

Smart Grid Advisory Committee

June 3-4
2014

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U.S. Department of Commerce



NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

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Smart Grid and Cyber-Physical Systems

- Internet of Things and Smart Grid
- Smart Grid and Cyber-Physical Systems
- Charge to the Committee



Internet of Things

What's new about the "Internet of Things:"

- Capacity
- Capability
- Reach

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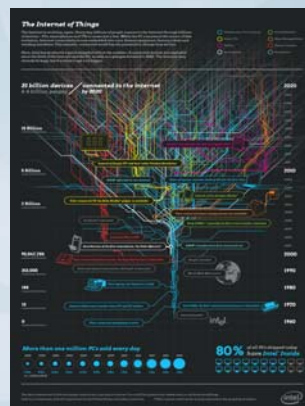
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Internet of Things - Capacity

Devices connected to the Web:

- 1970 = 13
- 1980 = 188
- 1990 = 313,000
- 2000 = 93,000,000
- 2010 = 5,000,000,000
- 2020 = 31,000,000,000



Source: Intel

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Internet of Things - Capability

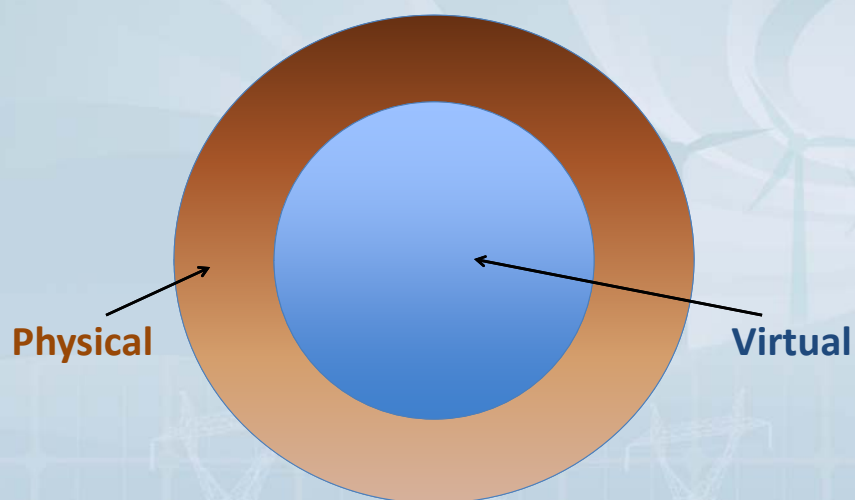
Intel Edison:

"It's a full Pentium-class PC in the form factor of an SD card"

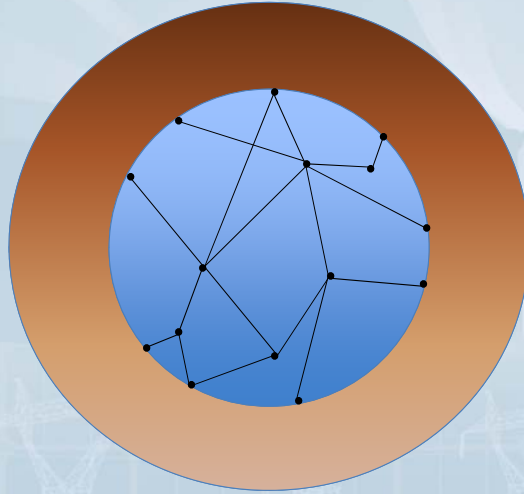
Intel CEO Brian Krzanich



Tech View of the Universe



Internet

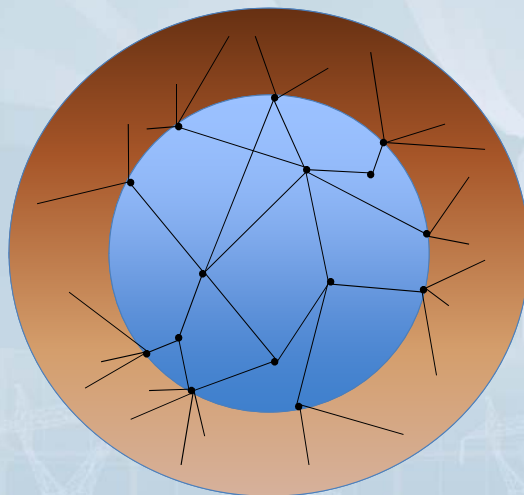


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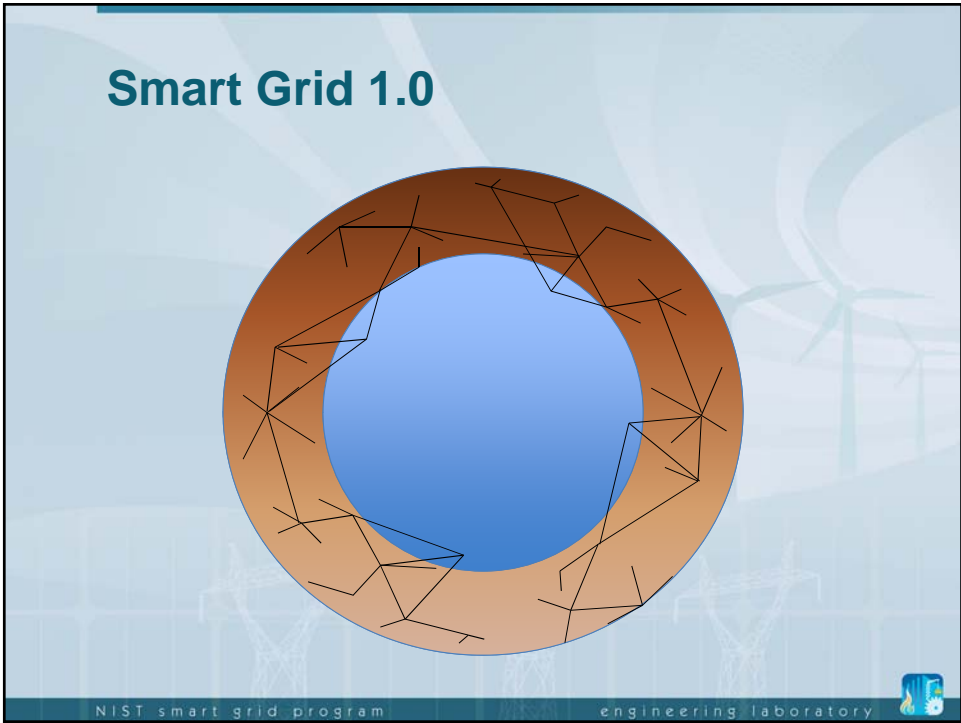
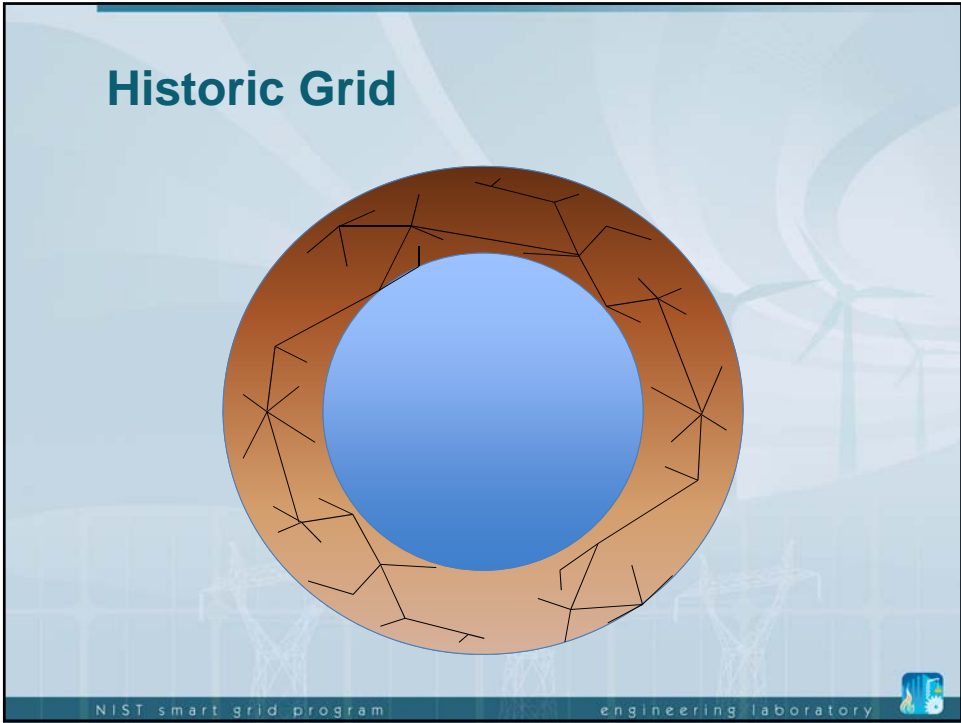
Internet of Things

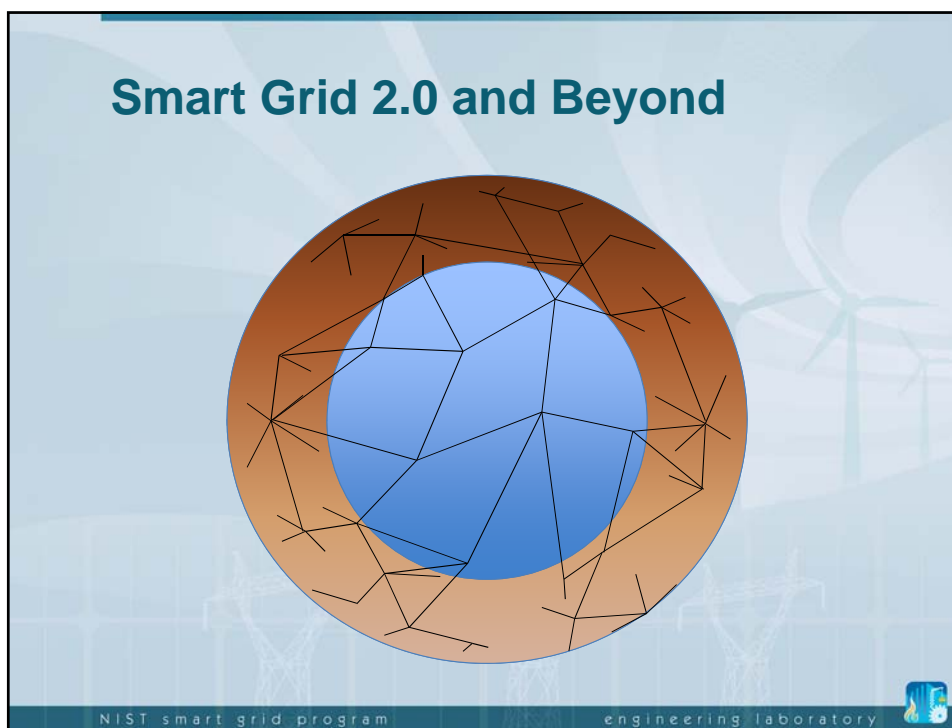


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Common Technology Drivers - Examples

	Communications	Grid
Analog → Digital	Packet Switching	Smart Grid
Capability at the Edge	Smart Phone	DER
Infrastructure as Platform	eCommerce	Transactive Energy
Dynamic Configuration	NATs/ Subnets	Customer-owned μ grids
Physical → Virtual	SDN	DACR

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Smart Grid and Cyber-Physical Systems

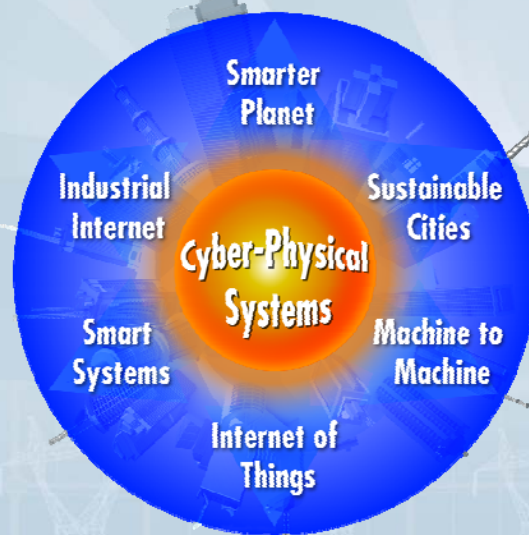
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A Common Core Context



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What are Cyber-Physical Systems?

- Integrated, hybrid networks of cyber and engineered physical elements
- Co-designed and co-engineered to create adaptive and predictive systems
- Respond in real time to enhance performance*

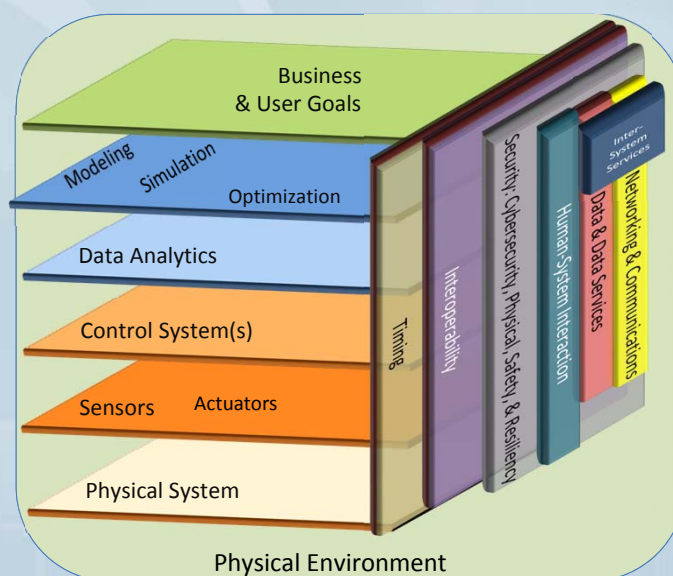
* Key metrics include: efficiency and sustainability, agility and flexibility, reliability and resilience, safety and security

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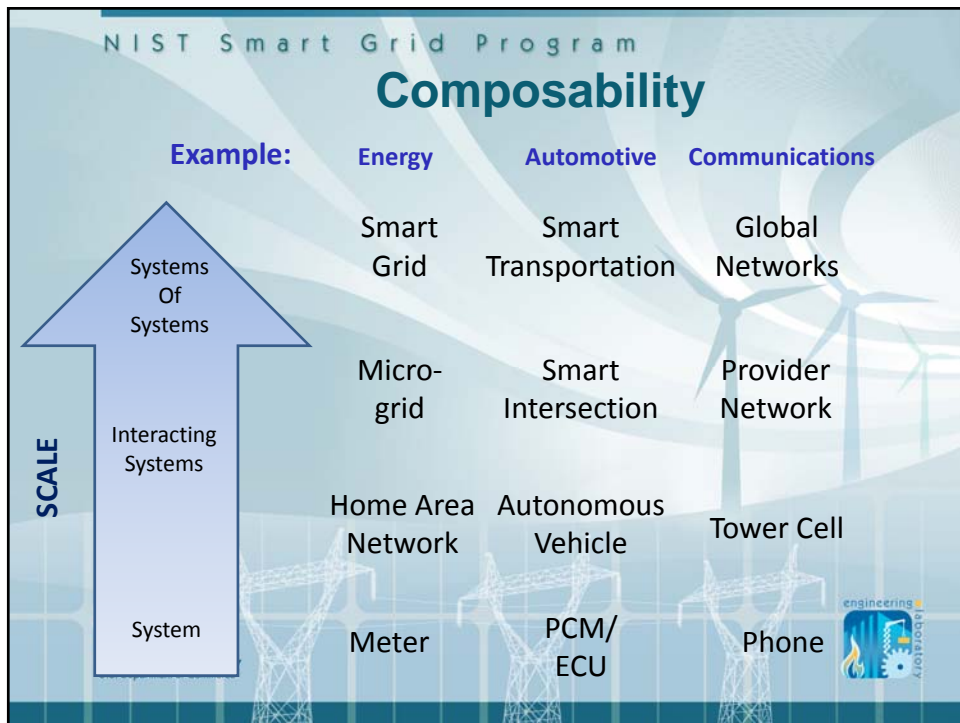
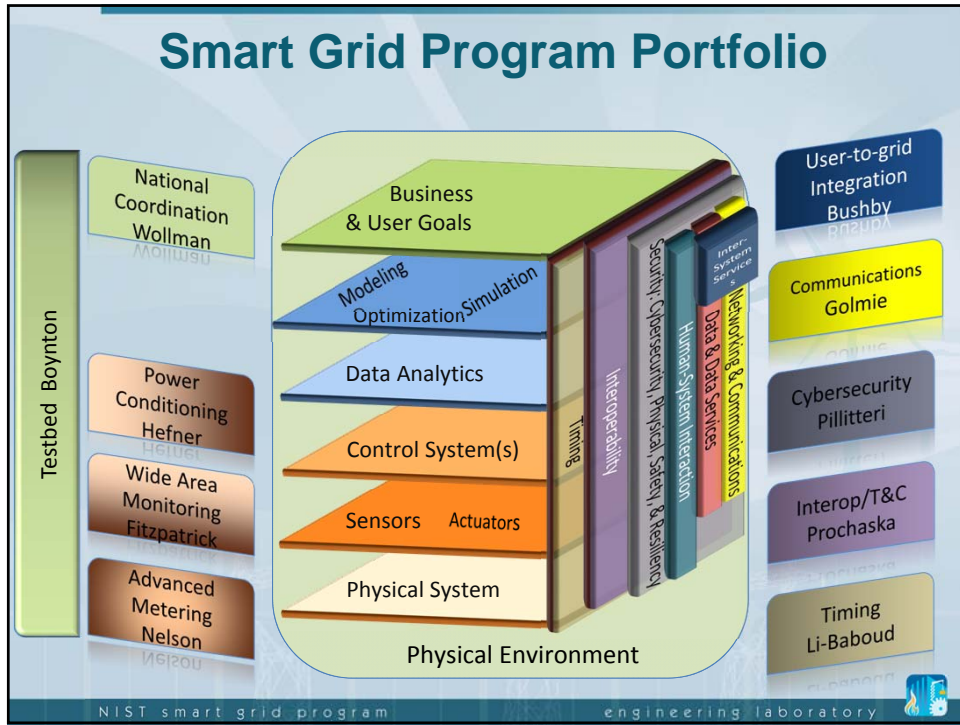
Notional CPS Reference Architecture

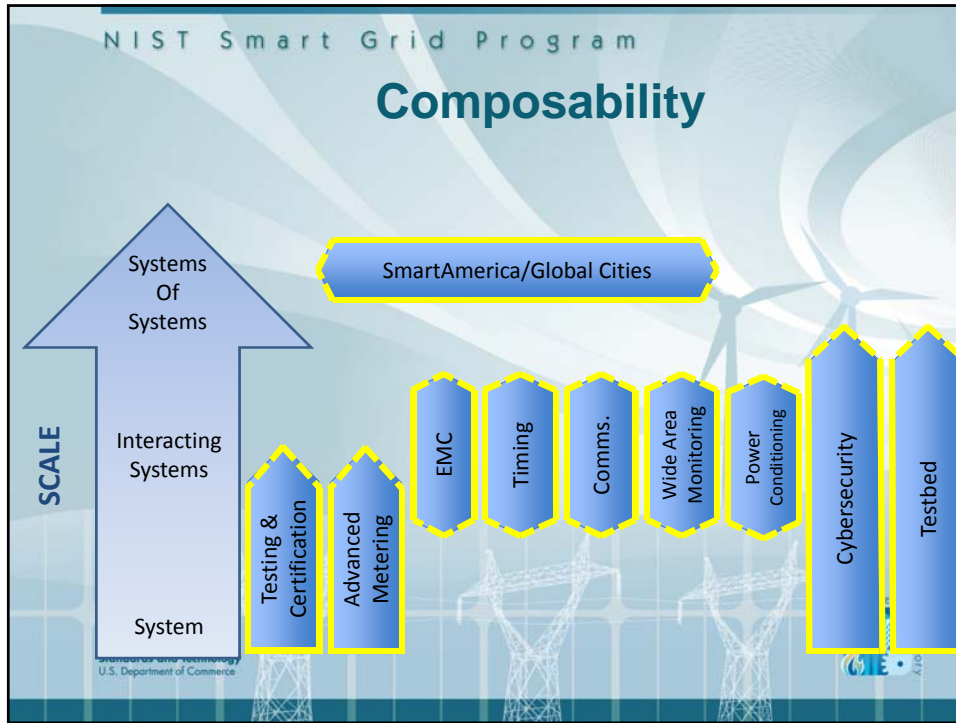


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Progress toward Smart Grid v1.0

- An estimated 65 million smart meters will be installed nationwide by 2015
- Electricity suppliers have committed to making Green Button energy use data accessible to more than 50 million homes and businesses
- Through ARRA investments, more than 1,000 networked PMUs will be deployed by the 2014-2015 time frame
- The rate of deployment of photovoltaic arrays grew by 41% in 2013 with PV providing 12.1 GW system-wide at the end of 2013



Disruptive forces

- Increasing renewable energy investments
- Greenhouse gases
- Decreasing PV costs
- Distributed Energy Resources
- Transactive Energy
- DR-enabled thermostats, smart appliances
- Price of natural gas
- Residential scale storage
- Customer-owned microgrids
- Microturbines
- Big Data technologies
- Your example here



Charge to the Committee

Help us to envision the technology and standards foundations that:

- Ensure the landscape of disruptive forces can be forces for progress;
- Empower industry in responding to change;
- Provide the basis for sound policy-making; and
- Enable a Smart Grid of the future that provides for clean and reliable energy.

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