



The Path Is Open to **Software-Defined Networking**

Drive innovation with Dell Open Networking

Virtualization has revolutionized data centers, facilitating extraordinary gains in efficiency and ROI. A similar transformation is underway in networking. Break free from the proprietary restrictions of single-vendor network platforms, with switches based on open standards. By adopting a Dell Open Networking platform powered by Intel® processors, you can choose an operating system (OS) that's best suited for your needs. Gaining this level of network control and flexibility is a requirement for software-defined networking (SDN) and an important step toward realizing the ultimate agility a software-defined data center delivers.

Dell offers the largest set of Open Networking solutions available today that use Intel® technology. Switches include industry-leading hardware and software from Dell and third parties, so you can get the performance, scale, density and control you need to meet your requirements. Plus, with a Dell Open Networking solution, you can take advantage of end-to-end global support and services.



Intel Inside®.
Powerful Solution Outside.



Dell Open Networking switches include highly reliable, application-specific integrated circuits (ASICs) to run your choice of software. However, you can save time and money by selecting options that are prequalified to run on a Dell Open Networking solution.

For example:

Choose this technology...	To...
Dell Networking OS9	Build a robust, scalable, extensible and resilient network infrastructure
Dell Networking OS10	Run the same unmodified Linux OS on switches as well as the rest of the data center
Cumulus Linux	Orchestrate and manage compute and networking using industry-leading Linux tools and customized scripts
Dell Networking OpenDaylight SDN controller	Facilitate SDN in OpenStack environments based on the OpenDaylight Platform
Midokura's MidoNet Network Virtualization Overlay solutions	Use existing hardware to support SDN with OpenStack
Big Switch's Switch Light SDN Operating System and SDN Controllers	Deploy hyper-scale SDN fabrics with integrated tapping and monitoring capabilities
IP Infusion's Open Compute Network Operating System (OcNOS)	Set up a network with cost-effective, multiprotocol label switching (MPLS) capabilities
Pluribus Networks' NetVisor	Facilitate networkwide visibility and analytics
NEC's ProgrammableFlow Networking Suite	Gain a commercially supported SDN controller for heterogeneous environments enabled by OpenFlow
VMware's NSX Network Virtualization Overlay solutions	Deploy a network virtualization SDN platform for the software defined data center (SDDC)

Customers are achieving more with Dell Open Networking solutions — you can too.

With Dell Open Networking, you're empowered with:



Investment protection

Future-proof the data center with a highly flexible and scalable platform that supports traditional, evolutionary and revolutionary networks including SDN. This means you get to keep the same hardware and can change your networking design and capabilities as your requirements change.



Innovation velocity

Create new services and value-added workflows quicker by using the same tools to design and manage automated processes, orchestrated workflows, and resources on networks and servers — freeing up time and money for core research and development.



Business agility

Drive growth with a flexible network platform that supports your vision, whether it's saving money by consolidating infrastructure, fueling revenue via web-scale growth, provisioning workloads quicker, accelerating development or revolutionizing offerings with the Internet of Things. You decide.

*Curious about Open Networking and SDN?
The following pages give snapshots of how four different organizations are using Dell Open Networking solutions to get results.*





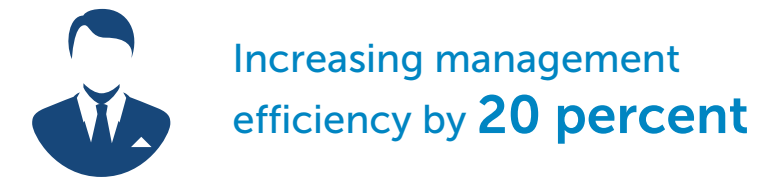
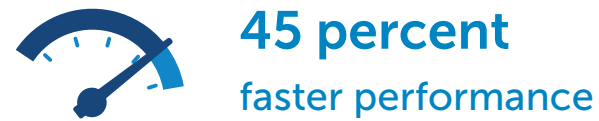
ICM
Netsystems

“We can make tailored solutions for each customer without thinking about our base infrastructure. ... We are future ready with our Dell networking solution.”

Iñaki Calvo
CEO,
ICM Netsystems

To provide reliable, high-performance cloud services for its customers, ICM Netsystems must scale and configure its infrastructure rapidly to support an increasing amount of data, more users, and new products and services.





Why was ICM Netsystems' previous network restricting competitiveness?

- Clients' cloud services weren't as fast as they needed to be.
- Inflexible technologies restricted growth and innovation.
- Employees spent too much time managing IT.

To drive growth, ICM Netsystems decided to deploy an Open Networking solution

By doing so, it could:

- Build a flexible, future-ready network for its data center.
- Simplify IT management by running a Linux-based OS on its switches.
- Increase control over network resources to improve service levels and boost utilization.

Why ICM Netsystems engaged Dell

- Dell is already its trusted IT provider.
- Compared with other network solution vendors, Dell delivers unbeatable price/performance.
- Engineers can choose the switch configurations they need to meet requirements.

The new network

- Dell Networking S6000 Open Networking switches that feature Intel® processors run the Cumulus Linux OS and so behave as Linux servers with added networking functionality.
- The switches feature multiple 40GbE and 10GbE ports to support varying client requirements.
- To meet the compute needs of more customers, ICM Netsystems also added Dell PowerEdge R630 and R730XD servers with Intel Xeon® processors.

Today, ICM Netsystems protects investments

- Speeds network performance by 45%, which improves customer satisfaction and allows for growth.
- Meets new requirements by monitoring and adjusting traffic flows to improve switch utilization.
- Improves resource utilization by simplifying switch management.

Drives innovation

- Facilitates a 35% growth rate in business volume.
- Eases development and fuels innovation with switches that use open-technology standards.
- Improves IT staff efficiency by 20% so they have time to focus on building new products and services.

Transforms business agility

- Increases network flexibility by 50% compared with the previous solution.
- Accelerates the onboarding of new clients and speeds service customizations.
- Eliminates network bandwidth, inflexibility and complexity as business obstacles.





Midokura

“With software-based networking virtualization and distributed architecture, MidoNet allows enterprises and service providers to build, operate and manage virtual networks at scale with increased control and flexibility.”

Akane Matsuo
Director of Business,
APJ, Midokura Japan

Midokura helps enterprises and service providers build, operate and manage virtual networks using its MidoNet open-source network virtualization platform. To increase adoption of MidoNet, developers need to continually fine-tune the solution and add features.



Eases **migration**
time frames



Improves ability to support
global cloud services



increases **efficiency**



Lowers cost
of setting up IT environments

What was restricting Midokura's competitiveness?

- The rising cost of its monthly public cloud-services bill restricted the R&D budget.
- Developers had little control over IT infrastructure.
- There was no easy or reliable way for testing new technologies in production.

To drive growth, Midokura decided to deploy a private cloud and an Open Networking solution

By doing so, it could:

- Increase insight and control over its network.
- Facilitate consistent, predictable operating costs.
- Get the infrastructure flexibility it needed to test more technologies.

Why Midokura engaged Dell

Midokura chose a Dell Open Networking solution and Intel®-powered Dell servers to:

- Deploy switches that support the Open Network Install Environment, native Linux management tools and zero-touch deployment.
- Gain "impressive" performance and compute density.
- Create a cloud that's based on open-technology standards on every level.

The new network

- Dell Networking S6000 Open Networking switches run the Cumulus Linux OS and behave like Linux servers with added networking functionality.
- Dell Networking 2824 and S4820T switches connect Dell PowerEdge R320 rack servers with Intel® Xeon® processors.
- IT staff use MidoNet to create virtual L2, L3 and L4 network services.

Today, Midokura protects investments

- Eases migration time frames by running workloads in its private cloud and the public cloud.
- Reduces risk by isolating some workloads in separate containers and network zones.
- Reconfigures virtual switches, routers, DHCP, NAT, load balancers and firewalls as needed.

Drives innovation

- Improves MidoNet's ability to support global cloud services.
- Gives developers stable test and production environments.
- Increases efficiency: Engineers manage the network and servers with the same Linux commands.

Transforms business agility

- Reduces the time required to test new functions to 10 days or less.
- Lowers the cost of setting up IT environments, greatly expanding testing capabilities.
- Accelerates IT provisioning so engineers can quickly allocate and reallocate IT resources to meet changing requirements.





Cornell University

“We were very early adopters of SDN, and we worked closely with Dell to identify and resolve design issues. Not only did we overcome our challenges, but we also reduced our physical network equipment by more than 50 percent compared with our previous network environment.”

Scott Yoest,
IT Director of Computer Information Science
and the College of Engineering, Cornell University

Computing and Information Science at Cornell University needs to provide fast and reliable network services to more than 30,000 student and staff to support day-to-day workloads as well as cutting-edge research and development projects.





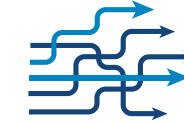
Saves money & space
by cutting network footprint



Accelerates IT
development



200 percent research
efficiency increase



Supports a **larger** number of
concurrent workloads

Why was Cornell's previous network restricting competitiveness?

- Existing networks were too rigid to support diverse user requirements.
- Research traffic slowed application performance for faculty and students.
- Researchers could not test new network technologies in a production setting.

To drive growth, Cornell University decided to deploy an SDN solution

By doing so, it could:

- Increase insight into and control over network resources.
- Support more IT tools, test environments, data and concurrent researchers.
- Future-proof the network to facilitate long-term innovation and boosts Return on Investment.

Why Cornell engaged Dell

Cornell chose a Dell Open Networking solution to:

- Ensure its new network could support SDN and the communications interface, OpenFlow.
- Have one network platform for SDN, traditional networks, production traffic and research.
- Collaborate with Dell to implement a reliable, long-term solution using emerging technologies.

The new network

- An open-technology platform based on Dell Networking S4810 and S4820T switches with Intel® processors delivers 10/40GbE.
- IT staff partition individual physical switches into multiple control planes using a custom OpenFlow solution.
- Production planes use the enterprise-grade NEC PF6800 ProgrammableFlow Controller. Staff and students deploy different SDN controllers in the research planes depending on project requirements.

Drives innovation

- Saves money and space by halving its network footprint.
- Accelerates IT development including the creation of new SDN controllers.
- Advances multidisciplinary research by analyzing more data, faster.

Transforms business agility

- Increases researchers' efficiency by 200 percent.
- Supports a larger number of concurrent workloads so more researchers can work during the day, instead of at night.
- Keeps IT staff focused on value-added tasks by facilitating network automation.





U2 Cloud

“With our software-defined storage and networking from Dell, Intel, Nexenta and Big Switch Networks, we can provision environments in minutes.”

Pete Valentine,
Executive Vice President, U2 Cloud

U2 Cloud delivers purpose-built, cloud-based desktop and infrastructure services for individuals and organizations. To continue to grow at web-scale speeds, the company must provide each customer with timely, reliable and affordable services.





Services run **300 percent** faster than before



Supports greater **customization**



Increases staff efficiency



Maintains **high availability**

Why was U2 Cloud's previous network restricting competitiveness?

- It lacked the bandwidth needed to provide consistently fast cloud services.
- Proprietary tools and manual processes cut into IT staff efficiency and increased the risk of error.
- The network's design required more physical hardware than necessary.

To drive growth, U2 Cloud decided to deploy a software-defined data center

With these technologies, U2 Cloud could:

- Save time and money.
- Improve customer experience.
- Reduce costs.

Why U2 Cloud engaged Dell

U2 Cloud engaged Dell for SDN as well as Intel®-powered, software-defined storage (SDS) so it could:

- Speed provisioning by up to one week with a preintegrated, pretested SDN solution that runs on Big Switch's Big Cloud fabric, which does not require additional tools or overlays.
- Cut the cost and accelerate the performance of storage with a preintegrated, pretested SDS solution that includes Nexenta software.
- Reduce the risk of adopting a software-defined data center, and save time with one point of contact for support services.

The new network

- Dell Networking S6000-ON switches support a 40GbE, leaf-spine architecture.
- SDN controllers run on Big Switch's Big Cloud Fabric and Dell PowerEdge R320 servers powered with Intel® Xeon® processors.
- SDS is facilitated by NexentaStor SDS software, Dell Storage MD1420 direct-attached storage arrays and Dell PowerEdge R720 servers with Intel® Xeon® processors.

Today, U2 Cloud protects investments

- Runs more than one virtual switch on one physical switch.
- Makes changes to virtual components on the fly, instead of having to plan ahead.
- Chooses which software to run on its switch hardware, including operating systems, controllers and management tools.

Drives innovation

- Delivers services that run 300 percent faster than before.
- Supports greater customization including hybrid architectures with technologies from the customer and U2 Cloud.
- Changes network software without automatically having to replace hardware.

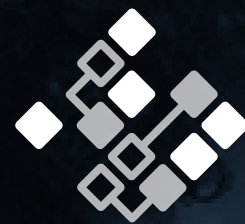
Transforms business agility

- Onboards new customers and facilitates service changes in minutes rather than weeks.
- Increases staff efficiency because all engineers can manage more types of infrastructure.
- Maintains high availability.



"The global software-defined networking market will soar at a compound annual growth rate of 61.5 percent ... from 2012 to 2018."

Transparency Market Research, July 29, 2015



100% of Dell data center switches are SDN-ready



Up to **86% reduction** in design and deployment time



400+ customers use Dell Open Networking solutions.

View All Dell Case Studies at Dell.com/CustomerStories

[Learn more about Dell Open Networking offers here](#)

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