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

- Services
- Project Plans
- Industry Conventions
- Regulations
- Standards
- Policies
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

Which standards to apply, and where?
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

Left to industry to decide, based on regulations.
**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*
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!