

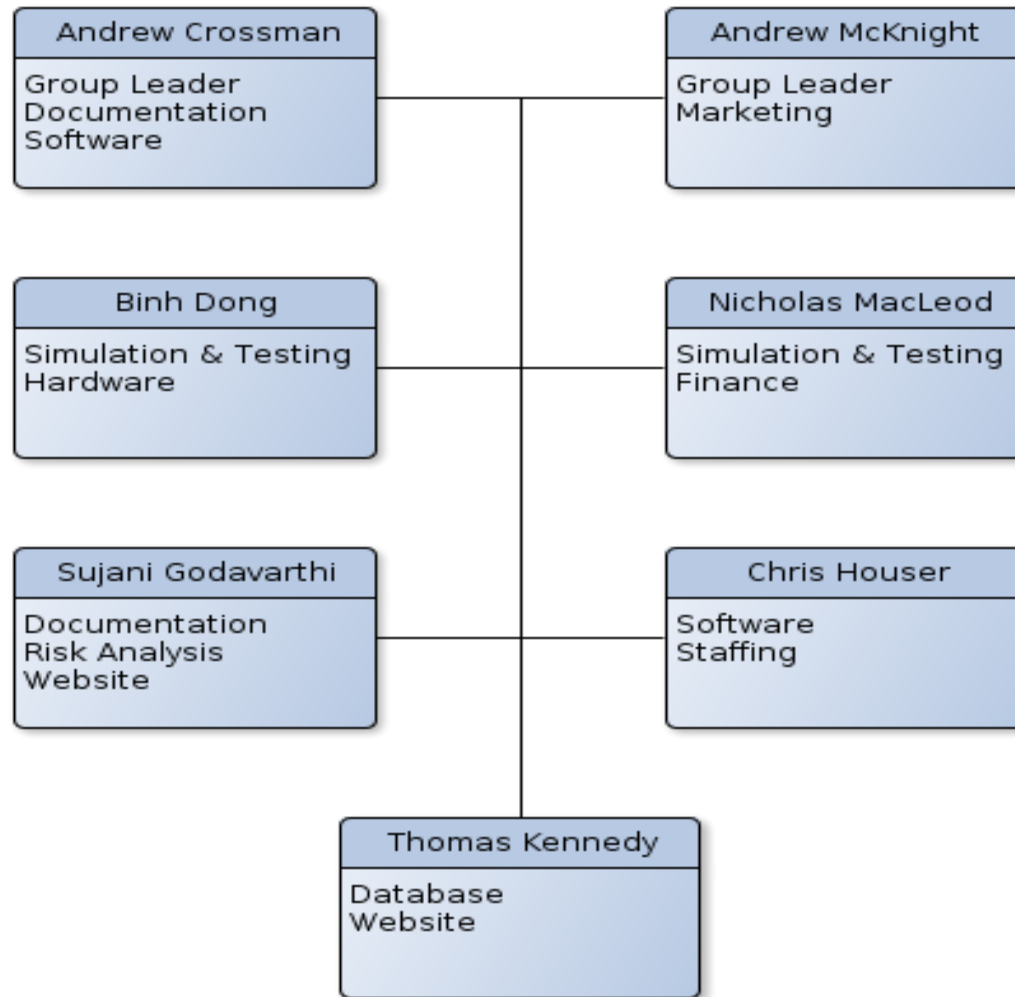
Personalized traffic-monitoring smartphone app

Traffic Wizard

Outline

- Team Blue Staff
- Team Blue Domain Experts
- Without Traffic Wizard
- Societal Problem
- Heavy Traffic Factors
- Traffic Wizard Solution
- Virtual Checkpoints
- With Traffic Wizard
- U.S. Traffic Data
- U.S. Population Data
- Major Functional Components
- Software Milestones
 - Databases
 - Data Flow
 - Interface
 - Algorithms
 - Testing
- Customer Identification
- Market Analysis
- Competition
- Risk Assessment
- Work Breakdown
- Phase 2 Staffing
- Phase 2 Resources
- Conclusion

Team Blue Staff



Team Blue Domain Experts



Michele Weigle, Ph.D.

Research:

- Vehicular Networks
- Network Simulation
- Internet Congestion Control

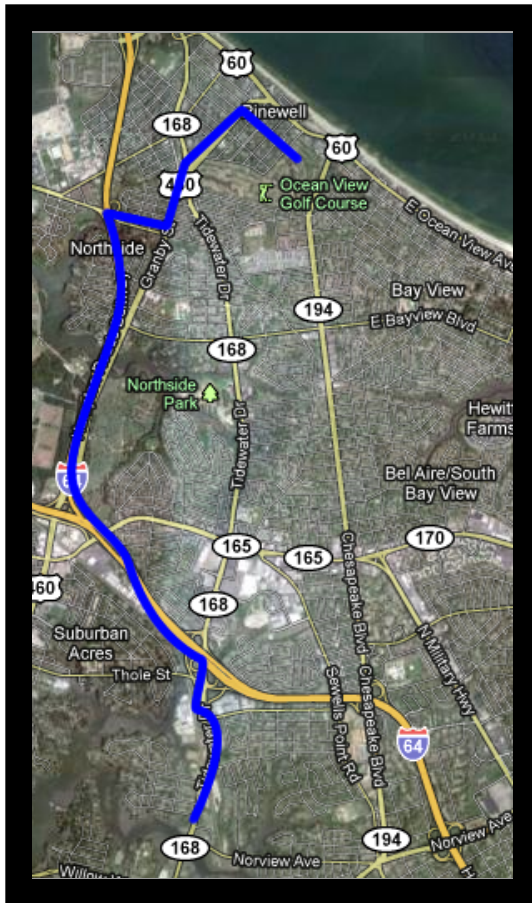


Tamer Nadeem, Ph.D.

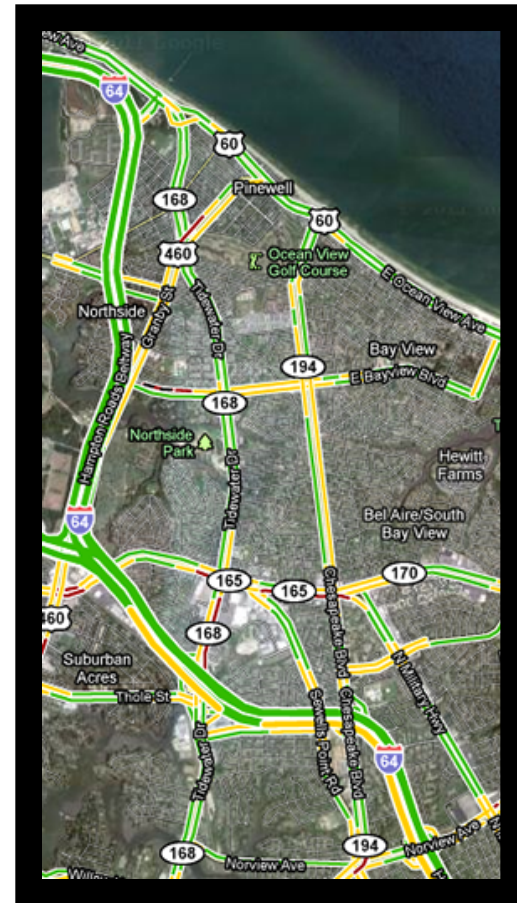
Research:

- Vehicular Networks
- Mobile Computing
- Location Determination Systems

Without Traffic Wizard



Typical Route

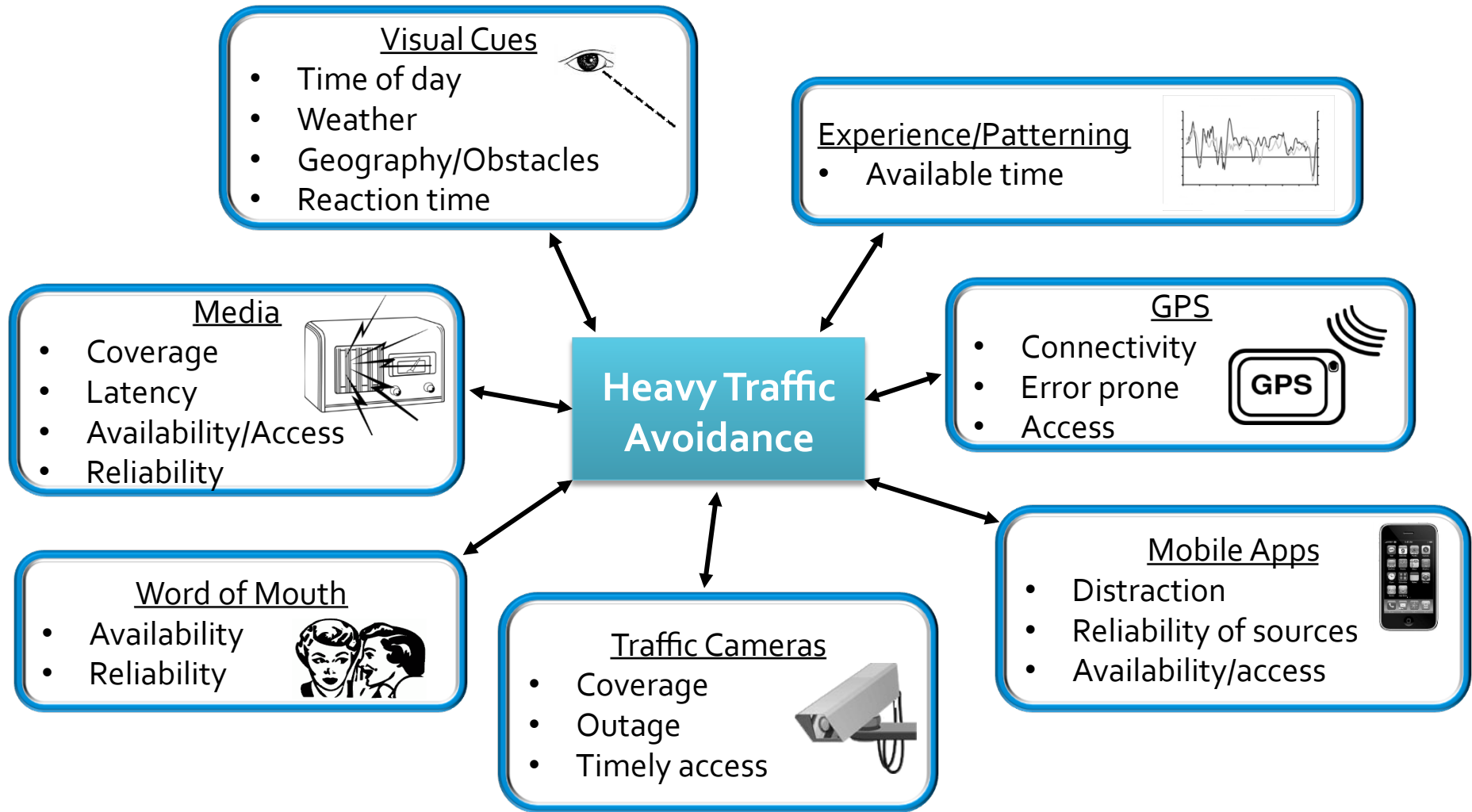


“Current Traffic Conditions”

Societal Problem

A driver's limited awareness of adverse traffic conditions increases his/her potential to get caught in heavy traffic congestion.

Heavy Traffic Factors



Traffic Wizard Solution

- Personalized smartphone application for traffic updates
- User profile system for storing frequent routes
- Analysis of stored routes before or during travel time
- Accurate traffic information based on custom routes
- Virtual checkpoint system for efficient data exchange

Virtual Checkpoints



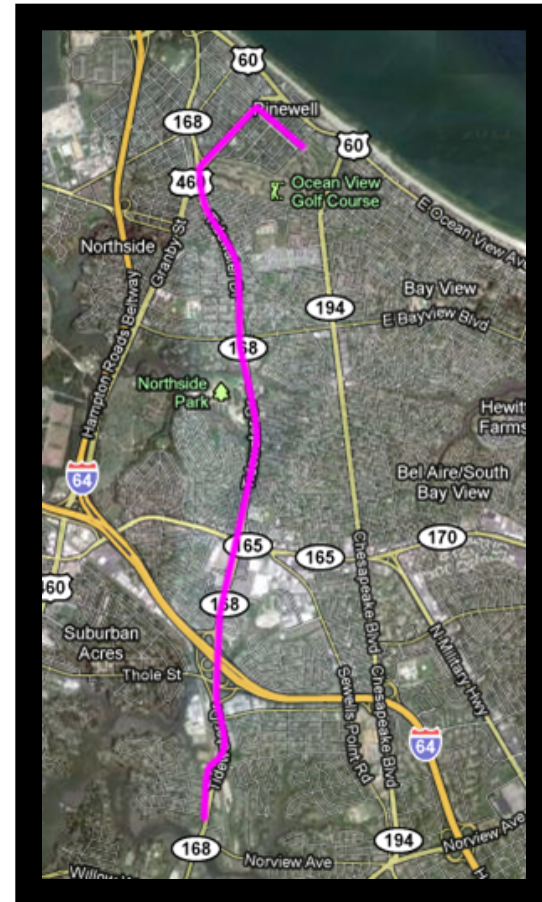
What are virtual checkpoints?

- GPS locations of specific points along roadways
- Label road segments by amount of traffic congestion
- Can be dynamically re-allocated as roads and traffic patterns change

With Traffic Wizard

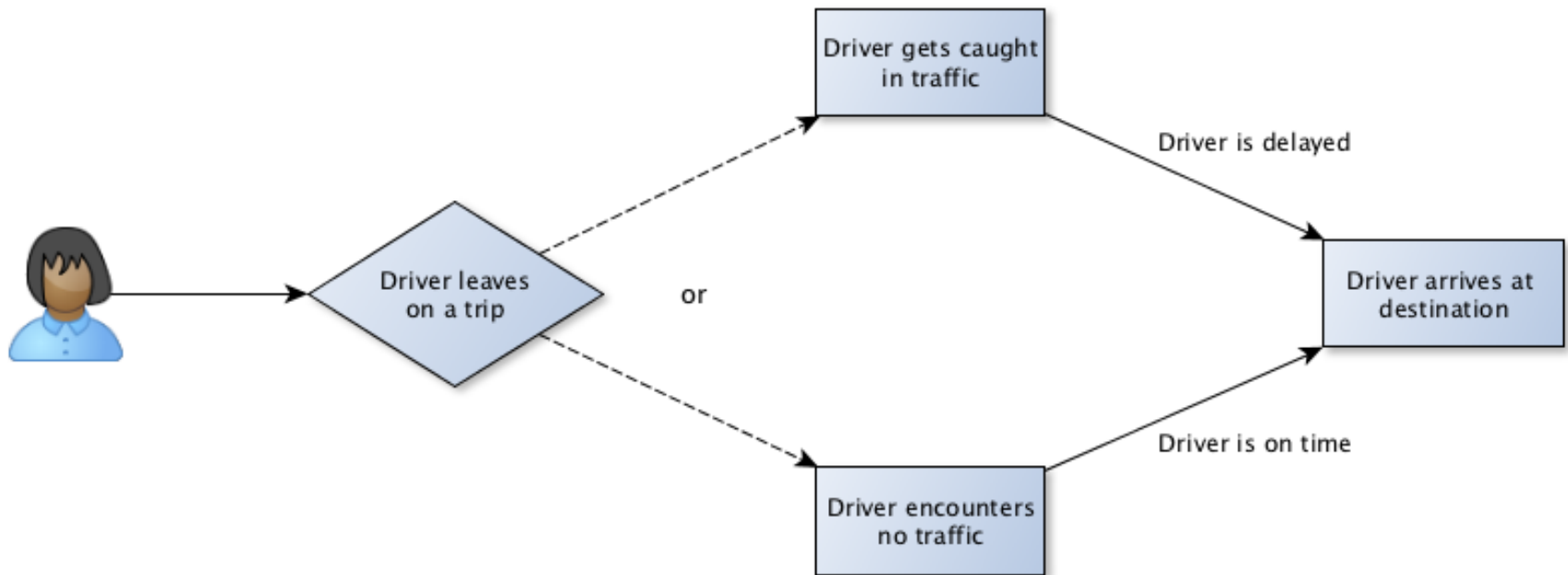


Real-time Conditions
(Virtual checkpoint representation)

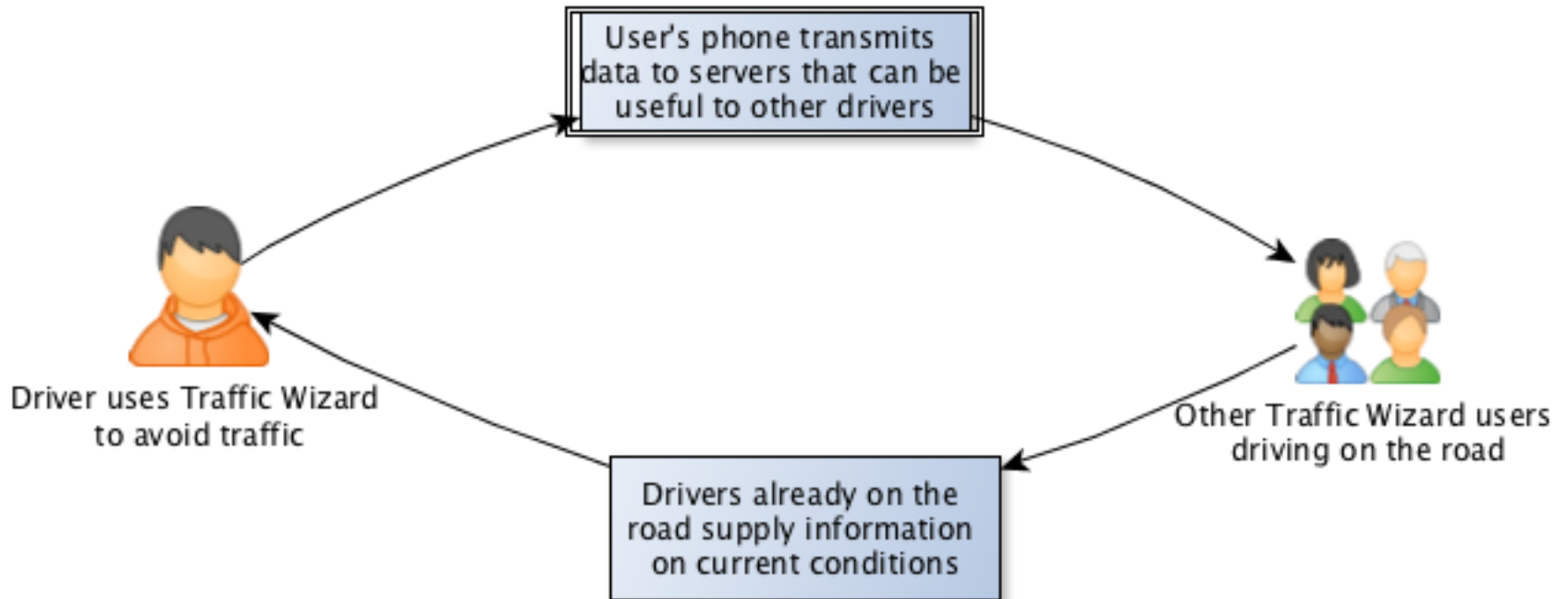


Current Optimal Route

Without Traffic Wizard

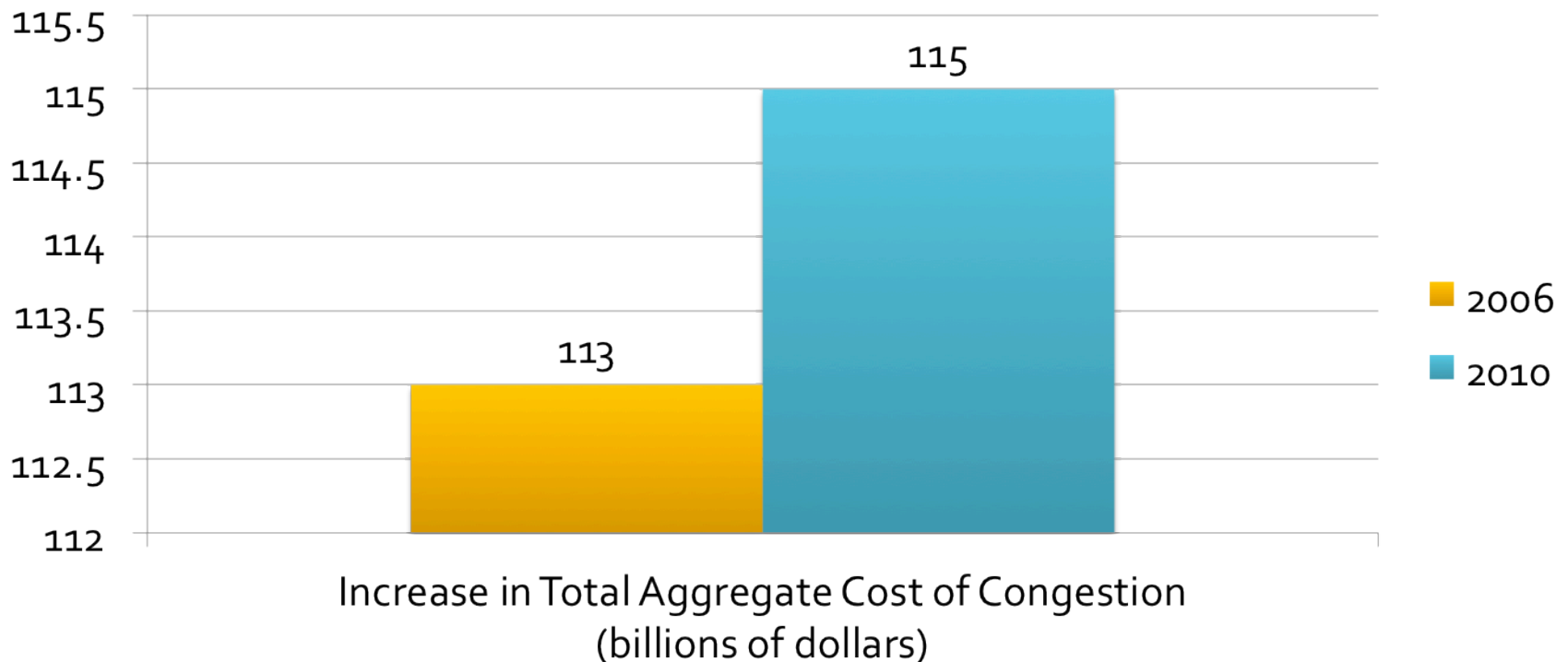


With Traffic Wizard



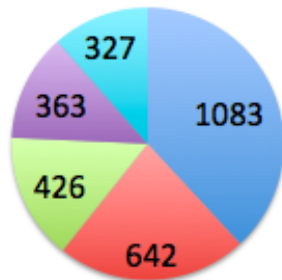
U.S. Traffic Data

- 4.8 billion hours of excess commute time
- 1.9 billion gallons of excess fuel consumed

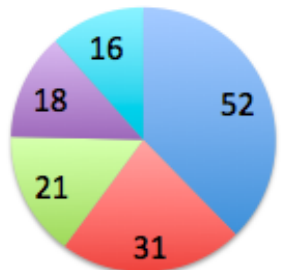


U.S. Traffic Data

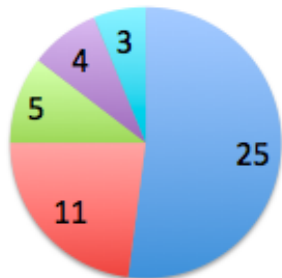
(per driver, per year)



Aggregate Cost, as calculated from fuel and delay excesses (dollars)



Average Hours Delayed



Average Fuel Excess, due to longer commute times

Legend of population sizes

Very Large Areas
> 3,000,000

Large Areas
> 1,000,000

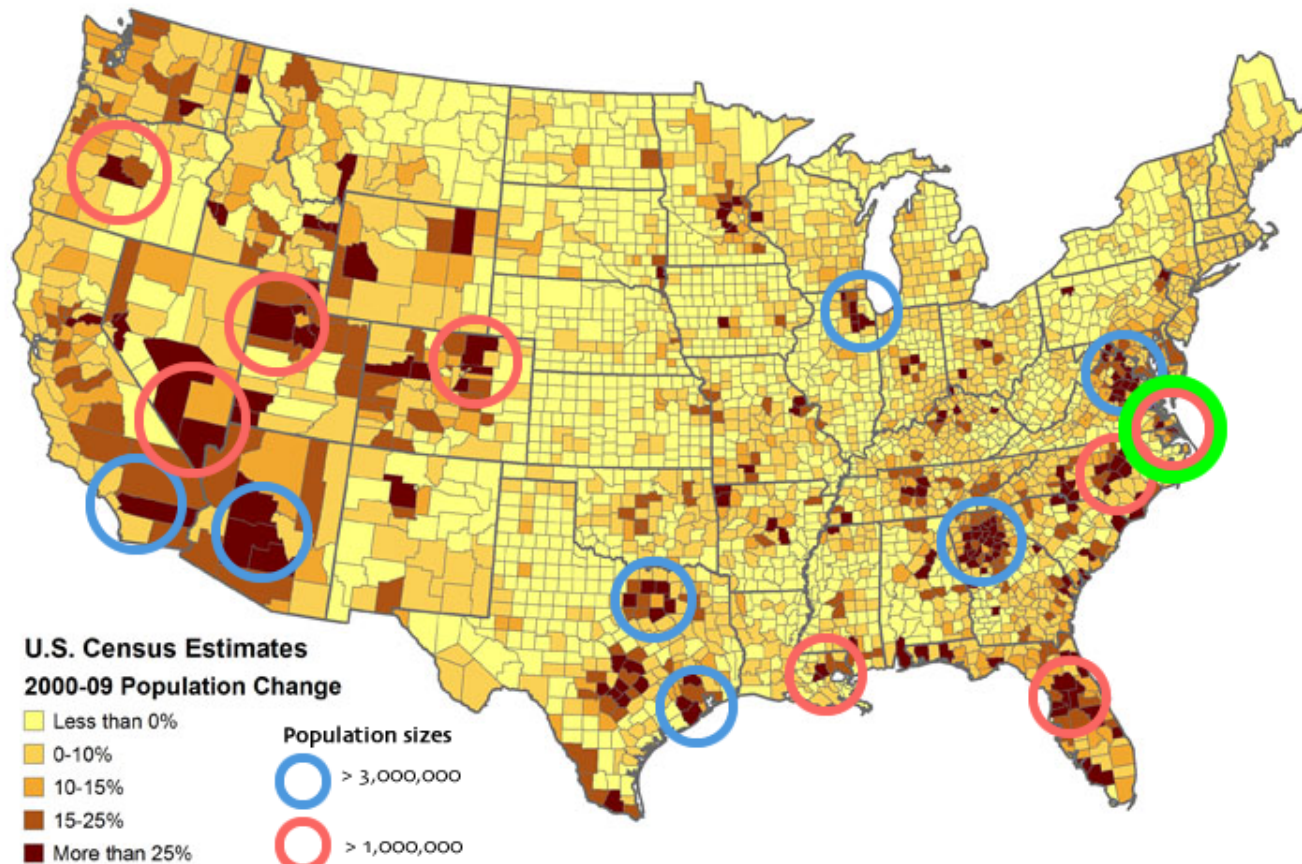
Medium Areas
> 500,000

Small Areas
< 500,000

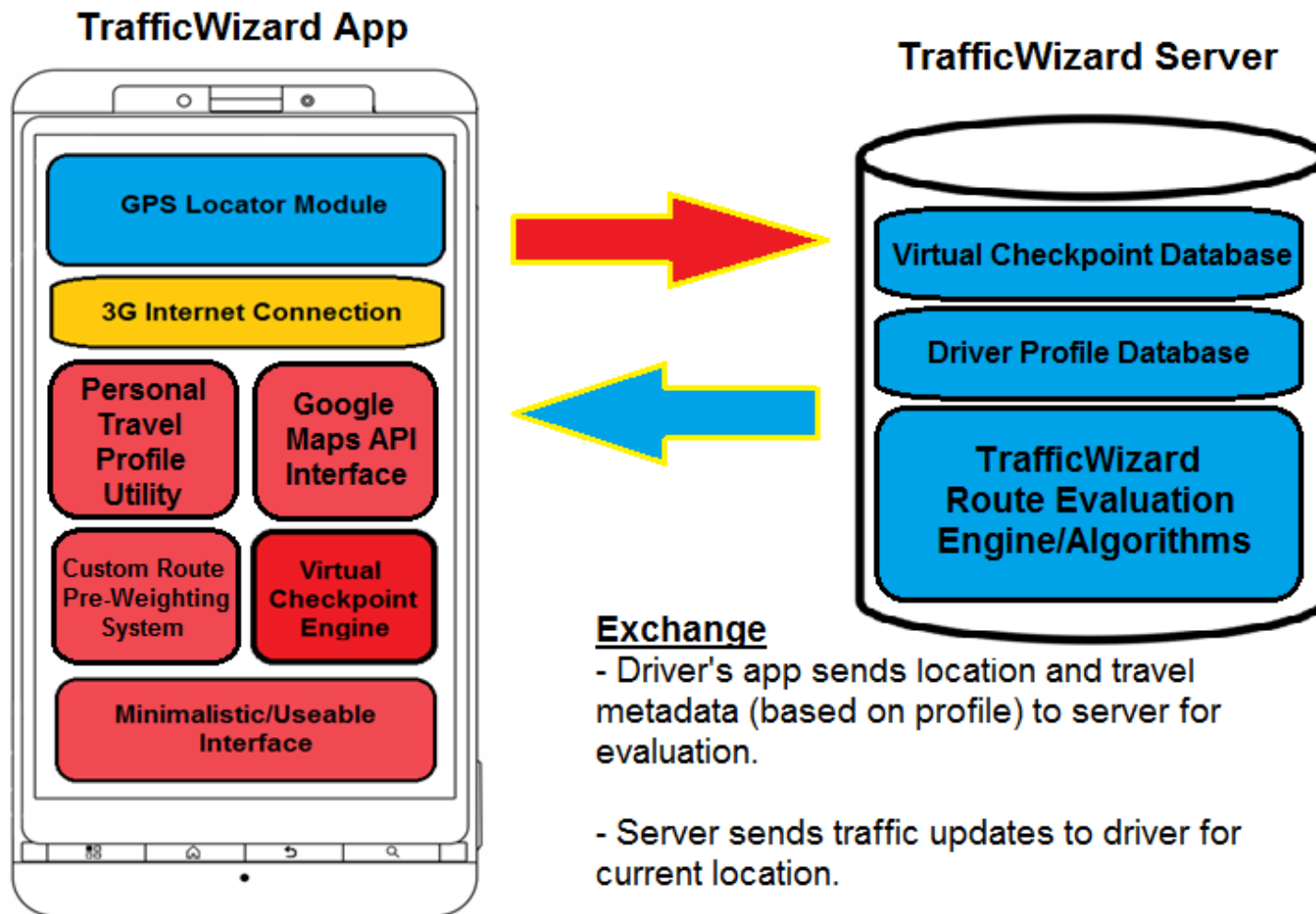
Other Urban Areas

U.S. Population Data

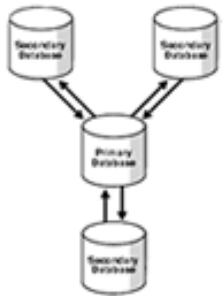
- The highest congestion cost is incurred in areas with larger populations.
- Populations are increasing at the fastest rate in these high population areas.



Major Functional Components



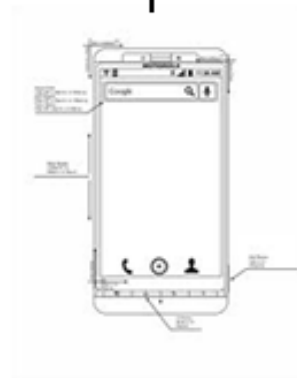
Software Milestones



Databases



Checkpoints



User
Interface

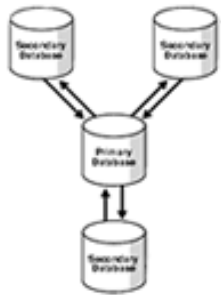
```
-(BOOL)shouldAutorotateToInterfaceOrientation:  
    Return YES for supported orientations  
    return YES;  
  
-(NSInteger)tableView:(UITableView *)tableView  
    numberOfRowsInSection:  
    return [self.columns count];  
  
-(UITableViewCell *)tableView:(UITableView *)  
    tableView cellForRowAtIndexPath:  
    NSString *cellIdentifier = @"Cell";  
    UITableViewCell *cell = [tableView dequeueReusableCellWithIdentifier:  
        cellIdentifier];  
    if (cell == nil) {  
        cell = [[UITableViewCell alloc] initWith  
            reuseIdentifier];  
    }  
    return cell;
```

Analysis
Engine



Testing

Software Milestones



Checkpoints

User Interface

Analysis Engine

Testing

Databases

- Speed Limit Database
- Checkpoint Database
- User Database

Databases: Schema

User
user_id
last_name
first_name
type
email
username
password

User_Group
group_id
description
max_routes

Payment_Info
payment_id
user_id
last_name
first_name
address
city
state
zipcode

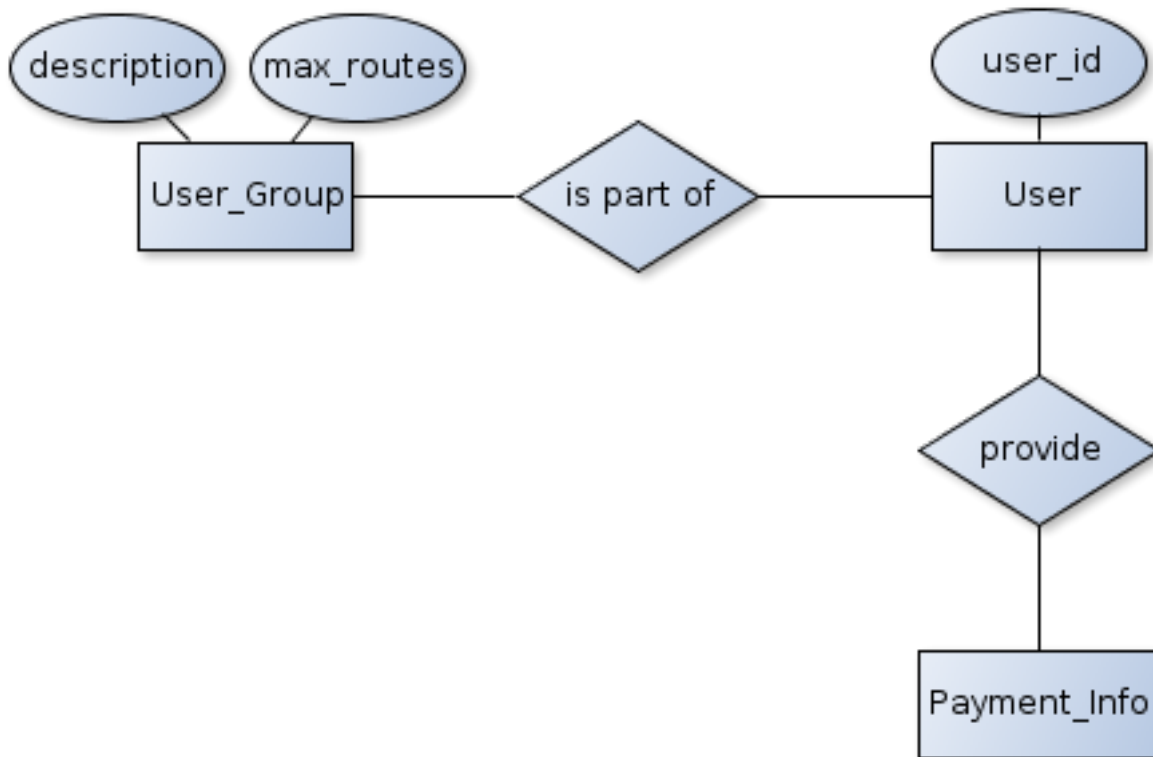
VC_Statistics
vc_id
time_of_day
shortest_time
longest_time
avg_time
high_speed
low_speed
avg_speed
direction

VC_Data
vc_id
time
speed
direction

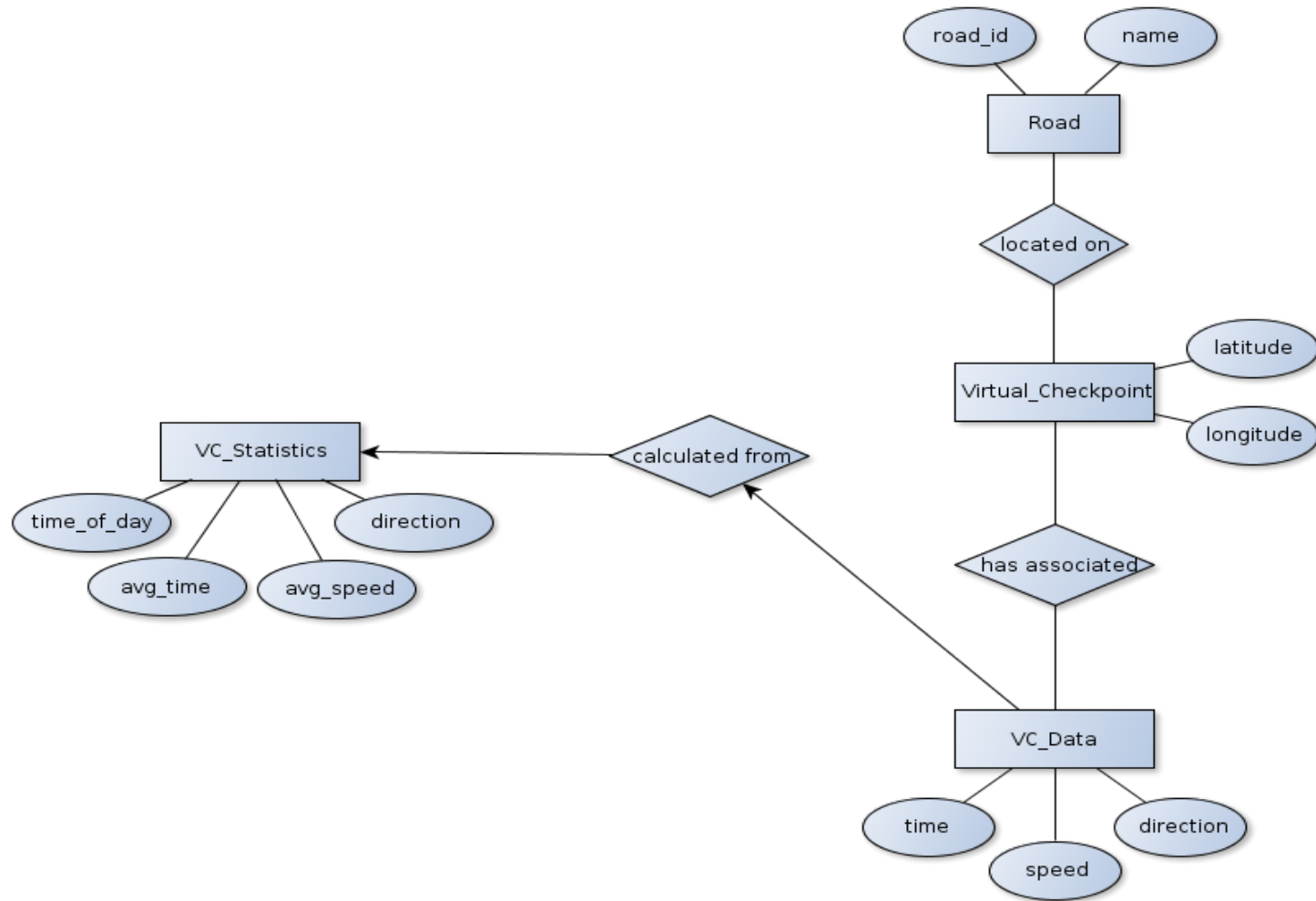
Road
road_id
road_name

Virtual_Checkpoint
vc_id
latitude
longitude

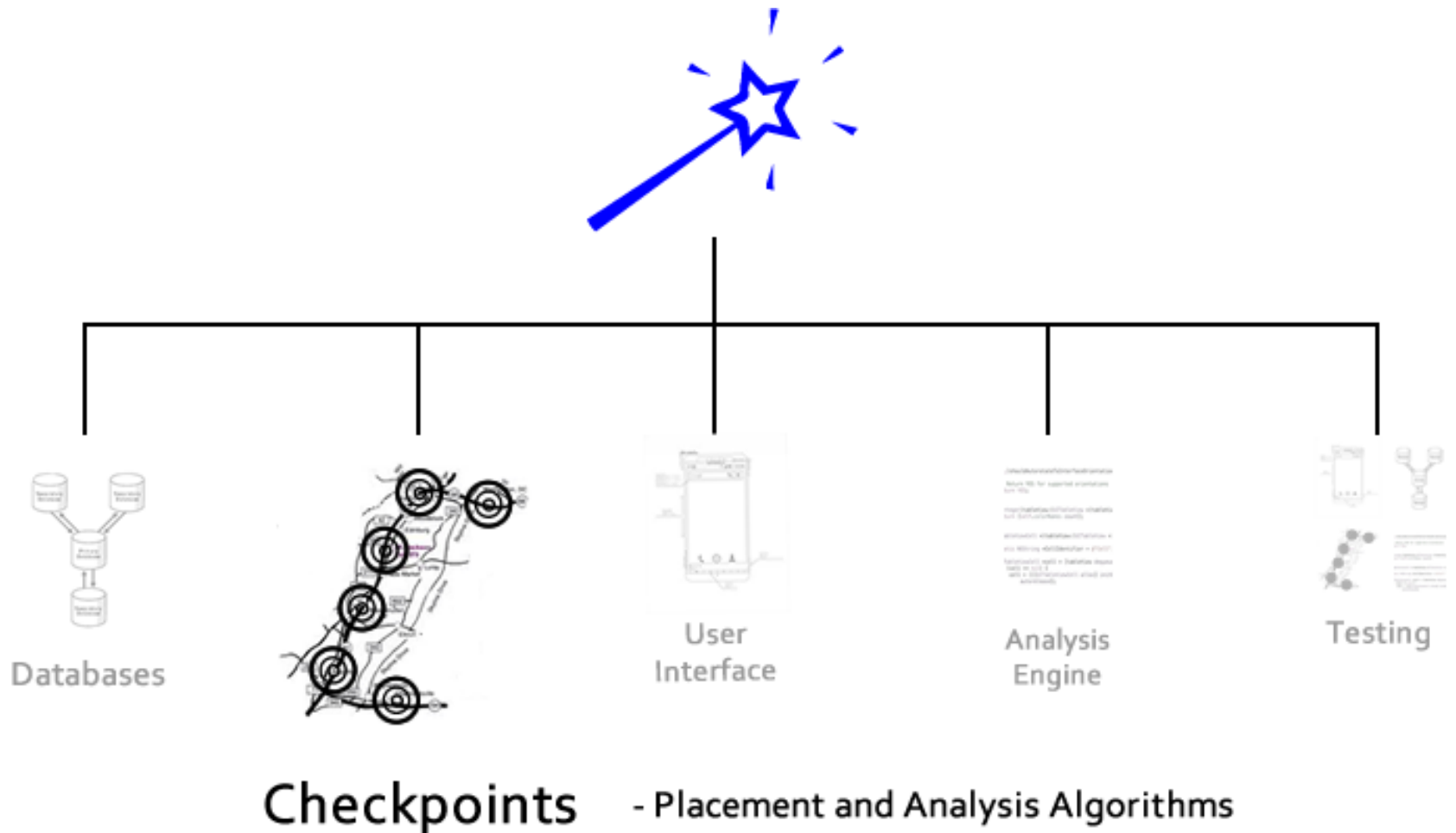
Databases: Customer



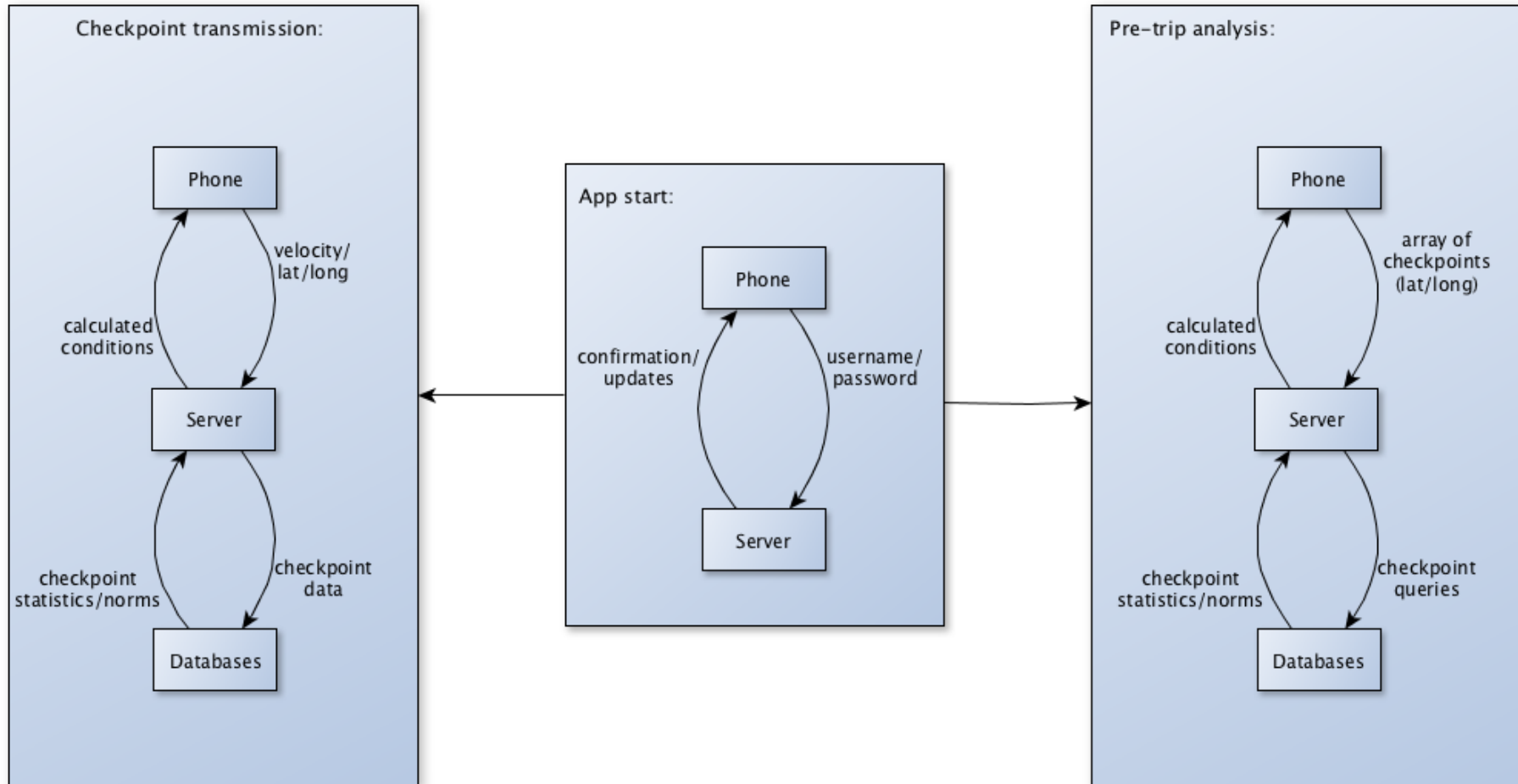
Databases: Route



Software Milestones



Data Flow



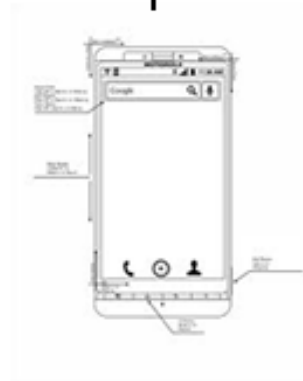
Software Milestones



Databases



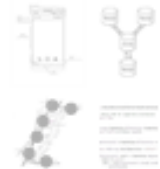
Checkpoints



User
Interface



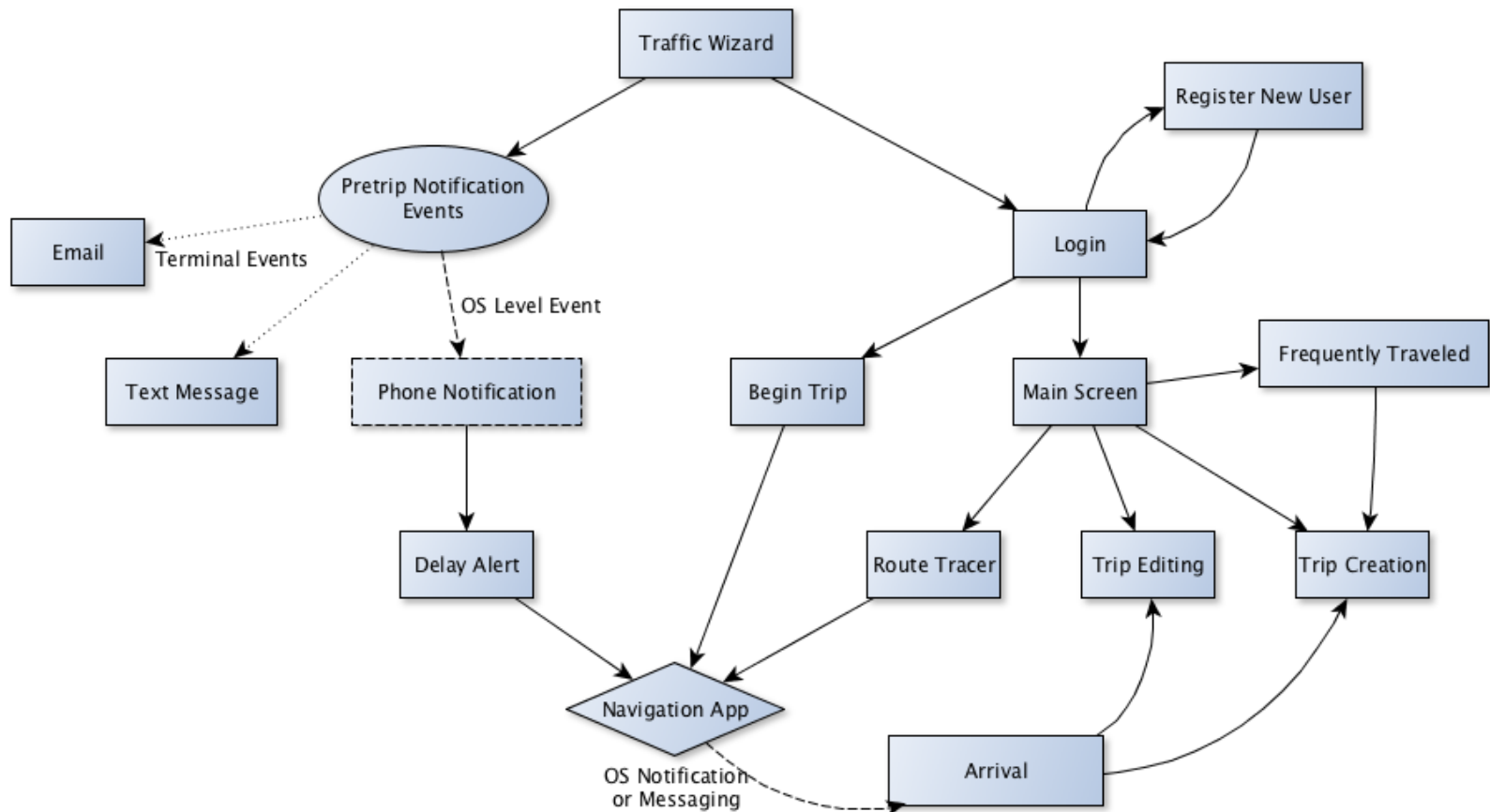
Analysis
Engine



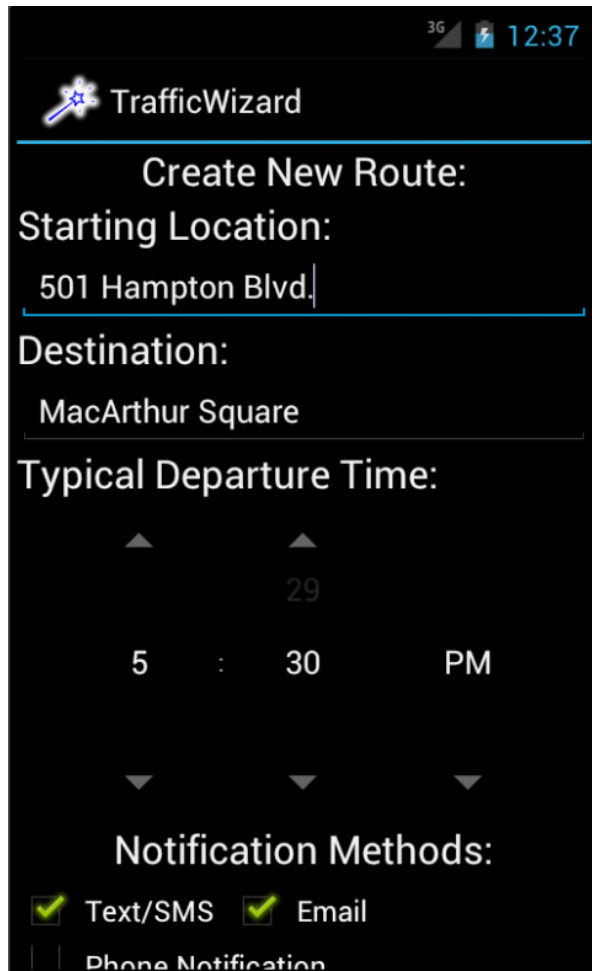
Testing

- Smartphone App Interface
- Across several different OS's

GUI Site Map



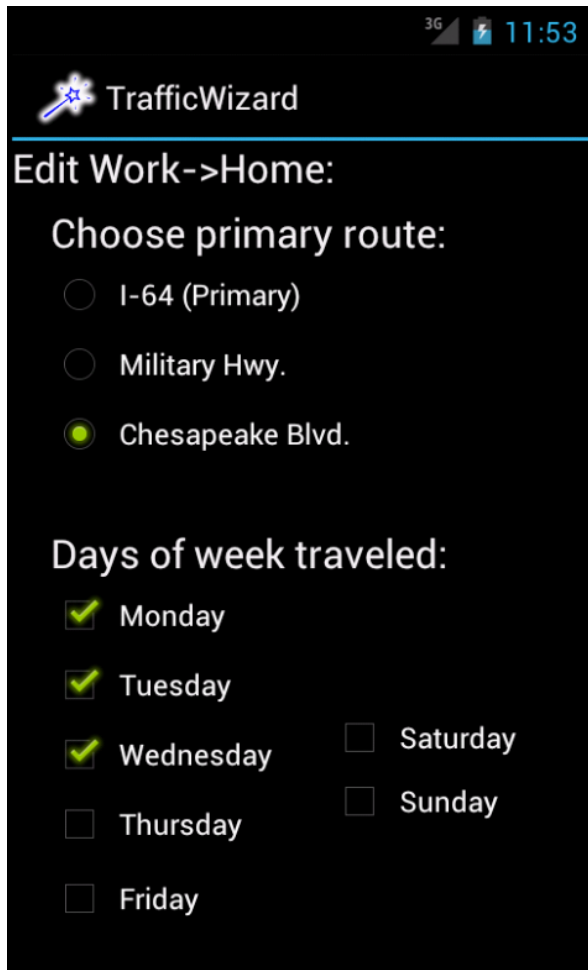
Interface: New Route



The screenshot shows the 'Create New Route' screen in the TrafficWizard app. At the top, the status bar displays '3G', signal strength, and the time '12:37'. The app title 'TrafficWizard' is at the top left. The main heading is 'Create New Route:'. Below it, there are three input fields: 'Starting Location:' with the text '501 Hampton Blvd.', 'Destination:' with the text 'MacArthur Square', and 'Typical Departure Time:' with a time picker set to '5 : 30 PM'. At the bottom, there is a 'Notification Methods:' section with three options: 'Text/SMS' (checked), 'Email' (checked), and 'Phone Notification' (unchecked).

- Location and time specific trips
- Multiple notification methods

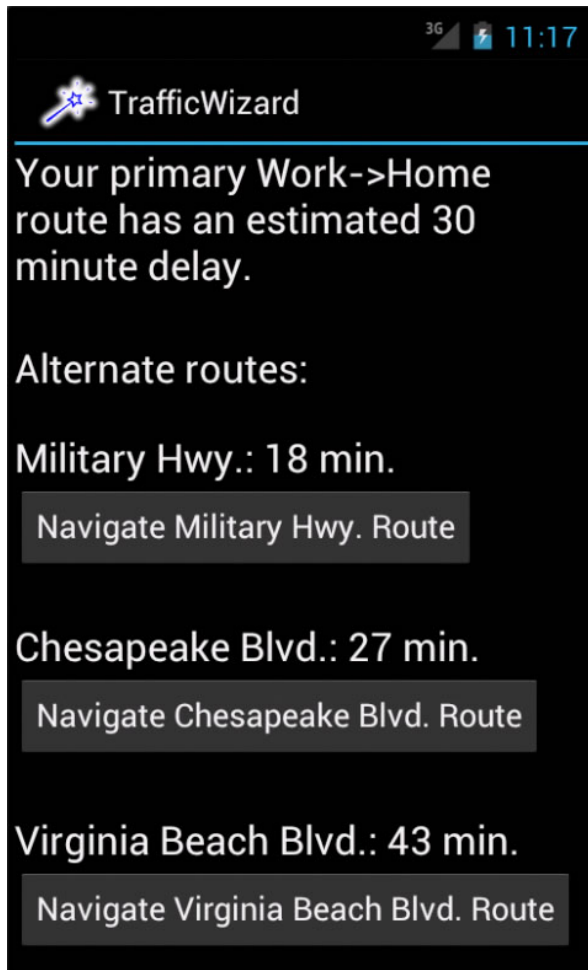
Interface: Edit Route



The screenshot shows the 'Edit Route' screen in the TrafficWizard app. At the top, the status bar displays '3G', a signal strength icon, a battery icon, and the time '11:53'. Below the status bar is the app's logo, a blue star with a white trail, followed by the text 'TrafficWizard'. The main content area is titled 'Edit Work->Home:' and contains two sections. The first section, 'Choose primary route:', has three radio button options: 'I-64 (Primary)', 'Military Hwy.', and 'Chesapeake Blvd.', with the third option selected. The second section, 'Days of week traveled:', has seven checkboxes for the days of the week: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday. Monday, Tuesday, and Wednesday are checked, while Thursday, Friday, Saturday, and Sunday are unchecked.

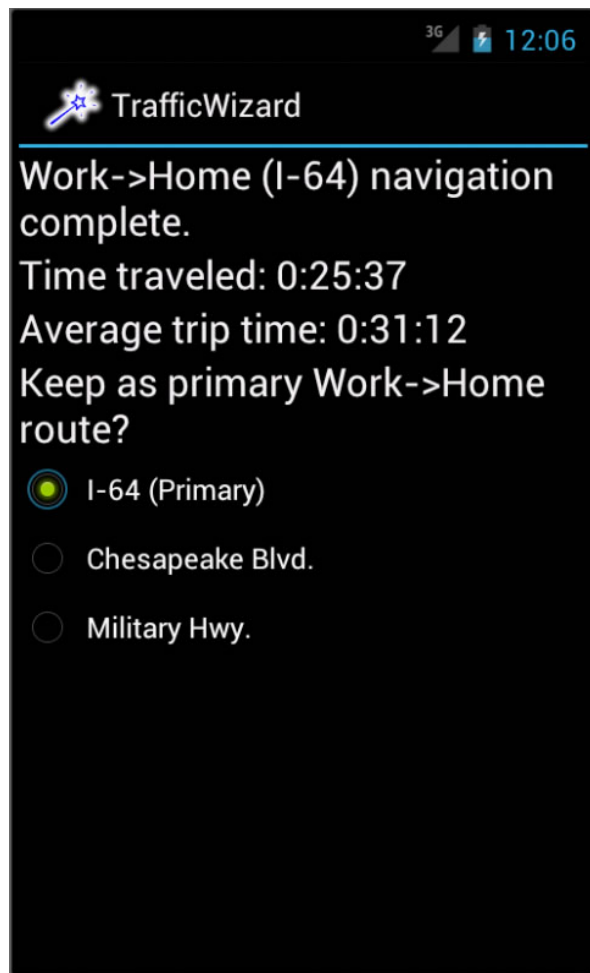
- Set times of travel
- Change primary route for trips
- Trip/route specific settings

Interface: Delay Notification



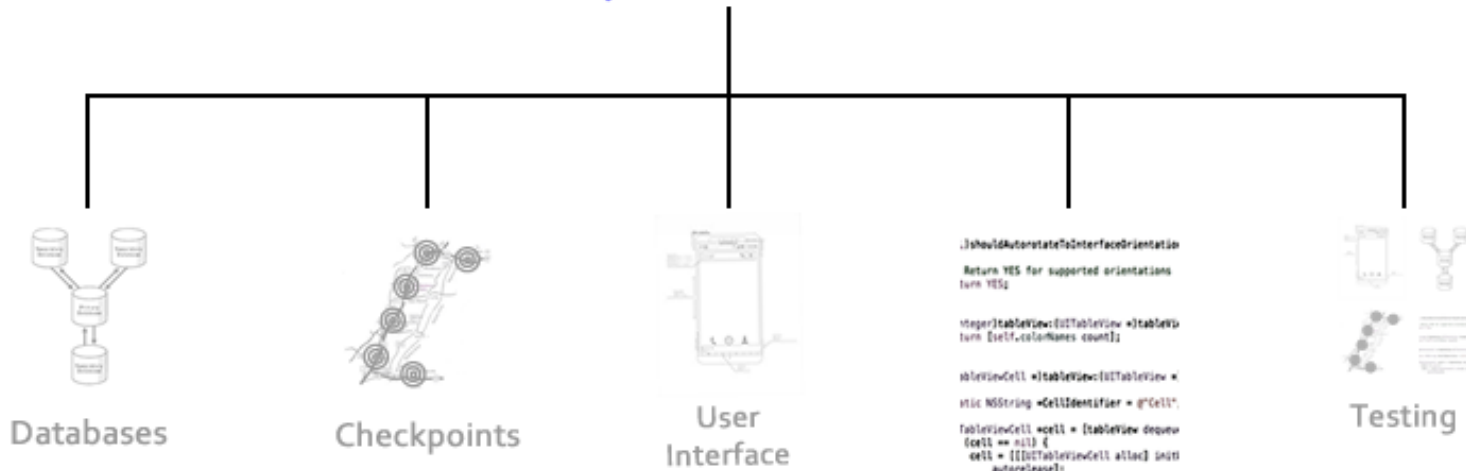
- Informs of delays on route to be traveled soon
- Presents options for alternatives
- Can lead to third party navigation app for unfamiliar routes

Interface: Arrival



- Trip summary
- Ability to adjust route settings, or set new primary route

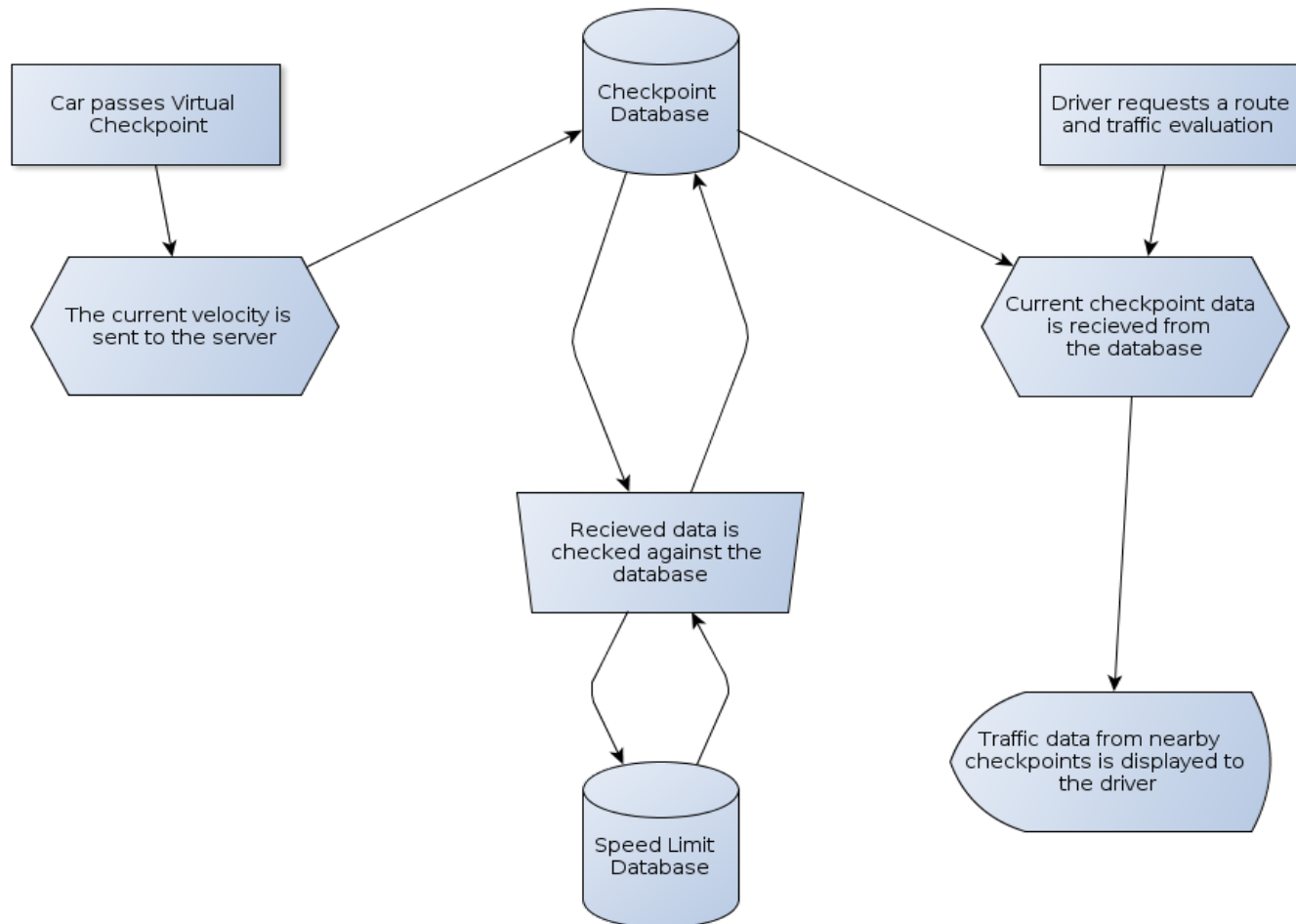
Software Milestones



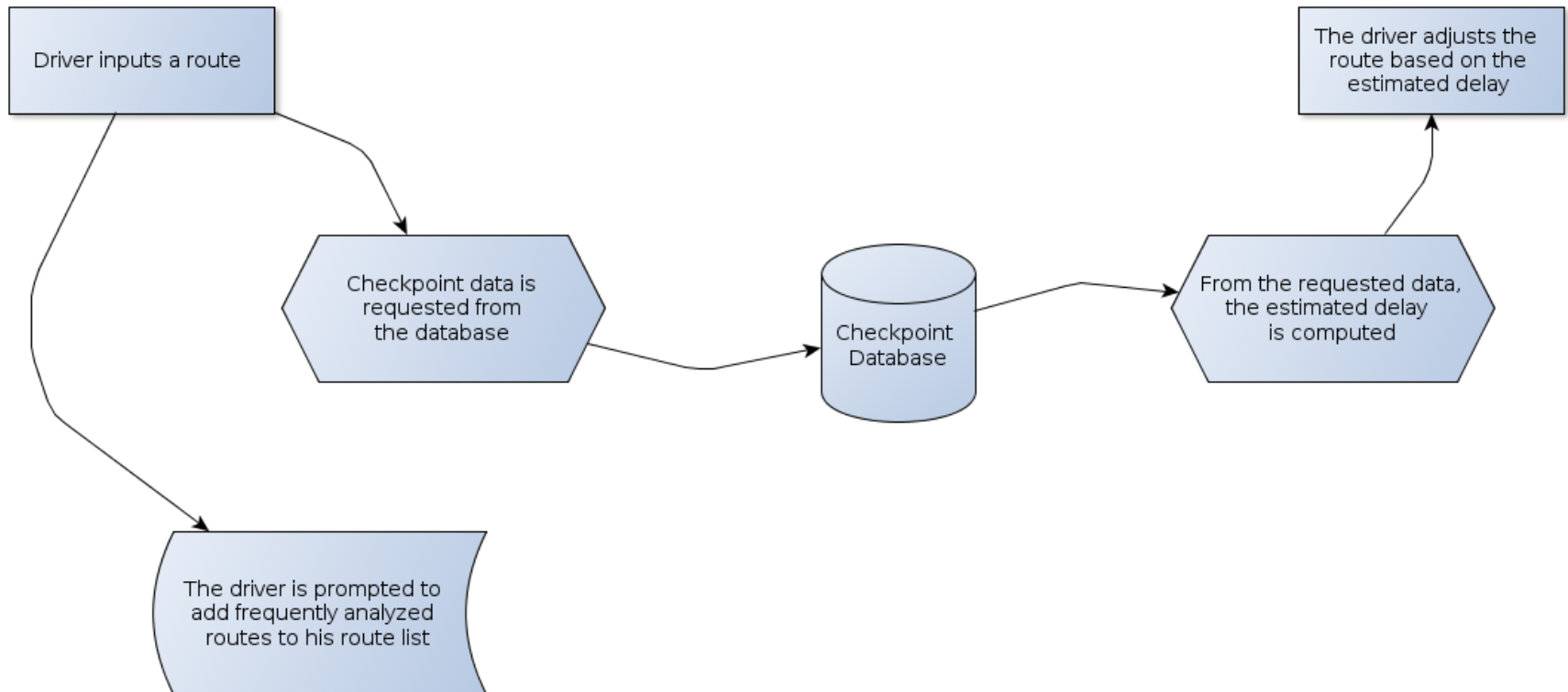
Analysis Engine

- Based on profile
- Uses checkpoint information
- Route analysis algorithms

Algorithms: Checkpoint



Algorithms: Route Analysis



Software Milestones



Databases



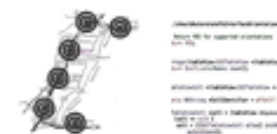
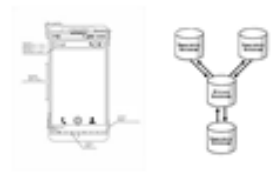
Checkpoints



User Interface



Analysis Engine



- Alpha and Beta phases
- Checkpoint revalidation
- Server load testing
- GUI functionality

Testing

Testing

Alpha Testing Phase (Closed)

- Virtual Checkpoint placement verification
- Efficient driver data collection
- Functionality testing (GUI / Analysis)
- Server Load testing



Beta Testing Phase (Public)

- Virtual Checkpoint re-allocation
- Verify driver data transmission throughput
- Trip/Route integration (Profile-based)
- Increased Server Load Testing

Work Breakdown: Planning

	Task Name	Duration	Start	Finish	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter		
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	<input type="checkbox"/> Phase 2	291 days	Mon 1/9/12	Mon 2/18/13															
2	<input type="checkbox"/> Develop Project Team	30 days	Mon 1/9/12	Fri 2/17/12															
3	Interview/Hire Webmaster	30 days	Mon 1/9/12	Fri 2/17/12															
4	Interview/Hire Database Developer	30 days	Mon 1/9/12	Fri 2/17/12															
5	Interview/Hire Software Developer	30 days	Mon 1/9/12	Fri 2/17/12															
6	Interview/Hire GUI Developer	30 days	Mon 1/9/12	Fri 2/17/12															
7	Interview/Hire Reports Expert	30 days	Mon 1/9/12	Fri 2/17/12															
8	Interview/Hire Marketing Specialist	30 days	Mon 1/9/12	Fri 2/17/12															
9	Interview/Hire Documentation Specialist	30 days	Mon 1/9/12	Fri 2/17/12															
10	<input type="checkbox"/> Planning	35 days	Mon 1/9/12	Fri 2/24/12															
11	Risk Management	25 days	Mon 1/9/12	Fri 2/10/12															
12	Support Plan	15 days	Mon 1/9/12	Fri 1/27/12															
13	Hardware Plan	10 days	Mon 1/9/12	Fri 1/20/12															
14	Software Plan	35 days	Mon 1/9/12	Fri 2/24/12															
15	<input type="checkbox"/> Hardware	6 days	Mon 2/27/12	Mon 3/5/12															
16	Research workstation brand/model	1 day	Mon 2/27/12	Mon 2/27/12															
17	Purchase workstations	5 days	Tue 2/28/12	Mon 3/5/12															
18	Research server brand/model	1 day	Mon 2/27/12	Mon 2/27/12															
19	Purchase server	5 days	Tue 2/28/12	Mon 3/5/12															
20	<input type="checkbox"/> Software Development	166 days	Mon 2/27/12	Mon 10/15/12															
52	<input type="checkbox"/> Documentation	7 days	Tue 10/16/12	Wed 10/24/12															
59	<input type="checkbox"/> Testing	90 days	Tue 10/16/12	Mon 2/18/13															

Work Breakdown: Software

	Task Name	Duration	Start	Finish	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter		
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	[-] Phase 2	291 days	Mon 1/9/12	Mon 2/18/13	[Gantt bar spanning from Mon 1/9/12 to Mon 2/18/13]														
2	+ Develop Project Team	30 days	Mon 1/9/12	Fri 2/17/12	[Gantt bar from Mon 1/9/12 to Fri 2/17/12]														
10	+ Planning	35 days	Mon 1/9/12	Fri 2/24/12	[Gantt bar from Mon 1/9/12 to Fri 2/24/12]														
15	+ Hardware	6 days	Mon 2/27/12	Mon 3/5/12	[Gantt bar from Mon 2/27/12 to Mon 3/5/12]														
20	[-] Software Development	166 days	Mon 2/27/12	Mon 10/15/12	[Gantt bar from Mon 2/27/12 to Mon 10/15/12]														
21	+ GUI Development	28 days	Thu 4/19/12	Mon 5/28/12	[Gantt bar from Thu 4/19/12 to Mon 5/28/12]														
26	[-] Algorithm Development	45 days	Mon 2/27/12	Fri 4/27/12	[Gantt bar from Mon 2/27/12 to Fri 4/27/12]														
27	Virtual Checkpoint Allocation Algorith	45 days	Mon 2/27/12	Fri 4/27/12	[Gantt bar from Mon 2/27/12 to Fri 4/27/12]														
28	GPS Data Collection Algorithm	10 days	Mon 2/27/12	Fri 3/9/12	[Gantt bar from Mon 2/27/12 to Fri 3/9/12]														
29	Route Analysis Algorithm	20 days	Mon 2/27/12	Fri 3/23/12	[Gantt bar from Mon 2/27/12 to Fri 3/23/12]														
30	Congestion Notification Algorithm	10 days	Mon 2/27/12	Fri 3/9/12	[Gantt bar from Mon 2/27/12 to Fri 3/9/12]														
31	[-] Database Development	52 days	Mon 2/27/12	Tue 5/8/12	[Gantt bar from Mon 2/27/12 to Tue 5/8/12]														
32	Analysis	5 days	Mon 2/27/12	Fri 3/2/12	[Gantt bar from Mon 2/27/12 to Fri 3/2/12]														
33	Design	15 days	Mon 3/5/12	Fri 3/23/12	[Gantt bar from Mon 3/5/12 to Fri 3/23/12]														
34	Implementation	12 days	Mon 3/26/12	Tue 4/10/12	[Gantt bar from Mon 3/26/12 to Tue 4/10/12]														
35	Integration	10 days	Wed 4/11/12	Tue 4/24/12	[Gantt bar from Wed 4/11/12 to Tue 4/24/12]														
36	Testing	10 days	Wed 4/25/12	Tue 5/8/12	[Gantt bar from Wed 4/25/12 to Tue 5/8/12]														
37	+ Hardware Interface Development	38 days	Mon 2/27/12	Wed 4/18/12	[Gantt bar from Mon 2/27/12 to Wed 4/18/12]														
42	+ Data Mining	52 days	Wed 5/9/12	Thu 7/19/12	[Gantt bar from Wed 5/9/12 to Thu 7/19/12]														
47	+ Traffic Analysis Engine	62 days	Fri 7/20/12	Mon 10/15/12	[Gantt bar from Fri 7/20/12 to Mon 10/15/12]														
52	+ Documentation	7 days	Tue 10/16/12	Wed 10/24/12	[Gantt bar from Tue 10/16/12 to Wed 10/24/12]														
59	+ Testing	90 days	Tue 10/16/12	Mon 2/18/13	[Gantt bar from Tue 10/16/12 to Mon 2/18/13]														

Work Breakdown: Testing

	Task Name	Duration	Start	Finish	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter			1st Quarter		
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	[-] Phase 2	291 days	Mon 1/9/12	Mon 2/18/13															
2	+ Develop Project Team	30 days	Mon 1/9/12	Fri 2/17/12															
10	+ Planning	35 days	Mon 1/9/12	Fri 2/24/12															
15	+ Hardware	6 days	Mon 2/27/12	Mon 3/5/12															
20	+ Software Development	166 days	Mon 2/27/12	Mon 10/15/12															
52	+ Documentation	7 days	Tue 10/16/12	Wed 10/24/12															
59	[-] Testing	90 days	Tue 10/16/12	Mon 2/18/13															
60	[-] Alpha	20 days	Tue 10/16/12	Mon 11/12/12															
61	Server Load Testing	10 days	Tue 10/16/12	Mon 10/29/12															
62	System Functionality Testing	20 days	Tue 10/16/12	Mon 11/12/12															
63	[-] Beta	90 days	Tue 10/16/12	Mon 2/18/13															
64	Server Load Testing	20 days	Tue 10/16/12	Mon 11/12/12															
65	System Functionality Testing	90 days	Tue 10/16/12	Mon 2/18/13															

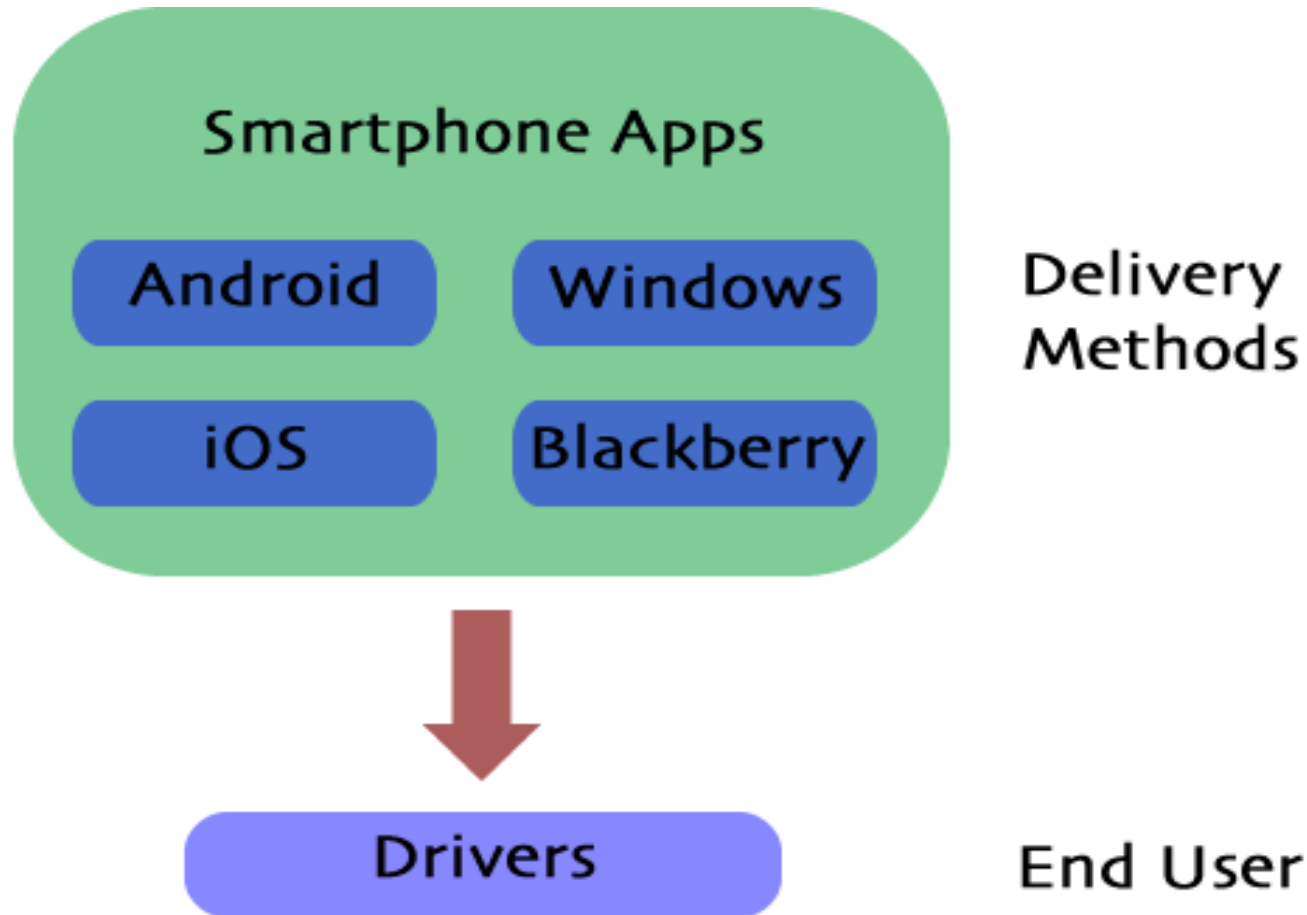
Phase 2 Staffing

Position	Number of Employees	Salary	Hourly Rate	Cost
Project Manager	1	\$84,000	\$42.00	\$74,760.0
Software Engineer	4	\$68,000	\$34.00	\$242,080.0
Database Administrator	1	\$80,000	\$40.00	\$72,000.0
Software/Hardware Tester	2	\$62,000	\$31.00	\$111,600.0
Salary Cost				\$500,440.00
40% Overhead				\$200,176.00
Total Cost (Phase 2 Staffing)				\$700,616.00

Phase 2 Resources

Resources	Quantity	Cost Per Unit	Total Cost
Workstations*	10	\$1,000	\$10,000.00
Servers*	5	\$2,000	\$10,000.00
Android Phones	10	\$600	\$6,000.00
Google Maps API	1	\$10,000	\$10,000.00
SQL		\$0	\$0
XML		\$0	\$0
PHP		\$0	\$0
Apache		\$0	\$0
Total Cost (Phase 2 Resources)			\$36,000.00
*Hardware requirement will be per region.			

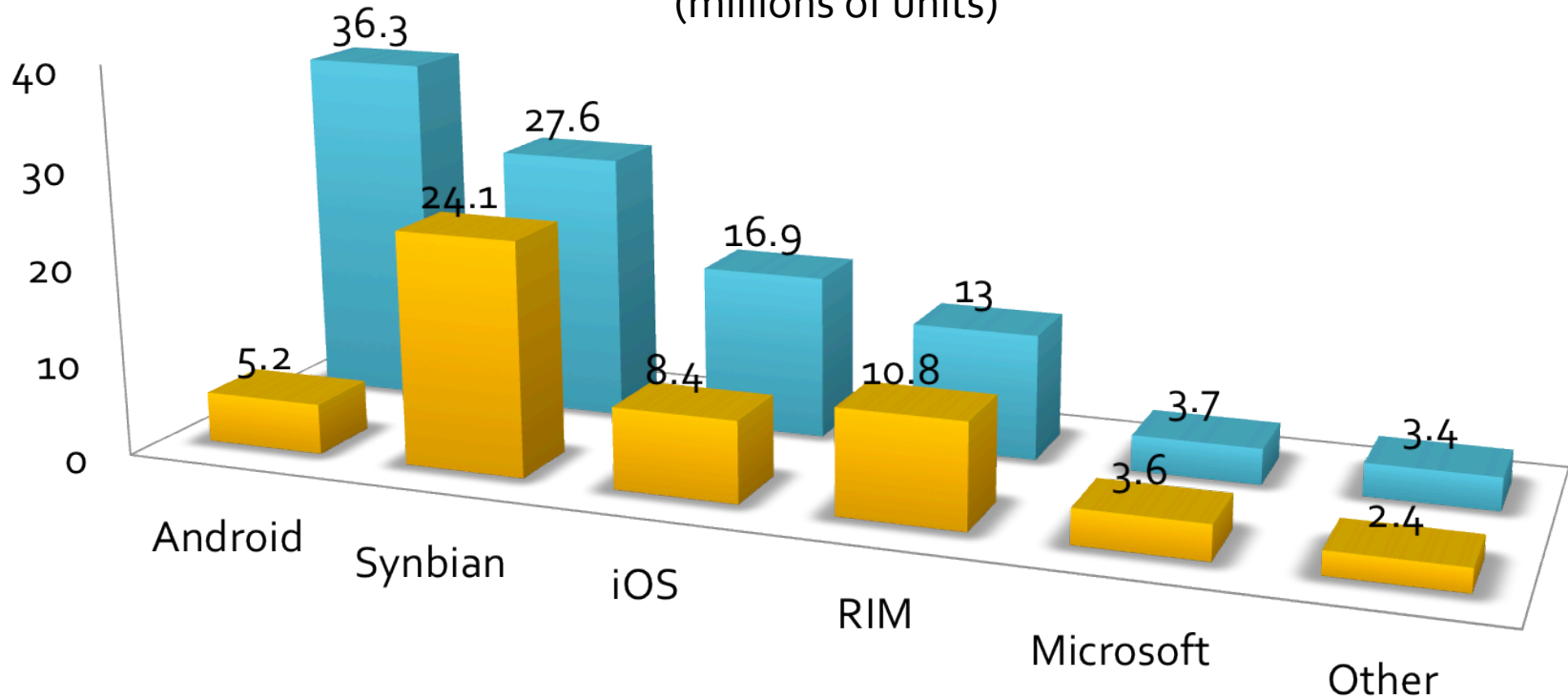
Customer Identification



Market Analysis

Worldwide Smartphone Sales Increases by OS

(millions of units)

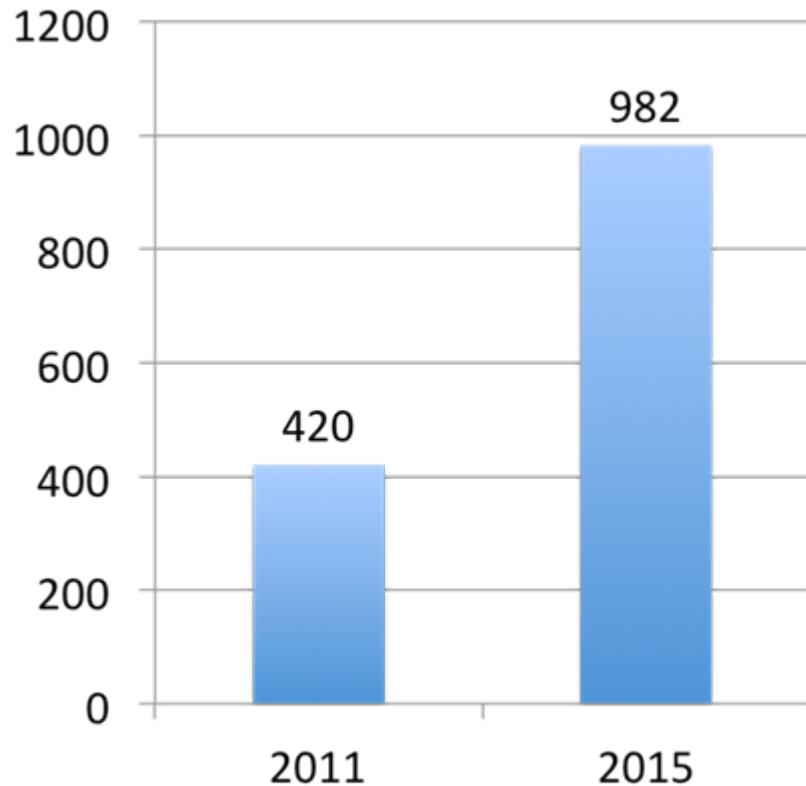


■ 1Q2010: Total 54.6 million

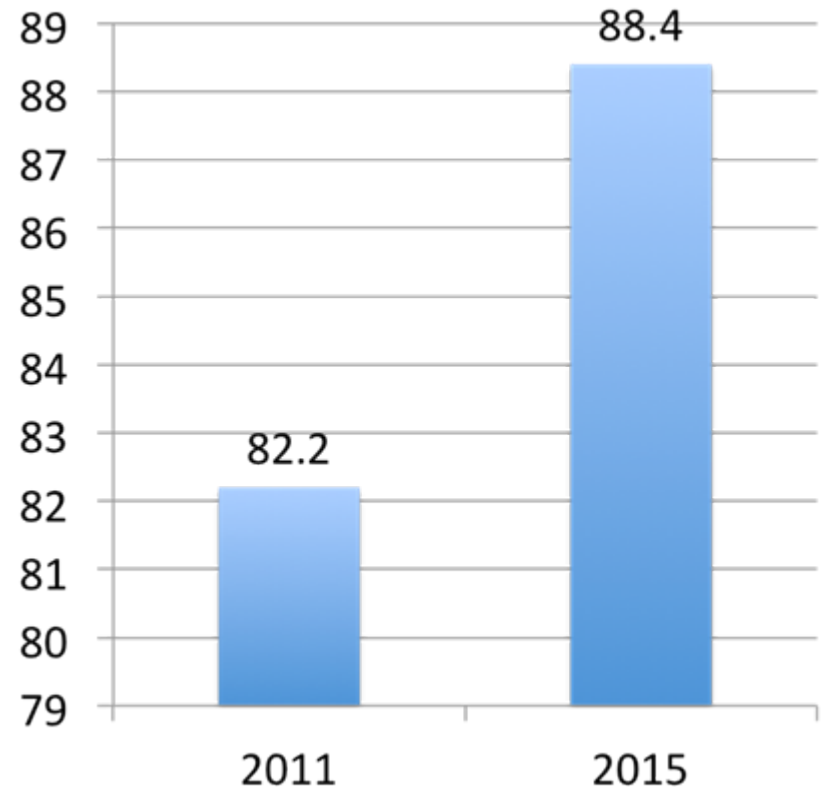
■ 1Q2011: Total 100.9 million

Market Analysis

Projected Worldwide Smartphone Sales
(Millions of units)



Projected US Smartphone Sales
(Millions of units)



Competition

	Traffic Wizard	INRIX	TomTom	Sygc	RAC Traffic (UK)	Beat The Traffic
Android Support	x	x		x	x	x
iPhone Support	x	x	x	x	x	x
Real-time Traffic Updates	x	x	x	x	x	x
Accident Notification	x	x			x	x
Time Predictions	x	x	x	x		x
Turn-by-turn GPS Directions			x	x		
Traffic Camera Viewer						x
Virtual Checkpoint System	x					
Personalized Travel Profile	x					
Price	Free \$4.99/yr \$14.99	Free \$24.99	*\$49.99 - \$119.99 \$9.99 w/WEBFLEET	*\$14.99 - \$69.99 *€9.99 - €19.99/yr	Free £0.69	Free \$3.99

*Price dependent on country

*Price dependent on country

Price	\$4.99/yr \$14.99	\$24.99	\$49.99 - \$119.99 \$9.99 w/WEBFLEET	\$14.99 - \$69.99 €9.99 - €19.99/yr	Free £0.69	Free \$3.99
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Risk Assessment

		Probability				
		1	2	3	4	5
Impact	5		S1	C1,T2		F1
	4	T1	S2	F2,C1	C3	
	3		C4,T3			S3
	2					
	1		C2			

Financial Risks

F1. Customer Investment – Vital to growth and sales

F2. Hardware/Software Network Maintenance – Fixing broken equipment, maintaining network

Customer Risks

C1. Product Interest – Market competition

C2. Ease-of-use to Customer – Simple and easy to use interface / installation

C3. Driver Distraction – Interaction becomes a potential distraction to driver

C4. Product Accessibility – Requires smartphone / data plan to provide traffic updates

Technical Risks

T1. Communication Protocols – Latency of technology

T2. Server Infrastructure – Configuration for distribution (scalability of regional systems)

T3. Hardware Failure – Potential for server failure

Schedule Risks

S1. Database Design – Virtualizing checkpoints (critical placement, initial allocation)

S2. Application Development – Oversights while improving app functionality and features

S3. Prototype / Test Phase – Dependent on quality, used for resolving issues

Risk Assessment: Financial

Financial Risks

F1. Customer Investment

Probability 5 Impact 5

Traffic Wizard cannot succeed if customers do not buy into it. This is highly dependent on marketing and will be mitigated with effective advertising.

F2. Hardware/Software Network Maintenance

Probability 3 Impact 4

Server infrastructure is subject to needing repairs and the network connecting drivers must be maintained. Since the foundation of the app lies in drivers' smartphones (as opposed to additional hardware), the probability of this is decreased.

Risk Assessment: Customer

Customer Risks

C1. Product Interest

Probability 3

Impact 4

With so many products and competition in the market, customers will need to prefer this solution over others. This can be overcome with effective marketing.

C2. Ease-of-use to Customer

Probability 2

Impact 1

Low cost, efficient, and easy installation of the product onto drivers' smartphones.

C3. Driver Distraction

Probability 4

Impact 4

Interaction with an app while driving is a high distraction risk. This will be mitigated with a minimalistic interface that assists the driver with little to no physical interaction with the device.

C4. Product Accessibility

Probability 2

Impact 3

Not every driver has a smartphone to access and download the app. The smartphone market has been well analyzed and is expected to grow immensely.

Risk Assessment: Technical

Technical Risks

T1. Communication Protocols

Probability 1

Impact 4

Communications between a device and the cloud are designed to occur within small time frames. Latency will negate the usefulness of traffic data. Traffic Wizard's virtual checkpoint system will assist with efficient information exchange.

T2. Server Infrastructure

Probability 3

Impact 5

The configuration and design of the server infrastructure must be able to compile and distribute data to connected drivers. The server will have to be efficiently scalable in design. Traffic Wizard is expected to hold the potential to connect with manufacturer telematics to assist with future scalability.

T3. Hardware Failure

Probability 2

Impact 3

The inevitable risk of technical issues due to hardware failure will be present in Traffic Wizard's operations. Sensible upkeep and maintenance should prove to mitigate this factor.

Risk Assessment: Schedule

Schedule Risks

S1. Database Design

Probability 2

Impact 5

Traffic Wizard's virtual checkpoint system will require initial (and recursively re-assessed) latitude and longitude assignments as virtual checkpoints in critical areas. This is necessary to act as the foundation for traffic analysis. Checkpoints will be able to be dynamically re-allocated as necessary.

S2. Application Development

Probability 2

Impact 4

Oversights in implementation and development can significantly delay progress of the app. Best practices in the software development process should help mitigate any issues in functionality.

S3. Prototype / Testing Phase

Probability 5

Impact 3

This phase is heavily dependent on the quality of execution of the product. Design issues must be resolved in this stage and the program must be proven to work. With an Alpha and Beta testing phase, an initial user base can be built along with initial patterning statistics from the checkpoints.

Conclusion

Traffic Wizard will assist drivers by providing them effective real-time traffic updates timely enough to help them avoid unfavorable traffic.

With Traffic Wizard's virtual checkpoint system, custom route profile utility, and pre-travel analysis engine, this will be accomplished in an efficient way that makes these benefits more accessible than ever.

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References

Competition App Reference Links:

Beat The Traffic:

<http://itunes.apple.com/us/app/beat-the-traffic/id339660839?mt=8>

Sygi:

<http://www.sygi.com/en>

INRIX:

<http://www.inrix.com/mobile.asp>

TomTom:

http://www.tomtom.com/en_gb/products/mobile-navigation/tomtom-app-for-iphone/

RAC:

<http://itunes.apple.com/gb/app/rac-traffic-plus/id389339076?mt=8>

Traffic.com:

<http://itunes.apple.com/us/app/traffic.com/id327245871?mt=8>