

SNAPP

WPI SNAP Services Assistive Application

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Abstract

SNAP is a Student Government Association funded transportation service offered to WPI community members at night. As it is a popular campus service it experiences heavy usage which slows its service times. For students awaiting service their safety is sacrificed when they must wait long periods of time unsure if and when their request will be fulfilled. The goal of the project is to create an application, SNAPP, to enhance SNAP services and increase student safety on campus through increased awareness and communication with SNAP services. The results of this project demonstrated a strong desire for this application from students; with this also came suggestions for SNAPP. SNAPP is currently still in the process of being developed and will be continued by an MQP team for the academic year of 2018-2019.

Acknowledgements

Special thanks to the WPI Police Department and Lieutenant Karen Bueno, the SNAP Service Liaison, who has helped our team throughout the three terms of our project by providing us with the procedures, concerns, and areas of improvement desired by her and her SNAP team. Having them as our customers allowed us to develop and structure the specifications required to create the dispatch portion of the application and perfect it to their needs.

Much appreciation to Professor Ciaraldi for advising our IQP project. When we first began we were a team that lost its advisor to differences in vision and a countless amount of effort placed into the development of this application. Professor Ciaraldi came as a saviour to our team with the ideas and insight necessary to propel our research and development leagues beyond what we would have otherwise accomplished.

And thank you to the WebTech Group especially Taylor Stephen, Derek Ferreher, and all the members working on the SNAPP who devoted numerous hours to making this application possible. Their experience delivered tremendous support and feedback ensuring that development was fast and streamlined. Without them the SNAPP would not be where it is today in development and perhaps more importantly would not even exist.

We would like to offer special recognition to Jeffrey Snider for guiding us in the development of a Terms of Use and Privacy Policy contract to provide with the SNAPP application. Having this documentation serves to protect us, our developers and WPI from potential issues from the misuse and misrepresentation of the application as an entity separate from the SNAP transportation services at WPI.

Executive Summary

To ensure the safety of students that must commute to school every day many universities and colleges in the United States have taken many different methods to modernize and simplify the transportation services offered to their students. One such method is through van transportation that operate on user requests as opposed to fixed routes, oftentimes paired with an application that allows online request creation aside from the standard phone call.

Using our experience with WPI's Student Night Assistance Patrol (SNAP) transportation services and feedback from WPI students, we determined that common issues SNAP riders face when receiving transportation were:

- the unpredictability of the service due to largely varying wait times from 5 minutes to multiple hours;
- not knowing whether a requested ride was missed or still en route (in instances where users are not waiting outside due to circumstances such as inclement weather); and
- the inability to enter a van due to current luggage and/or passengers consuming space.

These problems generate serious safety concerns for students who wish to utilize SNAP transportation such as students who have stated in reports moments where they waited an hour for a SNAP van to arrive at their location. Situations such as these yield the potential of students being harmed by other parties or inclement weather by waiting for a SNAP van or deciding to walk to their destination at night. With WPI Police reports stating events of students being assaulted on walks home in the evening, it raises the question if these students had considered utilizing SNAP before walking and whether they decided not to due to its infamous waiting times. Because of this, we envisioned the development of an application platform for SNAP in which users could easily make transportation requests, cancel them if desired, and offer them suggestions for alternate modes of transportation if they do indeed cancel their requests.

State of the Art

Many universities contract external firms to provide transportation to its students. In particular, our selected study group of UMass Dartmouth, Duke University, Pennsylvania State University, and Harvard University all share a similarity to WPI in that they provide their own transportation services. Their difference lies in that they contract an external dispatch service provider, where in all instances, a map is provided of the school's service area or a map of their shuttle routes.

How Harvard (and similarly other universities such as Pennsylvania State) handles transportation requests is by having users enter into either the app or mobile website:

1. The location at which they wish to be picked up,
2. The desired destination; and
3. The number of passengers in their party.

We believe this is a proper procedure students must follow in making transportation requests. In fact one issue mentioned previously was that riders occasionally were unable to enter a SNAP van as there were more passengers than were expected. By explicitly inquiring the number of passengers associated with a given request SNAP operators can make proper van assignments and optimize driver routes. One final detail to know is that each university's service provided a terms of use and privacy policy agreement that users had to abide by when utilizing campus transportation. Considering this we decided legal documentation outlining proper expected usage by riders and service operators and how sensitive user information is handled must be created.

Drawback to Transportation Contract Services

The main drawback of using external applications is the cost of utilizing them. To implement the TransLoc system (the dispatch system used by Harvard University) for example, universities must create a direct contract with the firm in order to obtain the application. According to Lieutenant Karen Bueno the SNAP service supervisor, the current cost of maintaining four SNAP vans is \$25,000 a year. As SNAP is primarily funded by the WPI Police Department and the Student Government Association, this budget is difficult to expand; the majority of funding is already used to pay work-study staff and maintain two to four service vehicles, something the previously mentioned services do not provide. While WPI could contract one of these services for SNAP, doing so would take away SNAP employee positions available for students by consuming the budget available to pay them or replacing them entirely. SNAP is student run and funded and offers individuals the opportunity for work experience, social experience, and connection building. Simply contracting an external transportation service provider is not a desired option for the SNAP team and the WPI community.

Final Product Requirements

After completing our observations of dispatch procedures, meeting with Lieutenant Bueno to discover her concerns of the service as liaison, and considering what other universities do we generated the following list of product requirements for a rider and dispatch application of the SNAPP platform:

Dispatch Interface

- Easy to use desktop application.
- Replicate the current paper procedures
- Dispatch must have the final say on whether to accept or reject a request
 - Unless the request meets requirements for obvious rejection.
- Organize incoming requests and accepted requests separately.
- Application must be able to keep track of these statistics per day/week/month/year:
 - Number of cancellations
 - Number of no-shows
 - Total number of completed rides
- Be able to store historical service data in a Archive.
- Ability to change van assignments until a request has been completed.
- Ability to manually handle requests that may be received through a phone call.

Rider Interface

- Easy to use application.
- Include a student login/registration.
- Allow riders to submit ride request in-app.
 - Required Information:
 - Number of Passengers
 - Pick-up Location
 - Drop-off Location
 - Optional:
 - Accommodations

Product Design and Specifications

To begin the design process, we first constructed use case documentation to reflect the customer requirements and outline actions and situations that must be designed for. Following this, our team designed all user interfaces for both the Dispatch Interface and Rider Interface. These were then discussed and edited accordingly with the WebTech Group and members of SGA.

In the Rider Interface, a user may perform a ride request simply by entering their location, their desired destination, the number of passengers in their party, and any additional accommodations they must make SNAP dispatchers aware of. Finally they may select the “submit” key to send their request to SNAP. The Dispatch Interface of SNAPP will receive these requests and serve to replicate all current ride handling procedures. This would allow dispatchers to process requests as usual.

For more information on the SNAPP rider interface and further design implementations and functionalities please reference chapter 3 section 5 of this report where they are further discussed.

Findings

To determine the desirability and potential effect of the application we conducted two surveys: one for the employees of SNAP and another for the riders utilizing the service. Both surveys had brief introductions explaining the corresponding interfaces and our intentions of the project along with closed-ended and open-ended questions. Many responses gave birth to new ideas for features to be added as well as reasonable concerns. In addition, the student survey confirmed that having an application for this service is a desire amongst most students at WPI.

Final Recommendations

Based on our findings from both the rider and SNAP employee surveys, we have produced the following list of recommendations. This list provides an outline for the steps to be taken by the MQP team for the academic year of 2018-2019.

We recommend creating a downloadable application for SNAPP for both Apple and Android devices. Within our findings, we came to the conclusion that a phone application is of high priority. However, finding additional funding for the service will be necessary prior to approaching this task in order to fund software licensing.

We recommend utilizing the Product and Technical Specification documents specified in appendices H and G when developing this platform. Every detail about the SNAPP platform has been written out and explained within these documents, this involves design specifications for the first phase, future additions, and research and notes useful for developmental stages. All specifications have been confirmed by Lt. Bueno and is to be what is expected from this platform.

We recommend consulting with the WebTech Group as well as the WPI Police Department prior to working on this project. These organizations have been a large part of the developmental process thus far. The WebTech Group can assist in guiding through all technical specifications, whereas the Police Department will be a main component and have final say on everything regarding this platform.

Authorship

Marysol Zamaniego, Shannon McCormack, and Juan Caraballo all contributed to the research and writing of this report. Below is a layout of how the report was split up amongst group members.

Marysol wrote the Acknowledgements, half of the Background, and parts within the Executive Summary, Methodology and Findings. Shannon was responsible for the Abstract, Introduction, half of the Conclusions, as well as some parts within the Executive Summary, Methodology, and Findings. Juan contributed by writing the majority of the Executive Summary and parts of the Conclusions, Background and Findings, in addition to a large portion of the Methodology.

In addition to the individual sections each member was tasked to write, all members were also responsible for editing, helping with transitions, and expanding for the entirety of this report. No section went untouched by any member to create a uniform flow throughout this report, all sections were discussed and agreed upon as a team, much like all decisions made throughout the duration of this project. This is exemplified by the decision that the team would follow a “Flat” team structure where no leader or coordinator is designated.

Here since no members are designated as leads or coordinators creativity is more encouraged within the group which we felt important to the project as it involved the design and development of a whole application platform. Additionally, there is equal participation within the group as all members are tasked with the same jobs (although each member was assigned to drafting a section, all others were dedicated to reviewing and editing those drafts). Effectively our work and project creates a uniformity of ideas and decisions contributing to a singular identity of our group.

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1 Introduction

As frequent SNAP (Student Night Assistance Patrol) users, we considered the performance issues of SNAP from a user standpoint. One such issue is the wide range of time it takes for SNAP to service a ride request. From the moment transportation is requested to the time an individual is picked up, the time elapsed can range from five minutes to as long as three hours. A range as large as this can lead to frustration, especially when the rider must wait outside to be on the lookout for a van. In cases such as these, a rider will often decide to walk instead of continuing to wait blindly. More often than not, this is done without alerting the service of their cancellation. This creates a “snowball effect” increasing the wait times for other students, and potentially putting other student’s safety at risk as well.

Our objective is to develop a means of increasing safety for students utilizing SNAP transportation services in the evening with SNAPP, the WPI SNAP Service assistant. This application would aim to relieve SNAP service operators of these concurrent complications that come with the request load of students, while increasing student safety through better ways to communicate service status. With WPI being a tech school, it goes without saying that modernizing one of the most popular programs used is essential to improving student safety and the quality of our college. This report will explain the research and networking accomplished by our team to jump start this platform for SNAP services at WPI. In addition, it will discuss all design mockups made for the application, the current progress of development, and a layout of future steps to be taken.

2 Background

The Security Night Access Patrol (SNAP) started in 1981 to assist the WPI Police Department with ensuring the security of the WPI campus. When this service began, it provided a monitoring system comprised of a group of students. In 1990, it evolved into a transportation service for students on and off campus where students involved in SNAP would escort other fellow students to their destination at night. Currently, they use vans to transport students, giving students a free and safe method of transportation at night. The process requires three components: student dispatch, co-pilot, and a driver. Dispatch receives requests via telephone, writes the request information in a log book¹, and chooses and assigns a van based on location and time of request. This is communicated through radio to the co-pilot, sitting in the passenger seat of the van. He/she will then write down the request information in the van log book and inform the driver.

Over the years, this service has been used by thousands of students in need of safer transportation at night. This need comes from the sad truth about the city that surrounds the WPI campus, that has put numerous students in dangerous situations upon traveling at night.

2.1 The Importance of SNAP

The usage of the SNAP services is essential to ensure the safety of the student body due to the dangers in the surrounding neighborhoods of the WPI campus. Worcester is not particularly known for its safety; with above average crime rates, traveling at night becomes a large concern for students of WPI. SNAP allows students to arrive at their destination without being put in a potentially risky situation, especially during late hours.

¹ See Appendix A to view dispatch logbook format.

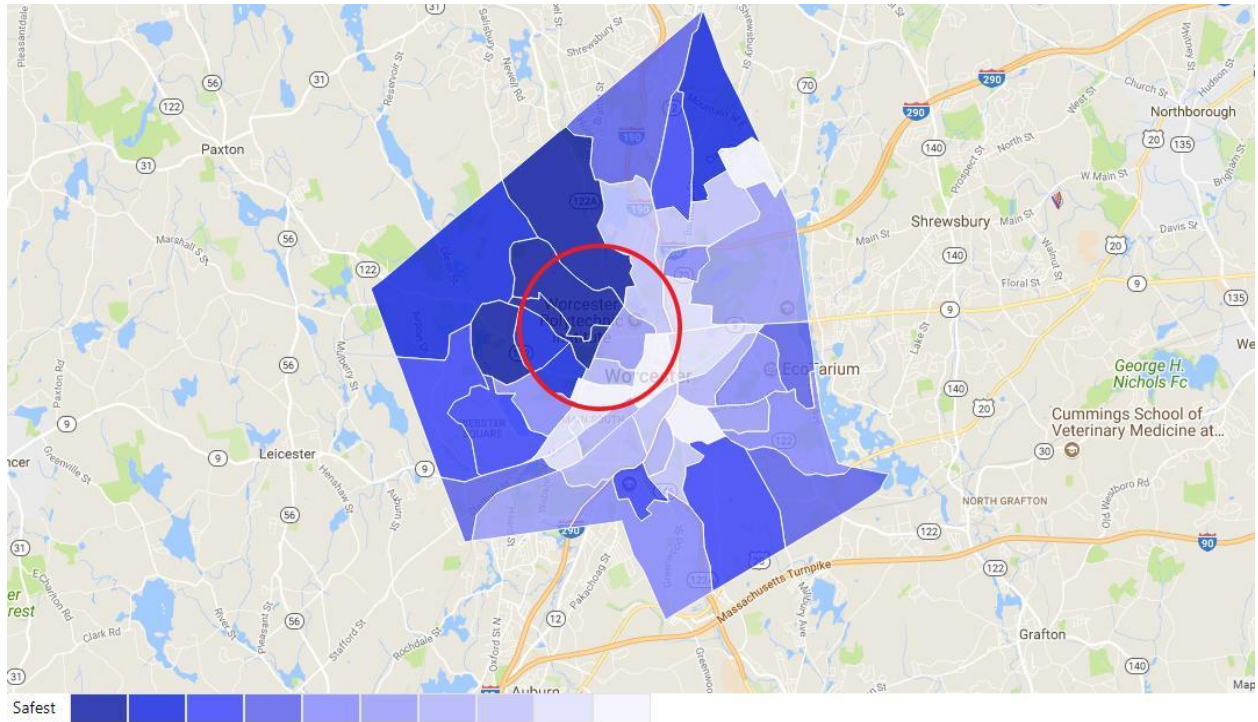


Figure 2.1: Map of Worcester (divided by neighborhood and colored by respective crime rate levels)²

Referencing Figure 2.1 above the lighter shade of blue corresponds with higher crime rates, with SNAP’s one mile radius depicted by a red circle. This data shows that approximately half of the one mile radius which SNAP caters to encircles the highest crime rates in the city. It is within that area that cases of stabbings, robberies, assault and battery, and even kidnapping have been recorded. Unfortunately, this area is also home to the majority of students who live off campus.

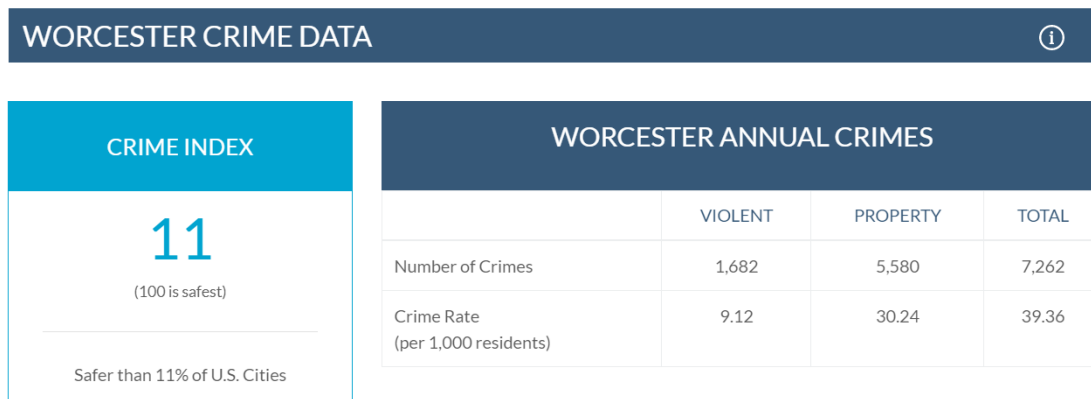


Figure 2.2: Worcester’s Crime Index

The crime rate in Worcester is considerably higher than the national average across all communities in America. Despite having 39 crimes per 1000 residents, although high, Worcester

² Figures 2.1, 2.2, and 2.3 acquired from NeighborhoodScout.com. Please review the references section for more information.

does not qualify as having the highest crime rate in the nation. However, within the state of Massachusetts, Worcester crime rates are higher than 97% of the state's cities and towns. The chance of becoming a victim of violent or property crime in Worcester is 1 in 25 per year. Applied to the students of WPI, that would mean approximately 266 out of 6,642 students could become a crime victim in Worcester.

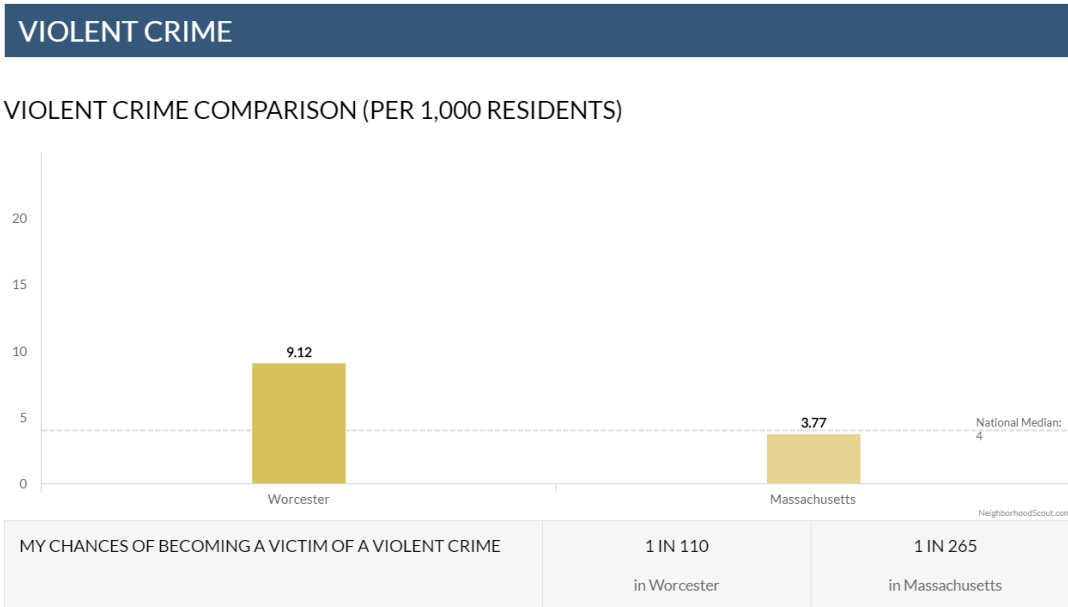


Figure 2.3: Massachusetts as a whole vs Worcester, Violent Crimes Per 1000 Residents

Overall crime rate of the city can be further illuminated by understanding the contributions of violent crimes versus property crimes to the general rate of crime in Worcester. Violent offenses include rape, murder and non-negligent manslaughter, armed robbery, assault with a deadly weapon, and aggravated assault. As stated on the NeighborhoodScout website “According to FBI reported crime data, the chance of becoming a victim of one of these crimes in Worcester is 1 in 110. Whereas the rate for property crime is 3 per 100 population.” Property crimes include motor vehicle theft, arson, larceny, and burglary. Chances of becoming a victim of either of these crimes in Worcester is 1 in 33.

But do these crimes specifically affect WPI students? From the WPI Police Department Emergency Management Safety Notification, we found a report of attempted unarmed robbery at 8:05pm (Sunday 10/08/2017). “A student was walking alone on 146 West Street, when he was approached by two males demanding money from him. When he refused, the attackers assaulted the student several times.” This is just one of several police reports from students given every year due to Worcester’s crime rates. Situations such as this raises the question whether the student had considered SNAP service could these occurrences have been avoided, and whether they decided not to use it due to the common issues persistent in SNAP services. This is one of many reports made public on the WPI website. The intention of this publicity is to raise awareness of the potential dangers that come with living in this area of Worcester; as a result, students are urged to utilize services such as SNAP in order to remain safe within the city.

2.2 Current SNAP Complications

SNAPP would tackle the common issues that deter students from using the van service, as well as fix issues dealt with by dispatch. Users are currently troubled with waiting outside for an unpredictable SNAP van, the unknown of whether they have missed their ride, lack of preparation due to varying wait times with no ETA, not being able to fit in a SNAP with pre-existing riders due to luggage and/or other passengers, etc. Frequent problems dispatch faces include lack of notice of when cancellations occur, unexpected rerouting, unclear location of SNAP vans in use, and difficulties in communication with riders.

Even though SNAP services provides the WPI student body with convenient transportation, there are certain limitations and drawbacks to the program which have resulted in problems over the years, such as discouraging students from taking advantage of this service. According to the rules and regulations of SNAP available on their WPI based website, this service is only available to students traveling within the one mile radius of campus and excludes any commercial businesses in the area. Although most students do live within that one mile radius, the main issue with that rule is if a student were to be intoxicated or in trouble while at a commercial area, they would not be able to be picked up. This leads to the student having to walk back inebriated. A loophole many students have found is to claim they need to be picked up at the address of a nearby house or apartment which is highly discouraged by the WPI Police Department.

Furthermore, since SNAP is overseen by the WPI Police Department but funded by SGA, a student run organization, the budget currently is not high enough to afford more transportation vehicles. At the moment, there are four vans, in which only two of those are utilized for the service while the other two are either in maintenance or not functioning enough for safe servicing. Another concern that Lieutenant Bueno has expressed to the team was the severe understaffing of student workers in SNAP, meaning there is not an adequate amount of staff to provide four vehicle service in the case that they were all running.

However, the largest drawback of SNAP services is the lack of information communicated between dispatch and the student rider. The current process begins with a call from a student directly to dispatch, in which the student is prompted to state the pick up and drop off locations. After, the dispatcher advises the student to present their student ID card prior to entering the vehicle and the call is terminated. From that point on, there is no other communication or follow ups between the dispatcher and rider. Some useful messages from dispatch would include vehicle updates on delays, cancellations due to inclement weather or car malfunctions, and alerts to notify the rider when the SNAP van has arrived. A message for the user to communicate would be to inform dispatch if the student decided to leave or cancel before the SNAP van had arrived. Since there is no easy way for communication between riders, drivers, and dispatch, most riders choose to leave without informing dispatch of their cancellation. The SNAP van will then go to the pick up location and wait five minutes for a person that is no longer there. This delays the arrival time for the upcoming requests, which in turn can lead to more unknown cancellations due to the longer wait times, creating a vicious cycle of no shows and no communication. Due to their current protocol, time is wasted and unsafe practices are heightened within the students choosing to walk to their destination at night rather than bothering with SNAP. Additionally, in the case that a student does decide to wait for the ride, if there are prior no-shows, leading to

multiple five-minute extensions, the student might feel discouraged from utilizing SNAP services again due to incredibly high wait times.

Once in the vehicle, according to SNAP service protocol, the driver and copilot need to ensure that the person getting into the van is in fact a WPI student. Protocol states that the student needs to be asked for their school ID as well as their final destination prior to entering the vehicle. However, after conducting experiments on the subject, students were rarely asked to verify their identity.

2.3 Problems SNAPP Could Help Relieve

WPI, like other universities, offers systems and services necessary to provide safe transportation for their students. However, what makes WPI different from other schools is that the service is not outsourced from an external provider. Everything is kept internal, offering work-study positions for students in financial need, in addition to minimizing our campus police department's expenses and maintaining greater control of the service and its practices. The issue at hand persists to be the time delays experienced by requesting riders. A solution to this would be increasing communication between students, dispatch, and service vans. This would include necessary accommodations, estimated arrival times, and more. If this communication were present, it would allow for smoother operation of services with frequently lower delay times for service. Greatest of all, increasing student safety by encouraging students to consider safer alternatives for transportation in the event that ETA's are too grand for their needs. With pre existing knowledge of something as minimal as the current call volumes, a student will have a clear mindset when determining alternate transportation. To access the application, students will first need to register to ensure that all riders are affiliated with WPI, including students and faculty. This would be done by logging into their Central Authentication Service (CAS) account, ensuring that the email is an active WPI email. If the system detects otherwise it will prohibit the registration and thereby access to the application.

2.4 State of the Art

The idea of having a designated application that allows student users to request and cancel ride requests and view shuttle routes is a needed upgrade to WPI's current means of requesting transportation. Currently, the service consists strictly of call lines between users and dispatch. Other universities have implemented modern techniques to request and track transportation vehicles, something we wish to take inspiration from.

Like WPI, the two common modes of transportation services offered by universities are single route shuttles and requested route transportation. Additionally, some colleges contract a specific application or service provider to provide and track service vehicles.

2.4.1 UMass Dartmouth

One such University is UMass Dartmouth, which only implements the "Corsair Shuttle"; a fixed route and request-able shuttle service. Shown below is the shuttle map where red lines represent the shuttle route and pink dots indicate shuttle stops:

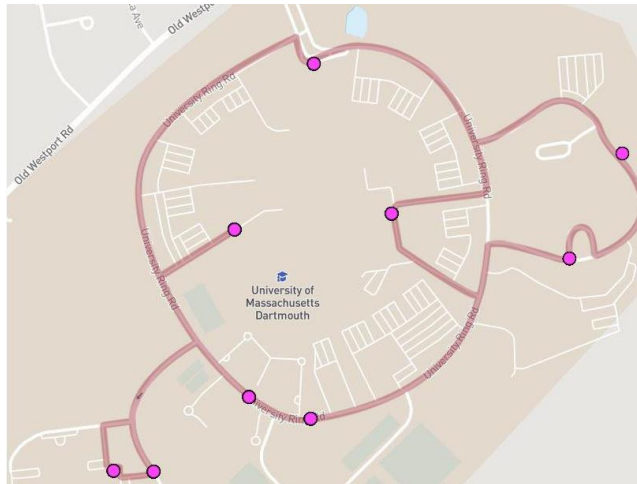


Figure 2.4: UMass Dartmouth DoubleMap Shuttle Route

During the day the university offers transportation from a fixed shuttle route. During campus after hours, they allow students to make custom requests on where they will be dropped off and where they must be picked up so long as it is from or to any of the shuttle stops. Most importantly, the university implements an application named *DoubleMap* to track the shuttles in real time. The above figure demonstrates the UMass Dartmouth shuttle route used by DoubleMap. Note that this is all the campus uses in terms of digital transportation communication for users. Rides must be requested through phone call.

2.4.2 Duke University

A second example of which we extracted inspiration for SNAPP is Duke University in Durham, North Carolina. This university implements two primary transportation services that are near equivalent to WPI: buses and vans that operate on fixed routes around the campus, and Duke Vans which operate on custom user requested pick-ups and drop-offs during campus after hours, precisely like WPI SNAP vans. Where they differ however is how users can request rides. Students can request rides online, through a mobile app, or through a call. To request a ride online, students must log in to the Duke Ridecell portal with their university credentials. The Ridecell service Duke utilizes provides automated ride requests, dispatch, tracking, and routing. Unfortunately, because one must sign-in with Duke Credentials, we were unable to view the website's user interface and processes. The Ridecell website also offers very little with regards to how the service functions. Fortunately however, the login screen also consists of a Q&A page where users may find important details about usage of the Duke Vans and procedures to follow given events such as needing to change the request destination. The last entry on this page describes what the process after logging in is:

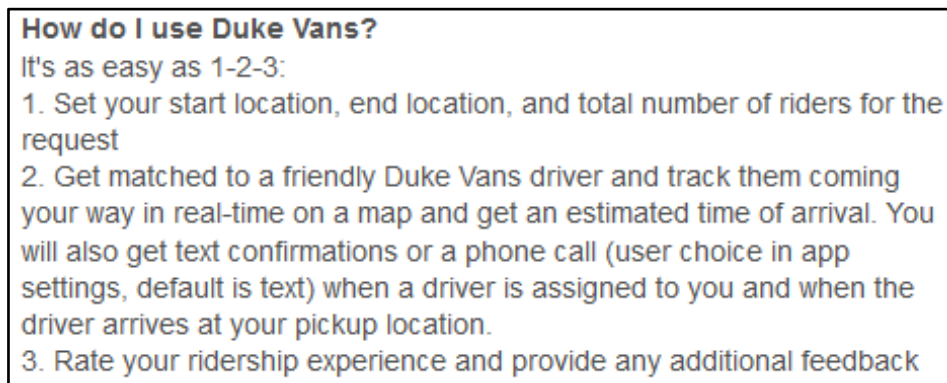


Figure 2.5 Duke University Online Van Request Process

As can be seen above, students must enter their desired pickup location, destination and the total number of passengers they are traveling with. Once this is entered and the ride is accepted, they are provided with a map to track the van's location and obtain an estimated time arrival.

Duke University also has an application that provides general campus information equivalent to their website. In this application students may also request transportation, however attempting to do so simply provides a reroute to the Duke University Ridecell web portal. In essence, the application is equivalent to visiting the website. Ridecell has its own application, but it only redirects to the Duke University mobile application when installed.

2.4.3 Pennsylvania State University (Penn State)

Penn State offers a couple of options for vehicle transport to and around campus through campus shuttles/buses and ZimRide. Zimride is a service created by the Enterprise Rent-A-Car company which allows its users to schedule ride shares and choose who may ride with them or who they wish to ride with. By partnering with ZimRide, Penn State offers a service for students, faculty, and staff to travel together when traveling to similar locations. Note that unlike the services offered by Duke University, and Harvard below, Zimride is not an on-request transportation service and requires its users to not only plan rides in advance with others, but pay for rides as well (costs of transportation are divided amongst each rider). Unfortunately, we also could not access the Penn State Zimride web application as it requires a valid Penn State web account to sign in. However, an image of the Zimride web portal is shown below:

zimride by Penn State

PennState

Zimride is a private ridesharing network for Pennsylvania State University.

Miles Posted: 833,348 Potential CO2 Reduced: 183,336 lbs

Anytime, Anywhere Post your Ride

Now with Zimride's mobile friendly website you can access PSU's private Zimride network anytime and anywhere. Try it today as it is free to sign up and post your ride as a driver or passenger.

CarShare's Special Rates

Can't find a ride on Zimride? Simply reserve one of the Enterprise CarShare cars located on the Penn State campus, then post your ride on Zimride and share the costs. [CLICK HERE](#) to learn more about Enterprise CarShare at Penn State and for terms and conditions.

Access Account ID login

Log in

Access Account ID

Logging in indicates you agree to [Terms of Use](#) and [Privacy Policy](#).

What is Penn State Zimride?

Zimride is Penn State's private ride-matching network that matches you with other students, faculty and staff who are going the same way, allowing you an easy way to share the seats in your car or catch a ride.

Who can use this site?

Penn State requires a valid **Penn State WebAccess ID** and password to join Zimride. Once you have created your profile, you can choose with Penn State campus you go to.

Have a car? Need a ride?

Penn State Zimride helps you offer or request rides for commutes, road trips, and popular events. If you have a car, split costs by offering rides. If you don't have a car, find rides where you need to go.

What do I need to know to use Penn State Zimride?

All students, faculty and staff are advised to carefully read the [Zimride Terms of Service](#) and to be sure they can fully abide by the terms and

Figure 2.6: Pennsylvania State Zimride Web Portal

Penn State also utilizes an application named Transloc to track its campus shuttles and provide detailed information on shuttle routes and shuttle tracking. This application is discussed further below, as Harvard University also utilizes Transloc.

2.4.4 Harvard University

Below, in Figure 2.7, is a flyer for Harvard University's Evening Van Service:

Book It!

Order Harvard's Evening Van Service Online!
Book It! from 7pm-2:30am, no advance reservations available.

- 1

Click the Blue Rider in the TransLoc Rider App, visit eveningvan.transportation.harvard.edu, or scan the QR code below
- 2

Select Pickup Location


- 3

Select Drop Off Location


- 4

Select # of Passengers

Group members going to different drop off points need to book separately.
- 5

Confirm Trip

We'll text when the van is on its way!
Please be at the pickup location when you're notified.

Visit transportation.harvard.edu for *step-by-step instructions*.



HARVARD
Campus Services
TRANSPORTATION

Contact Us:
 617-495-0400
shuttle@harvard.edu
transportation.harvard.edu



Figure 2.7: Harvard University Evening Van Poster

As shown above Harvard, like WPI, offers students the ability to custom request where they wish to go and specify where they are. Additionally, as shown below in Figure 2.8, the school offers a fixed route shuttle service with the tracking information of each shuttle.

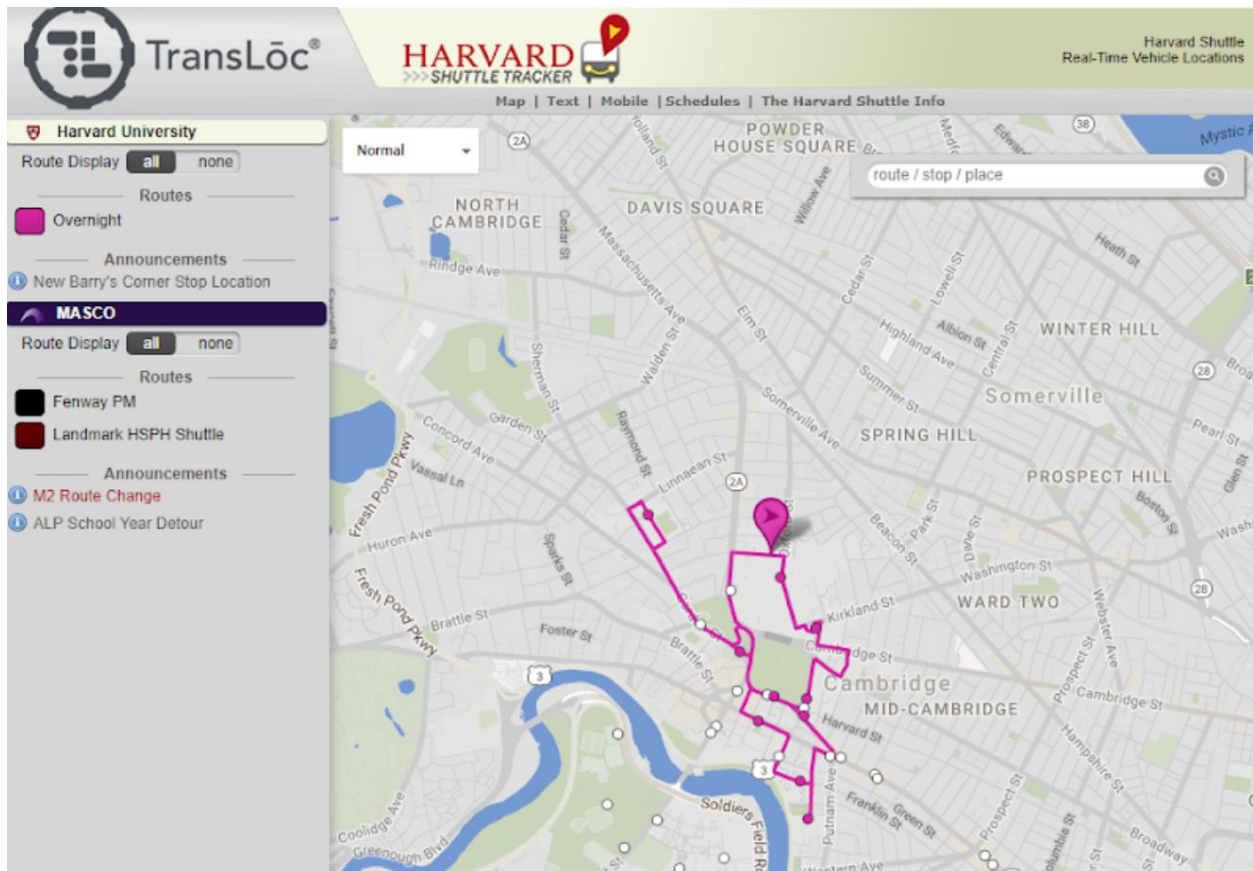


Figure 2.8: Harvard University Shuttle Tracker

Note that in both figures above there is mention of an application named TransLoc. Transloc is a service that promotes to “deliver the ultimate rider experience” by providing specialized software for on-demand dispatching, routing, and tracking. This application allows Harvard dispatch to have more control over monitoring pending, in progress, and completed rides. Upon submitting a request, information about the passenger’s GPS location will be available through this app, allowing for a quick and efficient dispatch to the user. Using TransLoc smart technology enables the rider to have real time communication to change or cancel their requests accordingly. In addition, the user is given the ability to track a shuttle’s given location, along with alerts of shuttle arrival.

2.4.5 Drawback to Transportation Contract Services

The main drawback of using applications such as DoubleMap, Ridecell, Zimeride, and Transloc all discussed above, is the cost of utilizing them. To implement the TransLoc system, for example, universities must create a direct contract with the firm in addition to providing its own vehicles and staff. As provided by Lieutenant Karen Bueno the SNAP supervisor, the current cost of maintaining four SNAP vans is \$25,000. As SNAP is primarily funded by the WPI Police Department and the Student Government Association, this is a difficult to expand budget as the majority of funding is already used to pay work-study staff and maintain two of four service

vehicles; something the previously mentioned services do not provide. While WPI could contract one of these services for SNAP, their use would likely defeat work study positions available for SNAP services by consuming the budget available to pay these students, or simply by performing their jobs. This would be detrimental for some students as the more jobs that are available on campus, the more jobs students can take on to help fund their college career. Alongside this, SNAP is student run and funded and offers individuals the opportunity for work experience, social experience, and connection building. At its current state, SNAP truly is much more than just a transportation service. It is a safe haven and professional builder for the students that operate it; simply contracting an external transportation service provider is not a desired option for the SNAP team and the WPI community.

3 Methodology

With all the current complications that arise with utilizing SNAP services, we decided an application would be a suitable addition to it. As shown in the State of Art, many colleges pay for transportation services and applications. By using an outside service, this would not only be costly for SGA, but would also diminish student job opportunities on campus. Therefore, our project provides a solution for improving SNAP services without going over budget. Our vision is to develop an application that notifies students of the service load and the approximate time to when they will be serviced; aiming to reduce the amount of time students wait outside for a SNAP van, lower the number of no-shows per night, and ease the process of the service for both dispatch and the rider.

3.1 Market Research

In order to provide a strong argument behind our pitch for this project, we collected information from our fellow WPI students. A survey was constructed to prove to SNAP services and the WPI Police Department the importance of this application for the student body. This survey consisted of the following five questions:

1. Are you a frequent SNAP user?
2. Where do you live?
3. What is the longest you have waited for a SNAP?
4. Do you see yourself using this app?
5. Questions/Comments? (Optional)

The survey was purposely short in order to get as many responses as possible. To conduct this survey, we reserved a table in the Campus Center and pulled over students passing by, acquiring a total of 73 responses³. Students were prepped for the survey with a brief explanation of what our application idea entailed. The results gathered gave a strong argument for our project. We found that even though only approximately 40% of our participants were current SNAP users, 94.5% of participants answered that they would use this app. This suggests that many students have avoided utilizing the service, demonstrating how vital and influential an app would be to the student's opinion of the SNAP service.

3.2 Starting Up the SNAPP Project

For years, IQP and MQP teams have tried, without success, pursuing this project. Therefore, our approach for getting permission from the Police Department to going through with this project had to be effective and thorough. After attempting to communicate with the Police Department via email and phone, we scheduled a meeting with Dean Snoddy to seek help and advice. Upon pitching the idea of an application for SNAP services, the Dean of Students had agreed to reach out to Lieutenant Karen Bueno, the head of SNAP services, as a means to help us obtain contact with the WPI Police Department. This granted our team a meeting with both Lieutenant Bueno and the Chief of the Police Department, Cheryl Martunas, to discuss the project.

³ See Appendix C for Market Research Survey Data.

Additionally, a meeting was scheduled with the head of Student Government Association (SGA) prior to meeting WPI PD. The intention of this meeting was to gather information on SGA's involvement with SNAP due to them being the sole monetary provider for funding this service. During this meeting we met Taylor Stephen who, coincidentally, was in pursuit of creating an app for SNAP as well. He had met with Lt. Bueno once before regarding the possibility of the app, but no progress was made in developing an application. In this meeting, Taylor informed us of the WebTech Group consisting of various WPI Computer Science students that take on application/web development projects to improve the quality of student life on campus. Following this meeting, we agreed to merge with both Taylor and the WebTech Group for the production of this application, changing our project from developing an application to managing a development team.

The initial purpose of meeting with Chief Martunas and Lt. Bueno was to be granted permission to create an app for SNAP, something Taylor had already accomplished. Therefore, shifting the purpose of the meeting to introducing our involvement and ideas for the project to the WPI Police Department.

The agenda for this meeting consisted of four main points:

1. To have an application with minimal to no change in SNAP's current procedures.
2. To keep the application as simple as possible.
3. To ensure the maintainability of the application.
4. To introduce our role on the newly combined team (IQP Team, SGA, and the WebTech Group).

Teams in the past have pitched this project idea with little consideration to the current protocol of SNAP services, therefore, our plan was to mirror the current protocol in place. We introduced this to the Police Department by explaining our intentions of observing SNAP services and looking through the current setup for logging information. This would allow for creating a Dispatch User Interface that resembles their current paper log as well as have the process of receiving requests resemble the process done via telephone.

The second main point was simplicity; this is important for developing any user driven application. Rather than focusing on all the "bells and whistles" this application can have, we first needed an easy-to-use application that implemented all the necessary components the app would require. Lt. Bueno described this as "baby steps", inferring the development process should be done in phases. For our involvement of this project, we assisted in developing the first phase and brainstormed features we hope to execute later down the road. The first phase consisted of having all basic functionalities; for example instead of focusing on how to implement GPS, we first planned to develop an application where the riders can easily send a request for the dispatch to then receive.

Ensuring the maintainability of this application was probably one of the main concerns for the Police Department, which was something most teams lacked in the past. By joining teams with WebTech and SGA, we are able to provide maintenance for this application, in order to prevent the app from being terminated due to lack of maintenance. The WebTech Group is a club in the

making, but it is a group that welcomes all students at WPI that are interested. This allows a certainty of maintainability that most teams in the past did not have, because even when the head of the WebTech Group graduates, there will be Sophomores and Juniors ready and able to take his place. Therefore, the SNAPP Project can live on in this group where they can monitor and improve the application for years to come.

Lastly, we informed Lt. Bueno of our team roles, as described in the following section, Team Development. Both the Lieutenant and Chief were impressed with our pitch, and decided that all future communication with the Police Department regarding this project would be directly handled by our IQP team. This was the true beginning of our SNAP Services Assistance Application Project.

3.3 Team Development

Initially, our team was ready to take on the ambitious task of developing the application ourselves. We were confident in our ability as we were a team consisting of two electrical and computer engineering students and an aerospace engineering student with a variety of programming experiences. However, by combining our group with SGA and the WebTech Group, this weight was able to be lifted off our shoulders and allowed us to focus on the design and implementation of the application. The full project team then consisted of ourselves, Taylor Stephen (SGA), the WebTech Group, and the Police Department as shown in the figure below.

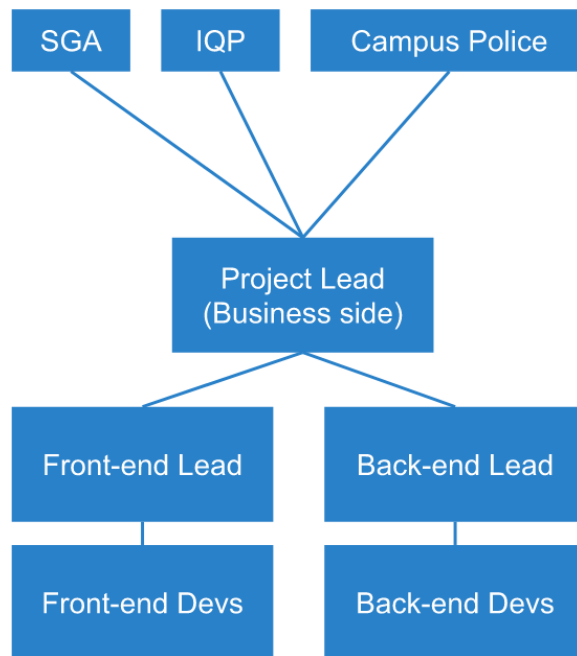


Figure 3.1: Development Team Structure Diagram

Our IQP team provided the research, communication between all listed groups and other contributors, and design and customer specification required for development of the application. In order for the application to fulfill its intended purpose, research first had to be done. This included obtaining requirements from the police department, observing the current SNAP

protocol, gathering all legal requirements, and taking note of all pros/cons of our competition. The role of communications was a huge part in our involvement on this project, we met with Lt. Bueno frequently to update her on the progress of the application and take note of all suggestions/requirements specified by her. This information was then organized and presented to the WebTech Group accordingly. We also met with the Senior Counsel on various occasions to develop all necessary legal documentations of the application. The design portion of our role included the making of all user interface designs and basic functionalities of the application and its workflow. We presented the application's designed in team meetings and once a week informed the team of all updates. Project management fell to both us and Taylor Stephen, our job focused more on managing the development process whereas his focus was team management.

Taylor Stephen, project lead, coordinated team meetings and helped with communication between us and the WebTech Group. Every week, meetings were organized, lead, as well as scheduled by him. In addition, with Taylor being President of SGA, he is in control of the SNAP budget and monetary requirements for this service.

The WebTech Group is an organization on campus for all WPI students interested in application and web development. The group started up this year, with its first project being our SNAPP Application. Out of all students participating in the WebTech Group, five were selected by Derek Feehrer, an active member of SGA, to be a part of this project. Derek Feehrer was in charge of this team as well as communications between us and Taylor Stephen regarding the WebTech Group and the application development process. The five programmers were split into two groups; two students were in charge of frontend and three were in charge of backend. The frontend team focused on what the user sees, making the user interfaces we designed become a functioning web-application. Backend was in-charge of everything behind the scenes, primarily the functionality of the database and interactions between the rider and dispatch applications of the platform.

The Police Department provides the SNAP service and therefore is the "customer" of our project. Lueteniant Bueno, being head of SNAP, was our direct contact regarding the service. She provided information on SNAP, put us in contact with SNAP coordinators to assist us on research, set out requirements for our application, and much more. We met with her as frequently as possible to show her all progress and obtain her feedback, making her a crucial member of the adaptation of the application.

3.4 Product Requirements

Gathering product requirements is crucial to any developmental process. Therefore, the beginning stages of the SNAPP primarily consisted of obtaining information from fellow students and faculty. Through observational visits and meetings, we were able to develop an application uniquely geared to fulfill the needs of its users. The three main parts that contributed to this list were meetings with the WPI Police Department, meeting with our development team and the senior general counsel, and observing dispatch protocols used by the service. Through this process, we formed a list of product requirements for the team to use when developing the application.

3.4.1 Police Department

To obtain specific requirements that fit within the current SNAP protocol, we directly met with the WPI Police Department and spoke with Lt. Bueno. The first meeting took place during B term on November 30th, 2017, in which Lt. Bueno specified what must be included within the application. We pitched to her our goal of wanting to accommodate to students and SNAP services in a simple and unobtrusive manner. She was in agreeance with most of our initial ideas for the app, for example, including a student login/registry in order to ensure that only WPI community members would be able to use the service. Another app function mentioned to Lt. Bueno was to include user accommodations, such as luggage, as well as passenger numbers per requested party to ensure that SNAP is fully aware of the passengers requesting a ride. Both recommendations were agreed upon, as she felt these features would be large improvements to the current procedure.

Within the menu section of the app it was suggested to include the services rules and regulations to remind the user of them, that were terms accepted prior to making an account to use SNAPP. Lt. Bueno suggested to include a link to SNAPP on the Campus Safety Transportation website and vice versa. She also added that in the case a student decides to cancel a request, a pop up should appear giving them alternative safety transportations as well as including WPI PD's number to contact in the case of an emergency. One restriction Lt. Bueno mentioned was the use of GPS. GPS is restricted due to SNAP vans being considered police vehicles, therefore they cannot be tracked for both the safety of the students and drivers.

The second term of the IQP project's fundamental points were to organize and obtain a clear progress of the application, fully understand the SNAP service's protocol in order to provide the best application that accommodates dispatch, and hold meetings to discuss terms, modifications, and further additions to the application. Lt Bueno brought to our attention that, in the menu for the rider interface, the hours that SNAP provides service for each academic term should be readily available as well as a list of rules and regulations⁴ the user must abide by.

After a user logs into the rider application, Lt. Bueno suggested to include a brief tutorial. The tutorial will lead the user through the process of the app, from explaining features in the menu to showing how to request a ride, including the process that the user must go through until the request is fulfilled. This tutorial will also be available in the menu in case a user needs a refresher in the application. Currently, dispatch does everything on paper, therefore dispatchers must periodically tally up data such as the amount of cancellations, no shows, and the total amount of completed rides. The dispatch application will not only record and analyze this data for the employee, but it also allows for more precise data and minimizes loss of documentation.

It was brought to our attention that during harsh weather environments, SNAP services release campus wide announcements that the service will be closed until further notice. In turn, for the

⁴ See Appendix H for completed list.

rider application we planned to have this statement released on the main screen to anyone attempting to use the app. The app will be set to close a half hour before SNAP Services closes. Instead of the usual request screen, a text box will appear in its place and state the reason for SNAP's end of service for the night. Although the application will not allow further requests to be made, it will inform the user that calls can be made until the service is officially closed. This allows for an easier managed request load for dispatch when the service must close earlier than expected. It also must be noted within the terms of use that SNAP vans are not emergency vehicles, in the case of an emergency the proper connections would be easily provided within the app.

More ideas were discussed, however it was determined by the team that the following would be updates that will be available in upcoming versions of the app. Lt. Bueno hoped to have a designated sign in for dispatch which would prove significantly useful during changing of shifts. Another update was for dispatch and SNAP drivers to have the ability to record maintenance of their vans. Currently it is done by hand, but it would be a useful addition to be able to electronically record maintenance of the exterior/interior of the vehicle, safety, and starting/ending mileage of the SNAP vans. In further renditions of the app, it is hoped that the copilot would also be accessible to it, allowing the copilot to indicate when the ride was completed to get an even more precise timestamp of the drop off time. The process of that would be first, the Copilot presses a button indicating a successful drop off, this then timestamps when the ride is completed, however dispatch must still clear it on their side of the app in order to remove it from "current rides" to the archive. Also, the idea of adding a 'I'm here' button for the copilot to press to indicate to the user that their ride has arrived at the indicated location. This will ensure fewer accidental "no shows" in the case that a student was at the location but was unaware that the van had arrived.

3.4.2 Additional Contributions

An important requirement for this application is legal documentation, for this we met with Jeffrey Snider, Senior General Counsel, which will be further address in a later section. Other contributions were also made by our SNAPP project team, Taylor Stephen, Project Lead; Derek Fehrer, Head of WebTech; and the WebTech Group.

Full team meetings were held once a week for both C-Term and D-Term of the 2017-2018 Academic Year. Every other one of these meetings marked progress deadlines for the team, also known as Sprints. At the beginning of each Sprint, tasks were assigned to be completed by the end of this two week period. Throughout the development process, as new ideas and information were gathered, our list of requirements was constantly changing and discussed at these meetings. However, before our first full team meeting, we met with Taylor and Derek to form a product requirement list to jump start the development process of this project.

After collecting data from our first meetings with Lt. Bueno, we met with Taylor and Derek to show them our current list as well as brainstorm new requirements. This was our first app design meeting with the other two leads on the project. To start off, Derek informed us that a web-friendly application would be the best option for this project as it would combat the need of

finding funding to license the application on the Apple or Google application stores. The team had come to an agreement that, moving forward, this application would be accessed through the web. We also agreed that this product would need two separate User Interfaces, one utilized by the rider and other by dispatch. It was in this meeting we developed our first User Interface for dispatch.

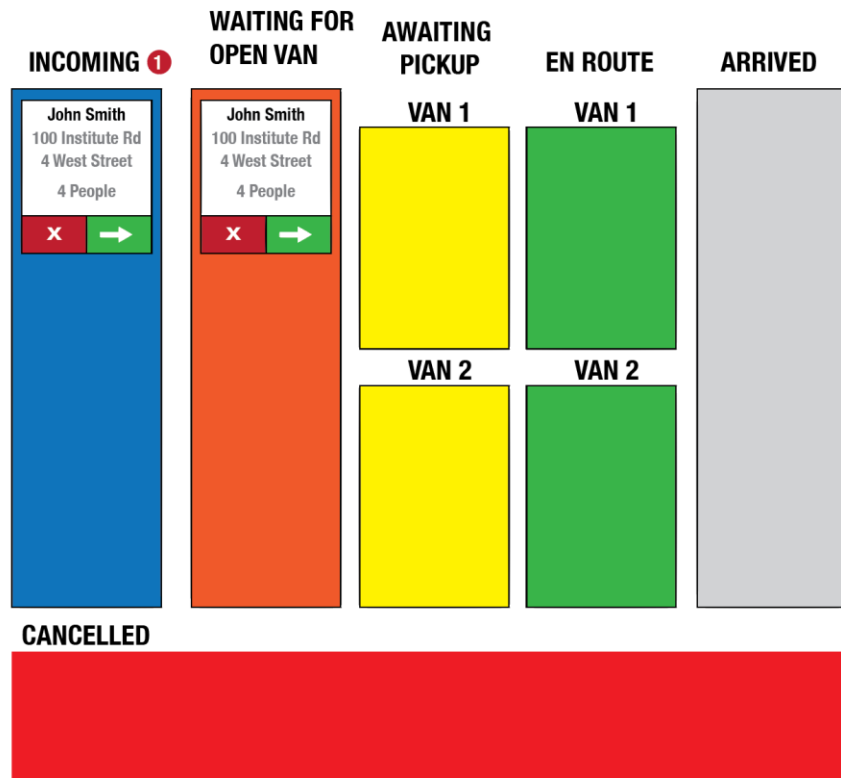


Figure 3.2: First Draft of Dispatch UI

However, this design was dismissed due to the added complexity of its usage. All teammates had to be frequently updated on product specifications due to occurrences such as this; enforcing the importance of our weekly meetings.

3.4.3 Dispatch Observation Visit

As mentioned previously, our plan was to program an application that mirrors the current SNAP protocol as much as possible. To do this, we observed SNAP services from the point of view of Casey Maffucci, a SNAP coordinator, who was on shift as dispatcher at the time. Prior to arrival, we prepared a list of questions to ask during the session. This included:

1. How does dispatch currently utilize the given computer?
2. What is the average time taken for a SNAP van to pickup a request?
3. Average duration of a ride from pickup to drop off?
4. Average time from receiving a request to cleared?
5. List of days of the week that are most to least busy?
6. Are there any days in particular with higher call volumes?

7. What would you imagine the dispatch interface to look like? Any features you really hope to see?
8. What is the specified one-mile radius?
9. Are there any common complications that arise that you believe the app could eliminate?
10. How often are cancellations? How often are no-shows?
11. How willing do you believe dispatch would be for more interaction with the website?
12. If more riders than expected show up to enter van, what happens?

As most questions were answered by Casey⁵, some had to be brought to the attention of Mark DellaCroce, SNAP Coordinator in charge of statistics. In this session, we recorded the script⁶ followed by co-pilot and dispatcher and observed the process from the dispatch point of view.

The information obtained was especially essential to the development of the dispatch user interface. A rather large detail, we had previously misconceived, was the amount of communication between the vans and dispatch. Since there are minimal calls between them, our application has to abide by this. Originally, the rider was expected to have a more detailed waiting screen (Figure 3.2), but this had to be changed to a more simplistic design. Therefore, the columns: “Waiting for Open Van”, “En Route”, “Arrived”, and “Canceled” were removed. This left us with two columns: Incoming Requests and Processing Requests, as well as an accessible archive for all completed or cancelled requests.

In this visit we also observed small details that could have otherwise gone overlooked. Firstly with van assignment, it is crucial that dispatch has the ability to change van assignment at any point prior to picking up the rider. Casey specified that this assignment is very fluid throughout the process and therefore our app had to reflect this. Furthermore, Casey had mentioned that in their current protocol, it is not required for the rider to specify the number of passengers. This can cause chaos for the service with vans holding more students than intended and increasing the wait times for some riders. Therefore this would be an extremely beneficial user request requirement. It was in this visit we also received ideas for the archive of this application, such as to include automated statistics based on day, week, and/or month.

3.4.4 List of Product Requirements

After obtaining requirements from most of the people involved with this service, we were able to form a complete list of requirements. Using the list shown below, we were able to move onto the design portion of the application development process.

Dispatch Interface

- Easy to use desktop application.

⁵ See Appendix D for Dispatch Q&A.

⁶ See Appendix B to see the detailed SNAP script.

- Replicate the current paper procedures
- Dispatch must have the final say on whether to accept or reject a request.
- Organize incoming requests and accepted requests separately.
- Application must be able to keep track of these statistics per day/week/month/year:
 - Amount of cancellations
 - Amount of no-shows
 - Total number of completed rides
- Be able to store historical service data in a Archive.
- Ability to change van assignments until a request has been completed.
- Ability to manually requests that may be received through a phone call.

Rider Interface

- Easy to use web application.
- Include a student login/registration.
- Allow riders to submit ride request in-app.
 - Required Information:
 - Number of Passengers
 - Pick-up Location
 - Drop-off Location
 - Optional:
 - Accommodations
- Allow riders to cancel ride request in-app.
- Notify riders of the one-mile radius service area.
 - Automated request rejection upon attempting to submit a request outside SNAP bounds.
 - Safety alternatives pop up when cancellation occurs:
 - WPI PD phone number
 - Suggestion for user to use alternative services such as Uber/Lyft
 - Advise student to call a friend to accompany them to their location
- Waiting approval screen after submitting a request.
- Once the request has been approved, goes to “In Progress” screen, then provides the user with their position in the queue.
- Rider updates when new service statuses (cancelled due to inclement weather, etc.)
 - In the case SNAP services is cancelled for the night the app will also shutdown simultaneously
- Provide in the Drop-down Menu:
 - Shuttle schedule
 - Service schedule
 - Emergency contact and general SNAP contact information
 - Rules and Regulations, Terms of Use, and Privacy Policy to abide by
 - How-to tutorial

Restrictions

- Not allowed to implement GPS.
- Cannot have phone application just yet.
 - Due to budgeting reasons.

3.5 Application Development

In this section we extrapolate the previously listed customer requirements to formulate the final design decisions for the functionality and appearance of SNAPP for both the rider and dispatch interfaces. Additionally we cover the largest impediment faced by the team when developing the application, the use of Google Firebase and why we were required to transition all programming to utilize Amazon Web Services (AWS).

3.5.1 Product Design and Specifications

To begin app specifications the following use case UML diagram was constructed to reflect the customer requirements previously listed:

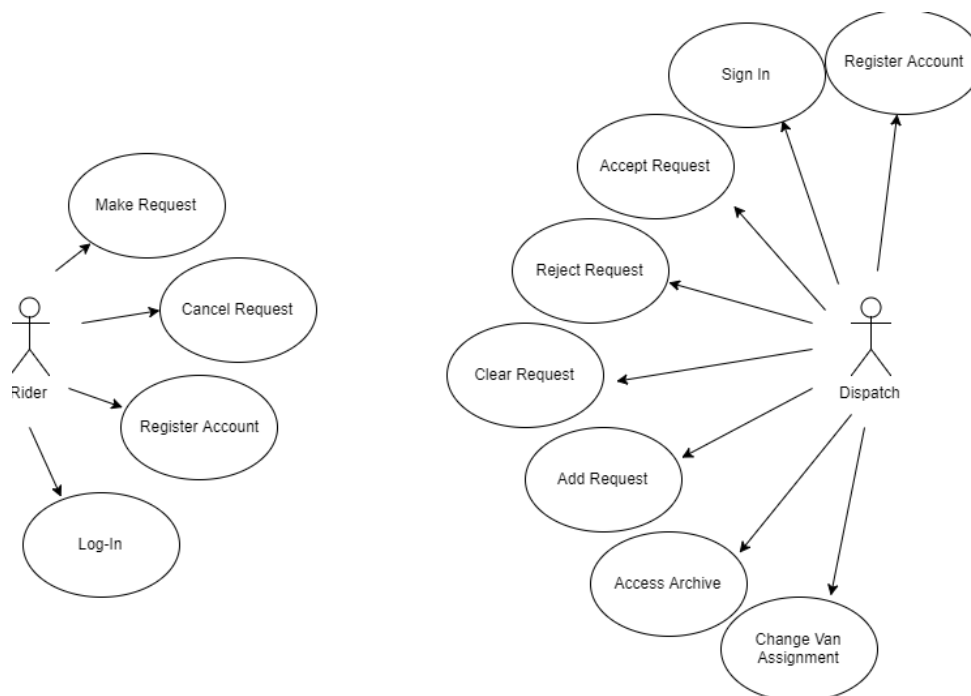


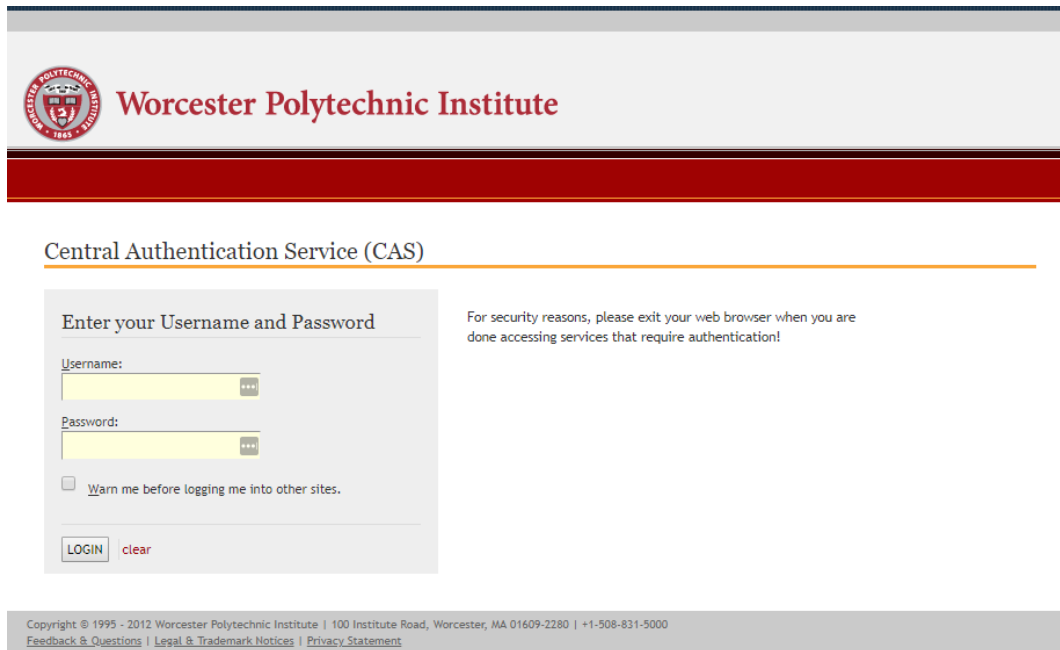
Figure 3.3: Application Use Case UML Diagram

A UML diagram is one in which use cases⁷ created to specify the actions and functions an individual can utilize are graphically displayed. As in the UML diagram above each stick figure represents an “actor” which can take several actions within the application platform. Note that these actors can be non-human and can describe, as an example, autonomous database handling systems. In the SNAPP UML diagram there are two primary actors: the rider and dispatch each with several actions they may perform.

⁷ Please visit appendix J for full use case documentation on each action represented within the UML diagram.

3.5.1.1 Rider Interface

As the UML diagram and customer requirements show riders should be able to register and log-in to the application. To do so we will utilize WPI's Central Authentication Service (CAS) to "register" individuals upon joining the WPI community as valid users and allow them to login to the application prior to its use from the CAS login portal shown below:



The screenshot displays the CAS login portal for Worcester Polytechnic Institute. At the top, the WPI logo and name are visible. Below this, the text "Central Authentication Service (CAS)" is underlined. The main content area is divided into two sections. On the left, a form titled "Enter your Username and Password" contains fields for "Username:" and "Password:", each with a "clear" button. Below these fields is a checkbox labeled "Warn me before logging me into other sites." At the bottom of the form are "LOGIN" and "clear" buttons. On the right, a security notice reads: "For security reasons, please exit your web browser when you are done accessing services that require authentication!". The footer contains copyright information: "Copyright © 1995 - 2012 Worcester Polytechnic Institute | 100 Institute Road, Worcester, MA 01609-2280 | +1-508-831-5000" and links for "Feedback & Questions", "Legal & Trademark Notices", and "Privacy Statement".

Figure 3.4: CAS Login Portal

Once users sign in to CAS the application is then made available to them as shown below:

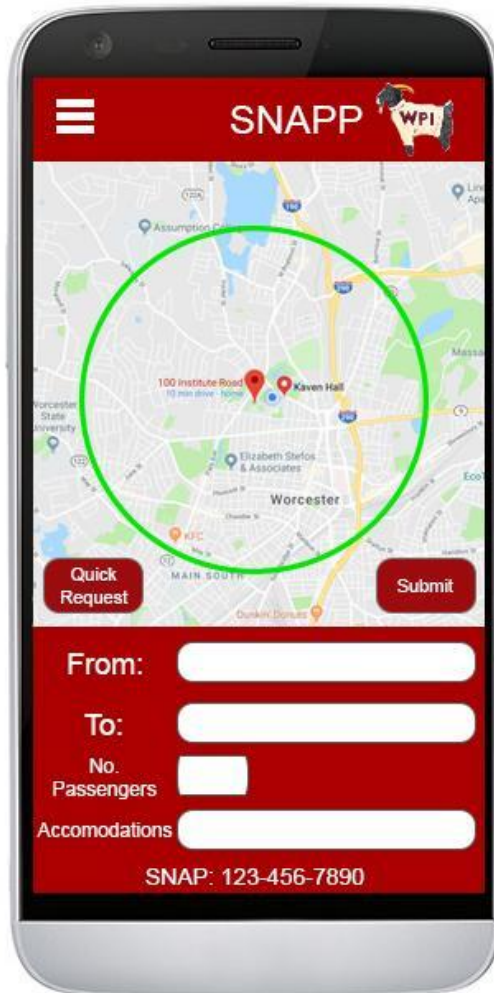


Figure 3.5: SNAPP Main Rider Interface

From here a user may perform a ride request by entering their current location (or the location at which they wish to be picked-up), their desired destination, the number of passengers in their party, and any additional accommodations they feel necessary to make aware. At this point they can press submit to send the request for approval. Notice that to satisfy notification of the one-mile radius service area a circle is placed on the map that indicates the area of service surrounding 100 Institute Road. Additionally, to make the application as simple as possible for its users we designed the interface to be very linear in that, desired actions follow one path of execution; for example the ride request procedure described above. To find information like service hours and the shuttle route users can select the three dashed lines (often coined as a “hamburger”) at the top left of the screen to display the following menu:



Figure 3.6: SNAPP Rider Menu

Here the user is provided with the options to view the shuttle route, SNAP service hours, the rules, terms and conditions, and contact information for the SNAP service. Notice that each screen (including those shown below) statically holds SNAPs phone number at the bottom of the screen in case the user wishes to make a call to the service. This menu and its entries satisfy the need for supplying rider with a shuttle schedule, service schedule and SNAP/ WPI Police contact numbers, and a means of reviewing the rules, terms and conditions associated with usage of the application.

3.5.1.2. Dispatch Interface

As the dispatch interface of SNAPP will serve to replicate all current ride handling procedures within the service its design has proven to be a much larger task than was the case for the rider interface. This is exemplified by the UML diagram for the dispatch interface where several more actions must be made available to the dispatch operators. To replicate current dispatch procedures we centralized the functionality of the interface primarily to the ability of handling incoming and current ride requests and replicating the current dispatch paper procedures. As we will be using WPI CAS authentication to sign in dispatchers, we do not need to implement dispatch registration. Simply, upon accessing a dispatch login portal they must sign in to CAS

after which they will be automatically delivered to the main dispatch interfaces shown below. Reiterating the actions a dispatcher must be able to complete when doing their work as shown in the UML diagram of Figure 3.3, dispatch operators should be able to:

- Accept ride requests;
- Reject ride requests;
- Clear ride requests;
- Manually add requests;
- Change request van assignments; and
- Access an archive of historical request data

The artist renditions for the dispatch main interface, as well as a demonstration on how the bullets above were implemented, are shown below:



Figure 3.7: Dispatch Application Main interface

As given by our product requirements, an important design implementation is to replicate current dispatch paper procedures while separating requests by status of incoming/new and accepted. As shown above we divide the interface into two columns to meet this requirement. As riders make requests through the rider application those requests appear within the “New Requests” column. To acknowledge a request, the dispatch operator needs only to select an incoming request. Once this is done the following prompt is shown:

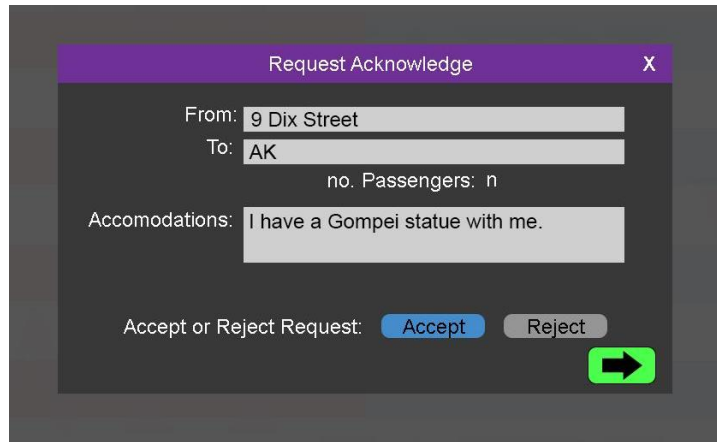


Figure 3.8: Dispatch Application Ride Acknowledge Prompt One

From here the operator is presented with all information associated with the request and the choice of whether or not to accept the request. If they accept the request and confirm the decision, another prompt is displayed:

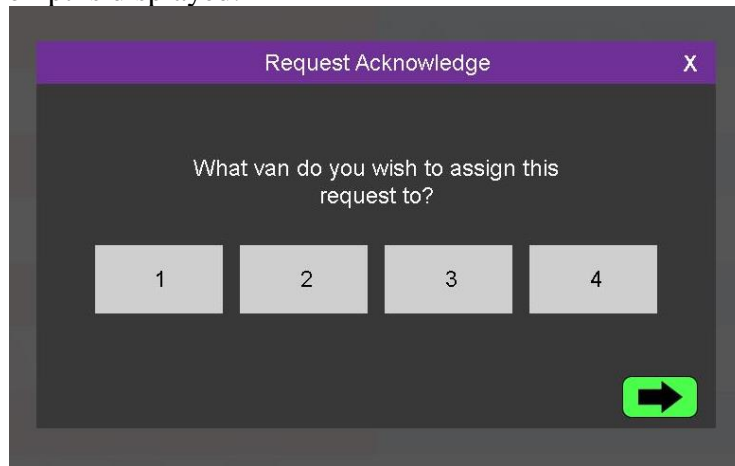


Figure 3.9: Dispatch Application Request Acknowledgement Prompt Two

From here, the operator selects the desired van to assign the request to and the request automatically moves itself to the “In Process” column. Note that additionally it was required to implement a means of manually adding requests for any that arrive through phone. To do so the dispatch operator may select the *Add* button at the top left of the main interface.

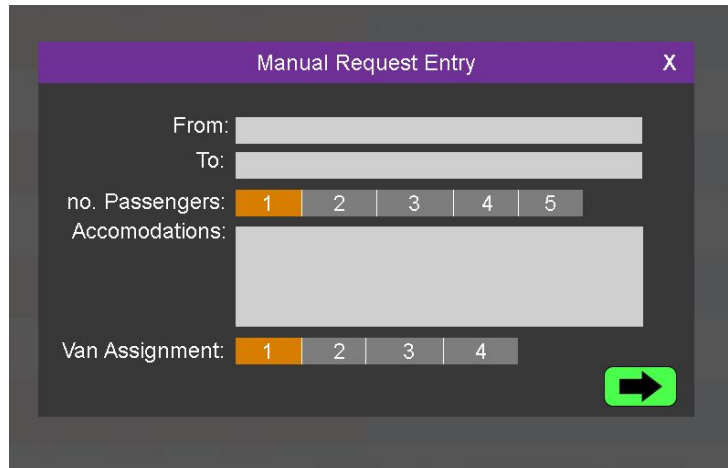


Figure 3.10: Dispatch Application Manual Request Entry

From here an operator need only type in the location of the rider, the destination to which they wish to go, the number of passengers associated with their request, any accomodations specified by the user, and the final van assignment of the request. Once an operator is ready to clear a request (be it because it was completed, it was a no-show, or simply a cancellation) they may select the desired request from the “In Process” queue. Once this is done a prompt appears that begins the process of ride clearing.

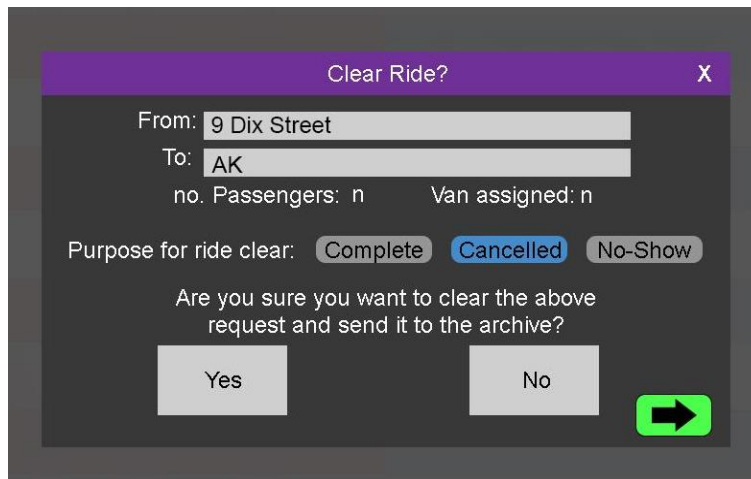


Figure 3.11: Dispatch Application Ride Clear Prompt

Here the operator is presented with all relevant information concerning the request. All the operator must do to clear the request is choose the reason for clearing and confirm if the action is desired, noting that the request will be removed from the in process queue and placed within a historical archive of past ride requests.

There are multiple additional features to the process above that are present within the dispatch application. For example, as riders can now provide accomodation information, any accomodations supplied with a request are always presented with it.

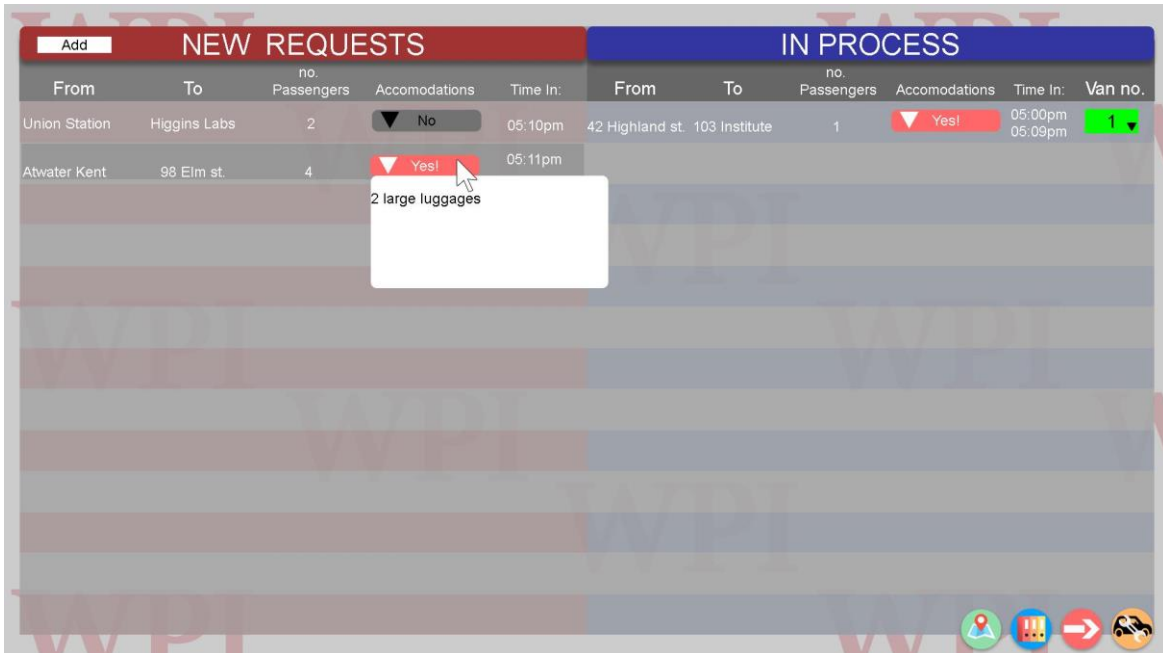


Figure 3.12 Dispatch Application Request Accommodation Information

If a given request has accommodations provided with it a button will be marked within each request that indicates whether or not any are present. If a request has accommodations a dispatch operator can select this button to view what they are as shown above. Another feature added to the design of the dispatch interface was the ability to change van assignments while requests were in the in process queue. Shown below is that feature:



Figure 3.13: Dispatch Application Van Assignment Modification

This feature was specifically implemented as during our observations of dispatch procedures we found that on occasion the dispatcher would change the van assignment for a given request as it was more efficient for another van to respond to it. This further adds to our commitment to replicate current dispatch procedures and ensure that no actions were missed. A final detail made to the interface was the situation where riders cancelled their requests. To make a dispatch operator aware of a cancelled request, the request will flash red. From here when the dispatcher selects the request to clear it the “Cancelled” option is automatically highlighted to allow for quick acknowledgement. Four small icons were finally added to the application.



Figure 3.14: Dispatch Interface Feature Icons

In order, these provide access to Google Maps, a historical request archive, a sign out button, and a vehicle maintenance button where dispatchers can make reports of vehicle status after van inspection. These features were added from our original dispatch design, our observation of dispatch procedures, and finally recommendations made by Lieutenant Bueno.

3.5.2 Technical Implications

Section 3.5.2 goes in depth in regards to what was our initial proposition to develop the application, any technical breaches the team had to overcome, and thoroughly explains the solutions to any issues encountered.

3.5.2.1 Initial Development Technologies

In the initial stages of the app development, meetings with the WebTech Group were conducted in order to brainstorm and research on which server and web application development platform to use that would be the best fit for our project. The WebTech Group came to the conclusion of using Firebase, which runs under Google, as the appropriate platform to enable the team to create the SNAP App in a simple and efficient way, while still allowing them room for creativity and special features.

Trusted by the largest apps

Development teams around the world—including NPR, Shazam, Duolingo, and Venmo—use Firebase to ship their apps.

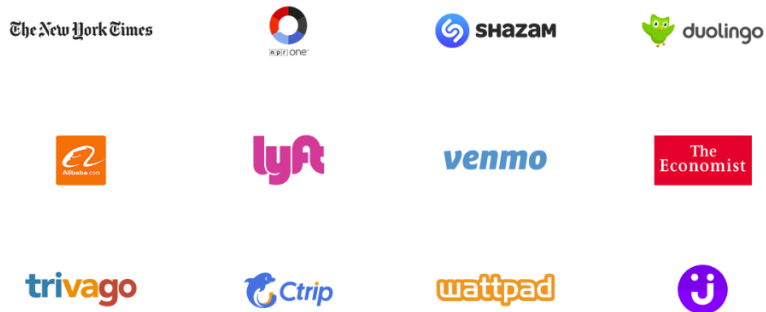
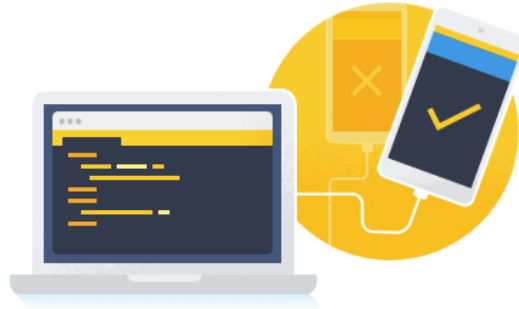


Figure 3.15: Largest Apps Using Firebase

Originally, the team had the assumption that Firebase being involved with Google servers would be a great choice for a platform; this was reinforced with the fact that huge well known companies such as Lyft, The New York Times, and Venmo use and trust the platform with even more sensitive, classified information than the SNAP App would ever require. For the purpose of our application we only required to store data such as user emails and passwords for when they register to login to the app, attached to the request the user's pick up and drop off locations will also be recorded and saved into the archive.



Develop & test your app

- Realtime Database**
Store and sync app data in milliseconds
- Crashlytics**
Prioritize and fix issues with powerful, realtime crash reporting
- Cloud Firestore** BETA
Store and sync app data at global scale
- Authentication**
Authenticate users simply and securely
- Cloud Functions** BETA
Run mobile backend code without managing servers
- Cloud Storage**
Store and serve files at Google scale
- Hosting**
Deliver web app assets with speed and security
- Test Lab for Android**
Test your app on devices hosted by Google

Figure 3.16: Firebase Features

Firebase was highly praised for its ability to effortlessly allow creators to test and develop their apps. Its quick and efficient features were very appealing to the team since it allowed them to develop the necessary functions we required for the app. Firebase would have enabled us to include a login authentication prompt for the users to register to prior to using the app. This was a crucial part, especially since we planned to test the app with a small group of people before releasing it to the entire student body. Another component that Google Firebase promotes is the use of its Cloud feature, addressing that all informational data would be more safe than if it was held in a physical server.

Easy to integrate on iOS,
Android, and the Web

Ship cross-platform apps with ease. Firebase APIs are packaged into a single SDK so you can expand to more platforms and languages, including C++ and Unity, with Firebase as your unified backend.



```
AUTHENTICATE A NEW USER
SWIFT OBJECTIVE-C JAVA JAVASCRIPT C++ UNITY
Auth.auth().addStateDidChangeListener { (auth, user) in
  if let user = user {
    let email = user.email
    // ...
  }
}
Auth.auth().signIn(withEmail: userEmail, password: password) { (user, error) in
  if let user = user {
    // ...
  }
}
```

Figure 3.17: Cross-Platform Application

One of the most valuable features of Firebase is that it gave the team the ability to easily create cross platform apps, which would allow our users to access SNAPP through iOS, Android, and Web-based platforms. This would reduce costs due to the fact that we would not have to purchase software and monthly/yearly memberships to create an app on each individual platform.

3.5.2.2 Development Complications and the Progress Made on Google Firebase

Originally, Lt. Bueno wanted to test the application during the term break between B and C term since SNAP will not be as busy with most students away on Spring Break, in order to train the dispatchers in a less stressful environment before the app goes live in D term. However, due to some setbacks in the production of the application regarding WPI application protocols, we were unable to have the entirety of the app ready by the end of C term. A meeting was set with WPI PD, the majority of WebTech Group members working on the SNAP App, and an IT employee in order to gain a full understanding of what WPI requires and whether we had permission to use Firebase to develop the app since it is for the WPI student body it had to follow WPI's protocols. By midterms of C term front end of the rider app was completed while using Firebase. Upon reviewing with ITS, in regards to obtaining CAS for the app as well as receiving approval for the development of the application using Firebase servers, the IT representative informed us that we were not permitted to use Firebase. Since Google Firebase holds their data in servers within and outside of the US, WPI had concerns using using them especially in this case that student information would be acquired and stored. Firebase cannot guarantee that all data will be held within the United States, so their methods would be inconsistent with WPI policy and best practices. Upon receiving the news that the application had to be redone to fit the rules and regulations of WPI, meetings had to be held immediately with IT Information Security to ensure

that the application was recreated using the proper software and to discuss the app's database. It was recommended to utilize AWS instead to develop and manage our application.

3.5.2.3 Our Solution to Development Complications

During the final term of the IQP project we focused more on terms, policies, and ensuring that we were making the correct transition from the Firebase to AWS according to WPI's rules and regulations that involves students information. We first met with IT to discuss Firebase usage as well as using CAS identification simplifying login certification since it already used by WPI applications we wanted to implement it to ours. Our advisor Professor Ciaraldi, who reached out to Patty Patria, Vice President for Information Technology and CIO, in order to gain a further understanding of AWS and the relationship/contracts that WPI has with the platform. Patty then referenced us to other members of the IT team, Siamak Najafi, Sean O'Connor, and James Kingsley, who informed Professor Ciaraldi that a campus wide academic agreement with AWS was signed by Siamak which would allow faculty and students to use the services free of charge up to a certain level. Throughout their interaction James thoroughly explained the difference tiers and aspects of the WPI contract with AWS and what would be available to use. However, for the time being the WebTech Team will continue to transition and develop the SNAP Application using AWS.

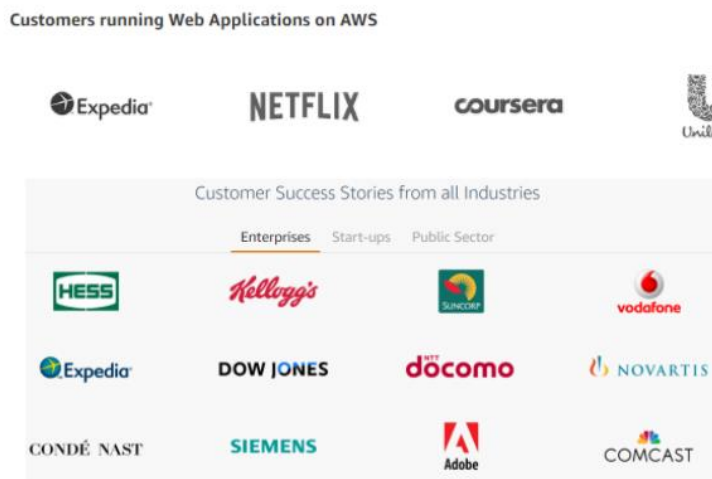


Figure 3.18: Trusted Companies that Utilize AWS

Similar to Firebase, AWS is well trusted by reputable companies from a variety of industries ranging from Netflix that is used by 125 million users worldwide to Expedia, a global travel company, that holds the information of hotels and airlines.

Explore Our Products

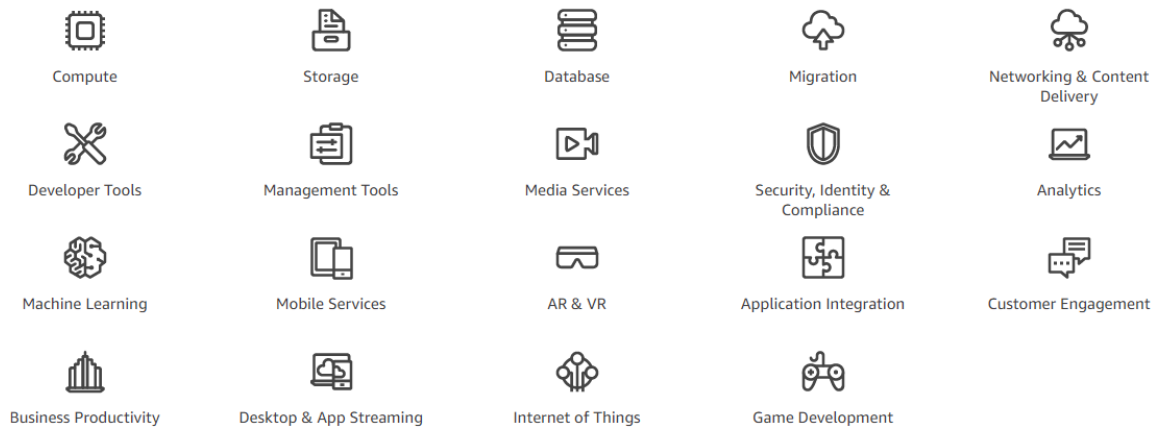


Figure 3.19: AWS Available Features

Amazon Web Services has a plethora of features that would help the construction of “sophisticated applications” and cater users with a wide variety of functions that would enhance their new or current technological project. Products such as Cloud Migration, Database Servers, and Desktop & App streaming would prove to be very useful for the production and development of the application. Unlike Google Firebase AWS allows you to specify in what country the databases that serve an application are located. This is ultimately what required us to use AWS as any and all student and university information must be handled by requirement of WPI within databases located in the United States of America.

3.6 Legal Documentation

When creating an application that offers a service to external users and collects user data, it is crucial to create explicit documentation that outlines precisely how the application handles user information and the terms by which the user must abide to utilize the service. This protects the intellectual property of the application, its users, and its developers and service providers from inopportune incidents. For example, if a SNAP Van were involved in a car crash, the repercussions and actions that take place after such an event would be specified to indicate where liability would fall and how WPI would handle damages. Given the above arguments our team decided to develop two legal documentations for the SNAPP: a Terms of Use - outlining the proper usages by users of the application and SNAP service, and a Privacy Policy - which outlines precisely how the SNAPP App utilizes and stores user data.

3.6.1 Consultation from the General Counsel - Representing WPI

When beginning the development of these two documents we identified that as SNAP is a WPI-owned service, it was best to first consult with the university’s general counsel. Representing a portion of the university, it was important that our terms of use and privacy policy made use of

professional practices and included details pertinent to the universities standards. To ensure these standards, our team met with Jeffrey Snider, Senior Counsel of the WPI General Counsel. During these meetings, several interchanges were made concerning the ownership of the application, its purpose, and more. The most important lessons we received from him however, were the purpose and importance of a Terms and Conditions Agreement uniquely for our application, the need for a privacy policy, the importance of how each document should be displayed to the user, and the means by which the user accepts them. Upon mentioning this meeting to Lt. Bueno she was insistent about being sent all information directly to her regarding everything we discussed with the Lawyer as well as including any questions and answers we received from him. She also required that all Disclaimers and Terms and Conditions should be approved by her first. In turn we set up a meeting with both Jeffrey Snider and Lt. Bueno to discuss the legal portion of the application. We presented out current rendition of the restrictions and disclaimers in which Mr. Snider suggested that we focus solely on the restrictions and disclaimers for SNAPP and not the SNAP Service since they must have their own. In which he asked Lt. Bueno if the rules and regulations and restrictions/disclaimers were made public to the student body in which case she said there was just protocols set by her for the SNAP employees but nothing public for the entire student body. They held their own private meeting to discuss this issue and create the legal documents for SNAP Services. In regards to our Privacy Policy, Mr. Snider stated that since this application will go under WPI's name we should reference WPI's privacy policy and include within ours a similar format.

3.6.1.1 Importance of Terms of Use Document

A Terms of Use document specifies all rules the users must agree to abide by prior to using the service. This document is largely for the purpose of protecting its institutor from lawsuits developed under situations such as if someone were to be harmed or if their information, protected by the institutor, were to be stolen from unauthorized third parties. It should cover:

- Things that can go wrong when utilizing the service.
- What should happen in the event something does go wrong and who would be at fault.
- What is expected by users to maintain proper order and function of a service.
- What is expected of the service provider to maintain proper order and function of the service and the security and confidentiality of the users.
- Disclaimers of data inaccuracies or potential faults within a service and guarantees that cannot be made.

Note that similarly to the Privacy Policy, described below, a Terms of Use is not required of a service provider for their services to be offered. However for the SNAPP application, if in the event something does go wrong, for example if someone were to hack into the application's databases and user information was stolen, liability would fall naturally on WPI. As the owner of the application WPI could also face legal charges that could have been avoided by protecting itself with terms agreed on between them and a user.

3.6.1.2 Importance of Privacy Policy

A Privacy Policy is a document often paired with a Terms of Use that discloses all the ways a service provider gathers, uses, manages, and distributes a user's information. Even if the collected data is something seemingly minor such as a user's habits on when they utilize a service, it is important to detail if and how this information is used as it is all considered personal information. Understandably, what constitutes personal information can vary depending on the context by which the information is considered; with that prevails a "gray area" of what should be included in a Privacy Policy. Below is an excerpt from the U.S. General Services Administration's (GSA's) website on what constitutes personal/personally identifiable information:

"Personally Identifiable Information (PII)... refers to information that can be used to distinguish or trace an individual's identity, either alone or when combined with other personal or identifying information that is linked or linkable to a specific individual. The definition of PII is not anchored to any single category of information or technology."

In essence, information such as when and where a user was picked up (in the case of the SNAPP App) is considered personally identifiable information especially as it is linked to WPI's Central Authentication Service (CAS), a technology used to organize and collect user information for members of the WPI community including name, date of birth, and more.

Another large reason to have a Privacy Policy is to meet legal policy. Many laws are in place that restrict services from performing certain practices such as distributing user information without that user first agreeing to it. One such is COPPA or the Children's Online Privacy Protection Act which "imposes certain requirements on operators of websites or online services directed to children under 13 years of age...that have actual knowledge that they are collecting personal information online from a child under 13 years of age" as specified by the Federal Trade Commission (FTC). Under this law there are restrictions for the use, collection, and/or disclosure of child information. As there are generally too many laws to attempt meeting, a rule of thumb specified by Jeffrey Snider was to precisely detail how ALL information is collected and used, and why in attempt to cover "all bases" where lawsuits could be generated through any information use practiced by SNAPP.

Given the arguments above we would need to include in our privacy policy:

- Information the SNAPP App collects from the user:
 - Pickup location
 - Transport location
 - The number of passengers in their party
 - Any additional information they provide
- How the above information is used.
- A statement on how the SNAPP App and its operators will not distribute the above information (unless required by law).
 - This is mainly due to the overhead by the WPI Privacy Policy where no user information is shared to third parties.
- A statement on how the SNAPP App does not intentionally acquire child information and how this situation would be handled.

- As many individuals of young age attend WPI it is important that we specify that the application is intended for the use by members of the WPI community exclusively and as such any and all child information collected falls under the overhead provided by the WPI Privacy Policy and its policies.

3.6.2 Analysis of Lyft's Terms of Use and Privacy Policy

Although SNAPP is not a peer-peer ridesharing service such as Uber or Lyft, it holds similarities with these applications due to its purpose and function, to transport users from one location to another upon request. Because of this, we began our research by looking into the legal documentation provided by Lyft to discover how they format their terms of use and privacy policies, and what legal topics they cover within those documents.

Upon first look of Lyft's terms of use, we notice the entering paragraph is one that serves to identify themselves as the issuer of its terms discussed in the document: "Lyft", "we", "us, and "our". This is done to ensure to whom a term or clause applies within the legal document. This piece is then followed by the following statement:

"By entering into to this Agreement, and/or by using or accessing the Lyft platform you expressly acknowledge that you understand this Agreement ...and accept all of its terms. If you do not agree to be bound by the terms and conditions of this Agreement, you may not use or access the Lyft Platform."

This is perhaps the most important specification of the whole document. If Lyft did not explicitly state the means by which an individual agrees to the terms (be it by acceptance of agreement or access of the platform) and a user somehow gained access and utilized the service without first agreeing to them, the terms and conditions would become null and leave them defenseless in the event of a lawsuit brought upon them by a user. From this point onward the document is divided into several sections that specify various topics such as restricted activities, confidentiality, communications, and eligibility. Of all of them, the sections we believed were most applicable to a SNAPP Terms of Use were:

- Section 1: The Lyft Platform
- Section 2: Modification to the Agreement
- Section 3: Eligibility
- Section 6: Lyft Communications
- Section 7: Your Information
- Section 9: Restricted Activities
- Section 11: Intellectual Property
- Section 12: Disclaimers
- Section 15: Limitation of Liability
- Section 18: Confidentiality
- Section 21: General

In Section 1: The Lyft Platform, Lyft describes who they are as a platform and how Lyft is “A marketplace where persons who seek transportation to certain destinations... can be matched with persons driving to or through those destinations”. Additionally they specify that “*Any decision by a User to offer or accept services is a decision made in such User’s sole discretion. Each transportation Service provided by a Driver to a Rider shall constitute a separate agreement between such persons.*” Simply put, Lyft is not a service that provides transportation, they merely negotiate the offer of transportation services between individuals. Here lies a large similarity between SNAPP and Lyft. The SNAPP app serves only to provide an alternate and increased means of communication between student riders and SNAP service operators. It does not provide transportation services and this is a grand distinction that we must specify in our terms of service as any lawsuits users would wish to bring to SNAPP would have to be coordinated and processed through them and WPI.

Section 2 discusses the procedure for any modifications to the Terms of Use. Here they describe “*In the event Lyft modifies the terms and conditions of this Agreement, such modifications shall be binding on you only upon your acceptance of the modified Agreement. Lyft reserves the right to modify any information...from this Agreement from time to time, and such modifications shall become effective upon posting.*” A guarantee that we must provide then, like Lyft, is that SNAPP reserves the right to modify the terms of use and make them effective upon doing so. However, one thing we must do, is ensure that users agree to any terms that are modified, possibly by withholding app operation from a user until the terms are re-accepted.

Section 3 of Lyft’s terms is eligibility. Here Lyft states that the platform is only available to individuals who are adults and those who can form legally binding contracts under applicable law. Furthermore, they describe that by becoming a user you state that you meet the requirements of being “*at least 18 years old and that you have the right, authority and capacity to enter into and abide by the terms and conditions of this Agreement.*” Since SNAPP is ultimately owned by WPI, we must approach eligibility under the terms of the university. Instead of reserving the application to those 18 and over, we reserve the application for all registered members of the WPI community. Additional restrictions based off circumstances such as age would fall under specification by WPI as they, through being a university, maintain members of many ages and occasionally those under 18. As such separate agreements are made for those part of and affiliated with WPI.

Section 6 of the Lyft terms is a description that by using the Lyft Platform you agree to receive email, text, call and push notifications regarding situations such as updates on the service, changes to the terms, and details of ride requests. As of now , the SNAP service sends out emails regarding the status of the service and whether it will be running due to inclement weather. For SNAPP, we plan to initially make communications strictly internal to the app for our users. In app notifications will be available to describe the service load and whether a submitted request was accepted or rejected.

Section 7 titled “Your Information” describes that any and all information provided by the user to the Lyft platform and other users within the application is strictly their information. Additionally, users must consent that any information provided will be used to create a user account to allow use of the platform, as stated in the privacy policy. Due to the SNAPP App

utilizing the WPI Central Authentication Service (CAS) to retrieve and access user information, we would need to state that the user must abide by the CAS terms in addition to WPI user information terms, likely represented by a link to these documents. As WPI owns SNAPP, the university's terms and privacy policy serve as parent to the application's and are essential to include.

Section 9 describes all restricted activities related to use of the Lyft platform; users cannot sell their accounts, stalk, threaten, or harass any other users and more. As mentioned previously, SNAPP will be made distinct from the SNAP service, in that it is a separate entity strictly for the purpose of communicating with the service. Per request of Lt. Karen Bueno and Jeffrey Snider of the WPI General Council, this section must include restrictions of activities specific to use of the application. Such terms⁸ would include:

- Modification and reverse engineering of the application.
- Renting, loaning and/or selling your account information to any other parties.
- Posting, emailing, or otherwise transmitting any malicious code, files or programs designed to interrupt, damage, destroy, or limit the functionality of SNAPP services or databases.

Section 9 describes the intellectual property of Lyft. Here they state that all Lyft platform property “*shall be owned by Lyft absolutely and in their entirety*”. Again, as SNAPP will be WPI-owned, it is here that we outline that all source code, graphics, and other property developed for SNAPP is the exclusive property of the Worcester Polytechnic Institute.

Section 12 details all disclaimers Lyft makes concerning their application and platform such as:

- Who the disclaimers apply to.
- What service they provide (a peer-peer ride sharing platform; they do not offer transportation services).
- Any non-guarantees that exist with the service (like SNAPP, that estimated times of arrivals or queue positions may be slightly inaccurate to the current situation).
- The responsibility of users when using the application that their human interactions are with other users and not Lyft (in our case then human interactions occur between users and the SNAP service and not the application).
- Submitted information is not protected or safe when shared between other users within the application (for example rider to driver information).
- Lyft is not liable for cellular costs for usage of the application.

In essence, here is where we must identify that the SNAPP app exists as a separate entity from the SNAP service in addition to any areas of disclaim where we cannot make guarantees to the user such as fully accurate estimated times of arrival. We may also add here that SNAPP and its developers cannot be held at fault for any potential issues experienced with usage of the SNAP Service itself or be held responsible for the loss of information or harm due to hacking and costs of usage.

⁸ For the terms and conditions created, visit appendix I.

Section 18: Confidentiality, describes how users must agree to protect the technical, financial, strategic, and other proprietary and confidential information concerning the Lyft platform and its operations that is made available to them during their use and experience with the application. Additionally and in summary, this section covers the methods by which users must not make attempts to disrupt the the service, its properties, and intellectual property in release to the public domain.

Section 21: General serves as the closing section to the Terms of Use and offers a final means of contact for any additional information or assistance regarding the terms of service and any agreements set forth within it. Although the app will be WPI owned, the information provided here will be the SNAP service liaison as they are the individual responsible for the representation and management of SNAP. Additionally, the section finalizes the understanding and agreement between the user and Lyft (riders and SNAP) of all terms outlined.

3.6.3 Application Layout - Agreeing to Terms and Presenting Ownership

In this section we describe the legal design decisions made on the layout and appearance of the initial sign-in process for SNAPP and its user interfaces. The method in which users may agree to the Terms of Use and Privacy Policy of SNAPP and how WPI ownership of the application will also be discussed.

Prior to their first use of the application, it is important that SNAPP App users agree to the Terms of Use and the Privacy Policy supplied with it. This, in turn, protects WPI from any potential lawsuits that derive from usage of the application and the SNAP service. As recommended by Jeffrey Snider, the following process will be used to ensure that users agree to the application terms: After using WPI CAS to sign into their WPI account, users will be redirected to a page informing them that before accessing SNAPP, the individual must agree to the Terms of Use and Privacy Policy displayed on the page. This will be followed by a disclaimer stating that the user can accept the terms at the bottom of the page subsequent to reading them.. The purpose of this is to represent that all steps were taken by WPI to make sure that users of SNAPP had all ability to view and agree to the terms specified for use of SNAPP. If the user decided to agree without first reading the terms, WPI can no longer be at fault for any lawsuits brought against them.

To distinguish WPI ownership of SNAPP, and to prevent copies of the application by third parties, we have decided to place a copyright notice at the bottom of each user interface for the student rider portion of SNAPP. This will not be done for the dispatch interfaces as those are all used internally and will not be revealed or shared with the public.

4 Findings

Initially, we had reserved D term to test a completed prototype of the application and observe its effect on dispatch procedures and rider satisfaction and whether riders felt it improved communication between them and the service. However, the development of the application was unable to be completed by the end of the year. To compensate for this, we improvised by creating an advertisement of the application interface for the rider that had been developed so far as a final product. This was shown at the beginning of the rider survey along with a brief explanation on the purpose of the application and survey. To collect data for this survey, we sent a google link via email to WPI students as well as collected participants in person.

Since the dispatch interface has not been developed, we had a separate solution for this survey. To introduce the survey for SNAP employees, we gave a descriptive run through of all user interfaces designed for the application. Upon gaining Lt. Bueno's approval on all survey questions and descriptions, the survey was sent to employees via email through Lt. Bueno.

4.1 Rider Survey

To collect the opinions of fellow SNAP users, we constructed a survey consisting of a variety of open-ended and closed-ended questions following an introductory description and informational video. The intention was to not only collect data relevant to our application, but also receive suggestions from colleagues as well as recruit students for testing and application development purposes.

4.1.1 Introduction

To introduce the application to students, we first gave a brief explanation of the app and survey. It was expected that the participant would thoroughly read this description to assist in clarifying any misconceptions. In retrospect, we should have given more detail in our inquiries or included a question solely for the purpose of assuring that the student had informed themselves. This realization came from the numerous responses that lacked insight of the information given in the description below.

Please watch the video provided before starting the survey.

Our team is working alongside the WPI Police Department to develop a web-friendly application for SNAP services and want your opinions!

This survey only concerns the Rider interface of the platform. There is a separate application for the Dispatchers, and a separate survey for them.

We have not been granted permission from the WPI Police Department to implement GPS tracking, therefore have had to create an application that does not involve this feature for the initial phase.

Keep in mind this is the first phase of this application, so our primary focus was to accomplish the basic functionalities of the application. We plan to add much more features after launching the first phase.

If you have any questions during this survey please feel free to ask one of our team members!

Assuming the passage above was read, the student was now prepared to watch the video made for this survey. This video advertised the first working prototype of our rider application. After an amusing introduction displaying the various application name ideas, the video presented the request screen, menu options, shuttle schedule, and SNAP schedule within the application. Lastly, the video mimicked the process of submitting a request.

Question One

How often do you use SNAP? *

- Once a week (or more)
- Once a month
- Once a year
- Once
- Never

Figure 4.1: Rider Question One

The first question was intended to get a better understanding of how many students are currently utilizing this service.

How often do you use SNAP?

70 responses

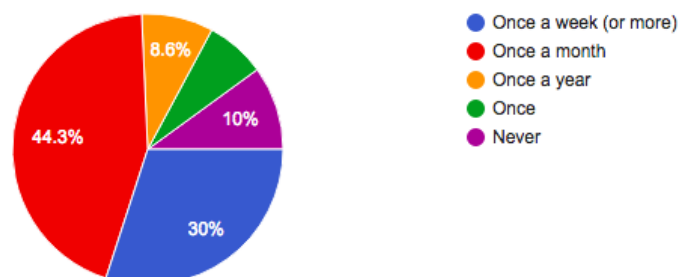


Figure 4.2: Rider Question One Data

These results were similar to our expectations, showing that approximately 75% of students utilize this service. This information was also helpful at better understanding results in the following questions.

Question Two

Do you see yourself using this application? *

Yes

No

Figure 4.3: Rider Question Two

The second question was to extract an approximate percentage of students interested in this application. Furthermore, when compared to question one, this data shows whether or not more students will be utilizing this service.

Do you see yourself using this application?

70 responses

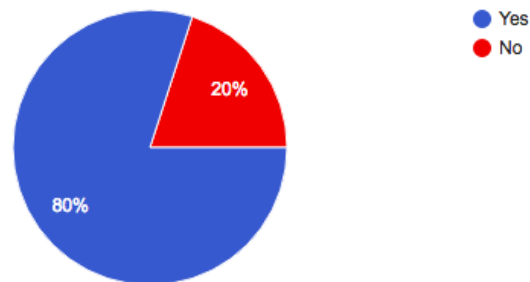


Figure 4.4: Rider Question Two Data

The responses predict that there will only be a slight increase in students that use this service. As shown in the figure above, 20% of students expressed that they do not plan to use this application. In the data from the first question, it shows 10% of students do not use SNAP, 7.1% of students have only used the service once, and 8.6% use it once a year. Therefore, approximately 25.7% of students rarely request rides. Comparing these results, it is possible that this 25.7% encompasses the 20% of people replying no; showing that there would only be a 5.7% increase. An increase this minimal could arguably never be problematic for SNAP services due to the decrease our application will have on no-shows.

However, unfortunately that is a large assumption. This prediction would have been stronger had we included two separate options for “no”. One as, “No, I plan to continue calling in my requests.” and “No, I do not plan to use this service.”. The additional options would give more

accurate data, therefore moving forward we plan to implement these newly observed techniques to improve our survey results.

Question Three

Would you prefer using this web-app over calling in a request? *

- Yes
- No
- I would most likely be using both interchangeably.
- Other...

Figure 4.5: Rider Question Three

This was essentially a more detailed version of question two which sought to determine if, under the assumption that a user were to consider using the application, whether they would prefer making a phone request instead.

Would you prefer using this web-app over calling in a request?

70 responses

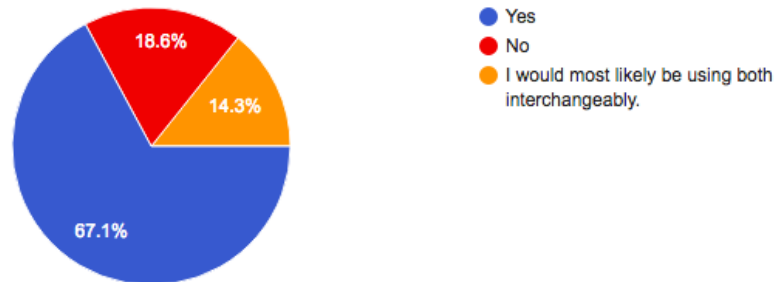


Figure 4.6: Rider Question Three Data

We were interested in how students felt about the app in comparison to the current system. Judging by our results we can say that most students would prefer to use the application as opposed to making phone requests, potentially driving all request traffic through the SNAPP platform.

Question Four

On a scale on 1-10 how necessary do you believe a downloadable application * would be over a web application?



Figure 4.7: Rider Question Four

This question was geared towards the future phases of the application. At the beginning stages of this project, our team envisioned creating a phone application for SNAP. However, due to the monetary budget of the service, in addition to other reasons, this goal was unattainable. Further down the road, it is expected that a downloadable app will be developed alongside our web application, therefore these results were to establish the priority of this addition.

On a scale on 1-10 how necessary do you believe a downloadable application would be over a web application?

70 responses

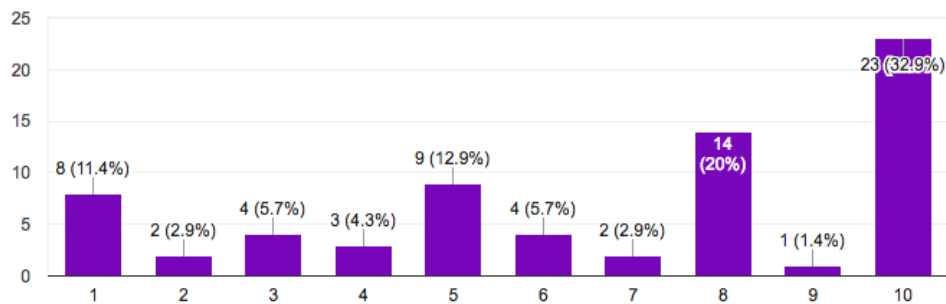


Figure 4.8: Rider Question Four Data

Prior to the survey, a downloadable application was low on our priority list for this project. After viewing that 62.9% of students were favourable of a phone application, we feel this may be a bigger priority than expected. This data will be brought to the attention of the students who participate in the MQP for this project to express the importance of this addition.

Question Five

What do you think our web application should be named? *

- SNAPP
- SNAP App
- SNAPPLICATION
- SNAPPEI (Get it? Like Gompei...lol)
- Snappy
- SNAPAPA
- Snapper

Figure 4.9: Rider Question Five

While considering potential names for our application, we decided it was best to obtain the opinions of our users.

What do you think our web application should be named?

70 responses

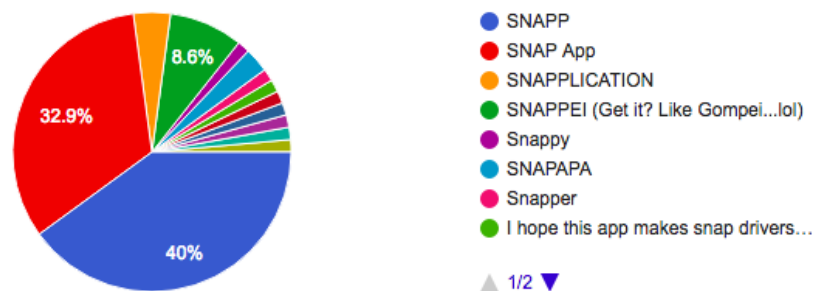


Figure 4.10: Rider Question Five Data

Our results finalized our decision to name our application “SNAPP”, being the leading option.

Question Six

On a scale of 1-10, how easy do you believe this would be to use? *



Figure 4.11: Rider Question Six

One of our goals when developing this application was that it was quick and easy to use. Therefore, we wanted insight from the application’s prospective users on whether they felt we had reached this goal.

On a scale of 1-10, how easy do you believe this would be to use?

70 responses

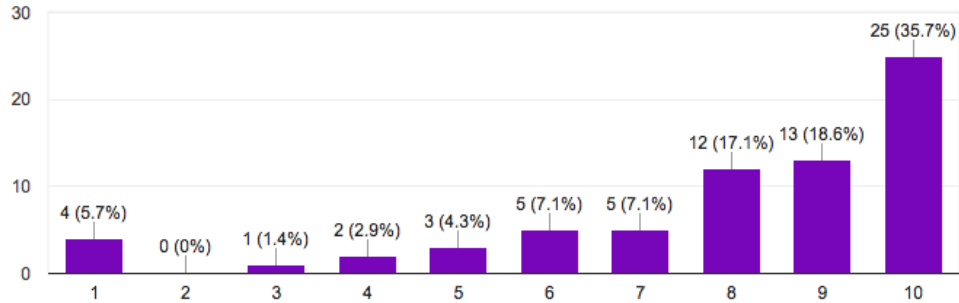


Figure 4.12: Rider Question Six Data

Approximately 71.4% of participants felt our application seemed easy to use, this reassured that our application was headed in the right direction.

Question Seven

Do you have CS experience and would like to join the SNAP App team? Or would be interested in taking this project on as an MQP? (We have professors interested in advising this project, all that's needed is some dedicated students!) Please leave your email in the response if this applies to you!

Your answer

Figure 4.13: Rider Question Seven

This question was not required, however we felt the survey was a good way to recruit for our team. We were able to obtain a surprising amount of eager students, varying in experience, offering their assistance in the development and maintenance of this application.

Question Eight

If you would be interested in participating in testing this application, please leave your email below. (Must be on campus for the academic year of 2018-2019)

Your answer

Figure 4.14: Rider Question Eight

Much like the question above, the intentions of Question Eight differed from the majority of the survey. Approximately one third of participants expressed their interest of participating in testing this application.

Question Nine

Do you have any questions/concerns regarding the web app? If you would like an emailed response, please leave us your email in your answer.

Your answer

Figure 4.15: Rider Question Nine

This question gave our participants an opportunity to voice their personal opinion about the application. Although optional, students gave a lot of feedback within their responses. However, unfortunately 10 out of the 12 responses were inconsequential due to the participant having lacked or incorrect information.

One accepted response mentioned having optimal routes for SNAP employees. We feel this should definitely be implemented, but it would only be applicable for the co-pilot application. Therefore, it will be mentioned in our product specifications and this feature will be considered for added in future phases.

Another student asked, “Would there be any difference in wait time for students who request a SNAP ride by call or by app?”. To this, we responded no, app requests will not have priority over phone requests.

Question Ten

Is there any additions to the application you would really like to see? (That we most likely have not already considered/plan to implement)

Your answer

Figure 4.16: Rider Question Ten

Similar to the problem that surfaced with question nine, most responses for this question were not applicable in our data. Since the participants were unable to first experience the application and impact this will have on the service, most responses shared concerns unrelated to our project.

4.2 SNAP Employee Survey

To obtain the opinions of SNAP employees, we sent out a survey via email through Lt. Bueno. This survey was composed of an introductory paragraph, the UI designs for the dispatch application, two closed-ended questions, and three open-ended questions. Each question was designed with the intention of avoiding any potential biases for the participant, especially keeping in mind the results of the rider surveys. However, we still expected altered results due to not having an accessible prototype. Since we were unable to launch the application for testing purposes to a select group of students, employees were not able to have a complete understanding of our application prior to this survey.

4.2.1 Introduction

The purpose of the first section of the survey was to introduce the participant to the dispatch application to the fullest extent, while lacking a prototype. Following the student survey, we realized the extreme importance of acknowledging the improvements the application will have on the service in the introductory description, as shown below:

Our team is currently developing an application platform for SNAP services that aims to offer riders an additional means of requesting SNAP transportation and simplify and encourage them to cancel their requests when they no longer wish to receive transport. With this platform we are developing a dispatch interface that aims to replicate current dispatch procedures and be as minimally intrusive to the current ride handling process as possible; while providing an additional set of features for storing and viewing historical request data.

Below is the current UI for the Dispatch interface, we would love to hear your thoughts and opinions on this system's design.

Defining the benefits of the application was meant to relieve the participant from any negative predispositions regarding an application for SNAP services. Students in the past have made such applications with minimal consideration for dispatch and the intentions of this service. Thus, we kept in mind the possibility of employees entering the survey with false beliefs of our objective. With this description being the first thing seen after clicking the link to the survey, we hoped that most students would read through the passage. However, upon reading the responses, it was evident some disregarded this description. After the participant completed reading this passage, they were instructed to view the designs made for the dispatch user interface, included with text. This allowed the participant to experience a narrative flow of the application to reference while completing the survey.

Question One

Noting that the goal is to replicate the current dispatch procedure, would you prefer this over the current paper system used by dispatch? *

- Yes
- No
- Other...

Figure 4.17: Dispatch Question One

Question number one was intended to be a straight forward simple question to ask in order to gain a grasp of the SNAP Employees opinion on using an electronic system rather than the current paper system that has been in place since the beginning of the service. Being a technology immersive university and the fact that the entirety of SNAP employees are young students, we expected the votes to be unanimously in favor of the creation of the app however that wasn't the case. The current responses tallied up to 55.6% of people to preferred the current paper system while only 44.4% of the responses preferred upgrading to an electronic system.

9 responses

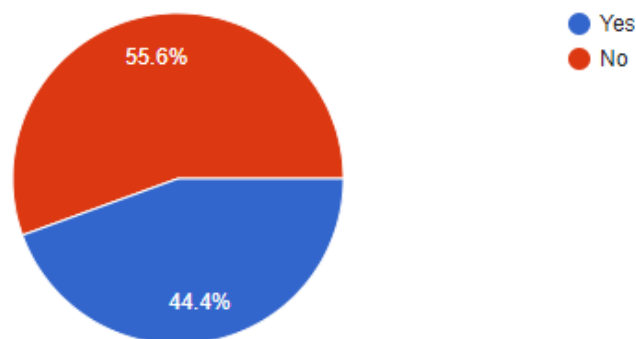


Figure 4.18: Dispatch Question One Data

As the votes were coming in we noticed an interesting pattern. Whenever an employee would vote yes, it was followed by positive reinforcement but not much contribution was done to the open ended section of the survey. We were able to make this observation by keeping track of each tally as they were individually coming, which wasn't a difficult task since we only received nine responses. A function within Google surveys allowed us to anonymously but individually trace each response. Upon further analyzing the responses, the participants who gave an initial negative review to this question also negatively answered the following questions. Meaning they began answering the survey with a previously negative misconceived notion that the app would not be a good idea and would hurt the service rather than help and that in turn affected their responses. Another greatly influential factor that affected our results was the small group of

participants that responded to the survey and even smaller were the participants that effectively went through and answered all the questions included the open ended ones. In total only nine responses out of the approximate 15 current SNAP Employees responded to our survey, which is unfortunate due to the fact that it takes so little to affect the results, such as in this case where it may seem that the greater majority do not want to partake in the transition from a written system to an electronic. However, in actuality only five people were against it and four people were in favor, meaning it only took one person to sway the ballot to display a negative result. Furthermore, it is also vital to address that only half of the SNAP Employees responded to the survey making the results misleading since it does not fully represent the views of the entire SNAP workforce, just of those who bothered to fill out the form.

Question Two

On a scale of 1-10, how easy do you believe this would be to use? *

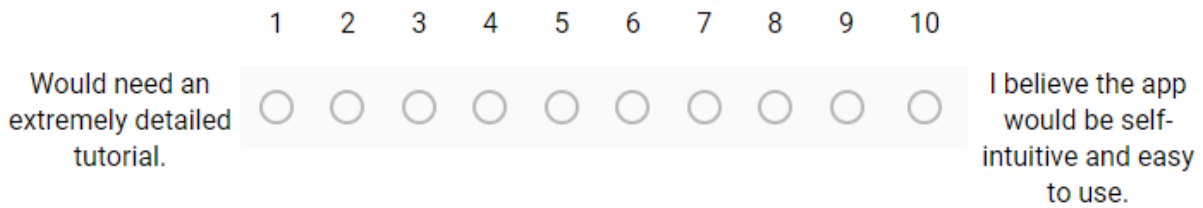


Figure 4.19: Dispatch Question Two

Question Two was asked to find how easy did SNAP employees believe the dispatch application would be to use given the interface walkthrough discussed previously. This primarily served to see whether or not we had designed the interface and its functionalities in a way that made sense to the employees and whether or not it fairly represented their paper procedures. Below is an image of the survey results.

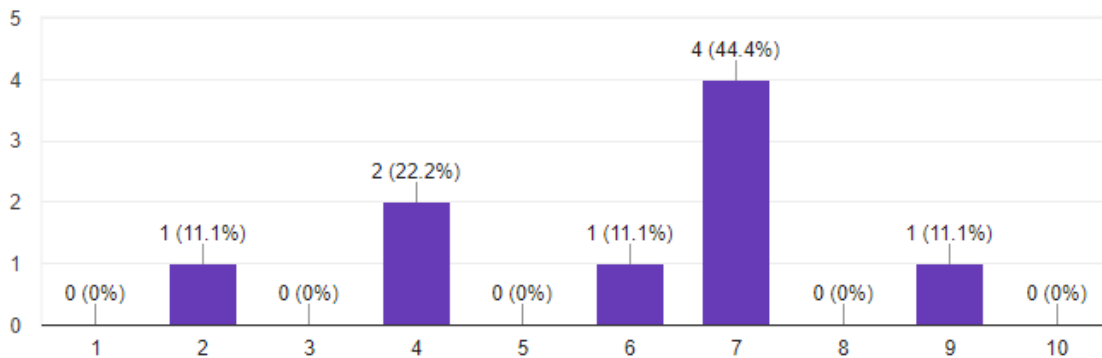


Figure 4.20: Dispatch Question Two Data

Given the results six out of the nine employees believed that the application appeared “easy to use”, indicated by their responses number greater than five on the response scale. However despite this fact we recognized that nearly half of the participants felt the interface did not seem easy to use and would require a tutorial. Given this the application would need to be supplied

with some form of tutorial for use that goes through how the application works, what are its features, and what an individual could expect from an action. This is similar to the use case specifications discussed in Section 3.5 and in fact serves as a good example for creating the tutorial.

Question Three

The icons in the bottom right corner of the images above represent GoogleMaps, Archive, Sign out, and vehicle maintenance. Are there any other interfaces or functionalities you would wish to utilize during a dispatch shift? *

Long answer text

Figure 4.21: Dispatch Question Three

Question Three was inquired to see what features SNAP employees would like to have within the application in addition to what has not been already provided. As noted in the question several features have already been considered such as accessing Google maps and states that their icons can be found at the bottom right of the dispatch interface.

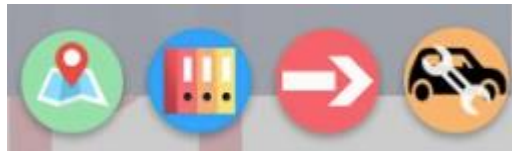


Figure 4.22: Dispatch Interface Feature Icons

These features were designed to be implemented given our observations of SNAP procedures and features the SNAP liaison desired to have. As this was an open-ended question intended for customer participant input we will mention constructive responses here. Note that the full responses can be found in appendix F.

There should be an option to get in contact with campus police dispatch for emergencies

Figure 4.23: Dispatch Question Three, Response One

One of the features a student gave was to have a button where dispatch could alert the campus police department in the event of an emergency. While we definitely feel this would be a fair addition to make to the application, we question the necessity of it as at the moment the SNAP dispatch is located within the WPI police department where police dispatchers are actively nearby. Nonetheless we see a benefit to having such a feature as it allows SNAP dispatch to contact the campus police without disrupting their work. Considering the potential sensitivity of this, it would be an addition to first confirm with the SNAP liaison as to whether it may be implemented.

Employee sign in

Figure 4.24: Dispatch Question Three, Response Two

Another feature a few participants inquired for was a sign in button for logging in. As mentioned in Section 3, this is a feature that will already be implemented using WPI CAS. However, we realize that this is an area where we did not specify how dispatchers would sign in to the application (and their shifts). This is a common issue that propagated through multiple survey responses and will be discussed further below.

Question Four

Are there any additions to the dispatch interface you believe should be added?
(That we may not have shown to implement based on what we have presented)

Long answer text

Figure 4.25: Dispatch Question Four

The intent of Question Four was to gain further insight for the Dispatch Interface from the Dispatchers. Within the web application we planned to implement a variety of necessary features to the dispatch interface that enables them to complete their current SNAP procedures as well as additional helpful components that would further enhance their work experience. The UI shown to them was previously approved by Lt. Bueno and it was ensured that the added components followed SNAP's work protocol. However, we wanted to get the input of the employees on any other additions they would find useful in the app.

I have considered a dispatch interface in the past. The right hand side of the screen should have different sections that are divided up by van for easy viewing and dispatching. Similarly, in the vans themselves there should be a tablet/app on employees' phones that can clear the calls for the dispatch interface. Also, we sometimes need to reference cleared calls. Will there be an option to do so?

Figure 4.26: Dispatch Question Four, Response One

Further down the road, we wish to implement a mobile app within the vans', this feature is specified in our product specifications, however due to budgeting reasons, we cannot add this interface quite yet. Addressing the commenters concern with being able to reference previously cleared calls, this can be accessed by clicking the "Three Binders" icon to the right on the bottom right of the screen. This will bring the user to the archive, completed requests in the archive can be edited or brought back for a specified duration of time, as well as review total data analytics such as No Shows, Cancellations, and Completed rides.

Immediate access to typing in a text box rather than having to click and add new entry

Figure 4.27: Dispatch Question Four, Response Two

We took this idea into consideration, however we felt due to the number of entries per request and for better organization, to enter a phone request it is best to use an "add" button. Although, upon further considering the idea, we came up with an alternative solution to have a keyboard shortcut to enter in requests manually. For reference, our data showed that given our sample proportion, approximately 67.1% of students plan to use this app over calling in, 14.3% plan to

make both phone and app requests, and only 18.6% of students would prefer calling in a request. Therefore, it is to be expected that only a small fraction of requests will be manually entered.

It'll be easier if number of transports in an entry field. While we don't transport more than 5 at a time, often on weekends we'll get calls for more than 5 and have to assign it to multiple vans or have one van make a double trip. Have the calls labeled for being in app and by phone. That way if snap is cancelled due to weather conditions during a shift, calls can be canceled to the people with the app, as they will get notified, reducing the time a vehicle is forced to drive in dangerous conditions. Also give the app the ability to deny locations that people enter that Snap doesn't transport to and from. Do this by checking the locations they have entered to see if they are outside of the radius or not and if it's an approved location or not.

Figure 4.28: Dispatch Question Four, Response Three

Question Five

Do you have any questions/concerns regarding this new system? If you would like an emailed response, please leave us your email in your answer.

Long answer text

Figure 4.29: Dispatch Question Five

The final question of the survey released to SNAP dispatchers asked for final thoughts on the application as it was presented. This is where we received descriptive responses and most importantly, feedback that indicated an issue in our presentation of the application to SNAP employees. One response, shown below, succinctly demonstrated the majority of concerns expressed by participants. As such, we created a response to the individual addressing the concerns mentioned and acknowledging the ideas presented for future versions of the application:

Dear Participant,

We understand your concern and respect your passion for this service, so in turn we would like to address everything brought up within your response. Below, we have copied and pasted your submission from the survey and have inserted detailed responses accordingly. We hope this eases any concern you have with this application. However, if you feel there is still something that needs further clarification or you have new feedback regarding the application, please email us at snapapp-igp@wpi.edu, and we will get back to you as soon as possible. Thank you for sharing your concerns, your input assists us in designing the application to best meet the demands of the SNAP team.

“Overall I do not think that SNAP as a service will work more smoothly with an application. My largest concern is that people would abuse the system. When requesting a ride from SNAP the dispatcher serves a valuable purpose, they can screen the calls and get more information.”

Although we cannot prevent users from abusing this system, just as they might have been prior to this application, all requests are not confirmed until being approved by dispatch just as they were for phone requests; that is so long as they do not meet automatic rejection conditions such as a destination being on a blacklist as described further below. The application for employees is not to replace dispatch, rather to digitize procedures, store data in a more organized manner, and ease the process of handling requests.

“From my experience driving and dispatching many students who utilize SNAP don't necessarily know the rules or intentionally try and circumvent them. I believe having a human element to the call accepting process is integral. For example if I were able to request a call within this app from Morgan Hall to 108 Grove St the system does not know that 108 Grove is a commercial location, or whether someone has called and requested to be taken to 108 Grove and been denied on the request and then immediately call back and request a residential address directly next to The Fix.”

With regards to individuals requesting to commercial locations, we have planned for this and will be implementing a “black list” of addresses to which when entered by users are automatically rejected by the application with a statement that “the entered destination is registered as a commercial location to which SNAP does not provide transportation to. If you feel this is an error or that the request is valid please email or call *the email and number requested by the current SNAP liaison.* Note that this blacklist would be strictly modifiable and visible to the SNAP team. Similarly, we hope to implement distance recognition within the application where if an entered address falls outside of the 100 Institute Road 1 mile radius the request is rejected and a message similar to that given above is displayed to notify the user that it is recognized as being outside the service area and to call if they feel this is incorrect.

“A second major issue that I see is the ability for people to spam calls that leads to the dispatcher having to manually go in and refuse the requests. It is far easier to refuse a request over the phone once and dissuade people from calling again with the request. For example people will request a call from 34 Institute to 17 Dean which is one door of Sigma Pi to another.”

Assuming the request has met the proper submission requirements, a dispatcher will always have the final say on whether to accept or reject a request. Dispatch is able to reject a request with just two clicks, one to target the individual request and a second click to reject. In the case of a user spamming the service we hope to prevent this from occurring taking the following precautions:

In order to use the app, students will have to login using their WPI email. Therefore, the app will record who made the request by linking the user's email to the request. This should discourage people from making phony requests or spamming the system since it would not be anonymous, unlike phone requests. You make a strong argument here therefore we will discuss with Lt. Bueno the idea of the app to begin automatically rejecting a user's requests after dispatch has previously rejected two requests within 20 minutes. If a person were to continue to make additional requests, the app would automatically block the person from using the app for a specified period of time. As well as prompt them to call directly to SNAP dispatch in the case they believe they are being rejected unjustifiably. For an example, the user might have accidentally made the request to the wrong place or did not know how to use the app properly.

In addition, no rider can make a request while one is being processed. If their account has an active request, the home screen will either be a “waiting approval” screen or “position in queue” screen. The request screen is inaccessible to the user through their account until the request is completed and sent to archive by dispatch.

“Within the system that is a valid request and if it takes no effort and there is no way to dissuade people from requesting that call repeatedly over the app. I think that an app would be helpful but this approach is not necessarily the correct one. I would love to hear your response to these issues.”

Thank you again for your feedback on the application and we truly appreciate your reaching out to us. If you have any additional comments or feedback please feel free to contact us at snapapp-iqp@wpi.edu and we will make sure to respond as promptly as possible.

Sincerely,

The SNAPP Team

Multiple other responses by participants, such as the penultimate one found in appendix F presented many points as well that seemed non-constructive although allowed us to identify that there were certain details we did not provide at the beginning of the survey.

“Anonymous SNAP requests through an app would also encourage transports that fall outside SNAP guidelines/rules.”

In the response above, the participant mentions “anonymous SNAP requests” that would be made with the rider application. As discussed in Section 3, SNAP requests from the application would not be anonymous as each rider would have to sign-in with their WPI username and password. Although not shown in the dispatch interface, user information would be attached to each of their requests, making app-made requests less anonymous than phone requests and providing campus police the ability to view this information within the archive when desired. Furthermore, the application would have an automatic ride rejection feature. In our design, the application would determine if a ride request is valid when compared against a set of preconditions prior to sending it to dispatch. If these preconditions are not met the app would reject the request and notify the user to why.

Considering the responses received⁹ in Question Five and the statements made previously for the discussion of Question One, we fear that the survey results may have been affected by undercoverage survey bias. In this form of survey bias, results are affected due to underrepresentation in the sample used to collect survey results. In our case, the current SNAP employee count is 15 employees. At the moment we have a total of nine survey responses which, as shown for Question One, created a divide in responses where nearly half of the participants were in favor of the application, and half was not in favor of it. Because of this we cannot conclusively state the desirability of the application for current SNAP dispatch employees from the survey alone. However, considering the strong interest by the previous and newly assigned SNAP liaisons, whom have worked with the service for a longer period of time than the employees, it seems there is a strong desire for this application regardless of our survey results. A refinement in procedures such as digitizing them and adding features to increase the amount of data associated with each request, will cause for an immense improvement in SNAP service procedure. This points to a strong need for an increase in communication between riders and SNAP dispatch which we have attempted to create in the design of this application. Nonetheless,

⁹ please note that the remaining responses are available within appendix

because of the issues mentioned within the survey, we recognize that not enough information was given to dispatch employees before submitting a survey to them.

At the beginning of the survey we make statements concerning the application to offer survey participants a background on the design of the application; specifying that the platform was designed to "...offer riders an additional means of requesting SNAP transportation", and encourage riders to "cancel their requests when they no longer wished to receive transport". We follow that then with a small "tutorial" of what it would be like to use the application. However, we never discuss how users would log-in, how request queue positions would affect the rider application, and perhaps most importantly we never mention that the platform can automatically reject requests and feed users information concerning the status of the service. These are considerably important details as they concern the potential effect of the application on day to day dispatch procedures which many survey participants expressed concern about. Often in several cases, they inquired about potential features to implement that were already considered in our studies and designed as application specifications; however, we never made some of these details known to them. This is expected to be the leading cause for the division in responses on whether the app was favorable or unfavorable, therefore we could not make general conclusions from some of the collected data.

5 Conclusions and Recommendations

For many years past IQP and MQP teams have attempted to create some form of application and procedure change to SNAP services. These projects were rejected for the desire to implement additional devices and technology in hopes of improving the service or tracking service vans that all included a heavy cost, such as the purchasing of GPS tracking devices for every van or contracting external firms to provide dispatching services. When we first analyzed the service we found that many riders were held in positions of deciding to walk home without first cancelling their requests out of frustration, or waiting for an extended period of time unsure if and when a SNAP van would arrive. This demonstrates obvious safety concerns for SNAP riders which we felt were important to address. Our envision for a solution was an application that allowed riders to make SNAP requests without the need to call them in and provide additional details concerning the status of the service and their requests. Additionally, to make it as affordable and non-intrusive to current dispatch procedures, the application would replicate the paper forms used to record ride request data. With the current progress made in developing this application we are passing on this project to a SNAPP MQP team for the 2018-2019 academic year.

Within the open-ended questions of our dispatch survey, multiple employees shared their concern about the increase in usage of SNAP services. In response to this, we recommend that the new representative from SGA on this project look into additional funding options for the service. Finding funds for this service may be difficult therefore we suggest consulting with Dean Snoddy, as he has been very helpful and passionate about this project. For the MQP team, advertisement within the rider application for student SNAP jobs should be implemented. Both of these ideas were presented and agreed upon by Lt. Bueno.

As shown by our results for Question Five of the student SNAPP survey, 62.9% of participants felt it necessary to have a phone application. For the MQP SNAPP team of 2018-2019, we urge them to consider designing a downloadable application, as it seems to be a bigger priority than we had anticipated. Although, this recommendation relates to that above because of the expense that comes with licensing and hosting a phone application.

In the dispatch survey one SNAP employee mentioned his concern with potential “spamming” from student users. We reassured him that the users have to register to use the application, therefore it would be unlikely to occur. However, this concern should still be dealt with. To avoid this, we recommend that a temporary account deactivation be implemented by the MQP SNAPP team for any abusive activity; as mentioned in the Findings Section.

One response in the survey results asked for a defined one-mile radius for Google Maps in the dispatch application. We felt this idea would be a great addition to this application and that it should be implemented moving forward. The software for this feature is already written within the rider application and therefore just needs to be moved to the dispatch application as well.

Something discussed in multiple meetings was the possibility of a co-pilot application. The integration of this application would allow for a “SNAP has arrived” button, a feature to timestamp cleared requests, and more. Many participants in our surveys had mentioned this as well, however due to budgeting reasons and the goal of developing a working prototype of the

SNAPP platform we have not yet began designing this addition. We recommend that the coming SNAPP MQP team to design and implement such an addition to the platform.

In addition to the recommendations stated above, many features have not yet been implemented for the rider and dispatch applications of the SNAPP platform. Due to this, we have prepared technical and product specification documents that describe, in detail, everything to be passed on to the MQP team. These documents can be found in Appendices G and H.

With great confidence our team believes that we have gotten the ball rolling on a much needed addition to the WPI community. With our work we instituted a drive to update the technologies and procedures used by SNAP to improve their service and the load associated with their work. Furthermore through the partnership with SGA we assisted in bringing to light a small startup club within WPI named WebTech. A group dedicated to the development and maintenance of WPI-borne applications. Our project was the first for the WebTech team and to them we offer a great thank you for their work and dedication to developing the application and bringing our research and designs to life. Once the SNAPP platform is completed and released to the WPI community students, staff, and Professors will have an additional means of more conveniently requesting SNAP transportation and make better travel decisions in the event that SNAP cannot service them satisfactorily. In effect potentially reducing the SNAP service load, and most importantly improving student safety with increased communication and awareness with the SNAP service.

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Appendix A: Dispatch Log Format

Van #	From	To	Time Received	Time Cleared
3	9 Dix St	AK	9:04 PM	9:26 PM

*They write NS¹⁰ or Cancel on far right

¹⁰ NS: No Show

Appendix B: SNAP Script

Incoming request

RIDER: *makes call*

DISPATCH: This is SNAP, your call is being recorded.

RIDER: I would like to go from A¹¹ to B¹².

DISPATCH: Have ID ready¹³, have a good night.

Write down where from where going, and time call was made.

Assign call to a van based on pick up location.¹⁴ (also written down)

Assigning to Van

DISPATCH: A to 3¹⁵

COPILOT: 3

DISPATCH: A to B

COPILOT: A to B received.

No Show

COPILOT: A to B no show.

DISPATCH: received

CLEARED

COPILOT: A to B cleared.

DISPATCH: received.

Cancellation

DISPATCH: A to B cancelled.

COPILOT: received.

¹¹ Pick up Location

¹² Drop off location.

¹³ They often forget to tell them to have ID, and the van often does not ask for one.

¹⁴ This may change while awaiting pickup.

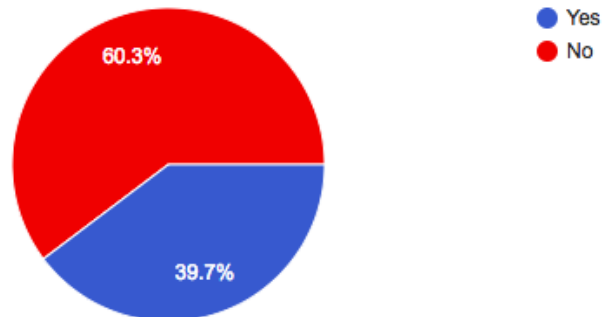
¹⁵ This is the van they assign

Appendix C: B-Term Student Survey Results

1. Are you a frequent SNAP user?

Are you a frequent SNAP user?

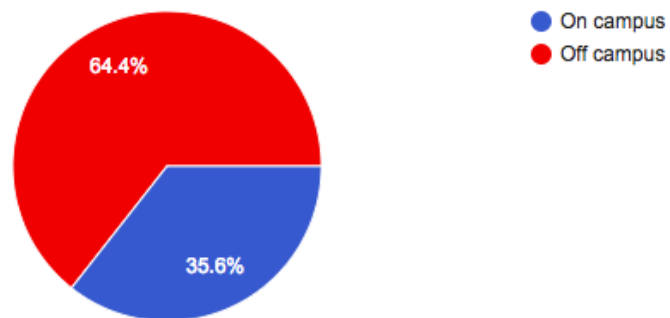
73 responses



2. Where do you live?

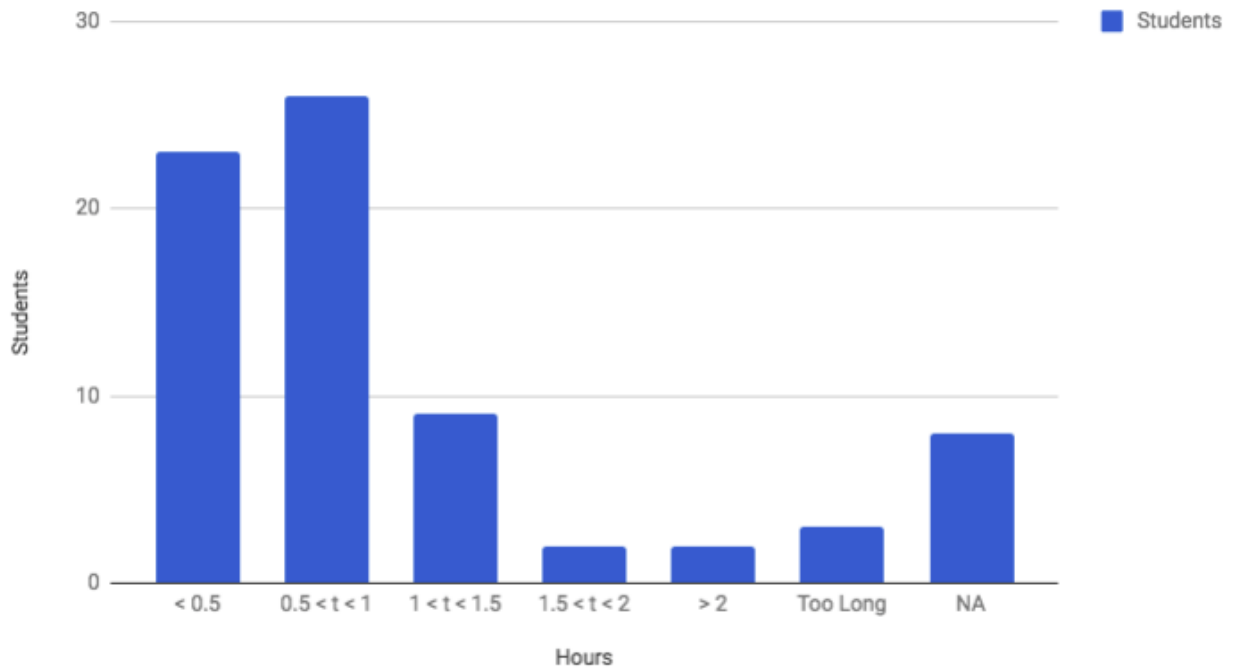
Where do you live?

73 responses



3. What is the longest you have waited for a SNAP?

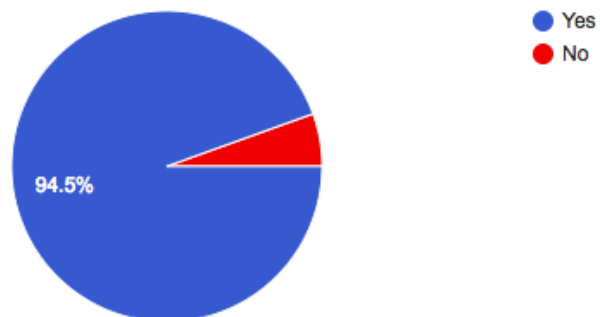
Students vs. Hours



4. Do you see yourself using this app?

Do you see yourself using this app?

73 responses



5. Questions/Comments? (Optional)

<p>“This seems like the best idea ever guys, do it UP!”</p>
<p>“Git er done!”</p>
<p>“WE NEED ETA!!!”</p>
<p>“Uber has one and it works like a charm. A great model for this”</p>
<p>“SNAP is frustrating sometimes because you never have a clear estimate or indication of how long it'll take to be picked up”</p>
<p>“could definitely improve, an app would make it easier for students to know when their ride is coming”</p>
<p>“ETA would be the biggest improvement. if i knew how long it would take i could determine if i should take snap or not”</p>
<p>“Make snap faster”</p>
<p>“This is awesome!”</p>
<p>“Usually I have long waits and am told that there is only one van running.”</p>
<p>“Will the app give you wait times?”</p>
<p>“An App would be dope”</p>
<p>“Could you hire more people to work. More snaps are REALLY NEEDED.”</p>
<p>“ETA is super important, also it would be nice if it said how many vans are working”</p>

Appendix D: Dispatch Q&A

1. How does dispatch currently utilize the given computer?
 - a. Sign in sheet, look up addresses, clear view of map.
 - i. Maybe add feature for dispatch UI that allows them to access Google Maps through the desktop application.
2. What is the average time taken for a SNAP van to pickup a request?
 - a. Casey did not know this information, this was to be handled by Mark DellaCroce¹⁶.
3. Average duration of a ride from pick up to drop off?
 - a. Casey did not know this information, this was to be handled by Mark DellaCroce.
4. Average time from receiving a request to cleared?
 - a. 20 minutes, maybe less. Depends on location, volume, etc.
5. List of days of the week that are most to least busy?
 - a. Casey did not know this information, this was to be handled by Mark DellaCroce.
6. Are there any days in particular with higher call volumes?
 - a. Casey did not know this information, this was to be handled by Mark DellaCroce.
 - b. However, Casey mentioned that the 8PM-12AM shift is the busiest and that D and A term are less busy.
7. What would you imagine the dispatch interface to look like? Any features you really hope to see?
 - a. Casey did not know this information, this was to be handled by Mark DellaCroce.
8. What is the specified 1 mile radius?
 - a. 1 mile radius around 100 institute road based off of google maps pin.
9. Are there any common complications that arise that you believe the app could eliminate?
 - a. To ask for number of passengers per request.
 - i. This became required information for the user upon making a request.
 - b. Reducing no shows.
 - c. Relieving stress of calling.
10. How often are cancellations? How often are no-shows?
 - a. Casey did not know this information, this was to be handled by Mark DellaCroce.
 - b. However, Casey mentioned that most user cancellations are no-shows, that few people call to cancel a request.
11. How willing do you believe dispatch would be for more interaction with the website?

¹⁶ Mark DellaCroce is the second SNAP Coordinator, he is in charge of statistics.

- a. Try to keep radio traffic down, so it is NOT ideal to add communication with dispatch and co-pilot.
 - i. After meeting with Casey, we redesigned the UI interface for both rider and dispatch. From then on there were only 3 stages, waiting approval, waiting pickup, and completed.
 - b. No set in stone van assignments, so that will not be good to add for dispatch.
 - i. Instead of entirely removing this feature, we made it so van assignment could be changed throughout the process until the request is completed.
 - c. They would be not only willing, but excited to type in information instead of writing it down.
 - i. This encouraged us to pursue an electronic dispatch log. At the time this was not yet confirmed, leaving us unsure if they would continue using paper logs with our application solely for receiving requests.
12. If more riders than expected show up to enter van, what happens?
- a. This is a frequent problem for the service, as of late protocol was to assume one person.

Appendix E: Rider Application Survey Results

How often do you use SNAP?

70 responses

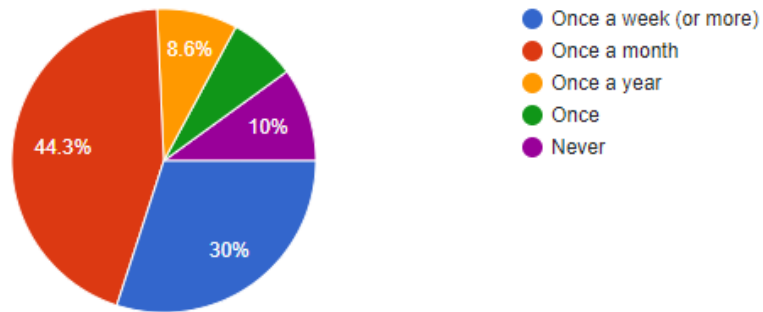


Figure E1: Rider Application Survey Question 1 Results

Do you see yourself using this application?

70 responses

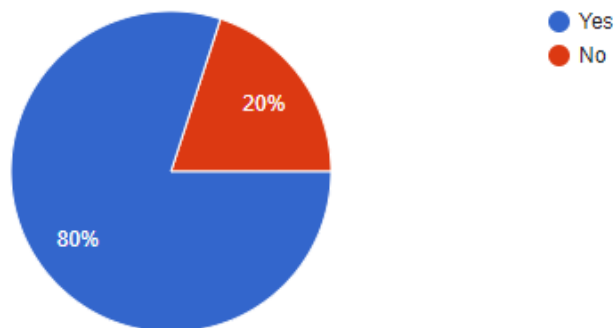


Figure E2: Rider Application Survey Question 2 Results

Would you prefer using this web-app over calling in a request?

70 responses

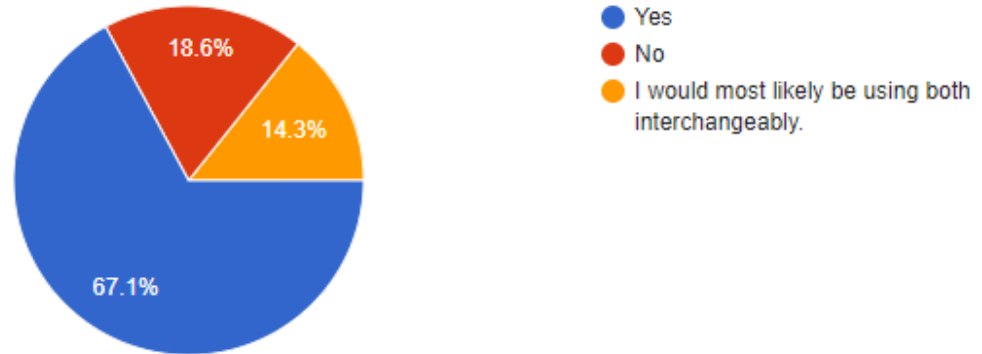


Figure E3: Rider Application Survey Question 3 Results

On a scale on 1-10 how necessary do you believe a downloadable application would be over a web application?

70 responses

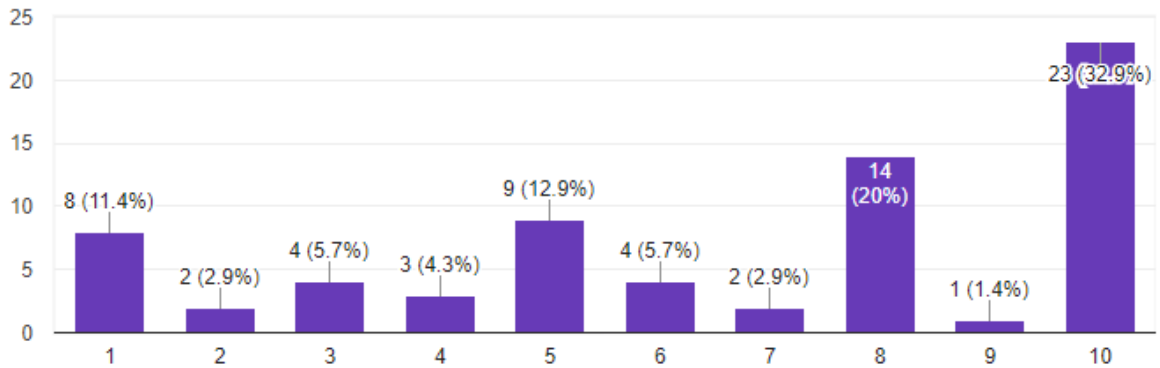


Figure E4: Rider Application Survey Question 4 Results

What do you think our web application should be named?

70 responses

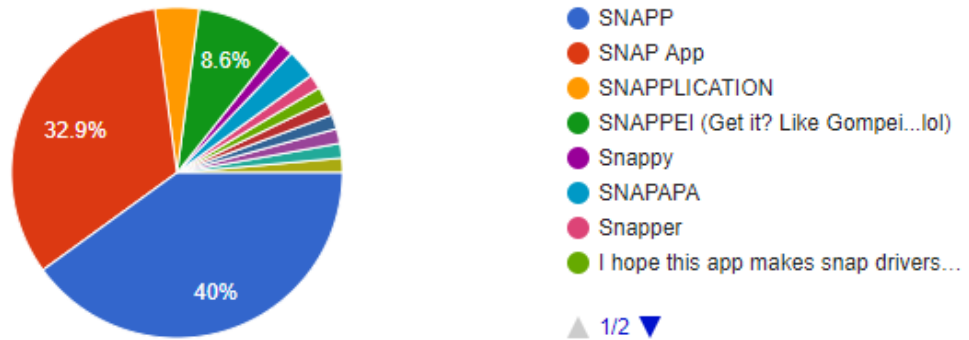


Figure E5: Rider Application Survey Question 5 Results

On a scale of 1-10, how easy do you believe this would be to use?

70 responses

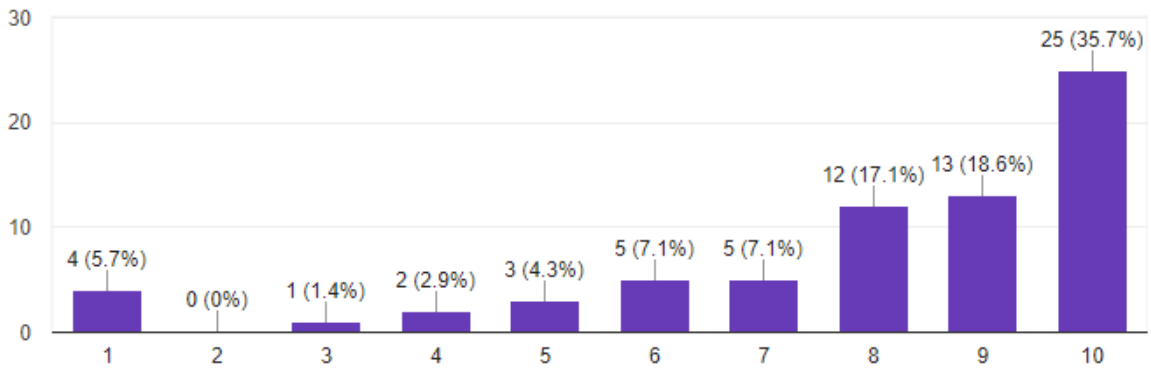


Figure E6: Rider Application Survey Question 6 Results

Do you have any questions/concerns regarding the web app? If you would like an emailed response, please leave us your email in your answer.

13 responses

Is there an optimization behind handling the request pick ups?

The time table is ugly and hard to read... not sure right now how to improve. Maybe look at what the MBTA does for guidance.

How would calls be filtered since SNAP only transports to commercial locations? If there isn't gps what is being tracked? How would snap employees use the app or would there be a different application for employees? Have you contacted campus police? Have you asked SNAP employees what they think?

no

I'm not sure you're qualified to create this app without having at least multiple members who actually work in CSTP. Almost every current experienced employee should tell you that requesting a SNAP transport anonymously through an app would create more backlog and encourage transports that fall outside the SNAP rules/guidelines

As a current SNAP employee, I do not see a need for this app, nor do I think it is a good idea. Having to call in to talk to a real person is an important part of the process because it allows us to filter out calls to commercial locations, calls between shuttle stops, and most importantly, keeps the number of calls to SNAP at a reasonable number. Having to talk to a person on the phone is JUST enough of an inconvenience that people who don't really need to take SNAP don't. This ensures we have the capacity to transport people who rely on SNAP and need the service to get them around Worcester in a safe and timely manner. Without having to interact with an actual human being, I am very concerned that SNAP will be flooded with a huge number of calls, resulting in greatly increased wait times and preventing those who need the service most from using it.

Please consult folk who have the slightest clue how SNAP works (read: SNAP employees). Otherwise whatever you design will not be feasible.

I feel like this application just simply creates a text version of what can be done over the phone, which doesn't add much to the service, except that there is no idiot proofing, since multiple requests can be made without passing an actual person. Additionally, this would likely bring more traffic to SNAP, something they cannot really handle with only two shuttles maximum running at any time, understaffed as they are.

Does this application add any kind of route optimization for the driver when given multiple drop off and pick up locations based on location and traffic conditions? or will they still have to do that themselves? (surely this can be done to an extent despite the lack of GPS usage just by simply ordering the locations in an efficient route). Without anything like that, this just seems like a very simple app created too keep information in one place and make it so people don't have to use a phone.

There is no way to deal with fake calls or cancel calls or with double calls. This solves none of the problems and only makes it harder for snap drivers.

Have you taken into consideration how this may affect SNAP? They are already backed up with calls a lot of the times, and have issues with complaints of it taking to long because of this. If you implement something like this, it could cause a huge overload on the amount of work SNAP does (since people are probably more willing to press a button on an app as opposed to calling in). SNAP is not meant to be a taxi service. It's a safety transport service. By implementing an app like this, you stand a very high chance of turning it into something it's not by trying to make it like Uber or Lyft. I don't think this would benefit the community at all. If people want a ride from SNAP, then they should make the phone call.

I think you need to consider the limitations of the program and the impact of this app on the people who will have to deal with the consequences (i.e. the employees). Perhaps a better use of time would be streamlining hiring processes or marketing the actual purpose of SNAP (safety not convenience) and the rules about its use.

Couldn't filter out calls to commercial locations

Would there be any difference in wait time for students who request a SNAP ride by call or by app?

Figure E7: Rider Application Survey Question 7 Results

Is there any additions to the application you would really like to see? (That we most likely have not already considered/plan to implement)

18 responses

- Optimal routes!
- where you are in waitlist/ how long it will take
- I would strongly recommend allowing the app to auto fill the user's current location via GPS. This is different from what I believe WPI Police has restricted (GPS in SNAP vans).
- Bio for the snap driver/music tastes/hotness level
- Rating and comments for the driver, music tastes of the driver, time it will take in minutes to get to destination, positions of all snap vans on the map
- no
- Remove the functionality to request a ride within the app. SNAP is not Uber. Our purpose is to provide safe, reliable transportation at night for those who feel unsafe, not to run people around Worcester on errands. We do not have the capacity to transport the massive increase in calls we would undoubtedly have if people perceive the service as such. I STRONGLY encourage you to speak to the coordinators - or ANY SNAP employee - before continuing development on this app.
- The absolute biggest thing it needs to do is tell me when snap is here or just about here. It doesn't even have to be an app, a single automated text would be fine. But the app is nice.

The option for employees to decline rides to places SNAP does not transport to, a cap on how many times people can take snap (we have people who have us drive them down the road home for dinner and back 45 minutes later), a bigger SNAP budget so we can get enough staffing and vans to handle the increased call volume this will create, advertisements for Uber or Lyft (which, SNAP is not.)

It would be great if maybe you talked to the people working at SNAP to get their feedback instead of blindly developing an application that they do not need whatsoever in any way.

A way to see how long it is until you get picked up

That it stops now.

It would be cool if you could see how long until the shuttle arrives. For example, you select your location, and it gives you an estimated time based on the last time the shuttle completes the route or the last stop.

maybe an update on how many rides are before you, since some nights the wait for a snap can take a long time

Estimated wait time plss

It would be great if the app could notify you when they're outside or give an estimate on how long it'll take to pick up, such as "We're pretty busy, it might take a while" or "It's a slow night, please be outside soon".

Let people know how many other trips are before them so they get a rough estimate of when to be picked up. Have the ability to cancel your trip so that SNAP does not waste time going to pick up someone that no longer needs a ride.

Maybe a part that can tell you about how long it will take and your spot in line i guess

Figure E8: Rider Application Survey Question 8 Results

Appendix F: Dispatch Survey Results

Noting that the goal is to replicate the current dispatch procedure, would you prefer this over the current paper system used by dispatch?

9 responses

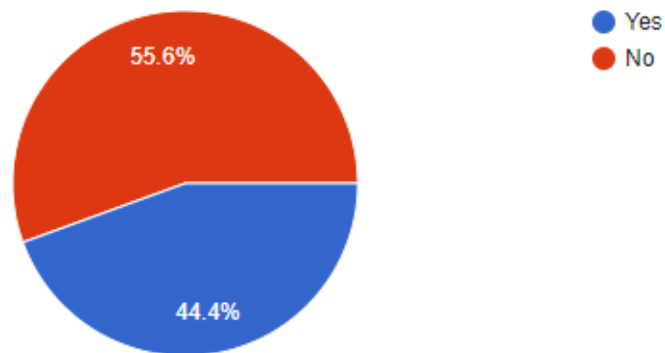


Figure F1: Rider Application Survey Question 1 Results

On a scale of 1-10, how easy do you believe this would be to use?



9 responses

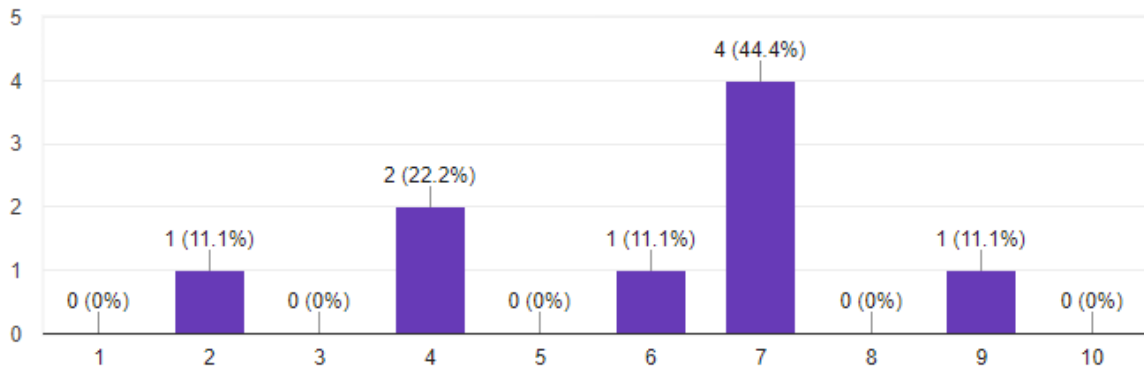


Figure F2: Rider Application Survey Question 2 Results

The icons in the bottom right corner of the images above represent GoogleMaps, Archive, Sign out, and vehicle maintenance. Are there any other interfaces or functionalities you would wish to utilize during a dispatch shift?

9 responses

No (2)
There should be an option to get in contact with campus police dispatch for emergencies
N/A
Not just Google maps but a map with the 1 mile radius circle. Because if road limitations sometimes getting to places in the radius is over a mile
Sign in sheet
If by sign out you mean sign in, it has to be able to deal with whatever random combination of people work a shift. Sometimes a 4 hour shift is worked by 4 different people. So long as it's fluid and easy to use with that, there won't be an issue.
Employee sign in
Not that I can think of at the time

Figure F3: Rider Application Survey Question 3 Results

Are there any additions to the dispatch interface you believe should be added? (That we may not have shown to implement based on what we have presented)

4 responses

I have considered a dispatch interface in the past. The right hand side of the screen should have different sections that are divided up by van for easy viewing and dispatching. Similarly, in the vans themselves there should be a tablet/app on employees' phones than can clear the calls for the dispatch interface. Also, we sometimes need to reference cleared calls. Will there be an option to do so?
Immediate access to typing in a text box rather than having to click and add new entry
It'll be easier if number of transports in an entry field. While we don't transport more than 5 at a time, often on weekends we'll get calls for more than 5 and have to assign it to multiple vans or have one van make a double trip.
Have the calls labeled for being in app and by phone. That way if snap is cancelled due to weather conditions during a shift, calls can be canceled to the people with the app, as they will get notified, reducing the time a vehicle is forced to drive in dangerous conditions. Also give the app the ability to deny locations that people enter that Snap doesn't transport to and from. Do this by checking the locations they have entered to see if they are outside of the radius or not and if it's an approved location or not.

Figure F4: Rider Application Survey Question 4 Results

Do you have any questions/concerns regarding this new system? If you would like an emailed response, please leave us your email in your answer.

5 responses

Overall I do not think that SNAP as a service will work more smoothly with an application. My largest concern is that people would abuse the system. When requesting a ride from SNAP the dispatcher serves a valuable purpose, they can screen the calls and get more information. From my experience driving and dispatching many students who utilize SNAP don't necessarily know the rules or intentionally try and circumvent them. I believe having a human element to the call accepting process is integral. For example if I were able to request a call within this app from Morgan Hall to 108 Grove St the system does not know that 108 Grove is a commercial location, or whether someone has called and requested to be taken to 108 Grove and been denied on the request and then immediately call back and request a residential address directly next to The Fix. A second major issue that I see is the ability for people to spam calls that leads to the dispatcher having to manually go in and refuse the requests. It is far easier to refuse a request over the phone once and dissuade people from calling again with the request. For example people will request a call from 34 Institute to 17 Dean which is one door of Sigma Pi to another. Within the system that is a valid request and if it takes no effort and there is no way to dissuade people from requesting that call repeatedly over the app. I think that an app would be helpful but this approach is not necessarily the correct one. I would love to hear your response to these issues. My email is ehschutzman@wpi.edu

With the ability to request rides through the phone, have you performed any surveys or studies to analyze the increase in call volume? I'm worried that with the increase of "non-phone" requests, the current staff will not be able to handle the calls.

The survey sent out to students mentioned a "queue number" feature and I am concerned with this. SNAP calls are cleared by best route hit by order of receiving.

1. An accommodations field would send the wrong message to students, especially if they're using a Gompei statue example. I thought SNAP was a student transportation service, not a cargo moving service? End of the year SNAP transports will try to use SNAP to move stuff into their new apartments (one particular example that irked me was Stoddard to 19 Dover THREE TIMES so he could move stuff in), which is NOT SNAP's purpose. 2. Anonymous SNAP requests through an app would also encourage transports that fall outside SNAP guidelines/rules. Experienced employees know the common transports from throughout the year and can almost instantly flag suspicious calls. For example, we have never gotten dropoffs on Townsend St, despite being in the radius, so any calls to that street are 99.9% likely students going to one of the many restaurants in that area. We also know which buildings on a street actually have WPI students in them. Having a phone dispatcher allows for weeding of such calls out so SNAP's time isn't wasted. 3. I don't believe improving SNAP's efficiency lies with the dispatching system. I believe it lies with the transports themselves. Very few people outside the actual employees are familiar with what SNAP is. As far as I was aware, SNAP is a safety transportation service. The majority of the transports we get are the SAME STUDENTS we get almost every night, using SNAP as their daily transportation when that is not what SNAP exists for. We also tend to get very very short transports, such as Berkshire St to Higgins Lab, a mere quarter of a mile walk. Personally, I have a huge problem with the students that call SNAP for this, as it is less than a 5 min walk, and you can literally see campus (Riley or Daniels Hall) from any point on Berkshire St. Other common short transports include academic buildings to the Ellsworth Apartments or academic buildings to Dover St, where most of the route home lies on WPI campus, not on public streets. If there's a safety issue on campus, campus police should be notified, not SNAP. Another set of common requests are those that are either evening Shuttle transports or lie very close to the evening Shuttle stops. Sure, those calls were indeed told to take the Shuttle at first, but students have still tried to call SNAP (repeatedly) instead of waiting for the Shuttle (the same students that claim that SNAP is easier and don't want to wait for the Shuttle, and then aren't ready to go when SNAP gets there and thus waste's SNAP's time). This is the next huge issue. Very often, students force SNAP to wait when it arrives because they are not ready to go. These are typically the students who take SNAP often and realize SNAP can take some time to actually arrive. A more accurate time estimate would be very nice to have, but seeing as a SNAP van will be handling multiple calls at once in order to transport everyone, it is impossible to implement, as the van's route will change by the minute in order to prevent looping back around on the same roads and to save time (and when SNAP gets busy, this is a HUGE necessity). Students need to be ready to go as soon as they call SNAP. The wait time could be less than a minute, or it could be in excess of a full hour. That is the drawback of using a FREE student service (another issue entirely, minimum wage doesn't give us incentive to do our jobs to the fullest. I'd like to think I do, but there are moments I wonder why I applied for this job). If a student wants a transport at a specific time or with minimal wait time, they can and should call UBER. Seeing as the radius is only a mile anyways, the cost of UBER will be relatively cheap. Students need to learn how SNAP works BEFORE using the service. Very often, bad information is passed down to new students at the beginning of each year, either by campus dorm RAs to freshmen or by graduating students to their new apartment tenants, and SNAP follows a repeating cycle every year.

We the added ease of an app, snap is going to be even busier. We need to fix this issue before implementation of an app that increases not only the flow of people in and out of snap, but the stress on the employees to deal with the large volume of calls.

Figure F5: Rider Application Survey Question 5 Results

Appendix G: Technical Design Specifications

SNAP Technical Design Specification

This document outlines the code standards, data model, API specs and other technical design decisions that the team collectively agrees on. Anyone can add or suggest changes to this document, by discussing with the team.

API Definition

- Because the security rules cannot be used as filters we need to keep the user's current ride under their user document
- HTTP trigger to update a status for a ride for a given ID
- Backend moves ride to whichever table necessary

Database Specification

Tables:

- Archive
 - List of all rejected, completed, or cancelled rides
- RequestQueue
 - List of rides waiting to be approved or rejected
- WaitingQueue
 - List of rides that have been accepted but not completed
- Service
 - List of different 'things' that would tell the snapp is operating or not
 - time, weather, duplicates, distance, etc

Ride Document Specification

- fromAddress
 - Where the ride is coming from
- toAddress
 - Where the ride is going to
- numPassengers
 - The number of passengers on the ride
- accomodations
 - Any accommodations listed
- email
 - Email of the user who submitted the ride request
- status
 - Possible values:
 - "submitted" - Request was submitted by a user and waiting for approval/rejection by dispatch
 - "rejected" - Dispatch rejected the ride
 - "approved" - Dispatch approved the ride, waiting to be completed

- “completed” - The passengers have been dropped off, and the ride is completed
- “cancelled” - The user or dispatch cancelled the ride
- “noShow” - The passengers did not show up for the ride

Snapp Status Object

- Operation
 - “operating” - Snapp is currently operating
 - “closedTime” - Snapp is not currently operating because its outside the hours of operation
 - “closedWeather” - Snapp is not operating due to weather
- Time - Object containing the start and end times
 - SunStart - Sunday
 - SunEnd
 - MonStart - Monday
 - MonEnd
 - TuesStart - Tuesday
 - TuesEnd
 - WedStart - Wednesday
 - WedEnd
 - ThursStart - Thursday
 - ThursEnd
 - FriStart - Friday
 - FriEnd
 - SatStart - Saturday
 - SatEnd
 - Each time is an integer 0-23
 - Admins must update this every term or when necessary

AWS

- AWS and Firebase Login info:
 - Email: wpiwebtech@gmail.com
 - Password: **** Please Contact Professor Ciaraldi of the WPI Computer Science Department for how to retrieve this information
- Basic architecture:
 - NoSQL Database using DynamoDB
 - Lambda functions to handle database maintenance
 - Verifying new entries
 - Transferring entries among queues as status updates
 - IAM and Cognito to verify the API authentication
- To connect the AWS API from the web service, we have to use Cognito
 - Cognito is designed to handle account management and user logins, especially with external services like facebook and google. However, it also allows you to give users that have not logged in through these sites access so that things they do in the browser can make changes to AWS services
 - In our case, that means making sure unauthenticated users can update the DyanmoDB database through their actions on the site, e.g. requesting a ride

- Note that “unauthenticated” is from AWS’ perspective, as in not authenticated through their service. We will be authenticating these users through CAS, but since that’s not connected to AWS Cognito, it still considers them “unauthenticated”.
 - How it works:
 - Open the Cognito dashboard:
<https://console.aws.amazon.com/cognito/home?region=us-east-1>
 - Select “Manage Federated Identities”
 - Select “Create new Identity Pool”
 - Enter a name, i.e. “SNAPP”
 - Be sure to check “Enable access to unauthenticated identities”
 - After creating the Identity Pool, set the unauthenticated role to an IAM role that has access to DynamoDB functions
 - Update the Rider Node.js script to use this Identity Pool’s ID in the AWS.CognitoIdentityCredentials attribute
- Note for troubleshooting: the AWS web browser sometimes changes between North Virginia servers (us-east-1) and Ohio servers (us-east-2) without warning you! This means you might work on one thing on us-east-1 and another on us-east-2 by accident. Watch out for this!

Front end

Utilizing Grid and Paper components from material-ui included in the node_modules package, the current Dispatch UI visualizes column headers and headers for the incoming requests.

New Requests					In Progress					
From	To	No. Passengers	Accom.s	Time In	From	To	No. Passengers	Accom.s	Time In	Van No.

Figure G1: Current Dispatch Application Progress

Appendix H: SNAPP Product Specification

This document outlines the product-side terminology, stakeholder requirements and product design standards that the team collectively agrees on. Anyone can add or suggest changes to this document, by discussing with the team.

SNAP Terminology and Operations

Clear a Ride

Cleared: The passenger has been dropped off at specified location.

No-Show: The driver waited five minutes, request was canceled.

Cancellation: The student called in and canceled their request.

Note: these are all treated the same in term of being cleared, but dispatch writes a note specifying if no show or cancellation.

SNAP team

Dispatch: Sits in office at PD and walkie-talkie between co-pilot and logs all information, calls between riders, takes requests.

Co-Pilot: In shotgun of van, in charge of logging information and walkie talkie.

Driver: Drives the van.

Rider: Student/Employee getting a ride through SNAP.

UI Screens

Key: * = Not required

Dispatch

- Incoming & Processing Requests: Current requests.
- Archive: All cleared requests.
- Employee Login: Somewhere for an employee to login for their shift.
 - Also need registration.
- *Google Maps: Easy access, they use this on their computer now, thinking it maybe be nice to have all this in one place.
- *Van Maintenance: Information regarding vans, Karen was saying it would be great to have the ability to easily access information such as
 - Exterior/interior of vehicle
 - Safety hazards of vehicle

- Starting/ending mileage
- Current vans in use

Rider

- Login
 - CAS registry.
 - Prior to registry, the user will need to accept Terms.
 - Ciaraldi mentioned also something about cookies?
- Request Screen (with drop down menu)
 - Menu
 - Contact Information
 - Term Hours
 - Rules and Regulations
 - Shuttle Information
 - Evening Shuttle
 - Gateway Shuttle
 - Summer Gateway Shuttle
 - Tutorial
 - Privacy Policy

Copilot (not in first phase, later down road)

- “I’m here” Button
- Time stamp
 - Does not clear ride, but puts time cleared down for dispatch. Dispatch still has to clear this but allows for more accurate clear times.
 - Must have option to click no show or dropped off.

Incoming & Processing Requests (Dispatch UI)

Features

Key: * = not required

1. Request Information (Oldest request at top, newest at bottom)
 - a. Pick-up Location
 - b. Drop-off Location
 - c. Number of Passengers
 - d. Accomodations
 - e. Time request was received
 - f. *Student Name
2. Processing Information (Oldest request at top, newest at bottom)
 - a. Pick-up Location
 - b. Drop-off Location

- c. Number of Passengers
 - d. Accomodations
 - e. Time request was received
 - f. Van Assignment
 - g. *Student Name
3. Click request to move to processing from incoming.
 - a. Pop up will show specifying the request chosen and asking which van should be assigned.
 4. Request flashes red when canceled, but can only be cleared manually..
 - a. Upon clicking a request in the processing column, a pop-up will appear asking if you are sure you would like to send request “ ___ to ___ ” to archive? This dialogue will also request that dispatch enter the purpose for clearing: Complete, Cancelled, or No-Show.
 5. Van assignment can be changed throughout process, until request is cleared.
 6. *15 minute “LET’S GO!” warning for incoming requests that have not been acknowledged, just something to tell dispatch that this request is taking too long to be acknowledged.
 7. Manual log, ability to type in a request upon receiving a call. (requires all information needed for request information)
 8. Going to need some kind of menu or tab selection for:
 - a. Archive
 - b. Shift Log-In and Log-Out
 - c. Map
 - i. Try to use google maps if possible, that’s what they use currently
 - d. *Van Maintenance
 - i. *Each vehicles maintenance is cataloged in the snap and shuttle maintenance sheets at beginning and end of each shift and includes vehicle mileage, any mechanical complaints, such as strange noises from vehicles, and cosmetic damages are inspected for daily and recorded in the maintenance sheets distributed daily to each vehicle. The Dispatcher at the end of the day being 4am takes all the information and emails problems and concerns to SNAPMAINTENANCE@WPI.EDU which goes to the Admin Coordinator (Mark) as well as to Lt. Bueno and Jane as well. Later that morning problems and concerns are immediately addressed.
 - ii. *Information stored: The date, the 4 character badge numbers of the driver, the call taker, and the dispatcher, The shift being early, middle or late, the van used 1,2,3 etc., the starting mileage and the ending mileage for every shift, any damage to the vehicle dents, scratches etc., and brief lights checklist to ensure headlights, tail lights, roof light, and emergency lights are all properly functional for each shift.
 - iii. *This is updated every shift, every day, to every van used, and from there the Admin Coordinator (Mark) compiles all the data and keeps track of all these numbers in Excel on the computer at the dispatch station. This is updated every day with new numbers to keep track especially of when vans need oil changes. This is the responsibility of the Admin Coordinator (Mark) to keep track of when vans need and receive oil changes based on the daily recorded mileages on the vans.

UI Mockups



Figure H1: Dispatch Mockup

Archive (Dispatch UI)

Features

Key: * = not required

1. Cleared Requests Information
 - a. Time of request
 - b. Pick-up Location
 - c. Drop-off Location
 - d. Van Assignment
 - e. Student Name*
 - f. Number of Passengers
 - g. Time Cleared
 - h. Type of Clearing
 - i. Accomodations
2. Stats
 - a. Number of no shows.
 - b. Number of cancellations.
 - c. Average time to complete requests.
3. Organized by day?

UI Mockups

*No current artist rendition available

Request Screen (Rider UI)

Features

Key: * = not required

1. Map visual with specified 1 mile radius
2. Request Information
 - a. Pick-up Location
 - b. Drop-off Location
 - i. *For pick-up and drop-off have a drop down for recent locations, just options so that they do not have to type it all again.
 - c. Number of Passengers
 - d. Accomodations (not required for rider to input)
3. Make Request Button
 - a. If there is a request made to the hospital, have pop-up saying “We do not transport for medical emergencies, please contact WPI police. For any further questions/concerns call/email Lt Bueno.
4. Before the waiting approval screen, a ride can be rejected by the application due to the following:
 - a. Any request not in the one mile radius
 - i. Pop up Message for user upon rejection: We are sorry, this address seems to out of our 1 mile radius, for questions or concerns please call 1234567890.
 - b. Any of these addresses:
 - i. Pop up Message for user upon rejection: We are sorry, this address seems to be a commercial location, for questions or concerns please call 1234567890. SNAP services do not take requests for commercial locations.
 1. 52 Highland Street (O’Brien Insurance)
 2. 57 Highland Street (Grille 57)
 3. 60 Highland Street (Mt Olive Church)
 4. 64 Highland Street (Highland Dental)
 5. 74 Highland Street (Asian SPA)
 6. 77 Highland Street (Highland Services)
 7. 93 Highland Street (Boomer’s Sub and Deli)
 8. 94 Highland Street (Law Office)
 9. 95 Highland Street (Honey Farms)
 10. 102 Highland Street (JC Auto)
 11. 104 Highland Street (Drag Nasty)
 12. 113 Highland Street (The Bean Counter)
 13. 118 Highland Street (The Sole Proprietor)
 14. 119 Highland Street (The Boynton)
 15. 121 Highland Street (Highland Liquors)
 16. 129 Highland Street (Shipmate)
 17. 131 Highland Street (Cherry Nails)
 18. 137 Highland Street (Tech Pizza)
 19. 141 Highland Street (Wooberry)
 20. 143 Highland Street (Sahara)
 21. 149 Highland Street (Tattoo Project)
 22. 151 Highland Street (SubWay)

23. 154 Highland Street (Tech Cleaners)
 24. 179 Highland Street (Bonardi's Formalwear)
 25. 18 Denny Street (Jim Dandy)
- c. For union station, the rider is expected to put their times in accommodations.
 - d. *For Price chopper, if possible it would be cool for it to have timed rejections/accepts. If not, manual cancellation by dispatch for this is fine.
 - i. A and D term a SNAP transport can be to or from Price Chopper all days of the week besides Friday and Saturday from 6pm onward. For B and C term a SNAP transport can be to or from Price Chopper all days of the week besides Friday and Saturday from 4pm onward.
5. Once brought to waiting approval screen, if ride is rejected, Lt Bueno wants the rider to receive the reasoning behind this as well as something telling them to call/email her regarding any questions or concerns.
 6. *Quick Request Button
 - a. Mainly for places most people do not know the address to.
 - i. For example, AK or Founders
 - b. In alphabetical order, but maybe a few frequent or favorited places at top of the list
 7. Menu button (in top left)
 8. In small text at bottom, SNAP's number

UI Mockups:

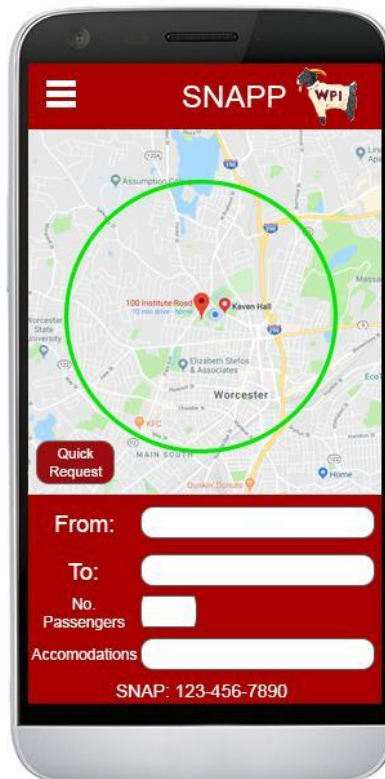


Figure H2: Rider Mockup

Menu Drop Down (Rider UI)

Features

Key: * = not required

1. *Request Ride/Current Trip (also can click outside drop down and get same result)
2. Contact Information
3. Term Hours
4. Shuttle Information (with drop down? Otherwise, leads to another screen with the three options)
 - a. Evening Shuttle
 - b. Gateway Shuttle
 - c. Summer Gateway Shuttle
5. Rules and Regulations
6. Tutorial
7. Privacy Policy

Contact Information (Rider UI)

Features

Key: * = not required

1. Menu button (in top left)
2. Text Screen Information
 - a. SNAP Call Line: 123-456-7890
 - b. Lt. Karen Bueno
 - i. SNAP Liaison
 - ii. 508-831-5433
 - iii. kbueno@wpi.edu
 - c. For more information, click link below

UI Mockups

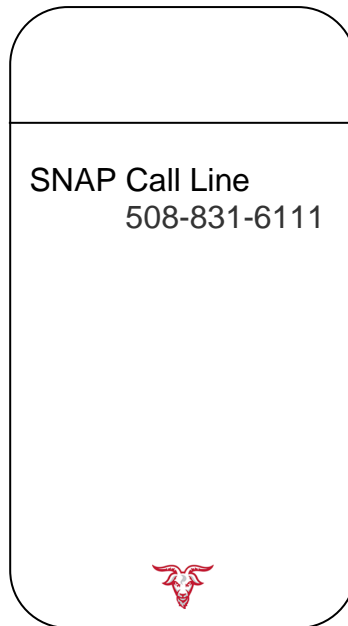


Figure H3: SNAP Contact Screen Mockup

Term Hours (Rider UI)

Features

Key: * = not required

1. Menu button (in top left)
2. Text Screen Information
 - a. A-Term: 6PM-6AM
 - b. B-Term: 4PM-6AM
 - c. C-Term: 4PM-6AM
 - d. D-Term: 6PM-6AM
 - e. E-Term: Not available

UI Mockups

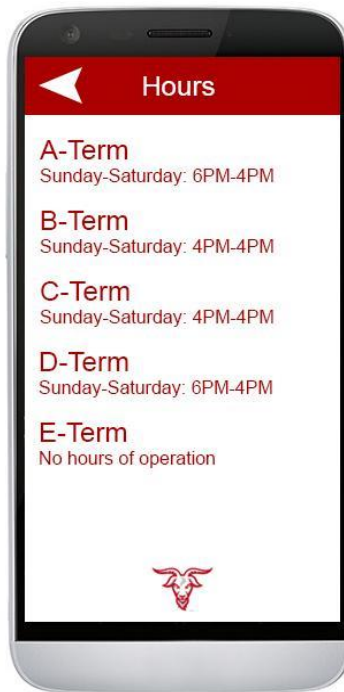


Figure H4: Rider SNAP Service Hours Mockup

Shuttle Information (Rider UI)

Features

Key: * = not required

1. Menu button (in top left)
2. Text Screen Information
3. Link for more information

Evening Shuttle

<https://www.wpi.edu/student-experience/resources/safety/campus-transportation/shuttle>

Spreadsheet Link (Schedule): <https://docs.google.com/spreadsheets/d/108sajWmmVpw3AN-Dlh3VwmoaWuZ42RPyuAkdgE8CH3o/edit#gid=0>

Gateway Shuttle

<https://www.wpi.edu/student-experience/resources/safety/campus-transportation/gateway-shuttle>

Spreadsheet Link (Schedule): <https://docs.google.com/spreadsheets/d/108sajWmmVpw3AN-Dlh3VwmoaWuZ42RPyuAkdgE8CH3o/edit#gid=1538235166>

Summer Gateway Shuttle

<https://www.wpi.edu/student-experience/resources/safety/campus-transportation/gateway-shuttle>
Spreadsheet Link (Schedule): <https://docs.google.com/spreadsheets/d/108sajWmmVpw3AN-Dlh3VwmoaWuZ42RPyuAkdgE8CH3o/edit#gid=1257039032>

Rules & Regulations (Rider UI)

Features

Key: * = not required

1. Menu button (in top left)
2. Text Screen Information

Rules

1. Transports must fall under a limit of a one mile radius.
2. Transports will be provided from off-campus housing, to campus and from campus, to off-campus housing.
3. Transports will be provided when on campus to anywhere else on campus.
4. A and D term a SNAP transport can be to or from Price Chopper all days of the week besides Friday and Saturday from 6pm onward. For B and C term a SNAP transport can be to or from Price Chopper all days of the week besides Friday and Saturday from 4pm onward.
5. Transports are not used for rides to shopping centers, restaurants, bars, or any other commercial locations.
6. Transports may be provided to WPI students traveling to and from Union Station for traveling purposes only, we advise that you give a 45 minute warning so that dispatch can fit this in their schedule.
7. Transports are not allowed by law to transport any forms of drugs or alcohol. SNAP drivers are authorized to view any enclosed packages and /or containers.
8. You must have a VALID WPI ID and be an active member of the WPI community to utilize SNAP services.

UI Mockups

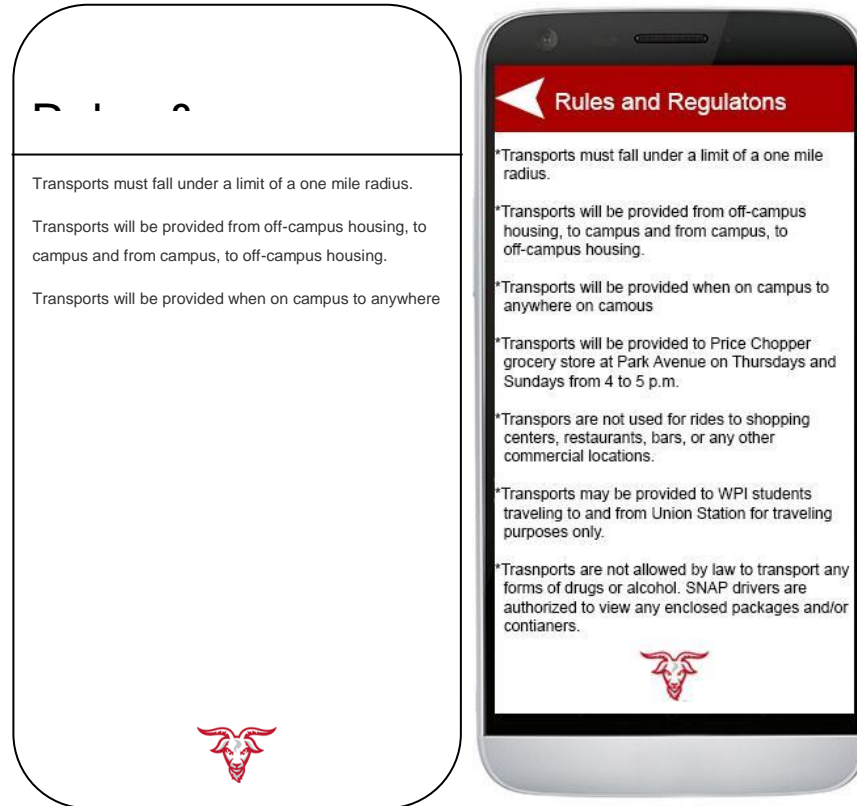


Figure H5: Rider Rules and Regulations Mockups

Tutorial

Features

Key: * = not required

1. Menu button (in top left)
2. Once initialized cannot exit until completed? (or cancel button for tutorial in case accidentally reinitiated)
3. **Do this last, a finalized application will be needed prior to creating a tutorial.**

Appendix I: SNAPP Application Terms and Conditions

SNAPP Application Terms and Conditions

March 31, 2018

The following terms and conditions apply to the use of the Student Night Assistance Patrol (the “SNAP Service”) and the SNAP application (the “SNAP App”) that can be used to request a ride

from the SNAP Service. The SNAP Service and the SNAP App are owned by Worcester Polytechnic Institute, 100 Institute Road, Worcester MA 01609, and operated by the WPI Police Department. By using the SNAP App and/or the SNAP Service, you are agreeing to the following terms and conditions. Violation of these terms and conditions may result in loss of the privilege of using the SNAP App and/or the SNAP Service, and/or may result in disciplinary action by WPI.

Eligibility

To use the SNAP App and the SNAP Service, you must have a current, valid WPI Identification Card and be an active member of the WPI community. You agree not to allow other persons to use your WPI Identification Card or your password or impersonate you in order to use the SNAP App to access the SNAP Service.

Pickup and Drop Off Locations

- Transports are provided within a one mile radius from 100 Institute Rd. as indicated on Google Maps, unless otherwise specified below. Please see the map linked below for an illustration.
 - <https://www.google.com/maps/place/100+Institute+Rd,+Worcester,+MA+01609/@42.274444,-71.8116049,17z/data=!3m1!4b1!4m5!3m4!1s0x89e4065898213eeb:0xb7956b8b4590459a!8m2!3d42.274444!4d-71.8094162>
- Transports are provided from off-campus housing to campus, and from campus to off-campus housing.
- Transports are provided from campus to anywhere else on campus.
- Transports may not be requested for rides to shopping centers, restaurants, bars, or any other commercial locations, other than Price Chopper as described below.
- Transports to Price Chopper may be requested during the following hours:
 - A and D terms: Sunday through Thursday, from 6pm to closing
 - B and C terms: Sunday through Thursday, from 4pm to closing
 - No transports available Friday or Saturday
- Transports to or from Union Station should be requested at least 45 minutes in advance, and may be requested only in connection with travel by rail to or from Worcester.

Restricted Activity

General Restrictions

- ONLY eligible members of the WPI community may utilize the SNAP App and the SNAP Service.
- ONLY eligible members of the WPI community may enter any of the SNAP vehicles.
- SNAP drivers and the WPI Police are authorized to search any enclosed packages and/or containers brought into a SNAP vehicle.
- Users of the SNAP App are forbidden to do anything that could interfere with or disrupt the SNAP Service.
- Neither the SNAP Service nor the SNAP App may be used to:
 - Distribute weapons or narcotics

- Stalk, threaten, or otherwise harass any person
- Violate any law, statute, rule, permit, ordinance or regulation
- Discriminate against or harass anyone on the basis of race, national origin, religion, gender, gender identity, physical or mental disability, medical condition, marital status, age or sexual orientation, or cause any third party to engage in these restricted activities

Restrictions Related to the SNAP App

Users of the SNAP App are forbidden to:

- Interfere with or disrupt the servers or networks connected to SNAP Service
- “Frame” or “mirror” any part of SNAP services without prior written authorization, or use meta tags or code or other devices containing any reference to WPI, the SNAP App or the SNAP Service in order to direct any person to any other website for any purpose
- Post, email or otherwise transmit any malicious code, files or programs designed to interrupt, damage, destroy or limit the functionality of any computer software or hardware or telecommunications equipment or surreptitiously intercept or expropriate any system, data or personal information
- Send information or interact with the SNAP App in a manner which is fraudulent, libelous, abusive, obscene, profane, sexually oriented, harassing, or illegal
- Modify, adapt, translate, reverse engineer, decipher, decompile or otherwise disassemble any portion of the SNAP App or any software used on or for SNAP Service
- Rent, lease, lend, sell, redistribute, license or sublicense access to any portion of the SNAP App or data collected by or in connection with it

Restrictions Related to the SNAP Service

[Note this section is incomplete and requires Lieutenant Karen Bueno’s updated SOP]

Disclaimers

The SNAP staff use their best reasonable judgment to schedule pick-ups and drop-offs as promptly as possible. Drivers do not necessarily pick up students in the order in which they submit requests, so the queue is NOT an accurate measurement of pick-up time.

While SNAP has protocols in place to readily inform students of any delays or interruptions (including those related to inclement weather), in the event the SNAP App is not functioning properly or the SNAP Service is suspended, an email will be sent to all users.

All reasonable measures are taken to train student drivers, maintain the SNAP vehicles, and oversee the operation of the SNAP Service. Nevertheless, **the absolute safety and satisfaction of the SNAP App and the SNAP Service cannot be guaranteed.** Users who witness dangerous conditions, poor driving, unsafe vehicles, unsafe behavior, or anything else that is of concern should report such things to WPI Police immediately.

While the SNAP application has measures in place to ensure the security and proper functionality of its collected user information and databases, we cannot be held accountable in the event our database security is breached and user information compromised. If such an event occurs, WPI will take all reasonable steps to eliminate the breach and secure all user information.

Privacy Policy

We respect the privacy of our users and have implemented this Privacy Policy to explain how we use and protect the information we may gather from and about your use of the SNAP App and/or the SNAP Service. By using the SNAP App and/or the SNAP Service, you consent to the collection, use, and disclosure of your information as described in this Privacy Policy.

Information We Collect From You

You may provide us with certain information in connection with your use of the SNAP App. If you choose not to provide information, you may not be able to make ride requests through the SNAP App to the SNAP dispatch operators. The information we collect may include:

- Your location and the destination to which you wish to travel to be taken
- The number of passengers you will be traveling with
- Any information you provide to request any special accommodations during your ride

How We Use Your Information

We use the personal information we collect from you for the following purposes:

- To keep track of your individual ride request and the van assignment made internally to it
- To allow us to evaluate historical service-wide request information and analyze where the service can be improved and what the service load is like during specific times of the day

Who Will Have Access to Your Information

All of the data collected during usage of the SNAP App will be kept confidential and shared only with employees of WPI in connection with providing the SNAP Service. WPI will not sell or otherwise distribute to parties external to WPI the information collected during usage of the SNAP App. The information may be shared with the WPI Police if requested to ensure the safety of drivers or passengers of the SNAP Service or the WPI community.

Security

The SNAP App has security measures in place to protect against the loss, misuse, and alteration of the information collected through it. The application itself is restricted by domain to members of the WPI community. Reasonable measures have been taken to ensure that the application cannot be hacked, providing access to the information collected, but no system can ever be absolutely secure.

Changes in Terms

This Privacy Policy may be amended or updated to reflect changes to our information practices. If any material changes are made, they will be highlighted during the application sign in process on the SNAP web portal.

Contacting SNAP

If you have any questions about this privacy statement, or the practices of the SNAP application, please contact:

Lt. Karen Bueno, WPI Police
SNAP Liaison
508-831-5433
kbueno@wpi.edu

Appendix J: Application Use Cases

Below are a few cases created for either the rider or dispatch application of the platform. Note that use cases were not made for all functionalities as they were agreed to be too trivial to require documentation. These are things such as signing out of the dispatch application where after selecting “log out” the operator is signed out of CAS and the web page is closed.

Use Case 1: Request a Ride

Trigger:

- User presses “Make request” button

Primary Actor:

- Student rider

Supporting Actors:

- Dispatch

Preconditions:

- Student rider has entered location, destination, passenger, and accommodation information

Steps in the process:

1. Verify that the student rider has entered location and destination information
2. Verify that the student rider is located within the 1mi. radius and the destination is within the 1mi. radius
3. Verify that student rider’s passenger count is less than 5
4. Submit request information to dispatch.
5. Move to “awaiting approval” screen.

Minimal guarantees:

- Request will be considered (What if their request is not valid? We cannot guarantee that dispatch will receive it because we will not let the request go through)

Success guarantees:

- Dispatch will receive ride request

Quality Requirements:

- Request will be considered
- Dispatch will receive ride request
- Request button will commence request validity checks and submit information to dispatch if clear

Use Case 2: Cancel Ride Request

Trigger:

- User presses “Cancel Request” button

Primary Actor:

- Student rider

Supporting Actors:

- N/A

Preconditions:

- Student rider has submitted request
- Request was accepted and processed by dispatch
- Student rider is sitting within the “request being fulfilled” screen

Steps in the process:

1. Ride cancellation is submitted to dispatch
2. Application feeds back “Ride cancelled” message and returns to home screen.

Minimal guarantees:

- Cancellation button will be available and functioning

Success guarantees:

- Ride request will be cancelled

Quality Requirements:

- Cancellation button will be available and functioning
- Ride request will be cancelled
- Application will return to home screen where another request can be made

Use Case 3: Accept Request

Trigger:

- User receives ride request

Primary Actor:

- Dispatch Operator

Supporting Actors:

- Student Rider

Preconditions:

- Student rider's request is pre-validated for general violations and is submitted through dispatch queue.

Steps in the process:

1. Dispatch operator presses selects request from New Request queue
2. Operator selects the accept request option
3. Operator selects van assignment
4. Request is moved to processing queue
5. Notification is sent to user stating "Request accepted"

Minimal guarantees:

- Request moves to processing queue

Success guarantees:

- Request is removed from dispatch queue
- Notification is sent to user stating "Request Accepted"

Quality Requirements:

- Request moves to processing queue
- Request is removed from new request queue
- Notification is sent to user stating "Request Accepted"

Use Case 4: Confirm Dropoff (Clear Request)

Trigger:

- SNAP driver calls to notify dispatch operator that a student rider has been dropped off

Primary Actor:

- Dispatch operator

Supporting Actors:

- Student rider
- SNAP Driver

Preconditions:

- Student rider request is sitting within van assignment queue indicated as “Confirmed Pickup”

Steps in the process:

1. Dispatch operator presses request button from in process queue
2. Operator selects the purpose for clearing and confirms
3. Request moves to historical archive
4. Request is removed entirely from the dispatch interface
5. Student rider is notified of their dropoff confirmation

Minimal guarantees:

- “Confirm Dropoff” button will exist

Success guarantees:

- Request will be moved to historical archive
- Request will be removed entirely from the dispatch interface
- User is notified of their dropoff confirmation

Quality Requirements:

- “Confirm Dropoff” button will exist
- Request will be removed entirely from the dispatch interface
- User is notified of their dropoff confirmation
- Button will functional properly and be interactable

Use Case 5: Reject Request

Trigger:

- A student rider's request does not meet SNAP ride fulfillment protocol

Primary Actor:

- Dispatch operator

Supporting Actors:

- Student rider

Preconditions:

- Student rider's request is pre-validated by application before submission to dispatch
- Student rider request is sitting within dispatch queue

Steps in the process:

1. Dispatch operator presses the "Reject Request" button
2. Dialogue prompting reason for rejection is displayed
3. Dispatch operator enters reason for rejection
4. Request moves to historical archive
5. Student rider is notified that their request has been rejected

Minimal guarantees:

- "Reject Request" button will exist

Success guarantees:

- Request will be removed from dispatch queue
- Historical archive entry added with reason for rejection
- Student rider is notified that their request has been rejected

Quality Requirements:

- "Reject Request" button will exist
- Request will be removed from dispatch queue
- Historical archive entry added with reason for rejection
- Student rider is notified that their request has been rejected