

Building Networks

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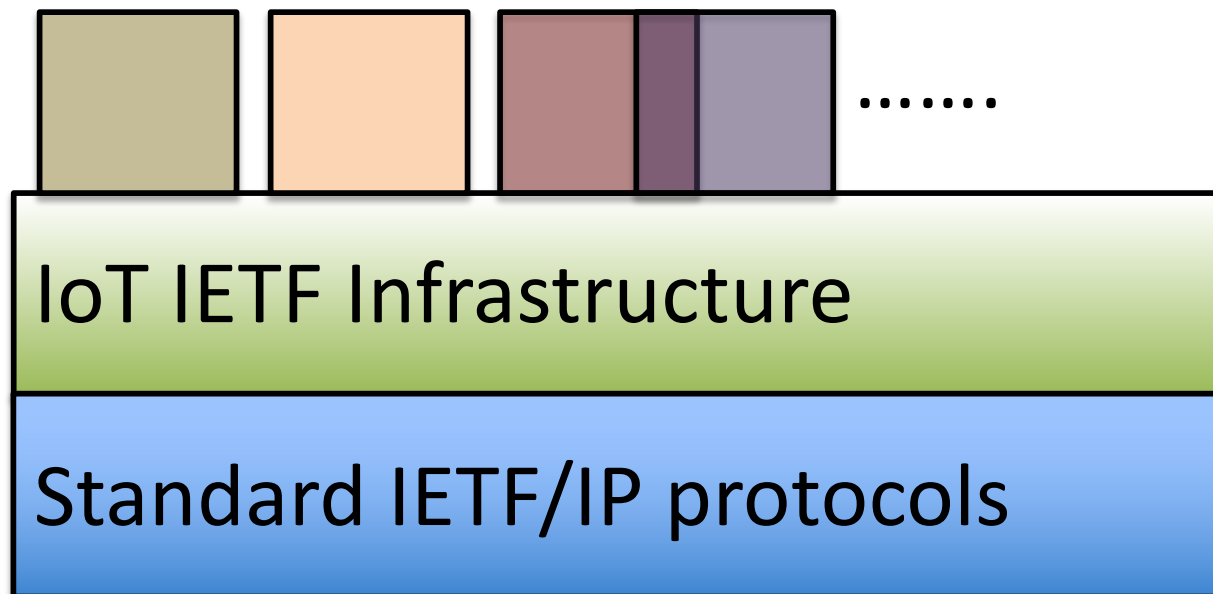
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Ideal IoT Structure ?

Application areas



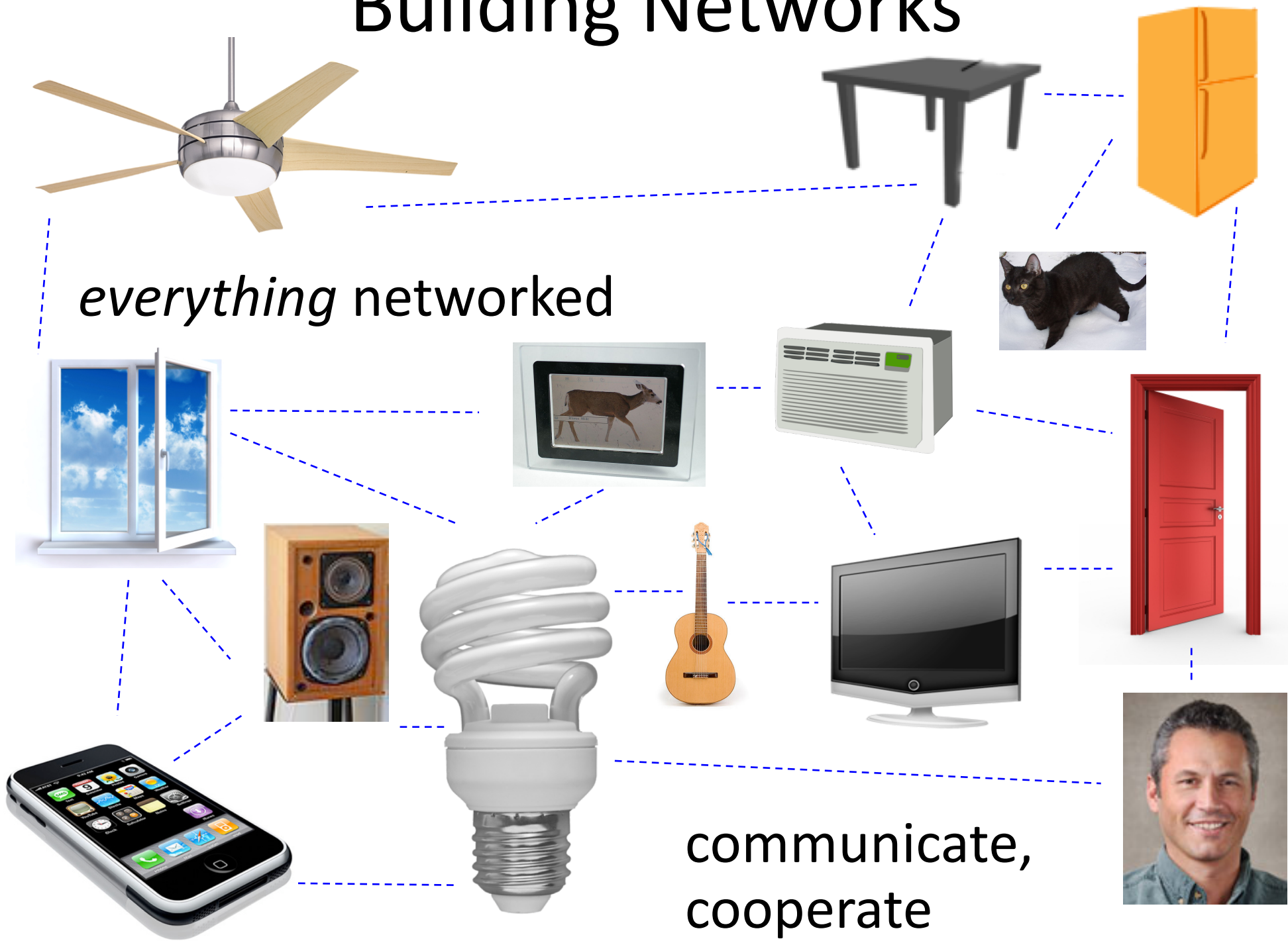
IoT Context

- IoT spans a great range of applications
- People bring varied assumptions about what devices are “things”
- Most IoT devices have constraints ...
- ... but nature of constraints varies

It difficult to have conclusive discussions about IoT

- IoT needs to be divided into manageable topic areas; one of these is “Building Networks”

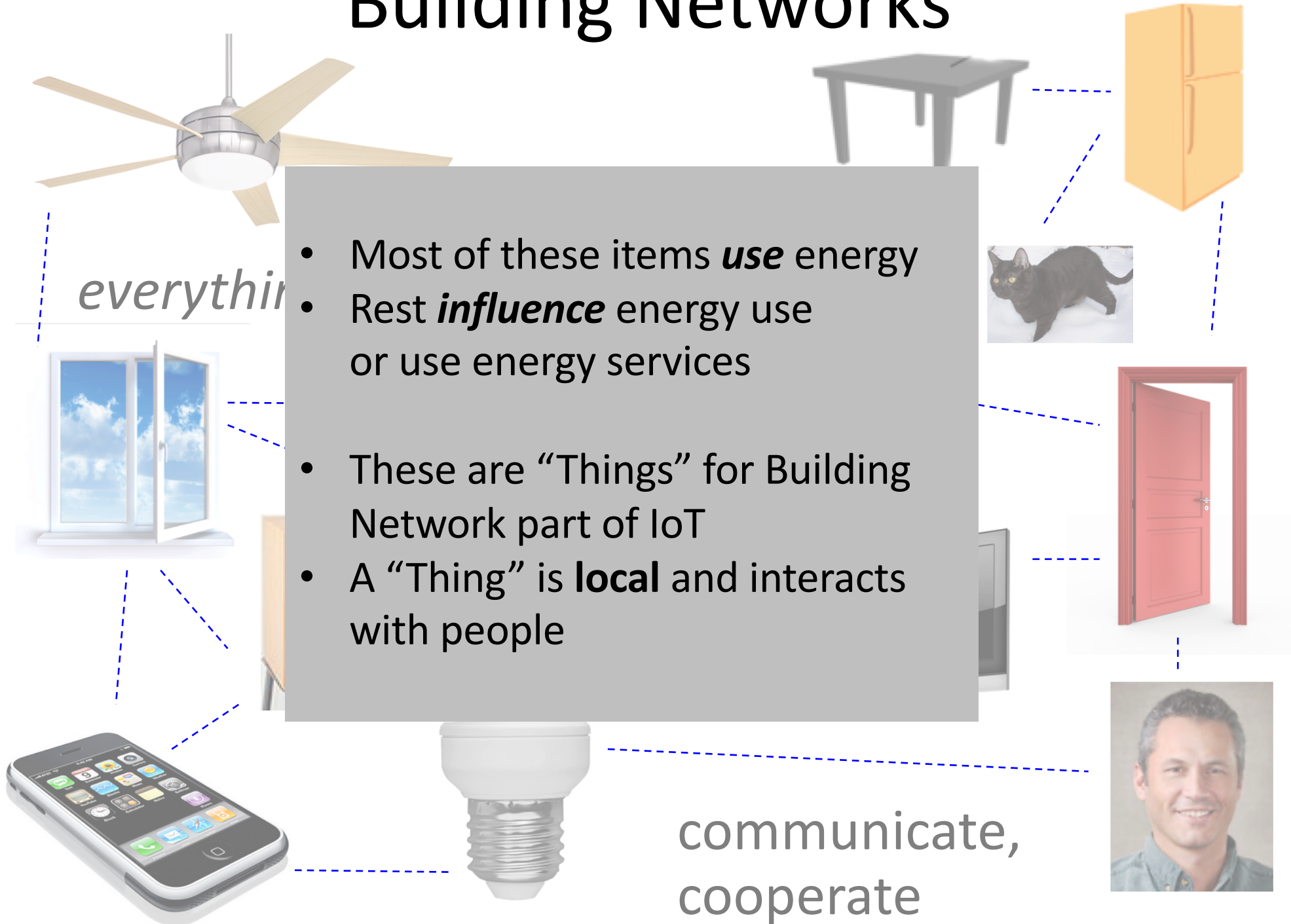
Building Networks



everything networked

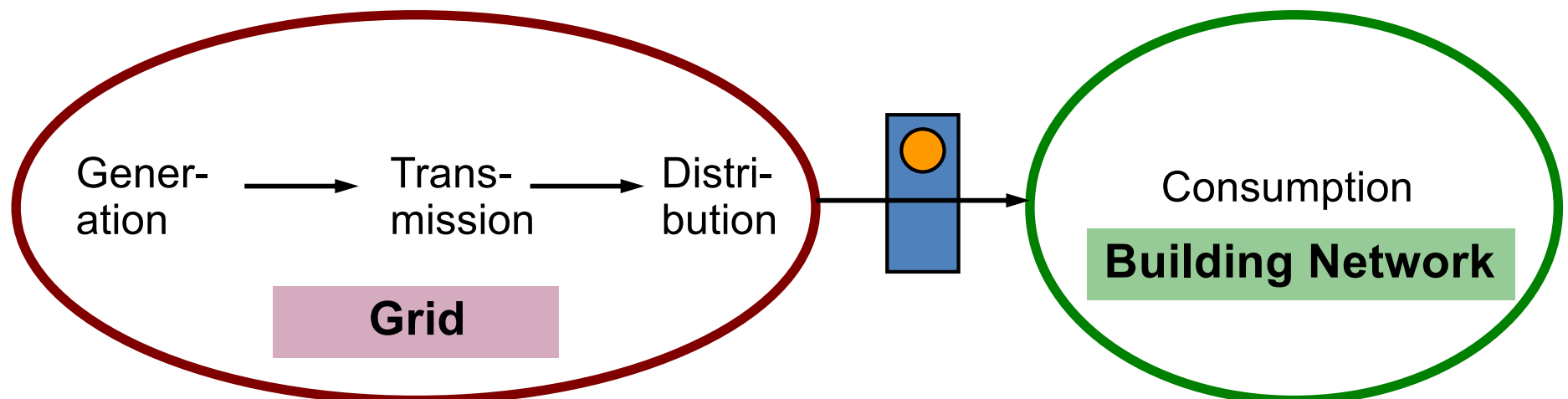
communicate,
cooperate

Building Networks



Assumptions about Building Networks

- Building networks will use standard IETF protocols for **all** lower layer functions (incl. IoT infr.)
- Only functional connection to electricity grid is receiving price / price-forecast information
- Building networks will emerge by adding devices to existing IT networks



Building Network — Definition

A communications network that:

- enables arbitrary communication between any two or more devices in a space / building
- provides for **location awareness** — devices understand their own location, and their relation to others
- provides for **identity** – devices know what each device **is** – to know how to interact
- logically **contains people as nodes on the network** (albeit with a different set of standard interfaces)
- provides a **common data model**
— enables interoperability among devices and people
- embraces “**universal interoperability**” as a core goal

A building can be a house, commercial building, car, ...

Universal Interoperability

*Any device should work with all other objects
in any space*

- Across building types
 - Residential, commercial, vehicles, ...
- Across geography
 - Countries, language, ...
- Across time
 - Worthy of durability
- Across end uses
 - Coordination, cooperation
- Across people
 - Age, disability, culture, activity, context, ...

IoT Research Topics for Building Networks

Core topics

- Location
- Identity

Other topics

- Authority
- Security / Privacy
- Prices
- Data model
- Expectations
- People
- User Interfaces
- Preferences
- Non-ordinary conditions

Location (within building)

- Devices need to know what other devices are near; situation; context
 - “near” influenced by distance, walls, windows, ...
- Devices need to know where they are in building, room; type of space

In IETF

- Representing
- Communicating

Outside IETF

- Determining
- Acting

Identity – what it is

- “... whatever makes an entity **definable** and **recognizable**, in terms of possessing a set of **qualities or characteristics** that distinguish it from other entities. In layman's terms, identity is whatever makes something the same or different.” (Wikipedia, “Identity (philosophy)”)
- Element of taxonomy (ontology?) – system of organization – categories – meaning

For IoT, Identity is self-determined

Identity Needs (from eman WG)

- What
 - Species: e.g. switch, server, PC, refrigerator, light, ...
 - Origin: e.g. brand X, model Y (URL)
- Who
 - Name (human readable): e.g. “Bruce’s PC”, “Kitchen Light”
 - Network address/identity: _____ MAC? IP?
- Reuse existing mechanisms
 - Some, not all, already exist

Questions for IAB

- Who should develop the data model (and other semantics) for the physical world?
- Who should develop user interface standards?
- Can IAB/IETF accept protocol responsibility for identity, location, preferences, and prices?
- Are new security / privacy mechanisms needed?
- Can IAB/IETF adopt “Universal Interoperability” goal? (for building networks)
- Can IAB/IETF/IRTF help define upper layers of building network architecture?



Thank you

Backup

Building Networks vs. Smart Grid

	Building Network	Smart Grid
Scope	All devices in a building; only building side of meter	Power plant to end use devices (and everything in between)
Focus	Needs of people	Needs of electricity system
Control Strategy	Distributed, based on preferences, prices	Central, derived from existing control systems
Paradigm	Consumption	Production
Interoperability goal	Universal	Limited (<i>not</i> bldg types, countries, people, ...)
Utility role	Source of (some) prices	Large; two-way communication
Timeframe	Existing & medium/long term	Short term

Two Electricity Paradigms

