"I Feel the Need… for Low Speed"

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Speed is Relative

- 802 has speeds from DC to 100Gb/s, with 400Gb/s on the horizon
  - 1Gb/s and below are considered "low speed" (!)

- Many M2M applications do not require "high" speeds
  - Many devices only require Kb/s (sensors, keypads, etc.)
  - Many applications are well served by 10, 100, or 1Gb/s and lower-speed wireless
  - **Reach, power, cost and ease of installation/maintenance** are of paramount importance

- New and expanding application spaces outside traditional enterprise/computing include:
  - Vehicular networking
  - Non-traditional Power over Ethernet (PoE)
  - Commercial lighting/energy management/building automation

- Tonight we'll focus on lighting and building automation systems (BAS)

Policy Drives the Market

- New **model, local and stretch codes** require sophisticated control strategies
  - ANSI/ASHRAE/IESNA Standard 90.1 (Energy Standard for Buildings Except Low Rise Residential Buildings)
  - IECC (International Energy Conservation Code)
  - California Title 24 and other local/regional codes
  - USGBC LEED (Leadership in Energy & Environmental Design)
  - ASHRAE 189 ("Green Standard")
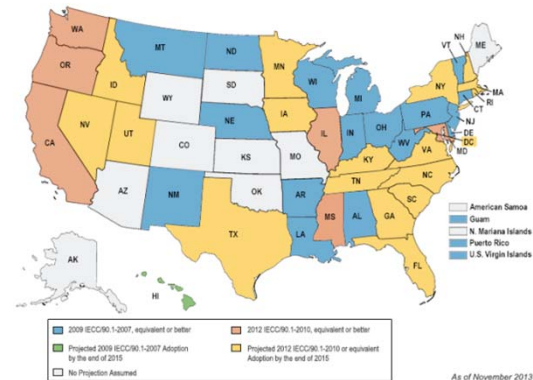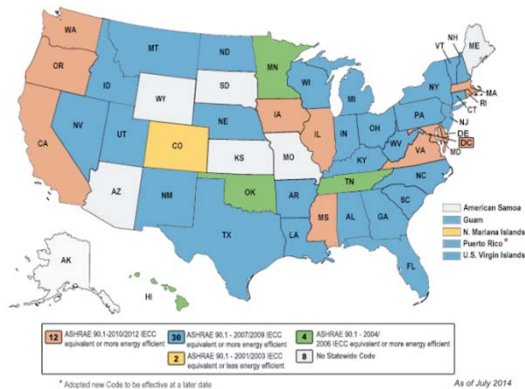
- **Disclosure laws** require benchmarking and reporting of energy use

- Policy goal is **net zero energy** buildings

Requirements and Solutions

- Performance requirements include:
  - Space control, multi-level control, daylighting control, demand response
- High performance solutions integrate multiple building systems via BAS
  - Lighting, plug loads, HVAC, fire, security, access control, asset management, etc.
- BAS may connect to dozens of data points per room or area, and to the grid
  - Solutions require a dizzying array of protocols and topologies
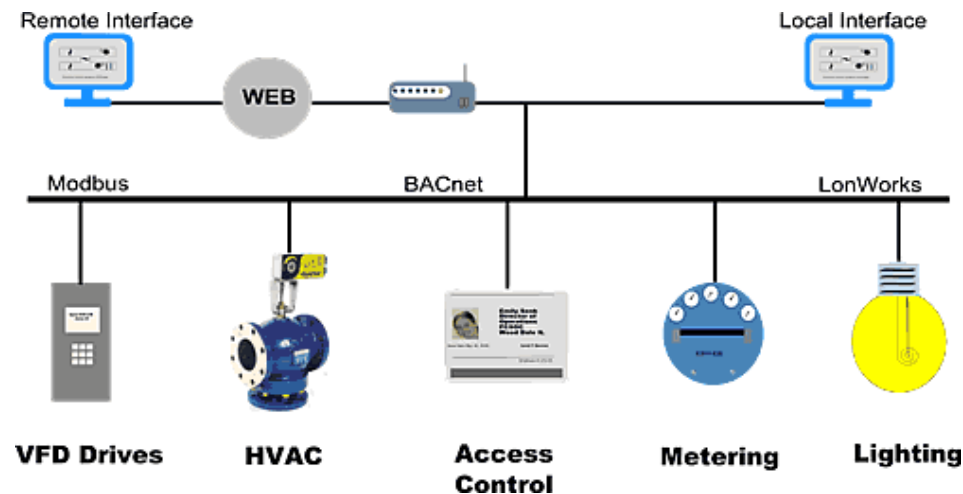
- Offices, campuses, stadiums, airports, hospitals, hotels, etc…inside and out

Maturing Technology

- SSL is now the **dominant force** in commercial lighting
  - Energy saving of 70% or more
  - Source lifetimes measured in decades
  - Easy to control and dim
  - Encourages more granular control (per fixture)
  - Enables Visible Light Communications (VLC)

- SSL runs on constant-current DC, a **perfect match with PoE**
  - Some estimates suggest PoE can reduce installation cost by 50%
  - Changes the model for power distribution

- Future fixtures powered and controlled using PoE
  - Sensors may be embedded in the fixtures
    - Light, occupancy, temperature, VLC, and more

- LED lamp shipments to reach **1.28** billion units by 2021
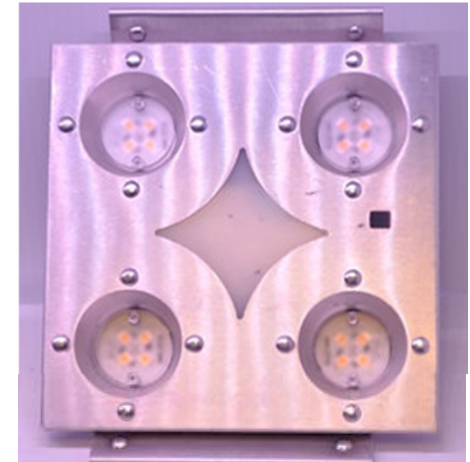
802 and the Competition

- Many proprietary and competing technologies have footholds in this space

- Other standards include:
    - BACnet (BACnet IP, BACnet MS/TP), DALI, DMX-512A, LonWorks, and many, many more
    - USB (adding power to 100W)
    - EnOcean Alliance
        - ISO/IEC 14543-3-10 Information technology - Home Electronic Systems (HES) - Part 3-10: Wireless Short-Packet (WSP) protocol optimized for energy harvesting - architecture and lower layer protocols

- Proprietary technologies - too many to list

- SELV DC distribution in buildings is already here
    - EMergeAlliance.org
    - NEC 2014 Code: Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems

High Performance Building
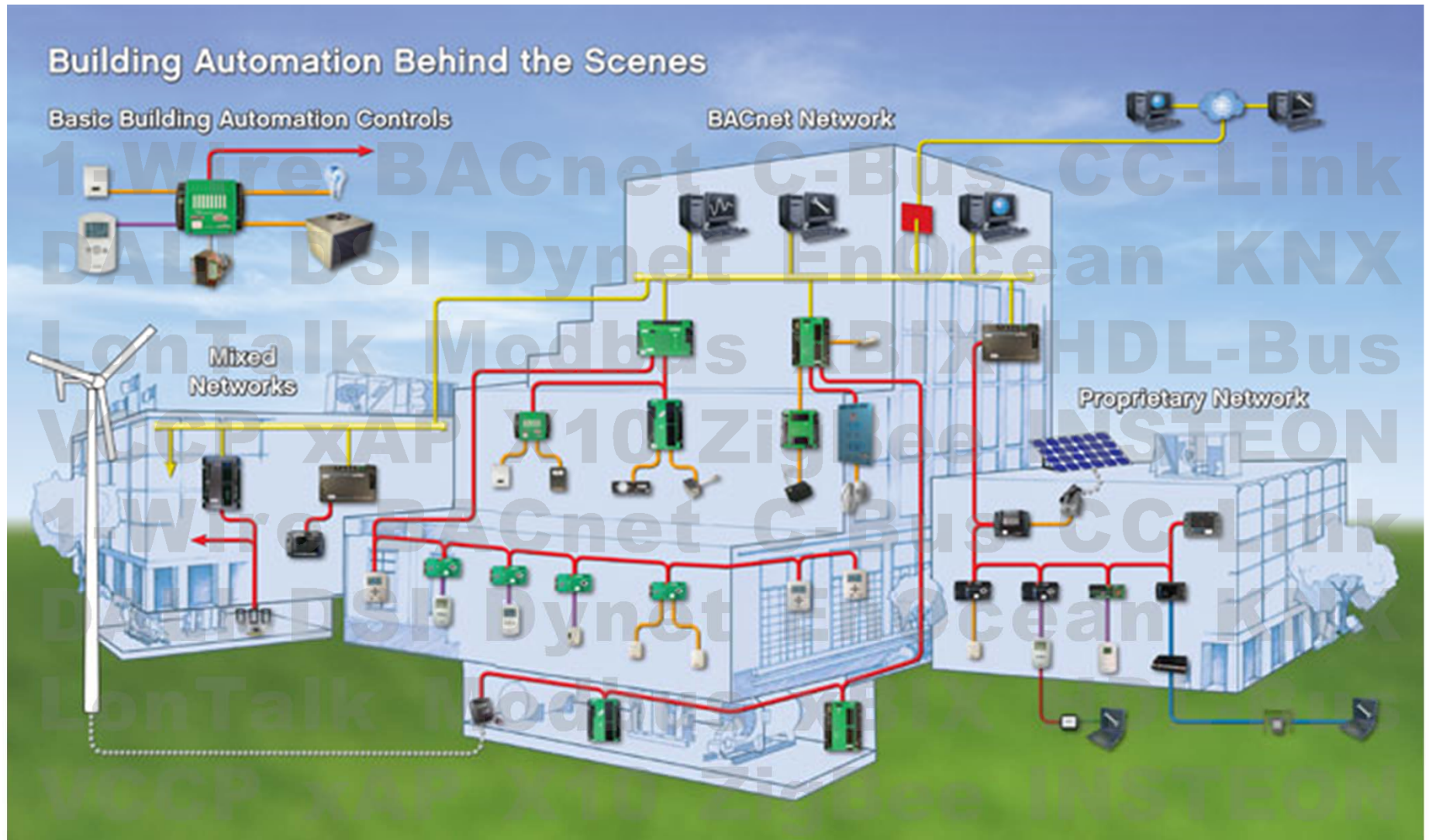
802 Advantages

- An **802 suite of solutions** has the opportunity to be the best game in town
  - 802 Architecture
    - MAC bridging, AVB, TSN, MACSEC (802.1)
    - Security features (802.x)
  - Wireline (802.3)
    - High and low speed (copper and optical)
    - Power and data
  - Wireless (RF and visible light, 802.11 and 802.15)
    - High and low speed
    - Short and long range
  - Smart Grid (802.24)

- Building owners are increasingly demanding open standards

- **If manufacturers see an opportunity to adopt a standard that meets price and performance criteria, they're likely to do so**

Where do we go from here?

- There are emerging, high-volume markets that are outside of 802's normal application space

- 802 needs to provide **tailored solutions** to these spaces

- There is a lot of competition, both from other standardized technologies as well as proprietary solutions

- 802 has the **greatest collection** of compatible wireless and wireline physical layers on the planet

- 802 needs to **work together** to present a unified face to the emerging application spaces