VOLTTRON

Open Source Platform for Energy Management

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What is VOLTTRON?

VOLTTRON is an open source distributed control platform used for efficiently managing energy use applications and devices

- Heating and Air Conditioning
- Ventilation
- Refrigeration
- Electric Cars
- Lighting
- Others

Used for

- Small Facilities such as homes (can communicate with each other, as well as power utilities for control data)
- Large facilities such as businesses, research facilities, universities, etc…

Funded by the U.S Department of Energy

Developed by Pacific Northwest National Laboratory

Project Definition

- Create a Hardware Platform to allow for the successful launch and implementation of the VOLTTRON algorithm
- Utilize a small Linux computer with enough processing power to run the algorithm and control desired hardware (BeagleBone Black)
- Create a GUI interface on a web server that can communicate with the BeagleBone wirelessly and interact with VOLTTRON and control attached devices
- Document all steps of VOLTTRON implementation to provide students with a strong foundation for future use

Implementation- System Architecture

Raspberry Pi

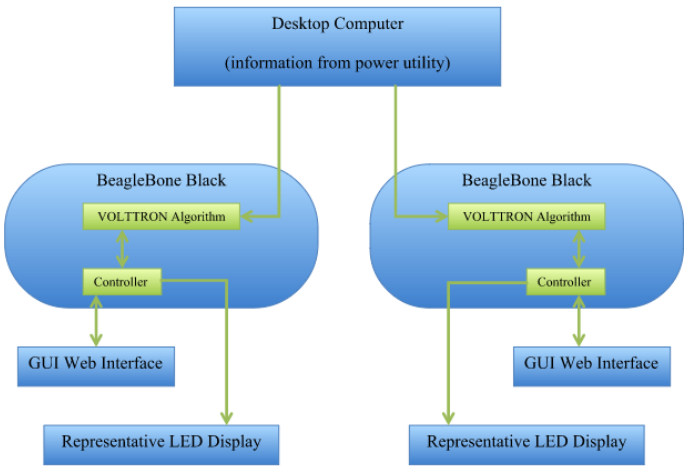
CPU: 700 MHz ARM processor
RAM: 512MB SD
Ethernet: 10/100 RJ45
USB 2.0: Available
Price: $35
Size: 3.4"x2.2"

beagleboard

CPU: 1GHz ARM Cortex-A8
RAM: 512MB SD
Ethernet: 10/100 RJ45
USB 2.0: Available
Price: $55
Size: 3.4"x2.1"

Model	BeagleBone Black	Raspberry Pi A+	Raspberry Pi 2 B+
CPU	ARMv7 1000MHz	ARMv6 700 MHz	ARMv7 900 MHz QuadCore
Memory(MB)	512	256	1024
VOLTTRON compatibility	Yes	N/A	N/A
Requirements to get started	No requirements Comes with on board Memory and power cable	Needs SD card and power Cable	Needs SD card and Power Cable
Setup Time	2 hours	N/A	N/A
Cost	$55	$25	$35
Release Date	April 2013	May 2014	Feb 2015

Implementation- System Architecture



Implementation- Wireless GUI Interface

Implementation- Agent Creation and Use

Message Bus (Part of VOLTTRON)

- Hub for all information within VOLTTRON to travel through
- Agents can subscribe to specific or multiple other agents from the message bus

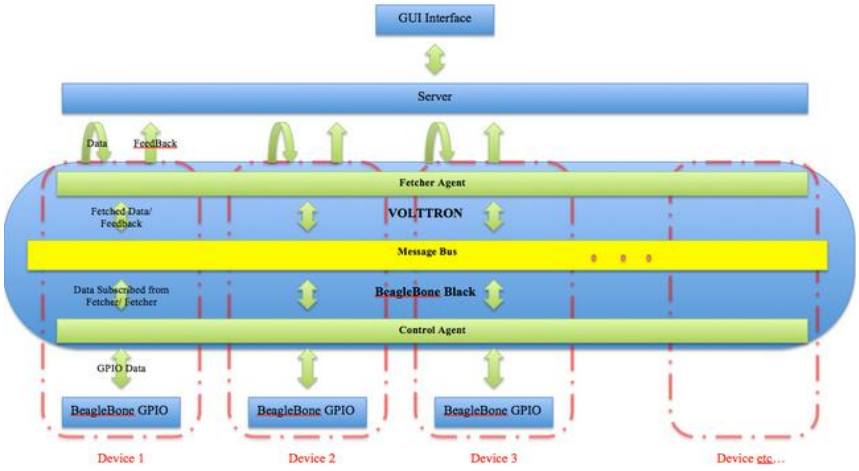
Fetcher Agent

- Receives data from GUI and publishes to message bus
- Subscribes to control agent data in message bus for feedback information that is sent to the GUI

Control Agent

- Subscribes to fetcher agent data in message bus for control information
- Publishes feedback to message bus (devices states)

Implementation- Agent Creation and Use



Demonstration

Future Use (VOLTTRON 3.0)

Project Report will be a resource for next group to take on VOLTTRON

- Additional installation instructions and troubleshooting tips for VOLTTRON user guide
- Agent development guide
- Guide for activating and running VOLTTRON successfully
- How to install onto BeagleBone Black
- Instructions for development and manipulation of GUI interface

VOLTTRON 3.0 has improved functionality

- sMAP server removed (obsolete)
- Adding Devices

Questions?

Sources:

http://energy.gov/sites/prod/files/2014/07/f18/Volttron%20Applications%20-%20VA%20Tech%20%28Rahman%29_0.pdf