

“Thermal Manage” Features and Benefits

Tech Note by

Hasnain Shabbir

Rick Hall

Doug Iler

Summary

This Tech Note covers the features and benefits of using the “Thermal Manage” features within the iDRAC Datacenter license.

Introduction

With increasing server densities and the desire to maximize compute power per unit area at the datacenter level, there is an increasing need for better telemetry and controls related to power and thermals to manage and optimize data center efficiency.

“Thermal Manage” includes features of the iDRAC Datacenter license and provides key thermal telemetry and associated control features that facilitate deployment and customization challenges.

Thermal Manage – Feature Overview

Thermal Manage allows customers to customize the thermal operation of their PowerEdge servers with the following benefits:

- Optimize server-related power and cooling efficiencies across their datacenters.
- Integrates seamlessly with OpenManage Enterprise Power Manager for optimized management experience.
- Provides a state-of-the-art PCIe cooling management dashboard.

Represented in the following diagram (See figure 1) and listed below is a summary of the features and its utilities.

1. **System Airflow Consumption:** Displays the real-time system airflow consumption (in CFM), allowing airflow balancing at rack and datacenter level.
2. **Custom Delta-T:** Limit air temperature rise from inlet air to exhaust to right-size your infrastructure level cooling.
3. **Exhaust Temperature Control:** Specify the temperature limit of the air exiting the server to match your datacenter needs.
4. **Custom PCIe inlet temperature:** Choose the right input inlet temperature to match 3rd party device requirements.
5. **PCIe airflow settings:** Provides a comprehensive PCIe device cooling view of the server and allows cooling customization of 3rd party cards.

Details and Use Cases

By default, Dell server thermal controls algorithm works to minimize system airflow consumption and maximize exhaust air temperature. The higher the air exhaust temperature going into the HVAC (CRAC units) – the higher capacity they exhibit.

- It is directly proportional to the temperature difference between return air (exhaust) and the cooling coil for a given coil flow rate.
- This could result in lower CRAC capital costs if you can cool more with fewer CRAC units and an operational savings of cooling with less equipment.

Some customers, however, have challenges with high exhaust temperatures in the hot aisle, namely:

- Technicians don't like the extra heat while working in the hot aisle.
- Components in the hot aisle (PDUs, cables, network switches) may have exceeded their ambient temperatures.

In either case, we allow customization of this exhaust temperature via iDRAC interfaces.

Using the real-time airflow telemetry, a datacenter can create a good balance of airflow delivery vs. airflow demand at the server. A reduction in CFM also can be monetized on a dollar/CFM basis.

- In an example analysis using a 17 KW rack, a drop in CFM by 10% could result in capital savings (CRAC costs of \$257/rack) and an annual operational savings of \$93 per rack based on the typical energy cost and data center efficiencies assumed.
- However, the greater benefit is the potential ability to fit more racks on the floor (or more servers in a rack), if airflow balancing is achieved by closely matching the server/rack airflow consumption.

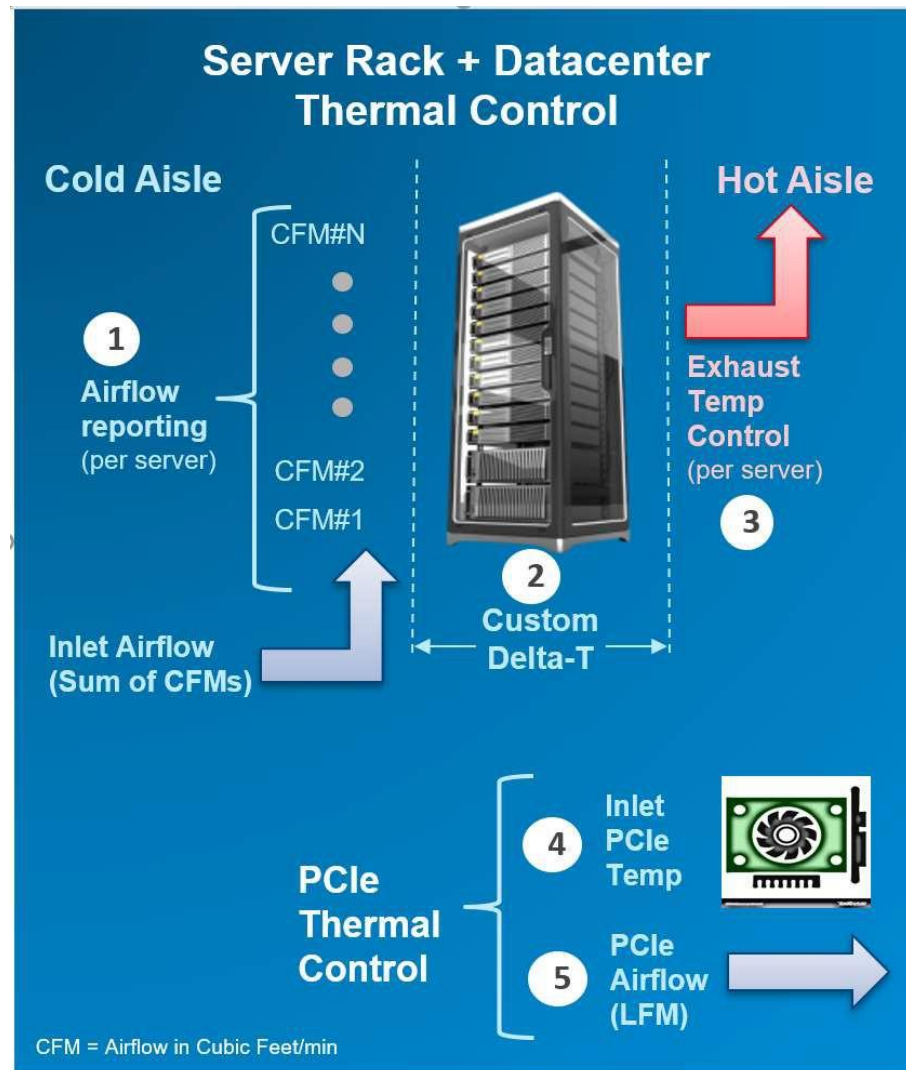


Figure 1 displays the features and its utilities.

iDRAC Thermal Manage features require an iDRAC Datacenter license. Here is an image from the iDRAC GUI showing the thermal telemetry and customization options:

▼ Cooling Configuration

The screenshot displays the 'Cooling Configuration' section of the iDRAC GUI. It includes several settings:

- Automatic Fan Speed Calculation:** Thermal Profile Optimization is set to 'Default Thermal Profile Settings (Maximum Performance)'.
- Fan Speed Offset:** Fan Speed Offset is set to 'Off'.
- Thresholds:**
 - Current Temperature Readings: System Inlet Temperature is 22°C (71.6°F) and System Exhaust Temperature is 25°C (77.0°F).
 - Exhaust Temperature Limits: The 'Set Maximum Exhaust Temperature Limit' checkbox is unchecked, with a dropdown menu set to 'Default, 70 °C (158.0 °F)'.
 - Target Exhaust Temperature Limit is 70°C (158.0°F).
- Minimum Fan Speed in PWM (% of Max):** Set to 'Default' with a range of 25 - 100.

Buttons for 'Apply' and 'Discard' are located at the bottom of the configuration area.

Deploying 3rd party PCIe cards in PowerEdge servers is a common practice. The PCIe airflow settings feature allows a better understanding of the cooling state of the PCIe devices. This helps customers protect their high-value PCIe card with the right amount of cooling. Additionally, this optimizes system airflow, which ties into the earlier point of data center airflow management.

By default, the presence of a 3rd party card may cause the system fan speeds to increase based on internal algorithms. However, this additional cooling may be more or less than required and hence the need for allowing customers to customize airflow delivery to their custom card.

In the iDRAC GUI under PCIe Airflow Settings (Dashboard » System » Overview » Cooling » Configure Cooling – see example snapshot below), the system displays high-level cooling details for each slot in which a card is present. It also displays the max airflow capability of each slot. This airflow information is provided in units of LFM (Linear Feet per Minute), which is industry standard for defining the airflow needs for a card. Only for the 3rd Party Card, customers can see min LFM value delivered to the card and either disable the custom cooling response for that card or disable and then set custom LFM value desired (based on card vendor specifications).

NOTE: For Dell standard devices, the correct power and cooling requirements are part of the iDRAC code, which allows for the appropriate airflow.

PCIe Airflow Settings

Apply Discard

PCIe Slot		PCIe Card Classification					
PCIe Slot	Max LFM	Inlet Temperature	3rd Party Card	Type	Target LFM	LFM Mode	Custom LFM
1	750	29 °C (84.2°F)	Yes	Fibre Channel	118	Automatic	0
2	710	31 °C (87.8°F)	No	NonRAID	Airflow Controlled	Automatic	0
3	510	34 °C (93.2°F)	No	CoProcessor	Airflow Controlled	Automatic	0
4	530	28 °C (82.4°F)	No	Unknown	Airflow Controlled	Automatic	0
5	470	30 °C (86.0°F)	No	NIC	Airflow Controlled	Automatic	0
6	670	32 °C (89.6°F)	No	NIC	Airflow Controlled	Automatic	0
7	690	30 °C (86.0°F)	No	PCIeSSD	Airflow Controlled	Automatic	0
8	710	32 °C (89.6°F)	No	AHCI	Airflow Controlled	Automatic	0

In Conclusion

Thermal Manage features within the iDRAC Datacenter provides industry-leading custom thermal control options that provides valuable custom cooling and efficiency optimization options for both the system and data center level.



PowerEdge DfD Repository
For more technical learning



Contact Us
For feedback and requests



Follow Us
For PowerEdge news