Lab Commissioning, DDC Systems, Complexity and Persistence

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Overview

- Lab Commissioning
- Complexity
- DDC Systems
  - History
  - Essence of a BAS
  - Ultimate Pieces of a BAS
- Persistence
  - Analogy
  - Observations

What Is Commissioning?

Merriam-Webster OnLine

Merriam-Webster FOR KIDS | Encyclopædia BRITANNICA | Merriam-Webster ONLINE | Merriam-Webster COLLEGIATE® | Merriam-Webster UNABRIDGED

Main Entry: commission

Function: transitive verb

Inflected Form(s): -mis·sioned; com·mis·sion·ing /-'mi-sh(&-)ni[ng]/

1 : to furnish with a commission: as a : to confer a formal commission on <was commissioned lieutenant> b : to appoint or assign to a task or function <was commissioned to do the biography>

2 : to order to be made <commissioned a portrait>

3 : to put (a ship) in commission

An analogy to a ship's sea trials or "shake-down" cruise

Commissioning;

- **Commissioning is a systematic process of ensuring that all building systems perform interactively according to the contract documents, the design intent and the Owner's operational needs**
  - Begins in predesign
  - Documents the design intent
  - Continues through construction, acceptance, the warranty period, and through the building's life cycle
  - Includes functional testing
  - Includes training
  - Documents performance

Commissioning is about performance and integration

People Skills Can Matter

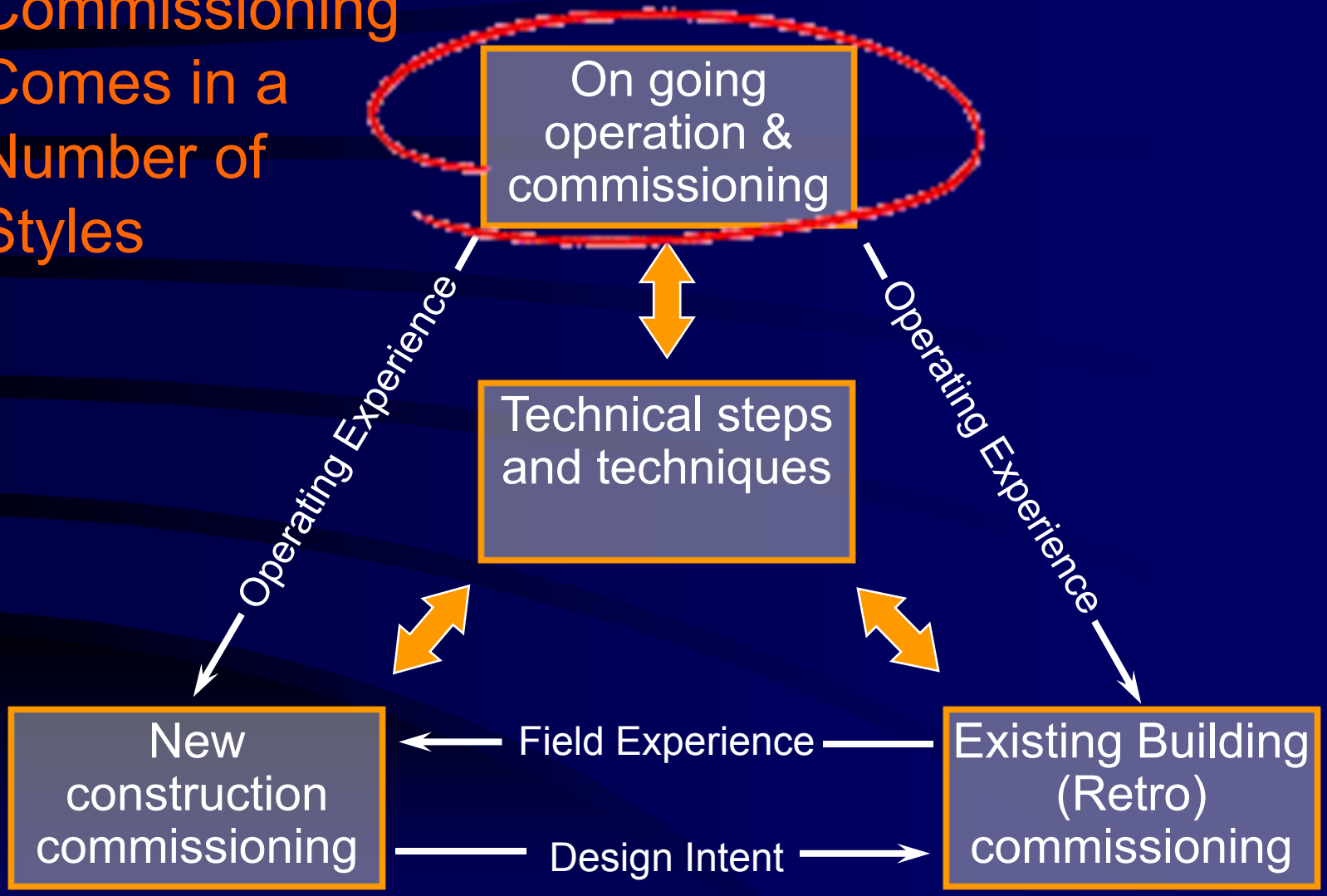
Commissioning

Function: transitive verb

Pronunciation: k&-'mi-sh&ni[ng]

The art of telling people things they don't want to hear at a time when they don't want to hear them and convincing them to do something about the problem despite all of that.

Commissioning Comes in a Number of Styles



LAB HVAC = Complex Systems

- Variable flow supply air
- Variable flow hoods
- Variable flow exhaust air
- Doing the math:

Variable system flow relationships
\+ Fixed distribution duct sizes

Variable system pressure relationships

LAB HVAC = Complex Systems

- Variable flow supply air
- Variable flow hoods
- Variable flow exhaust air
- Doing the math:

Variable system pressure relationships
\+ Fixed lab pressure differential requirement

Complex control and operation problem

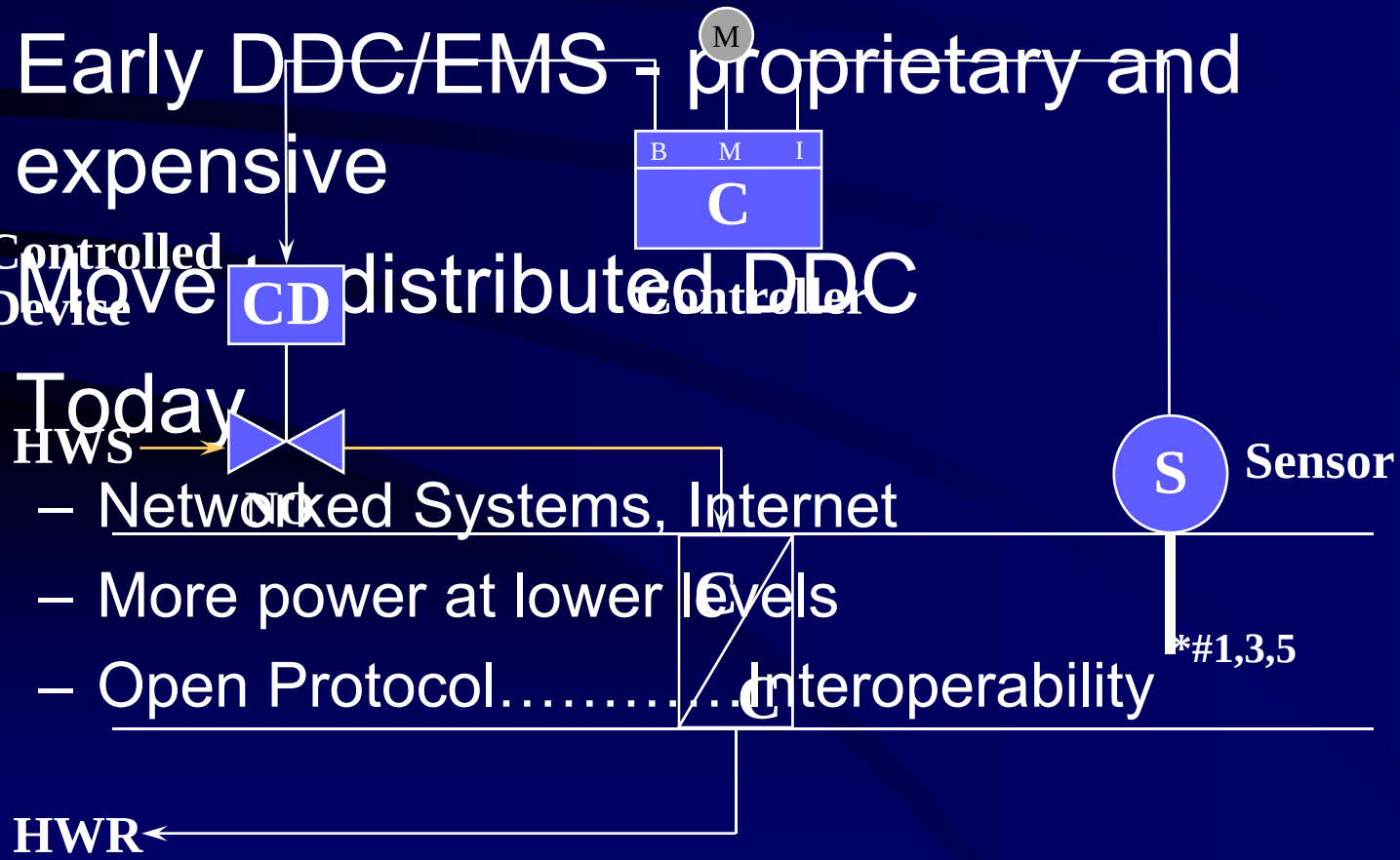
Lab HVAC ≠ Only Complex Lab System

- Variable flow chilled water
- Variable flow hot water
- Central steam systems
- Isolated water supplies
- Waste water treatment systems
- Emergency power
- Uninterruptable power
- IT Systems
- Life safety systems
- Canopy hoods
- Fume hoods
- Bio safety cabinets
- Downdraft tables
- Perchloric acid exhaust
- RODI water
- Ultra pure piping and gasses
- Autoclaves
- Glass washers
- Cage washers
- Rack washers
- Cage cleaning systems
- Animal watering system
- Bag in/bag out filters
- Alarms system
- M&V systems
- Security systems

All complex, all interactive, all the time!

History - DDC Changes over the Years

- 25 years ago, we had Open Protocol, Interoperability, Plug & Play
- Early DDC/EMS - proprietary and expensive
- Move to distributed DDC
- Today
  - Networked Systems, Internet
  - More power at lower levels
  - Open Protocol……Interoperability



Essence of a HVAC Control System

- Stuff
  - Sensors
  - Controlled Devices
  - Controllers
  - Interface Devices
  - Networks
- People
  - Programming
  - Installation
  - Quality Control
- Tools
  - Software
  - Documentation
  - Training

Ultimate “Stuff”

- Sensors
  - Super accurate
  - Super cheap
  - Wireless
  - Low maintenance
  - “Green”
  - Self Calibrating
- Controlled Devices (actuators, etc.)
  - Inexpensive, reliable, powerful
  - Feedback
  - Low maintenance

Ultimate “Stuff”

- Controllers
  - Powerful, lot of memory
  - Interchangeable (true plug & play)
  - Common programming……
  - Flexible, expandable
  - Reliable
  - Upgradeable….
- Controller Interfaces, Networks
  - Self configurable
  - Use standard Networks
  - “Open”

Ultimate “People”

Ultimate “People”

- Engineers
  - Design
  - Commissioning
- Manufacturers
- Contractor/Installers
- Owners
  - Project Managers
  - Contracting
  - Operations
- Related Parties
  - Other Contractors

Ultimate Tools

- Software
  - Open
  - Intuitive
  - Self Help
    - For DDC Manufacture Specific Issues
    - Diagnostics for Building Issues
  - Help make decisions
- Documentation
  - Accurate
  - Electronic
  - Automatically updating

Ultimate Tools

- Training
  - Better training material
  - Better instructors
  - More
  - Better Students

Current Practice

- HVAC Controls are Performance Specified
- Specifications aren't very specific
- Controls are typically "Design/Built" by 3rd tier subcontractor
- Application Engineer for vendor is key
- Documentation quality varies
- Resources are limited, enforcing good specs are a challenge
- Training is critical
- Difficult to get a system to work as planned
- Commissioning becomes necessary

Problem Solving

The significant problems we have cannot be solved at the same level of thinking with which we created them.

Albert Einstein

Insanity

Doing the same thing over and over again and expecting different results

Albert Einstein

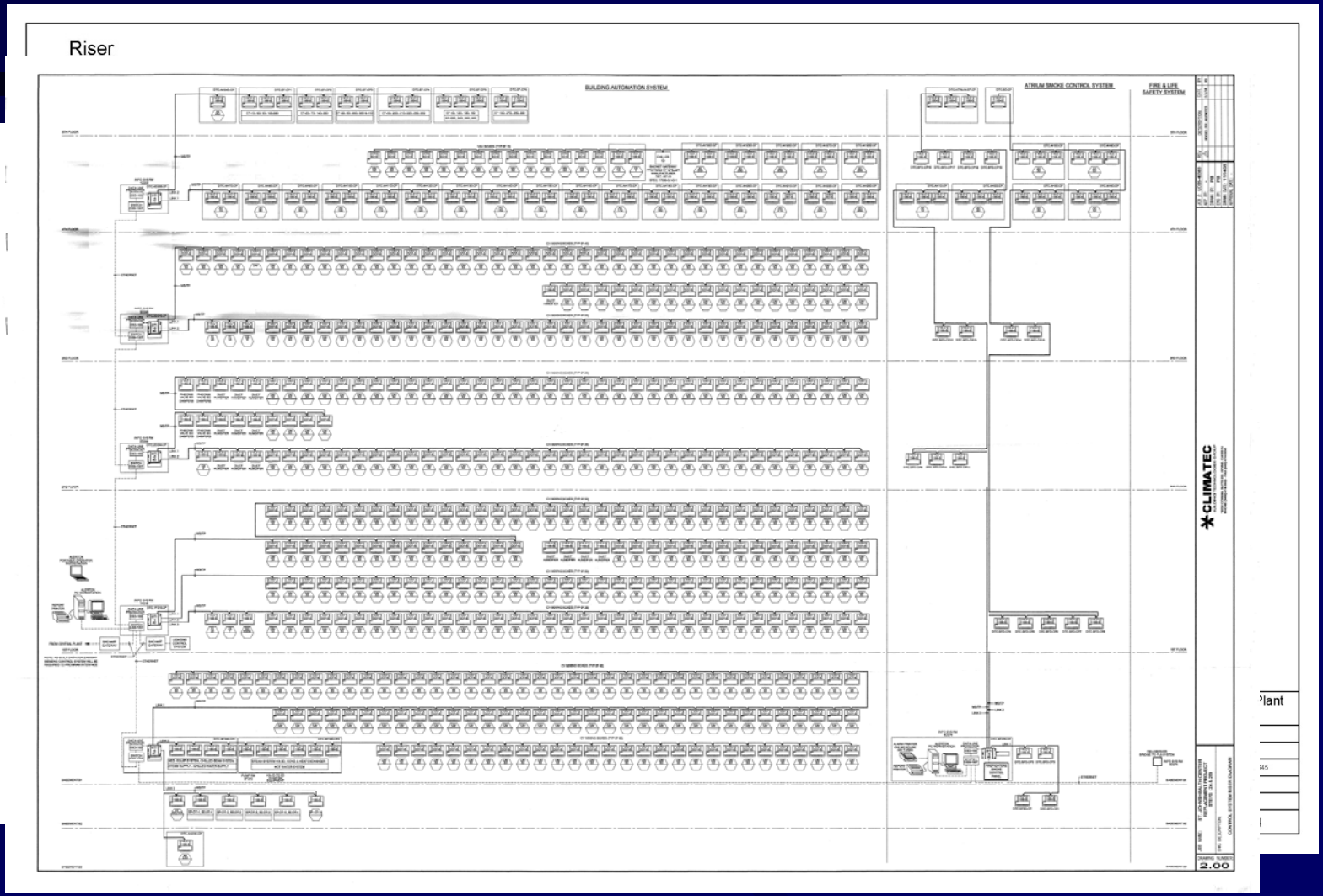
Only two things are infinite, the universe and human stupidity, and I'm not sure about the former

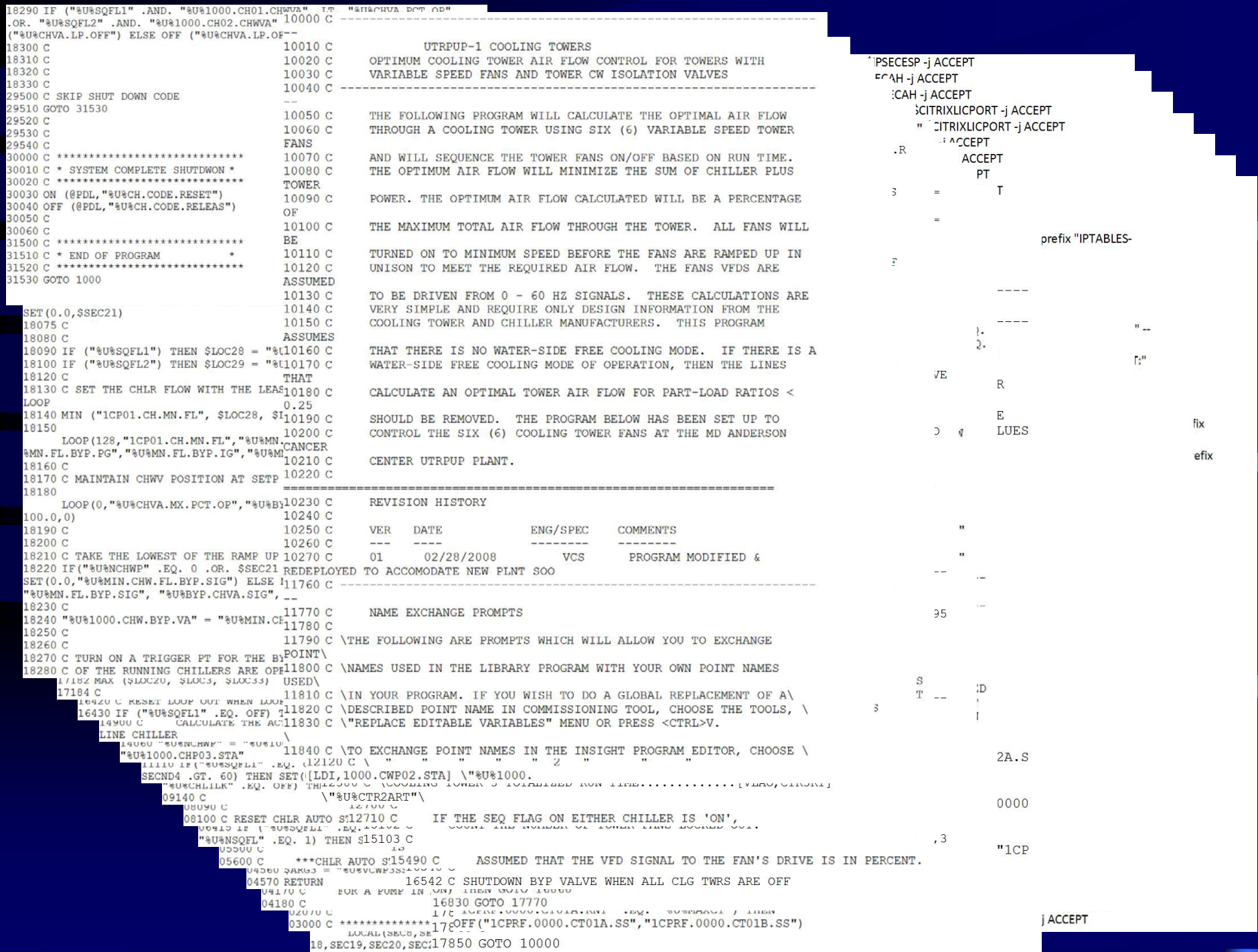
Albert Einstein

An Analogy

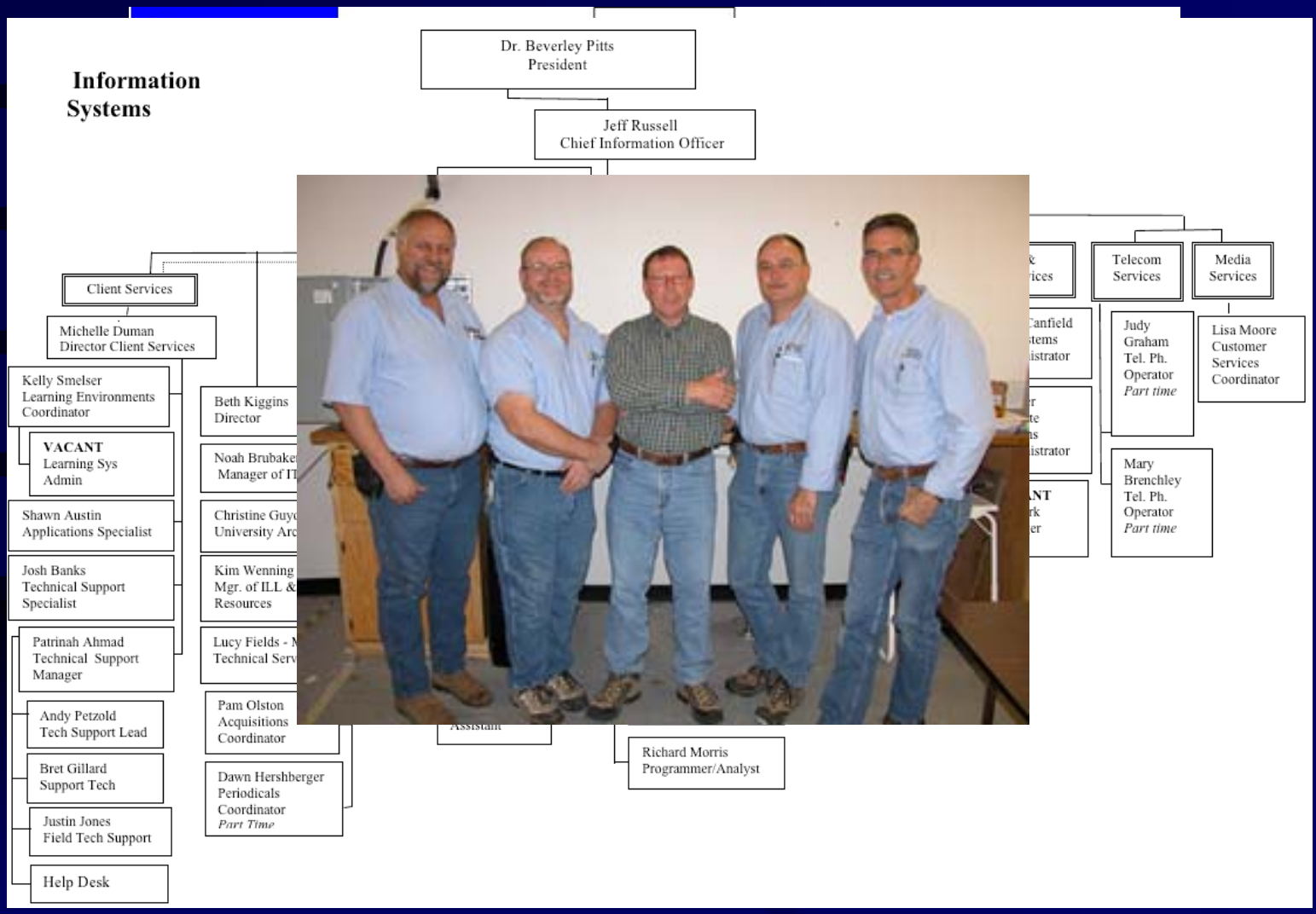
- IT Systems
  - Networks
  - Software
  - Organizations
- DDC
  - Networks
  - Software
  - Organizations

An Analogy


Riser
BUILDING AUTOMATION SYSTEM
ATRIUM SMOKE CONTROL SYSTEM
FIRE & LIFE SAFETY SYSTEM
CLIMATEC
2.00



An Analogy


Information Systems
Dr. Beverley Pitts
President
Jeff Russell
Chief Information Officer
Client Services
Michelle Duman
Director Client Services
Kelly Smelser
Learning Environments
Coordinator
VACANT
Learning Sys
Admin
Shawn Austin
Applications Specialist
Josh Banks
Technical Support
Specialist
Patrinah Ahmad
Technical Support
Manager
Andy Petzold
Tech Support Lead
Bret Gillard
Support Tech
Justin Jones
Field Tech Support
Help Desk
Beth Kiggins
Director
Pam Olston
Acquisitions
Coordinator
Dawn Hershberger
Periodicals
Coordinator
Part Time
Richard Morris
Programmer/Analyst
Telecom Services
Media Services
Judy Graham
Tel. Ph. Operator
Part time
Lisa Moore
Customer Services
Coordinator
Mary Brenchley
Tel. Ph. Operator
Part time

IT/DDC Impacts

- IT Systems
  - Productivity
    - Computers, Networks, Servers
    - Email, Internet, Security
- DDC Systems
  - Productivity
    - Space Comfort
    - IAQ
  - Energy

Organizational Histories

- IT Organizations are new
  - Ability to structure without any precedents
- DDC Systems are not
  - Subset of Facility Operations & Maintenance
  - Extension of HVAC Controls
    - Pneumatics

Observations

- IT versus DDC career path
  - Technical versus management tracks
  - Allowing people to remain technical
  - And still progress
- Not just training, experiential learning
  - Going to take some time
  - Need to create a career path

Other Observations

- How do we really get plug and play components for BAS?
  - New blood
  - This is more of a procurement/$ issue than performance one.
- People responsible for HVAC Designs must understand BAS & control details
- Diagnostic tools must mature to stretch and make up for people shortages

Summary

- Get our priorities in line
  - First cost versus life cycle cost
  - $ for “green” thing, versus $ for operational people
- Create technical track for HVAC system/control specialists
- Incent long term system performance
  - Energy
  - Performance
  - People
- Persistence is everything