Cisco Catalyst 9000 Switching Family

The Cisco® Catalyst® 9000 family of campus LAN switches is designed for a new era of intent-based networking. The network can now learn, adapt, and evolve. Designed to be intuitive, the network can recognize intent, mitigate threats through segmentation and encryption, and learn and change over time. The new network helps your organization unlock opportunities, enhance security, be more agile, and operate more efficiently.

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More, more. Faster, faster.

Your network is being challenged by more users and more devices that need more and more bandwidth. And this is just the start. The real deluge of IoT devices and the compounding complexity that comes with it has yet to truly accelerate. A recent Cisco Visual Networking Index™ analysis estimates that more than 27 billion devices will be connecting to the Internet by 2021. This is essentially three devices for every person currently in in the world. And it is not just growth in devices, but also growth in how much bandwidth each device uses.

By the numbers

By 2021
58%
of the population will be using the Internet **up from 44% in 2016**.

By 2021
61 GB
of internet traffic per month, per user **up from 24 GB in 2016**.

By 2021
3.5
networked devices and connections per person **up from 2.3 in 2016**.
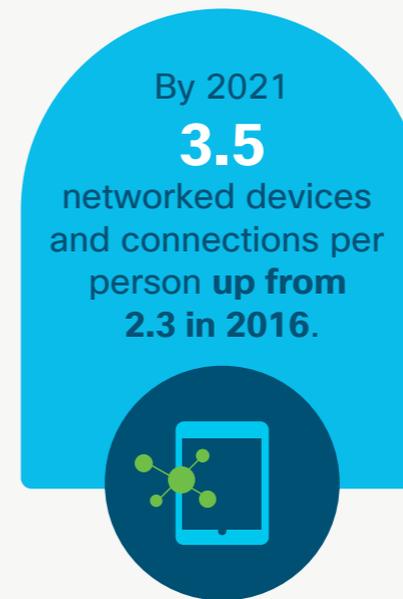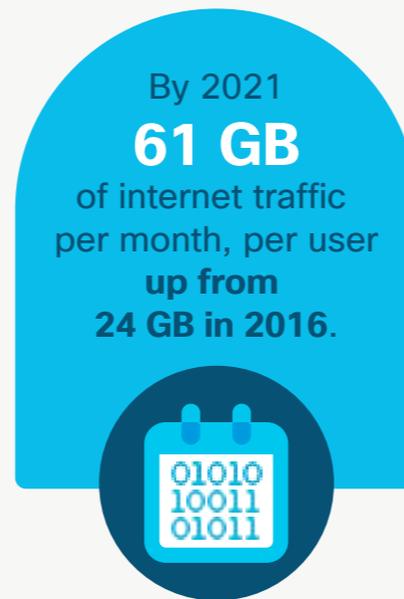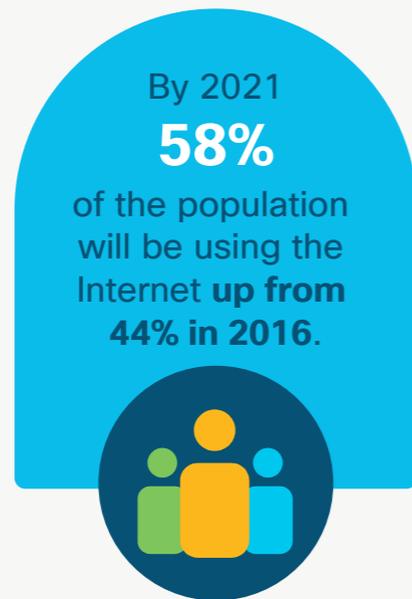
Cisco VNI 2016-2021

And while Cisco Catalyst 9000 switches have **twice the capacity** of those they are designed to upgrade, higher capacity alone may not be enough to handle the challenges ahead.

More, more. Faster, faster.

In fact you are likely being asked to do more with less – handle more users and devices with less budget and less staff to manage the network. The average number of devices that one IT staff member supports has been increasing, from a hundred devices to hundreds of thousands, with the expectation that it will be perhaps millions of devices in the future. This is clearly not possible in today's command-line interface (CLI)-driven management environment. And while software-defined networking (SDN) concepts have provided a starting point, it is just as clear that SDN by itself is not enough.

By the numbers

By 2021
80%
of all Internet traffic will be video **up from 67% in 2016**.

By 2021
53 Mbps
average broadbond speed **up from 27.5 Mbps in 2016**.

By 2021
20 Mbps
average mobile speed **up from 6.8 Mbps in 2016**.
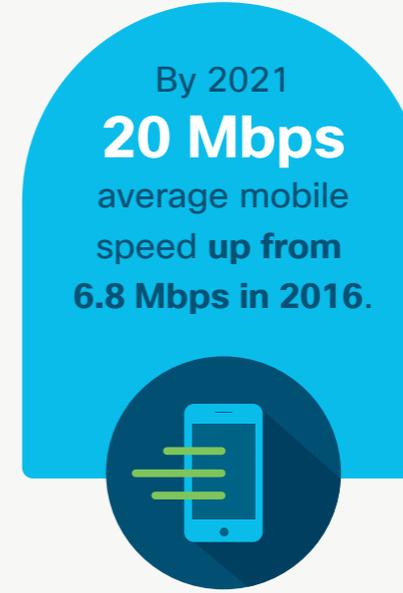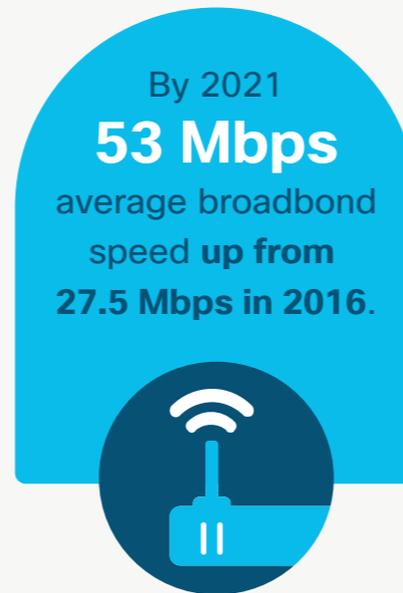
Cisco VNI 2016-2021

A new network is needed. A network that is software driven and hardware enhanced.

That is why we developed the Cisco Catalyst 9000 switching family as a foundational element of the Cisco Digital Network Architecture (Cisco DNA ™) and Software-Defined Access (SD-Access). Combining the power of the Cisco Catalyst 9000 switches' custom Cisco Unified Access® Data Plane (UADP) application-specific integrated circuit (ASIC) with policy-based networking, an intelligent network fabric, and automation makes intent-based networking a reality today. SD-Access makes the network look like a single large virtual switch to the users and devices connecting to it. Virtualization allows for agility and flexibility in ways that are not possible with a traditional network. Using the Cisco DNA Center™ management interface with the Cisco Catalyst 9000 family of switches, you can manage and secure your network from a single interface. This allows for faster network design, definition, provisioning, and maintenance, which ultimately improves network uptime. Altogether, the result is the most intelligent network available, one that allows your network to change as the needs of your business change.

The Cisco Catalyst heritage

The Cisco Catalyst 9000 family of switches is the next generation of our best-selling Cisco Catalyst line of enterprise LAN switches and operates with the same feature-rich Cisco IOS® XE 16 and field-reprogrammable UADP ASIC technology already widely deployed with the Cisco Catalyst 3850 and 3650 Series. The Cisco Catalyst 9000 switching family also takes advantage of a shared DevOps toolkit for open programmability, analytics, and telemetry. This means you can expect to have all of the advanced Layer 2 and Layer 3 capabilities that you have come to expect and more, at twice the capacity.

Cisco Catalyst 9200 Series
Up to 160 Gbps/stack

Upgrade from
Cisco Catalyst 2960 X/XR
80 Gbps/chassis

Cisco Catalyst 9300 Series
480 Gbps/stack

Upgrade from
Cisco Catalyst 3850 Series copper:
480 Gbps/stack

Cisco Catalyst 9400 Series
Up to 480 Gbps/slot, 9 Tbps/chassis

Upgrade from
Cisco Catalyst 4500E Series:
48 Gbps/slot, 928 Gbps/chassis
Cisco Catalyst 6500 Series:
80 Gbps/slot, 720 Gbps/chassis

Cisco Catalyst 9500 Series
Up to 6.4 Tbps/stack

Upgrade from
Cisco Catalyst 6880-X, 6840-X, 4500-X Series:
800 Gbps/stack

Catalyst 3850 Series fiber:
480 Gbps/stack

One key difference, however, is the new subscription licensing model that helps make ordering easy.

Rather than the multiple, perhaps confusing, licensing options, Cisco Catalyst 9000 switches are offered with three options – Cisco DNA Premier, Advantage and Essentials. Each of these are offered in 3, 5 and 7 year options.

The Cisco Catalyst 9000 switching family was designed from the ground up to do way more than just turbo-charge your network. These switches have been packed with a host of new features provided in the Cisco DNA Advantage package that provide greater security, automation, and insight than was previously possible. This includes Cisco DNA Center, SD-Access, and advanced security and analytics capabilities such as Encrypted Traffic Analytics*. Cisco DNA Premier includes Cisco DNA Advantage, ISE Base,ISE Plus, and Stealthwatch, along with embedded Cisco Software Support.

The Essentials licensing provides all the same great features you get from your current high-performing Cisco Catalyst switches and more. Full NetFlow, basic programmability, automation, and monitoring plus an onboard x86 CPU complex are included. And a Cisco Catalyst 9000 switch with a Cisco DNA Essentials package has been priced to be less expensive than current comparable Cisco Catalyst switches.

But for you, the one who actually runs the network, it is not so much about what the new Cisco Catalyst 9000 switches can do but what they can do for you regardless of where you are in the journey to intent-based networking

We have designed the Cisco Catalyst 9000 family of switches to meet five specific challenges facing your network, with breakthrough innovations in security, operational simplicity, mobility, IoT, and multicloud.

*Not available on Catalyst 9200 Series switches

The security challenge

Hardly a day goes by without some news about another network that has been hacked and another company embarrassed by the release of customer or employee data or, perhaps worse, the exposure of intellectual property.

It is more than just loss of reputation – a security failure can cost you big money. An average data breach costs a company nearly $4 million. In fact, it has been estimated that cybercrime costs companies and individuals more than a trillion dollars annually.

And threats against your network will only get more sophisticated and more harmful. No one wants to be the next headline.

At Cisco, we spend a lot of time thinking about the threats facing your network and how to defeat them. Like you, we believe the network edge is the first line of defense in an end-to end security solution. This is where policy is applied to determine who or what has access to your network. It is also where suspicious activity can be detected and isolated most efficiently.

Equifax hack exposes **143 million** consumers

"Hackers release Game of Thrones episodes after HBO hack"

"Netflix episodes of Orange Is the New Black season 5 were released online by hackers prior to its debut"

"Sony hackers release personal employee information"

"Uber pays hacker to hide massive data breach"

Cisco end-to-end security, including Cisco Catalyst 9000 switches and Cisco DNA Center, makes your network more secure than ever before

And so we developed Cisco Catalyst 9000 switches to be **a critical part of an end-to-end integrated security solution**, one that detects and stops threats. With access to Cisco's best in class security portfolio anchored by Talos, Trustworthy Systems, MACsec encryption and segmentation, the platforms provide advanced security features that protect the integrity of the hardware as well as the software and all data that flows through the switch and the network.

Like its predecessors, the Cisco Catalyst 9000 switching family leverages the field re-programmability of the Cisco UADP ASIC to evolve as new security protocols are introduced. This means your switch can have new, previously unimagined features to handle previously unimaginable threats with just a micro-code change.

And changes in Cisco IOS Software code have become better with support for new patching capabilities in Cisco IOS XE that help simplify operations and quickly overcome security vulnerabilities without having to certify a new software image.

Network segmentation, advanced endpoint profiling, advanced encryption, and Security sensor capabilities give these switches the ability to act as the first level of defense.

Built for security

Trustworthy solutions - Native NetFlow for Cisco Stealthwatch® Analytics
ISE, Security Sensor - AES MACsec encryption
Advanced endpoint profiling - Segmentation and micro-segmentation
Encrypted Traffic Analytics (ETA)* - Graceful Insertion and Removal (GIR) - software patching

Spot malware lurking in encrypted traffic

Another unique feature in Cisco Catalyst 9000 switches is Encrypted Traffic Analytics (ETA), where we take security a significant step further. Today, nearly half of cyberattacks are hidden in encrypted traffic, and their number keeps growing. ETA looks wide and deep using NetFlow data from the switches, learning to spot anomalies that could signal an incoming threat. Identifying the fingerprints of known threats, even in encrypted traffic, and taking action – without decrypting the traffic – means a more secure network with no impact on data privacy or network performance.

Security and policy enforcement work together across the network to simplify complexity, to keep your business more secure, and to make you more productive.

All told, the end-to-end security offers a reduced attack surface that secures your network before an attack, active analytics to detect malware and threats during an attack, and rapid automated threat response and containment after an attack.

*Not available on Catalyst 9200 Series switches

The operations challenge

Most enterprise networks are complex, error prone, rigid, hard to change, and slow to provision and maintain. Why? Because today we live in a CLIdriven world where more than 90 percent of all IT activities are manual.

What if you could give time back to IT? What if you could close the IT skills gap created by cloud, virtualization, and IoT? What if you could provide network access in minutes for any user or device to any application? What if you could troubleshoot problems in half the time?

Simplify and automate

Do more in less time. With Cisco DNA Center and SD-Access, Cisco Catalyst 9000 switches can operate as part of one fabric for faster, more secure network access. No more constant cutting, pasting, and tweaking, switch by switch. Create once and apply network-wide, using cross-domain policy enforcement and automation. By automating mundane day-to-day provisioning and maintenance operations, you can reduce errors, improve network uptime, and dramatically reduce operational cost, allowing you and your IT staff to focus on training, creativity, and design.

Network Provisioning	Threat Defense	Monitoring and Troubleshooting	End User Experience
67%	48%	80%	94%
Reduction in network provisioning costs	Reduction in cost impact of a security breach	Reduction in cost to resolve issues	Reduction in cost to optimize policies
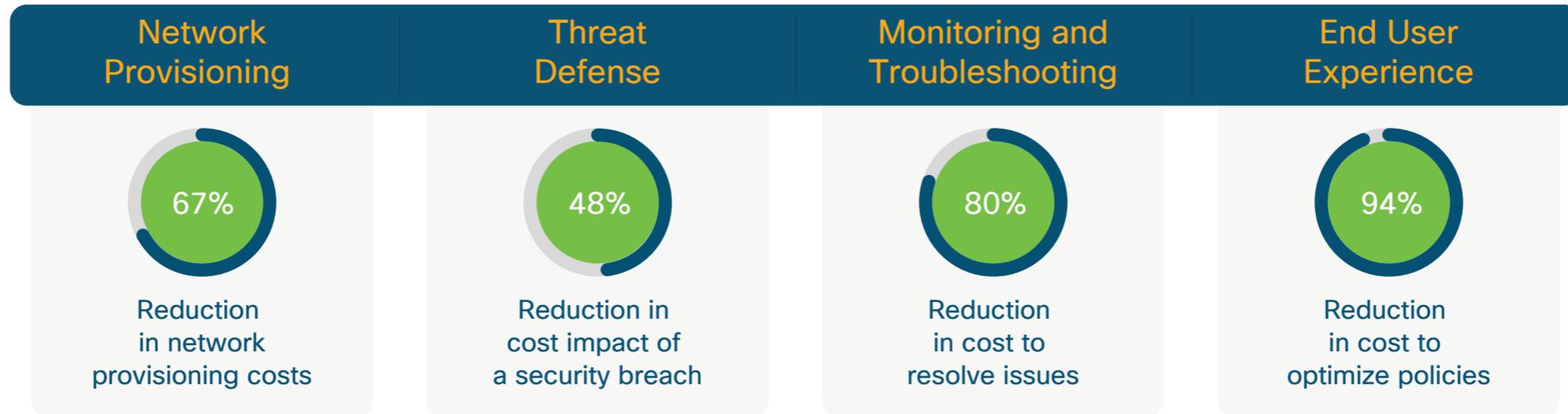
Internal and third party testing results of SD-Access and Cisco DNA Center

Accelerate change with programmability

Cisco Catalyst 9000 switches offer multiple programmability options that allow your network to change as the needs of your business change. This includes the onboard x86 CPU, the field-reprogrammable UADP ASIC, and open Cisco IOS XE Software, which supports model-driven programmability, NETCONF and YANG scripting, streaming telemetry, and patching. This makes your network:

→ **Simpler:** Make network policy changes and configurations once and automatically program them everywhere.

→ **Open:** Use open APIs and open standards to integrate Layer 4 through 7 services, virtualization, and management vendors.

→ **More innovative:** Use state-of-the-art third-party applications securely hosted in containers for maximum flexibility. This allows you to use your network to deliver new business capabilities closer to the user.

Designed for automation and programmability

→ Device provisioning Through Plug and Play (PnP), Zero-Touch Provisioning (ZTP), and Pre-boot Execution (PXE)

→ Configuration Model-driven operation through open APIs over NETCONF/RESTCONF and Python scripting

→ Policy-based automation Cross-domain policy enforcement and automation with SD-Access

→ Customization and monitoring Complete DevOps toolkit, streaming telemetry, and application visibility and control with Next-Generation Network-Based Application Recognition (NBAR2)

→ Upgradability and manageability In-Service Software Upgrade (ISSU), GIR, patching, and configure/replace

The mobility challenge

Mobility is likely mission-critical for you and your users, as it has become the primary access method for connecting. New and different devices are coming online every day, wanting more bandwidth to connect to new cloud-based services. Each creating a different security threat. There are new options to deliver higher bandwidth with 802.11ax and 802.11ac Wave 2 access points, but they require 2.5 to 5 Gbps, and often the current cabling (Category 5e or 6) was designed for only 1 Gbps. Cisco Catalyst 9000 switches offer converged wired and wireless network services that simplify your network and create consistency in policy, segmentation, orchestration, and automation, and assurance. This delivers the best experience for mobility, guest, IoT, multicast services, and overall network performance and gives you extraordinary visibility across wired and wireless access networks, while segmentation separates devices and users to help reduce the attack surface.

The Cisco Catalyst 9000 switching family has also been optimized to support the industry's highest-density Wave 2 deployments with Cisco Multigigabit Technology (IEEE 803.2bz), a technology that extends the life of your existing cabling at 1 to10 Gbps capability. And because the switch integrates with the fabric control plane (LISP), access points and clients are reachable in the fabric.

Optimized for mobility

802.11ac Wave 2 optimized

→ Support for up to 48x 2.5 Gbps and Multigigabit

802.11ax ready

→ Support for 2.5G/5G/10G mGig downlinks

Policy-based segmentation:
Wired, wireless, and IoT

NBAR2:
Visibility into wired and wireless networks

Optimized guest deployment

→ Simplified guest and mobility tunneling

→ No dedicated guest controller

The IoT challenge

There are two key challenges with emerging IoT on the enterprise network. First and foremost is security. IoT devices are often headless; once connected to the network, they access it without human intervention. The second challenge is access. The potential scale of IoT – with the number of devices expected to be three time the global population by 2021 – makes manual configuration and policy setting unmanageable. Flexible and automated network provisioning, segmentation, and policy management, like that offered in Cisco Catalyst 9000 switches, must be used so that networks can support IoT without interruption, while limiting where IoT devices go on the network.

Cisco Catalyst 9000 switches also support a broad array of standards and features that can literally power your digital building. These range from the highest Perpetual Power over Ethernet (PoE), PoE+, and Cisco Universal PoE (Cisco UPOE®)* density in the industry to support for multicast, Audio Video Bridging (AVB)*, time sync (IEEE 1588)*, and Bonjour service discovery with Cisco DNA Service for Bonjour*. Cisco Catalyst 9000 switches will also extend network trust to securely identify and onboard devices using centrally defined policies.

Ready for IoT

IT services (printer, Apple TV, collaboration)	Connected lighting	IP surveillance	Networked AV and timing
→ Cisco DNA Services for Bonjour for discovery/policy across WAN/LAN* → NBAR2 and NetFlow for full application visibility and control	→ Power high availability with perpetual Cisco UPOE® (90W ready)* → Constrained Application Protocol (CoAP) for built-in discovery of services and resources	→ Encapsulated Remote Switched Port Analyzer (ERSPAN) for monitoring and forensics → Superior Quality of Service (QoS), multicast, and buffer management	→ Audio Video Bridging for converged AV* → 1588 PTP for military and service provider apps*

*Not available on Catalyst 9200 Series switches

The cloud challenge

Connecting to cloud services exposes the same challenges and threats that we see elsewhere, but with an added twist. Connections are now made inside and outside your network to a variety of different cloud services. You may also be confronted with a wave of data from these services, but after the fact, meaning it is often too late to take advantage of the analytics the network can provide.

With Cisco Catalyst 9000 switches, you can simplify, secure, and transform your network to include a cloud or hybrid cloud environment. Equipped with a DevOps toolkit, you have the ability to use open APIs and model-driven programmability to customize provisioning, automation, and monitoring using off-the-shelf applications or your own creation that can be locally hosted on the switch with an onboard x86 CPU complex and container-based hosting environment.

Cloud hosting
Automation assurance policy

Cloud connectivity
Private/public cloud, SaaS, co-location

Analytics
→ Streaming telemetry
→ Monitoring network

On-box app hosting
Monitoring security IoT

DevOps toolkit
→ Zero-touch provisioning
→ Model-driven programmability
→ Server management tools

High availability
Patching, GIR, ISSU

We now live in a "disrupt or be disrupted" world where no industry is immune.

From caring for the sick or the homesick to manufacturing the next spinners or the next genius, your business and the network that drives your business will need to change.

Today, you need a network that constantly learns, constantly adapts, and constantly protects.

We all know why. An explosive growth in network use is underway, and with that growth comes an ever-expanding threat – and that is no hype.

Our Cisco Catalyst 9000 switches constantly adapt to help you solve new challenges. Their integrated security helps you address ever-changing threats. They simplify and automate management of your evolving mobility, IoT, and multicloud networks.

Whether you operate in a traditional environment or in full fabric-control mode, Cisco Catalyst 9000 switches offer more capabilities and higher densities at prices comparable to those of your existing Cisco Catalyst switches.

See how the Cisco Catalyst 9000 switches can take your network beyond the hype.

Visit https://www.cisco.com/c/en/us/products/switches/catalyst-9000.html.

But don't just listen to us, listen to customers like you who have been part of our early deployments

"The Catalyst 9000 has exceeded NASA's mission critical requirements for security and segmentation … and at twice the performance."

— Eric Latta, solutions architect,
NASA

"IT can easily orchestrate global policy to secure, differentiated access for staff and students across multiple campuses with SD-Access' network segmentation. The new network from Cisco makes our IT faster, more flexible, and more intuitive."

— Ulrich Hauptmann, head of IT, Jade University of Applied Sciences (Germany)

"Catalyst 9000 creates immediate IT efficiency results with a straightforward and simple provisioning view across secure segments."

— Kevin Tompkins, network architect, Scentsy (United States)

"As a leader in state-of-the art healthcare services, we depend on our 'always on' network. The resiliency, scale, and management simplicity of the Catalyst 9000 will allow our network to securely grow as quickly as our needs grow."

— Thomas Noppe, lead IT architect, UZ Leuven (Belgium)