

Design Review 1:

When: Week of February 4th

- Give a detailed description of all major components and describe the function they serve in your design and how the devices work.

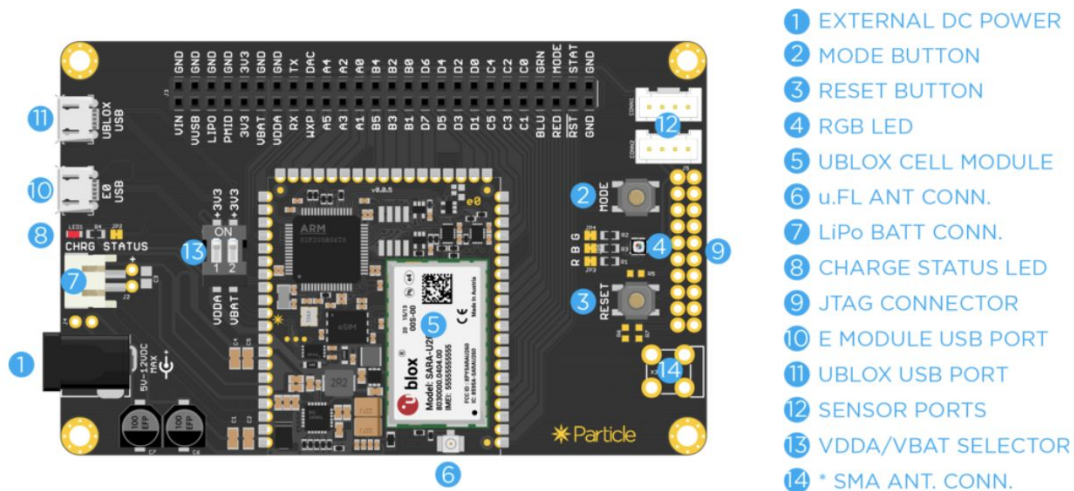
** Disclaimer:

Because our project involves both a skateboard (transportation device) and a circuit board, there may be some confusion as to which one we are referring to at any given time. In order to make our document easier to understand, whenever we are referring to vehicle skateboard, we will use the word “skateboard” specifically. Conversely, when referring to the circuit board, we will refer to it as the “IoT Board”.

- IoT Board Kit -- for this I think we just look at all the parts of the KIT we order, list them and talk about each
 - Cloud Access
 - This Particle component that comes included with the kit will serve as the medium through which we will send, receive, and process signals. With our purchase, we will also receive 3MB of cellular data for the device priced at (\$2.99 per device/month). Luckily, we already are given the first 3 months of cellular data for free with the purchase of the kit. This cellular interface is what we are planning to use in order to transmit a signal from a cellphone to the Board module, and have it receive the signal. The cloud access that we obtain from Particle also includes a software IDE and device management platform which we plan to use in order to program our device to interpret the received signal and be able to determine whether the board is in the “locked” or “unlocked state”.
 - E402 (LTE) module mounted on an evaluation board
 - This the IoT Board that will convert receive the transmitted signal and convert it into an electrical output. The IoT Board includes a physical USB access for flashing and serial communications as well as a Li-Po battery connector for connecting external batteries. As is standard for most circuit boards, it also includes pre-programmed MODE and RESET buttons, as well as a charge and status LEDs to visually illustrate the device state. We will likely be using these components very frequently during the testing portion of our project, for example, flashing the LED a certain color to indicate the successful reception of a signal. Additionally, The LTE E Series Evaluation board contains a soldered E402 module, which supports LTE M1 connectivity as well as 2G and 3G. As mentioned before, we will be using the device cloud feature to build, connect, and manage our skateboard.
 - Pinout reference card

- Website/App
 - Apple platform software (Swift)
 - Data in from IoT board cloud platform
- Physical
 - Skateboard or physical structure that holds all of our project.
 - Locking mechanism that will hold the remote in place (servo motor) and provide an indicator that the correct signal has reached our IoT board.
 - 3-D printed holster

• Specify essential connections on all major components. These would include all power and ground connections (with appropriate values for device voltage and expected current requirement), decoupling, and other essential support connections such as clocking, programming, etc.



- 1 EXTERNAL DC POWER
- 2 MODE BUTTON
- 3 RESET BUTTON
- 4 RGB LED
- 5 UBLOX CELL MODULE
- 6 u.FL ANT CONN.
- 7 LiPo BATT CONN.
- 8 CHARGE STATUS LED
- 9 JTAG CONNECTOR
- 10 E MODULE USB PORT
- 11 UBLOX USB PORT
- 12 SENSOR PORTS
- 13 VDDA/VBAT SELECTOR
- 14 * SMA ANT. CONN.

Servo motor wires and connections

- Power:
- Signal:
- GND wire

IoT Board wires and connection

- LTE Modem module:
 - $V_{in} = 5V$ (microUSB, draws 1.8A max)
 - $V_{cc} = 3.8V$ (3.0A max)
 - $V_{cc_UIM_SIM} = 1.8V/3.3V$ (0.15A max), fed from Vref rail, voltage preset based on SIM card
 - $V_{ref} = 1.8V$ (0.1A max)

- 3V3 power (0.15A max), supplied by voltage regulator
 - Power consumption
 - Lowest power consumption (power on, no band connections): <1.3mA
 - LTE bands working: 588 - 737mA
 - GPS data band working: 400-480mA
 - PMOD interface connector (SPI comms)
 - SIM interface
 - Data out to servo motor: will be able to use SPI/I2C for necessary comms
- There are likely to be a set of problems that you are not clear on how you will solve them. Give a list of these items and an action plan to reduce them to solved problems.
- A significant issue we faced last semester was securing cellular connectivity between our board and our phones. The roadblock last time was that we had purchased a board that operates only on 2G which, as we were informed by AT&T representatives, is now obsolete. Our proposed solution is using the Particle E-Series which operates with cellular and has a plethora of helpful tutorials for getting started.
 - One problem we are unsure of as of now is the configuration and management of the data we receive from the IoT board. Our current proposed solution to this problem is to utilize the IoT Rules Engine provided by Particle. This engine manages data and conditional actions based on that data which suits our application, we just need to learn how to use it.
- Demonstrate that the team has successfully accessed the team web site by placing Proposal and High Level design documents on the team web site with links.