

Security of EVSE and Electric Vehicles

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[2017 Internet2 Global Summit \(04/25/2017\)](#)



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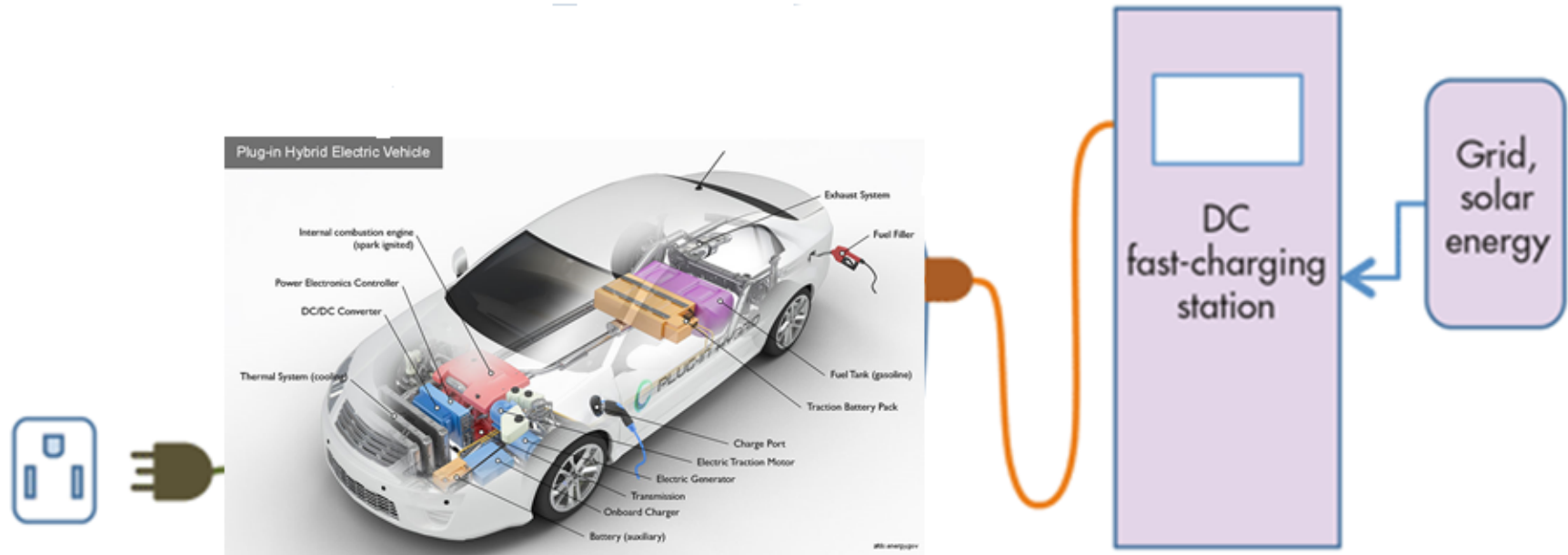
U.S. DEPARTMENT OF
ENERGY



Idaho National Laboratory



Charging a Plug-in Electric Car



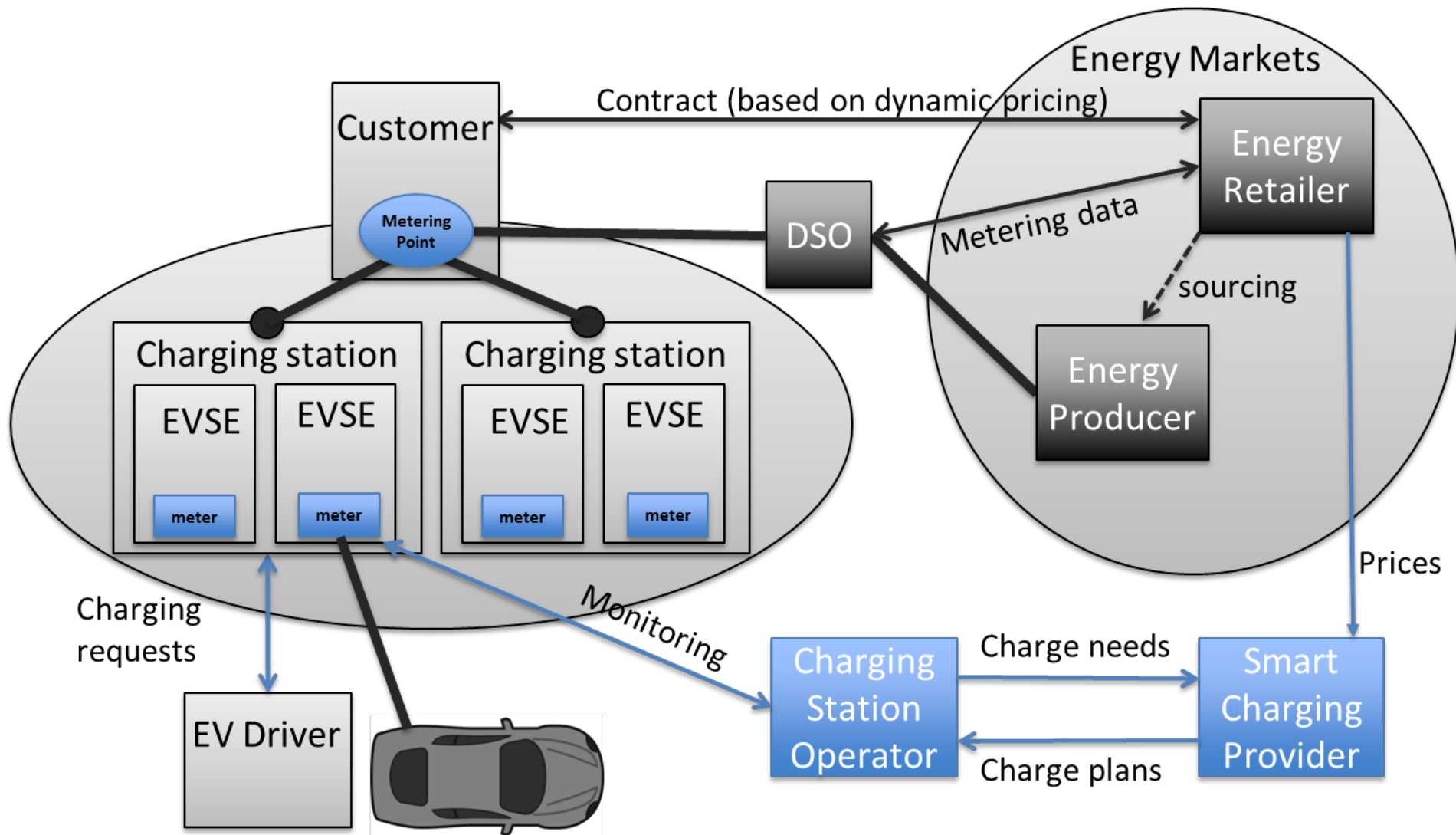
AC charging

- Every vehicle has an on-board charger.
- Limited power, slow charging.

DC charging

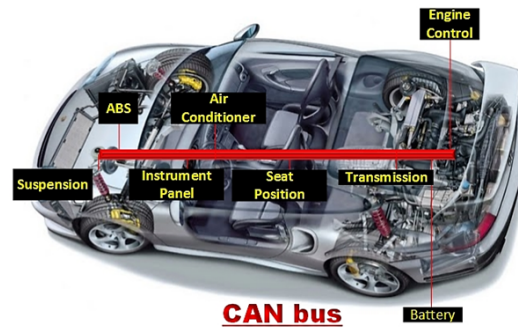
- Infrastructure investment is shared among hundreds of users.
- Large power rating, fast charging.
- Capable of integration with renewable resources.

How Smart Charging Works?



Cybersecurity vulnerabilities of connecting EV and EVSE

- RFID
- Zigbee
- RS-485
- CANBUS
- Key Fob
- Bluetooth
- Wi-Fi
- Cloud Security
- “People”



Source: <http://thehackernews.com/2016/11/hacking-tesla-car.html>



Charlie Miller • Chris Valasek • Work diligently since 2010 on DARPA funding • VIDEO DEMO Hacking Chrysler Jeep Remotely

Cybersecurity Testbed @ UL Lafayette



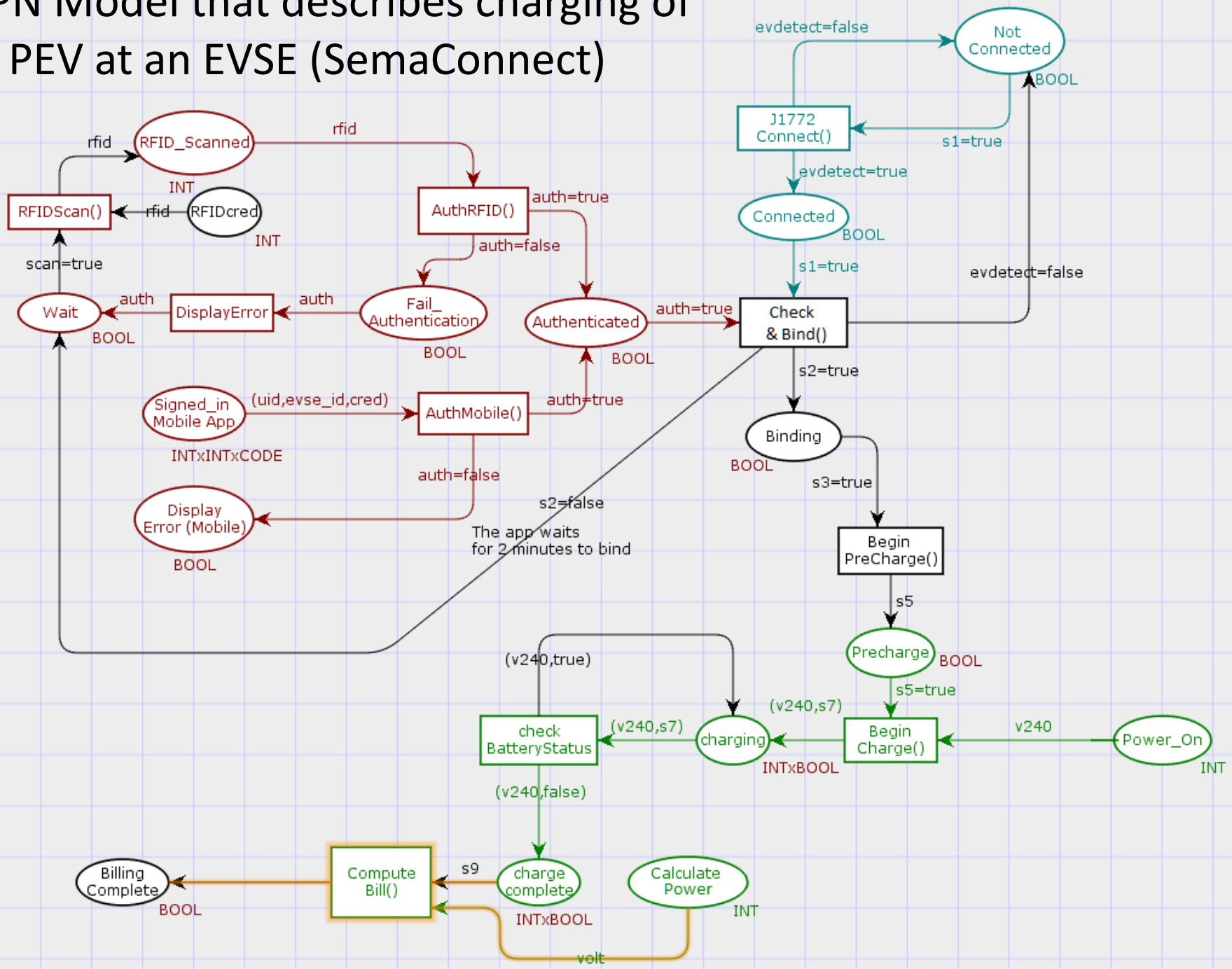
■ Power Supply
■ Communications



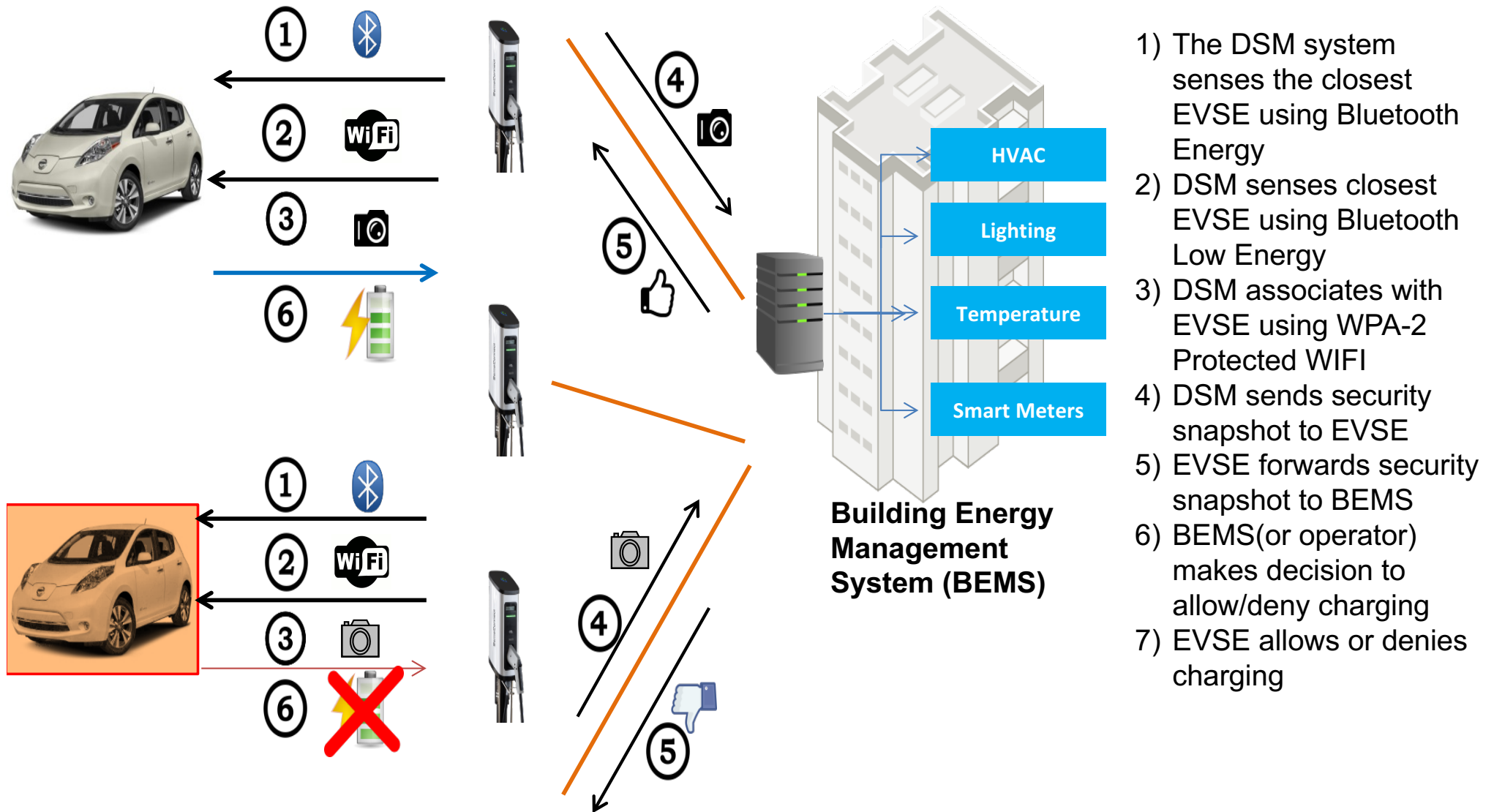
1. Formal Methods for Modeling Integrative Cyber-physical systems

- Formal methods provides rigorous proofs that all the system behaviors (i.e. PEV's, EVSE, etc.)– so they can be reasoned for meeting desired properties
- Instead of a piecemeal strategy – these methods rule out a range of possible entry points for attacks
- Formal methods have been successful in building systems with strong security properties such as control-flow integrity, memory safety and type safety [Chong 2016]
- Many formal modeling tools exist – we are exploring CPN (Colored Petri nets)

A CPN Model that describes charging of PEV at an EVSE (SemaConnect)



2. Fingerprinting Algorithms to uniquely identify devices and vehicles



Expectations & Timeline

- How can you use this system?
 - Project outcomes:
 - Digital Security Modules for EVSE and Building Energy Management System Integration
 - Share the outcomes of the project with I2 community (with permission from INL & DOE)
 - Work with charging station manufacturers and PEV's to pilot this framework in few universities
- Plan for deployment
 - Evaluation will be complete early 2018
 - Development of DSM (2018 to 2019)

Thank You

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