Hackathon Challenge Constraints

We hope these additional specifications will be helpful in designing an innovative research proposal.

Technical Challenges:

- **Outdoor Application:**
  - Device must be outdoors to enable it to connect to the NB-IoT network (reception may not be possible indoors, inside cars, in garages, etc.). However, the device may also include other connection technologies (e.g., Wi-Fi, Bluetooth, etc.) to achieve indoor connectivity through a home network, if necessary and/or relevant.
- **Low bandwidth:**
  - Small messages ranging from a few hundred bits to a few thousand bits for uplink or downlink.
  - Frequency of messages may be a few per hour to a few per day.
- **Latency tolerant:**
  - There can be significant delays in communications between a fielded device and the network tower on the order of between seconds and minutes. So a network may take seconds/minutes to send a message to a device, and a device may take seconds/minutes to send a response back to the tower.

Business Challengess:

- **Business Model:**
  - Devices able to be deployed to national market very quickly.
  - Fast time-to-market across the nation is a critical deployment need.
  - Direct to Consumer (d-to-c) deployment will meet this requirement.
  - Business-to-business (b-to-b) or business-to-government (b-to-g) deployment typically entails attaining business agreements/contracts, more conservative rollout planning, public funding, etc. that may work against our deployment goals. Given the uncertainty of this potential business friction, the product ideas which require these non-d-to-c deployment strategies will require some special time-to-market justification/consideration.
- **Viable Examples (short list):**
  - Soil moisture, temperature, and sensing:
  - Outdoor territory is within a single radio tower cell range
  - Tolerates latency and carries small packets of information
  - Can market direct to customers (farms, gardeners, etc.)