

EV-Smart Grid Research & Interoperability Activities

Keith Hardy

US EV-Smart Grid Interoperability Center
Argonne National Laboratory

Sponsored by DOE EERE Vehicle Technologies Office
DOE Annual Merit Review
Poster Session, 9 June 2015

Project ID#VSS095

US and EC EV Interoperability Centers

Harmonization of standards, technology and test procedures



DOE-EC JRC Agreement



ANL EV-Grid Integration lab



JRC VeLA-7 lab
(Joint Research Center- Institute for Energy & Transport, Ispra, Italy)



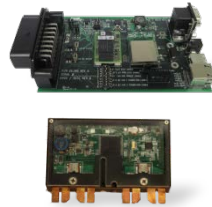
JRC-IET Cold Chamber



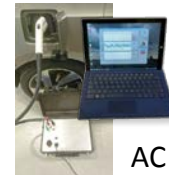
ISO/IEC15118-SAE Meeting and Festival (ANL Nov. 2014)

Embedded Controls

Sensing/Metrology



Standards Development and Verification Tools



AC Interoperability (SAE J2953)

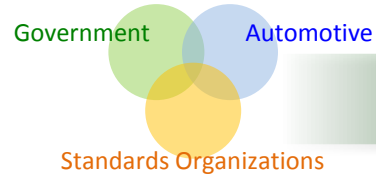


PEV Compliance (SAE J1772)



PEV test procedures

Government Support



Global EV Interoperability Requirements Specifications for a common US-EU test device



US EV Interoperability Center (Argonne)

Standard connectivity, communication and verification

2012

2013

2014



DOE-EC JRC agreement
(November 2011)



Official launch
(July 2013)

*Drafted SAE J2953 Interoperability Standards
[requirements and test procedures]*



*Developed SpEC module
[EV-EVSE-grid communication]*



*Developed
SAE J2953
Interoperability
Compliance
Tools*



*Developed
SAE J1772
Charge Coupler
Compliance Tool*



*Licensed for
Smart charging and
High power DC
PEV/EVSE emulation*



US EV Interoperability Center (Argonne)

Harmonization, grid interface technology, testing infrastructure

2014

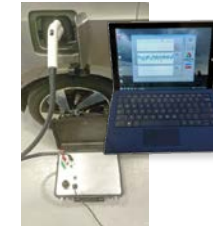
2015

Interoperability testing; universal requirements and open specifications for US-EU test device



Prototype EU/US AC Interoperability Test Equipment

Global InterOP Team



DC interoperability

BMW i3 EREV instrumented (Level 2) and tested at Argonne



Same vehicle tested at JRC-IET to harmonize test procedures

Embedded Controls



Common Integration HIL Platform

Sensing/Metrology



EUMD Commercial Form Factors



OpenADR 2	SEP2	IEC 61850	ISO 15118
Message Protocols			
Protocol Adapters/Translators			
VOLTRON® Agent Environment			
Physical Interfaces		Other Comm. Sensor Input	
Ethernet	Modbus port	HPGP	RS485

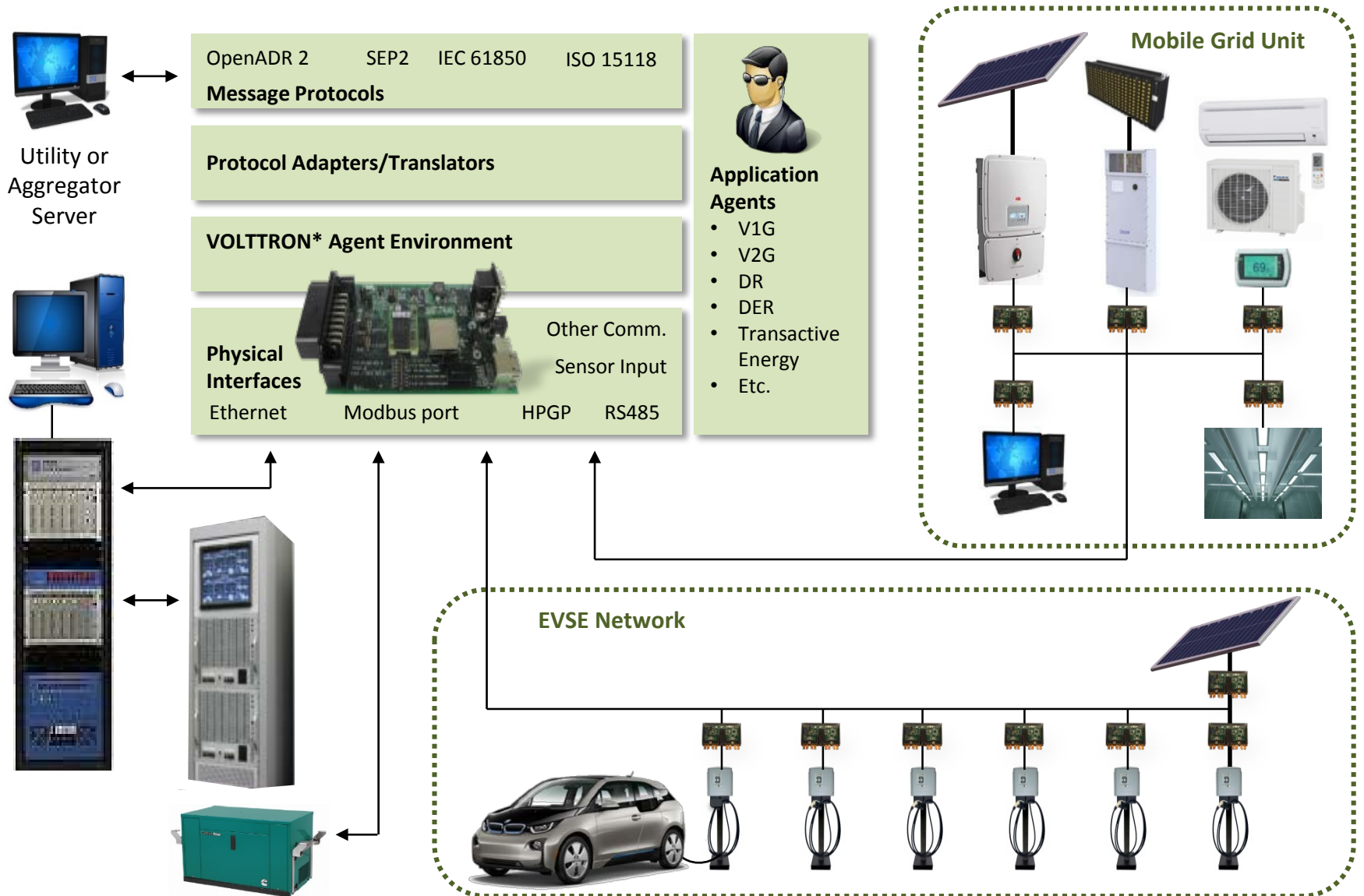
Application Agents

- VIG
- V2G
- DR
- DER
- Transactive Energy
- Etc.

Integration in Testing Infrastructure

- PEV-Grid HIL Lab
 - Smart Energy Plaza

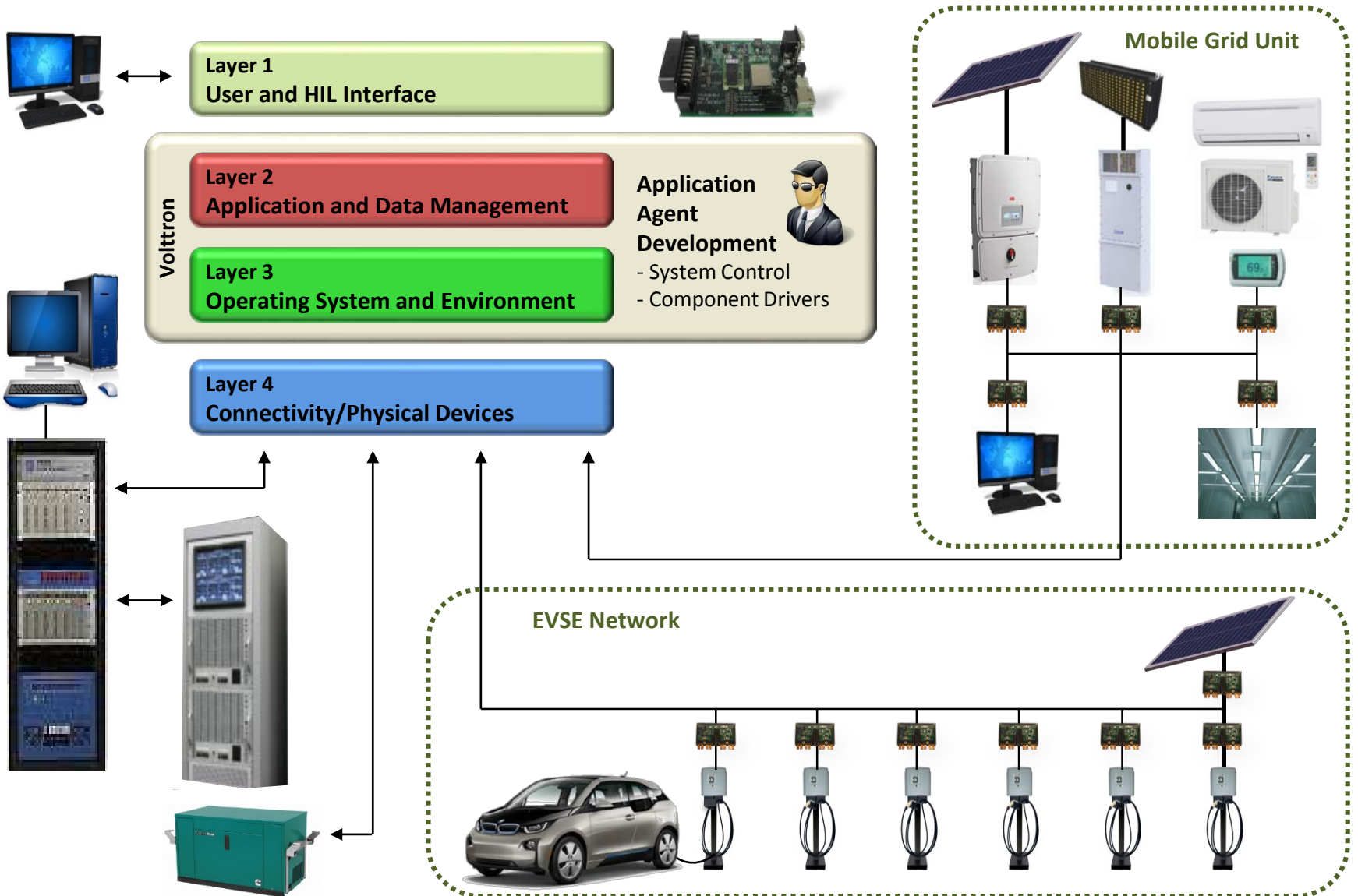
Common Integration Platform w/ Open Source SW



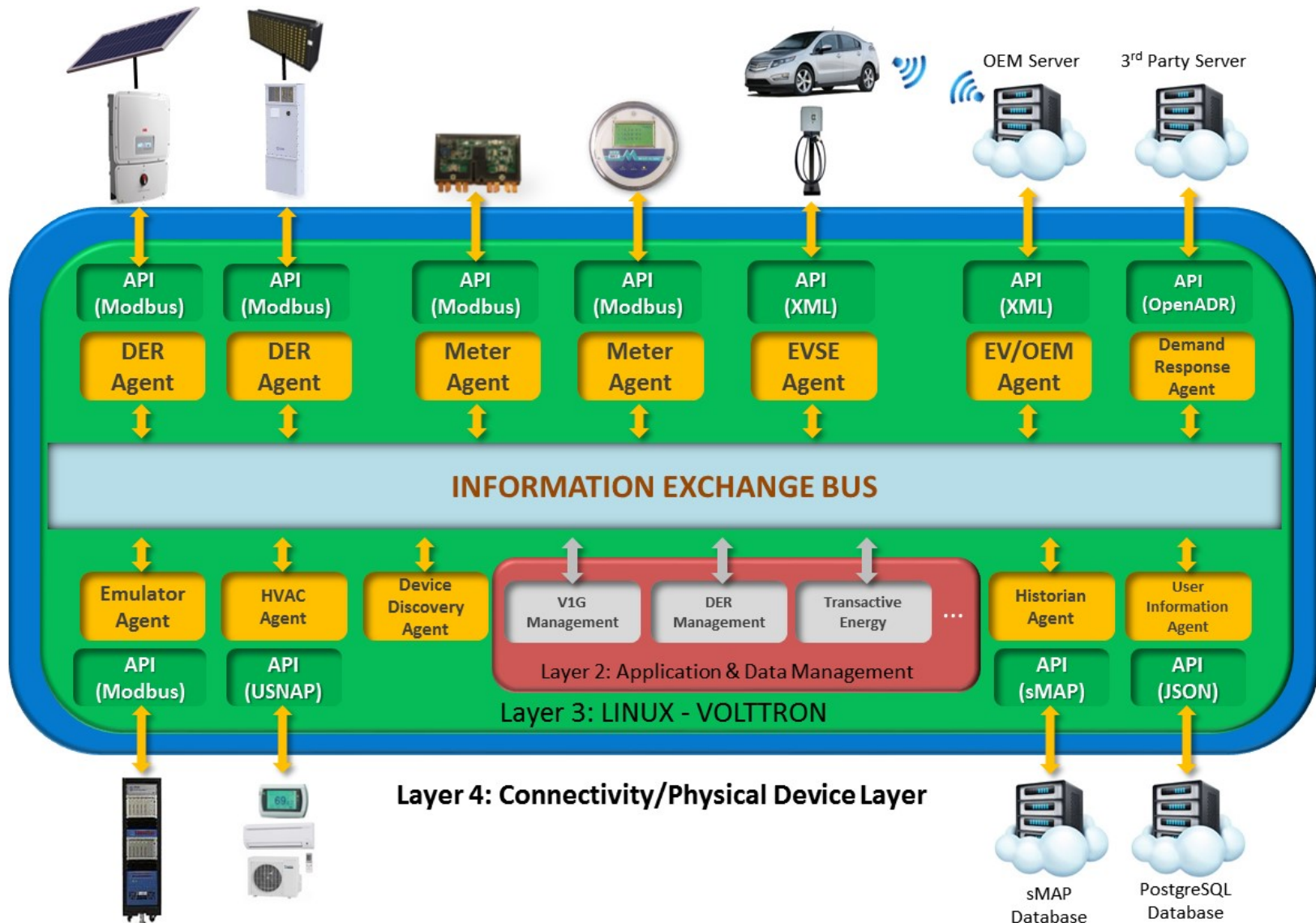
* Volttron – Open source agent system software developed by PNNL



Open Source Control Architecture



Common Platform Enables Grid Integration



FY 2016+ ... Joint Projects, Integration, Verification

Codes & Standards Committee Support

(1) SAE/ISO-IEC/NIST/IEEE¹

(2) Global InterOP Team¹

Embedded Controls & Communication

(3) Common Integration HIL Platform/Volttron²

(4) Protocol Translation³

(5) Smart Charge Adaptor

(6) PEV Emulator (?)²

Sensing & Measurement

(7) EUMD Commercial Form Factors

(8) NIST HB44 EVSE Metering¹

Testing Infrastructure

(9) PEV-Grid Communication HIL

(10) Smart Energy Plaza

Integrated Verification/Hardware Studies

(11) Wireless Ref. Technology/Interoperability

(12) PEV-EVSE Network Communication²

(13) PEV-Grid Integration/Advanced Features²

¹ Estimated milestones – determined by committees

² Possible joint projects with labs

³ Possible joint project with industry

