

## ECE4007 Project Summary

<b>Project Title</b>	WaitLess Bus Tracking System
<b>Team Members</b> (names and majors)	Matthew Brooks (Computer Engineering)
	Chris Chidi (Electrical Engineering)
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	Daniel Nadeau (Electrical Engineering)
<b>Advisor / Section</b>	Dr. Keezer / L04
<b>Semester</b>	2009 Spring
<b>Project Abstract</b> (250-300 words)	<p>The WaitLess bus tracking device is a standalone system designed to display the real-time location(s) of the buses on Georgia Tech's campus. The system will consist of a solar panel and backup battery, wireless module, microprocessor, and a LED embedded map of the Georgia Tech bus transportation routes. Assembly of these components will enable the tracking device to connect to the internet to obtain GPS data of the bus locations, which it will depict by activating LEDs in the approximate geographic positions of the buses on the route map. In addition, the device will be portable and sustainable; it will not require an external power source, which will eliminate long-term energy costs.</p> <p>NextBus, the tracking company that Georgia Tech employs to attain the GPS location of the campus buses, currently provides a \$3600 scrolling LED panel installed at three of the bus stops on campus. The display panel provides a rough text-based time estimate of the next arrival of a bus at the particular stop. The WaitLess bus tracking device will instead use LEDs to show the location of buses on a map; then, a better decision can be made whether to wait for the bus or just walk.</p> <p>The WaitLess bus tracking device will serve as a viable alternative notification system that will be more effective than the LED scrolling panel but for a quarter of the cost. A system prototype can be designed and assembled for approximately \$6,724.10, when accounting for labor and component costs. If, subsequently, 40 of these systems were produced to be installed at each of the bus stops on the Georgia Tech campus; each device could be individually sold for \$933 dollars, resulting in a 33% profit margin.</p>

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List <b>codes and standards</b> that significantly affect your project. Briefly describe how they influenced your design.	<p>Serial – RS-232: The link between the Wi-Fi module and Arduino microcontroller is a UART serial link over a RS-232 port.</p> <p>802.11b/g: The Wi-Fi module connects to the internet under the specifications of this standard.</p> <p>I<sup>2</sup>C: The Arduino microcontroller interacts with the LED drivers by means of this protocol.</p>
List at least two significant <b>realistic design constraints</b> that applied to your project. Briefly describe how they affected your design.	<ul style="list-style-type: none"> <li>• Can only poll the NextBus server every 10 seconds: <ul style="list-style-type: none"> <li>◦ LED indication on decal map will refresh only every 10 seconds.</li> </ul> </li> <li>• Total device power consumption must be under 1.1A (optimal supply from solar panel) at 5V in order for the device to sustain power: <ul style="list-style-type: none"> <li>◦ Blink LEDs to conserve power, use low-power microcontroller versus single-board computer.</li> </ul> </li> <li>• Could not purchase evaluation board for the Wi-Fi module due to budget limit: <ul style="list-style-type: none"> <li>◦ Connected the Wi-Fi module to the PC and experiment with serial communications using HyperTerminal. Also connected the module to the Arduino and used the programming platform to test the serial communication.</li> </ul> </li> </ul>
Briefly explain two <b>significant trade-offs</b> considered in your design, including options considered and the solution chosen.	<ul style="list-style-type: none"> <li>• To minimize the total power consumption of the device, the design will implement a microcontroller instead of a single-board computer. The single-board computer has more capabilities than a microcontroller and would make design implementation a lot easier.</li> <li>• Could have used an LCD display which would allow for more aesthetic display options; however, the LCD consumes a lot of power likely requiring hardwired power. Also requires a VGA connection which would demand the use of a single-board computer. These tradeoffs would defy the sustainable low power design goal of the project.</li> </ul>
Briefly describe the <b>computing aspects</b> of your projects, specifically identifying <b>hardware-software</b> tradeoffs, interfaces, and/or interactions.  <i>Complete if applicable; required if team includes CmpE majors.</i>	<p>The computing aspects of the project include writing code in C for a microcontroller to communicate with a wireless internet adapter over a serial-RS-232 interface. Also, code is to be written for the GPS data attained to be parsed and saved to appropriate variables. The final code that is to be written is to use the GPS data saved and through logic and the I<sup>2</sup>C protocol, send commands from the microprocessor to the LED Drivers, which control each LED.</p>