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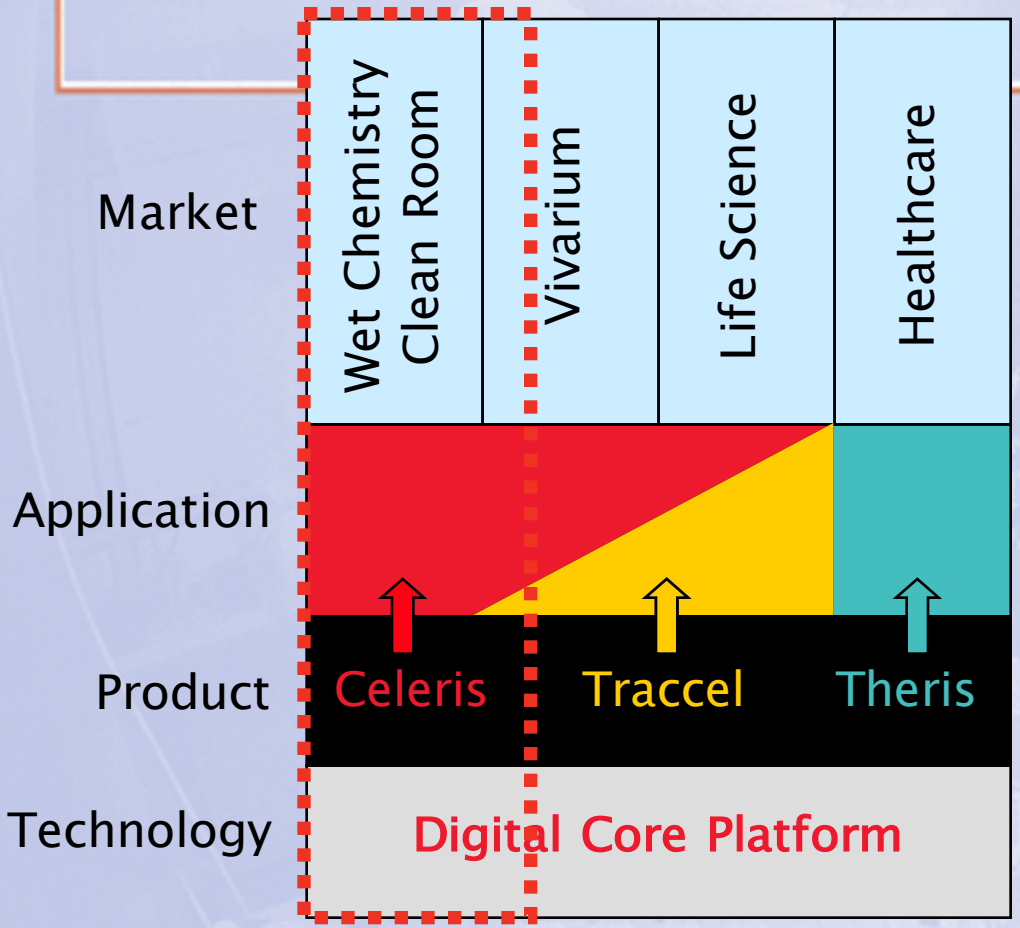
Phoenix Controls

Platforms and Markets



Celeris

- Designed for labs
- Complex control sequences
- For demanding applications

Traccel

- Designed for Life Sciences
- Simple control sequences
- For less demanding spaces
- VAV box alternative

Theris

- Designed for Healthcare
- Addresses industry guidelines
- VAV box alternative

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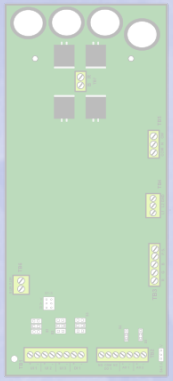
Valve Mounted Controller

- Performs valve control
- I/O for connecting sensors & actuators
  - Sensors and actuators may connect to any node
- Control functions are shared across the room-level network
  - Zone Balance
  - Temperature
  - Humidity
  - Occupancy
  - Emergency Mode
  - Fume Hood Control
  - Progressive Offset Control



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Celeris Applications

Wet Chemistry

- VAV fume hood labs
  - 1-second speed of response is critical
  - Up to 10 fume hoods per pressure zone
- Dynamic flow conditions
  - Pressure independent airflow control valves
  - Flexible Temperature control
    - Cooling with reheat control
    - Discharge air control
    - Thermal anticipatory control



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Celeris Applications

Pharmaceutical/ Biocontainment

- Progressive Offset control
  - Pressure control layered over high-speed volumetric offset
  - Precision airflow control for architecturally tight spaces
  - Cascade pressure zones
  - Shut-off control sequences
- Responds to dynamic room conditions
  - Flow control for switchable Biosafety Cabinets
  - Compensate for doors opening and closing and alarm



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Celeris Applications

Vivarium Suites

- Tracking Pair – precision, volumetric offset control
  - Shut-off control sequences
  - Flexible temperature control
  - Humidity control
  - Integrate miscellaneous points
- Suite level control
  - Sophisticated control for cage wash areas
  - Flow control for switchable Animal Holding Rooms



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Wet Chemistry Solutions



Objectives of Laboratory Airflow Controls

- Fume hood capture and containment
  - Safety for the User
- Laboratory pressurization
  - Secondary barrier of protection
- Minimum ventilation control
- Comfort control
- Local and remote monitoring



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The “Unique Requirements”

- Speed of Response
- Airflow Accuracy
- Pressure Independence
- Inlet and exit insensitive
- Corrosion Resistant
- Inter-system Stability
- Reliability/Simplicity



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Speed of Response

- Face Velocity Control
  - Fast volume change to match sash movement
  - Fume hood “Roll”
  - Vulnerability of a low face velocity
- Lab Pressurization Control
  - Secondary barrier of protection
  - Supply and General Exhaust performance
  - Disruptive effect on adjoining spaces



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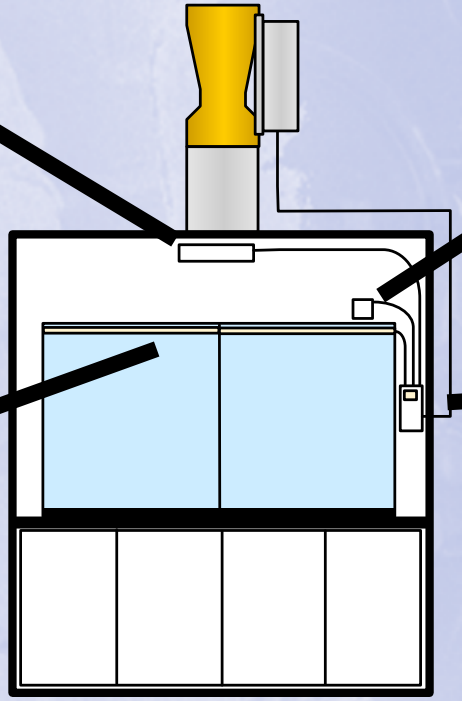
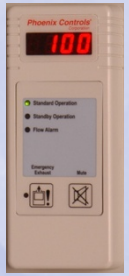
Fume Hood Components

Zone Presence Sensor

Vertical Sash Sensor



Horizontal Sash Sensor



Fume Hood Monitors

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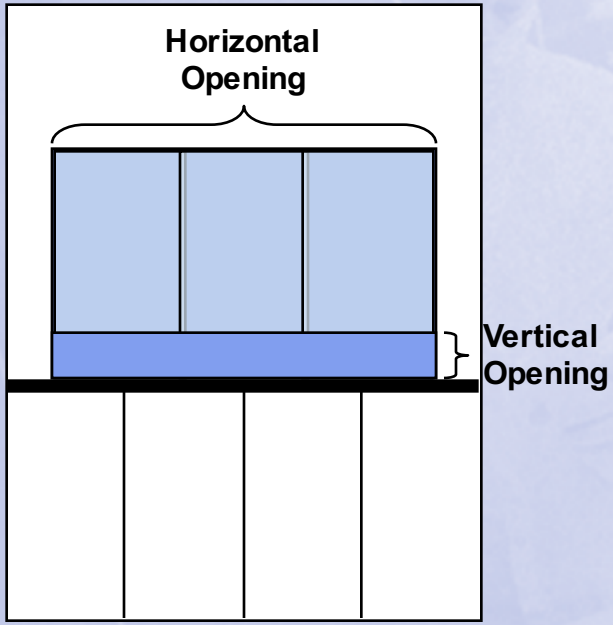
Sash Sensing



$$\text{Average Face Velocity} = \frac{\text{Volume (ft}^3\text{/min)}}{\text{Open Sash Area (ft}^2\text{)}}$$

$$\text{Volume (ft}^3\text{/min)} = \text{Open Sash Area (ft}^2\text{)} \times \text{Face Velocity (ft/min)}$$

Example: 4 foot wide sash, open 6 inches

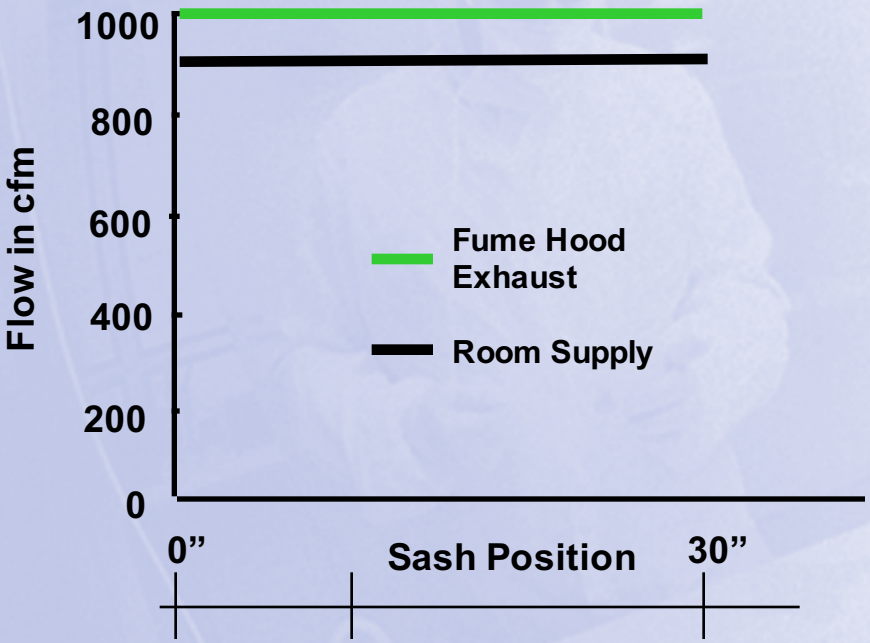
Volume = (4.0(ft) x 0.5(ft)) x 100(ft/min)

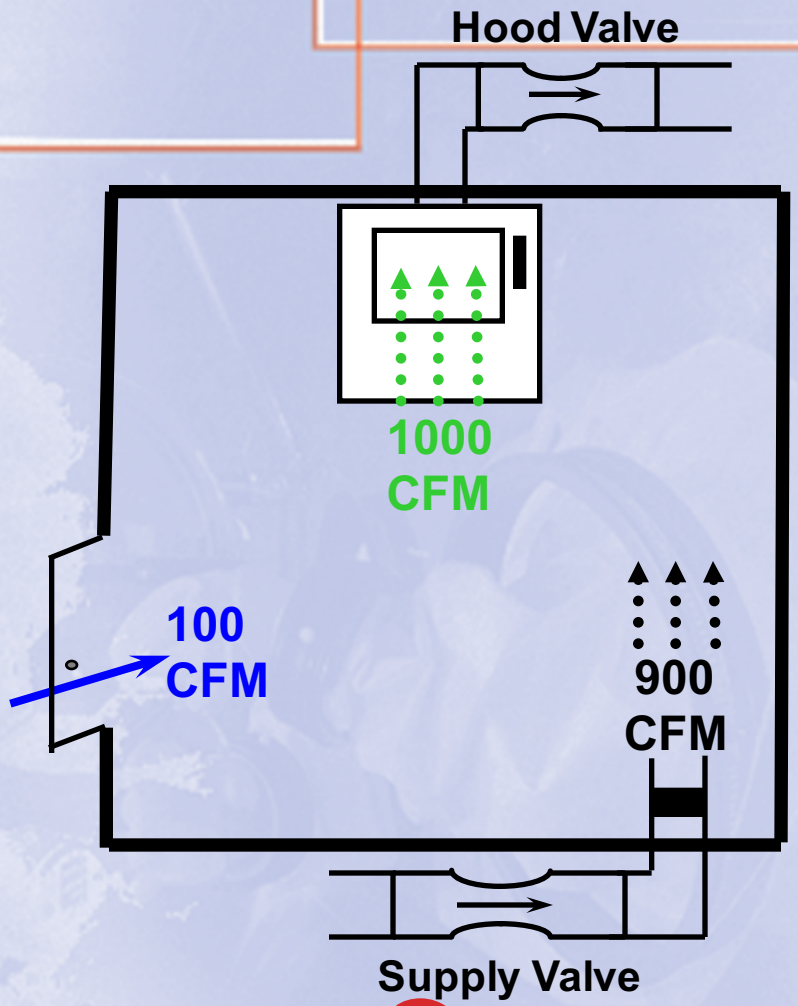
Volume = 2(ft) x 100(ft/min)

Volume = 200 (ft^3/min)



Constant Volume Control System





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Constant Volume Control System

- Advantages
  - Low ‘FIRST” cost
  - Simple operation
  - Low density fume hood labs
- Disadvantages
  - All fume hoods remain on and at constant volume.
  - No fume hoods or canopies, etc. are added/removed.
  - Larger offsets to “mask” degrading performance due to filter loading, etc.
  - Must be tested & balanced frequently to design conditions.
  - Commitment to Maintenance



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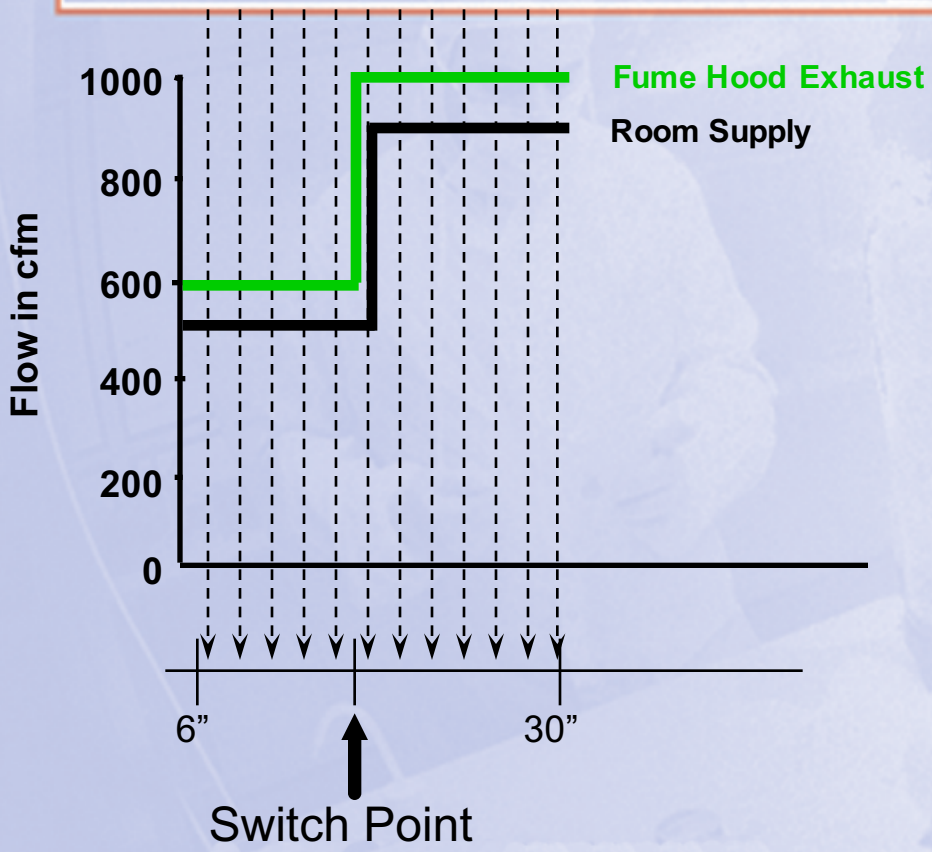
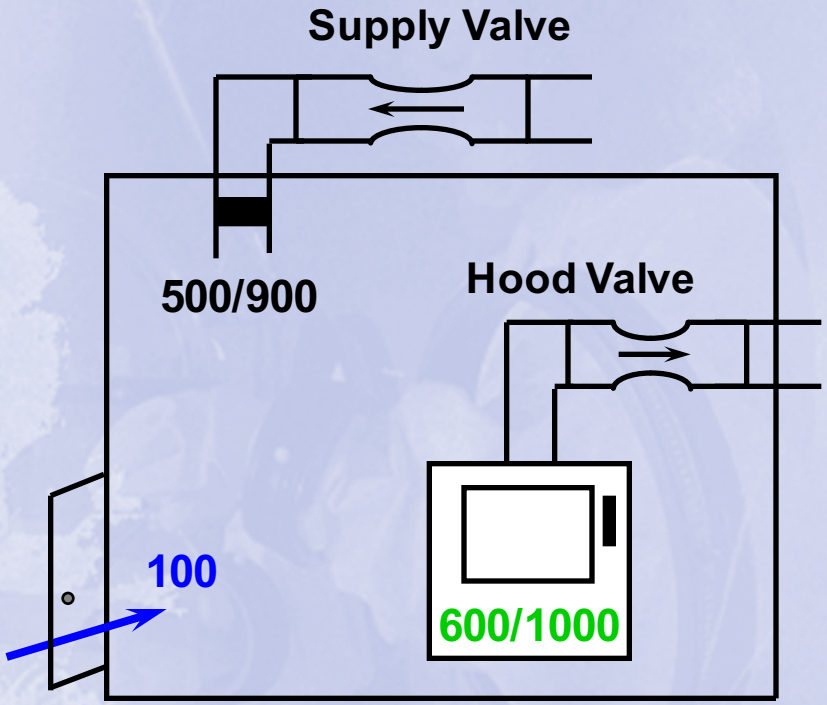
Two-State Control System





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Two-State Control System

- Advantages
  - Still lower cost
  - Still simple operation
  - Some energy savings available
  - Less extreme FV's at lower sash positions
- Disadvantages
  - Energy savings dependent on sash management
  - Excessive turbulence
  - Maintenance of switches



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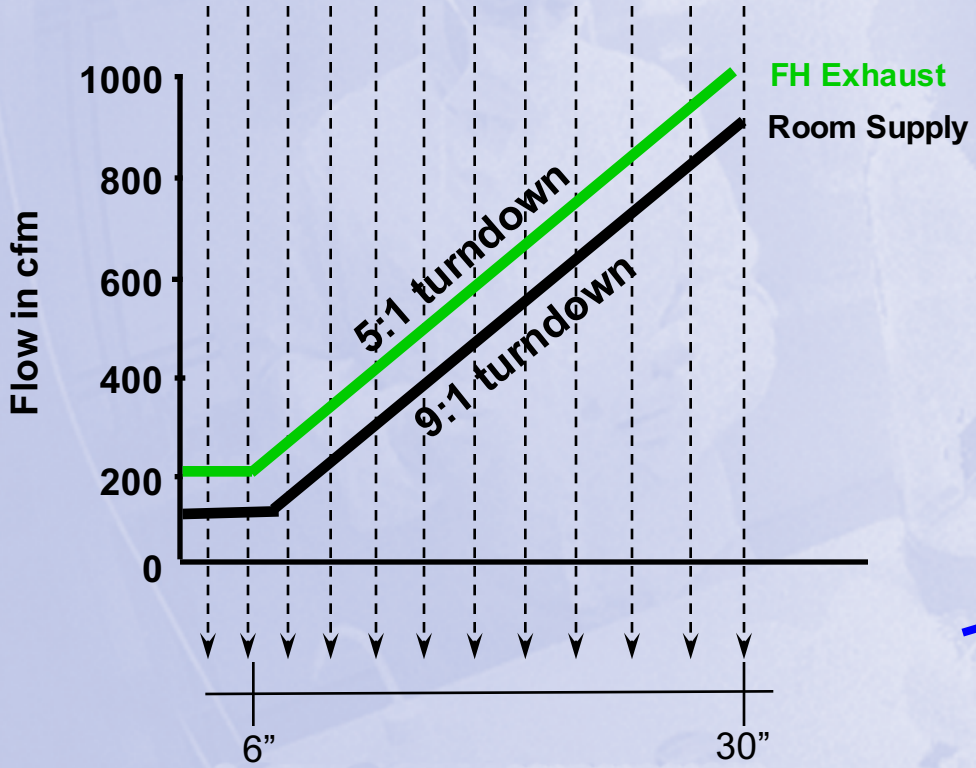
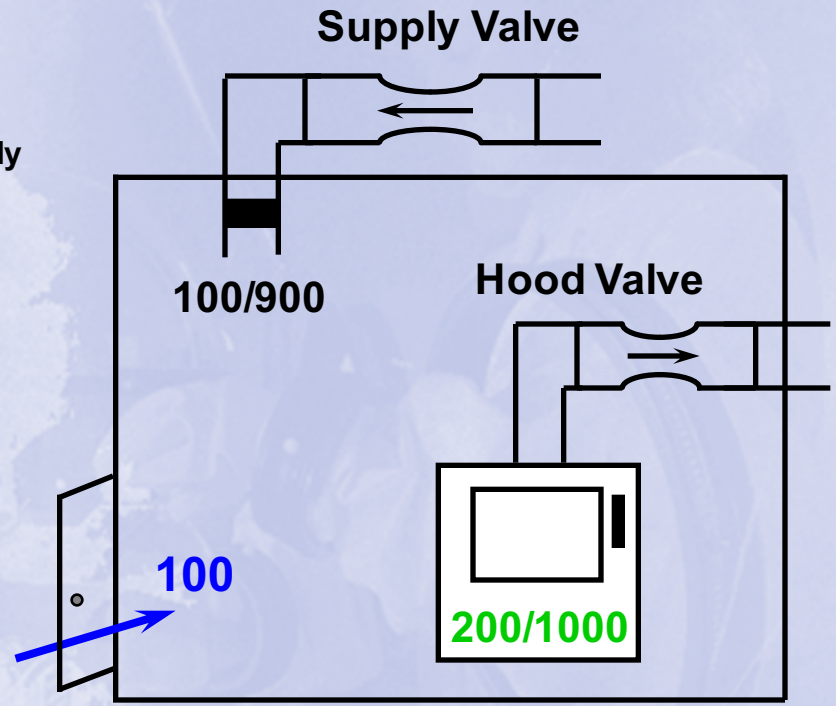
VAV Control System





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VAV Control System

- Advantages
  - Increased Safety
  - Maximum Energy Savings Potential
  - Diversity Consideration in Mechanical Design
- Disadvantages
  - Perceived complexity
  - Higher initial cost
  - Energy Savings are dependent on sash management



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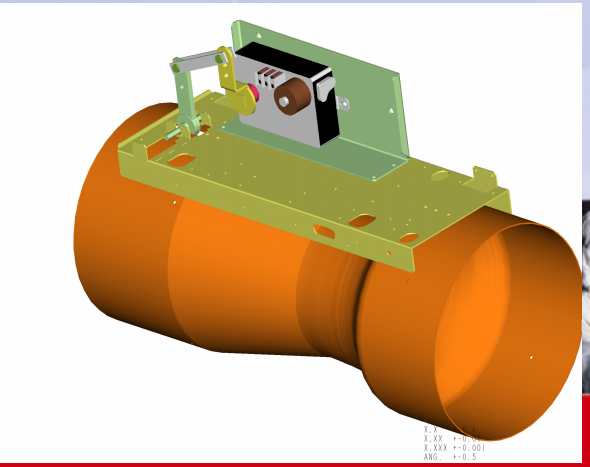
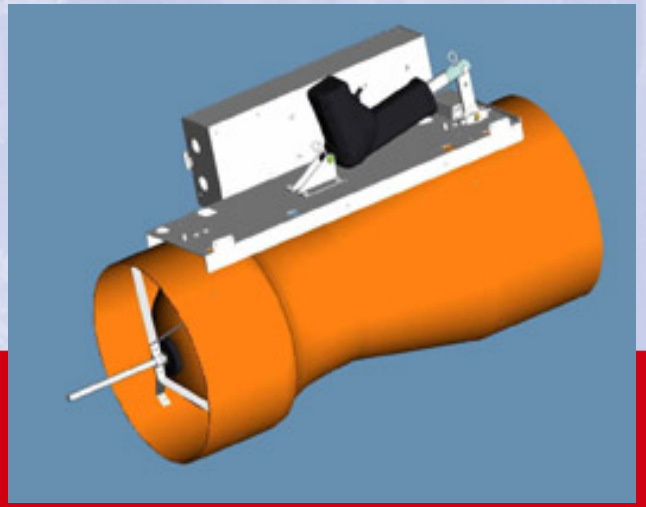
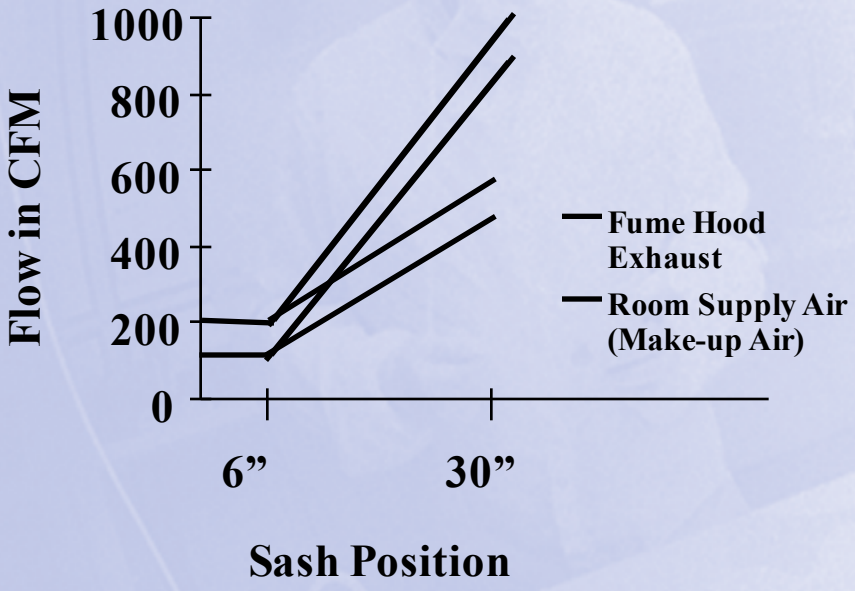
VAV Control System

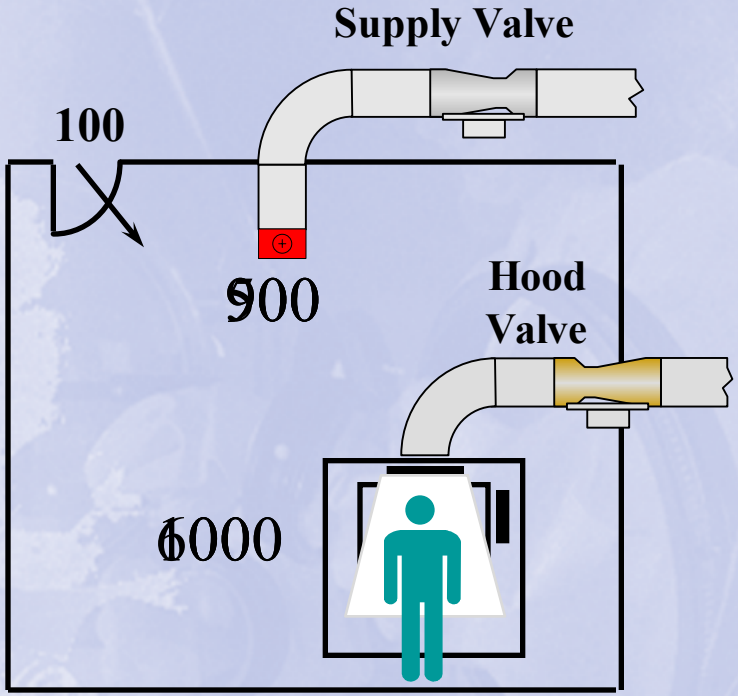
- Phoenix Advantages
  - Electric or pneumatic actuators
  - Optional pressure switch for status
  - Coatings for fume application or uncoated
  - Multiple sizes and configurations





Usage Based Control System





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Typical Fume Hood Lab

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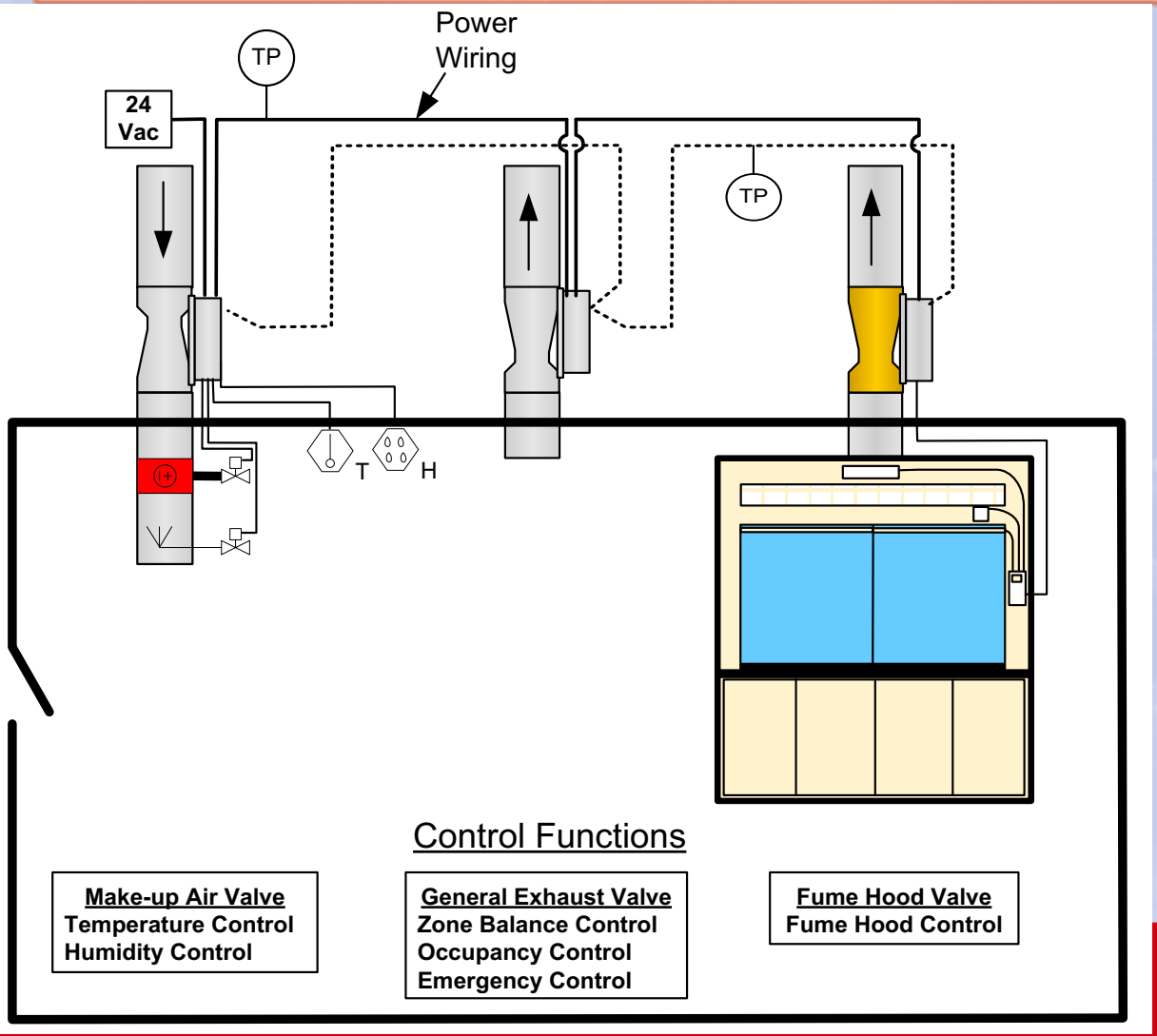
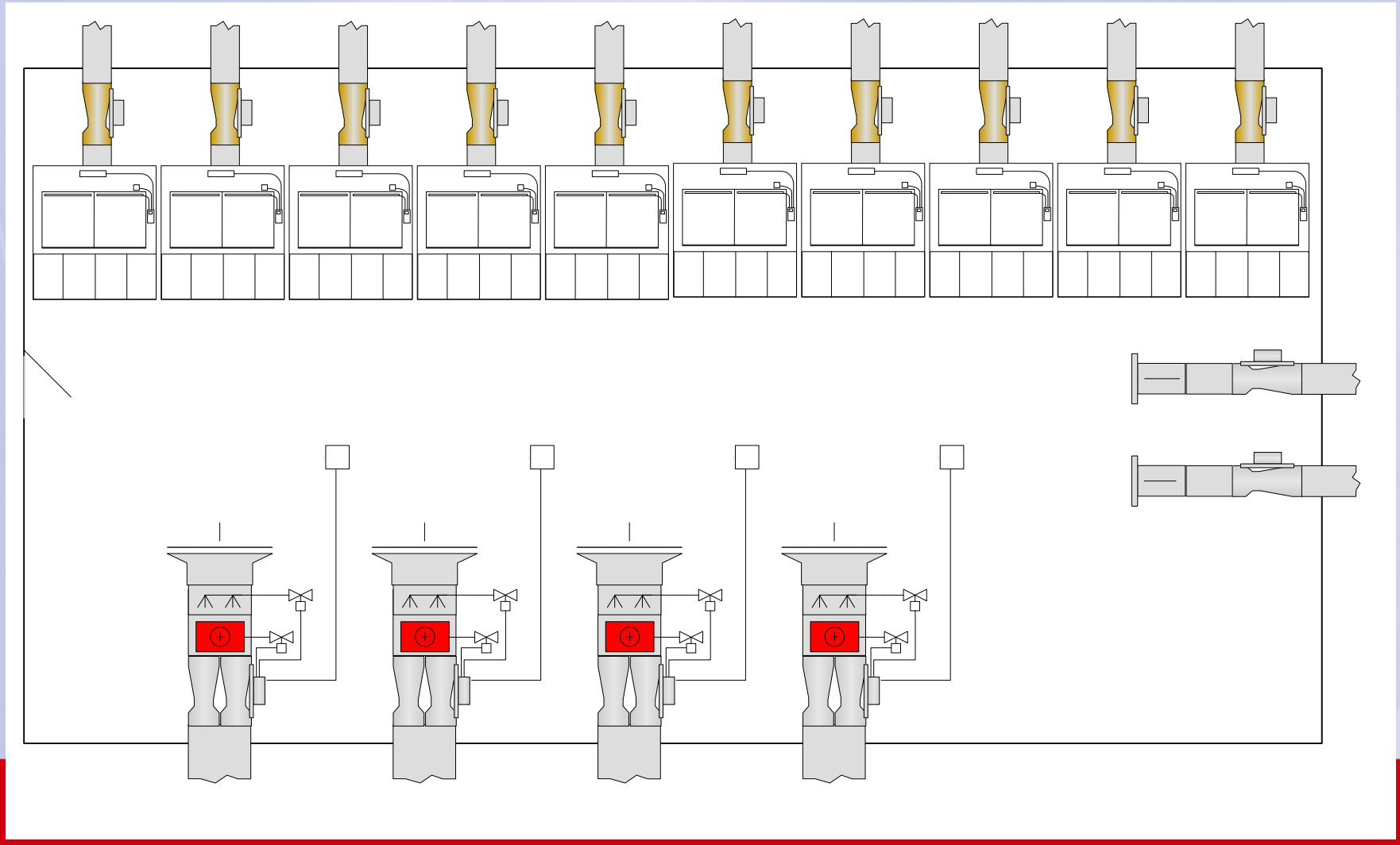


- Sensors and actuators may connect to any node

Complex Lab

10 hoods
4 Temp Zones



Control Schemes Specific to Hood Intensive Labs

Temperature control

- Average up to 5 sensors per temperature zone
- Define sensors as Room, Discharge, Exhaust
- Thermal Anticipatory Control
- BTU Compensation
- Discharge Air Reset Control
- Up to 4 temperature zones per pressurization zone



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Control Schemes Specific to Hood Intensive Labs

Air flow

- Occupancy control
- Usage Based Controls
- Make-up Air flow distribution
- Hood decommissioning mode
- Lab decommissioning mode
- GEX Shut-off
- IAQ (Demand-based) ventilation control
- Ratiometric Return/Exhaust distribution control



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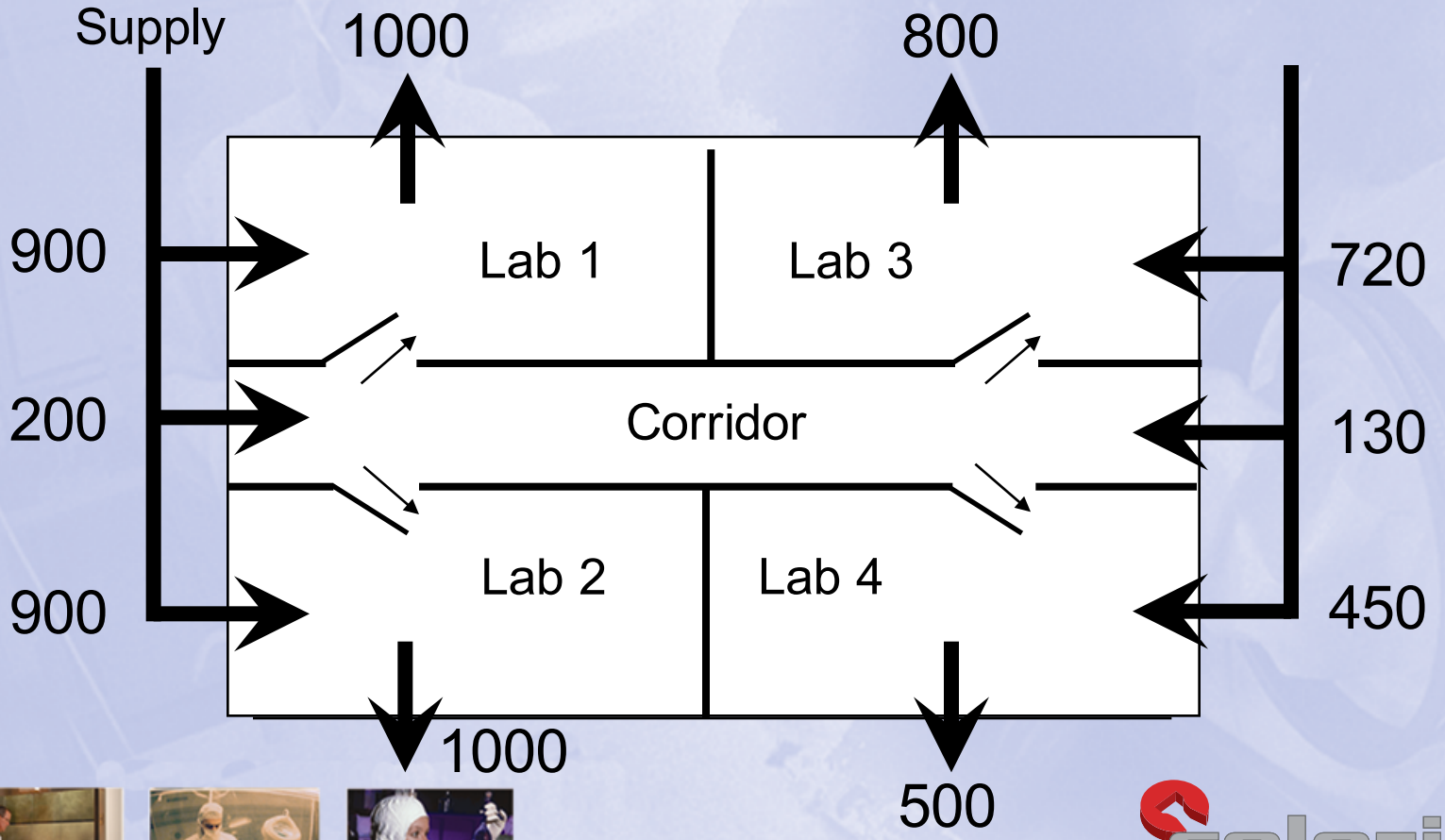
Volumetric Offset Control



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Benefits of using Phoenix

- Simplified ductwork configuration
  - Avoid straight duct runs & higher costs
  - Eliminate need for silencers
  - Optimum design of service chase
- Reduced startup time
  - Pre calibrated equipment
  - Seamless BMS interfaces



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Benefits of using Phoenix

- Eliminates balancing headaches
  - Accel valves self balance minimizing startup time
- Low Maintenance
  - improves customer satisfaction and reduces call backs
- Factory training available for customers
- Local sales, application and service support

Get the project done right the first time !!!



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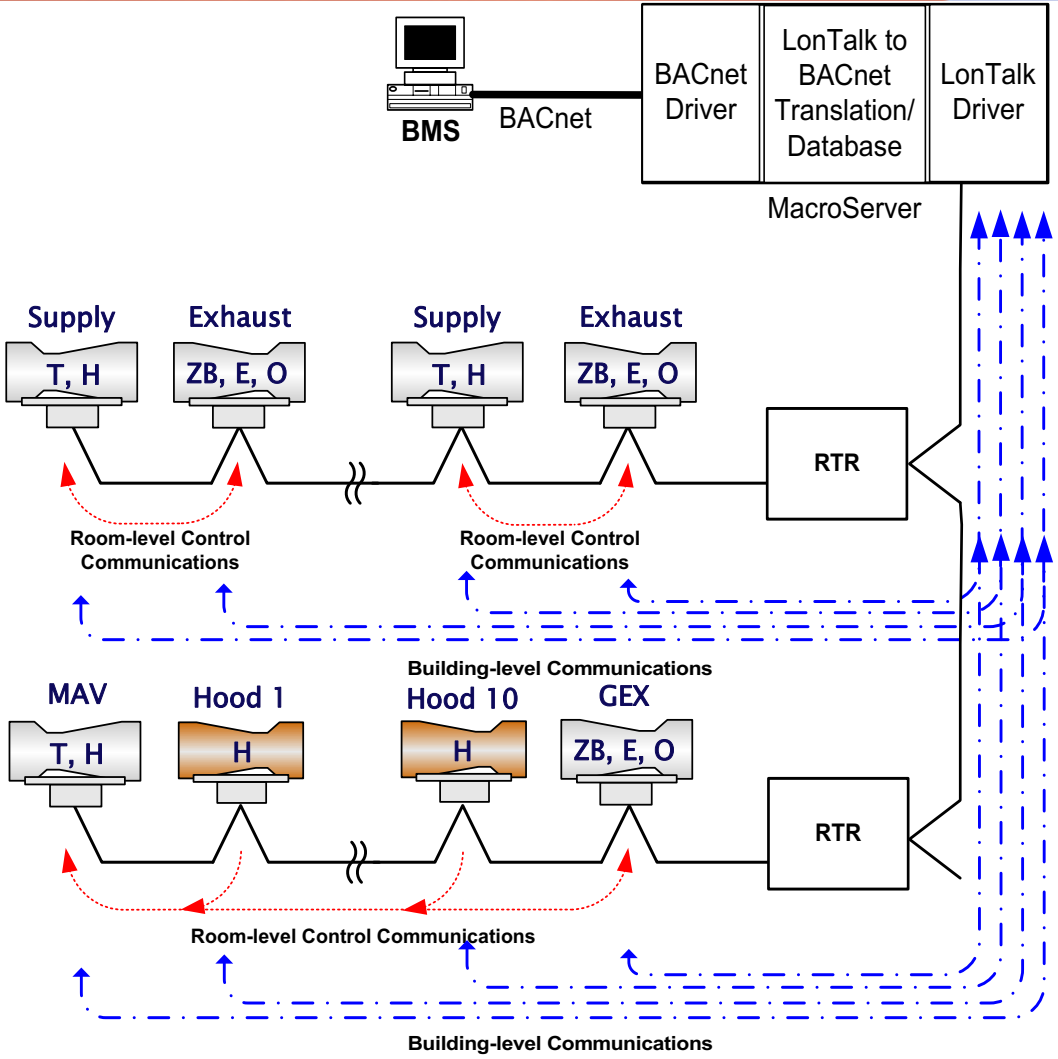
How it comes together…



Phoenix Integration Strategy

- Select “open” industry standards
  - BACnet – Celeris
  - LonTalk – Traccel & Theris
- Cooperate with all vendors
  - Exchange of specification
  - System testing
  - Document integration details
- Third party certification
  - BACnet Testing Lab (BTL) certified – Celeris
  - LonMark Certified – Traccel & Theris



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Integration Solutions

Data Servers

- LonTalk to BACnet Data Servers
  - Collects and stores data from LVC for BAS
  - Isolates (protects) our room-level control network
  - Maintains consistent interface with multiple BMS vendors

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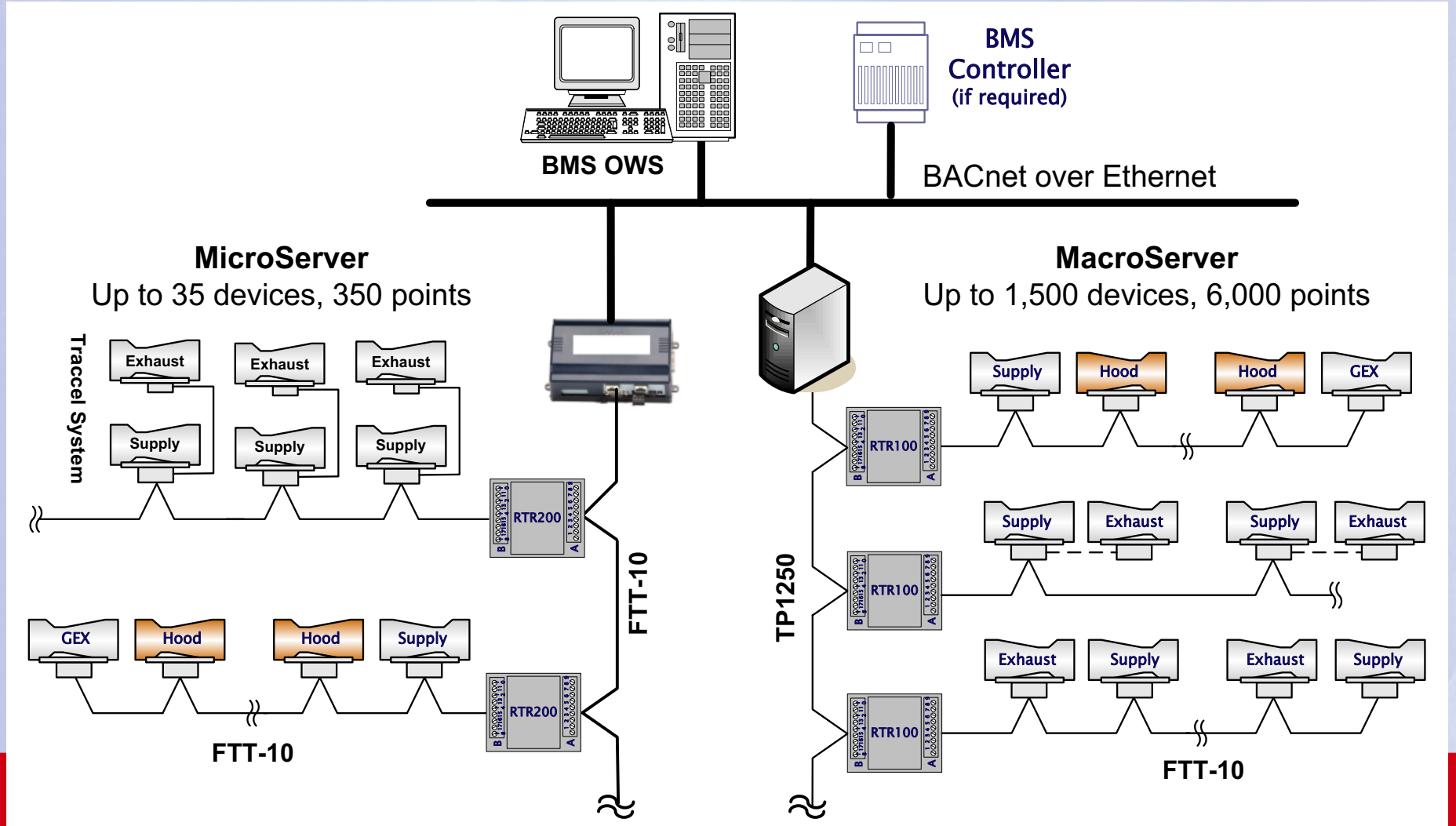
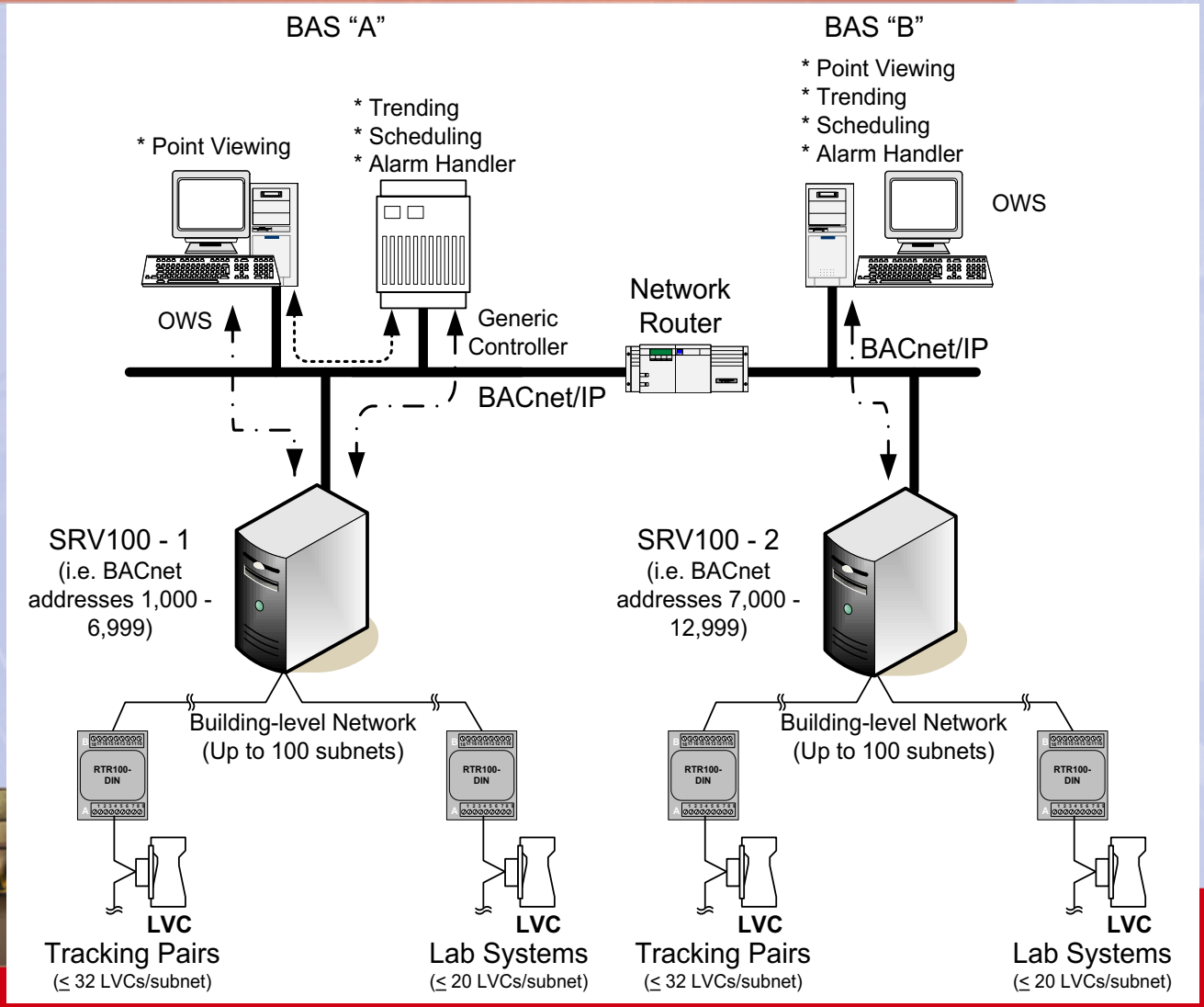
System Layout



Celeris Integration



BACnet Integration Solutions

- Alerton
- American Auto-Matrix
- Andover Controls
- Automated Logic
- Carrier
- Cimetrics BACnet/OPC
- Delta
- Eagle Technology
- FieldServer
- Honeywell
- Intellution iFIX
- Invensys
- Johnson Controls (BSI/NCM, NAE/NIE)
- Reliable Controls
- SCADA Engine
- Siemens
- Trane
- Tridium
- WonderWare



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Points Available for Integration

	READ	WRITE
Valve level		
- Flow set point	Y	
- Flow feedback	Y	
- Jam Alarm	Y	
- Flow Alarm	Y	
- User Definable Inputs/Outputs	Y	Y
- User Definable Alarm points	Y	
Zone Balance Control		
- Minimum ventilation rate (3)	Y	Y
- Offset & Offset set point	Y	Y
- Hood flow Feedback	Y	
- MAV Command & Feedback	Y	
- GEX Command & Feedback	Y	
- Return Command & Feedback	Y	
- Total Zone Supply Flow	Y	
- Total Zone Exhaust Flow	Y	
- Total Additional Supply Flow	Y	
- Total Additional Exhaust Flow	Y	
- Constant Volume Supply Flow	Y	
- Constant Volume Exhaust Flow	Y	
- Diversity Alarm	Y	

	READ	WRITE
Temperature Control		
- Space temperature	Y	
- Discharge air temperature	Y	
- Duct temperature	Y	
- Effective set point	Y	
- Temperature set points (9)	Y	Y
- Cooling demand	Y	
- Heating demand	Y	
- Heat delivered (BTU)	Y	
- Auxiliary temp control demand	Y	
Occupancy Control		
- Occupancy override	Y	Y
- Occupancy state	Y	
- Bypass time remaining	Y	
Humidity Control		
- Space Humidity	Y	
- Humidity set point	Y	Y
- Humidity demand	Y	
Emergency Mode		
- Emergency mode override	Y	Y
- Emergency mode state	Y	

Points Available for Integration

	READ	WRITE
Fume hood Control		
- Face velocity	Y	
- Face velocity set point	Y	
- Sash opening percentage	Y	
- User Status	Y	
- Hood override Alarm	Y	
- Sash height Alarm	Y	
Pressure Control		
- Zone Pressure	Y	
- Effective Pressure Set Point	Y	Y
- Pressure Warning Set Point	Y	Y
- Pressure Alarm Set Point	Y	Y
- Zone Pressure Alarm	Y	
- Sensor Failure Alarm	Y	
- Freeze Mode Time Set Point	Y	Y
- Freeze Mode Time Remaining	Y	
- Freeze Mode Offset Set Point	Y	Y
- Effective Pressure Control State	Y	



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The Celeris system offers

- A streamlined architecture
- Lower installed cost
  - Eliminate the need for room-level controller
  - Power, network and room-level device wiring
  - Connect room-level devices to most convenient node
- Powerful, efficient, and flexible platform
  - Integrate all critical parameters from Celeris system
  - Integrate non-networked room-level devices
- Based on a proven technology



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Thank You

Questions?