Enabling Portable Energy Applications with a Building Operating System

Gabe Fierro, Therese Peffer, David E. Culler
EECS Department
UC Berkeley
Current BMS/BAS Solutions

Non-extensible

Non-portable

Opaque

Vertically-integrated, vendor-isolated
XBOS: an Extensible Building OS

Hardware Presentation Layer
Canonical Metadata
Building Evolution Management
Security
User Experience
API
XBOS: an Extensible Building OS

Physical Information Bus: Query-Based Pub/Sub

Control Procs → Schedulers → Analytics → Apps → Kernel

Driver

Smart Devices
External Data
Legacy Protocols

Query Proc., API, Router, BtrDB, Metadata, Bldg Profile
SUBSCRIBE WHERE
Location/Room in [410, 411] AND Location/Building = “Soda”
AND Point/Type = “Sensor” AND Point/Sensor = “Temperature”

Physical Information Bus: Query-Based Pub/Sub

- Change is inevitable
- Build apps on relationships defined by queries
Canonical Metadata: BRICK

- Unified ontology for:
  - Sensors
  - Subsystems
  - Equipment
  - Relationships
- Represent building as a directed graph with named edges
What’s Possible: Zone-level HVAC Energy

- Simple estimate of RTU power
- Completely building and equipment agnostic
Future Directions: Security with BOSSWAVE

- Transport + permissions model
- Decentralized management
- Grant/revoke data + actuator access

Permission to read data stream X
Valid: 2016-05-13T13:00:00
Expires: 2016-10-13T13:00:00

BOSSWAVE developed by Michael P Andersen
Questions?

Gabe Fierro
gtfierro@eecs.berkeley.edu
GitHub: https://github.com/SoftwareDefinedBuildings/
Brick: https://github.com/BuildSysUniformMetadata/GroundTruth
BtrDB: http://btrdb.io/
Archiver: https://gtfierro.github.io/giles2/stack/
What's Possible:
Zone-level HVAC Energy

- Thermostats + power meter
- 3 different companies
- No building-specific code