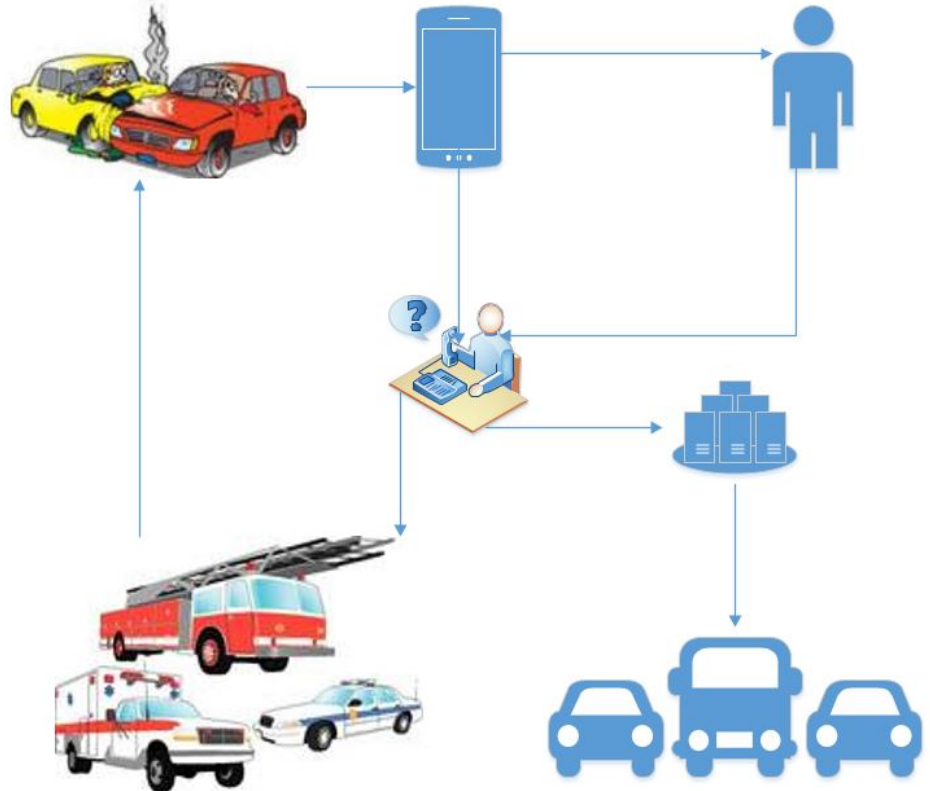
Selection Criteria	Weight	Accident Rerouting		Maintenance App		Weekly Summary	
		Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Increase in Safety	0.430	3	1.29	1	0.43	0	0
Ease of Integration	0.210	3	0.63	5	1.05	5	1.05
Cost of Integration	0.140	2	0.28	5	0.7	5	0.7
Ease of Maintenance	0.090	5	0.45	5	0.45	5	0.45
Social Acceptance	0.070	5	0.35	3	0.21	1	0.07
Increase in Driver Convenience	0.060	5	0.3	2	0.12	3	0.18
Total Score			3.3		2.96		2.45
Rank			1		2		3
Continue?			yes		no		no

5.0 Detailed Design

The ACES Notification System will analyze the data collected by the Airbag Deployment System (ADS) to determine a relative severity of the accident. This is done separately but simultaneously while the ADS itself deploys the airbags if necessary. If airbags are deployed, ACES prompts the driver via their mobile device to determine if they are functioning or incapacitated. If the operator responds then they are given full control over the incident but is prompted to contact the nearest emergency services dispatch center to report the incident and ensure help is sent as soon as possible. The connection between car and driver is maintained at all times for reliability of the service.

The phone to dispatch connection will be possible by utilizing the in place cellular communication tower network AT&T already operates using. With a databank of dispatch centers across the country being stored by AT&T, the phone's GPS location will determine which center to connect the driver to. Once the dispatch center is notified, if the incident is determined to be severe enough to warrant sending emergency services right away, then the dispatcher will alert the AT&T traffic handling system which notifies all drivers who have ACES or the ACES app within a 15 mi. radius of the incident.

Determination of the 15 miles radius is handled via the phone's GPS location at the time it is informed of the incident by the vehicle. Continuing use of existing integrated technology, the phone relays its position to the dispatch center during call or data dump, whichever happens first, and that information is sent to the AT&T hub. From there, AT&T's hub uses the cell towers near the accident to determine which users may be within a 15 mile radius, and those phones are then pinged from the hub, sending their GPS coordinates back. If they are within 15 miles of the incident then they receive a notification for the driver.



Once alerted to the incident, any driver who is on a path which intercepts the scene of the incident will be given the option to instead take an alternate route and avoid any backups and stoppages that were

caused by it. The route is calculated by their phone or integrated GPS navigation system. While notifying AT&T, the dispatch is also sending necessary responders to the scene. By giving drivers take alternate routes, to the one one which the incident occurred, emergency services are able to get to the area more quickly.

Accelerometers:

The accelerometers that would enable this system to function properly will need to have certain abilities as specified below:

- Variable output full scale ranges of 35g, 50g, and 70g
- 1.3 mA power consumption
- Complete sensor self test system

Phone to Car Connection:

The connection from the phone to car will be managed by a system which utilizes technology already implemented into smartphones and many modern vehicles, Bluetooth connectivity. The system we propose will:

- Have a range of ten (10) meters
- Hop between 79 frequencies at intervals of 1 MHz
- Use no more than 2.5mW of power when in operation
- Operate between 2.4 GHz and 2.485 GHz

6.0 Conclusions

We were given the opportunity by AT&T to create a system that would take advantage of the “Internet of Things” and machine to machine communication in order to better the lives of its users. After brainstorming a variety of ideas, our group eventually determined that the ACES Notification System was the best solution for the task that we were given.

Our project has been a success in every regard, as it effectively addresses the opportunity that we were given, satisfies the needs of the stakeholders, meets all of the specification that were made, and is an overall plausible solution. We stated in the beginning that we were given this opportunity by AT&T, and as a result the objectives that we were aiming to meet all applied to them. These included:

- Connectivity
- Social Acceptability
- Increases Safety
- Low Cost

Connectivity

In terms of “connectivity”, our solution has taken advantage of the ideas of the “Internet of Things” and machine to machine communication, which AT&T specifically mentioned. It has done that through the use of bluetooth technology, which links the car to the individual’s phone, GPS technology, automatic cellular communication of the phone to the emergency services/dispatcher (and vice versa), and the communication that already takes place within the emergency services themselves. Simply by connecting one’s phone to this system in place, an individual can take advantage of all that this system’s communication has to offer.

Social Acceptability

Additionally, our system is incredibly socially acceptable. By the very beginning, our group has made an effort to incorporate our design solution into systems that are already in place, in order to achieve this “acceptability” that we were striving for. First off, we made use of the user’s phone. This means that a major component of our network is a device that the users already use on a daily basis; the components of the system that the users see is already completely “normal” to them. Everybody is already very comfortable with how to navigate their phone, and use GPS. This greatly improves the “Social Acceptability” that we were attempting to achieve. Further, the ACES system also uses the dispatcher/emergency services network that is already in place. By doing this, we making use of the already widely-used network that is already in place, and not making anybody make any major systems. We believe that by fitting

our system in with networks that are already in place, we not only avoid unnecessary work, but we also make our product extremely socially acceptable.

Safety

AT&T has a great interest in increasing the safety of those who use the systems that we created, and we have done just that. The ACES Notification System quickly gives those in an accident the immediate assistance that they need, expedites that process by lessening the traffic flow in the area for the emergency service responders, as well as removes other drivers from the potentially dangerous area. The safety of the users also increases with the reliability that ACES provides. By using the airbag deployment to determine when an accident occurs, a reliable determination can be made, without false alarms or failures. The aim of project was to increase the safety of the users, and that was achieved through this system.

Low Cost

Additionally, AT&T had an interest in keeping the cost of this project as low as possible, in order to make the company the largest profit. The ACES Notification System insures that this objective will be met. As stated previously, this solution is a network that works off of systems that are already in place, such as the airbags, cell phone, GPS system, and dispatcher/emergency services network. Other than the application for the user's phone (which they will purchase), and a database to store the collected information, no other devices or systems will have to be created. By taking advantage of such devices and networks that are already established, not only does creating the system become easier, but the cost is drastically lowered. This means that by creating the ACES system, AT&T will have to invest minimal amount of time and money into setting up, and running the network.

The ACES Notification System has proven to be very successful for a number of reasons. It effectively takes advantage of the "Internet of Things" and machine to machine communication concepts that were presented to us, and has gone much further. With the ACES Notification System, users will have the peace of mind knowing that they can rely on the ACES system to insure their safety. Other drivers will avoid the hassle of having to deal with traffic, as they will be warned of the accident and rerouted around it if it could affect them. Emergency services will be able to respond to accidents quicker, and will arrive at the scene with less traffic holding them back. Overall, this system will benefit society as a whole, while keeping the costs low for AT&T.

AT&T has many reasons to support the ACES system. With all of the benefits that this network will bring users, and society as a whole, AT&T will certainly be a much more appealing service provider. With this added appeal comes more customers, and larger profit margins. There is absolutely no reason as to why this system cannot be created. AT&T, and our nation as a whole, will truly benefit once the ACES Notification System is put into place.

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