Cray Liquid Cooling Control

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Cray XC40 Liquid Cooling Control

- **Monitor Before Operation**
  - Pressure at coil inlet is within range
  - Water temperature entering coil is within range
  - Environmental dew point is within range

- **Control During Operation**
  - Adjust coil inlet valve to maintain air temperature within range
  - Adjust fan speed to maintain CPU temperatures within range

- **Non Operational Control**
  - Power off: Coil inlet valve fully closed

- **Expectations of Facility**
  - Supply water temperature within range
  - Pressure differential & flow within range
  - Water chemistry within range
Cray Next-Gen Liquid Cooling Control Concept

- **Monitor Before and During Operation**
  - Pressure differential and flow across heat exchanger (HEX) is within range
  - Water temperature entering the HEX is within range
  - Environmental dew point is within range
  - Secondary fluid chemistry is within range

- **Control During Operation**
  - Adjust HEX valve to maintain:
    - Secondary supply temperature & dew point within range
    - Primary side flowrate & temperature within range
  - Adjust secondary pump speed to maintain:
    - Secondary side flowrate & pressure within range

- **Expectations of Facility**
  - Supply water temperature within range
  - Pressure differential & flow within range
  - Water chemistry within range
  - Optional: Facility communication with CDU
Future Opportunities

● Tighter integration of facility and CDU cooling controls
  ● Via SNMP/Ethernet/ModBus communication
  ● CDU telemetry data & control available: pressures, flows, temperatures, valve position, status, power..etc
  ● Commercial CDU vendors: Eaton Williams, Motivair

● Specific facility integration methods are TBD
  ● Need better understanding of benefits
  ● Facility cooling time response is a concern
  ● Control complexity and reliability is a concern
  ● Can’t preclude data centers not willing to “integrate”
  ● Historically Cray has intentionally isolated itself from the facility
  ● Future systems will open up more opportunities
Questions / Discussion?