BEMOSS and Its Enhanced Applications

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Outline

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Introduction

Overview

- **BEMOSS** or **B**uilding **E**nergy **M**anagement **O**pen **S**ource **S**oftware
- Virginia Tech
- U.S. Department of Energy

Introduction

Motivation for BEMOSS

- Track and control different loads
- Improve sensing and control of equipment
- Increase energy efficiency
- Encourage demand response

- Communication support: Wi-Fi, Serial (RS-485), Ethernet
- Protocol support: BacNet, Modbus, Web, Zigbee, OpenADR, Smart Energy Profile protocols

- Django - Python Web Framework
- ZeroMQ - message bus
- Twitter Bootstrap - front-end framework
- Font awesome - Icons
- jQuery and jQueryUI - displays data on web interface
- Python - language of BEMOSS
- VOLTTRON - Operating System

Applications

Current Software in BEMOSS

- Lighting_scheduler
- Plugload_scheduler
- Illuminance based lighting control
- AC Fault Detection

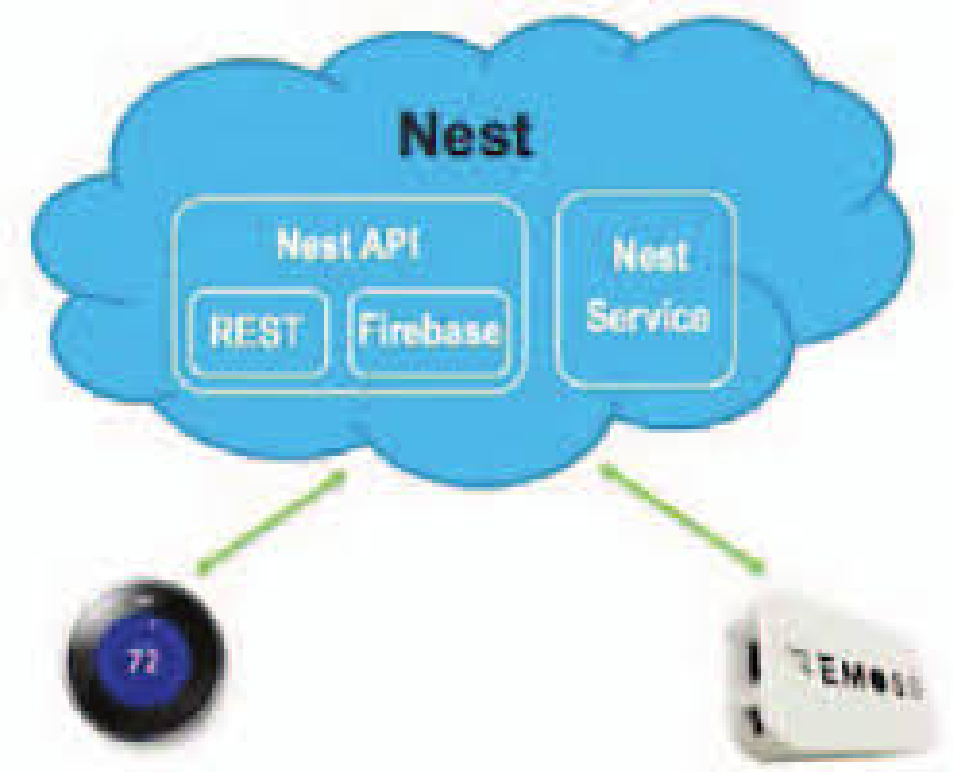
Applications

IoT Integration

- Lighting load controllers - Philips Hue
- Plug load controllers - WeMo Insight Switch
- HVAC Controllers - Google Nest

Applications

IoT Integration



- Supported devices in BEMOSS 3.5

Device Model	Vendor	Protocol
HVAC controller		
CT30 w/ Wi-Fi USNAP module	Radio Thermostat	Wi-Fi
CT50 w/ Wi-Fi USNAP module	Radio Thermostat	Wi-Fi
PL-M1000RTU/M2000RTU	Prolon	Modbus RTU
VC1000/VC2000	Prolon	Modbus RTU
Lighting load controller		
WeMo light switch	Belkin	Wi-Fi
Philips Hue	Philips	Wi-Fi/Ethernet
LMRC-212-U	Wattstopper	BACnet MS/TP
Plug load controller		
WeMo switch	Belkin	Wi-Fi
WeMo insight switch	Belkin	Wi-Fi
LMPL-201	Wattstopper	BACnet MS/TP
Sensor		
LMLS-400	Wattstopper	BACnet MS/TP

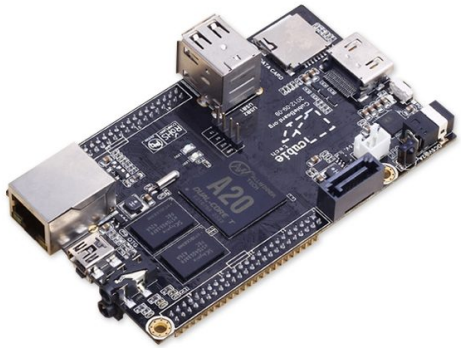
Application

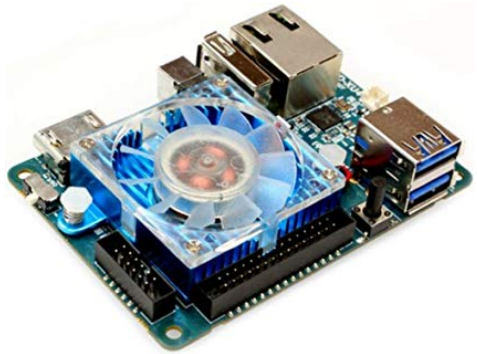
Potential Applications

- Machine learning algorithms - support vector machine, neural networks, linear regression
- Management of data - data filtering and distributed databases
- Manage multiple buildings

Hardware and Software for Installation

- Laptop or desktop running Ubuntu 16.04
- Single-board computer - Raspberry Pi, Cubieboard, Odroid





Future Work

- Machine learning algorithms
- Improve DC motor integration

Summary

- BEMOSS improves energy management in buildings
- BEMOSS has many applications
- Future work can be implemented

References I

M. Pipattanasomporn.
BEMOSS: An Agent Platform to Facilitate Grid-Interactive Building Operation with IoT Devices
IEEE Power and Energy Society 2015

Any questions?