The Dell EMC PowerEdge R640 Unique NVMe Implementation

When designing a server, Dell always seeks to optimally utilize all the capability of each of the components. Every server generation has its own limitations but each also provides new opportunities for design allowing Dell to provide new implementations that can help drive performance in a system.

Throughout a server, one of the most utilized areas of a server is always the PCIe bus lanes coming off of the processor. Typically, Dell maximizes the use of most of those lanes for the PCI slots. The 1U PowerEdge R640 gave Dell a unique opportunity though since this generation of processor added PCI lanes - from 40 to 48. This addition allowed Dell to use more of the lanes at the front of the server instead of the back.

At the front of the server, Dell also worked with the industry a few years previously to establish a standard for ultra fast Non Volatile Memory Express (NVMe) solid state drives (SSD). These drives can directly connect into the front PCI lanes. The combination then of more PCI lanes along with NVMe drives provides the potential for an ultra high performance solution for up to 8 NVMe drives on the PowerEdge R640. Using the 48 lanes, 8 drives optimizes the total PCI lanes without any drive sharing lanes.

Optimized Performance and Cost

The benefits of this implementation include:

- Lower Latency – the drives attach directly to the processor
- No need for a HBA to run the NVMe drives
- Power reduction – the eliminated HBA uses 7W to 15W of power

While many workloads and use cases require more PCI slots or NVMe drives, for solutions needing a smaller amount, this is a great way to use the direct implementation of the NVMe drives to provide high performance at a low cost. Dell designed this solution for users seeking to take advantage of the best performance possible for a small amount of NVMe’s when minimizing the amount of data center space used in a 1U server.