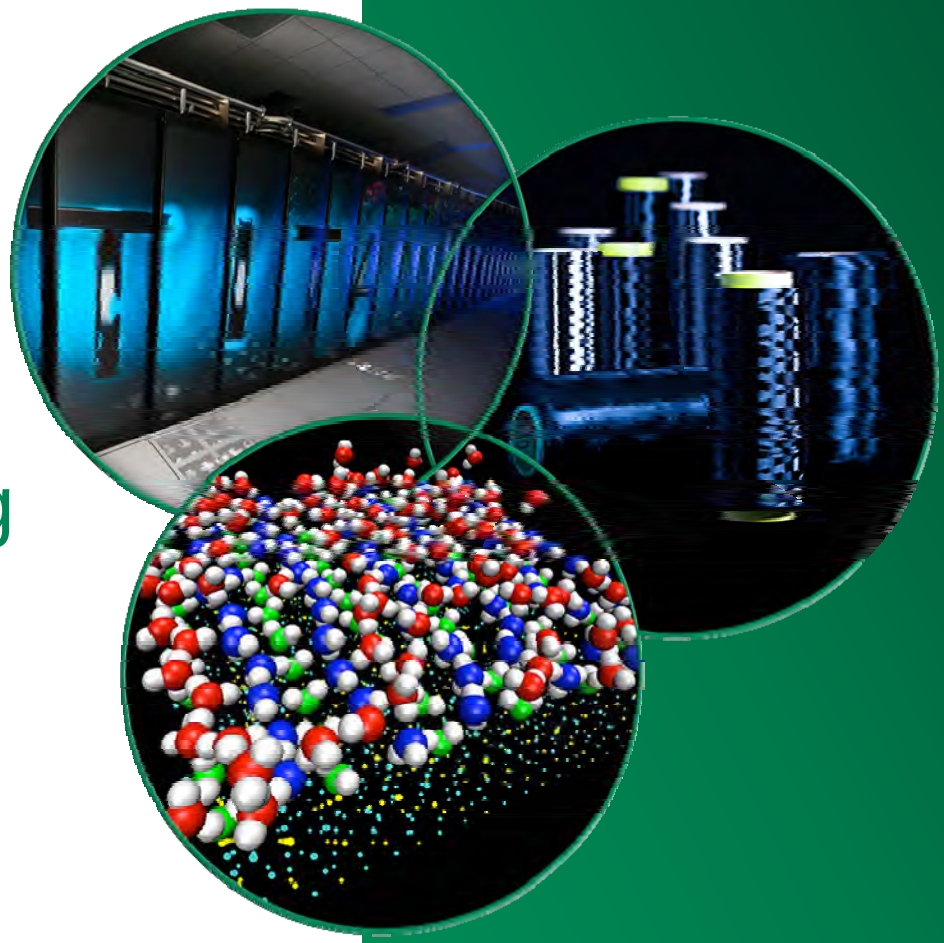
Oak Ridge National Laboratory

Computational Facilities Complex

DDC and Monitoring Systems



David Grant, PE, CEM
HPC Mechanical Engineer
Facilities Development Division

U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE U.S. DEPARTMENT OF ENERGY

Systems

Operations/Monitoring

*BAS – Mechanical Utilities - JCI DDC system

- Data Centers
  - CRACs – Modbus + Integrator (older)- BACnet moving forward
  - IRCs - BACnet
  - Space temperatures (N2)
  - Chilled water return temperatures (N2)
- Offices/Labs
  - VAVs (N2)
  - FCUs (N2)
- Central Energy Plants (CEPs)
  - Chillers – BACnet
  - VFDs – Pumps/Cooling Towers
  - Isolation valves
  - Other

Monitoring

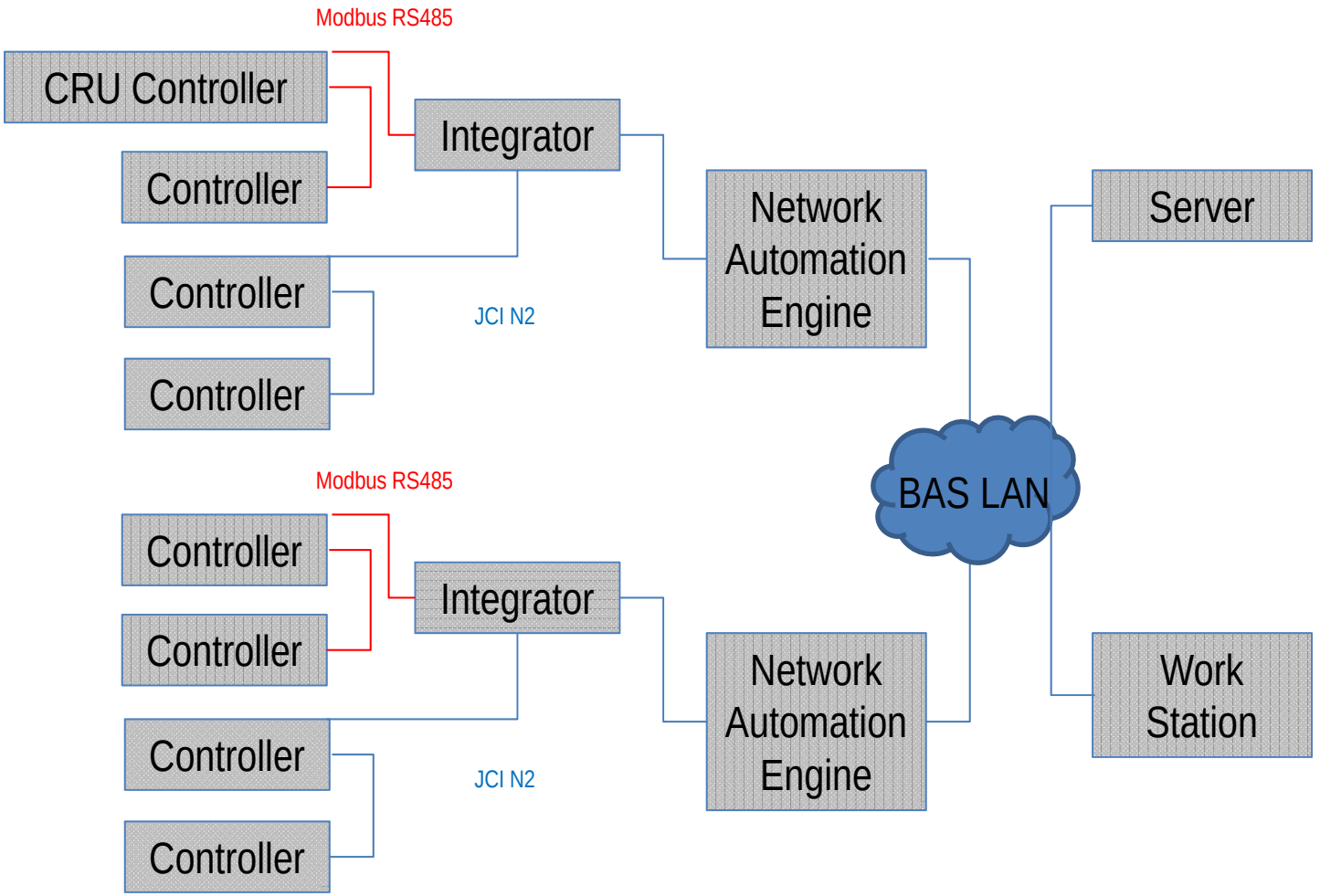
*ION – Power metering/System integration/Monitoring

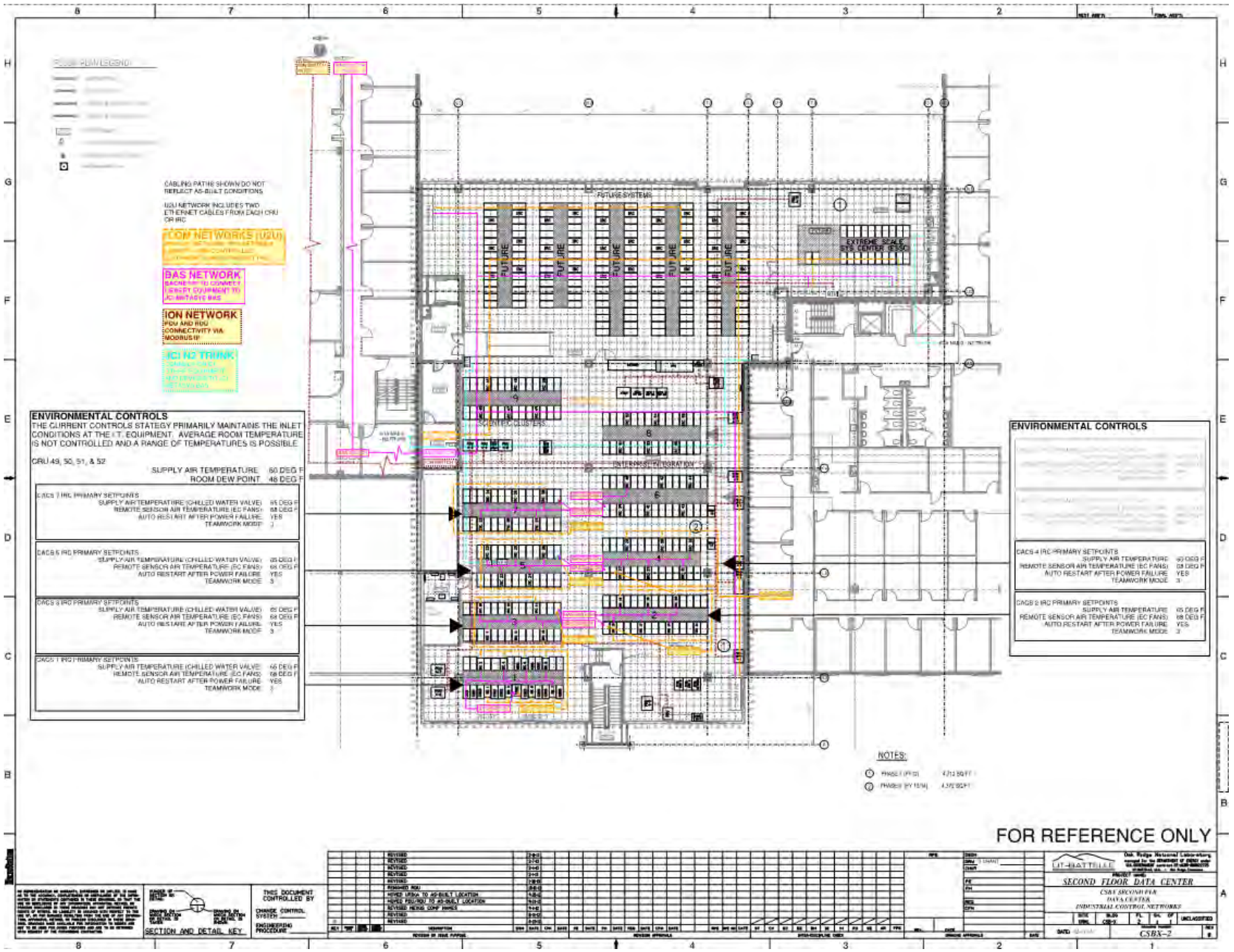
- Building Loads
- Data Center Loads
- IT System Loads
- Other Building Utilities
- Monitoring of selected information from the BAS system.

DCIM – Data Center Manager - Homegrown SNMP

- Space/Rack Management
- Rack inlet conditions and plug level power monitoring with smart powerstrips

* ORNL ICN





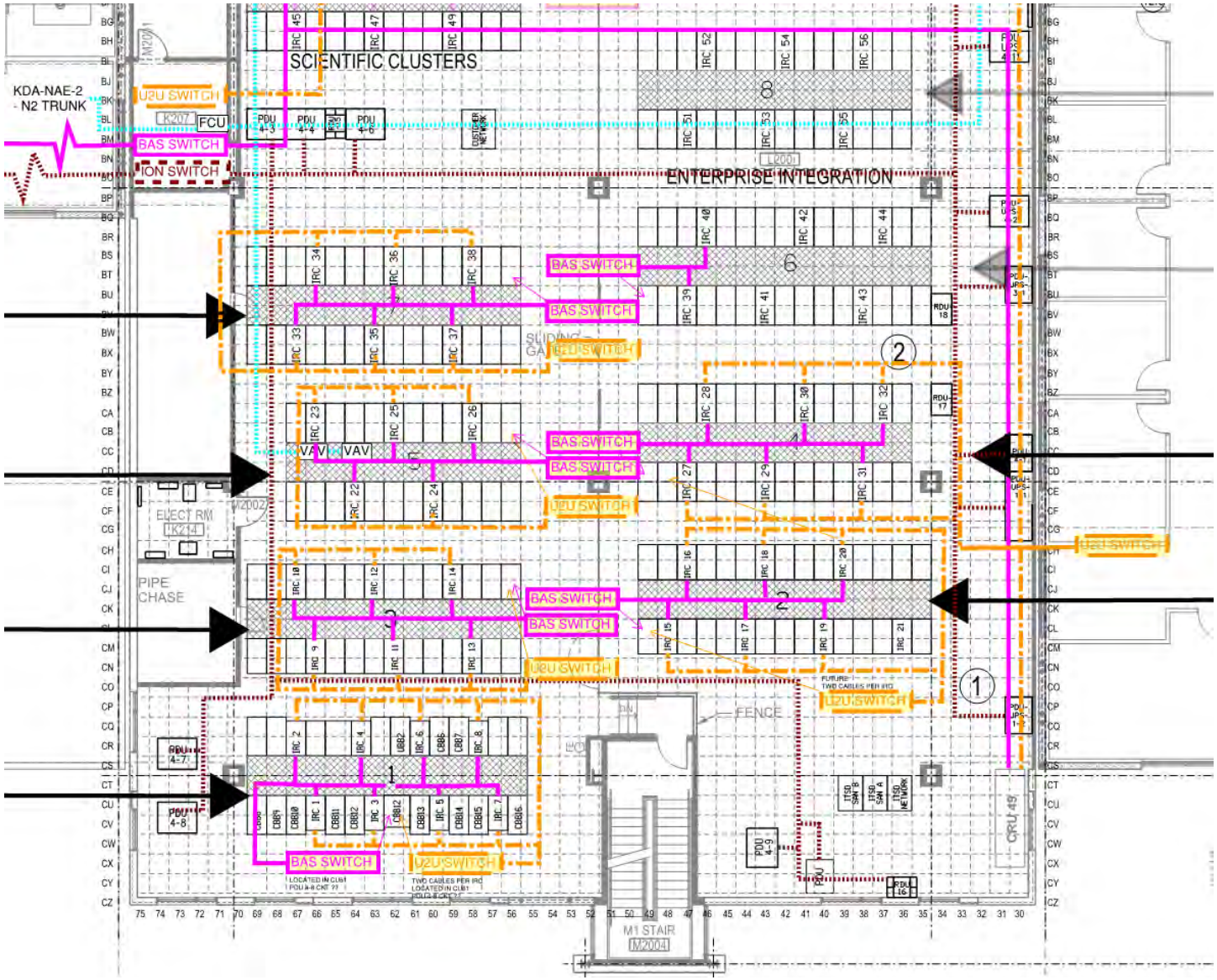
FOR REFERENCE ONLY

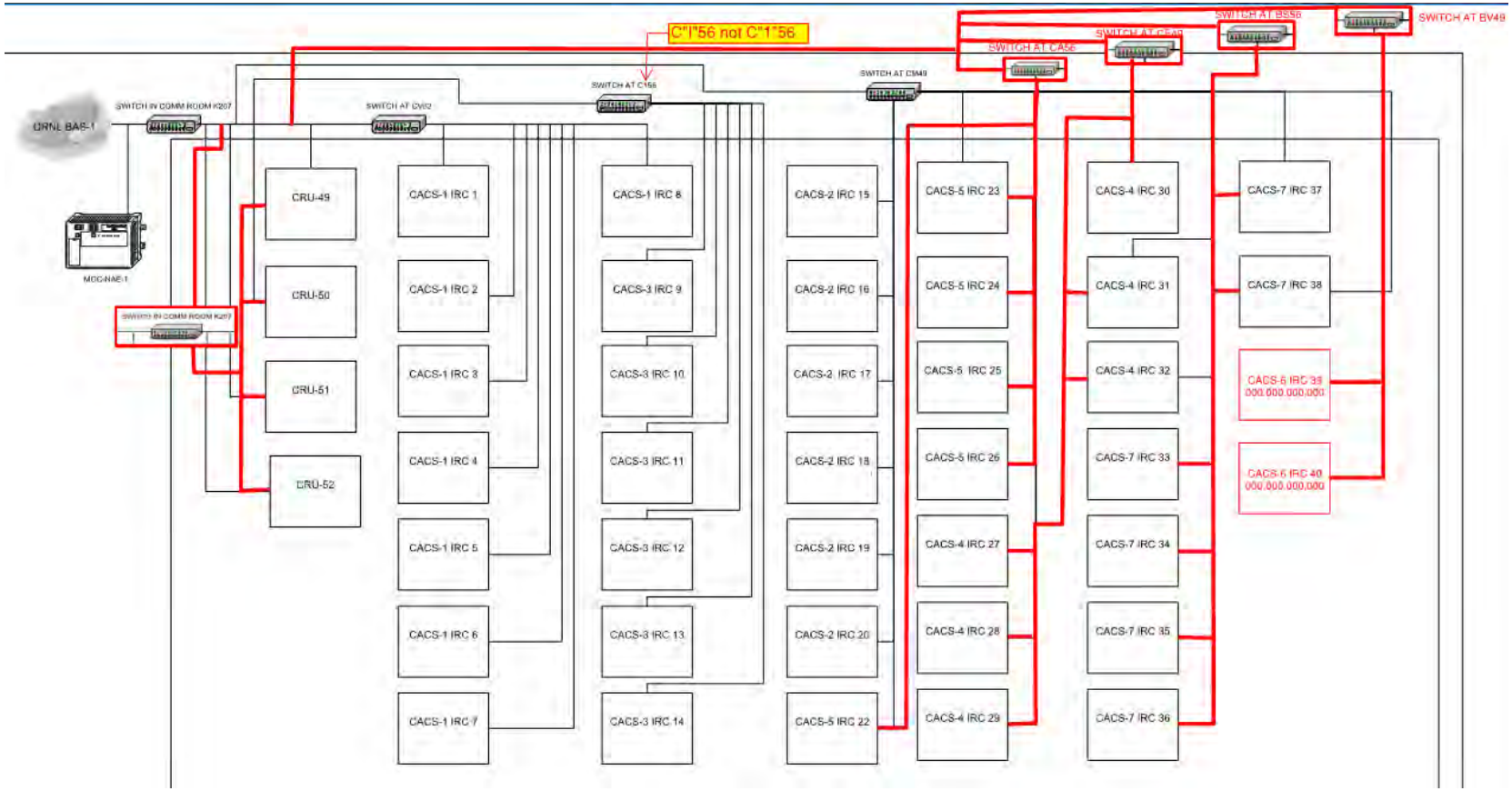
iCOM NETWORKS (U2U)
PRIVATE NETWORK (PN) BETWEEN LIEBERT iCOM CONTROLLED EQUIPMENT (4 INDEPENDENT PNs)

BAS NETWORK
BACNET/IP TO CONNECT LIEBERT EQUIPMENT TO JCI METASYS BAS

ION NETWORK
PDU AND RDU CONNECTIVITY VIA MODBUS/IP

JCI N2 TRUNK
CONNECTION OF OTHER EQUIPMENT AND DEVICES TO JCI METASYS BAS





Concerns/Interests

Hardware
- Single points of failure in CEPs

Software
- Firmware control
  - Point by point parameter checks
  - Vendor laptop vs owner laptop (security)
- Control Logic
  - System resilience
    - Load swings
  - Optimization for efficiency
  - Incorporate equipment availability
  - Reliability –
  - Performance indicators
- Feedback from the Computer systems
  - Scheduler – to work with energy optimization

Performance Indicators (born from experience with bad data)
- Applies to sensors and the equipment they serve
- Analog value range alarms
  - Temperatures
  - Pressures
  - Diff. Pressures
- Are control valves modulating with load (could indicate stuck valve)
- Are temperature sensors on same supply reading roughly the same temperature
- If a control valve is commanded closed does the downstream temperature change and settle at expected value?

Discussion

David Grant, PE, CEM
HPC Mechanical Engineer
Facilities Development Division
Oak Ridge National Laboratory
grantdr@ornl.gov