

# Eclipse VOLTTRON Overview

September 25, 2019

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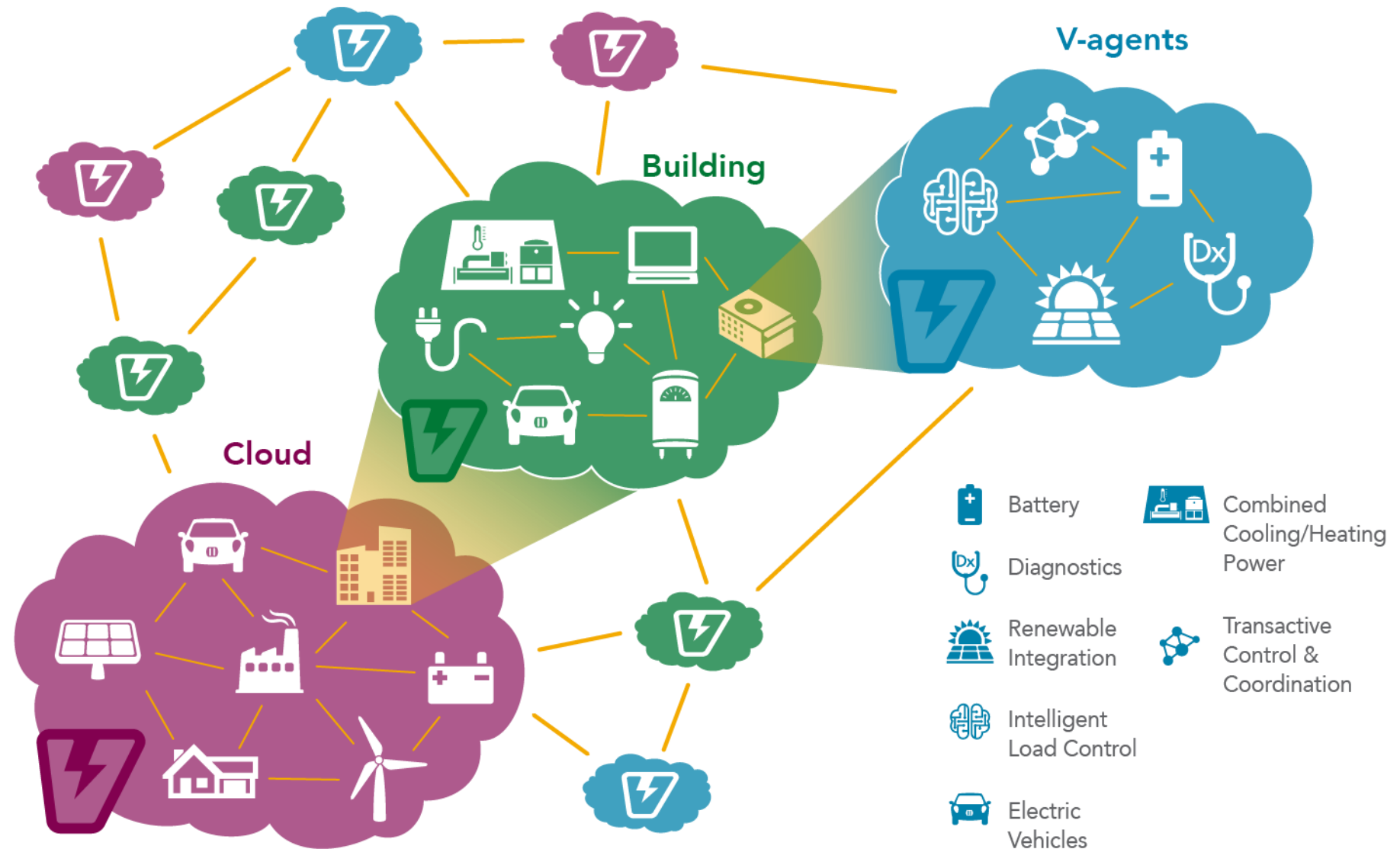


# Eclipse VOLTTRON™ Definition

- VOLTTRON is an application platform (e.g. Android, iOS) for distributed sensing and control applications
  - Written in Python
  - Deployable on Linux
- VOLTTRON utilizes protocols to interact with devices
- VOLTTRON enables applications but is not an application itself
  - Demand response can be implemented as an application on top of VOLTTRON
- VOLTTRON is open, flexible, and grows stronger with the community

# Eclipse VOLTTRON Eco-System

- Multiple standards and protocols in buildings space
- VOLTTRON™ can act as interoperability platform
- Capabilities expand along with community



# Key Benefits and Primary Uses

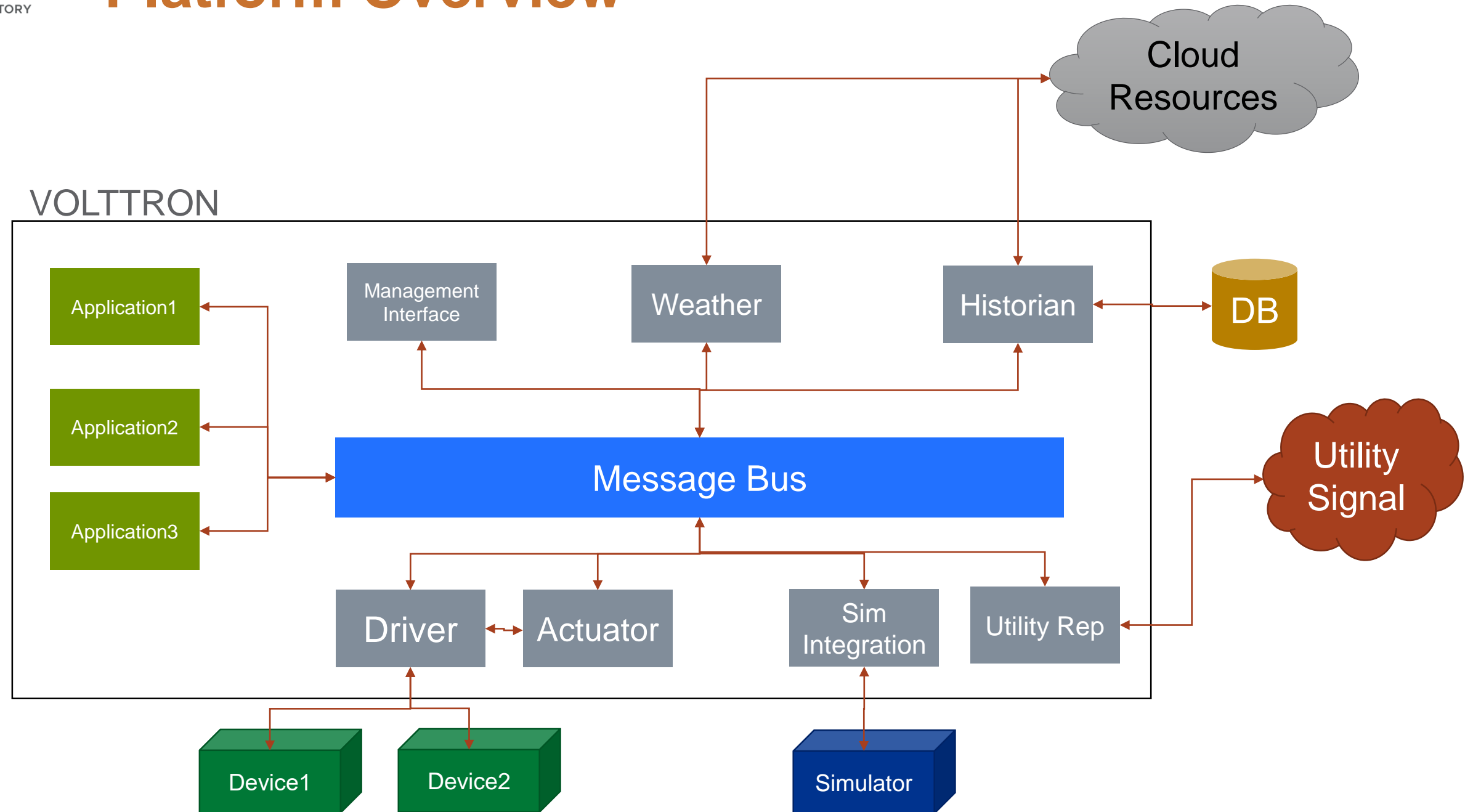
- 3 Key Benefits:
  - Cost-effective – Open source software (free to users) and can be hosted on inexpensive computing resources
  - Scalable – Can be used in one building or a fleet of buildings
  - Interoperable – Enable interaction/connection with various systems/subsystems, in and out of the energy sector
- 3 Primary Use Areas:
  - Building Efficiency – To help control building energy system performance
  - Building-Grid Integration – To support “beyond demand response” approach and integration of distributed energy resources into the grid
  - Transactive Control – To support a scalable, distributed control mechanism for transacting information about systems, loads and constraints to deliver user specified services.

# Pillars of VOLTTRON



- **Flexibility**
  - The platform should be flexible to meet requirements for a varied set of solution spaces
- **Usability**
  - The platform should be both easy to use and straightforward to develop
- **Scalability**
  - The platform should enable deployments at scale through proper deployment and division of resources
- **Security**
  - The platform must be secure to protect the devices being controlled and not provide a “backdoor”
- **Interoperability**
  - The platform must work across vendors and protocols and provide capabilities to simplify these interactions

# Platform Overview

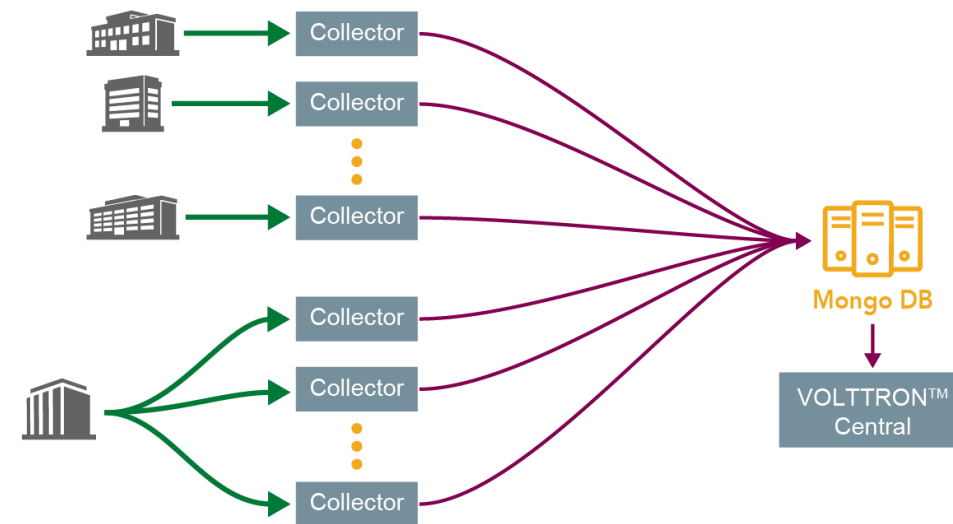
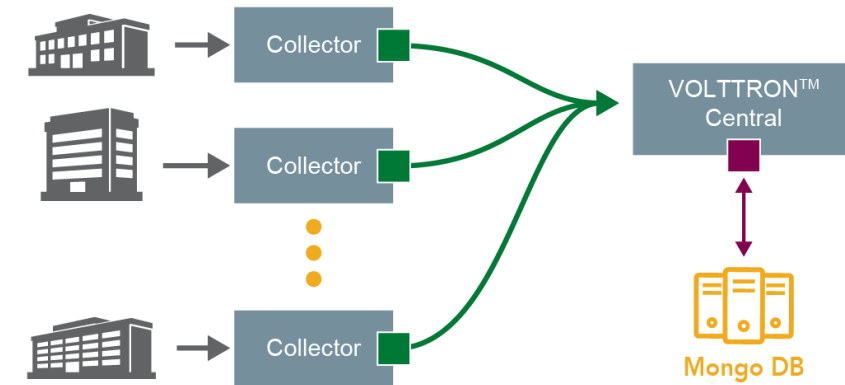
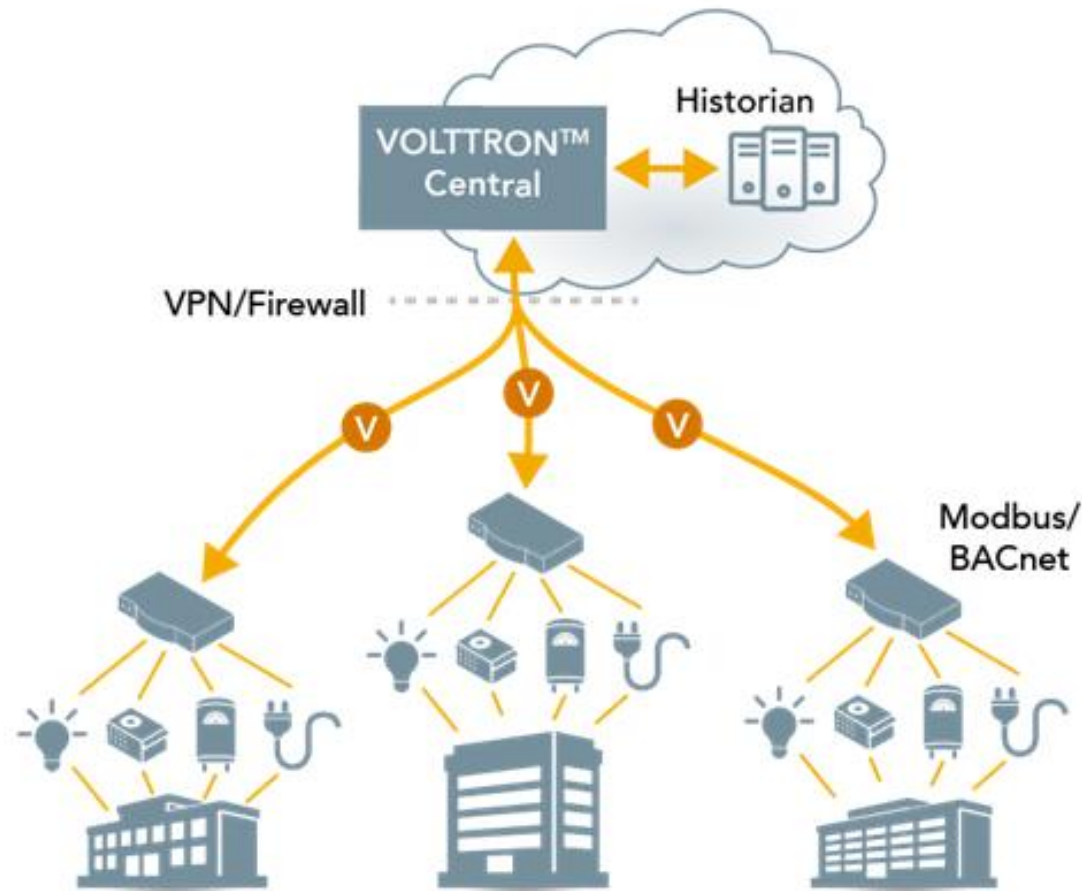


# Interoperability Platform

- MessageBus
  - ZMQ
  - RabbitMQ
- Device interaction protocols
  - BACnet
  - Modbus
  - Chargepoint
  - DNP3
  - SEP2.0
  - Device specific
- Simulation
  - Energy+
  - MATLAB
  - FNCS
- Data Storage options
  - SQLite
  - MySQL
  - Prometheus
  - CrateDB
  - MongoDB
  - Redshift
- Weather Data
  - DarkSky
  - Weather.gov
  - Weather Underground
- OpenADR Signal



# Flexible Deployment Options





# Platform Security

- Platform hardening guidelines for securing underlying Linux system
- Multi-platform Message Bus
  - Encrypted communication between VOLTTRON instances
  - Authorization required for agents to communicate with the VOLTTRON message bus
  - Pub/sub topics can be restricted to authorized agents
- Platform Security and Monitoring
  - Access to VOLTTRON instances restricted to approved hosts
  - System for forwarding crucial log files for analysis
  - Alerts can trigger emails to administrators
  - Monitor and alert on pub/sub topics for interruptions and unexpected values
- Agent Security
  - Role based access to agent capabilities
  - Agents execute in separate process from platform

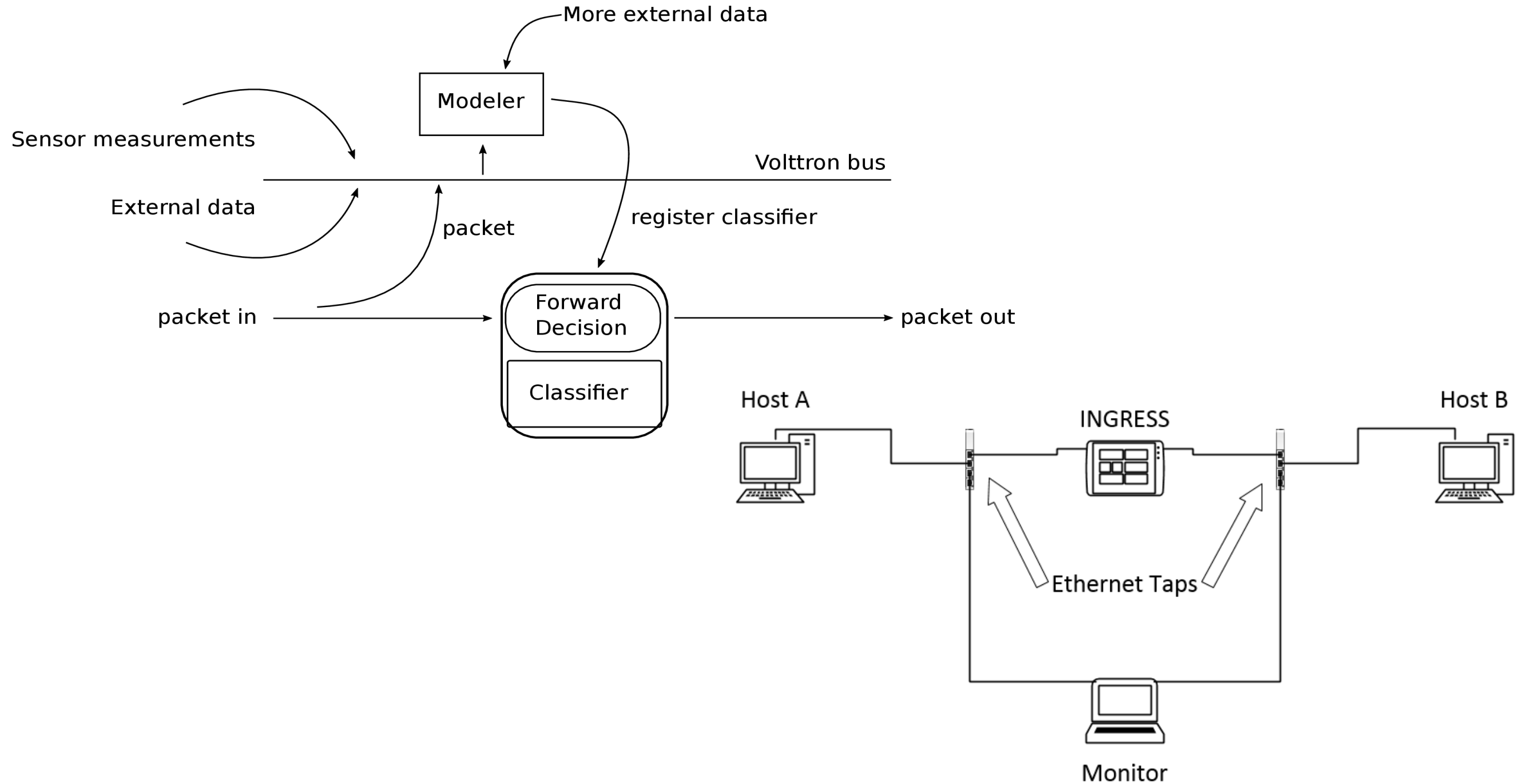




## Applications

- AFDD – Automatic Fault Detection and Diagnostic
- AFDDVis – Visualization for AFDD results
- AirsideRCxAgent - Air-side HVAC Auto-Retuning Diagnostics
- DrivenMatlabAgent – Integrates MATLAB code with VOLTTRON platform
- EconomizerRCxAgent - Application to detect and correct operational problems for AHUs/RTUs.
- ILCAgent – Intelligent Load Control Agent
- TCM2Agent
- WBE – Whole Building Energy
- Economic Dispatch

# Example Application – Inline Security Device



# VOLTRON Community

- Mailing list: 200
- Online Office Hours
  - Invite list: 60+ (recently pruned)
  - 20+ regular attendees
  - 3 years of recordings
- Slack: 86 members
- Github stats
  - 1200+ Views, 161 Unique visitors
  - 109 clones, 38 unique cloners
  - 42 contributors
  - 200 Watchers
  - 100+ forks
- Community
  - National Labs
  - Universities
  - Commercial Companies

## VOLTRON™ Office Hours

VOLTRON office hours occur every other week (Fridays at 11 a.m. PT), and are attended by the development team and members of the community. Meetings may have selected topics, but they are intended to provide an open forum for questions ranging from "How do I get started?" to detailed discussions of a specific VOLTRON feature.

To join our office hours, email [volttron@pnnl.gov](mailto:volttron@pnnl.gov).

## Playback recorded VOLTRON Office Hour sessions



### VOLTRON Office Hours - June 24, 2016

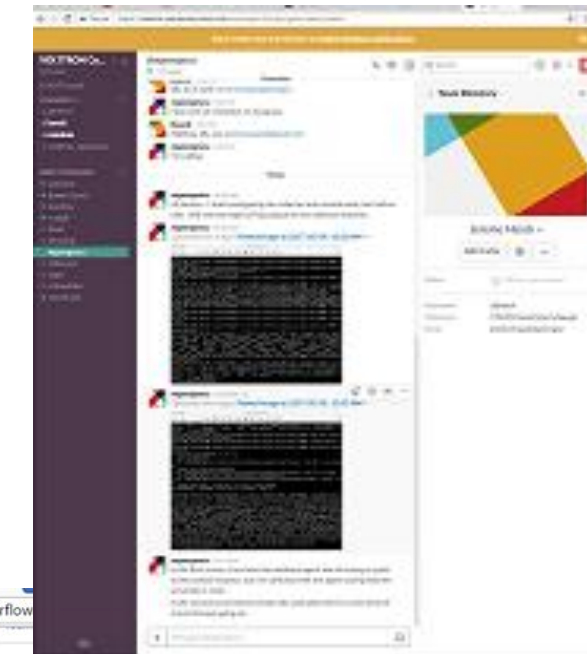
Chad Corbin of PNNL presented the Transactional Control of Commercial Building HVAC multi-agent VOLTRON application (recording is audio-only, download PDF of presentation [here](#)). PNNL-SA-119047



### VOLTRON Office Hours - June 10, 2016

Discussion of creating a data model for adding context to VOLTRON data, presentations on integrating VOLTRON with MATLAB and the FNCS project, and an update on data aggregation historians. PNNL-SA-118861

- ❑ TCP replay attacks are rejected but no exception is logged **security**  
#666 opened 5 days ago by fstshrkr ||| New Issues
- ❑ Denial of Service to VOLTRON Central does not allow a service to  
#665 opened 5 days ago by fstshrkr ||| New Issues
- ❑ Possible Improvements for VC and Platform Agent  
#661 opened 14 days ago by mikeroup 0 of 20 ||| New Issue
- ❑ setting min/max for chart y axis doesn't work **bug**  
#659 opened 18 days ago by jchap-pnnl VOLTRON 3.5.1 ||| Ready To Merge
- ❑ Make agent script fails when applications directory is missing  
#652 opened 27 days ago by mikeroup ||| New Issues
- ❑ charts should indicate if refreshing data or not **enhancement**



- 0 votes  
2 answers  
9 views  
**How to subscribe to different topics in Volttron**  
When I use the following code to subscribe to a topic, I can not use the same code to subscribe to some different topic. How can I subscribe to different topics? @PubSub.subscribe('pubsub', '...'  
asked 2 days ago  
Amin Mirakhori 26 • 2
- 0 votes  
1 answer  
12 views  
**VOLTRON Agents Naming**  
When I install my agents in VOLTRON platform, all of them are assigned the same name "Agentagent-3.0". I can change part of its name in setup.py. But, I don't know the right way to give a name to ...  
asked 2 days ago  
Amin Mirakhori 26 • 2
- 0 votes  
1 answer  
12 views  
**Setting up Volttron Central (VC)**  
I have some questions about Volttron Central (VC): What library/module/webserver is used to serve web content (html, css, js, etc.)? What is default username/password? And how do I change it? I ...  
asked Jul 22 at 23:11  
HNGO 163 • 1 • 4 • 17

# Thank you