



Reliability in Dell EMC PowerEdge Servers

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SUMMARY

Dell EMC follows a designated design for reliability process to ensure that Dell EMC PowerEdge servers are able to meet and exceed customer expectations. This reliability process covers three areas:

- Component
- Subsystems
- System

In addition to adhering to rigorous reliability processes, Dell EMC also conducts research on reliability in a variety of environmental conditions to develop means to keep systems up and running.

Reliability is the quality of performing consistently well, and for Dell EMC, well over time. Reliability is designed in to PowerEdge servers, and is constantly evaluated and improved throughout the server lifecycle. Full in house test and analysis capabilities allow Dell EMC to develop and implement robust product qualification and release procedures.

Dell EMC Design Guidelines

Dell EMC server design-to-criteria includes:

- Servers to operate continuously at 40C degrees/80% relative humidity, and allow for short term excursions to 45 degrees C and 90% relative humidity. [Note also that a 40C/85%RH capability is configuration specific, but the vast majority of DELL EMC Server configurations allow for these conditions.]
- Additional design life margin, and accommodation for lifetime limited warranty
- Potential deployment in uncontrolled environments – locations with polluted air and dust
- Customer special requests – for example, higher shock and vibration tolerance

Dell EMC Design for Reliability Process

The Dell EMC Reliability Engineering team is part of the Server product development team and has developed a full suite of procedures, many based on industry standards, which define DfR, Subsystem Qualification, Ongoing Reliability Testing, Validation, Shock and Vibration, and associated Failure Analysis requirements. This suite must be met and fulfilled before any product is released.



Figure 1: Dell EMC environmental test chambers

Dell EMC uses internally developed web-based design for reliability (DfR) tools for systems development. In addition to using these tools at Dell EMC, we require that our supply base use these tools in their product development processes to ensure our suppliers also design in reliability.

Design for Reliability Begins at the Component Level

Dell EMC reliability starts with choosing and approving component suppliers. Dell EMC specifies JEDEC qualified components from all suppliers (JEDEC is a global industry group that creates standards for broad range of technologies). To ensure enterprise-class reliability, Dell EMC may require qualification testing beyond the standard JEDEC suite depending on the nature of the component – new, unique, different, and difficult or NUDD. Dell EMC has specific qualification requirements for NUDDs.

Subsystem Level Comes Next

Dell EMC defines qualification protocol for all subsystems (HDD, SSD, PSU, fans, memory, PCIe cards, PERC, and daughter cards) and ensures that the supply base executes to Dell EMC requirements. Dell EMC does this by:

- Defining test requirements, sample sizes, ramp rates, durations, and accept/reject criteria
- Reviewing and approving results, and addressing qualification fails, if any
- Auditing product by conducting our own in house testing
- Auditing supplier factories
- Requiring ongoing reliability testing (ORT) on all subsystems throughout their shipping life

The System is the Third Level of Reliability

Dell EMC does extensive testing and analysis of all systems during development and prior to release:

- Dell EMC has developed and refined a suite of multiple environment over-stress validation tests that it executes on every system during its development and prior to release
- Dell EMC has a separate suite of shock and vibration tests, many of which are industry-standards-based, that we execute on every system prior to release
- Dell EMC has full internal capability to analyze test fails

Dell EMC Reliability is designed in, and closes the loop from the component level, to subsystem level, to system level. Our product qualification and release systems ensure that strict design criteria, including deployment life, additional deployment life margin, as well as accommodation for lifetime limited warranty, are met before product is launched.

This qualification and release system is based on industry standards, and on our own rigorous methods which have been developed and refined over multiple generations of PowerEdge products. This includes Ongoing Reliability Testing (ORT) on components and subsystems, which is required to be implemented throughout the shipping life of PowerEdge servers.

Dell EMC's focus is on Design for Reliability, using internally developed web based tools. Full in-house capabilities allow Dell EMC to conduct all phases of product qualification and release in house, including multiple environment overstress tests, shock and vibration tests, and failure analysis.

Dell EMC also conducts research on long term reliability of our products in expanded operating environments. This research began in 2008 – PowerEdge 11th Generation was the first generation of PowerEdge that benefited from the results of this research (Dell EMC designs and warrants to 40C continuous operation – PowerEdge products survive this – and Dell EMC engineers know how and why). This research, and associated multi-million dollar investments in applied research facilities, allow Dell EMC to continue to conduct research and expand the type of research conducted on standard Dell EMC PowerEdge products. In addition Dell EMC researches the effects of accelerants and pollutants on our products, and is developing methodologies that notify users of adverse conditions.