

Motivation and Objective:

Technology is a means to make living simpler. The intention here is to give the benefits to the students of Georgia Tech. I have chosen to work on an application that provides bus tracking service at the Georgia Tech.

At Georgia Tech we have several bus routes facilitating easy transportation on campus. A Bus tracking service for these bus routes will make this facility much more accessible. Georgia Tech provides a GPS-based location tracking service in collaboration with NextBus that provides real-time bus tracking and arrival timing prediction. However, to access this facility the users need an access to web browsers. Typically, this facility makes more sense in situations such as when you are walking around campus, running between classes, parking your vehicles, waiting at a bus stop and the bus doesn't seem to arrive, etc. In any of these conditions users do not have access to the NextBus website[2] to use the bus tracking facility.

The objective of this project is to provide a Bus tracking facility wherein users send a text message as an email using their mobile phones and the application will get back with the time of arrival of the next bus on the route. Bus tracking using mobile phones will provide the information to the users when they need it the most.

I intend to provide bus tracking for all the routes existing on GeorgiaTech. The idea is not a new one. In fact initial work in this direction(a prototype implementation) was done as a project in the CS 8803 class of spring 2005. The plan is to make the idea richer by adding several valuable features. The intention is to make the idea a reality and let each Georgia Tech student have an access to this facility. In fact the goal of deploying this project for real time use and to make sure it becomes a part of the campus life is the major challenge and hence the major motivation.

Related Work:

- i. As mentioned above, work was done on these lines in CS 8803 class of spring 2005[3]. This provided tracking for one of the routes(Trolley) on campus. There were no extra features apart from sending text messages (with the route name, the direction and the destination stop) and receiving the response as another text message. This was an excellent new idea and was successful over the scope it was defined. That project is a major motivation for my work.
- ii. The Georgia Tech Trolleys have a tracking mechanism whereby users can log onto Georgia Tech's Parking [1] website and navigate to a Bus locator (handled by Nextbus). Using this website a user can specify a particular stop and know when a Bus will next arrive at that stop. This is exactly the information that I intend to provide through my project. The problem with this implementation is that it requires an access to a web browser(which is not always accessible) to retrieve the information.
- iii. The Los Angeles Metro System [4] and the MyBus project [5] in King County, Washington also provide bus tracking services. These projects are on much larger scale compared to my project. The Los Angeles Metro System provides the information on a LCD screen while the MyBus project supports queries from mobile phones.

Proposed Work:

The basic functionality of the application:

Input: Route name, Destination stop, Direction of travel.

Output: The predicted time of arrival of the next bus.

The application will support tracking of all the routes on the Georgia Tech campus.

Apart from naïve bus tracking following *features* will also be added to make the project more usable:

1. Logging:

All the incoming requests on the server and our response to these requests will be logged. We can generate a daily email as a report of the day's activity. This will allow us to learn the daily pattern of requests. Future work or modifications can be made based on study of logs.

2. Creating user profiles:

We can identify users based on the phone number from which we get the request. This information can then be used to provide user specific features.

3. Special messages like info, route, and feedback:

Info: If a user sends a query containing key word info, the response will contain brief information about how to use the system.

Route: If a user sends a query with only the route name, the response will contain all the stops on that route.

Feedback: User can provide a feedback of their experience with the system. The message should have keyword feedback in the subject

4. Speed Dialing:

This is one of the user specific features.

It is understood that typing text message on the mobile phone is a lot of pain. This feature is to overcome this drawback. The motivation behind this feature is to allow the user to convey all the information and still keeping the message size to the bare minimum.

For instance A user can send "*1" as a message which will mean some thing specific for him. A user can register with us that *1 means he is standing at the COC stop waiting for the Red route bus to go to the Campus Recreation Centre.

5. Splitting of messages:

Here the user can specify whether he would like to have the response as a single message or divided into multiple messages. The user can also specify the size of individual messages.

6. Scheduling:

This is another user specific feature wherein a user can register with us to receive information regarding a certain route at a certain stop at a fixed time everyday. The user is allowed to specify the frequency of repetition of each message and the time interval between repetitions.

For instance a student can register with us so that he receives information about the trolley daily at 5.00 pm when he leaves the COC.

7. Response Message Manipulation:

The users can choose whether they want their query back in response or not. Such features are useful since output screen on the mobile phones is a constrained resource. It is nice to allow the users decide what form of output they would prefer.

Success Criteria:

Minimum: To implement all the features and have the application running.

Major: To have the system deployed and have real time users using it.

Architectural Design:

Please find the sketch for architectural design at the end of this document.

Plan of action:

This project is being funded by OIT. Hence all the resources (Software and Hardware) required for this project are available through them. The project is on Linux using Java.

The things that are being used:

1. A server where the application will run.
2. An email account where the clients will send their text messages.
3. A mobile phone for testing the application.
4. NextBus website for getting real time information and prediction about bus locations.

<i>Date</i>	<i>Milestone</i>
Feb 16 th	Proposal.
Feb 23 rd	Basic functionality achieved and thoroughly tested for all routes on campus.
March 5 th	Features 1, 2, 3 added and unit testing done.
March 15 th	Features 4, 5 added and unit testing done.
March 25 th	Features 6, 7 added and unit testing done.
April 5 th	Integration testing, Black box testing, Performance Testing done.
April 5 th	Alpha release. Simultaneous debugging and Regression Testing.
April 20 th	Release on campus
April 25 th	Final Demo

Evaluation and Testing method:

While developing I will do standard unit testing of the code and component stress testing. The application will be thoroughly tested against all possible test cases. Error cases will also be tested. The intention is to release this as a service for students to use. Every care will be taken (in terms of testing for all test cases) before the project is released on campus.

There is a plan to do alpha release where in only the OIT employees will be using the service. This will be a major testing phase for the project. Only after passing through this phase the project will be released.

The application will be tested using the following criteria:

Performance testing:

The application will be tested to see how it performs under load. The intention is to have the application support at least one query per second.

Reliable:

The logging feature described above will be useful for reliability testing. The log will provide the input query as well as our response to the query. By studying the log it will be made sure that queries are responded correctly.

Responsive:

This is the time taken by the system from the time the message was received to the time the response was sent. The queries will be received in a mail box. The mail box will be popped at definitive intervals of time. Considering this, a response time of 20 seconds is proposed here. Logging will also enable responsiveness testing. The time stamps corresponding to the receipt of request and sending of response will be logged.

User Friendly:

The user friendliness of the system can be evaluated by getting feedback from the users. A feature will be added to provide the users with a way to provide feedback.

Bibliography

- 1) <http://www.parking.gatech.edu>
- 2) <http://www.nextbus.com>
- 3) http://disl.cc.gatech.edu/courses/cs8803h_spring2005/project/proposals/borna-pretesh.doc
- 4) http://www.mta.net/riding_metro/default.htm
- 5) <http://mybus.org>

Architectural Design for the Bus Tracking Project

