Intwine Connected Gateway for VOLTTRON Applications

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Who We Are

- IoT network provider / energy systems integrator
  - Located in Cleveland, Ohio
  - Partnership Case Western Reserve University
- Deep experience developing VOLTTRON based systems for >3 years
- Established relationship with EPRI
  - Successfully executed on NREL INTEGRATE project
  - Currently engaged with additional VOLTTRON demonstration projects
- Active development engagements with DOE national labs
- Designed, built and currently offer:
  - Grid-edge, multi protocol, cellular router
  - CTA-2045 modules
  - Complete end-to-end software stack

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 (4.0 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 on all major cellular carriers
- Global certification expected by the end of 2017

Communication Options

- VOLTTRON and the Intwine Application Framework run in parallel
- Enables users to develop or use VOLTTRON agents or AF agents
- Easily integrate existing AF agents for ZigBee, BLE, WiFi devices

Energy Management

Intwine Automation

Our occupancy, daylighting, and light-level tuning features can automate savings of 30-60% and eliminate maintaining confusing schedules.

Manual Switches/Dimmers

Wireless wall controls integrate with the system to work seamlessly with connected lighting strategies.

Thermostats

Intwine has multiple ZigBee and Wi-Fi thermostat partners to provide flexibility in aesthetic design.

Connected Lights

We are compatible with the industry's leading smart bulbs and fixtures with embedded connectivity.

Smart Relays/Dimmers

Supports a number of different smart relays and dimmers (DALI and 0-10V) to connect any light or load to the Intwine Network.

Plug Loads

Supported ZigBee and Wi-Fi smart plugs and switches enable monitoring and control of plug load.

Monitoring

Temperature/Humidity

Monitor climate-sensitive goods and areas with real time and trend based alerts.

Leaks and Moisture

Prevent costly damage and business interruptions with real-time water detection sensors.

Occupancy

Monitor occupancy, unauthorized access, and activity. Stay alerted with real-time events and analyze heat-map usage patterns over time.

Power Monitoring

Monitor power consumption by equipment or circuit. Gain insight into usage patterns, use the data to reduce consumption, and set up alerts for unusual spikes and patterns.

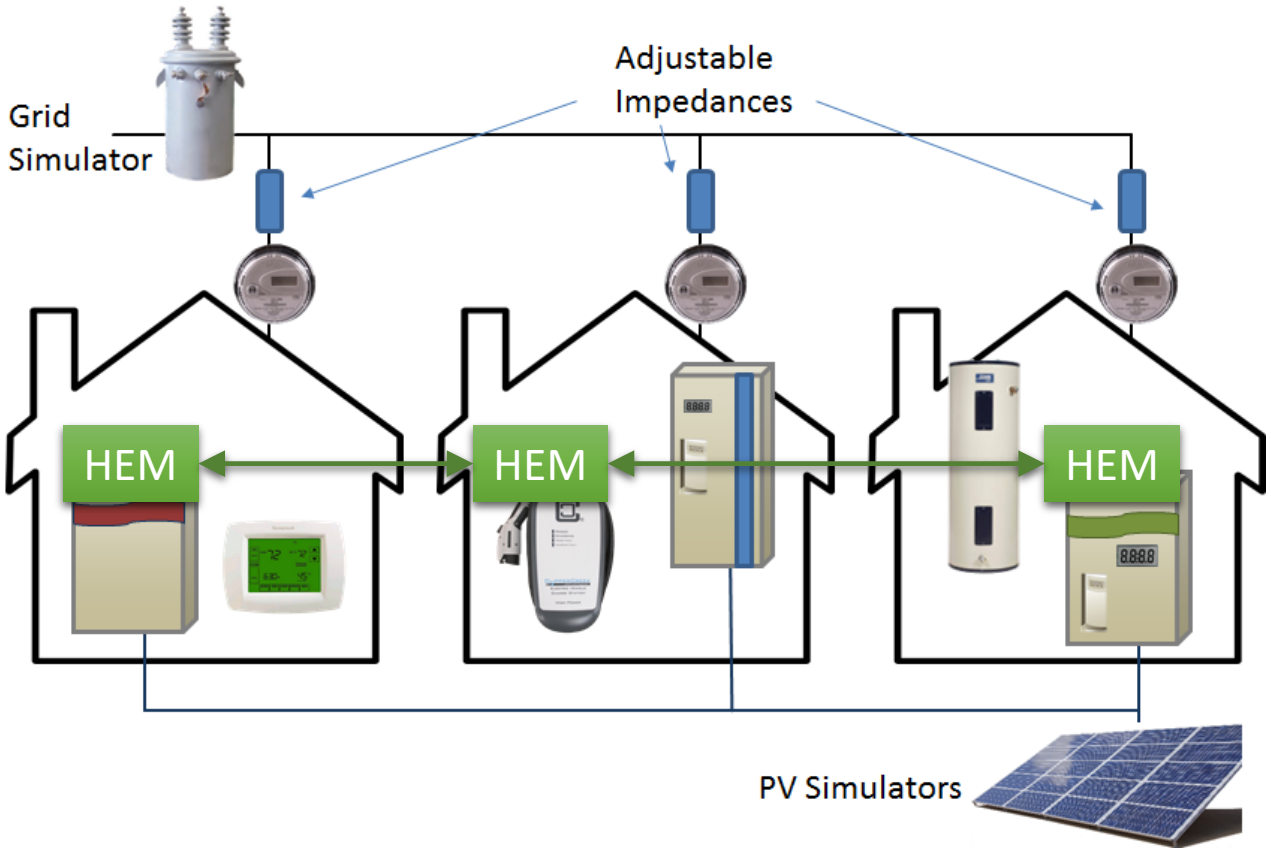
What is CTA-2045?

- Open Standard for interoperability with common home loads

- Intwine has WiFi Universal Communication Modules (UCM)
- Publicly available REST API that mirrors CTA-2045 command set
- VOLTTRON agent interact with the UCM

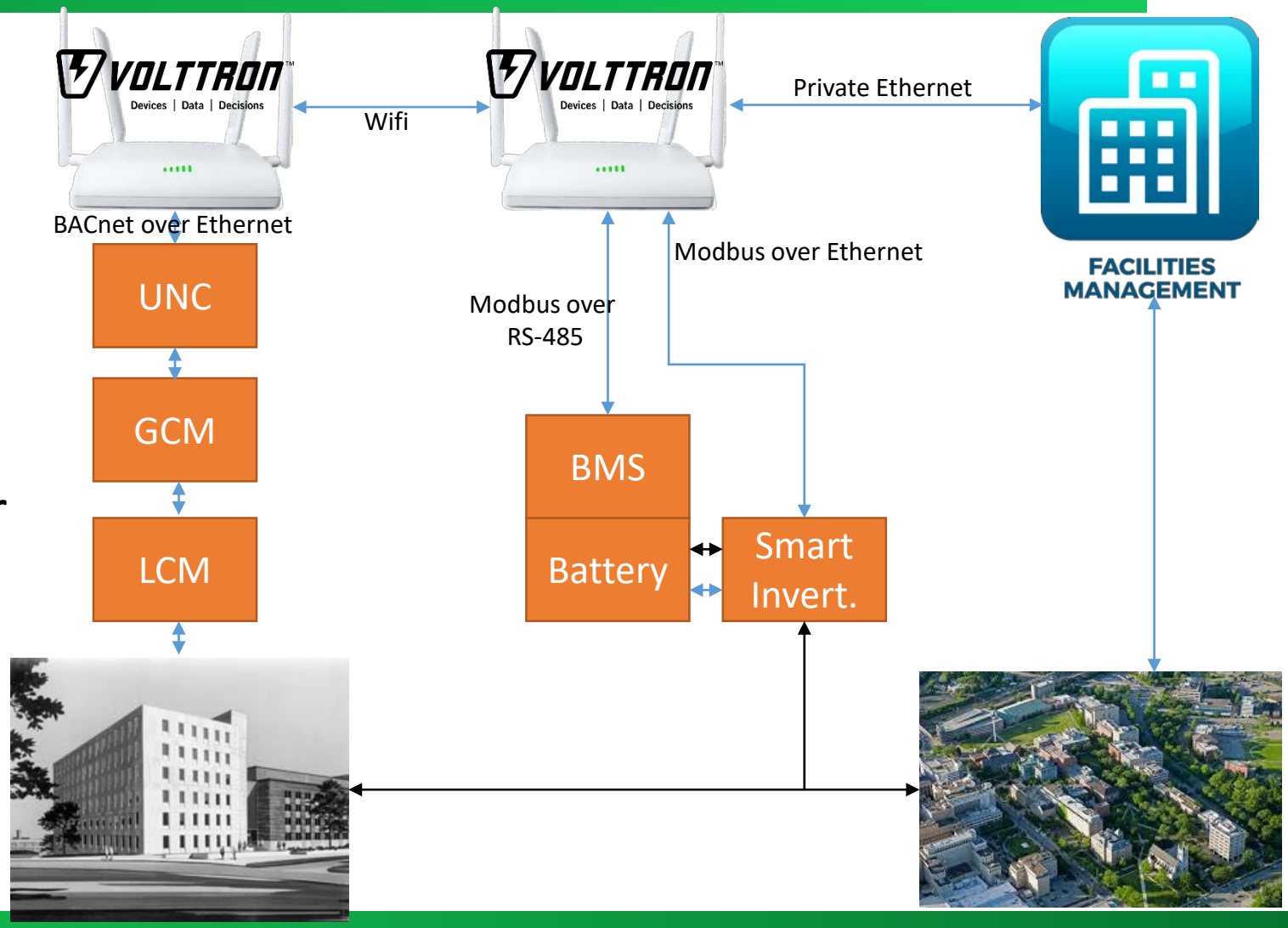
ICG as Brain for California Smart Grid

- Grant from California Energy Commission with EPRI, PG&E, SCE, SMUD, UL & device manufacturers
- Objective is to use HEMS for scalable solution to mitigate impact of Solar PV on distribution system
- ICGs will coordinate loads and PV within home and other ICGs in the neighborhood to minimize voltage droop at transformer



Olin Building @ CWRU

- DoE/PNNL Demonstration Project
- Integrating advanced controls into legacy BAS (Schneider 8000)
- 173 BACnet points for initial integration
- Private Facilities network for monitoring & control
- Objective is to use the storage and load control to flatten load observed by campus



To Order…

Single Piece: $600

http://intwineconnect.com/volttron

No contract cellular data is available

Backup Materials

Interoperability / Compatibility

- Runs DOE's VOLTTRON platform
- Standards we support
  - OpenADR2.0b to Cloud and Gateway
  - CTA-2045 using Intwine UCMs
  - ZigBee HA 1.2
  - WiFi b/g/n
  - Bluetooth 2 and BLE
  - 4G LTE cellular communication
  - Many more in the pipeline!
- CTA-2045 UCM source code is open-source
  - Also support SunSpec Modbus protocol
- Gateway Operating System is open-source

Why use a Gateway?

- Reduce cyber-attack vector
  - Instead of trying to secure EVERY connected device - secure one
- Parallel cellular connection means
  - the customer can’t accidentally firewall communications
  - Limited or no liability for problems/security on customer network
- Provides an interface between utility and customer
- Gateway provides value to customer
  - Energy efficiency, broadband backup, automation, monitoring, security