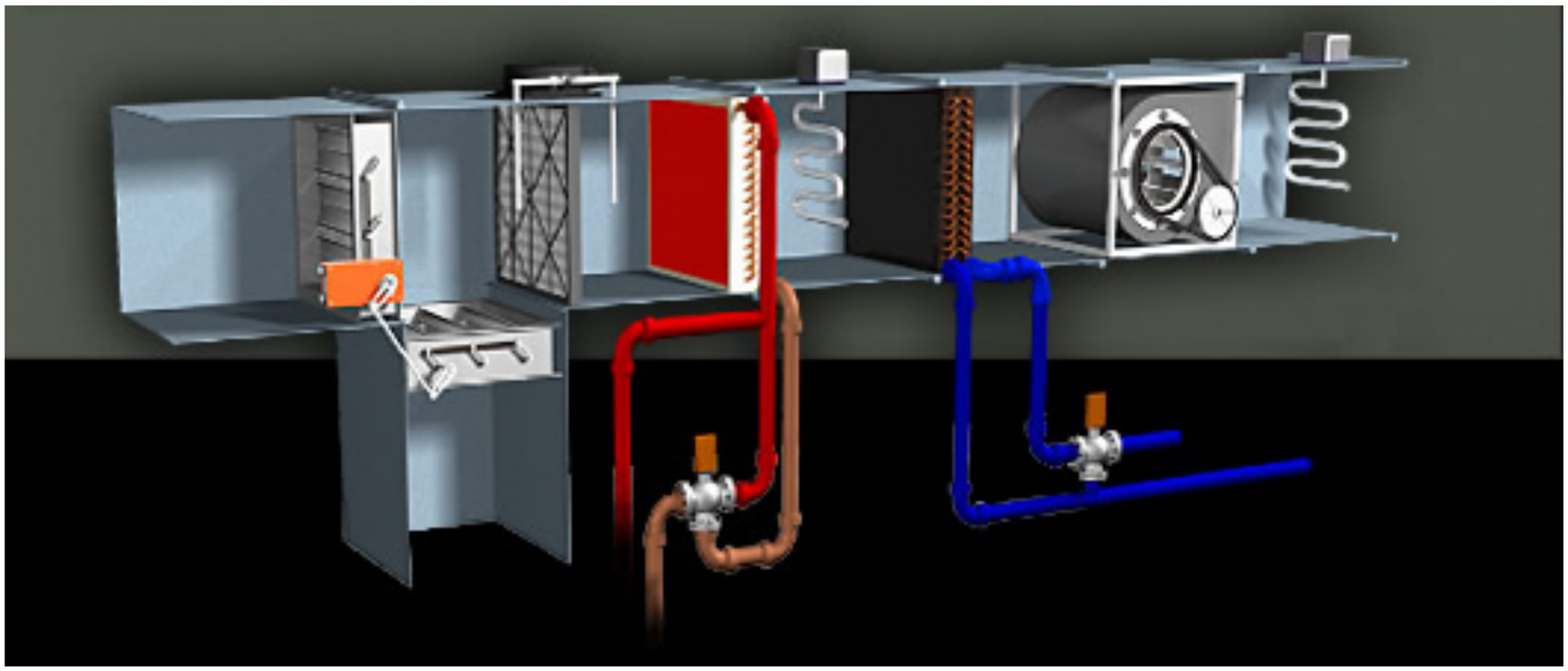
Improving Schools and Driving Change with Building Automation and Advanced Tools



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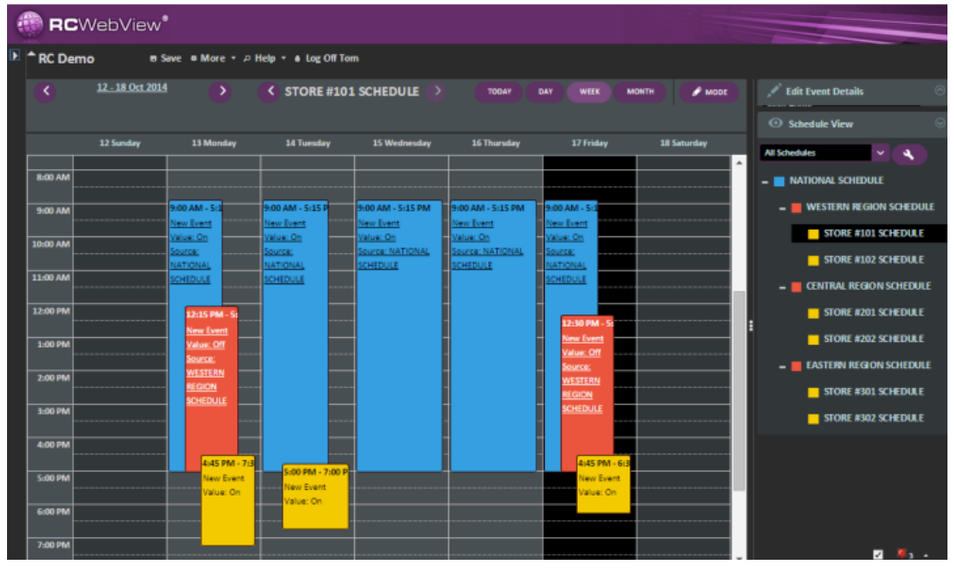
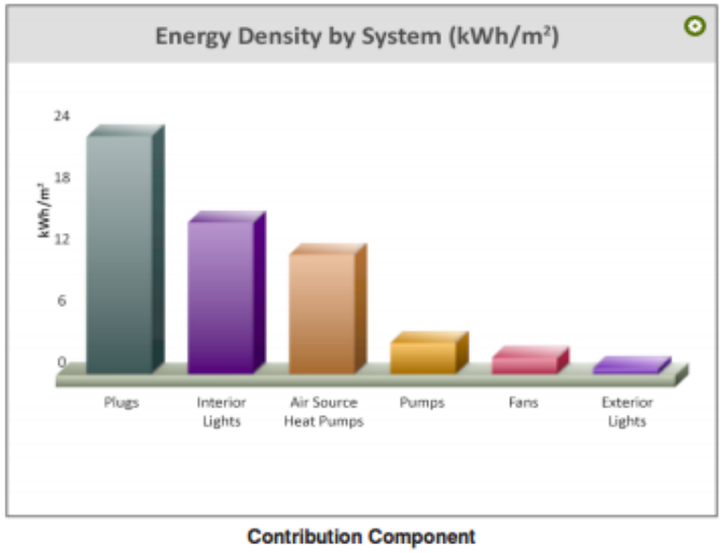
Learning Objectives

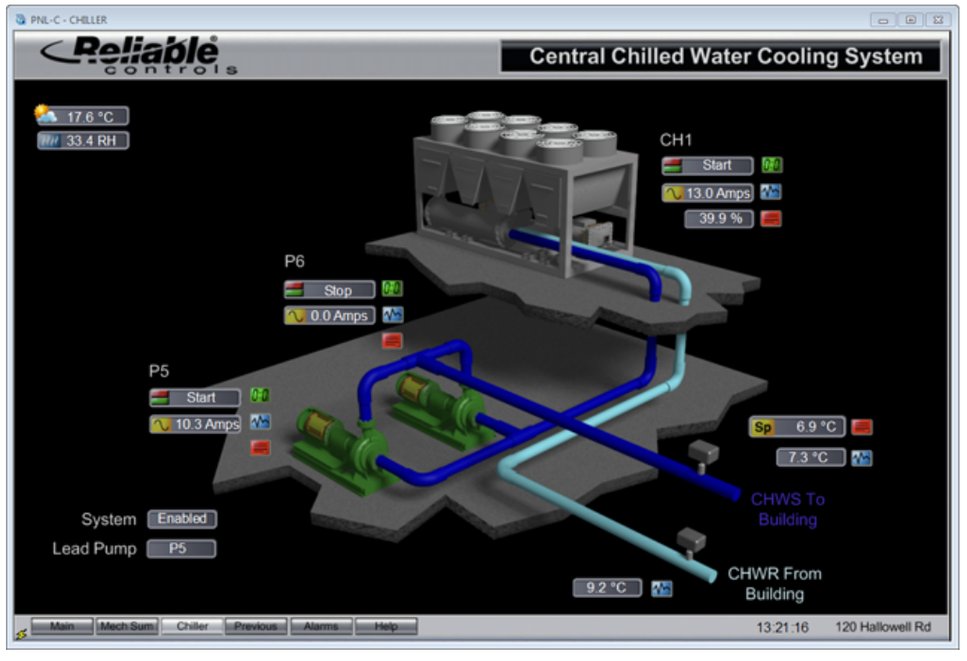
- **Basic understanding of building automation and controls**
- **Understanding how building automation systems impact the operations of a school facility**
- **Summary of the benefits associated with good building automation strategies for a school facility**
- **Understanding the important characteristics of a BAS system?**
- **Guidelines for decisions makers to consider when evaluating building automation for school facilities.**

What is Building Automation?

- Building Automation Systems (BAS) are centralized, interlinked, networks of hardware and software, which monitor and control the environment in commercial, industrial, and institutional facilities.
- BAS are primarily designed to control and monitor
  - HVAC equipment
  - Energy use
  - Water usage
  - Power
  - Security
  - Lighting
  - Life Safety Systems
  - Distributed and/or Renewable Energy Systems







How Does BAS Work?

Basic BAS have five essential components:

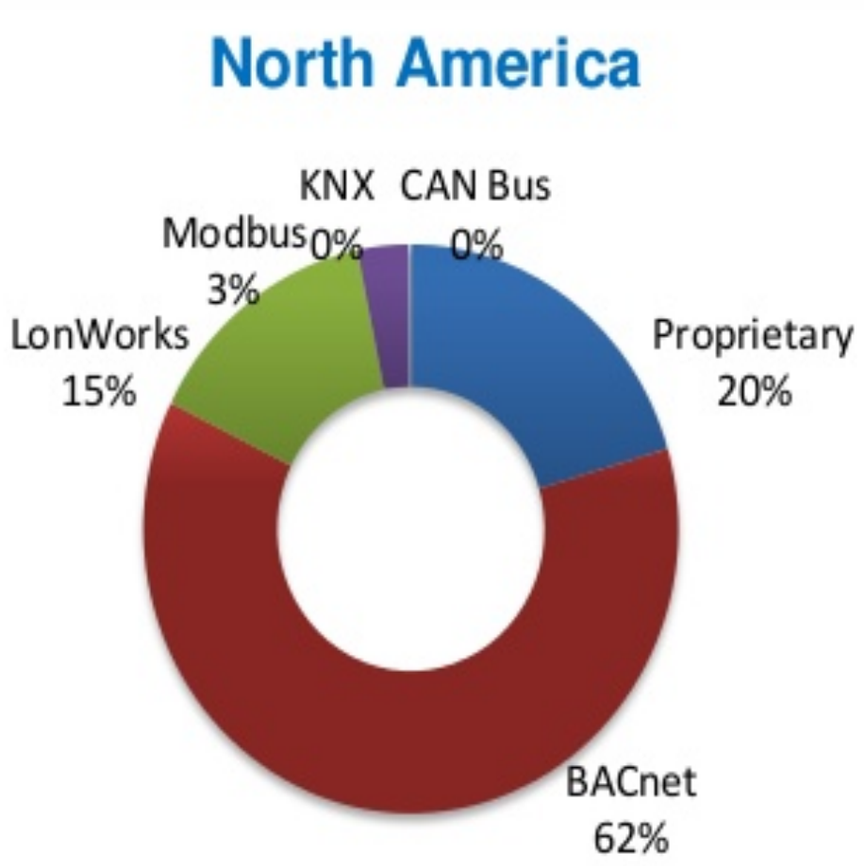
1. **Sensors**: Devices that measure values such as CO2 output, temperature, humidity, daylight or even room occupancy.
2. **Controllers**: These are the brains of the systems. Controllers take data from the collectors and decide how the system will respond.
3. **Output Devices**: These carry out the commands from the controller. Example devices are relays and actuators.
4. **Communications Protocols**: Think of these as the language spoken among the components of the BAS. A popular example of a communications protocol is BACnet.
5. **Dashboard or User Interface**: These are the screens or interfaces facility managers use to interact with the BAS, typically a user friendly graphical interface with newer systems . The dashboard is where building data are reported.

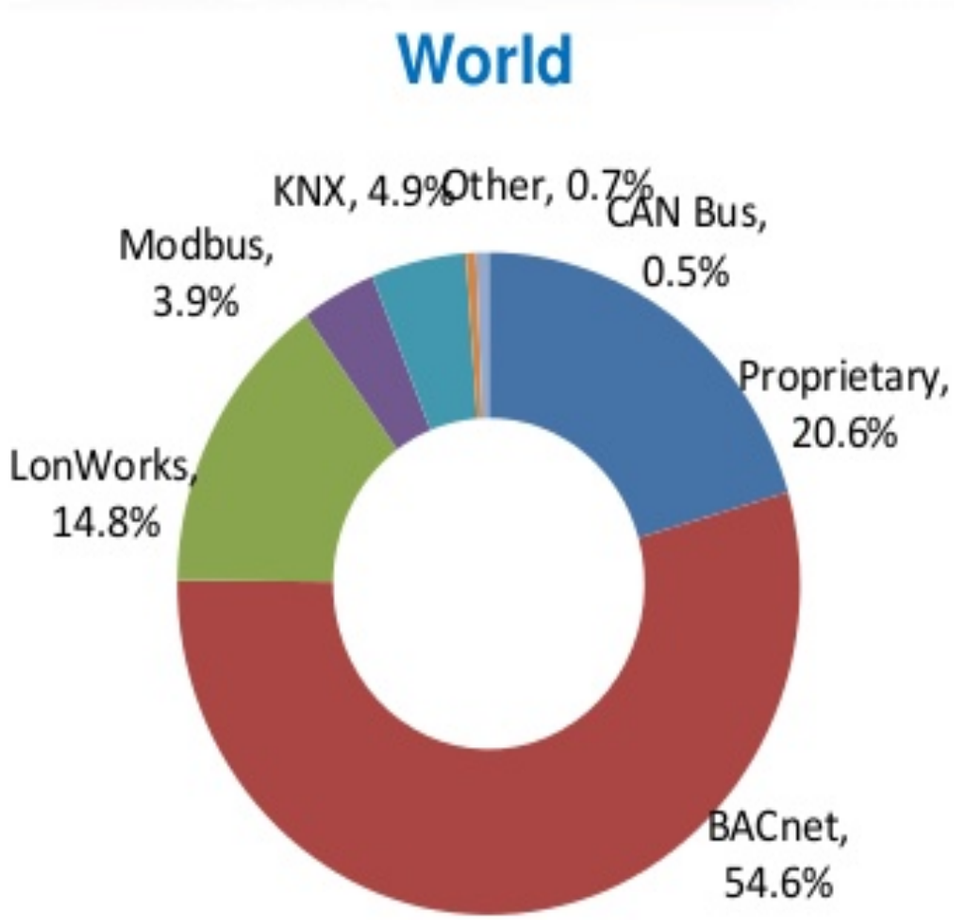
BAS Communication Protocols

A communications protocol is a system of digital message formats and rules for exchanging those messages in or between computing systems

- **BACnet**
  - BACnet is a nonproprietary, truly interoperable, open protocol communications standard developed by ASHRAE specifically for the building controls industry.
- **LonMark (LonWorks)**
  - Unlike BACnet, LonMark is an interoperable, **proprietary** protocol developed by Echelon Corporation and named as a standard by the Electronics Industries Alliance
- **Modbus**
  - Developed in 1978, this protocol was catered towards industrial control systems. It is a truly open standard and is one of the most widely used protocols in the industrial manufacturing environment.
- **Other**
  - Some manufacturers have developed proprietary protocols for their systems in lieu of BACnet, LonMark, or Modbus.

BAS Communication Protocol Market Share in 2013





Source: BSIRA

Benefits of Building Automation

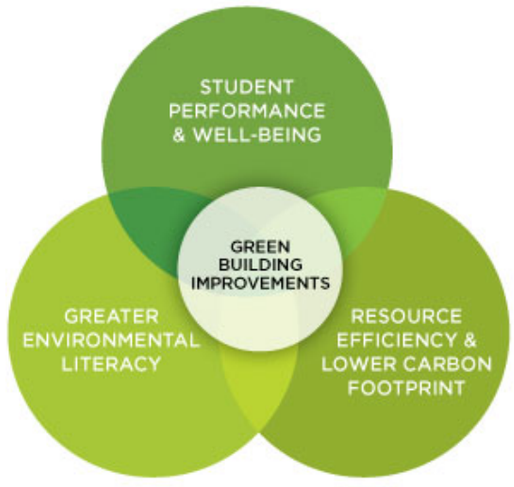
Building automation offers benefits in many areas including limiting the schools environmental footprint, saving on energy costs, increasing comfort, and improving building security and safety. It also gives the building a brain that not only regulates building functions, can also compile valuable data to help building managers determine ways to further optimize the building systems.

Benefits

1. Operational Cost Savings (Energy + Maintenance)
2. Increased Comfort, Resulting in Increased Productivity
3. Creates New, Interactive Learning Opportunities for Students
4. Environmental Impact Reductions
5. Operator Convenience & Simplification
6. Improved Security
7. Can Control Portfolio of Buildings from Single Interface

How BAS Impact Schools?

- Energy Savings
  - The leading cause of energy consumption in schools is an unoccupied classroom.
  - According to the EPA and DOE, schools waste up 20-30% annually due to poor control of their building systems
  - School systems have a vital mission to educate, and every dollar saved on energy and building operations can be directed to vitally-needed teachers and/or equipment.
- Improved Space Conditioning
  - Improving environmental control in a school usually leads to better student performance, not to mention happier faculty.
- Minimized Life Cycle Costs and Improved ROI
- Efficient and Intelligent Facilities Management
- The BAS System Allows for Integrated Learning for Students through Educational Dashboard



What to Know if you are in the Market for a Building Automation System

- BAS sequences are typically developed by the engineering partner, while BAS strategies are usually developed by controls engineers and/or the installing contractor. Therefore, one must understand the responsibilities of both parties.
- Build your entire BAS team during development stage, i.e. engineering, contractor, and commissioning agent
- Determine if the BAS system being considered is BACnet Laboratory Tested (BLT)
- Require your BAS service providers to provide project references?
  - Must consider their installation and programming capabilities relative to project
  - Must evaluate BAS product also
    - Can it speak to other systems,?
    - Is it BACnet Laboratory Tested BLT?
    - Is BAS system manufacturer established in the market to avoid risk of legacy issues in the future?
- Make sure when evaluating proposals that you are comparing apple to apples, not oranges. This starts with well thought out RFPs.
- Establish what post-installation services are included with the original contract and warranty associated.

Thanks!!!

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