

TEAM PROJECT PROPOSAL

TRAFFIC CONTROL PROJECT USING BLUETOOTH MESH

1. Describe what problem this project addresses.

The project aims to find a viable solution to the congestion of traffic that occurs during the peak hours. The mismanagement of traffic causes the congestion and can be rectified by implementing a better traffic control system. The current traffic management in most parts of the world, is based on a loop which goes on to clear traffic on a street, moves to the next street and comes back to the starting point. But, it may so happen that peak traffic congestion has taken place in a particular street, and more time is to be allocated to this street.

2. How does this project alleviate or solve the problem?

We plan to implement an algorithm which checks for traffic in the street through the magnetometer, this information is transmitted to the friend node, which then assigns a priority to the streets based on the traffic accumulation and goes on to clear the traffic in the streets based on their priority.

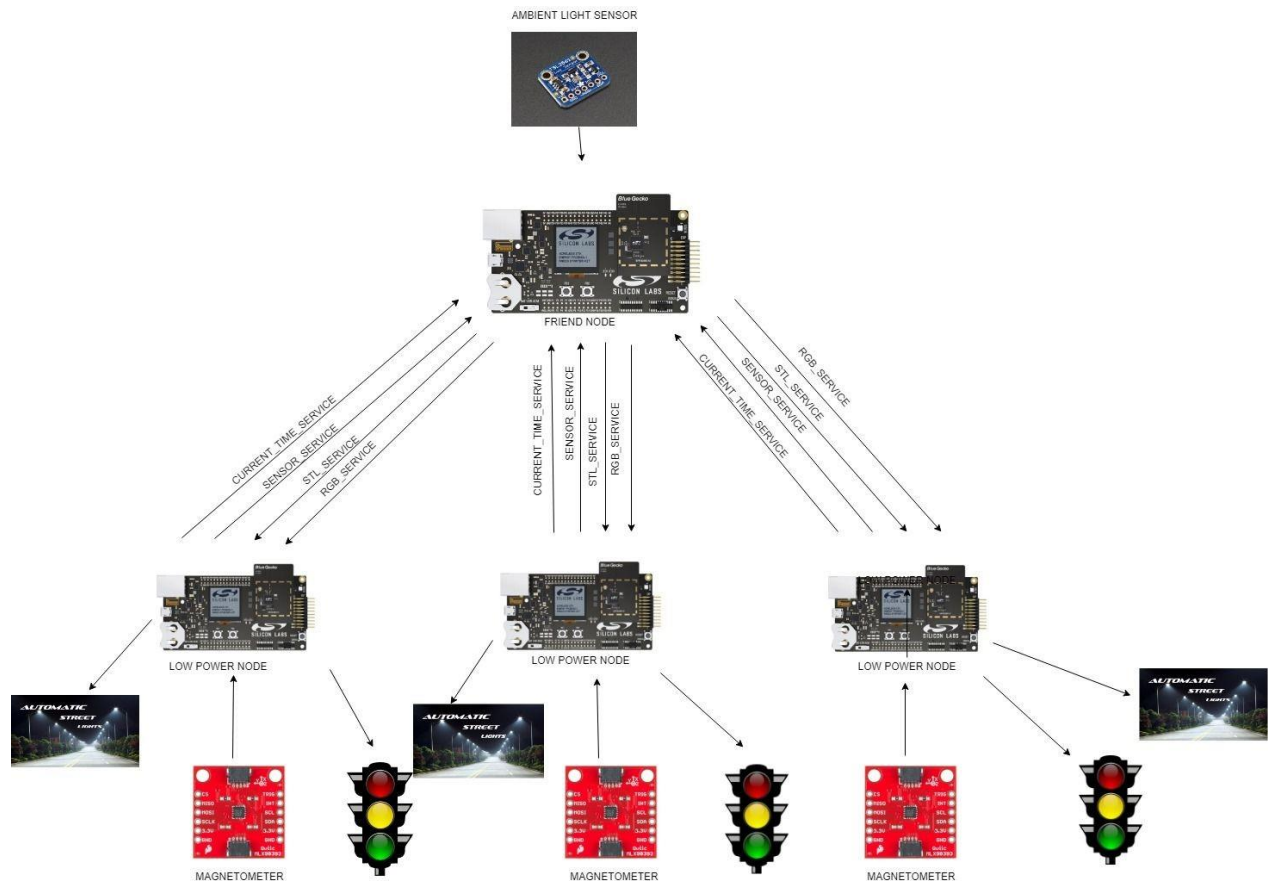
By using the "Current Time Service" available in the Bluetooth GATT Services, we will capture the time stamp of the traffic accumulation, plot this data to analyze which street has the maximum traffic congestion for a given point of time.

3. Summary of each individual project and how it plays a role in solving the team's project problem.

The project employs three low power nodes and one friend node. Three members of the team will be working on their individual low power node and one will be developing the friend node.

- Each low power node (LPN) will be interfaced with a magnetometer to detect the traffic congestion in a particular street and also 3 LEDs (Red, yellow and green) which will indicate whether the traffic should move or not. The inbuilt LED on board will be used as street lights. LPNs will send magnetometer data and current time to Friend node as services.
- The friend node will be interfaced with a luminosity sensor to detect the luminosity and accordingly send signals to low power nodes to switch ON/OFF street lights. The friend node will also receive magnetometer data from LPNs and based on the data received will send signal to appropriate LPN to turn on the traffic signal to get the traffic moving.

4. Project Block Diagram:



5. Team Members:

1. **Smitha Bhaskar (Low Power Node)**
2. **Satya Mehta (Low PowerNode)**
3. **Ayush Dhoot (Low Power Node)**
4. **Shubham Jaiswal (Friend Node)**

6.Team Validation Plan:

Sr No.	Verification Plan	Expected Result	Date of test	Tested By	Actual Result	Passed
1	Check If nodes are being provisioned by the silicon labs mesh application or not	The nodes should get provisioned after adding them to the group and Should show provisioned on the LCD.	11/5/18	Satya, Ayush, Smitha, Shubham.	Nodes are getting provisioned and we are able to create a network.	Yes
2.	Check If the nodes are being provisioned with out-of-band security authentication	The nodes should be provisioned only after out-of -band authentication	11/11/18	Satya, Ayush, Smitha, Shubham.	Nodes are getting provisioned using OOB Authentication method	Yes
3.	Check if the friend and LPN relationship is being established	The friend and low power nodes should establish the relationship	11/11/18	Satya, Ayush, Smitha, Shubham.	Relationship can be established	Yes
4.	Persistent data	The sensor data , threshold values and the state values should be retained	11/22/18	Satya, Ayush, Smitha, Shubham.	Data can be saved and loaded back from persistent storage	
5.	Interfacing the sensor with the Blue Gecko(Magnetometer) using I2C	Magnetometer (LMS303C) gives the values of X,Y,Z.	11/16/18	Satya, Ayush, Smitha.	Sensor shows X,Y,Z axis values on serial terminal. Communication initiated on external events generated by LETIMER interrupt.	Yes
8.	Interfacing the sensor with the Blue Gecko (Daylight sensor)	Luminosity sensor gives LUX values.	11/27/18	Shubham.	LUX values are being displayed on LCD.	Yes
9.	Checking friend node client model (Night-time scenario)	Based on the sensor values check if street lights are to be switched ON/OFF. Night-time - street lights on the LPN nodes should be switched ON.	11/29/18	Shubham	Street lights on the LPN node are switched ON when the LUX value falls below 50.	Yes
10.	Checking friend node client model (Daytime Scenario)	Based on the sensor values check if street lights are to be switched ON/OFF. Daytime - street lights on the LPN nodes should be switched OFF or if already OFF	11/29/18	Shubham	Street lights on the LPN node are switched OFF when the LUX value crosses the threshold value.	Yes

		no action needs to be taken.				
11.	Checking LPN node (Traffic Congestion scenario)	If the magnetometer data is more than threshold then send message to Friend node indicating traffic congestion.	12/4/18	Satya, Ayush, Smitha.	Message is sent to the Friend node when the magnetometer data crosses threshold value.	Yes
12.	Checking LPN node (No Traffic congestion scenario)	The LPN node should sleep and be in the lowest possible energy mode.	12/4/18	Satya, Ayush, Smitha.	LPN node sleeps in lowest possible energy state.	Yes
13.	Energy Profiler verification	Make sure all the sensors are working in the lowest energy mode	12/4/18	Satya, Ayush, Smitha.	Sleep state of the LPN nodes is verified with energy profiler.	Yes
14.	Integrating all the modules	The 3 magnetometer modules and the luminosity module.	12/6/18	Satya, Ayush, Smitha, Shubham	All the nodes are provisioned in the same network and friendship is established between Friend and 3 LPN nodes.	Yes
15.	Testing the system	All the nodes are communicating with each other and the prototype is working.	12/6/18	Satya, Ayush, Smitha, Shubham	Friend node is able to publish messages to group and LPN nodes are able to send the sensor data to Friend node.	Yes
16.	Test mesh hopping	Check if the message hops through the mesh network and reach destination node.	12/7/18	Satya, Ayush, Smitha, Shubham	The message from friend node hops through mesh network to reach the destination LPN.	Yes
17.	Verify different mesh addressing modes	Check if the nodes are assigned unicast, virtual and group addresses. Check if the nodes subscribed to a particular group receive message published to that group.	12/6/18	Satya, Ayush, Smitha, Shubham	Messages published to the group by friend node are received by all the LPN nodes and messages sent to a particular LPN using unicast address are received only by that node.	Yes