

LUMEN®

Preparing for the Networked Revolution

Your Field Guide to the 4th Industrial Revolution



Throughout human history, technology and innovation have shaped how humans live, work, survive, and thrive. In modern times, we've harnessed elemental factors such as steam and electricity to better mankind on a vast scale. We've experienced three technology-driven revolutions driven by steam, electricity, and computing.

Today, we're in the midst of a 4th Industrial Revolution (4IR), and its complexity, scope, and impact dwarf those of the industrial revolutions that preceded it. Four out of five senior IT decision-makers agree that we will experience a century's worth of technological advancement within the next five years, according to a global poll conducted by Quadrant Strategies in July 2020 for the [Lumen Global Trend Report: How the 4th Industrial Revolution Is Changing IT](#).

The 4th Industrial Revolution ties physical, digital, and biological systems into a seamless whole that is largely regulated and operated through intelligent automation. The benefits are numerous: increased market agility, previously unthinkable efficiency, hyperpersonalization of products and experiences, and much, much more.

This imminent revolution will see organizations leverage a host of next-generation applications, fueled by data that's acquired, analyzed, and acted on for better business outcomes. They'll be connected by adaptive, secure networks, and enabled by a platform that spans all types of cloud environments and on-premise deployments, all the way to the edge.

Advanced technologies will play a critical role, from artificial intelligence (AI) and the Internet of Things (IoT) to augmented reality (AR), virtual reality (VR), Software-Defined Networking (SDN), adaptive networking, and blockchain.

The future of infrastructure

In manufacturing, for example, the 4IR is building smart factories in which every aspect of the operation is digitized. Autonomous robots move material and goods, while workers wearing AR headsets can see overlays of schematics as they maintain equipment. In healthcare, robots and low-latency systems will enable remote surgery, while AI and wearable monitors will notify patients of potential health crises long before they become apparent.

In retail, AR will enable customers to try out products virtually, from the comfort of their own homes. AI will crunch petabytes of data to conduct highly personalized promotions and marketing campaigns. Finally, cities will be utterly transformed with fleets of autonomous vehicles that communicate with city systems and each other to sharply reduce accidents and congestion.

To make this vision of the future a reality, however, our public and private IT infrastructure needs to transform. After all, 73% of IT decision-makers say that their current infrastructure is insufficient to support upcoming requirements for performance and the management of large data volumes. [Seventy-five percent are concerned](#) about their organizations' ability to keep up with the advances of the 4IR.

In this dossier, we provide a guide to the 4IR, along with some ideas and strategies for ensuring your organization is ready.

IT implications of the 4IR

The 4IR is already underway, though it may not yet be noticeable to the general public—but it soon will be.

“In the moment, it feels like an evolution,” says Lumen Technologies CTO Andrew Dugan. “But the change will be so significant, it will feel like a revolution when we look back on it.”

According to [IDC FutureScape: Worldwide Future of Work 2020 Predictions](#) (2019), “By 2021, the contribution of ‘digital coworkers’ will increase by 35%, as more tasks are automated and augmented by technology, including AI, robotics, AR/VR and

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intelligent process automation.” These “digital coworkers” can perform routine and even dangerous tasks accurately and efficiently, enabling human talent to focus on higher-value tasks.

Before an organization can enjoy these benefits, however, it must first upgrade its infrastructure to support these new technologies. One of the most important infrastructure upgrades is aimed at enabling low latency. The Lumen [Global Trend Report](#) found that 60% of global IT decision-makers require fewer than 10 milliseconds of latency for their apps, and 20% say they need fewer than 5 milliseconds. More than 90% of IT decision-makers say they expect to implement edge computing to keep pace with IoT.

“There’s a balancing act that has to happen between where data needs to reside, where it’s most cost effective to reside, and where it has to reside to achieve the performance or the goals of whatever the application is that’s using and accessing that data,” says Paul Savill, Lumen Technologies’ senior vice president, products and services.

Autonomous vehicles, for example, require extremely fast connections to operate safely. Self-driving cars must make split-second decisions based on rapidly changing situations. Unfortunately, the speed of light places a hard limit on how fast information

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can travel. If the data center (whether the cloud or a traditional enterprise facility) is hundreds of miles away, lag is inevitable. And while the high-throughput and extremely low latency of 5G wireless technology will provide the final connection from vehicles to the network, 5G does not have a tremendous range.

To provide the required performance and enable 5G wireless capabilities, processing and storage must be moved to the edge of the network, close to the end user. In this way, tasks that require low latency can be performed at the edge, while less time-sensitive tasks take place within the cloud or a corporate data center.

Technologies beyond the edge

Extending processing and storage to the edge is not enough, however. Nine in 10 C-suite leaders say that an optical fiber network is required to connect to the cloud resources they use. A fast, adaptive network from the core to the cloud and the edge is vital to support the advanced use cases that are on the horizon.

Additionally, 81% of IT decision-makers say that a centralized cloud model will not meet the demands of their applications. Instead, organizations are moving to a hybrid cloud model, where local resources integrate with the cloud to deliver the speed of on-premises infrastructure and the unmatched scalability, ubiquity, and robustness of the cloud.

The network needs to be not only fast but also adaptive, so it can adjust to real-time capacity needs and deliver scalable, high-bandwidth connectivity. When usage spikes occur, remote surgery centers and autonomous robots on the factory floor can't wait for an engineer. The network must adjust autonomously to meet the need.

Security in a world outside the perimeter

Finally, an advanced infrastructure requires advanced security, which is the top concern for 93% of global IT decision-makers. After all, in a post-4IR world, users, applications, and devices will not be located behind the corporate firewall. Instead, each user, device, and application must be protected, no matter its location.

Security strategies will need to be rethought, based on networks and application workloads. The long-sought goal of security that's built into the architectural foundation and not relegated to an endpoint will have to become the norm, not the exception. Security systems will need to be intelligent and automated, to proactively identify and neutralize threats before they wreak havoc. IT will need to leverage AI and machine learning along with advanced analytics to keep pace with emerging threats and to ensure that every device and application is secure.

Putting it all together

With the right network infrastructure and security, the final step in preparing your organization for the advances to come is orchestration. The advanced use cases that the 4IR will enable are certain to require dozens, even thousands, of applications to integrate tightly with one another to achieve the desired outcome. Networking innovations such as adaptive networking and software-defined networking (SDN) can provide the flexibility necessary to enable the orchestration layer to create and tear down connections as needed to ensure peak performance and efficiency.

As noted at the very beginning of this guide, this modernization effort is extremely complex and fast moving. Today, market conditions shift at lightning speed, accelerating transformation and quickly making the 4IR a reality. A trusted partner can help provide the underlying network, security systems, and orchestration required to enable these advanced capabilities.

Lumen provides a highly scalable high-speed network with fiber connections to all major clouds; less than 5-millisecond latency to more than 100 edge market nodes; and automated threat detection that actively monitors 3.6 million threats per day. It's the ideal foundation on which to build your 4IR capabilities.

[LEARN MORE ABOUT LUMEN AND ITS MANAGED AND PROFESSIONAL SERVICES HERE](#) →

Further reading

WHAT IS IOT? THE INTERNET OF THINGS EXPLAINED

The internet of things (IoT) is a network of connected smart devices providing rich data, but it can also be a security nightmare. application is secure.



THE INTERNET OF THINGS IN 2020: MORE VITAL THAN EVER

Just when we needed it most, the internet of things is delivering gobs of data and remote device control across almost every industry, from healthcare to agriculture.



HOW MICROSEGMENTATION ARCHITECTURES DIFFER

Microsegmentation promises to thwart network attackers by curbing their movements and limiting access to enterprise resources. Architecture types include host-agent segmentation, hypervisor segmentation and network segmentation.



OVERCOMING THE CHALLENGES OF MACHINE LEARNING AT SCALE

As AI/ML technologies gain traction, organizations may struggle to move from POC to full-scale production.



Q&A: HOW AI, RPA AND BLOCKCHAIN CAN DRIVE CHANGE IN EMERGING MARKETS

Kate Krukiel, GM of UN Digital Solutions Centre and managing director of Sera Afrika, says emerging tech can address business and societal challenges alike.

