Scalable Smart Grid-Edge Controller

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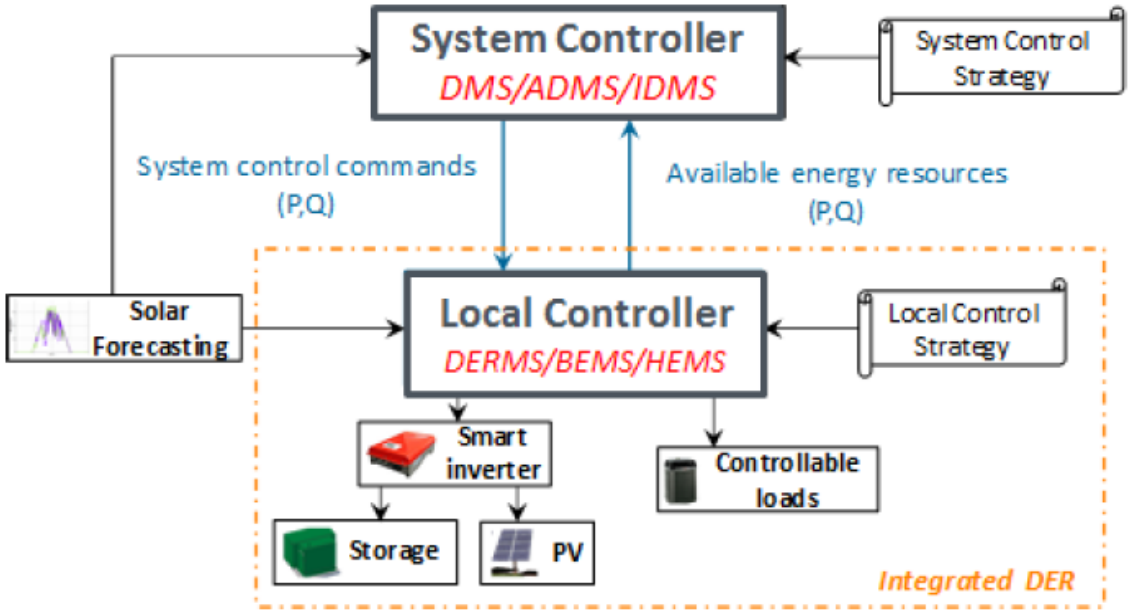
Goal of the System

- Provide Value to the Customer
  - Integrate into Intwine's "Triple-Play Service" (Cellular ISP, Voice, IoT monitoring)
  - Reduce customer's energy bill:
    - Peak demand reduction
    - Time-shifting of energy consumption (if time-of-use prices)
  - Facilitate integration of DER
    - Solar integration (with net metering or feed-in tariffs)
    - Battery Energy Storage (to increase amount of load shaping)

Goal of the System

- Provide Value to the Utility/Aggregator
  - Increase hosting capacity of Solar
    - Prevent reverse flow of power during peak-solar
    - Flatten the load-curve to reduce ramping requirements in evening
  - Single aggregation point to reduce complexity for managing DER
  - Enable power import/export constraints
  - Demand Response platform

System Architecture



Demonstration Site 1

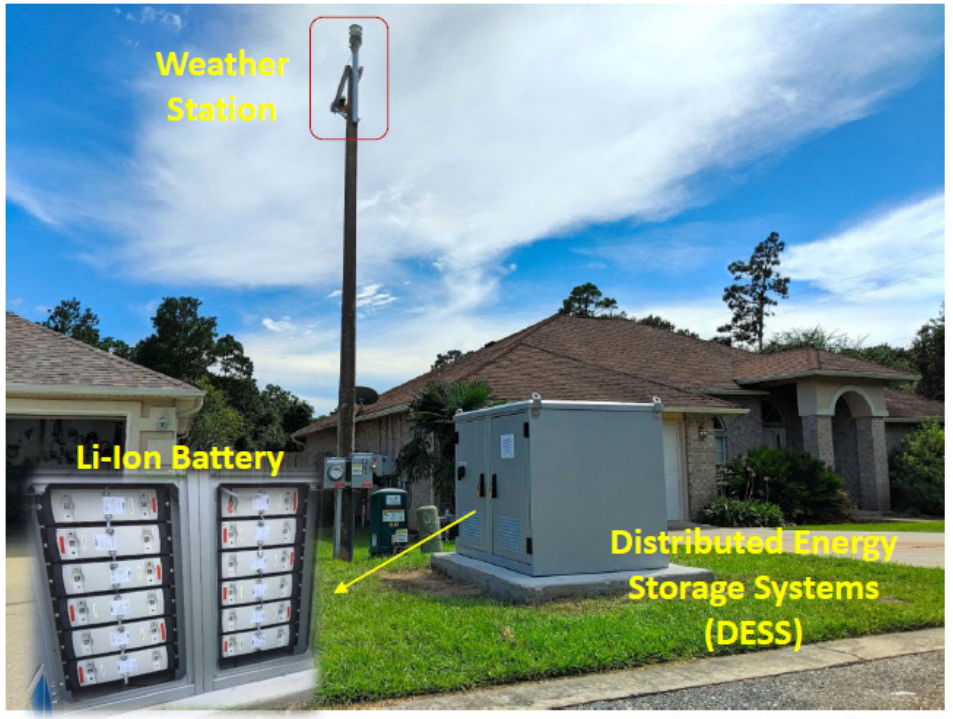
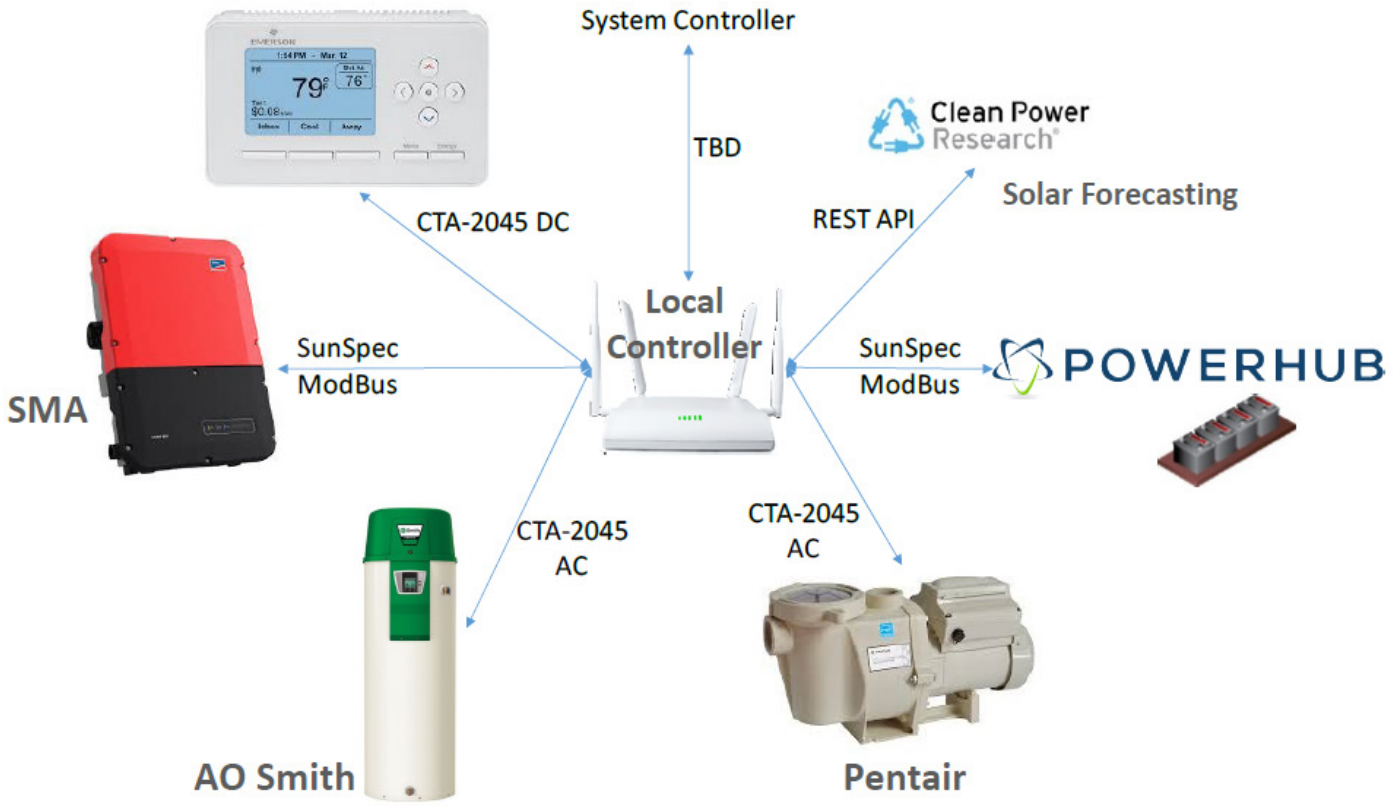


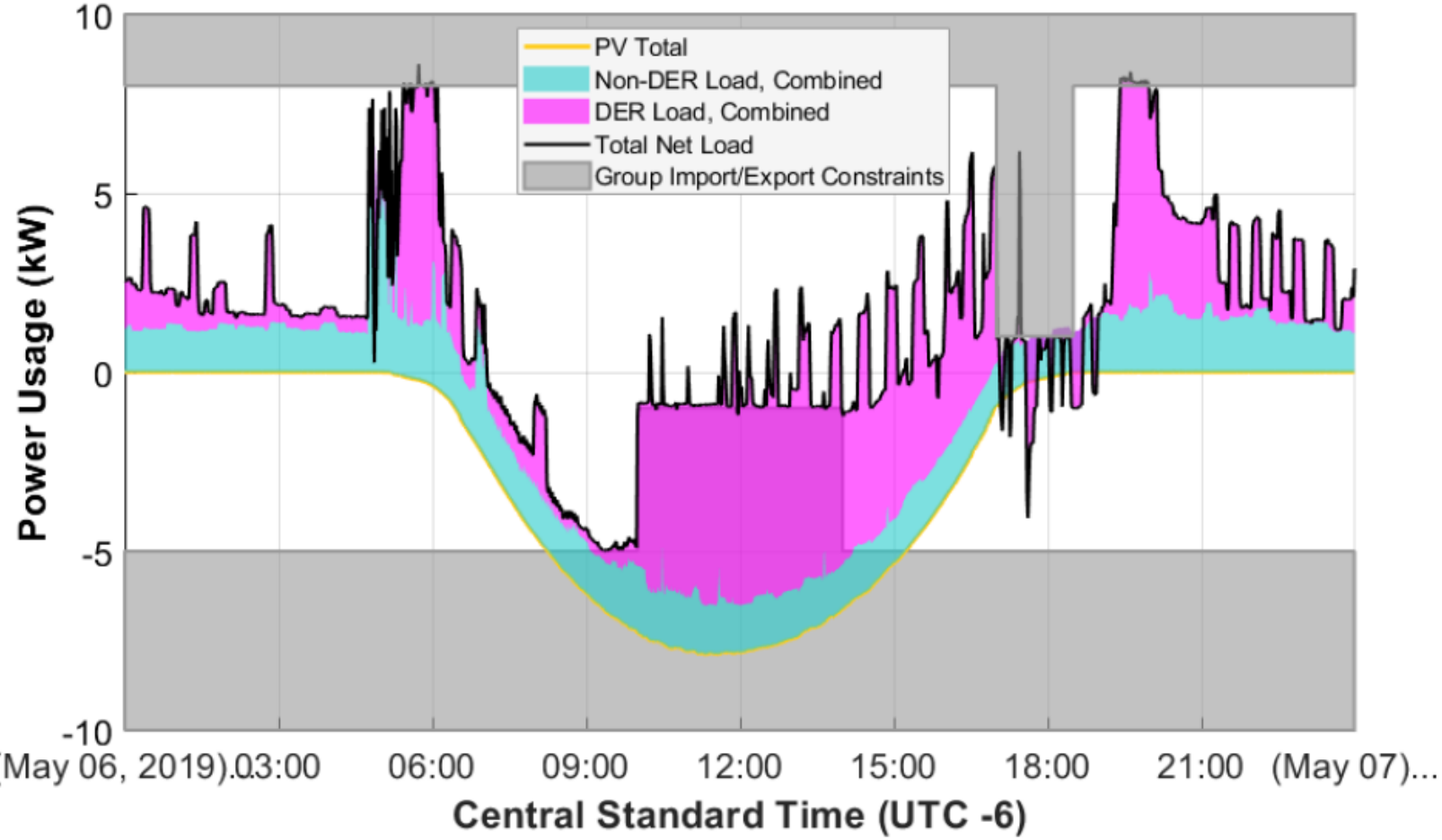
Image Source: Gulf Power

Demonstration Site 1

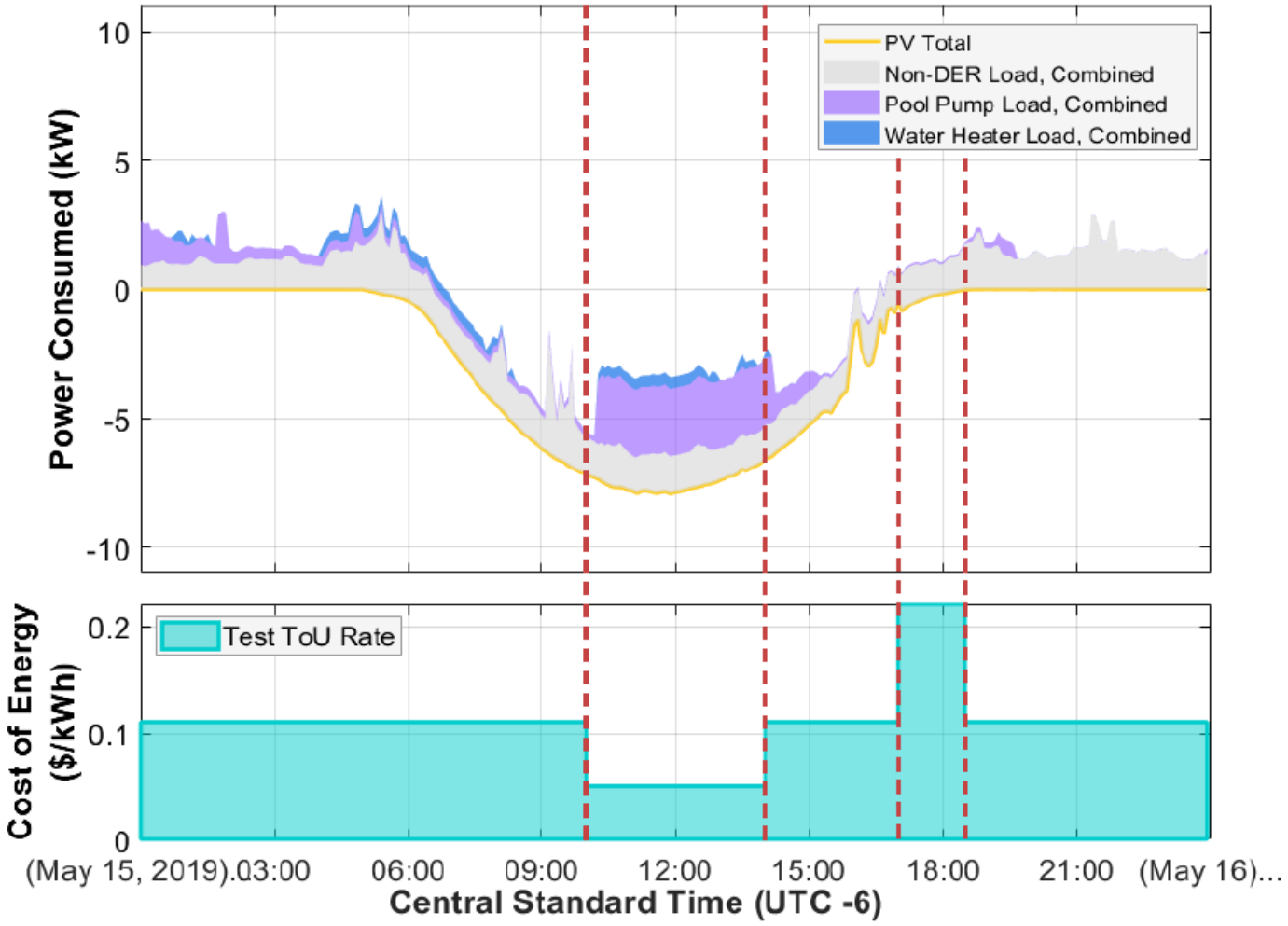


Field Test Results

Measured field data from May 6th, 2019



Field Test Results (cont.)



Demonstration Site 2

ModBus

ModBusIP

Clean Power Research

System Controller

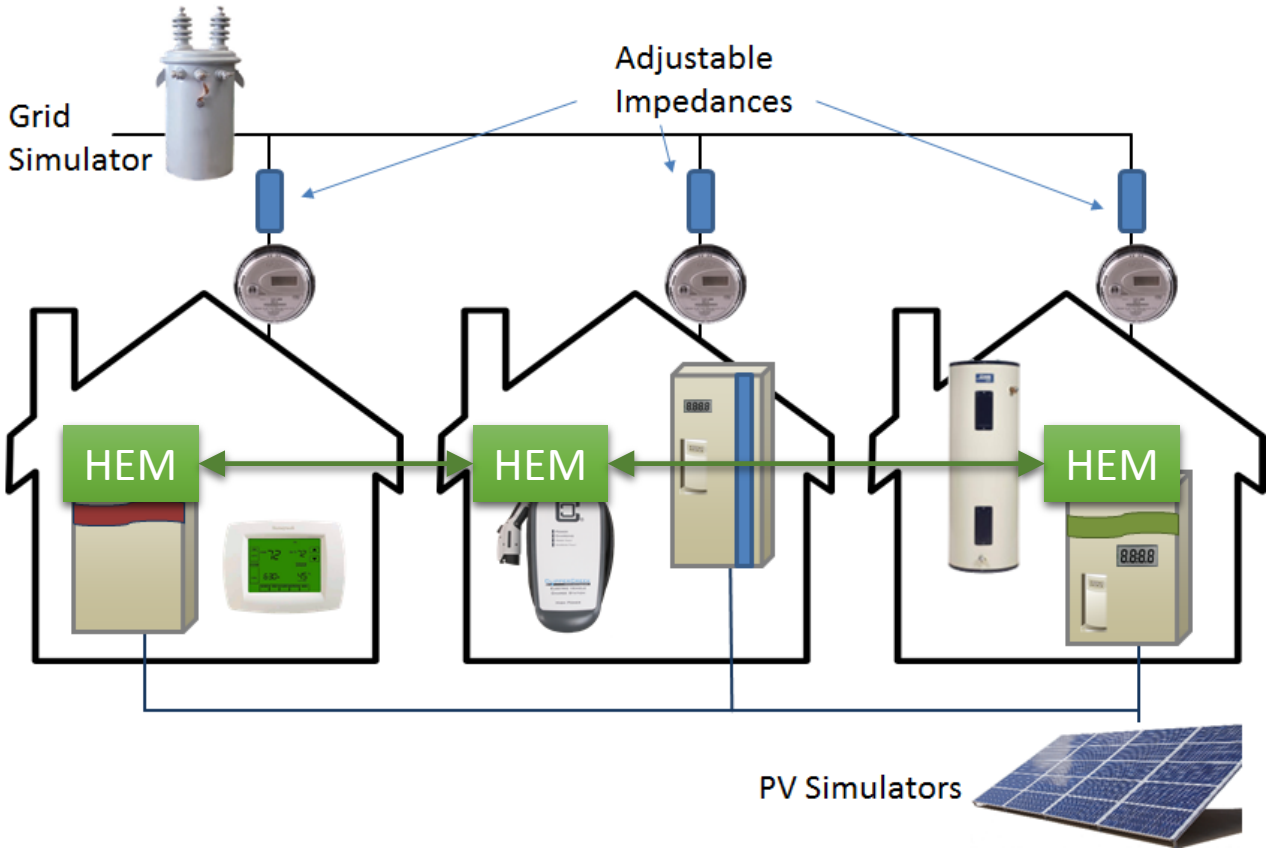
BACnetIP

HTTPS

OSI PI Server

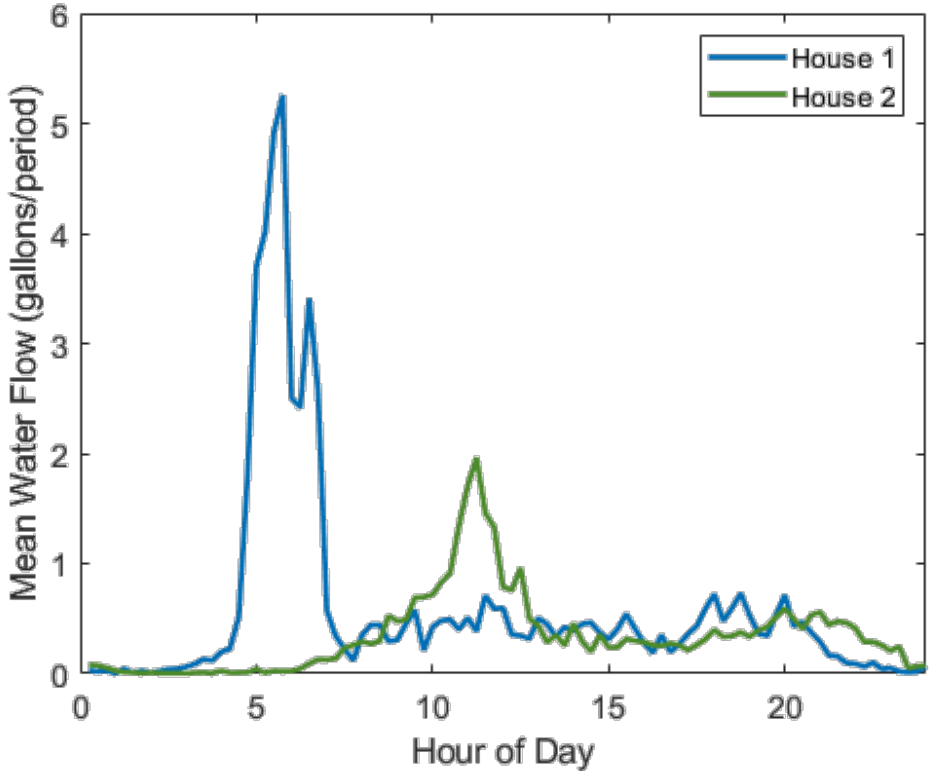
Neighborhood Coordination

- Not every building is equivalent
- Resources can be ‘shared’
- Further improves PV hosting capacity
- Enables decentralized “campus” level optimization



Next Steps

- Challenges:
  - Diversity of loads/equipment
  - Diversity of customer behavior



- Looking for partners for 100 home/building pilot
- Starting projects with universities to explore campus-level approach

Intwine Connected Gateway

- Linux based system
- Processor: Sitara ARM, 800MHz
- Memory: 512MB RAM, 4GB flash, MicroSD card slot
- Radios: WiFi b/g/n, ZigBee HA1.2, Bluetooth (4.2 and 2.0), LTE Cellular
- Physical: Ethernet (10/100/1000), USB
- Expansion Module: RS485, RS232, XBee, 2nd Ethernet, etc
- Open-Sourced operating system and application layer

- Rugged industrial version also available
- Certified for use in US, Canada & Mexico on all major cellular carriers
- CatM1/NBIoT certification pending!