



How is System Integration Achieved?

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Analogy – Building a House

- ★ **A house is an extremely complex, *integrated system*!**
- ★ **Many people are involved in its creation**
Town, developer, contractors, owner...
- ★ **Many strict requirements to be met**
Safety, security, insurance, contractual...
- ★ **Many interconnecting systems**
Structure, electrical, plumbing, telecom...
- ★ **Many different organizations involved**
- ★ **Many different processes underway**

Why does it work so well?





Factors in Achieving Integration





Policies

- ★ **Laws passed to ensure**
 - Accountability
 - Responsibility
- ★ **When building a house, e.g.:**
 - Insurance is required before sale
 - All homes must be inspected to be insured
 - Inspection must comply with building code
- ★ **When deploying load control, e.g.:**
 - All homes must contain a PCT
 - PCTs must comply with regulations
 - Utilities must provide infrastructure

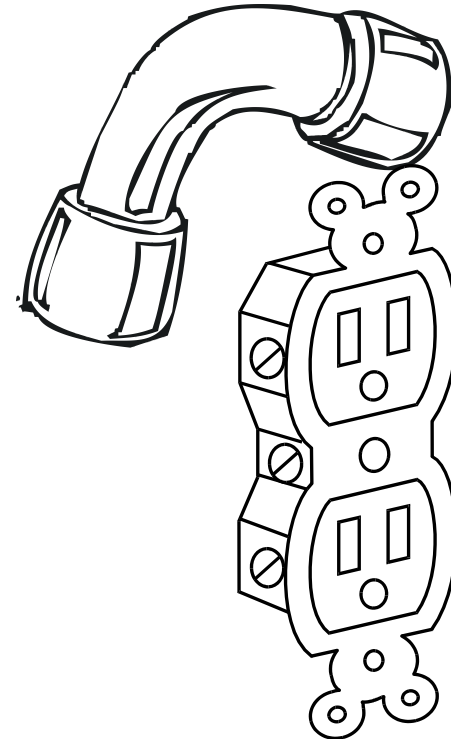


Set general principles of deployment



Standards

- ★ **Define particular interconnections**
- ★ **When building a house, e.g.**
 - Wire gauges
 - Pipe diameters and threads
 - Standard lumber sizes
 - Tests for smoke detectors
- ★ **When deploying load control, e.g.**
 - Universal Serial Bus
 - Ethernet
 - Public Emergency System
 - Terminal strips
 - Information models

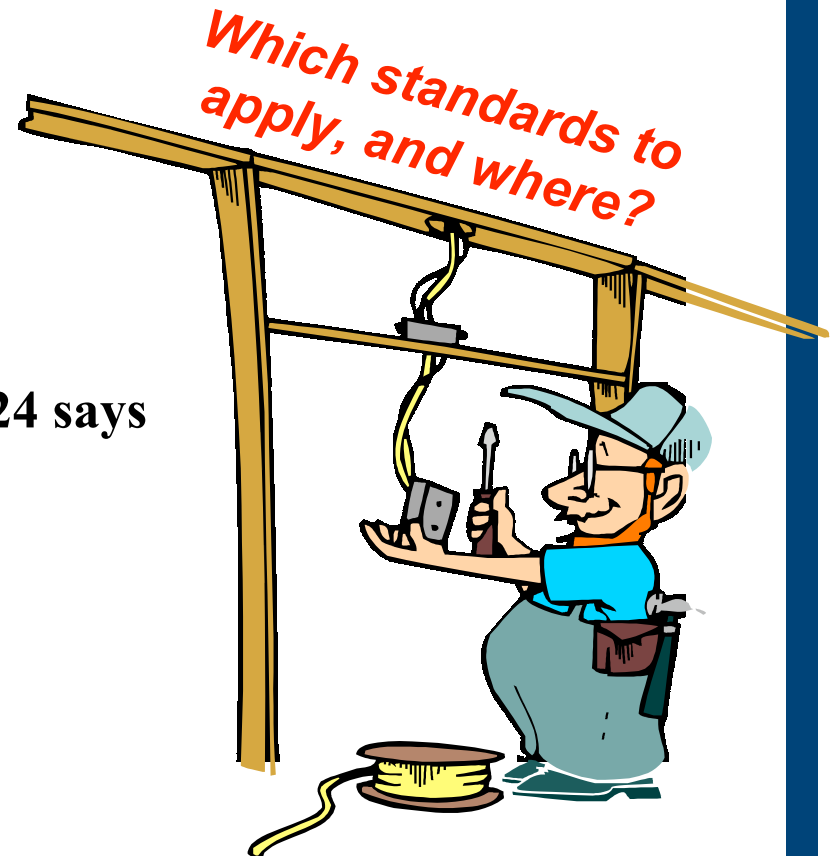


*Previously agreed by
industry – must be
selected for use*



Regulations

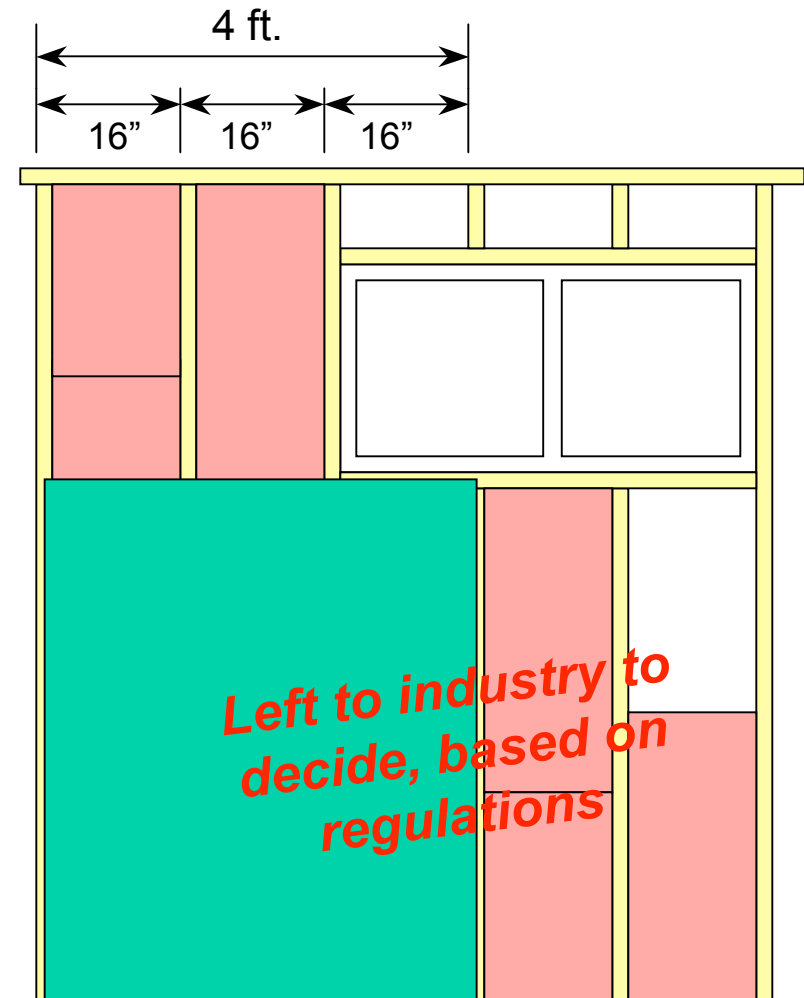
- * **Set minimums required for *safety, security, expansion***
- * **When building a house, e.g. building code says:**
 - Minimum 16" centers on 2x4 studs
 - Must use fireproof materials
 - Minimum wire gauges, wiring boxes
 - Maximum load on a circuit
 - Drain pipes must be bigger than supplies
 - Number of smoke detectors
- * **When deploying load control, e.g. Title 24 says**
 - Minimum Number and type of ports
 - Must be secure
 - Must connect to HVAC and WAN
 - Minimum information to display





Industry Conventions & Products

- * **Compatibilities that “*suddenly appear*” due to regulations**
- * **When building a house, e.g.**
 - 4x8 drywall fits on 16” centers
 - Insulation bats fit into 16” centers
 - Electrical boxes have ½” lip for drywall
 - Locks and hinges fit common door sizes
 - Electrical panel has expansion slots for circuits up to max service size
- * **When deploying load control, e.g.**
 - Compatibility with AMI
 - Compatibility with T&D control systems

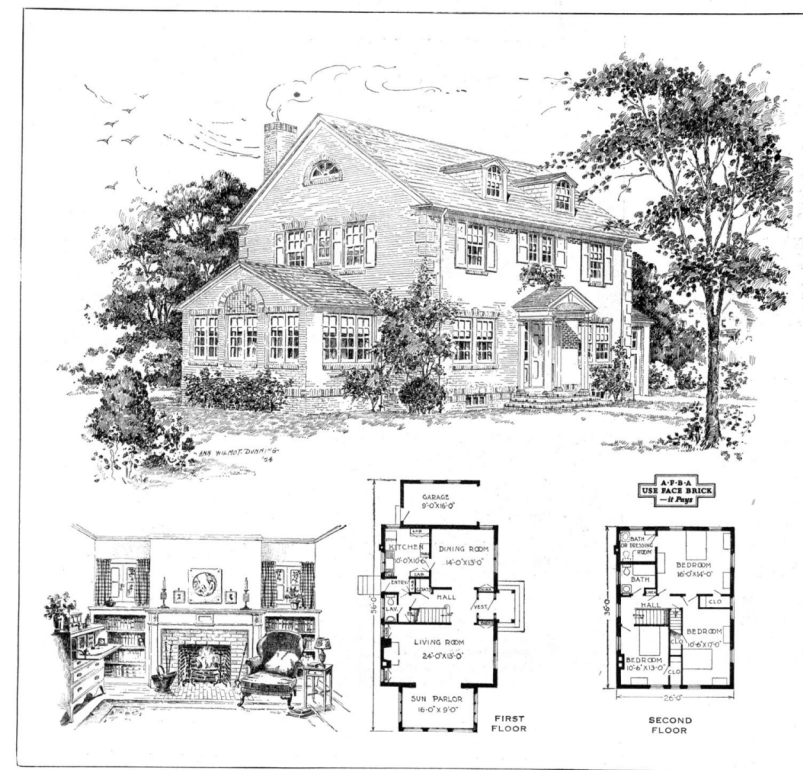




Project Plans

- ★ Requirements for a specific installation
- ★ Choices from options provided by regulations
- ★ When building a house, e.g.
 - ▶ Street layouts
 - ▶ Architect's drawings
 - ▶ Architectural constraints
 - ▶ From *developer/owner*
- ★ When deploying load control, e.g.
 - ▶ Functional specifications
 - ▶ Project schedules
 - ▶ Vendor contracts
 - ▶ From *utility/project manager*

Set the utility's goals for integration



SIX-ROOM HOUSE No. 651

Designed for the Savings Plan - American Eccl. Bldg. Assn.



Services

- * **New processes and infrastructure**
- * **Business opportunities due to regulation**
- * **When building a house, e.g.**
 - ▶ Building inspector, lawyer, real estate agent, insurance agent
- * **When deploying load control, e.g.**
 - ▶ Test facilities
 - ▶ Contracted operators
 - ▶ Consultants
 - ▶ Installers
 - ▶ Maintenance companies

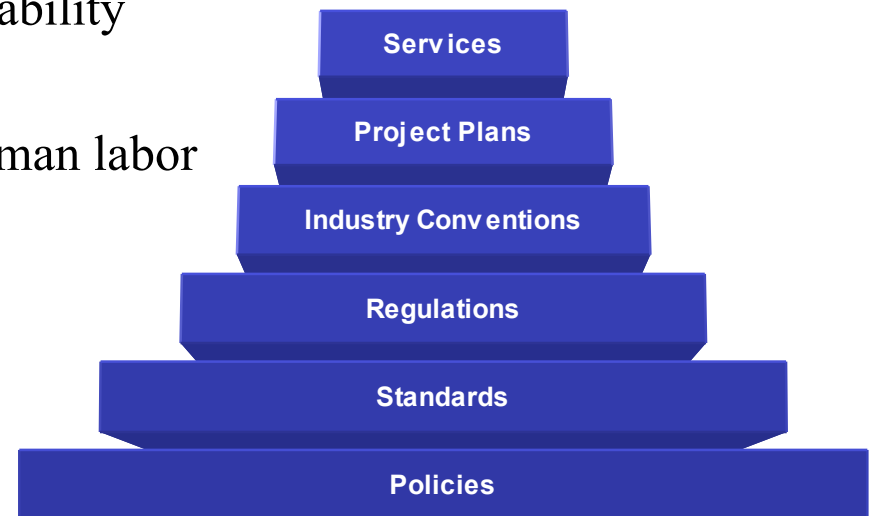


*Integration through
people's effort*



Summary so far....

- ★ **Establish system integration through:**
 - Policies to set general principles
 - Standards to ensure compatibility
 - Regulations to select applicable standards
 - Industry conventions to ensure usability
 - Project plans to meet utility goals
 - Service organizations to apply human labor





But There's a Problem...

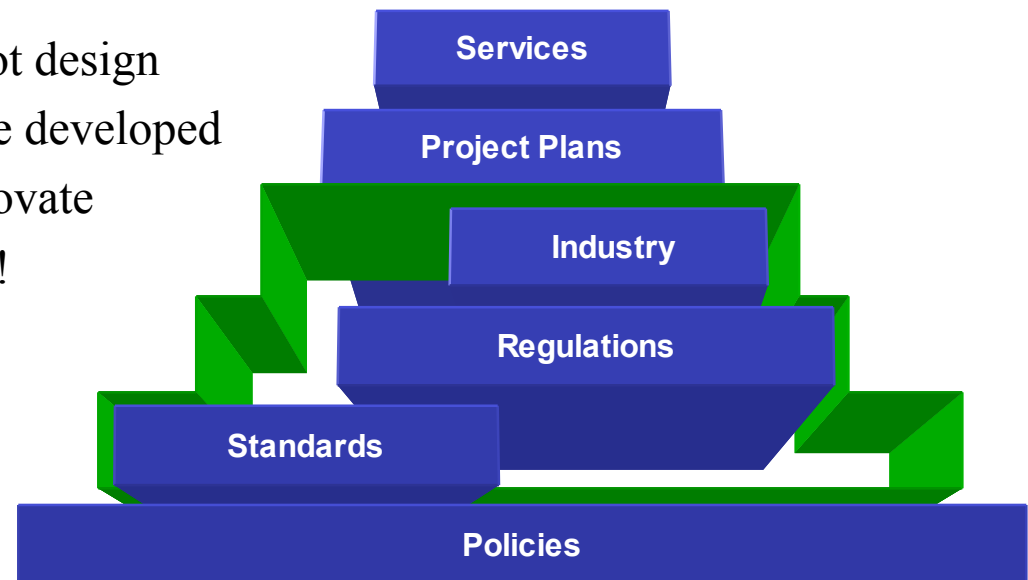
- ★ **No analogy is perfect**
- ★ **Housing is a very mature industry**
- ★ **Load control is just starting out**
 - Some of the necessary standards *don't exist*
 - Industry consensus on best practices is *still building*
 - Regulating in too much detail now could *stifle innovation*
- ★ **Higher costs, incompatibility...**





We Need Something New!

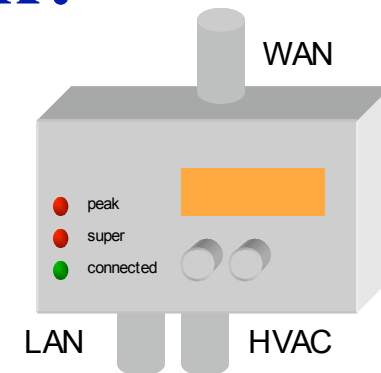
- * A *framework* for change
- * An agreement between industry and regulators
- * A general outline for a category of products
 - Not too specific
 - Describes *requirements*, not design
 - Permits new standards to be developed
 - Encourages industry to innovate
 - *BUT* ensures compatibility!





How Would It Work?

- ★ Convene an industry group
- ★ Define the framework in general
- ★ Don't specify particular standards at first
- ★ Define the *functions* of the device
- ★ Get agreement on an approach
- ★ Regulate more specifically later





Goals for the “Framework”

Define requirements for an entirely new *type* of product that:

- ★ Is Commercially feasible
- ★ Fits a regulated environment
- ★ Has a most basic version that is low cost
- ★ Does no harm!

