RTEM: Gaps & Solutions

Building Performance Lab
CUNY Institute for Urban Systems
Sponsorship

• An ambitious effort by NYSERDA to incentivize the buildings market to move towards advanced, information-enabled controls

• Broadly supported by NYC DEM to accelerate building efficiency through enhanced operations
The Critical Questions

Thinking of upgrading your BAS?

• How do I make this decision?

• What should I expect in the end?
The Vision – Emerging Capabilities

BAS:
Building Automation System

**FIGURE 1** BAS INFORMATION FLOWS – ORIGINAL AND EMERGING
GAPS

Various “GAPS” inhibit market decisions

• GAP-1: What can the existing BAS do? What upgrades are needed?

• GAP-2: What should the new application do? What should I expect from a vendor when they are all telling me slightly different stories?

• GAP-3: What if I don’t have a BAS to build on?
Addressing the GAPS

CUNY BPL does applied research with focus on:

• Energy efficiency in building operations
• Building Automation Systems and derived analytics, dashboards
• Operator decision-making

Research has led to solutions that address the RTEM GAPS
Gap-1/Solution-1
What Can My BAS Do?

Building Automation System Assessment Tool  BASAT – the starting point

• Captures the building systems connected and their sensors

• BASAT assesses a BAS for the functionality it provides: can it support Building Re-tuning? Demand Response? Does it provide information needed for Local Law 87 retro-commissioning and energy audits?
BASAT – Input Example

Please indicate if the following points are available from the BAS or additional sensors/meters. When finished, click "generate results".

<table>
<thead>
<tr>
<th>TEMPERATURES</th>
<th>COILS / VALVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Air Temperature</td>
<td>Chilled Water Coil Valve Position</td>
</tr>
<tr>
<td>Supply Air Temperature</td>
<td>Chilled Water Coil Valve Position Setpoint</td>
</tr>
<tr>
<td>Supply Air Temperature Setpoint</td>
<td>Chilled Water Entering Temperature</td>
</tr>
<tr>
<td>Exhaust Air Temperature</td>
<td>Chilled Water Leaving Temperature</td>
</tr>
<tr>
<td>Return Air Temperature</td>
<td>Heating Coil Valve Position</td>
</tr>
<tr>
<td>Supply Air Relative Humidity</td>
<td>Heating Coil Valve Position Setpoint</td>
</tr>
<tr>
<td></td>
<td>Re-Heat Coil Valve Position</td>
</tr>
<tr>
<td></td>
<td>Pre-Heat Coil Valve Position</td>
</tr>
<tr>
<td></td>
<td>Re-Heat Entering Temperature</td>
</tr>
<tr>
<td></td>
<td>Re-Heat Leaving Temperature</td>
</tr>
<tr>
<td></td>
<td>Pre-Heat Entering Temperature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DAMPER POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Air Damper Position</td>
</tr>
<tr>
<td>Return Air Damper Position</td>
</tr>
<tr>
<td>Exhaust Air Damper Position</td>
</tr>
</tbody>
</table>
BASAT – Output Example

**BASAT BUILDING AUTOMATION SYSTEM ASSESSMENT TOOL**

**To see the capability of the BAS to implement and monitor BRT - related control strategies, click on "Generate Results"**

<table>
<thead>
<tr>
<th>BUILDING &amp; BAS:</th>
<th>TRENDS TO LOOK FOR:</th>
<th>Available?</th>
<th>Points needed:</th>
<th>Points to Trend:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING:</td>
<td>Is reset being used to control the discharge-air set point?</td>
<td>Yes</td>
<td></td>
<td>Supply Air Temperature; Supply Air Temperature Setpoint</td>
</tr>
<tr>
<td></td>
<td>Is the discharge-air meeting set point, or do deviations occur?</td>
<td>Yes</td>
<td></td>
<td>Supply Air Temperature; Supply Air Temperature Setpoint</td>
</tr>
<tr>
<td></td>
<td>Are set points too high or too low, discharge-air temperature too warm or too cold?</td>
<td>No</td>
<td>Terminal Unit Reheat Valve Position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do the discharge-air temperatures remain relatively stable?</td>
<td>Yes</td>
<td></td>
<td>Supply Air Temperature; Supply Air Temperature Setpoint</td>
</tr>
<tr>
<td>AHU DISCHARGE - AIR TEMP CONTROL</td>
<td>Are outdoor-air temperature lockout set points for heating and cooling reasonable, do they overlap?</td>
<td>Yes</td>
<td></td>
<td>Outside Air Temperature; Chilled Water Coil Valve Position; Heating Coil Valve Position</td>
</tr>
<tr>
<td>AHU COOL:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BRT**

Results apply to the following:
AHU-1,2,3,4,5,6, CH-1,2,3, BLR-1,2,3

Metasya/5.2.18.0400 BAS has 28 out of 33 BRT trends available.
Gap-2/Solution-2

What Should the New Application Do?

“Minimum Standard of Care” – MSOC

• What minimum functionality should an owner should expect from an updated BAS?

• **Focus on the fundamentals** to manage energy e.g. KPIs, data capacities, inter-operability, external data sources

• Potentially evolve to third-party labeling

• We want industry input! ...Focus group participants from vendors / integrators, etc.
Gap-3/Solution-3
What If I Don’t Have a BAS?

Building Re-Tuning for buildings w/o a BAS: noBAS BRT

• A DEM-funded project to develop protocols to investigate building system performance

• A “kit-based” version of "Building Re-tuning”

• Includes a training component to teach the operators how to execute the process independently
noBAS BRT Example Installation

How is the boiler cycling, and what is the stack temperature?
noBAS BRT Example Output

Boiler 2 Cycling

Temperature (°F)

Date Time

Motor Status

Boiler 2 Stack Temperature
Boiler 2 Motor Status
Conclusion

• CUNY BPL is interested in your decision-process and is prepared to help as possible

• VERY interested in your thoughts about the MSOC concept – building focus groups

• Able to help you and your staff with energy efficiency training