DELL™ POWEREDGE™ FX2 SOLUTION SAVED ON HARDWARE AND NETWORKING COSTS

The Dell PowerEdge FX2 enclosure with FC630 servers provided extensive infrastructure savings* thanks to advanced architecture and space-efficient hardware design.

SAVINGS UP TO 28.5%

	Cable costs	10GbE card costs	I/O aggregators	Port costs
Dell	▬	▬▬	▬▬	▬▬▬▬▬▬
HP	▬▬▬	▬▬▬	▬▬▬▬▬ (not required for HP solution)	▬▬▬▬▬▬▬

Dell total: **$61,260**   HP total: $85,676
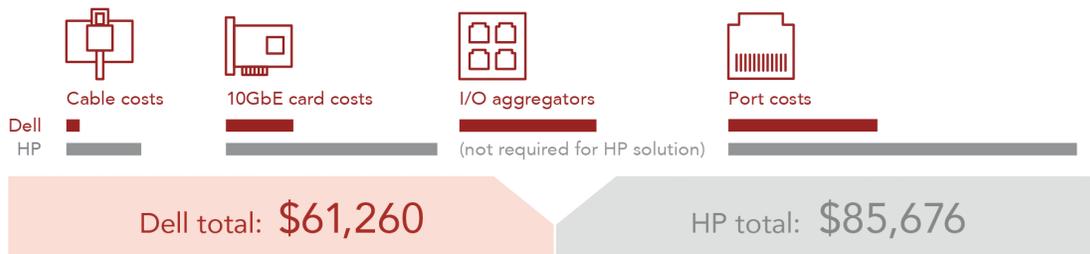
POWERED BY
THE INTEL® XEON®
PROCESSOR E5-2600
V3 PRODUCT FAMILY

*compared to HP ProLiant DL360 Gen9 rack servers

Those who manage enterprise data centers strive to increase their in-house server count while working within the constraints of their space, infrastructure, and budget. When examining costs, one often-overlooked advantage of choosing a high-density shared-infrastructure solution is the way it can reduce networking equipment requirements and provide cost savings through shared networking fabric components and cables.

The latest high-density, shared-infrastructure solution in the Dell portfolio is Dell FX converged architecture, a hybrid approach that combines the lower hardware cost of rack servers with the increased density you expect only in blade solutions. The core of the Dell FX architecture is the Dell PowerEdge FX2, a 2U chassis enclosure that holds Intel processor-powered compute and storage nodes and connects to the shared infrastructure I/O fabric via optional FN IO aggregators. By streamlining network traffic on the compute nodes in each Dell PowerEdge FX2, FN IO Aggregators reduce the number of cables and ports required.

In the scenario we examine in this report, Dell FN IO Aggregators more than offset their purchase price, reducing overall networking costs by 28.5 percent.

ADAPTERS, CABLES, AND SWITCHES – THE COSTS CAN ADD UP

When looking at datacenter hardware costs, it's easy to focus on the big-ticket items and overlook networking components such as ports, cables, and switches. The price of these components can be high and can add up quickly in the large quantities required to to keep your infrastructure up and running. Reducing and consolidating your networks can translate to some significant savings.

Adding redundant FN IO Aggregators to a Dell PowerEdge FX2 configuration with four Intel processor-powered Dell PowerEdge FC630 servers can consolidate and save on 10GbE network and 1GbE management cabling and port costs. We counted and compared the costs for these network components for a full rack of traditional 1U rack servers (42 servers), to the counts and costs for those components using the same number of FC630 servers in 11 Dell PowerEdge FX2 chassis, each with redundant FN IO Aggregators. We found that the FN IO Aggregators on the Intel processor-powered Dell PowerEdge FX2 chassis and Dell PowerEdge FC630 servers delivered:

- **A savings of more than $24,000** in network and port costs
- **A reduction in 10GbE cabling by up to 50 percent**, as demonstrated in our scenario by decreasing the number of cables from 84 for the 42 traditional rack servers to 42 for the same number of FC630 servers in the Dell FX2 infrastructure.
- **Decreased upstream top-of-rack (ToR) 10GbE ports by 50 percent**
- **Reduced LAN/SAN adapters by up to 47.3 percent**, as demonstrated in our scenario by decreasing the amount of adapters from one on each of the 42 rack servers to one on each of 22 IO aggregators on the 11 chassis, which would be shared by the daughter cards on the server nodes.
- **Reduced management cabling and upstream 1GbE ports by up to 73.8 percent**, as demonstrated by decreasing the number of cables from 42 for the 42 rack servers to 11 for the 42 FC630 servers.

ABOUT DELL POWEREDGE FN IO AGGREGATORS

With the Dell PowerEdge FX2 enclosure, you can use select network adaptors (SNAs) on the individual servers' blocks or consolidate the I/O of all the servers in the chassis using the optional FN IO Aggregators. Each Dell PowerEdge FX2 enclosure supports up to two FN IO Aggregators, each of which supports up to eight internal or external ports per chassis. These aggregators reduce upstream cabling and switch port usage by up to 4:1 for the half-width, half-height Dell PowerEdge FC630 servers. Figure 1 provides a simplified illustration. With the upcoming quarter-width, half-height Dell PowerEdge FC430 server blocks with eight servers per chassis, the reduction could potentially be greater.

Figure 1 shows an example of the Dell FN IO Aggregator compared to standard server configuration. The PowerEdge FX2 enclosure has two IO Aggregators installed for redundant purposes. Because the FN IO Aggregator is a converged networking system, the administrator can divide the network so that each port is shared by multiple FC630 servers, which reduces network cabling. A typical server, such as the HP ProLiant DL360 Gen9, requires you to plug in one cable per server, or two cables per server for redundancy, requiring many more network cables and switch ports.
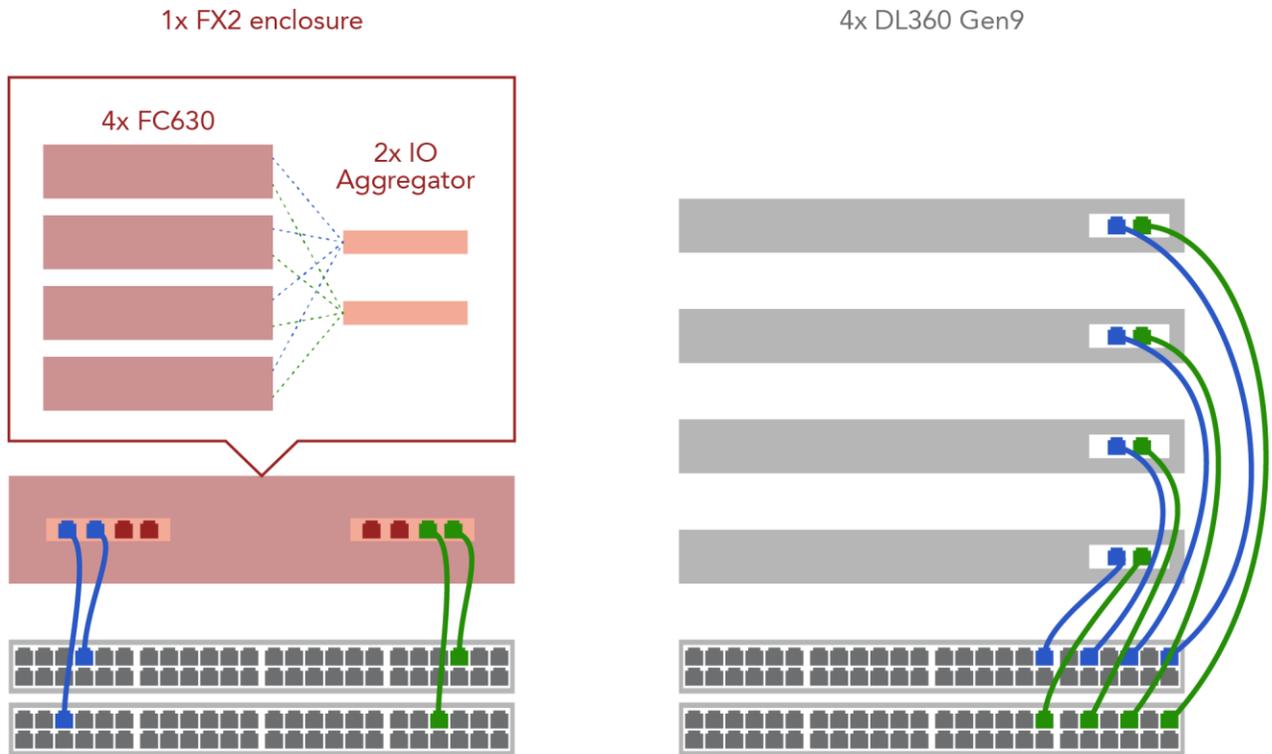

Figure 1: The FN IO Aggregator can reduce cabling and switch port usage.

Dell offers three models of FN IO Aggregators to provide options for Fibre Channel, Ethernet, or 10GBASE-T I/O upstream ports.

- FN410s 4-port SFP+ IO Aggregator, which we include in this analysis
- FN410t 4-port 10GBASE-T IO Aggregator
- FN2210s 4-port Combination Fibre Channel/Ethernet IO Aggregator

SAVE WITH DELL POWEREDGE FX2 FN IO AGGREGATORS

The shared infrastructure FX architecture can reduce network cabling complexity and network cabling and port costs significantly compared to rack servers. The multiple servers in a Dell PowerEdge FX2 chassis configured with an FN IO Aggregator can all share network and management cables and switch ports, whereas each rack server would need dedicated cabling. That consolidation cuts your cable and upstream switch costs, and simplifies cable and switch management. Additionally, these savings increase proportionally as your server count increases.

Less network complexity

For this study, we looked at the 10GbE networking and 1GbE management infrastructure for a full rack (42 servers) of a specific 1U rack server, the HP ProLiant DL360 Gen9 server, and the same infrastructure for the same number Dell PowerEdge FC630 servers in Dell FX2 chassis using FN IO Aggregators.

For our production network, we selected 10GbE networking, assuming that a typical server in both solutions would generate more than 1GbE network traffic, and accommodated for peak utilization traffic up to 5GbE per server. We also assumed that the network connections from each server should be redundant for high availability. Finally, we assumed a single connection for management to each server for the traditional HP rack solution, and a single connection for management to each chassis for the Dell PowerEdge FX2 solution.

Figure 2 shows our calculated quantities of 10GbE FlexLOM modules, cables, and switches to support redundant 10GbE networking ports and single 1GbE management ports for each of the 42 HP ProLiant DL360 Gen9 servers.

Component	Quantity
One dual-port 10GbE FlexLOM module per server	42
Two five-meter 10 GbE cables per server	84
One 10GB switch connection for each 10GbE cable	84
One management cables per server	42
One 1GbE switch connection for each management cable	42

Figure 2: 10GbE networking and 1GbE management port components for HP rack server solution.

The converged Dell FX2 infrastructure for the same number of servers can use fewer cables and ports because the servers in the converged FX2 chassis can share these components. Additionally, the 42 Dell PowerEdge FC630 servers are a more dense solution than the HP servers and require significantly less space, filling 10 and a half 2U Dell PowerEdge FX2 chassis. For redundancy, we included two FN IO Aggregators in each chassis.

Based on our capacity estimate of between 1GbE and 5GbE of required network traffic per server, we included redundant 10GbE connections on the two FN I/O Aggregators for each pair of FC630 servers in an FX2 chassis. As a result, each full chassis would use four of those 10GbE connections and four 10GbE cables, and the half-full chassis would use half as many. We included a single management cable per chassis. Figure 3 shows the quantities of each component.

Component	Quantity
One FC630 network card: Broadcom 57810-k Dual port 10Gb KR Blade Network Daughter Card per server	42
Two PowerEdge FN410S FN IO Aggregator 10GbE SFP+ (Internal 8 ports to External 4 Ports) on each of the 11 chassis	22
One 10 GbE five-meter cable per FN410S port used (need redundant ports for each pair of servers)	42
One 10GbE switch connection for each 10GbE cable	42
One management cable per chassis	11
One 1GB switch connection for each management cable	11

Figure 3: 10GbE networking and 1GbE management port components for the Dell PowerEdge FX2 solution.

Infrastructure and cabling savings

In light of the reduction in components, we calculated the costs for each solution. For the Intel processor-powered Dell PowerEdge FX2 solution, we included the costs for Broadcom 57810-k dual-port 10GBASE-KR blade network daughter cards on the servers and the FN IO Aggregators. For the HP ProLiant DL360 Gen9 rack servers, we included the costs of dual-port 10GbE FlexLOM module cards on the servers. We included costs for 10GbE and 1GbE cables and TOR switch ports, using the same costs for the individual items for both solutions.

The Dell FX architecture would save on these infrastructure costs by sharing infrastructure among the servers in each chassis. Figure 4 presents the potential savings.

	Dell PowerEdge FX2 solution (w/ four 10GbE cables per chassis)			HP ProLiant DL360 Gen9 solution (w/ two 10GbE cables per server)		
	Quantity	Price/unit	Total cost	Quantity	Price/unit	Total cost
10GbE card on server	42	$300.85	$12,635.70	42	$679	$28,518.00
Dell PowerEdge FN IO Aggregators	22	$923.77	$20,322.94	N/A	N/A	N/A
10GbE five-meter cables	42	$156.14	$6,557.88	84	$156.14	$13,115.76
10GbE switch (cost per port)	42	$510.41	$21,437.22	84	$510.41	$42,874.44
Management cables (1GbE cables)	11	$7.99	$87.89	42	$7.99	$335.58
1GbE switch (cost per port)	11	$19.81	$217.91	42	$19.81	$832.02
Total			$61,259.54			$85,675.80
Savings with Dell solution						$24,416.26
Percentage savings						28.5%

Figure 4: Potential savings for networking and management cards, cables, and switches for Dell FX architecture with 42 Dell PowerEdge FC630 servers compared to the same number of 1U HP rack servers.

You could expect even greater savings with the upcoming Dell PowerEdge FC430 servers, which offer twice the density of the Dell PowerEdge FC630 servers.

IN CONCLUSION

Dell FX2 infrastructure offers the option of I/O aggregation at the chassis level, which can reduce the number and cost of upstream cables and switches. We found that the savings in networking and management port and cable costs could more than pay back the cost of the FN IO Aggregators with a reduction in overall costs of 28.5 percent. The next time your business replaces servers in your datacenter or adds new ones, selecting the Dell FX architecture with Dell PowerEdge FN IO Aggregators rather than 1U or 2U rack servers could save money in networking costs for your organization.

For more information on the Dell FX architecture, see www.dell.com/us/business/p/poweredge-fx/pd. For more information on the Dell PowerEdge FN IO Aggregators, see www.dell.com/us/business/p/fn-io-aggregator/pd.

APPENDIX A – CABLE AND PORT COST SPECIFICS

We include the same costs for individual cables and switch ports for the two solutions.

- **10 GbE cables**. We priced the 10GbE cable on the Dell Web site and chose a five-meter cable.[1]
- **1GbE cables.** The 1GbE cable is also from the Dell Web site and is a 14-foot CAT6 cable.[2] Both types of cables should be long enough to connect to switches on an adjacent rack.
- **10GbE switch.** We selected the Dell Networking S4810 High-Performance 10/40GbE Switch with basic coverage,[3] and priced at $24,499.82 or an average of $510.41 for each of its 48 ports. Dell provided us the price of this switch. That price included basic warranty coverage and Force10 software. We divided the total cost of each switch by the number of ports on the switch to get a per-port cost. We assumed switch ports that the solution doesn't use could be used by components on other racks, so we included only the proportionate cost of the ports we use
- **1GbE switch.** We selected a Dell Networking 2848 Switch priced at $951.00 with basic support. It has 48 ports and a per-port cost of $19.81.[4]

For the Dell solution, we also include the costs of the daughter cards on the servers and the FN IO Aggregators.

- **Daughter cards.** We selected the Broadcom 57810-k dual-port 10GBASE-KR blade network daughter card that is available as an option for the FC630 server nodes on the Dell Web site.[5]
- **FN IO Aggregator.** Dell provided us with the price, which includes basic warranty, for the FN IO Aggregators.[6]
- **10GbE module.** For the HP ProLiant DL360 Gen9 rack servers, we included costs for an HP Ethernet 10Gb 2-port 560FLR-SFP+ Adapter FlexLOM module, which is an option for the HP ProLiant DL360 Gen9 server.[7]

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[1] Dell Networking, Cable, SFP+ to SFP+, 10GbE, Copper Twinax Direct Attach Cable, 5 Meters
[2] C2G Cat6 Snagless Unshielded (UTP) Network Patch Cable - patch cable - 14 ft
[3] www.dell.com/us/business/p/force10-s-series/pd
[4] configure.us.dell.com/dellstore/config.aspx?oc=bccwdk1&model_id=powerconnect-2848&c=us&l=en&s=bsd&cs=04
[5] configure.us.dell.com/dellstore/config.aspx?oc=pe_fc630_1369&model_id=poweredge-fc630&c=us&l=en&s=bsd&cs=04
[6] www.dell.com/us/business/p/fn-io-aggregator/pd
[7] h71016.www7.hp.com/dstore/MiddleFrame.asp?page=config&ProductLineId=431&FamilyId=3850&BaseID=45460&sc=CNET& jumpid=ex%5Fr2910%5Fcnet%2Fserverdatafeed%5Fservers&srccode=cii%5F7240393&cpncode=42%2D2324592

ABOUT PRINCIPLED TECHNOLOGIES

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1007 Slater Road, Suite 300
Durham, NC, 27703
www.principledtechnologies.com

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