NCBC 2007
Making Benefits Last with Persistence Strategies

Persistence Tracking in a Retro-commissioning Program

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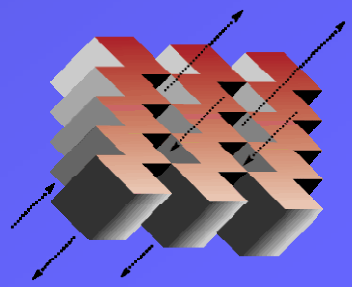


Overview

- Discussion of retro-commissioning program
- Introduction of persistence tracking
- Tracking system
- Preliminary results
- Failed persistence
- Resolution to issues

Retro-commissioning

- New building commissioning gaining steam
- Huge potential for savings in existing buildings
- Investigation required to identify savings
- Verified implementation required
- Control changes favorable, not obvious
- Utilities have stepped in to provide assistance

Utility Sponsored Retro-commissioning Program

- Preliminary scoping to determine potential
- In-depth retro-commissioning investigation
- Assistance for implementation

Persistence of Retro-commissioning Measures

- Verify correct measure implementation
- Verify that measures are maintained over time
- Verify that measures have not been overridden

Reasons for Abandoned Measures

- Comfort complaints
- Owner/operator does not understand measure
- Unintentional override

Persistence Strategies

- Portable datalogging equipment
- Building automation system trending
- Archive remote from building

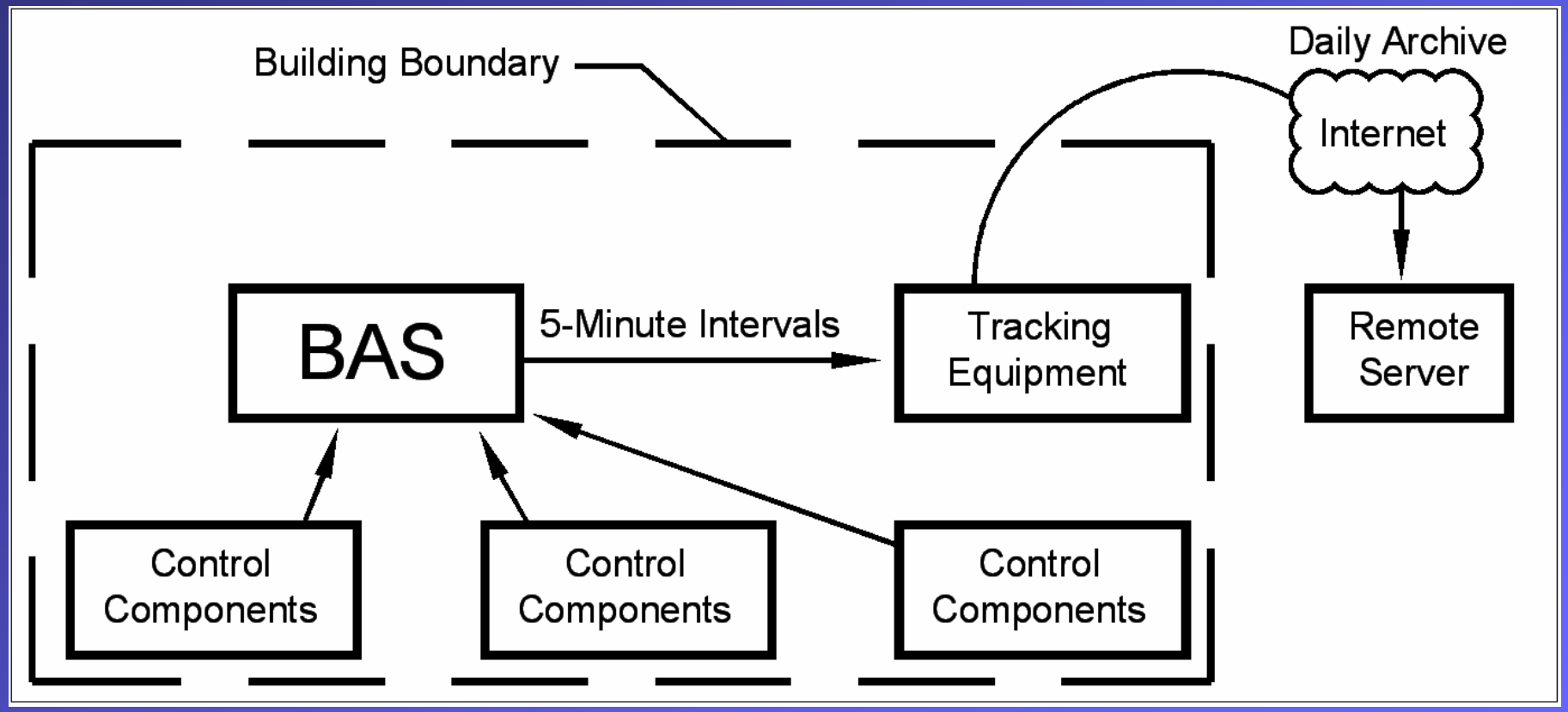
Benefits of Remote Archive

- Trends not subject to being cancelled
- Archive not subject to being deleted
- More control of hardware/software used

Persistence Tracking System

- Continuously monitor applicable control point
- Daily download archives to remote server
- Complete archive available independent of BAS
- Measures verified by inspection
- Passive monitoring system

Persistence Tracking System



Challenges in Implementing Tracking

- Multiple parties, security, technical issues
- Unintentional modification of some points
- Perceived conflict in building operation

Typical Points Archived

- Fan static – trend setpoint/actual
- Air/water temperature – trend setpoint/actual
- Schedule – trend fan control signal

Case Study

Building 1

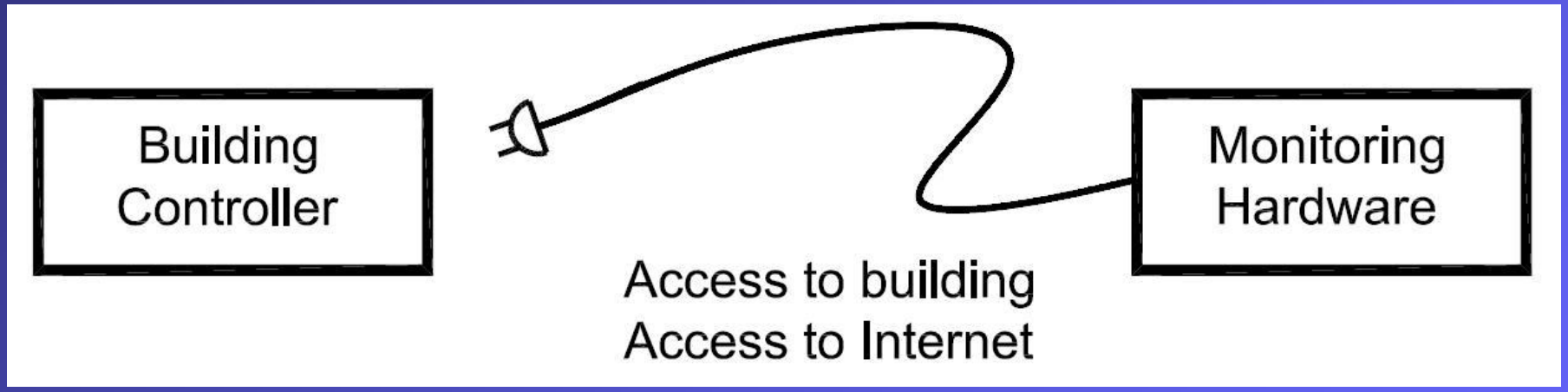
- ~400,000 sf, 20-story office tower
- 3600 MBH gas-fired boiler
- (2) chillers at ~550 tons
- common cooling tower
- 1 dual-duct AHU on each floor (20)
- 8 weeks tracking

Case Study

Building 2

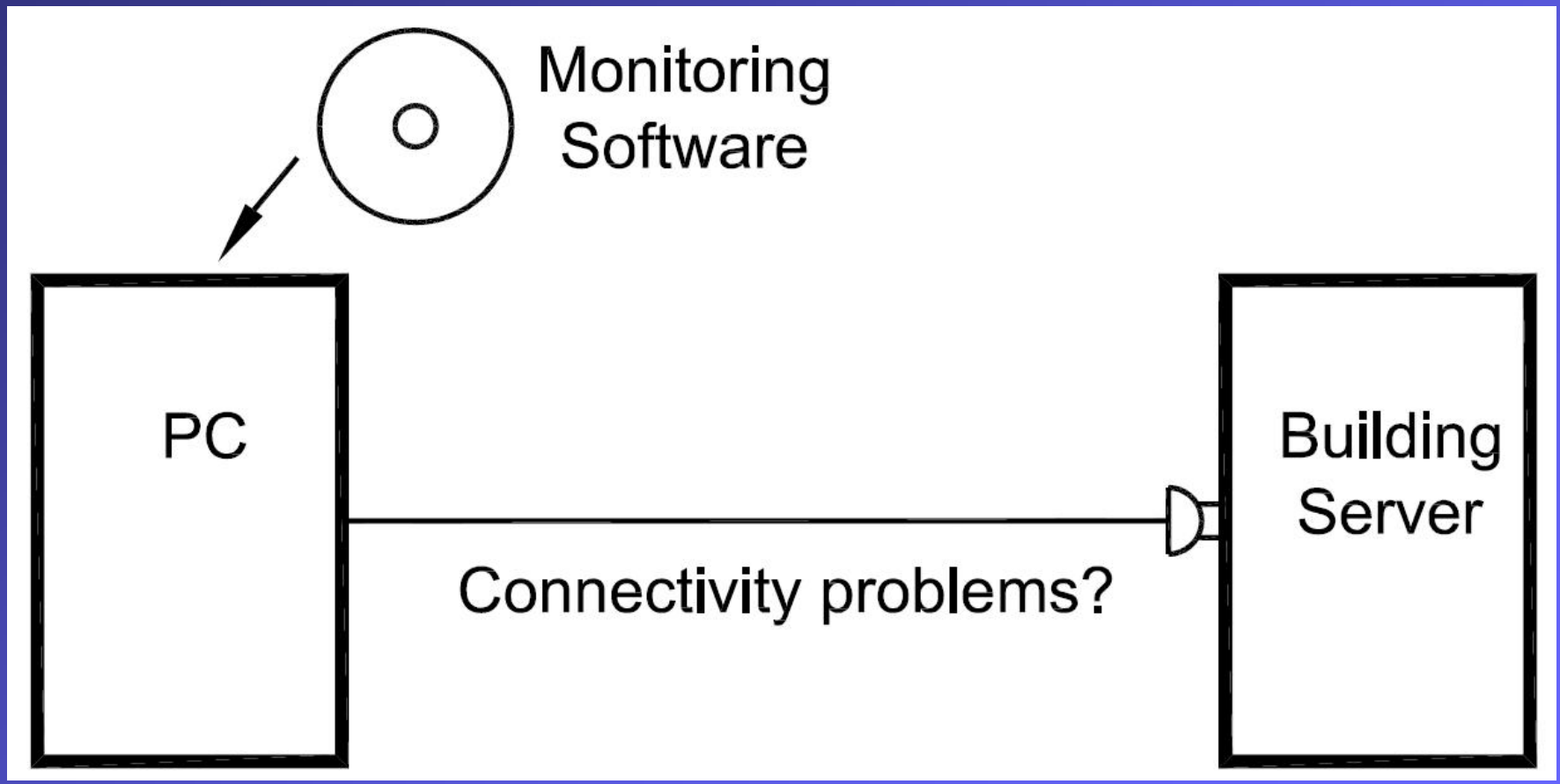
- ~600,000 sf, 30-story office tower
- 2400 MBH gas-fired boiler
- (2) chillers at ~550 tons
- common cooling tower
- (4) AHUs serve multiple floors
- 5 weeks tracking

Persistence Tracking System



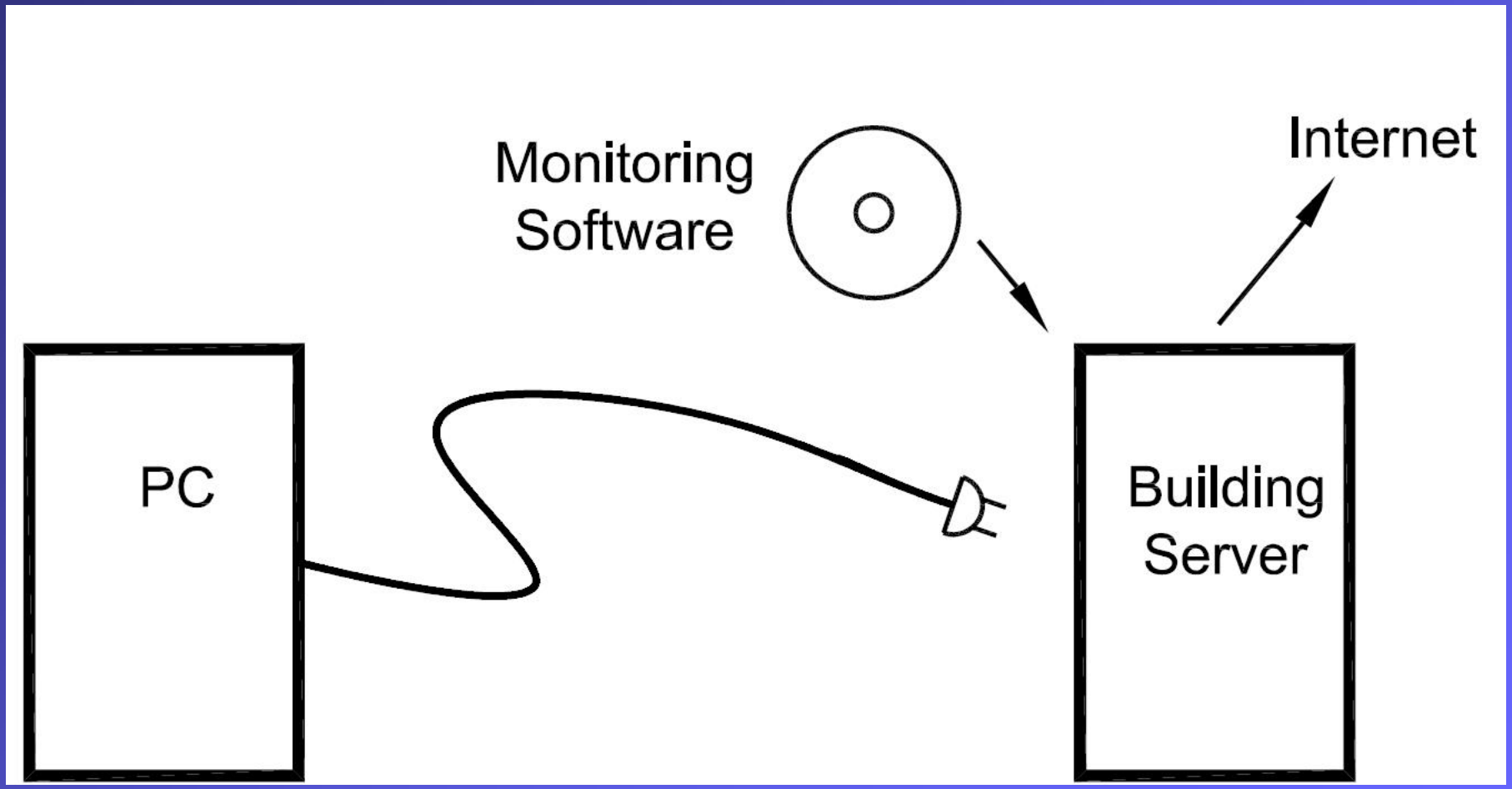
Building 1, relatively simple BAS

Persistence Tracking System



Building 2, relatively complex BAS

Persistence Tracking System



Building 2, tracking solution

RCx Measure Persistence Summary

Measure	Measure held?		
	Yes	*Partial*	*No*
Revise lobby AHU schedule	√		
Revise AHU cold deck pressure setpoint		√	
Reduce chiller plant condenser water setpoint			√

Building 1

Measure	Measure held?		
	Yes	*Partial*	*No*
Correct uneven cooling tower flow	√		
Sequence chillers for serial operation	√		
Increase chiller plant supply temperature setpoint		√	
Reduce AHU-1 chilled water valve cycling			√
Implement AHU-4 supply air temperature reset		√	

Building 2

Building 1 Reduced Duct Pressure Measure

Unit	Maximum Pressure Setpoint (in. wc.)	% Time Above Recommendation
AHU-2	1.0	14%
AHU-6	1.2	56%
AHU-7	1.2	56%
AHU-11	1.0	79%
AHU-13	1.0	9%
AHU-14	1.0	100%
AHU-16	1.5	77%
AHU-19	1.5	20%
AHU-20	1.5	94%

Building 1 Issues

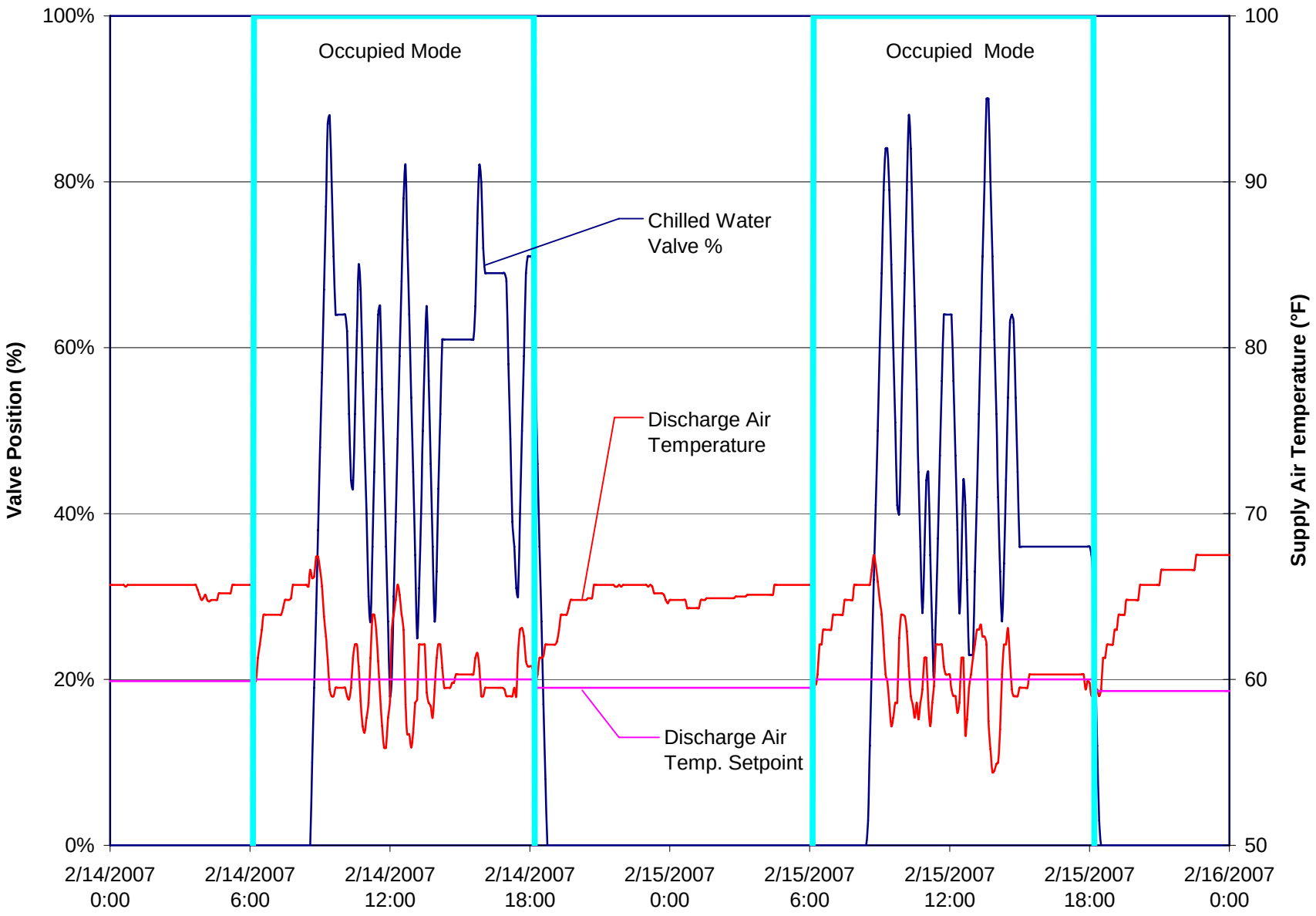
- Measures based on control strategy not there
- Chilled water measure not accepted
- Cold deck temperature setpoint not maintained
- Increase fan airflow to meet zone setpoints
- Cascade of events

Building 1 Solutions

- Demonstrate payback for chilled water sequence
- Establish line of communication for future issues
- Additional balancing issues may still be present

Building 2 Supply Air Temperature Reset

Building 2 Chilled Water Valve Cycling



Building 2 Issues

- Chilled water control not exactly as recommended
- Supply air control not exactly as recommended
- Valve control not tuned for all operation

Building 2 Solutions

- Coordinate programming with contractor
- Review reset schedules
- Review reset inputs (temperature vs. load)

Common Issues/Solutions

- Owner/provider feedback loop needs to be in place
- Programming/narratives must be part of verification
- Cascade of events should be considered
- Verify final recommended/accepted measures!

Program Success

- Many measures have been easy fixes
- Measure degradation can be addressed
- Thorough analysis has identified additional issues
- Improvement is expected in future monitoring

Conclusions

- Retro-commissioning is extremely beneficial
- Persistence tracking is a missing piece of the puzzle
- Continuous, long term monitoring required
- Communication essential in addressing issues

Questions?

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