

The Villanova Thermodynamic Analysis of Systems (VTAS) is a holistic modeling tool for data center IT equipment and cooling systems.

What is VTAS used for?

- Pinpointing efficiency bottlenecks
- Optimizing equipment layout in a chosen cooling strategy
- Comparing different cooling strategies

How does VTAS work?

- Data center components are linked by fluid loops
- VTAS applies steady-state energy balances to size data center equipment
- 1st and 2nd Law Thermodynamic analysis is done on the chosen cooling solution

Why is this approach useful?

- A 1st Law analysis can predict performance metrics (PUE, WUE, ERE, etc.)
- A 2nd Law analysis can pinpoint efficiency bottlenecks and assess the viability of waste energy recovery
- A flow network approach enables transient predictions of system response to failure scenarios

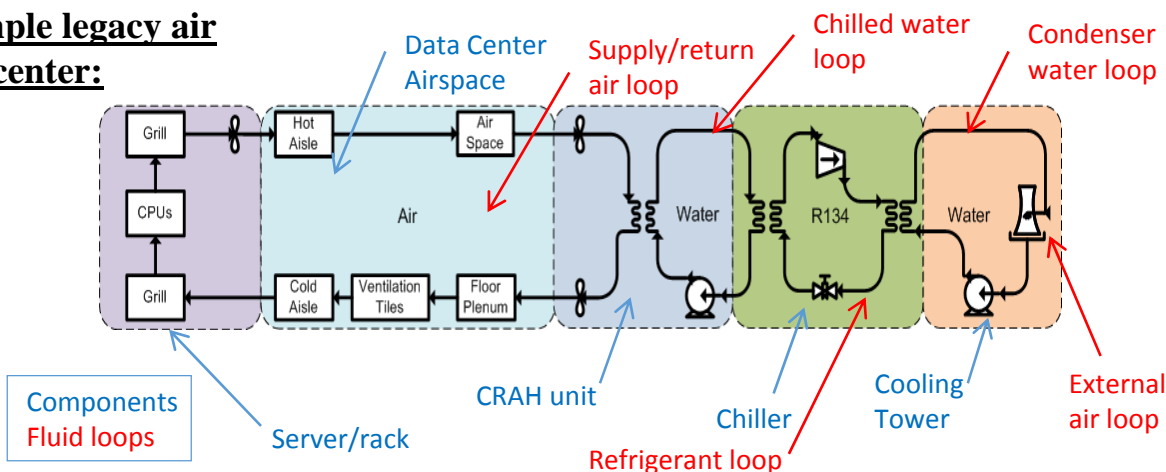
What components are available?

- Servers
- Junctions
- Fans/pumps
- Data center airspace
- Computer room air handlers (CRAHs)
- Computer room air conditioners (CRACs)
- Chillers
- Cooling towers
- Evaporative coolers & airside economization
- Rear door heat exchangers
- In-row heat exchangers
- Overhead heat exchangers
- Direct liquid heat removal (cold plates)
- Absorption refrigeration systems
- Organic Rankine cycle systems

What features does VTAS contain?

- Graphical User Interface (GUI)
- Import of climate data from database of 1000+ U.S. locations
- Link to airspace detailed CFD data
- User input checker
- Optimization and viability (parameter sweeping)
- System layout and component transient performance plotting

Example legacy air data center:



Questions? Contact Aaron Wemhoff at aaron.wemhoff@villanova.edu