SECURING THE FUTURE OF A SMART WORLD

OPPORTUNITIES AND CHALLENGES IN A 5G CONNECTED ECONOMY

REPORT | MAY 2019

BPI™

A10

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INTRODUCTION

The rollout of the next generation of wireless networks has begun in earnest, introducing what many believe will be one of the most seminal technology transformations of a still young digital age. 5G networks, with their dramatic advances in transmission speed, latency, capacity, energy efficiency and connection densities, promise to bring about a smarter and more connected world that will drive massive changes across the global economy.

5G-enabled breakthroughs will open new revenue opportunities and business models for operators and their customers. Powerful new use cases around evolved Mobile Broadband (eMBB), Ultra-Reliable Low-Latency Communications (ULLC) and massive Machine-to-Machine Communications (mMTC) will push the boundaries of digital transformation. From new user experiences in augmented and virtual reality and ultra-high definition video streaming, to high-speed fixed wireless, new types of cloud services and applications, autonomous vehicles, and smart cities, buildings, factories and farms—5G will unleash a plethora of new applications and uses that will change the way people work and live.

" *The mobile industry anticipates major new revenue opportunities with 5G*

The introduction of the first commercial 5G networks, which began in 2018, is picking up significant steam. In the U.S., Europe, Asia and the Middle East, the major carriers are pushing forward with their first commercial 5G deployments. By the end of 2019, according to Viavi Solutions, some 55 commercial 5G networks will have been launched.

Yet, full-scale 5G networking and the realization of its potential is still a long ways away. Operators and their technology partners still must make massive capital investments and drive major innovations in the next several years.

In partnership with A10 Networks, a leading provider of security solutions for mobile operators worldwide, the Business Performance Innovation (BPI) Network, has conducted a global survey of communications service providers to understand industry intentions, priorities and concerns about 5G. While the main focus of this report will be on the findings from communications service providers, the BPI Network also surveyed technology and business leaders among mobile, IT and cloud service providers to gather the insights for this study. In total, 145 technology leaders were surveyed for this report.

Our survey findings underscore the fact that mobile carriers around the world foresee rapid progress toward 5G over the next 18 months. They believe these investments will deliver significant new revenue opportunities for carriers and disruptive new use cases for many industries.

" *Operators globally anticipate rapid progress toward 5G over the next 18 months*

The survey also makes it abundantly clear that improved security is a major concern for operators as they assess the risks associated with new levels of traffic, explosive growth in connected things and demanding, mission-critical use cases planned for their networks. Indeed, the vast majority of mobile operators surveyed say that 5G is now a major consideration in their security investments. They are nearly unanimous in their belief that improved security and reliability must be an essential aspect of 5G networks. Indeed, mobile carriers rank security nearly on par with increased throughput and capacity as critical to the next generation of networks.

" *Security is a top concern for 5G operators, almost equal to increasing capacity and throughput*

Yet, the study also indicates that most operators have significant work to do in building the security foundation needed to support 5G. For example, while the great majority of respondents say they will implement new, higher performance Gi firewalls at the core of their networks, only 11 percent have completed implementation. Given survey responses, that percentage should climb rapidly in the coming months. It must, if operators intend to be prepared for new risks and challenges of 5G security.

KEY FINDINGS

Mobile operators are now moving decisively toward 5G transformation

Like past generations of mobile networks, 5G will be a long journey, not a sudden event. However, operators around the world are now moving rapidly toward implementation. Two-thirds of all mobile operator respondents say their companies will implement their first commercial networks within 18 months, with another 21 percent saying commercialization will occur within two years. Two-thirds of mobile respondents also say these initial networks will be operating in advance of final 5G standards. Just 21 percent say their companies are still only in the planning phase and just 4 percent say they have not yet begun planning.

As a result, 5G is now playing a significant role in the current technology decisions of operators. Some 96 percent of all mobile respondents say 5G is a consideration in their current technology decision-making, with three-quarters saying 5G either "very much" or "frequently" impacts their technology decisions.

Moving toward a Smart World—Assessing 5G benefits and use cases

Realizing the potential of full-scale 5G mobile networks will require major investments by carriers—and payback on that spend is a crucial issue for the telecommunications industry. The business case for 5G, of course, goes far beyond faster data transfer and download speeds for smartphone users. New industrial and public infrastructure use cases, driven by IoT and AI technologies, are a major part of the 5G scenario. They will have to be, if operators are to realize a satisfactory return on their investments.

> *Operators say growth of the mobile market will be a major benefit of 5G*

Indeed, operators see significant opportunities to increase revenues and innovate new business models. Asked what they believe will be the top benefits derived from 5G, some two-thirds point to overall growth in the mobile market. Second on the list of top benefits is better customer service and satisfaction, at 59 percent, followed by creation of new 5G-enabled business models at 43 percent. Fourth on the list is using 5G deployments to increase competitive advantage in winning new customers.

New uses cases will not happen overnight. Most operators (78 percent) are focusing on enhanced Mobile Broadband (eMBB), i.e. faster and better mobile connections, as the service area they will prioritize first. However, a significant percentage (44 percent) also point to Massive Machine Type Communications (MMTC), i.e., machine-centric communications providing connectivity to large

numbers of IoT devices, as a service priority from the start. And over a third (38 percent) also point to Ultra-Reliable Low-Latency Communications (URLLC), which will enable such use cases as autonomous cars and IoT-intensive settings like Smart Cities, as an early priority.

If fact, while high-speed connectivity is seen as major market driver for 5G, it comes in second to Smart Cities on the list of the most important use cases that operators say will drive 5G. Connected vehicles are the third biggest driver, followed by fixed wireless, industrial automation and smart manufacturing .

Smart Cities are seen as the number one driver for 5G networks

With its much higher data speeds, dramatically reduced latency and increased reliability, 5G will open the door to massive innovation and disruptive changes in virtually all industries. Respondents believe the automotive industry, with the advent of self-driving vehicles, will experience the greatest disruption due to 5G.

Cloud services are also high on this list, and second only to automotive, among industries that telco respondents say will undergo disruptive change. Among a subset of respondents who are cloud service providers, cloud services was identified far and away as the industry that will be most disrupted.

The cloud is already a major factor in the way the world experiences mobile networks. Cloud applications, services and storage are all key components of that experience. However, the dramatic improvements coming with 5G will make cloud applications and storage even more widely adopted and enable exciting new cloud-delivered services in areas such as IoT, robotics, smart cities and artificial intelligence. 5G will require changes in how and where data centers are built, and cloud service providers that are 5G-ready will have a significant competitive advantage.

Virtualizing Network Infrastructure

5G networks will require virtualization and improved programmability to achieve the flexibility and cost-efficiencies needed to tailor support to a much wider and varied range of use cases. Virtualization, via technologies like network function virtualization (NFV) and software-defined networking (SDN), will deliver major improvements in time-to-market for new services while reducing CapEx and OpEx.

At the network core, operators will use network slicing to create multiple virtual networks over a single physical infrastructure to support different types of services. At the edge, virtualization of the mobile radio access network will be needed to customize services for a wide variety of use cases like autonomous vehicles, IoT uses, augmented reality and others that require varying levels of network capacity, performance, reliability and latency.

> ## *Operators say they are well along the way toward implementing virtualization at the core of their networks*

Operator respondents indicate their companies are well along the way toward implementing virtualization of their packet core infrastructure. Some 40 percent report they have either completed or are well on their way to completion. Another 32 percent report making "good progress" toward virtualization, while 23 percent say they are just beginning or in the planning phase.

Securing a Smart World

The increased criticality, complexity and throughput of 5G networks will make security a major requirement and challenge for mobile operators. 5G will enable a massive increase in the number of connected devices, as new IoT use cases and deployments are expected to grow exponentially. Gartner estimates that there will be more than 20 billion connected IoT devices by 2020. New very high bandwidth applications will also take advantage of dramatic increases in network capacity and performance. The result will be a massive expansion of the attack surface available to cyber criminals to perpetrate activities such as distributed denial of service (DDoS) attacks and a massive increase in traffic that operators will need to analyze and secure.

The growing density of base station deployments and use of virtualization and the cloud will also put new security demands on these networks. Meanwhile, the consequences of security breaches will increase dramatically, with the advent of mission-critical applications on 5G networks, such as autonomous vehicles, remote patient monitoring and surgery in health care, and smart cities, factories and homes. As a result, 5G must be built on solid security foundation.

> ## *94 percent of operator respondents believe security and reliability concerns will increase with the advent of 5G*

Indeed, some 94 percent of all operator respondents expect growth in network traffic, connected devices and mission-critical use cases to significantly increase security and reliability concerns. Asked to identify the most important considerations in planning for 5G, carriers named only network capacity and throughput more often than security as a "very important" consideration. The fact that security is considered nearly as important as performance underscores how essential operators view security in tomorrow's 5G world.

Some 79 percent of respondents said security is already being considered in their current security investment, with only 2 percent saying they did not expect security to be an important consideration going forward.

Chief among their security concerns is fortifying the core network security, followed by endpoint security. 98 percent of respondents said core network security was either of very important (72 percent) or important (26 percent) concern.

> ## *Improved DDoS protection is a major concern for operators*

Asked what security advances are most critical to future deployments, three capabilities were identified as essential: forward compatibility to 4G and 5G standards, advanced DDoS protection to address larger attacks anticipated with 5G, and improved scale and performance to handle increased traffic and concurrent sessions.

Operators should be building their new security infrastructures in advance of 5G rollouts. Nevertheless, respondents indicate their companies still have a tremendous amount of work ahead of them to upgrade their security. Asked if they will upgrade their Gi firewalls given the increased traffic rates and scalability requirements of 5G, the vast majority of respondents said they are planning to do so. However, only 11 percent have already made this critical upgrade. Asked if they will upgrade their GTP firewalls, given complexity of the control and management planes in 5G networks, some three-quarters of respondents said they will make that upgrade as well, but only 13 percent have done so.

> ## *Consolidation of security and application delivery services at the core is seen as very important*

In assessing requirements for Gi-LAN upgrades, the vast majority of mobile carrier respondents said that consolidation of security and application delivery services is important to them given the need to reduce latency and costs. Consolidation is important because maintaining such services as firewall, carrier-grade NAT (CGNAT), traffic optimization and deep packet inspection on different servers will significantly increase latency versus processing traffic through a single multi-function solution.
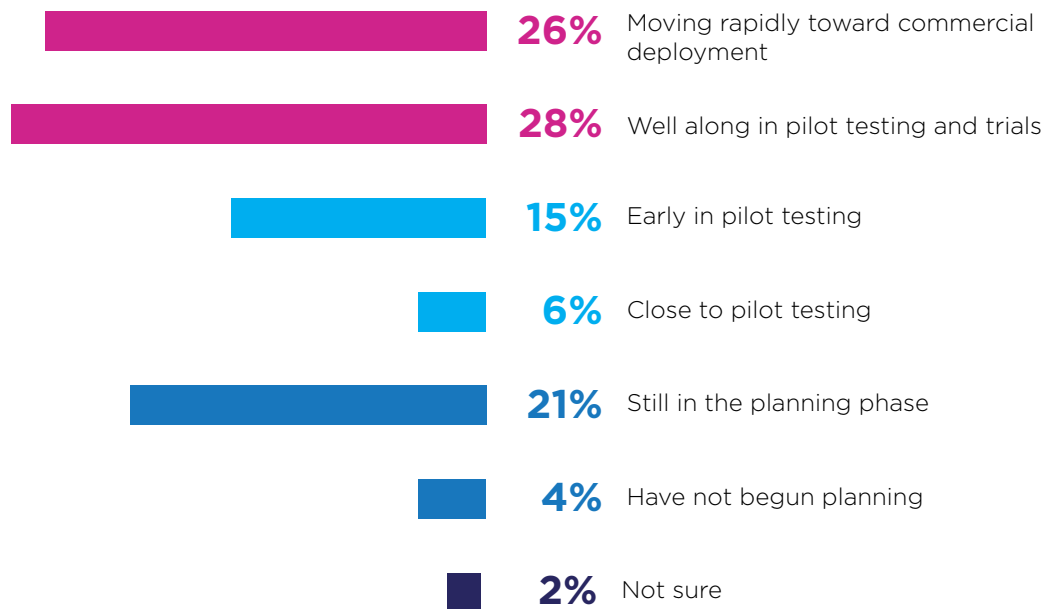
DETAILED FINDINGS

1 **MOBILE OPERATORS ARE NOW MOVING DECISIVELY TOWARD 5G TRANSFORMATION**

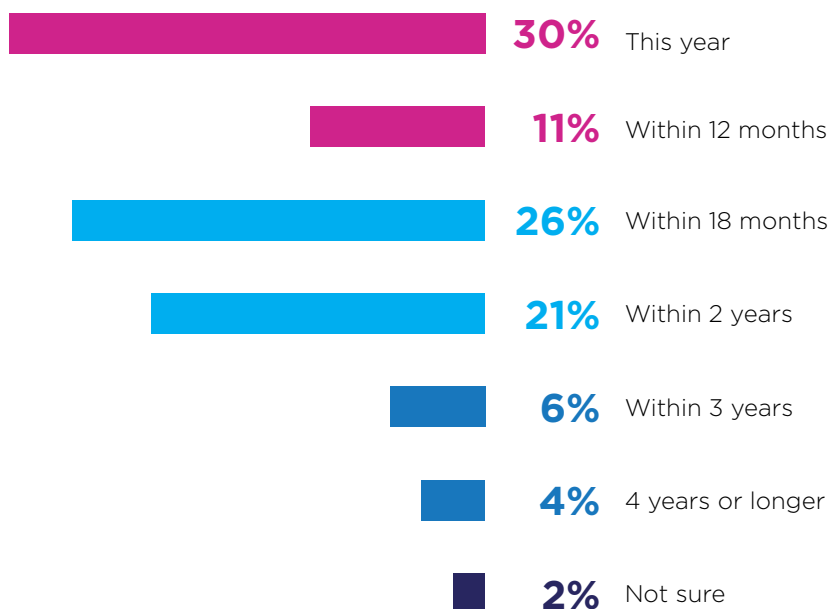## Where is your company in its journey toward 5G deployment?

Mobile operator respondents report they are making significant strides toward 5G. More than two-thirds say they have at least begun pilot testing, including 26 percent of respondents who characterize their efforts as moving rapidly toward commercialization

26% Moving rapidly toward commercial deployment

28% Well along in pilot testing and trials

15% Early in pilot testing

6% Close to pilot testing

21% Still in the planning phase

4% Have not begun planning

2% Not sure

When do you expect your company to begin its first commercial 5G deployments?

Reflecting the rapid move toward 5G, some 67 percent of respondents from mobile carriers say their companies will begin commercial deployments within the next 18 months, and 88 percent within 2 years.

30% This year

11% Within 12 months

26% Within 18 months

21% Within 2 years

6% Within 3 years

4% 4 years or longer

2% Not sure

Is the coming of 5G a significant consideration in your company's current technology decisions?

The intentions of mobile operators to move to 5G networks are having a significant impact on their current technology decisions. The vast majority of respondents say 5G is impacting their companies' technology choices today, including 77 percent who say the impact is significant.

49% Yes, very much

28% Yes, frequently

19% Some of the time

4% Not yet

0% Not sure
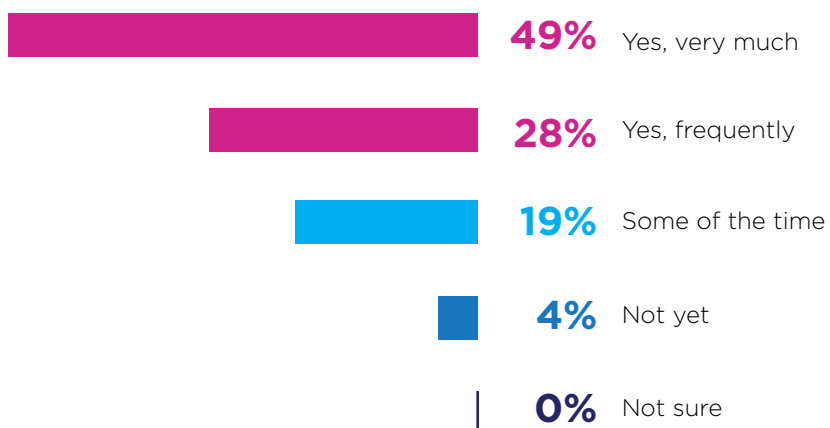
Do you expect to launch commercial 5G services in advance of final 5G standards?

The complete 5G standard, Release 16, has not yet been set. Release 16 will add standards for connected cars, smart factories, enterprise and private networks, and public safety. However, the great majority of respondents, some two-thirds, say they expect to deploy commercial 5G in advance of final standards.

15%
Not Sure

19%
No

66%
Yes

SECURING THE FUTURE OF A SMART WORLD

REPORT
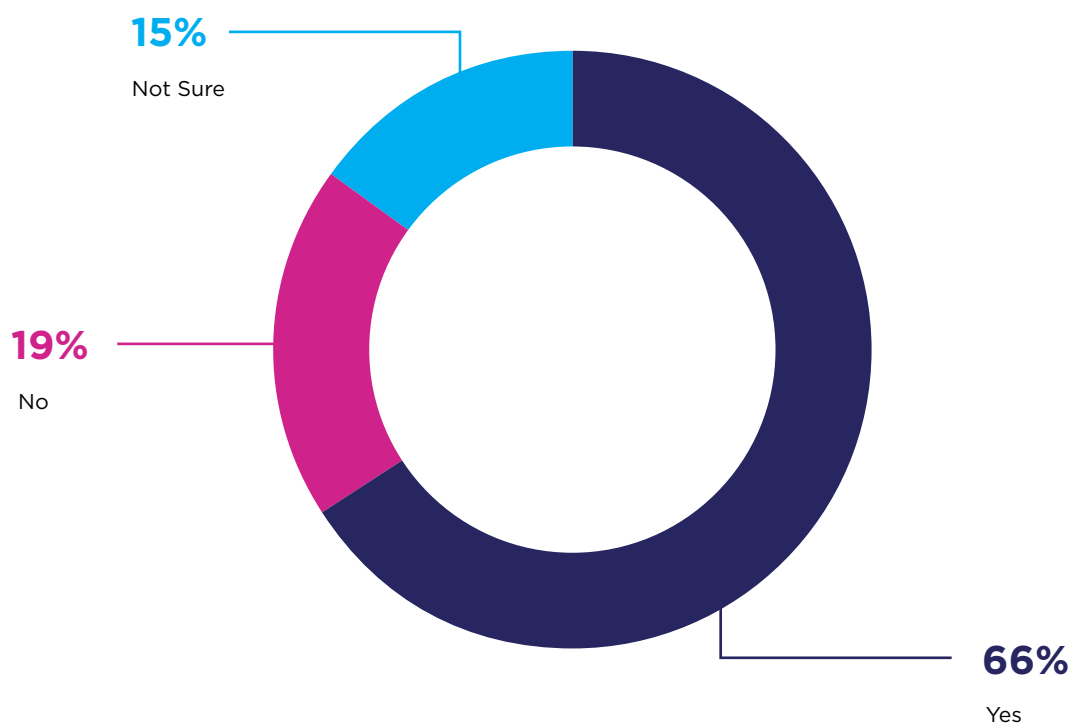
2 MOVING TOWARD A SMART WORLD—ASSESSING 5G BENEFITS AND USE CASES

Which 5G service will your company prioritize first? (Select more than one, if appropriate)
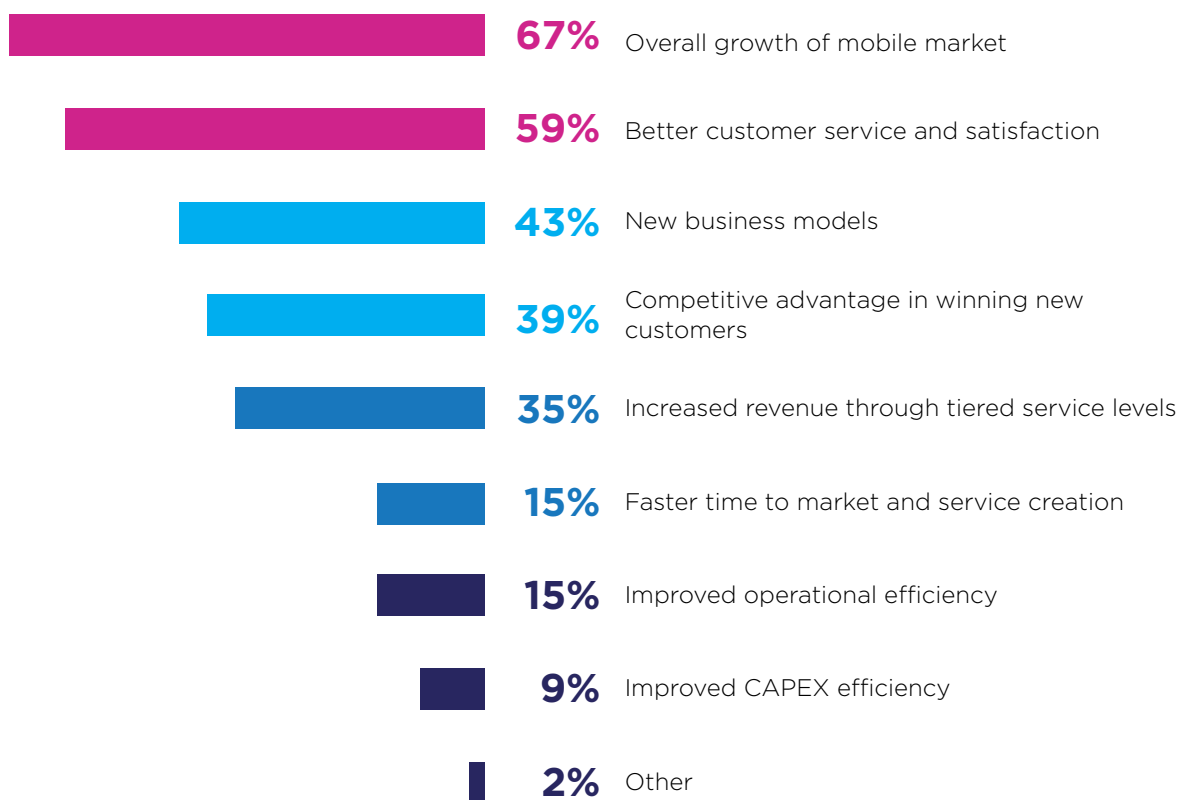
Most operators (78 percent) are focusing on Enhanced Mobile Broadband (eMBB), i.e. faster and better mobile connections, as the service area they will prioritize first. However, a significant percentage (44 percent) also point to Massive Machine Type Communications (MMTC), i.e., machine-centric communications providing connectivity to a large numbers of IoT devices, as a service priority from the start. In addition, over a third (38 percent) also point to Ultra-Reliable Low-Latency Communications (URLLC), which will enable such use cases as autonomous cars and IoT-intensive settings like Smart Cities, as an early priority.

38%
Ultra-Reliable Low-Latency
Communications (URLLC)

78%
Enhanced Mobile
Broadband (eMBB)

44%
Massive Machine Type
Communications
(MMTC)

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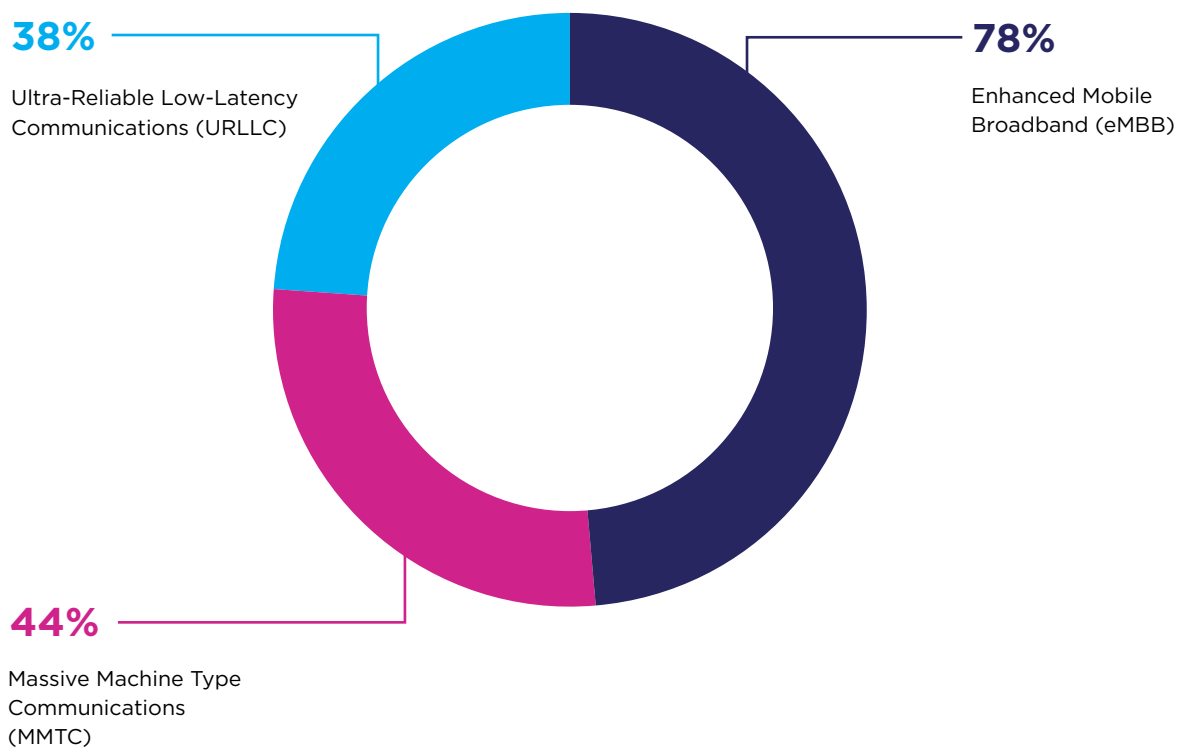
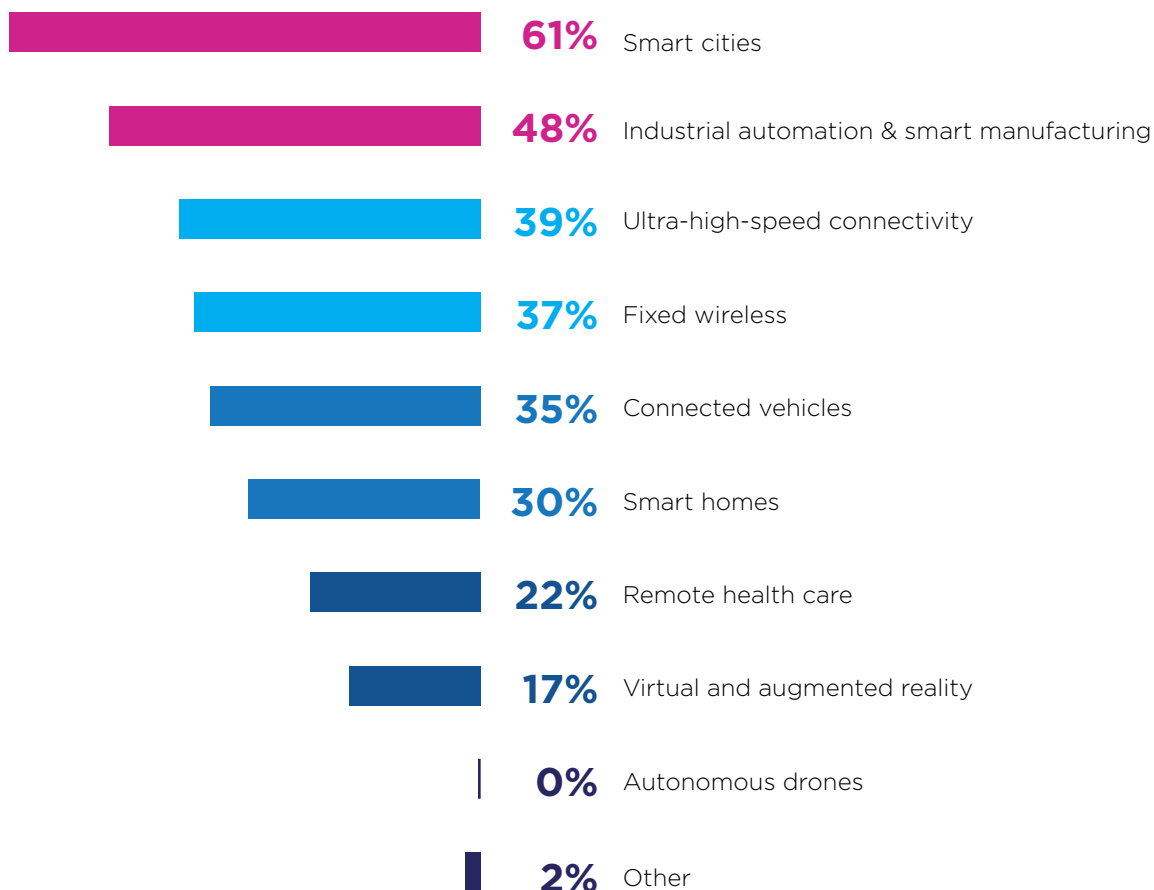## How will your company most benefit from 5G? (Select top three)

Operators see significant opportunities to increase revenues and innovate new business models. Asked what they believe will be the top benefits derived from 5G, some two-thirds point to overall growth in the mobile market. Second on the list of top benefits is better customer service and satisfaction, at 59 percent, followed by creation of new 5G-enabled business models at 43 percent. Fourth on the list is using 5G deployments to increase competitive advantage in winning new customers.

67% Overall growth of mobile market

59% Better customer service and satisfaction

43% New business models

39% Competitive advantage in winning new customers

35% Increased revenue through tiered service levels

15% Faster time to market and service creation

15% Improved operational efficiency

9% Improved CAPEX efficiency

2% Other

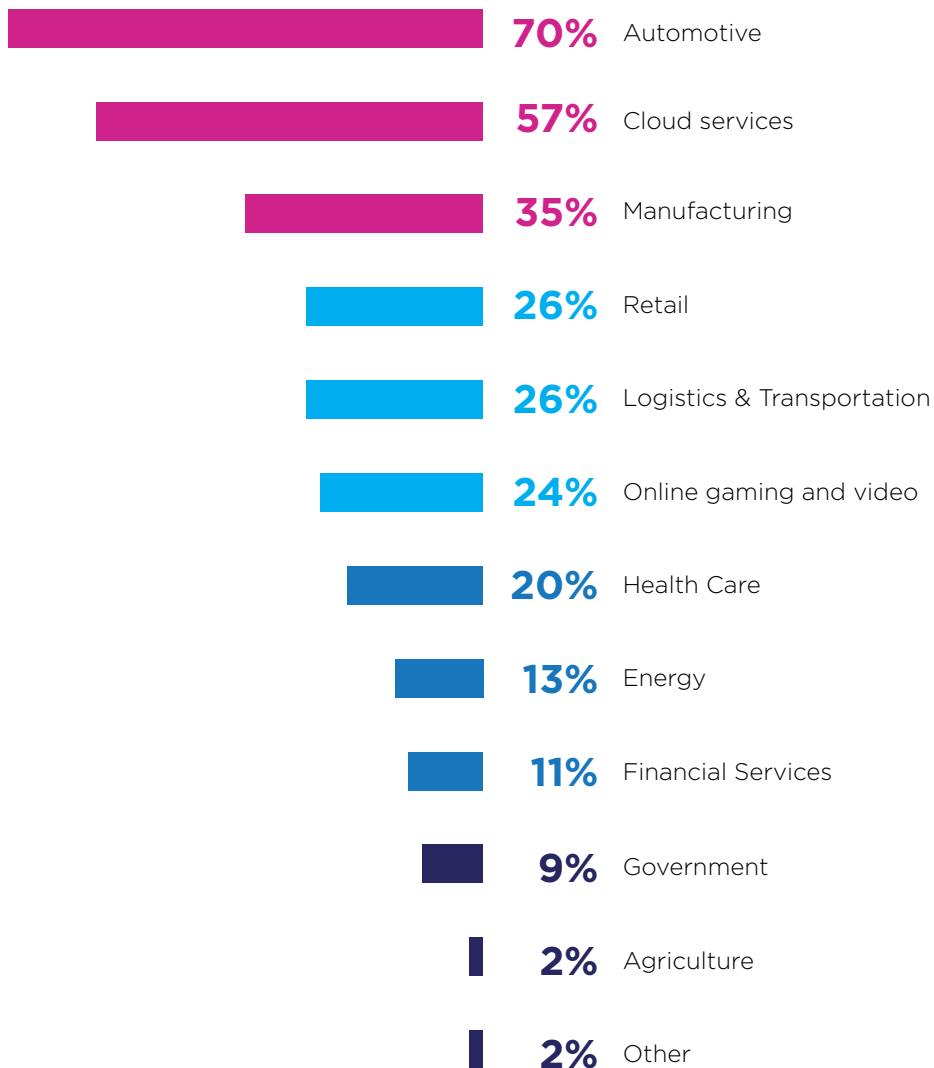## What use cases will be the biggest drivers for 5G? (Select top three)

For the massive investments required, operators need 5G to drive significant new revenues through market growth and new use cases. Survey respondents believe a wide range of use cases will be drivers for 5G. Chief among them is the advent of Smart Cities, followed by ultra-high-speed connectivity, connected vehicles and fixed wireless.

61% Smart cities

48% Industrial automation & smart manufacturing

39% Ultra-high-speed connectivity

37% Fixed wireless

35% Connected vehicles

30% Smart homes

22% Remote health care

17% Virtual and augmented reality

0% Autonomous drones

2% Other

In which industries do you expect 5G to cause the most disruptive change? (Select top three)

With its much higher data speeds, dramatically reduced latency and increased reliability, 5G will open the door to massive innovation and disruptive changes in virtually every industry. Respondents believe the automotive industry, with the advent of self-driving vehicles, will experience the greatest disruption due to 5G. Cloud services are also high on the list of industries that service providers say will undergo disruptive change due to 5G. In fact, among a subset of respondents who are cloud service providers, cloud services was identified far and away as the industry that will be most disrupted.
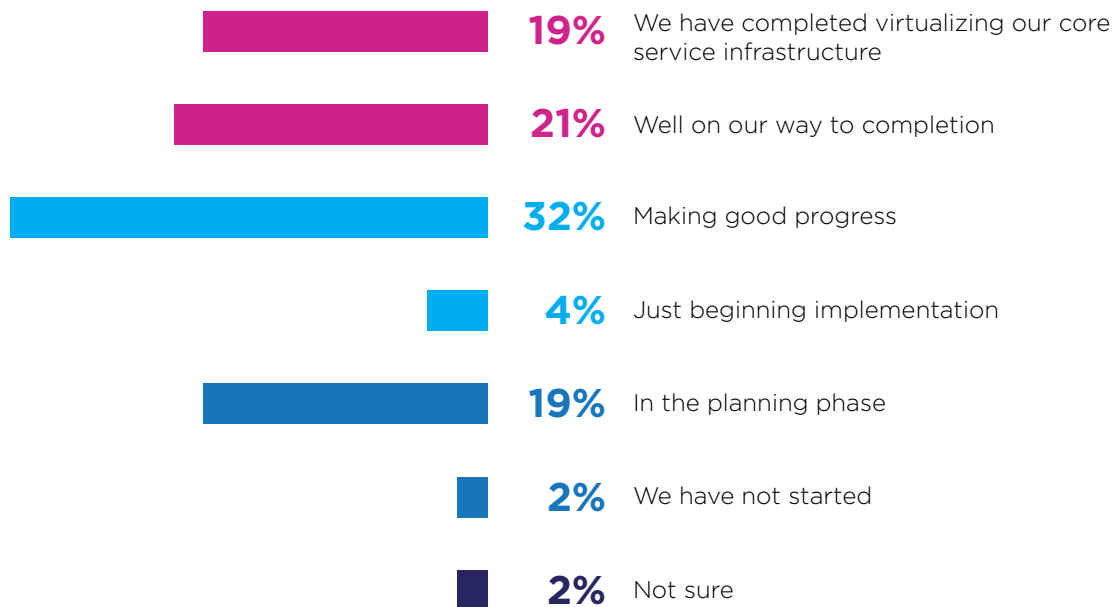
70% Automotive

57% Cloud services

35% Manufacturing

26% Retail

26% Logistics & Transportation

24% Online gaming and video

20% Health Care

13% Energy

11% Financial Services

9% Government

2% Agriculture

2% Other

3   VIRTUALIZING NETWORK INFRASTRUCTURE

At what stage is your company in virtualizing its packet core infrastructure to support 5G transformations?

5G networks will require virtualization and improved programmability at both the network core and edge to achieve the flexibility and cost-efficiencies needed to tailor support to a much wider and varied range of use cases. Virtualization, via technologies like network function virtualization (NFV) and software-defined networking (SDN), will deliver major improvements in time to market for new services while reducing CapEx and OpEx. Network operators report making significant strides toward virtualizing their packet core infrastructures, with close to three-quarters saying they have either completed, nearly completed or are making good progress toward virtualization.

19% We have completed virtualizing our core service infrastructure

21% Well on our way to completion

32% Making good progress

4% Just beginning implementation

19% In the planning phase

2% We have not started

2% Not sure

Do you expect growth in network traffic, connected devices, and mission-critical IoT use cases to significantly increase security and reliability concerns for 5G mobile operators?

There is widespread industry consensus that security challenges will escalate with the advent of 5G networks. The increased criticality, complexity and traffic throughput of 5G networks will make increased security and reliability a major requirement, mobile operators say. In fact, only four percent of all mobile carrier respondents say increased traffic, connected devices and mission-critical uses case will not increase the need for security.

2%
Not sure

4%
No

94%
Yes
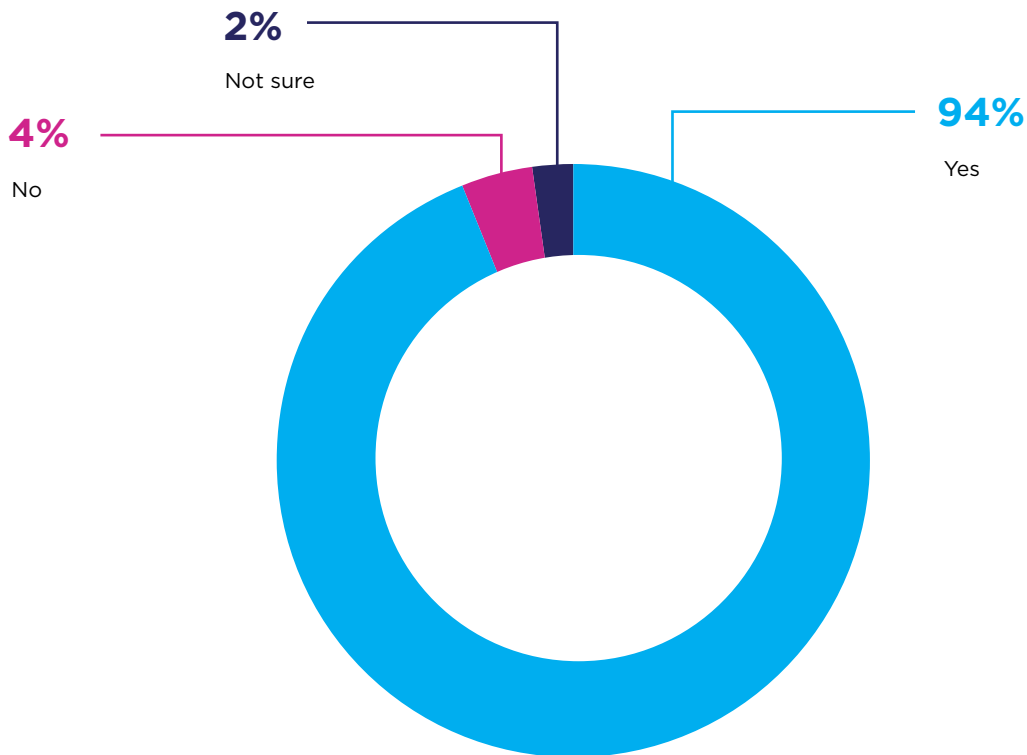
Please rate the importance of the following requirements in your current 5G planning and considerations.

Security is an overwhelming concern for 5G among mobile operators, almost on a par with network capacity and throughput. Over two-thirds of respondents cite security as a "very important" consideration in the build-out of next generation networks.

Question	Very Important	Important	Somewhat Important	Not important
Network Capacity and Throughput	72%	26%	0%	2%
Network Reach and Coverage	36%	62%	0%	2%
Automated Management & Configuration	17%	60%	21%	2%
Security	68%	26%	4%	2%
Other	56%	6%	22%	22%

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Is your company taking 5G requirements into consideration with your current security investments?

Security needs to be designed into 5G networks from the start. Fortunately, an overwhelming majority of respondents say their current investments in security are being influenced by 5G requirements.

79% Yes

17% No, but we're looking at it

2% No

2% Not sure
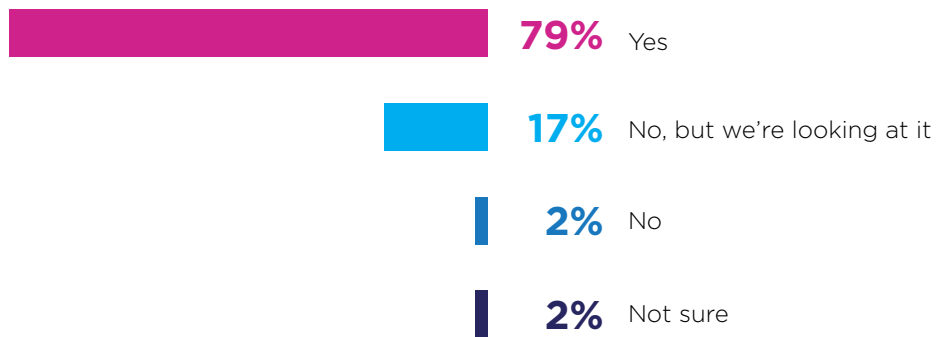
Rate the importance of these security concerns when rolling out 5G infrastructure and services.
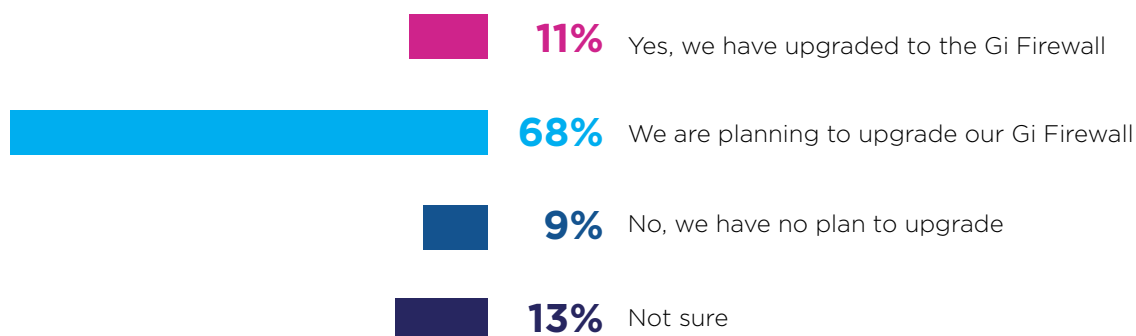
Core network security is the top of security concern for operators. Yet endpoint security is also highly rated, as is security management and staffing.

Question	Very Important	Important	Somewhat Important	Not important
Core network security	72%	26%	0%	2%
Endpoint security	60%	38%	0%	2%
Security management and staffing requirements	38%	57%	2%	2%

Given the increased traffic rates and scalability requirements of 5G, have you or are you planning to upgrade your Gi firewall?
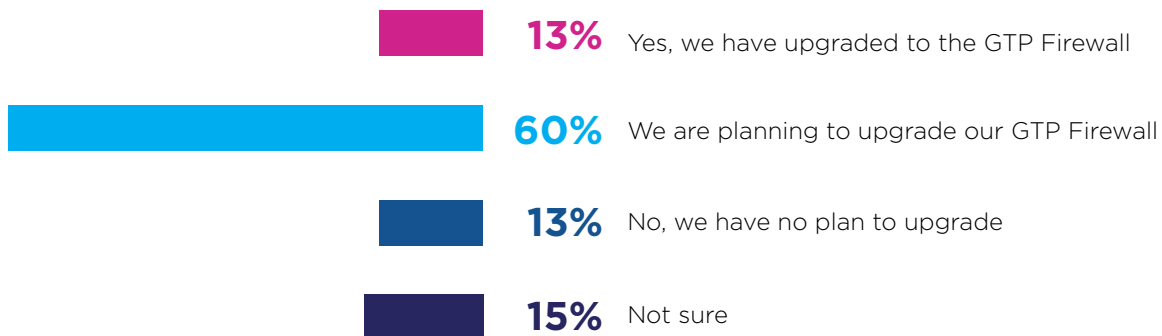
The need to upgrade the Gi firewall at the Evolved Packet Core is widely recognized as a critical need for improving 5G security, while it also delivers significant benefits to existing 4G networks. Some 79 percent of mobile operator respondents intend to upgrade given the increased traffic and scalability requirements of 5G. However, only 11 percent have completed the upgrade. Given responses to this question, we expect Gi firewall upgrades to increase significant in 2019.

11% Yes, we have upgraded to the Gi Firewall

68% We are planning to upgrade our Gi Firewall

9% No, we have no plan to upgrade

13% Not sure

Given the complexity of the control and management plane, have you or are you planning to upgrade your GTP firewall?

Asked if they will upgrade their GTP firewalls, given the complexity of the control and management planes in 5G networks, close to three-quarters of respondents said they will make that upgrade as well, but only 13 percent have done so. Again, given the importance of building 5G networks on a solid security foundation, we believe GTP firewall upgrades will and must increase rapidly.

13% Yes, we have upgraded to the GTP Firewall

60% We are planning to upgrade our GTP Firewall

13% No, we have no plan to upgrade

15% Not sure

How important to your company is consolidation of security and application delivery services in the Gi-LAN given the need to reduce latency and reduce costs?

The vast majority of mobile carrier respondents said that consolidation of security and application delivery services in the Gi-LAN is important given the critical need to reduce latency and lower costs. Maintaining such services as firewall, carrier-grade NAT (CGNAT), traffic optimization and deep packet inspection on independent servers significantly increases latency compared with processing traffic through a single multi-function solution.

34% Very important

51% Important

9% Somewhat important

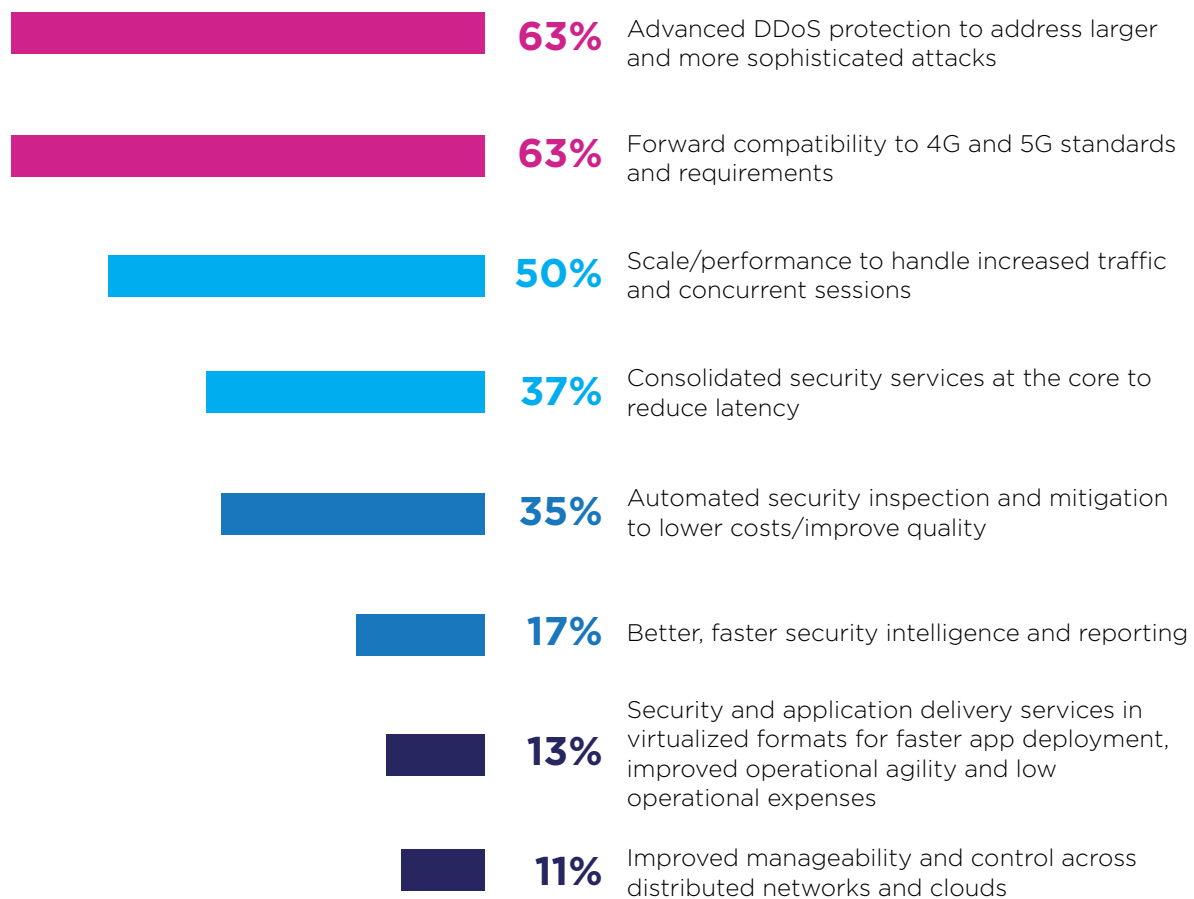**2%** Not important

4% Not sure
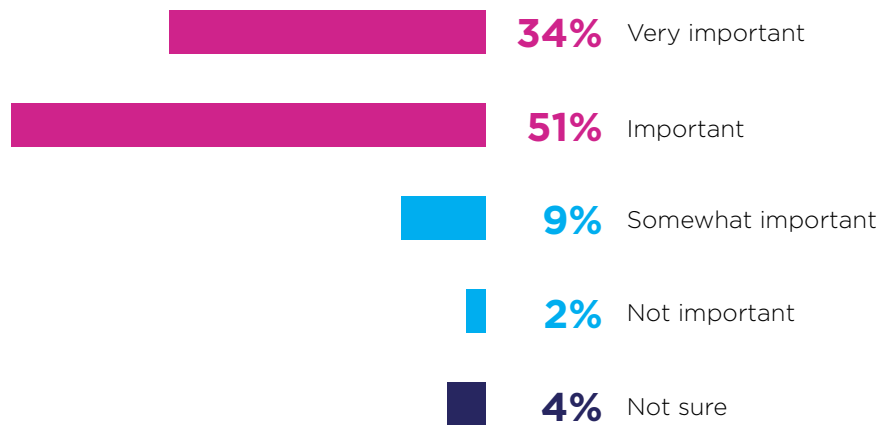
Which of the following security advances and capabilities are most important to your future security deployments? (Select top three)
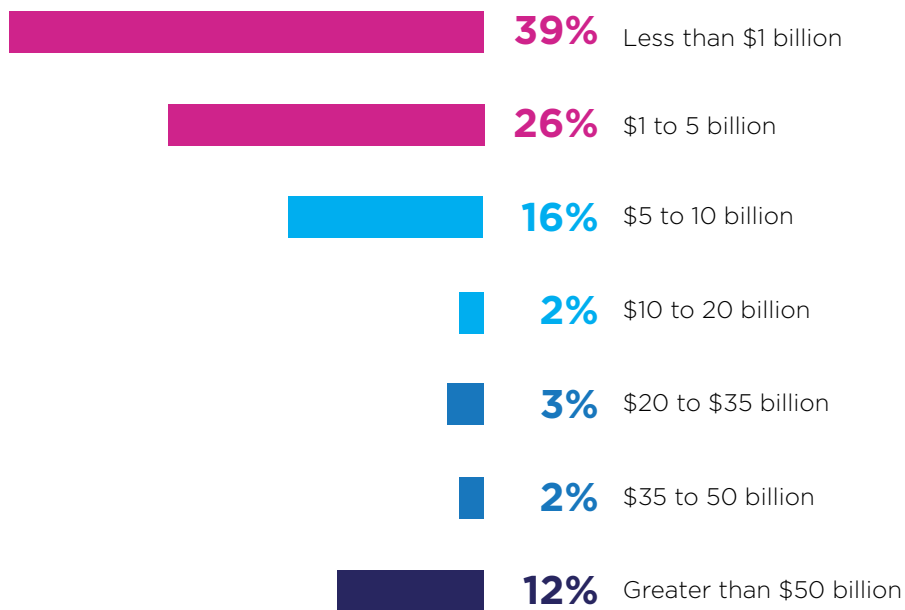
Improving DDoS protection is seen as a critical need in preparing for the coming of 5G, equal in importance to making sure that current security investments are compatible with both 4G and 5G networks. Operators also rate scale and performance and consolidation of security services high on the list of capabilities needed to improve 5G security.

63% Advanced DDoS protection to address larger and more sophisticated attacks

63% Forward compatibility to 4G and 5G standards and requirements

50% Scale/performance to handle increased traffic and concurrent sessions

37% Consolidated security services at the core to reduce latency

35% Automated security inspection and mitigation to lower costs/improve quality

17% Better, faster security intelligence and reporting

13% Security and application delivery services in virtualized formats for faster app deployment, improved operational agility and low operational expenses

11% Improved manageability and control across distributed networks and clouds

DEMOGRAPHICS

How large is your company in USD Revenue?

39% Less than $1 billion

26% $1 to 5 billion

16% $5 to 10 billion

2% $10 to 20 billion

3% $20 to $35 billion

2% $35 to 50 billion

12% Greater than $50 billion

What is your title?

16% C-level (CEO, CIO, COO, CFO, CMO, etc.)

3% Senior or Executive Vice President

12% Vice President

14% Executive Director

24% Director

7% Sr. Manager

23% Manager
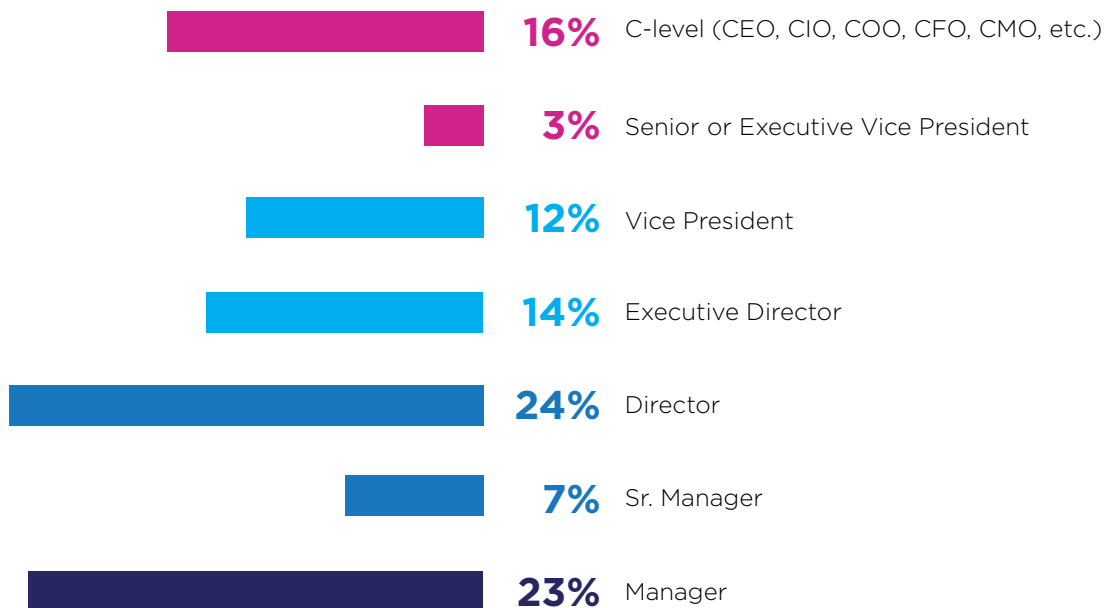
In which region is your company headquartered? (Select one)

44% North America

29% Europe

17% Asia Pacific

6% South America

4% Middle East

0% Africa
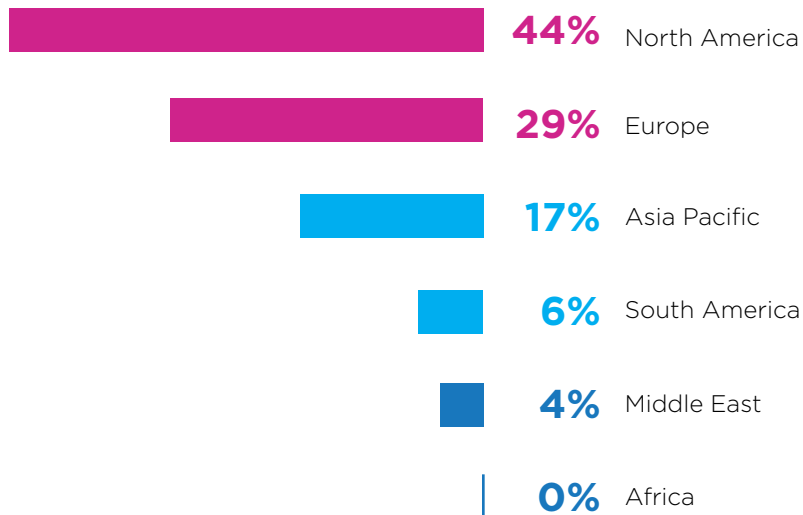
In which region(s) does your company operate? (Select all that apply)

58% Europe

56% North America

43% Asia-Pacific

37% South America

24% Middle East

20% Africa
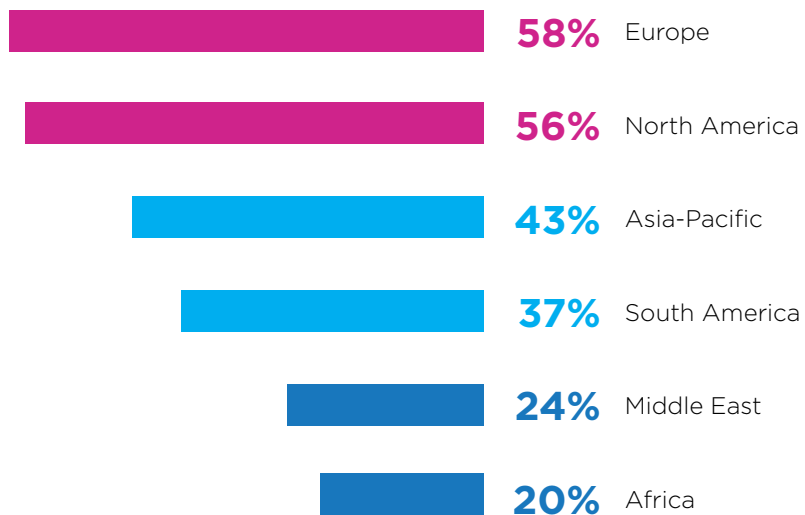
What best describes your company's industry sector? (Select one)

53% Telecom service provider

18% Cloud services provider

8% Information technology

8% Consulting/IT services

2% Government

0% Education

11% Other (please specify)
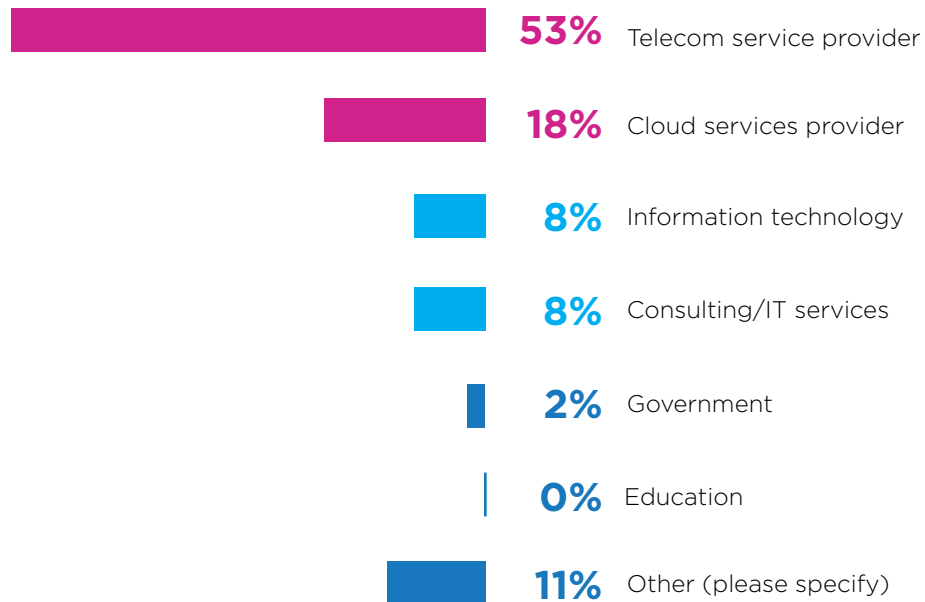
ABOUT A10 NETWORKS

A10 Networks was founded in 2004 with a mission to provide innovative networking and security solutions. A10 Networks makes high-performance products that help organizations accelerate, optimize and secure their applications. A10 Networks is headquartered in Silicon Valley, with offices in 23 countries including the United States, United Kingdom, France, The Netherlands, Germany, Spain, Brazil, Japan, China, Korea, Taiwan, Hong Kong and Australia. For more information, visit **www.a10networks.com**.

ABOUT BPI NETWORK

The Business Performance Innovation (BPI) Network is a peer-driven thought leadership and professional networking organization reaching some 50,000 heads IT transformation, change management, business re-engineering, process improvement, and strategic planning. It is dedicated to advancing the emerging roles of the Chief Innovation Officer and Innovation Strategist within today's enterprise. The BPI Network brings together global executives who are champions of change within their organizations through ongoing research, authoritative content and peer-to-peer conversations. These functional area heads (operations, IT, finance, procurement, sales, marketing, product development, etc.) and line-of-business leaders are advocates for Innovation as a fundamental discipline and function within 21st Century organizations. They seek to demonstrate where and how new inventive solutions and approaches can advance business value, gratify customers, ensure sustainability and create competitive advantage for companies worldwide. For more information, visit **www.bpinetwork.org**.

PARTNERS & AFFILIATES

QUALTRICS

Qualtrics is a leading global provider of enterprise data collection and analysis products for market research, voice of customer, employee performance, and academic research. Through an intuitive, easy-to-use interface and award-winning services and support, Qualtrics products enable both professional and DIY researchers to conduct quantitative research at a lower cost and in less time than competing alternatives. Founded in 2002, Qualtrics has more than 5,000 clients worldwide, including half of the Fortune 100, more than 1,300 colleges and universities, and 95 of the top 100 business schools. For more information and a free trial, visit **www.qualtrics.com**.

ADESTRA

Adestra is a trusted provider of First-Person Marketing solutions for global and growing brands. The company's industry-leading email platform provides a powerful infrastructure for one-to-one, contextual messaging and marketing automation, helping marketers communicate more effectively with their customers and subscribers. Robust reporting features allow marketers to efficiently evaluate and optimize their campaign results. The flexible structure and open integration architecture allow businesses to connect disparate technology platforms to create a seamless customer journey. Along with a best-of-breed platform that drives customer engagement and boosts ROI, Adestra was founded on the principle that marketing success takes more than technology, which is why customer service is at the heart of its business. For more information visit **www.adestra.com**.