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Eclipse VOLTTRON

Secure Open Source Platform

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Energy Storage Technologies and Applications Conference

Winston Chung Global Energy Center
UC Riverside

U.S. DEPARTMENT OF ENERGY | VOLTTRON™

Autonomous Open Source Agent Based Software Platform

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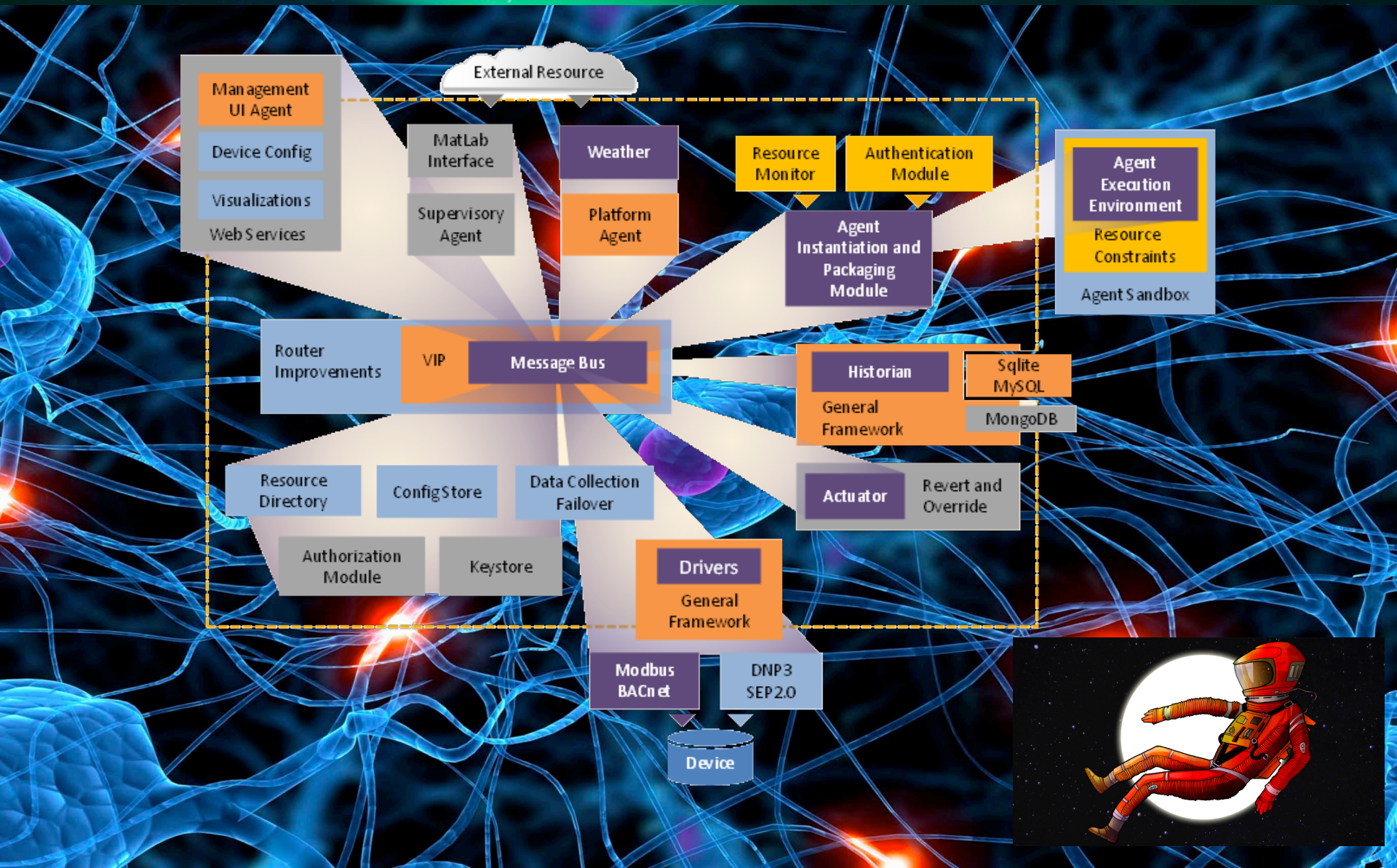


What is VOLTTRON?

VOLTTRON is an application platform (e.g. Android, iOS) for distributed sensing and control applications

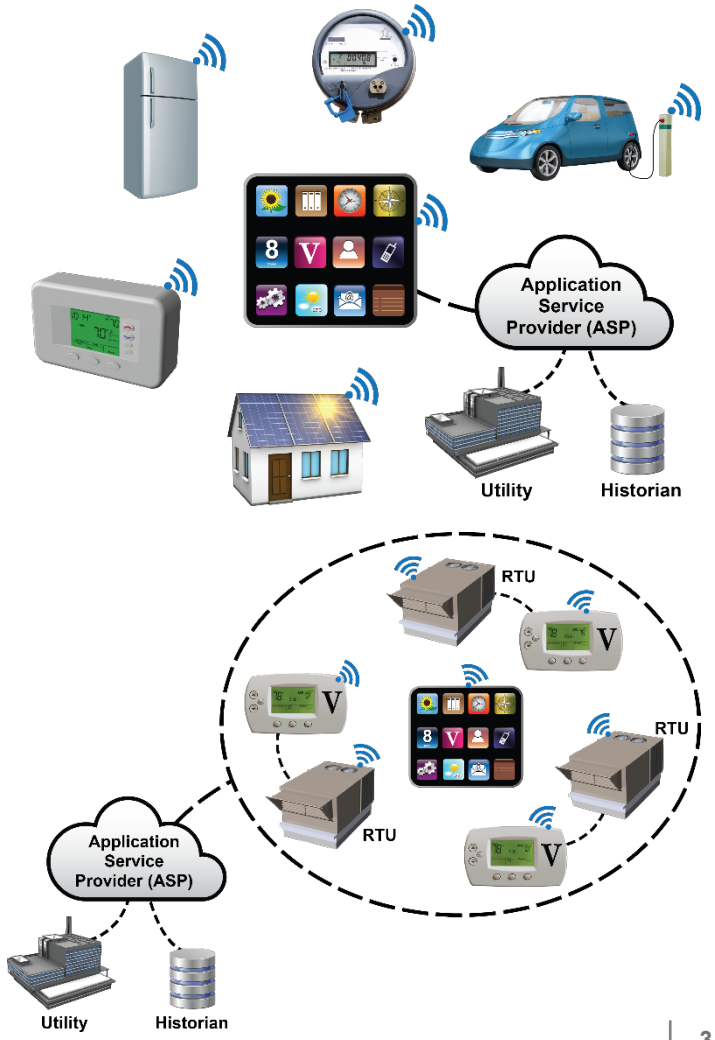
VOLTTRON is not a protocol

- A protocol, such as SEP2.0. or OpenADR, are implemented as applications

VOLTTRON is not an application such as demand response

- Demand response can be implemented as an application on top of VOLTTRON

VOLTTRON is open, flexible and scalable



VOLTTRON Attributes

Open, flexible and modular software platform

- Easy application development
- Enables interoperability across vendors and applications
- Simplifies power and control system complexities for developers
- Object oriented, modern software development environment
- Language agnostic. Does not tie the applications to a specific language

Ruby C C# C++ Python Java Perl

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VOLTTRON Attributes (cont.)

- Broad device and control systems protocols support built-in
  - ModBUS, BACNet, and others
  - Multiple types of controllers and sensors
  - Low CPU, memory and storage footprint requirements
  - Supports non-Intel CPUs
- Secure
  - Security libraries and cryptography built-in
  - Manage applications to prevent resource exhaustion (CPU, memory, storage)
  - Robust against denial-of-service (e.g. does not crash when scanned via NMAP)
  - Supports modern application development environments

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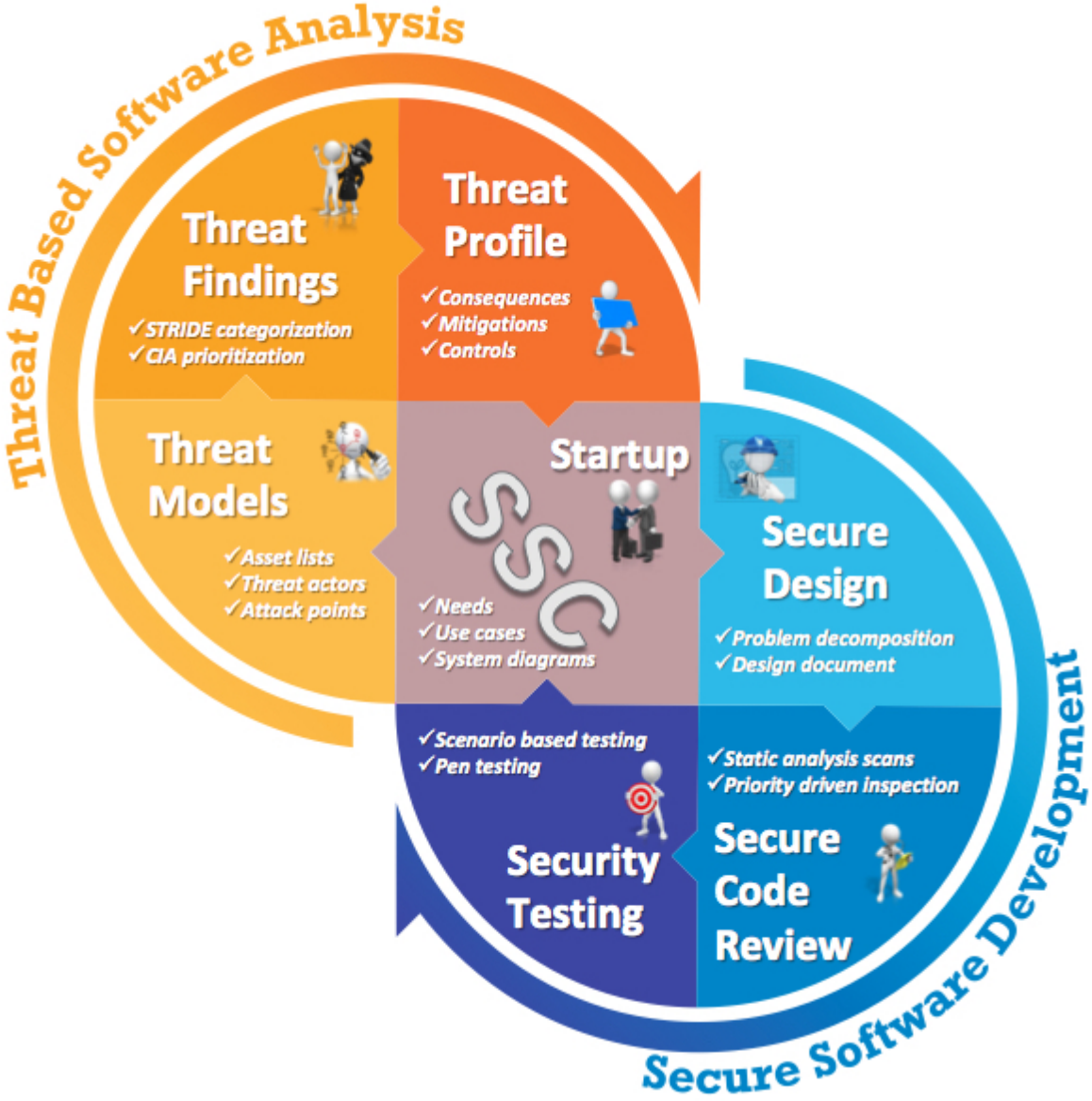
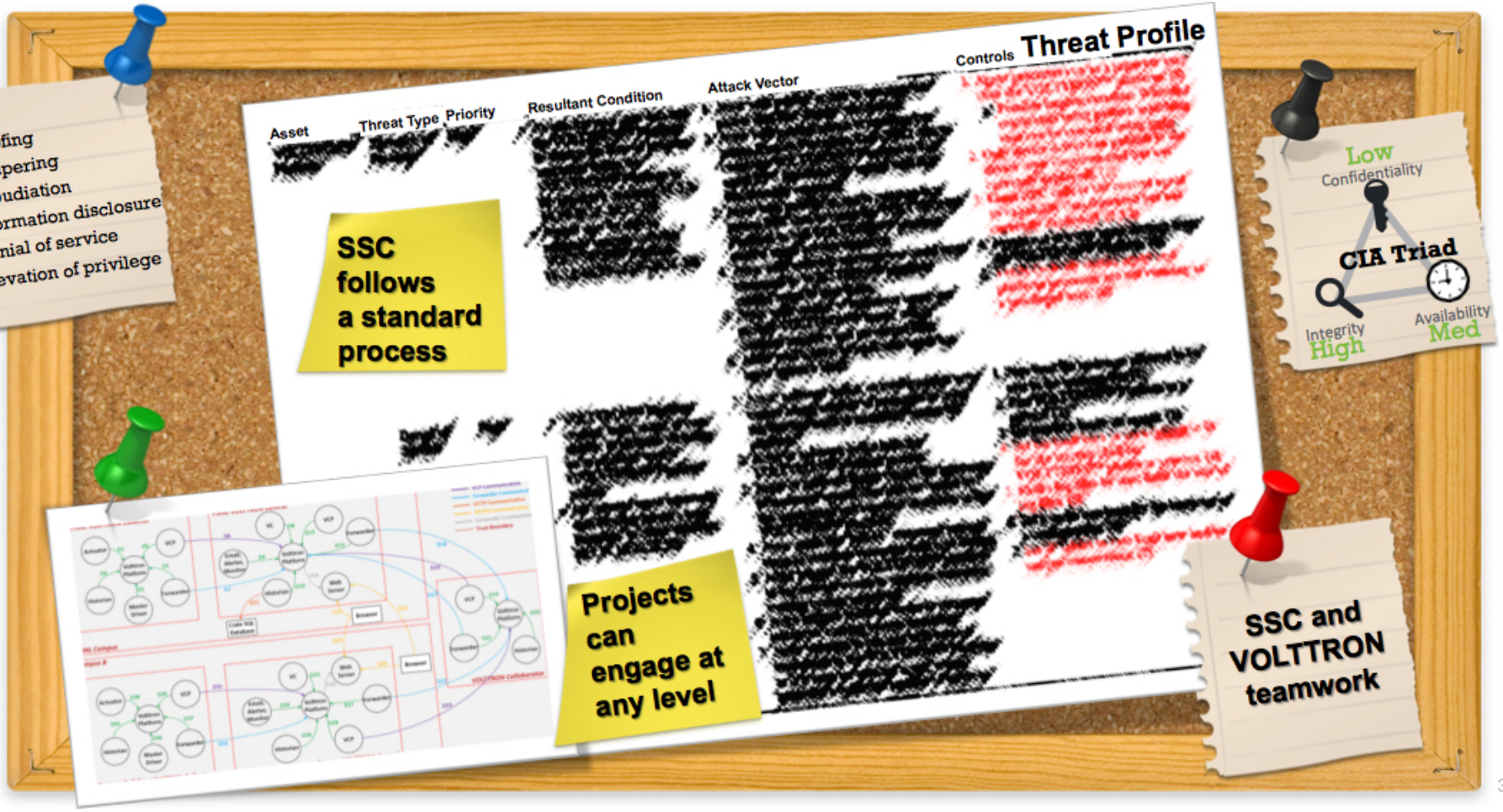
Security Strategies

- 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
- Platform hardening guidelines for securing underlying system

Secure Software Central



Secure Software Central Value



Use Case Threat Model Diagram

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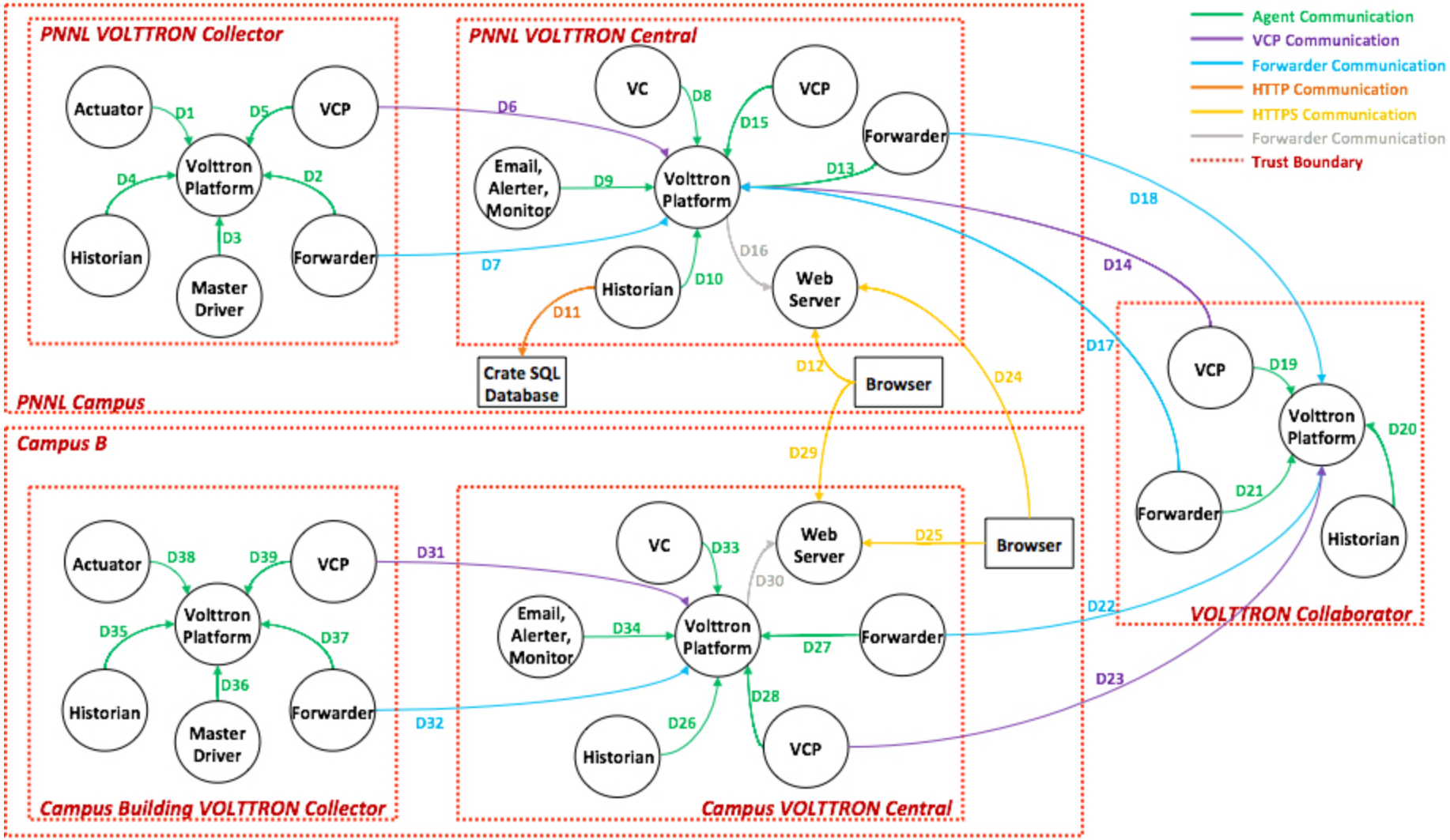

VOLTTRON Development Timeline

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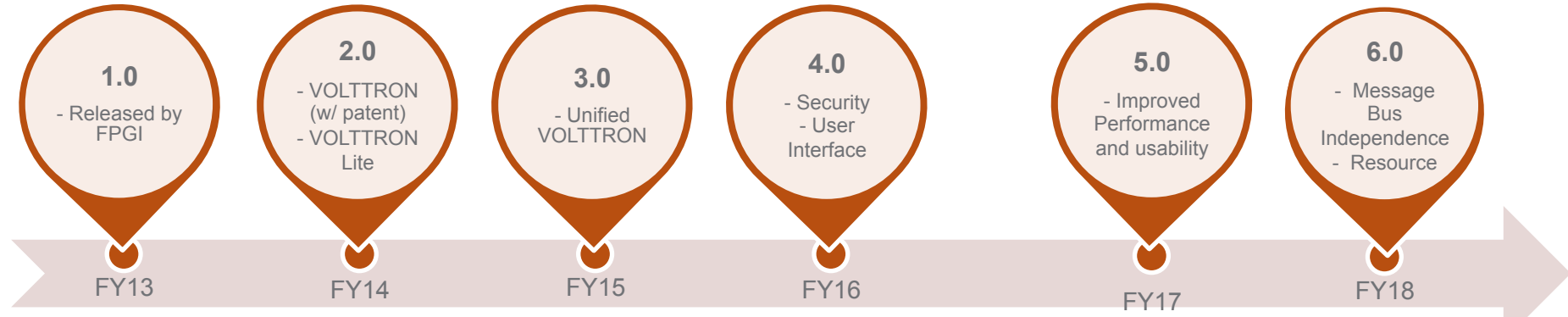
VOLTTRON™ Releases



Lab Home EV Demonstration

BEMOSS
RTU Network
First User Forum

NREL ESIF
2nd User Forum
Quality Logic Implements Transactive Node

NREL ESIF
3rd User Forum
Transactive Campus
BIRD-IP
GMLC Usage
Buildings Challenge
TWT Deployment
Intellimation deploying 100 instances

NW Tech Meeting
4th User Forum
VOLTTRON™ Foundation
Ecorithm Deployment
8minutenergy

Eclipse Transition
Refactored Message Bus
Skycentrics
ACE IoT Solutions

Use Case - Transactive Campus

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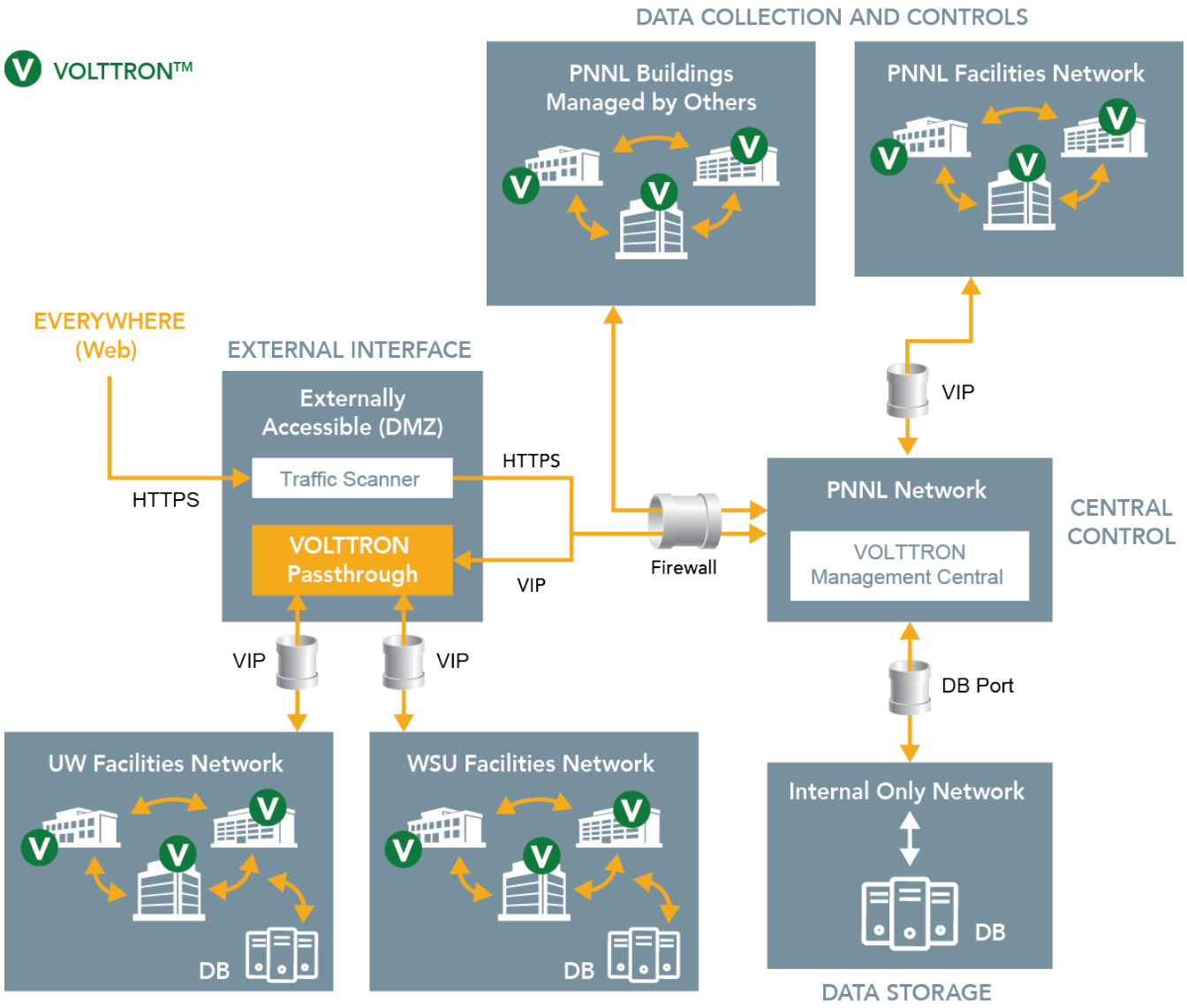

Use Case - ILC: Capacity/Demand Bidding

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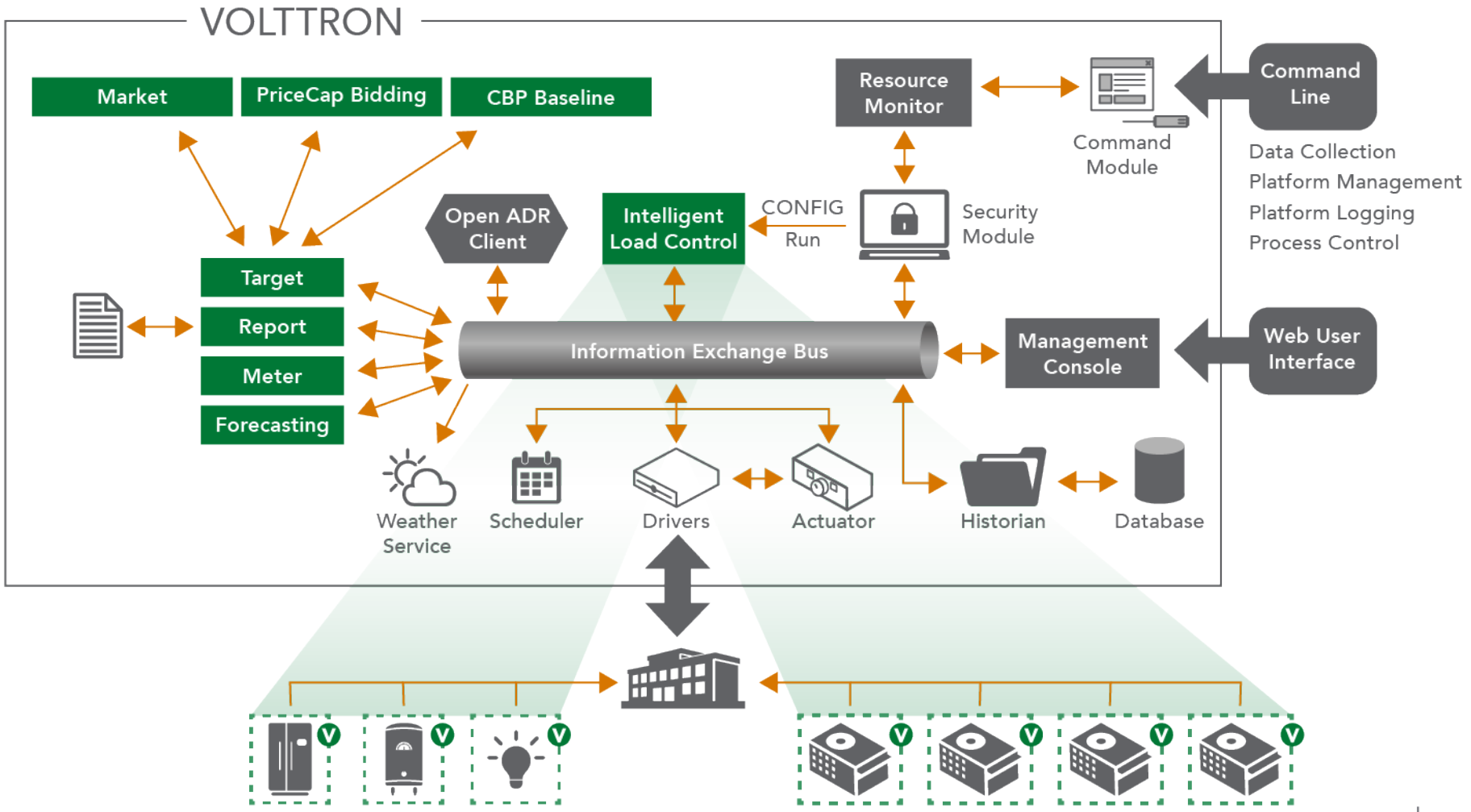

Use Case - Connected Home

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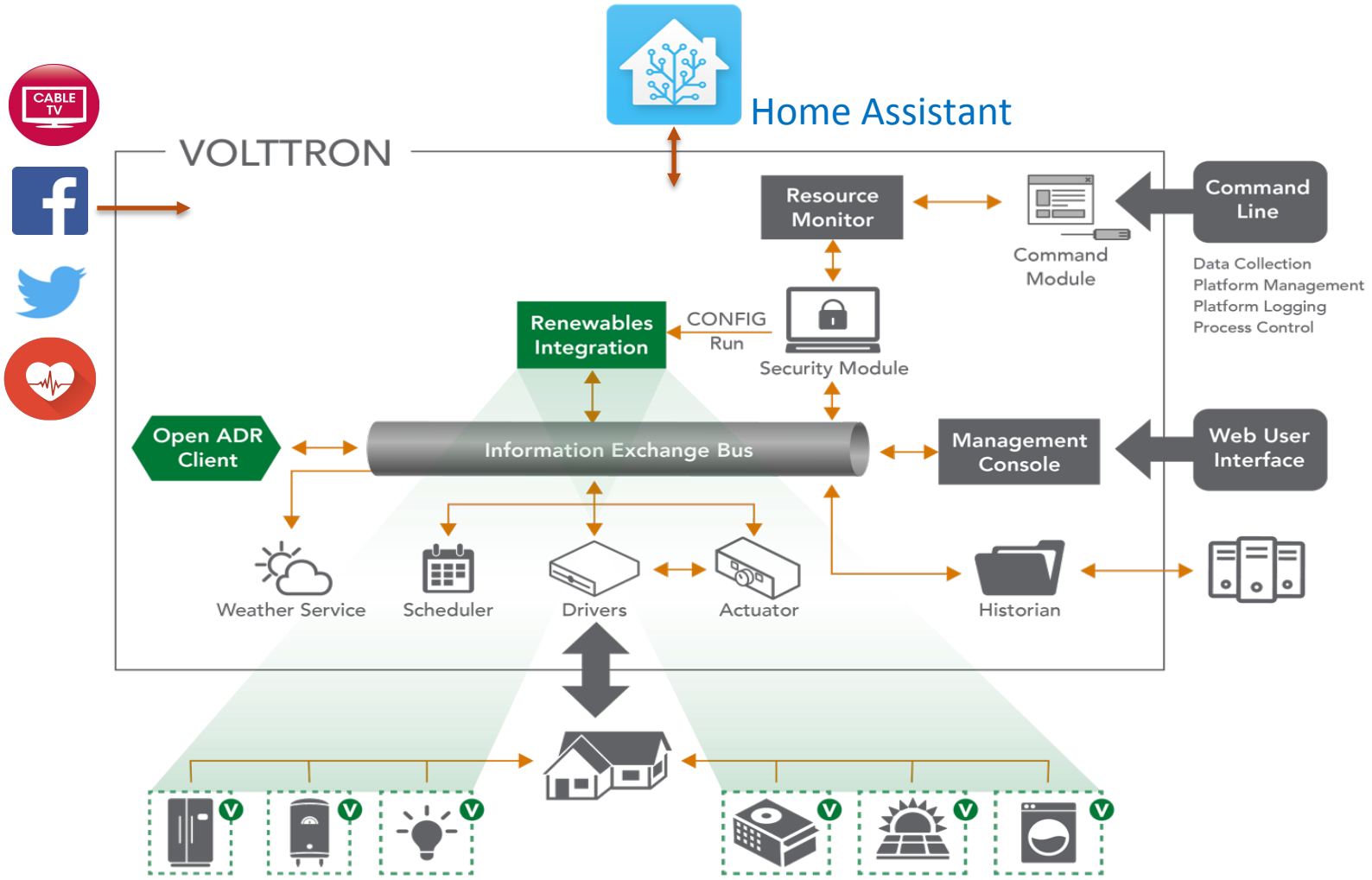

Growing the VOLTTRON Community

Eclipse VOLTTRON

https://projects.eclipse.org/projects/iot.volttron

Code: https://github.com/VOLTTRON/volttron

Documentation: https://volttron.readthedocs.io/en/latest/index.html

Project Home: https://volttron.org/