Dell PowerEdge R750 server featuring a modern 100Gb Broadcom 57508 NIC achieved higher bandwidth in iPerf tests

Compared to enabling the same bandwidth capability using four 25Gb NICs

In theory, enabling 100Gb network bandwidth should be possible by combining multiple smaller network interface cards (NICs). In reality, a piecemeal NIC solution must use some overhead to work together, and the often unpredictable nature of balancing multiple network streams across different network interfaces means that performance may not always be what you'd expect.

In the Principled Technologies data center, we used the synthetic iPerf test tool to test the maximum available bandwidth of two solutions:

- A Dell PowerEdge R750 server with Broadcom® 57508™ Dual Port 100Gb network interface card

- The same PowerEdge R750 server with four 25Gb NICs (Note: We used two dual-port NICs to achieve our 4 x 25Gb NIC configuration.)

We found that the PowerEdge R750 with Broadcom 57508 NIC offered stronger and more consistent bandwidth performance (see page 3) across all numbers of instances (TCP streams) we tested. For example, at four TCP streams, the Broadcom 57508 solution achieved an average of 99.1 Gb/s during the test, while the four-NIC solution achieved an average of just 65.6 Gb/s.

These results show the potential benefits of selecting a server with a single 100Gbe NIC to better optimize bandwidth performance.

Up to 2.3x the Gbps

at two instances, over an average of 15 runs

100% bandwidth consistency

at four TCP streams, compared to the four-NIC solution, which achieved maximum throughput twice over 15 runs

Maximize bandwidth with the 100Gb Broadcom 57508

We ran iPerf with different numbers of TCP streams to learn how adding traffic affected bandwidth performance. Figure 1 compares the bandwidth in Gbps that both solutions achieved over 15 test runs using varying numbers of TCP streams. Across all TCP stream counts, the Dell PowerEdge R750 server with additional Broadcom 57508 Dual Port 100Gb NIC achieved more average Gbps than the same server with four 25Gb NICs.

At a single TCP stream (or instance), there isn't enough traffic to make use of the 100Gb capacity. Still, the single Broadcom 57508 more than doubled the bandwidth of the four-NIC solution. At two TCP streams and beyond (through 32 streams), the server with the Broadcom 57508 NIC maximized its bandwidth, averaging over 99 Gbps.

In contrast, the four-NIC solution averaged only 42 Gbps at 2 streams, 65 Gbps at 4 streams, 81 Gbps at 8 streams, and 97 Gbps at 16 streams. Only at 16 and 32 streams did the four-NIC solution achieve its highest bandwidth, an average of 98 Gbps.

About iPerf

iPerf is a synthetic network test that measures maximum bandwidth. Test options include TCP, SCTP, and UDP; for our testing, we used TCP streams. iPerf generates TCP streams and then measures the bandwidth available, packet loss, and more.

To get more information on the iPerf test tool, visit https://iperf.fr/.

iPerf results Gbps | Higher is better   ● 1x 100Gb NIC (Broadcom 57508) solution   ● 4x 25Gb NIC solution
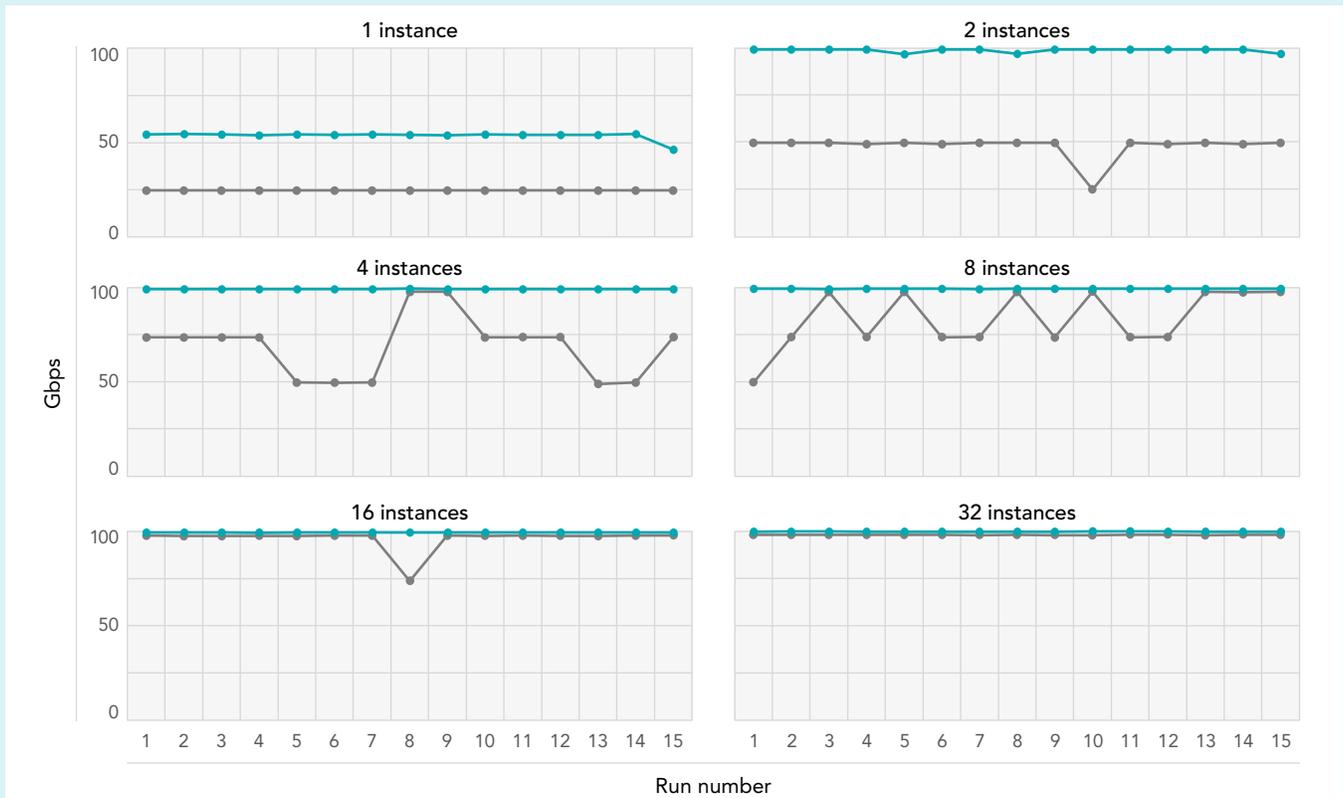

Figure 1: iPerf results, in Gbps, for the two NIC solutions. Higher numbers are better. Source: Principled Technologies.

See consistently high bandwidth using a single Broadcom 57508 NIC

Another meaningful way to look at performance is to assess bandwidth consistency as the streams traveled across the network. Figure 2 shows one such comparison: the performance for the four TCP streams over the various test runs, where the performance of each data stream is a different shade. While the Broadcom 57508 solution maximized usage of its 100Gb capacity and divided the allotted space evenly between the four data streams, the four-NIC solution did not make use of its theoretical 100Gb maximum, and the four streams traveled at inconsistent rates.
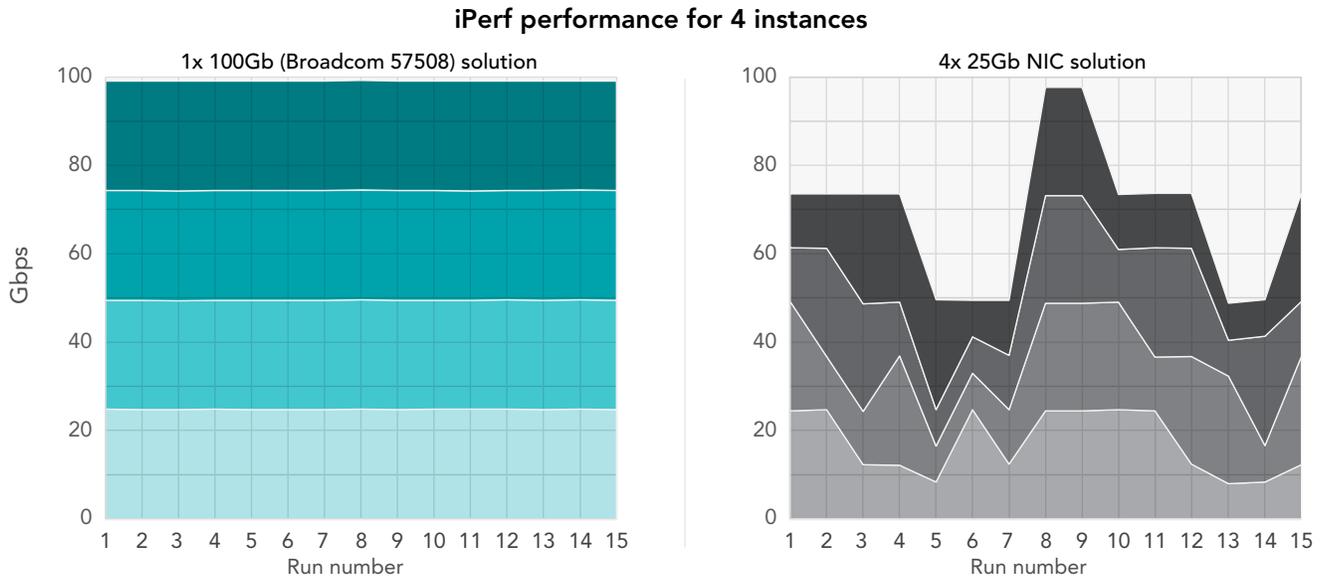
iPerf performance for 4 instances

Figure 2: iPerf results, in Gbps, for four TCP streams. Higher numbers and more consistency is better. Source: Principled Technologies.

We saw this general trend of consistency across test runs and number of TCP streams.
To see the rest of the data for the other stream counts, visit the science behind the report.

About the Broadcom 57508 Dual Port 100GbE network interface card

Compatible with a wide range of PowerEdge servers, the Broadcom 57508 Dual Port 100GbE network interface card is ideal for data centers or cloud computing.[1] According to a Broadcom data sheet, some features of the NIC include:

- Dual-port pluggable media interface, compatible with a QSFP56/QSFP28 optical transceiver or a copper direct-attach cable
- Secure PCIe adapter solution leveraging Broadcom BroadSAFE® technology
- Multi-host support: Dual-Host x8 mode
- Compliance with the SFF-8402 standard
- x16 PCI Express 4.0 compliant
- SR-IOV with up to 1k virtual functions[2]

To learn more, read the data sheet at www.broadcom.com.

About the Dell PowerEdge R750 server

The Dell PowerEdge R750 is a full-featured, general-purpose 2U rack server featuring 3rd Gen Intel® Xeon® Scalable processors. According to Dell, the PowerEdge R750 is purpose-built to optimize application performance and acceleration with PCIe Gen 4.0 compatibility, eight channels of memory per CPU, and up to 24 NVMe™ drives.[3] It also includes "I/O bandwidth and storage to address data requirements – ideal for: traditional corporate IT, database and analytics, virtual desktop infrastructure, AI/ML, and HPC."[4]

To learn more about the Dell PowerEdge R750, check out the spec sheet at https://i.dell.com/sites/csdocuments/Product_Docs/en/poweredge-R750-spec-sheet.pdf.

Conclusion

While using multiple 25Gb NICs is an option to increase overall bandwidth of a server, our tests show that it may not optimize bandwidth usage as well as configuring your Dell PowerEdge R750 with a single 100Gb Broadcom 57508 NIC. Across tests using varying TCP stream counts, the Broadcom 57508 solution delivered higher bandwidth and more consistent performance than the same server with four 25Gb NICs. If your organization's applications demand consistent, fast performance, consider equipping your PowerEdge R750 servers with Broadcom 57508 Dual Port 100Gb network interface cards.

1. Broadcom, "BCM957508-P2100G Dual-Port 100 Gb/s QSFP56 Ethernet PCI Express 4.0 x16 Network Interface Card," accessed October 5, 2022, https://docs.broadcom.com/doc/957508-P2100G-DS.

2. Broadcom, "BCM957508-P2100G Dual-Port 100 Gb/s QSFP56 Ethernet PCI Express 4.0 x16 Network Interface Card."

3. Dell, "Dell EMC PowerEdge R750 Spec Sheet," accessed October 7, 2022, https://i.dell.com/sites/csdocuments/Product_Docs/en/poweredge-R750-spec-sheet.pdf.

4. Dell, "Dell EMC PowerEdge R750 Spec Sheet."

Read the science behind this report at https://facts.pt/60kJ64W ▶

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