Manufacturing enterprises realize the benefits of adaptive networking

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CenturyLink

Manufacturing draws on the benefits of adaptive networking

WHAT IS ADAPTIVE NETWORKING?

Manufacturing executives see digital disruption taking hold in business operations. Across digital supply chains, the Industrial Internet of Things, digital twinning, and augmented reality, changes are coming faster, shifting network needs in unpredictable ways. Manufacturing executives' response is to turn to practices known as "adaptive networking" that are secure, flexible, and easy to scale and that deliver on performance. Figure A summarizes the manufacturing sector's priorities and lead benefits from adaptive networking practices.

Adaptive networking components include software-defined WAN (SD-WAN); hybrid networks that merge internet virtual private network (VPN) and private VPNs; flexible bandwidth, particularly bandwidth on demand; dynamic WAN ports into data centers and clouds; and network functions virtualization (NFV). The manufacturing sector combines these components and wraps them with security and reporting intelligence to meet its accelerating IT needs.
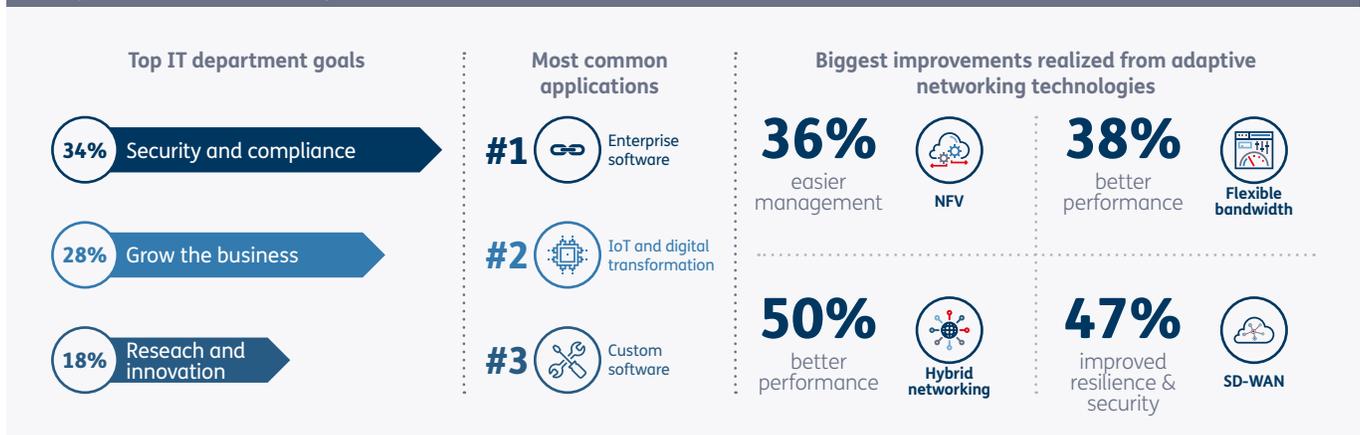
SD-WAN IS A KEYSTONE ENABLER

The manufacturing sector consists of businesses that bring in and process materials to create new goods. Whether companies refine raw materials, build components and subsystems, or assemble complex finished products, they face similar challenges. First, it is absolutely critical to keep the factory floor running. Materials shortages, a defective product or process, or a machine going out of service threaten to idle an assembly line or halt the batch.

A machine that goes faulty for few seconds at the wrong time can cost the business tens of thousands of dollars. Second is the relentless drive toward innovation and automation, which manufacturing industry leaders see leading to a digital future known as Industry 4.0 (I4).

Manufacturing executives have security and compliance top of mind. Compliance requirements run through all

Figure A: Manufacturing sector vital statistics

Top IT department goals
- 34% Security and compliance
- 28% Grow the business
- 18% Reseach and innovation

Most common applications
- #1 Enterprise software
- #2 IoT and digital transformation
- #3 Custom software

Biggest improvements realized from adaptive networking technologies
- 36% easier management — NFV
- 38% better performance — Flexible bandwidth
- 50% better performance — Hybrid networking
- 47% improved resilience & security — SD-WAN

Source: Ovum

aspects of the business: knowing the provenance of incoming materials; tracking on-site workplace safety, energy consumption, emissions, and environmental impact; and assuring the proper composition and safety of finished goods. Other manufacturing drivers include growing the business and driving innovation. The manufacturing sector embraces innovation and has pioneered technical roles including chief digital officer and innovation strategist and specialists in data analytics,

cognitive systems, supply chain automation, Industrial Internet of Things (IIoT), and process simulation.

Manufacturing IT executives draw on the full range of adaptive networking practices to support their industry's applications (see Figure B). The sector is especially drawn toward SD-WAN, which two-thirds (66%) of these companies already use to some extent. SD-WAN can optimize traffic related to monitoring and controlling performance-sensitive machines; it gives

Figure B: Major manufacturing industry applications and their adaptive networking solutions

Application	Adaptive networking solution
End-to-end **digital supply chains** promise fast turnaround, flexibility, and customizable end results. Full automation of the supply chain means more efficiency and less chance for human error.	**SD-WAN** ensures priority for key applications such as SCM, tracks traffic performance at the applications layer, and enforces security policies. If there is a problem, SD-WAN management reports show any network role in application issues. **Hybrid networking** allows for flexible support for both on-net and off-net suppliers, buyers, and partners.
Sophisticated machines on the factory floor use **IIoT** to communicate a stream of industrial data. Some information is extremely performance sensitive and must be processed locally via **edge computing**; some is latency tolerant and may go to a centralized data center or cloud. Collected data is paired with continuous analytics to identify changes in patterns, adjust the machine's responses, and issue alerts.	Whether it is sent as raw data or refined information, **SD-WAN** helps assure that machine-to-machine application traffic gets the performance it needs. SD-WAN also tracks, reports, and issues alerts on the condition of available networks. **NFV** paired with SD-WAN supports nodes located in or adjacent to IoT data repositories, to monitor and track end-to-end network performance.
Digital twinning represents new design and tracking techniques that create realistic simulations of physical products. Tests on **virtual simulations** save the time and cost of diverting and retooling production machines to build and iterate physical prototypes. Digital twins in manufacturing pair and track characteristics of individual products as they move through production.	**Flexible bandwidth** between sites and to the cloud helps companies in their prototyping, when they need to transfer large amounts of data related to design and test simulations. Flexible bandwidth also has a key role for digital twins in production. As digital models evolve and production volumes change, the company can adjust the amount of bandwidth it needs.
Augmented reality (AR) on the factory floor helps workers with complex assembly and assists technicians with maintenance and repair. A visiting site technician receives real-time information about the location and status of devices that need servicing, can access step-by-step instructions, and can activate a built-in camera to bridge in remote experts.	AR needs to work in real time to be useful. **Flexible bandwidth** adds priority bandwidth for technicians using AR on a site visit to ensure a smooth experience. **SD-WAN** helps manage the priority and performance of all applications that communicate off-site, making sure that there is no contention when temporary AR traffic is added alongside critical applications.
As manufacturers ship devices that include **IoT**, they capture data from the field. The more devices ship, the more the overall traffic volume of field data grows. The information feeds new revenue sources while lowering costs. It governs maintenance and repair, alerts to potential safety issues, and informs new product design.	**Flexible bandwidth** to the cloud can increase port size to transfer and store growing volumes of field data and communicate back to networked products. **NFV** embedded inside or adjacent to the cloud can provide virtual firewall and virtual router functions as additional levels of network control and network security.
Business analytics tools are widespread throughout manufacturing. Project teams benefit from **operational analytics** and **predictive analytics** that regularly review and adjust processes. Some analytics tools run constantly to detect, alert to, and remediate issues on the floor, avoiding under- or over-maintenance. Other data sets are analyzed intermittently to gather insights and make decisions that improve long-term efficiency and operational excellence.	**Hybrid networking** optimizes traffic to wherever analytics are run, whether on-net or off-net. **Flexible bandwidth** between data centers and cloud resources can quickly upload analytics tools and return results. Flexible bandwidth also supports big traffic bursts when data sets that reside in different locations are worked on.

Source: Ovum

the manufacturer flexibility to add and reconfigure sites quickly; it also can prioritize key applications to ensure transactions are completed. Manufacturers also deploy SD-WAN to improve security and network uptime. SD-WAN improves network resilience because it dynamically reprioritizes applications when network conditions change to make sure critical data related to factory floor operations always gets through. In terms of network security, SD-WAN can be set up to enforce policies that restrict some applications to certain network routes.

Manufacturing IT executives rank enterprise software, IoT and digital transformation, and custom software among their key applications. Manufacturing evolved together with leading enterprise software concepts such as enterprise resource planning (ERP); supply chain management (SCM); computer-aided design, manufacturing, and engineering (CAx); and product lifecycle management (PLM). IIoT and digital applications contribute major new roles. IIoT data collected from machines on the factory floor

Manufacturers that embed intelligent sensors and IoT in their products can make them perform better, improve maintenance and repair, and collect useful data for future product development.

supports real-time reporting and responds to changing conditions. Manufacturers that embed intelligent sensors and IoT in their products out in the field can make their products perform better, improve maintenance and repair services, and collect a trove of useful data for analytics for future product development. Custom software covers a large body of applications built for specific tasks related to the manufacturer's processes and business. Figure B summarizes some of the specific key current and future applications that manufacturers are adopting and how these applications benefit from adaptive networking practices.

MANUFACTURING COMPANIES EMPHASIZE ADAPTIVE NETWORKING'S FLEXIBILITY AND FAST TROUBLE RESOLUTION

Net adaptive networking benefits that manufacturing executives value most are flexibility to add and reconfigure sites more quickly, reduced dependence on legacy systems, reduced time to troubleshoot and resolve network issues, and an improved security posture. Manufacturing executives use the spectrum of adaptive networking tools to realize these gains, though they are especially drawn to SD-WAN for its range of benefits.

Ovum makes the following recommendations, based on the benefits realized by manufacturing companies that have adopted adaptive networking practices:

- Two-thirds of manufacturing companies already use SD-WAN in some fashion. Optimizing networks at the applications level for performance, uptime, and security is especially valuable to the sector. All manufacturing companies should explore SD-WAN's potential to support their business goals. Executives identify SD-WAN's **security and improved resilience** as the most valuable aspect, which improves their business by an average of **47%**.

Manufacturing executives value adaptive networking's flexibility to add and reconfigure sites more quickly, reduce dependence on legacy sites, reduce time to resolve network issues, and improve their security posture.

- Hybrid networking complements SD-WAN. Manufacturers that already use public internet access, for example, for collaboration or to extend the supply chain to off-net partners, can unite these networks and optimize traffic based on performance, security, and cost. Executives state they see an average **50%** improvement in **network performance** from adoption of hybrid networking. They also realize big gains on average in **resilience and security (46%)** and **ease of management** (also **46%**).

- Most manufacturing companies that use flexible bandwidth connect their cloud resources with bandwidth on demand. Executives in the sector see better performance as the biggest benefit for **flexible bandwidth**; those who have adopted the practice describe an average improvement of **38%**.

- The manufacturing sector works with NFV, but it is not yet widespread. Executives in the sector that adopted the technology see **ease of management** as the top benefit, with an average **36%** improvement to the business.

- Companies need to think of adaptive networking as a platform rather than individual tools. While any one technology helps the business, Ovum finds companies reap vastly higher benefits when they combine technologies to assemble an adaptive networking platform.

WHY CHOOSE CIENA

Ciena is a CenturyLink partner that provides solutions to help customers create the Adaptive Network™, enabling better customer experiences for their digital transformation journey. The Adaptive Network is Ciena's vision to empower financial services organizations to realize improved network agility, optimization, and real-time insights. The Ciena platform's key foundational elements are: Programmable Infrastructure, Analytics and Intelligence, Software Control and Automation, and Services.

NEXT STEP: BUILDING YOUR OWN ADAPTIVE NETWORK STRATEGY

In its survey research, Ovum finds most enterprises do not have a formal adaptive networking roadmap. Instead, IT executives treat adaptive networking as an ongoing, iterative, and interactive process. They investigate the solutions and services available, what the business can gain from each approach, and how, together, they deliver increased benefits to the business. IT executives set the organization on the right path to adaptive networking, reevaluate their options regularly, and make necessary adjustments.

Ovum's survey research finds organizations benefit most if they combine adaptive networking elements to build a solution. But enterprises do not have to revamp their operations completely to start seeing results. Organizations report benefits even from small changes. For example, the enterprise might add network virtualization in just a few places to add missing functionality. Or the organization might add bandwidth on demand to relieve a few key points in the network that need rapid scaling to deal with unpredictable traffic changes.

An adaptive networking solution is not built in a vacuum. The enterprise needs to have a dialog with service providers to understand what adaptive networking aspects they support and how they fit together elegantly. A complete solution to support enterprise applications meshes together provider services and vendor platforms into a unified solution. A strong partner will support a broad portfolio of adaptive networking services that fit together for this unified approach: a flexible, scalable network that is overseen by network intelligence and underpinned by network security. With a strong partner, the organization can add more adaptive networking practices where and when it needs them and benefit from platform synergy as it regularly reassesses progress, adds more pieces, and deepens its use of these practices over time.

WHY CHOOSE CENTURYLINK AS YOUR ADAPTIVE NETWORKING PARTNER?

Ovum sees CenturyLink as a major US and international provider of advanced networking services. The company is an innovator across the adaptive networking services spectrum. CenturyLink was a pioneer in national US bandwidth on demand down to the access port in 2012, including network intelligence tools and user controls over class of service. The company has extended its network intelligence tools to end locations and PoPs across its global network, covering North America, Europe, South America, and Asia. The company's global Cloud Connect service boasts one of the world's most far-reaching footprints connecting global data centers and cloud services.

CenturyLink debuted NFV-based commercial services in 2015 and launched its SD-WAN service in 2016. For both, the provider took a different approach from its peers. Its first virtualized network service comprised centralized firewalls designed to serve as flexible gateways between enterprises' own networks, their data centers and cloud services, and the public internet. With SD-WAN, CenturyLink took an open approach.

The company engaged the industry with well-defined packages and price plans at a time when most service providers kept their SD-WAN offers tightly under wraps.

CenturyLink understands both network and enterprise IT challenges. The company is a provider of managed services for cloud, big data, and hosted business applications. Enterprises use CenturyLink tools to enhance their DevOps and applications lifecycle management. The company adds a portfolio of managed security services to protect and support its network and IT services.

CenturyLink offers a Dynamic Connections feature that lets organizations rapidly set up private port connections from their data centers to private clouds and hyperscaler platforms including AWS, Google Cloud, and Microsoft Azure. Since its initial launch of NFV services, the provider has extended its NFV portfolio to enterprise sites. CenturyLink delivers the overall platform, orchestrates and manages individual network functions.

Appendix

RESEARCH METHODOLOGY

This document sources data from an enterprise survey on adaptive networking conducted by Ovum and sponsored by CenturyLink. Ovum conducted 320 telephone and voice interviews of US-based enterprises across seven vertical industries, including 50 businesses in the manufacturing industry. Ovum questioned qualified enterprise IT executives about their experiences, in terms of realized benefits and improvements, from their adoption of adaptive networking technologies.

IT executives were asked both to estimate business improvements from individual adaptive networking practices and to estimate benefits from their net adaptive networking practices. Enterprise improvement claims presented in this document are based on averaged results of respondents qualified to provide meaningful answers based on their experiences.

Additional data on the manufacturing sector comes from Ovum Enterprise Network Services research surveys (which included 40 businesses in manufacturing) and from qualitative discussions with enterprise IT executives about their networking plans and challenges.

OVUM CONSULTING

We hope that this analysis will help you make informed and imaginative business decisions. If you have further requirements, Ovum's consulting team may be able to help you. For more information about Ovum's consulting capabilities, please contact us directly at consulting@ovum.com

Ovum is a market-leading data, research, and consulting business focused on helping digital service providers, technology companies, and enterprise decision-makers thrive in the connected digital economy. We create business advantage for our customers by providing actionable insight to support their business planning, product development, and go-to-market initiatives.

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Adaptive networking described in this paper is a separate term from the Adaptive Network™ by Ciena. Organizations use Ciena's Adaptive Network solutions to build and operate platforms and infrastructure elements. Adaptive networking is an umbrella term representing agile, flexible enterprise platforms and services.

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