From: Paul Bemis [mailto:paul.bemis@koolsim.com]
Sent: Friday, December 26, 2008 9:59 AM
To: Fanara.Andrew@epamail.epa.gov
Cc: Howard, Arthur; Duff, Rebecca M.
Subject: RE: IT Equipment heat loads

I had been on your site prior to my email and have reviewed the docs you referenced (attached). They are a great start and you certainly have the attention of the key industry players. What I believe needs to be added is the requirement to list the server power and flow rate specifications for each of the models (and configurations) the IT suppliers produce. This is very important information to the facilities planner as they need to account for the additional thermal load placed by these systems. I realize this number is configuration dependent and change vary by a factor of 3x depending on system configuration, but even supplying the max configuration loads would be better than nothing, which is what we are all dealing with today. The problem is each supplier (HP, Dell, Sun, Cisco) has their own way of supplying this information and it takes hours to determine the thermal load of a data center (assuming measurement is not an option). Dell has the best mechanism we have found call their DCCP tool. It provides the size, power consumption, and flow rate (CFM) based on a given configuration. The other suppliers keep their data in product data sheets or use tools (HP) that are specific to only their equipment (HP). If there were a central location (like yours) where a database was kept, maintained by the suppliers containing server models and environmental specifications in a consistent format, this would add a great deal of value. It would allow users to perform side by side comparisons to choose the most efficient solutions, and also provide some basis for thermal loading (maybe Dell would offer their tool for other to also populate for example.)

Today, IT suppliers explain the thermal loading issue by telling buyers that “it depends” on the configuration and therefore do not expose the thermal loads until the end of the discussion. This is done for two primary reasons: 1. It *does* depend on the configuration, so they will not know it until the buyer decides what they want, and 2. They do not want to expose their poor thermal performance for fear they will lose the sale. The IT suppliers have not considered themselves responsible for cooling their equipment, and (until your team came along) have assumed cooling is “someone else’s problem”. As a supplier of CFD modeling tools in the data center, knowing the exact thermal loads and flow rates in the server are critical to accurate thermal modeling. I strongly recommend you pressure the IT suppliers to be more clear and transparent about how much power their servers consume and make the thermal information a key component of the energy star specification so we can all benefit from it. And by having a side by side comparison, the energy efficiency of the server would become a key product differentiator, which is in your best interest.

With respect to the table, I would recommend eliminating some of the detail on the flow rates. For example, it now reads “Airflow at maximum fan speed (CFM) at nominal and at peak (35C ambient inlet) temperatures” which will require two entries, one for nominal, and one for peak. At the moment, most of the vendors are still using constant velocity cooling systems, so the CFM would stay constant independent of configuration. I realize this is changing and we are fast approaching dynamic loads, but in the interest of simplicity I would at least recommend the following:

Thermal Information (as reported in ASHRAE Thermal Guidelines, ASHRAE, Atlanta GA, 2004)	**Minimum Configuration**	**Typical Configuration**	**Maximum Configuration**
Total power dissipation (watts)			
Expected Temperature Rise (degrees F)			
Flow Rate (CFM) at peak (35C ambient inlet) temperature			
Flow Rate(CFM) at peak (35C ambient inlet) temperature			

Have the suppliers provide the peak flow rates at the max inlet temperatures for minimum ,typical, and maximum configurations. I would also (in the interest of simplicity) recommend you could eliminate the minimum flow rates row. It is true that the flow rate would increase in the case of high inlet temps and minimum configurations, but we already have the max flow rates from the previous entry and would assume it for simulation anyway. This would reduce the data required down to 9 entries.

With respect to the QP list, the minimum information we would need to model the load is the max power and flowrate. We can “derate” the values down to match the configuration. Most IT people know if the server is “max, min, or half full”. From this description we can linearly “guesstimate” the load and would typically use the max CFM number. This would be much better than what we have now.

Paul Bemis
President & CEO
Applied Math Modeling Corp.