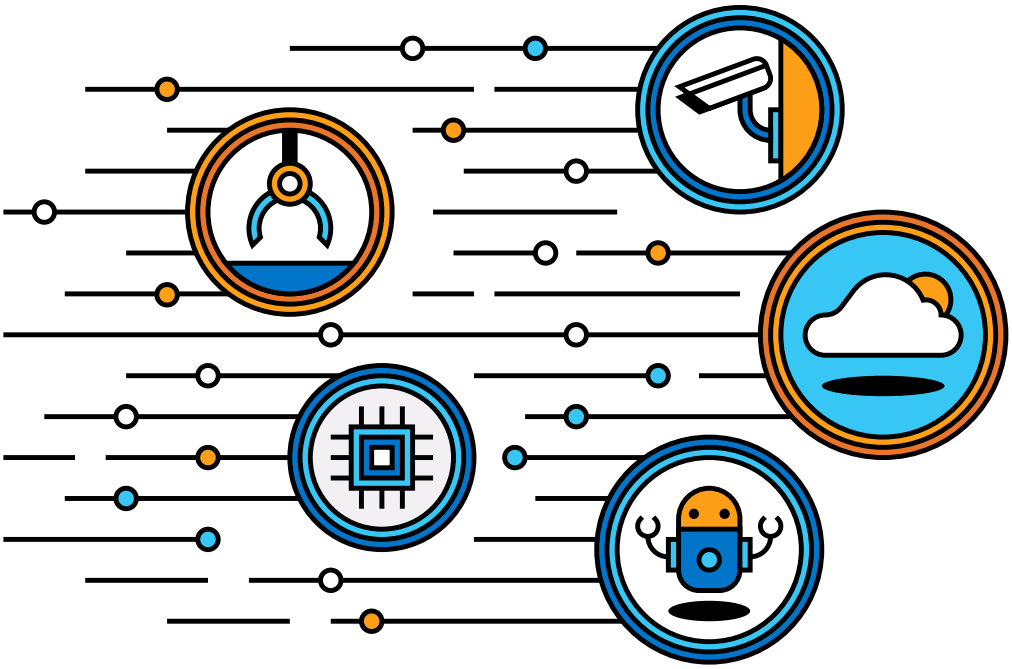
WHITE PAPER

Trend Report:

The Edge Compute Imperative



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Based on a Lumen-sponsored April 2021 Quadrant Strategies survey of more than 1,700 senior IT decision makers and C-suite executives worldwide,[1] this report highlights business requirements and use cases driving the adoption of "edge compute" infrastructure, platforms, software and services.

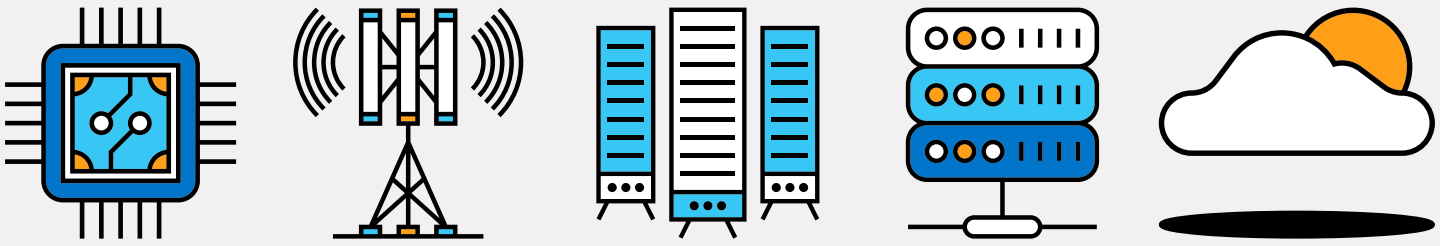
Businesses use next-gen applications to harness the power of the 4th Industrial Revolution by accelerating the cycle of acquiring, analyzing and acting on data. But traditional architectures present latency, coverage and cost issues: 83% of global IT leaders say network latency is the biggest determinant of application performance (Figure 1), and three in four are concerned that high latency is impacting the quality of their applications (Figure 2).

To transform data into amazing, differentiated experiences, next-gen applications need a secure, distributed edge compute architecture that operates close to where things and people produce or consume information. That's why 96% of U.S. IT decision makers say they would be more likely to move critical workloads to the edge if their edge network could cover 95% of the U.S. within 5 milliseconds (Figure 3).

At the same time, an edge service-subscription model can offer an attractive alternative to on-premises staff and infrastructure: most global IT decision makers say moving their organization's high-performance applications to edge compute locations will lead to cost saving in the long-term (Figure 4).

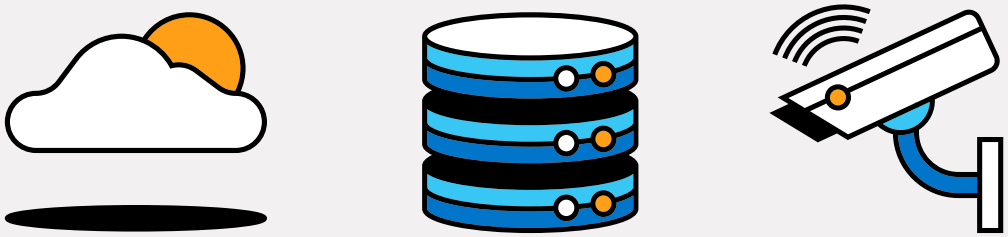
What is Edge Compute?

"Edge" means different things to different people. When asked, "Where is the 'edge' in Edge Compute?" a growing number of global IT decision makers say it is at the cloud datacenter. Other answers range from IoT, on-premises datacenters, end-user devices, and cell towers—there is no clear consensus. (Figure 5).



Lumen defines edge compute as the delivery of technology services—from data processing, storage, security services and other application services—delivered from a low-latency location near the point of digital interaction. An edge location can be on-premises or at a nearby service location—as long as it is close enough to impose less than 10 milliseconds of data transfer latency.

On-premises edge compute may be ideal for supporting real-time VR/AR and tactile internet applications. Metro edge compute is ideal for smart manufacturing, video analytics, point-of-sale transactions, retail robotics, and IoT use cases where sub-10 millisecond latency is critical, but so is the ability to consolidate data from multiple nearby points of interaction.



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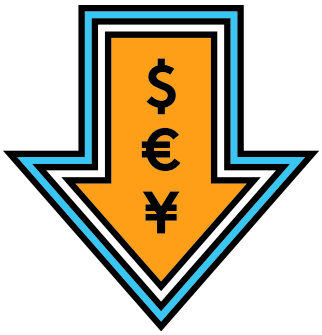

What drives you to the Edge?

Public clouds can address some total cost of ownership (TCO) concerns when it comes to on-premises infrastructure, but centralized public clouds have limitations when it comes to latency. Those issues drive organizations to investigate off-premises edge compute as a critical component of their hybrid strategies. In fact, 93% of global IT decision makers agree that moving their organization's high-performance applications from cloud-based apps to metro edge compute locations will reduce lag time and improve performance (Figure 6). That is especially true for the rapidly growing number of businesses that support intensive low-latency requirements of next-generation applications such as real-time health monitoring, autonomous vehicle piloting, and smart manufacturing.

Migrating on-premises applications to off-premises edge compute can maintain low latency, and IT leaders expect it to lower TCO, as well. Most global IT decision makers say moving their organization's high-performance applications to edge compute locations will lead to cost savings in the long-term (Figure 7), and nine in 10 of global IT decision makers agree that edge solutions provide the best balance of cost and performance between on-premises and major public cloud environments (Figure 8).

The IoT connection

The Internet of Things (IoT) represents one of the fastest-growing segments of technology today. According to a January 2021 Statista IoT report, "The technology reached 100 billion dollars in market revenue for the first time in 2017, and forecasts suggest that this figure will grow to around 1.6 trillion by 2025."

Two in three C-Suite global IT decision makers say their organizations will need to implement and integrate edge compute services to keep pace with the expansion of the IoT (Figure 9).

That effort is already underway or under consideration by the majority of global IT decision makers, with half of them saying that their organizations have already implemented IoT and IoT management (Figure 10).

Whether managing IoT devices, online customer engagement, or automated supply chains, unified orchestration of on-premises, core-cloud and edge environments is important to many IT leaders because it can help them manage next-gen distributed application performance, security, regulatory compliance and cost. Over half of global IT leaders say the lack of orchestration between IT infrastructure and applications negatively impacts the operational agility of their organizations (Figure 11).

In addition, application security is seen as nearly twice as important as application performance by global IT decision makers (Figure 12), and 82% agree that perimeter-based security is no longer sufficient to protect their business, employees, and customers from cyber-attacks (Figure 13).

Global IT decision makers generally want and expect more scalability, more engagement with customer data, more application performance, and lower TCO: more than half say edge compute provides the best mix of performance and cost compared to cloud or on-premises IT services, and 61% say edge compute will deliver a better way to manage vast volumes of data (Figure 14).

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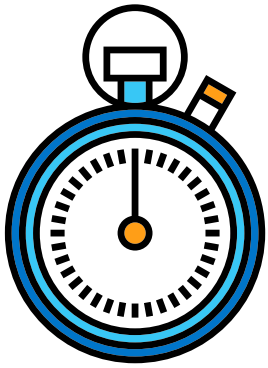


How important is latency?

Although they have varying definitions of where and what the edge is, one thing ITDMs agree on is the importance of low latency. Specifically, latency shows-up as the primary driver for edge compute adoption among global IT decision makers.

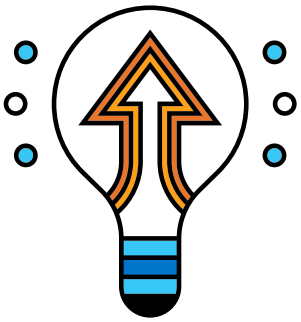
In fact, 86% of global IT decision makers agree that low-latency applications help differentiate their organizations from competitors (Figure 15), over 30% say low latency solutions are necessary for the success of their organizations (Figure 16). It is not surprising then, that 80% also are concerned that high latency is impacting the quality of their applications (Figure 17).

Network latency is driving IT plans and strategies: 83% of global IT decision makers say they need a lower latency solution than what they currently have (Figure 17); and 90% of global IT decision makers agree that edge compute is the best environment for applications that are latency sensitive (Figure 18).

They indicate that latency is the key reason to consider the adoption of edge compute services: four in five agree that an off-premises metro edge data center would meet their critical latency needs (Figure 17).

When asked for the latency requirements of their most mission-critical applications, 8% say 30+ milliseconds, 21% say 20 milliseconds, 44% say 10 milliseconds, and 17% say 5 milliseconds or less (Figure 19). As dynamic interaction with users or devices increases, business leaders and IT decision makers expect to require even lower latency: more than half of global IT decision makers say their most mission-critical application will require 5 milliseconds or less latency five years from now (Figure 19).

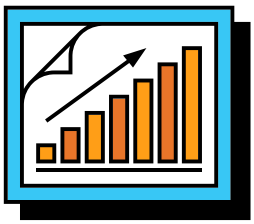
Asked what infrastructure they use today to achieve and maintain low latencies, 57% of global IT decision makers say fiber connectivity (Figure 20). 77% of global IT decision makers say their organization currently has latency challenges that can only be solved by Edge Computing (Figure 15).



The future: at the edge of interaction

Three in four global IT decision makers expect edge compute to have a positive impact on expanding access to technology and spurring innovation, and 73% say edge compute will improve data privacy and security. Positive impacts also were cited by about two thirds on job creation and stimulating entrepreneurship (Figure 21).

More broadly, 54% of global IT decision makers in the C-Suite say edge compute will have a significant impact on the future of business; and nearly half of U.S. and C-suite IT decision makers say edge compute will have a significant impact on society (Figure 22).

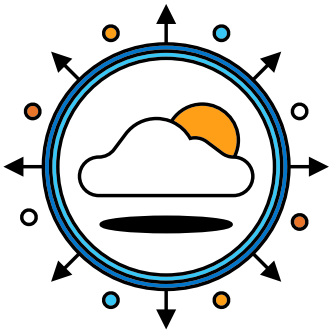


Although some may doubt those lofty expectations, nearly three in five global IT decision makers say edge compute will lead organizations into the future. When asked, only 16% say edge compute is overhyped while 24% say it is a widely misunderstood term. Half agree that edge compute will be essential for their business and will be critical in bringing about the technological advances of the 4th Industrial Revolution (Figure 23).

Edge compute is critical

Today, 57% of IT decision makers have at least 25% of their organization's compute at the edge, but in five years, 69% of IT decision makers expect to have more than 25% of their organization's compute at the edge (Figure 25).

Global IT decision makers are twice as likely (Figure 24) to say edge compute would do a better job of lowering latency and improving overall application performance than the public cloud. Not surprisingly, 84% of global IT decision makers say edge compute infrastructure services are critical to ensuring the strong performance of their organization's applications (Figure 26).



As they consider their options, IT leaders know that application migration can be a difficult, step-by-step process. Businesses tend to start migrating selected applications to the public cloud before they deploy next-gen applications to off-premises edge compute venues. That initial cloud migration experience can influence subsequent deployment plans; and while public cloud services offer many benefits, they also can be a source of disappointing performance and unrealized cost-savings—especially for dynamic AI-enabled workloads. The application overhead of many "round trips" and the bandwidth costs for connections between distributed locations and the public cloud can be very high.

Although more than 70% of global IT decision makers say that latency, performance and reliability of network services are concerns, data security is the biggest concern they say they have with cloud migration (Figure 27).

While 57% of global IT decision makers say they struggle to satisfy security and compliance needs with their current data solutions (Figure 28), 80% say they are concerned about the security of data when moving on-premises workloads to the cloud (Figure 27).

The failure of traditional approaches—such as perimeter-based security—is a key reason for that concern: 82% of global IT decision makers agree that perimeter-based security is no longer sufficient to protect their business, employees and customers from cyber-attacks (Figure 29).

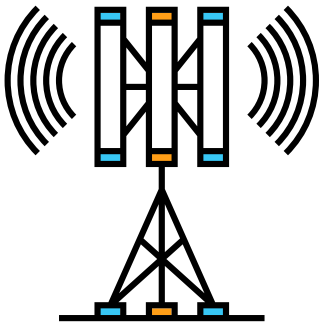
Those issues and concerns are reflected in what global IT decision makers say about their long-term commitment to migrating on-premises workloads to the public cloud: most are concerned about using public cloud solutions over a long period of time (Figure 30).

Despite that concern, however, global IT decision makers expect to double their use of distributed applications in the next five years (Figure 31).

The pain of managing IT infrastructure and operations is another key factor determining venue preferences: 73% of U.S. IT decision makers would, if possible, rather manage applications only and never manage infrastructure; four in five global IT decision makers agree that on-premises computing is expensive; and 78% agree that it consumes necessary space (Figure 32).

For those and other reasons, only 28% say they plan to keep on-premises computing as an integral part of their business (Figure 33).

Having spent years perfecting the value and agility of cloud services, IT leaders now see edge services as an extension of that strategy. IT leaders expect to apply key learnings on cloud governance, security and operational efficiencies to edge compute—in other words, edge extends the benefits of cloud.



5G needs edge more than edge needs 5G

The idea that edge compute enables 5G is interesting because fewer than half of global IT decision makers say their organization currently uses 5G technology and networks as part of their IT infrastructure (Figure 34).

In addition, over half of global IT decision makers say they don't think 5G will be commercially available across the country for at least two years (Figure 35).

Cost is another key concern: fewer than half of global IT decision makers say it's easy to get a low-cost connection to the cloud core or a facility using 5G (Figure 36).

And when asked whether they trust 5G or fiber network technologies more for availability and reliability, most global IT decision makers say fiber networks (Figure 37).

Fiber infrastructure stands out as a primary "go-to" for distributed infrastructure: 86% of global IT decision makers agree that a fiber network is essential to connect a distributed cloud network (Figure 38).

And when asked about their highest-priority applications, more global IT decision makers say edge compute and IoT are mission critical rather than 5G (Figure 39).

In addition, significant security concerns were expressed by half of global IT decision makers about their organizations using 5G networks (Figure 40).

IT leaders tend to agree that 5G is not a standalone solution—in fact, four out of five agree that 5G needs edge compute more than edge compute needs 5G (Figure 41). 5G offers compelling benefits, but it needs an underlying fiber network to deliver the security, availability and TCO that IT leaders need.

Use cases and applications for the 4th Industrial Revolution

The 4th Industrial Revolution is an era of autonomous vehicles, smart manufacturing, tele-health, services, digital concierge services and so much more. Businesses have begun competing to deliver amazing experiences using advanced technologies such as real-time analytics, AI, and VR/AR.

Of course, business applications range all the way from exciting next-gen experiences to traditional enterprise resource planning (ERP) processes and IT operations. When asked which use cases their organizations already have implemented, significant majorities of global IT decision makers say network security, data storage and backup, and IoT and IoT management. A growing number expect AI and VR/AR to have a significant positive impact on their industry in the next five years (Figure 42).

86% of global IT decision makers (Figure 43) agree that today's applications require something different than a centralized cloud model. But IT leaders need trusted partners to get there.

Nine in ten global IT decision makers agree that partners who can help them with edge and distributed compute also can help with the next wave of distributed advances such as increased bandwidth and application orchestration (Figure 44).

Drilling down on that point, 92% say that their organization needs a technology partner that can help them better understand edge compute and how they can best harness edge solutions for their business (Figure 45).

Despite that, global IT decision makers express concern about "vendor lock-in" and want to maintain control of their applications: 63% of those prefer to not deploy an edge compute solution that ties them to a cloud service provider (CSP); 65% agree that being locked in to a specific provider is a deal-breaker; 84% prefer to use industry standard services and APIs to deploy edge compute solutions; 88% would like a single management tool to manage their applications across cloud, edge, and on-premises environments; and 89% would like the ability to move applications between major CSP data centers, colocation facilities, edge compute nodes and on-premises hardware as needed (Figure 46).

IT decision makers demand broad coverage, low-latency, robust security, easy orchestration and low TCO. As they seek those from edge compute services, 95% say multi-cloud infrastructure management needs to include the control of an underlying network layer (Figure 47). Moreover, 96% agree that seamless integration of their applications and network is a top priority (Figure 48).

The Lumen edge advantage

To dynamically interact with people and devices at scale in near real-time, businesses need an agile, cost-effective architecture—one that meets the rapidly growing needs of IoT workloads and data-intensive, latency-sensitive end-user experiences. Lumen offers customers an open standards-based, intelligent platform built on adaptive infrastructure. It can orchestrate workloads and compute resources closer to the point of digital interaction—minimizing latency and maximizing next-gen application performance.

Lumen helps to improve business outcomes for customers by delivering an advanced application platform that is bolstered by the most inter-connected global network, a broad data center footprint, connected security and hybrid cloud services coupled with industry ecosystem partnerships.

The Lumen Platform and its capabilities are grounded in extensive global infrastructure. Lumen offers dynamic connections to more than 2,200 public and private data centers, with low-latency performance via global edge compute nodes, all delivering applications and data when and where they're needed. With this extensive infrastructure as a foundation, the Lumen Platform combines core IT elements into a unified application delivery solution for businesses, governments and communities—ultimately enabling them to adopt the emerging technologies defining the 4th Industrial Revolution.

Learn more

Across critical industries, organizations connect, protect and respond at the speed of business with the Lumen Edge Platform. lumen.com/edge

1. Quadrant Strategies, Global Poll: Edge Computing Trends, Barriers and Benefits, April 2021. Lumen sponsored a Quadrant Strategies online quantitative survey with 250 Senior IT Decision Makers and C-suite executives from large and midsize organizations worldwide.

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Appendix: Quadrant Strategies Global Poll Data

Edge Computing Trends, Barriers and Benefits
Prepared by Quadrant Strategies, April 2021

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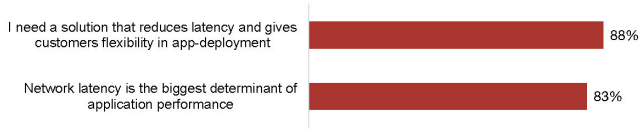
F1
Source: Quadrant Strategies, April 2021

8 in 10 Global ITDMs (83%) say network latency is the biggest determinant of application performance

To what extent do you agree or disagree with the following statements?
Showing % Total Agree



Showing % Total Agree	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
I need a solution that reduces latency and gives customers flexibility in app-deployment	88%	87%	87%	79%	93%	89%	85%	82%	90%	90%	95%
Network latency is the biggest determinant of application performance	85%	81%	75%	79%	83%	85%	89%	83%	87%	78%	93%

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Statistically significant nuance from Global All % (up or down)

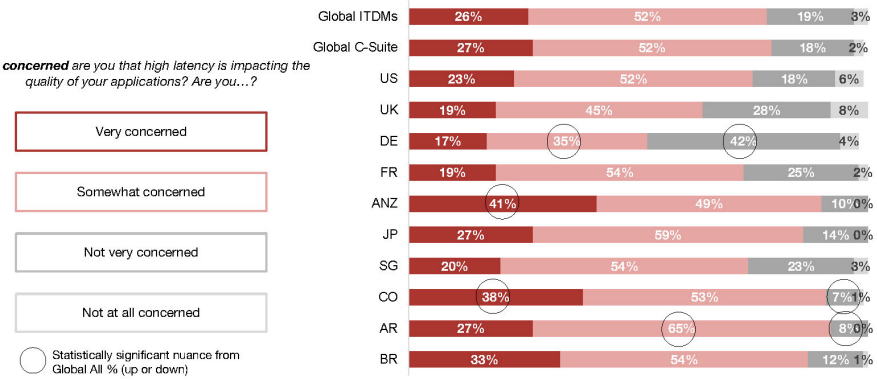
MOEs in Notes

F2
Source: Quadrant Strategies, April 2021

3 in 4 Global ITDMs are concerned that high latency is impacting the quality of their applications

41% of ITDMs in Australia and New Zealand are *very concerned*

*How **concerned** are you that high latency is impacting the quality of your applications? Are you…?*



QUADRANT STRATEGIES

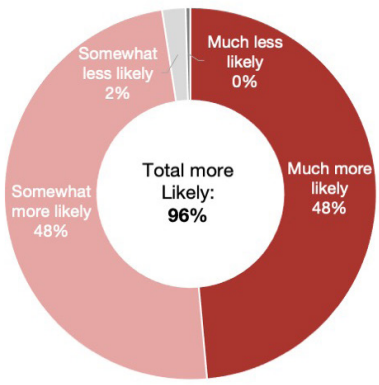
MOEs in Notes

F3
Source: Quadrant Strategies, April 2021

96% of US ITDMs say they would be more likely to move critical workloads to the edge if an Edge network could cover 95% of the US within 5 milliseconds of latency

If the below statement were true, how much more or less likely would it make you to move critical workloads to the Edge?

Our Edge network covers 95% of the US within 5 milliseconds of latency.



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MOEs in Notes

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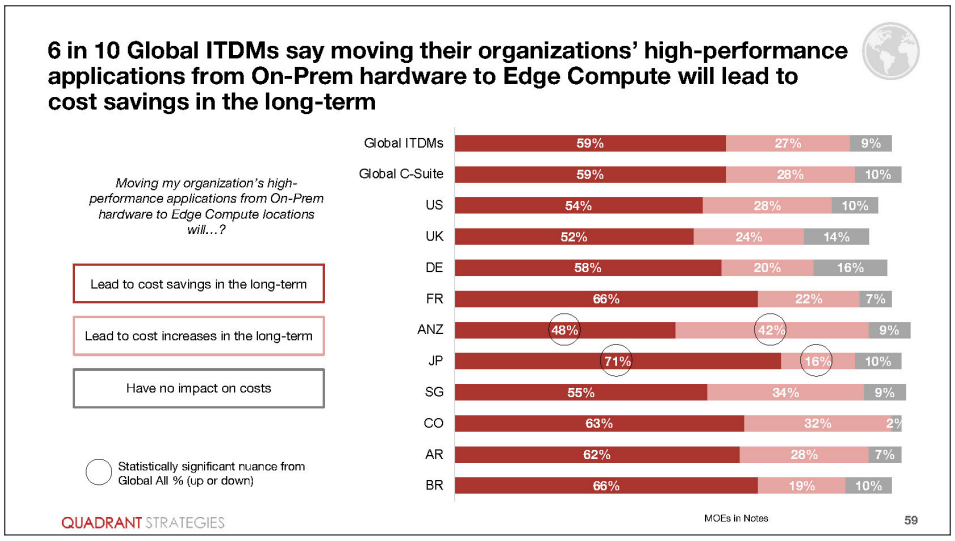
Source: Quadrant Strategies, April 2021



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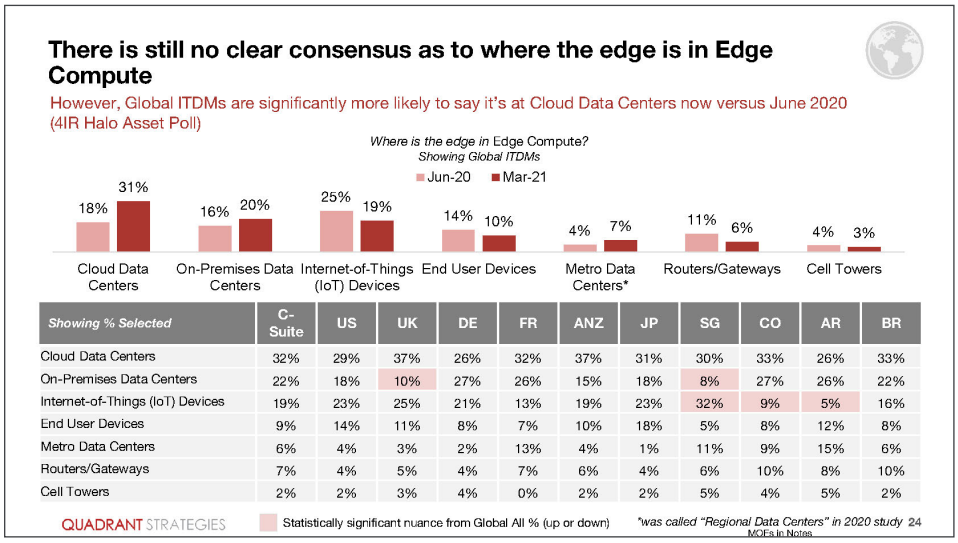
Source: Quadrant Strategies, April 2021



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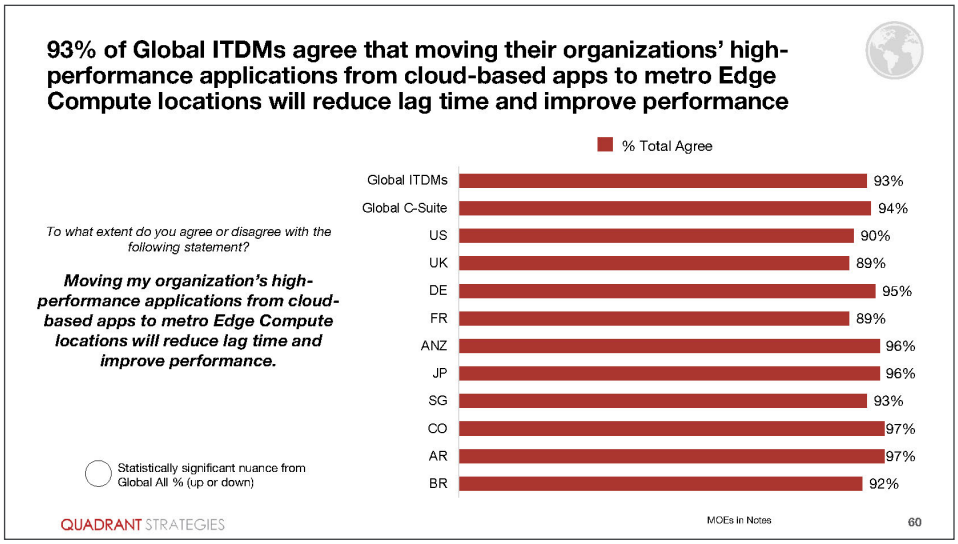
Source: Quadrant Strategies, April 2021



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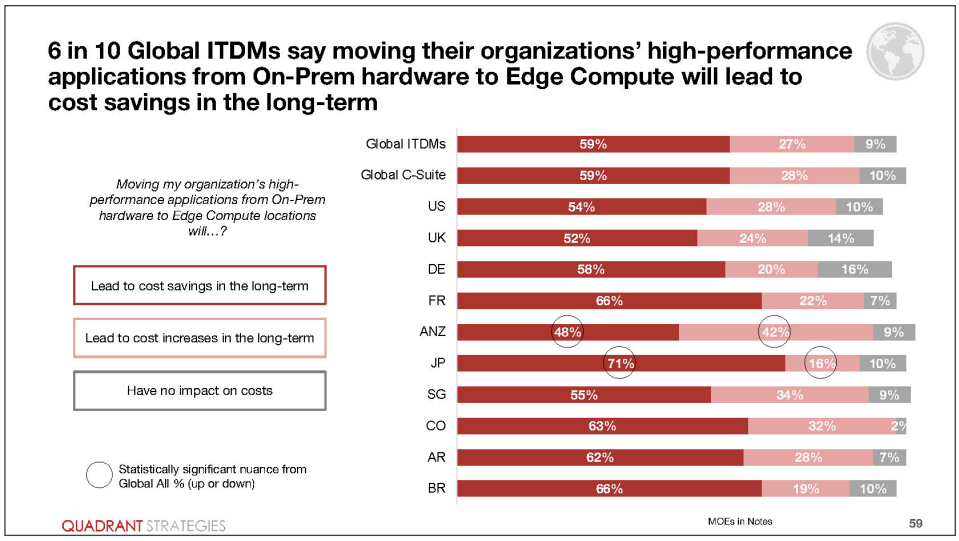
Source: Quadrant Strategies, April 2021



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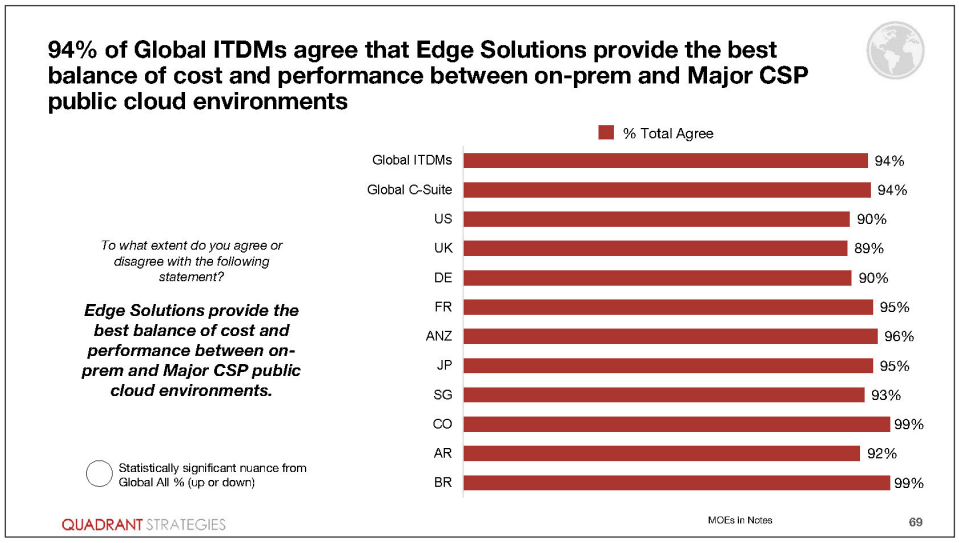

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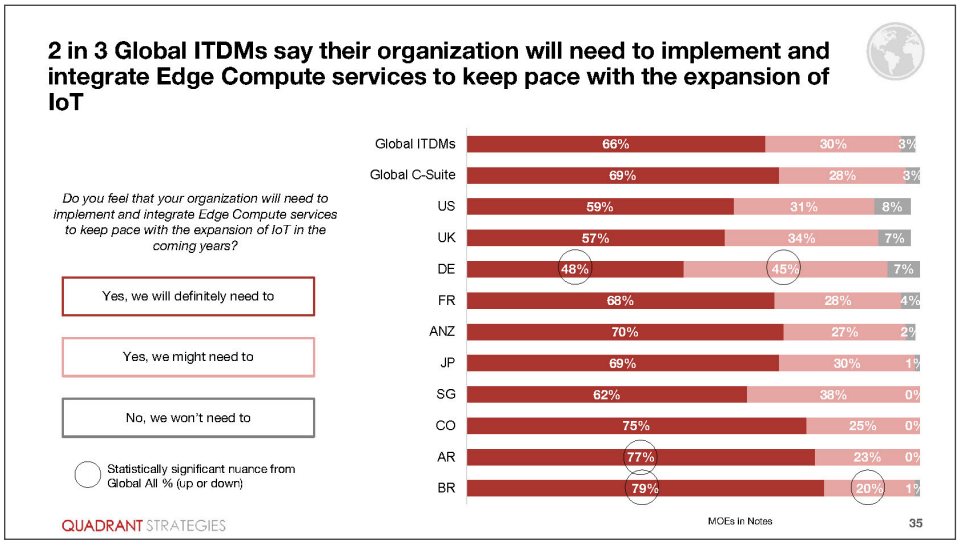
Source: Quadrant Strategies, April 2021



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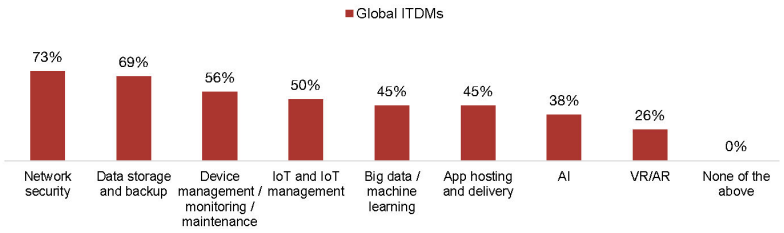
F10
Source: Quadrant Strategies, April 2021

Half of Global ITDMs say their organization has already implemented IoT and IoT management

Only 1 out of every 4 Global ITDMs say their organization has implemented VR/AR

Which of the following has your organization already implemented? Please select all that apply.

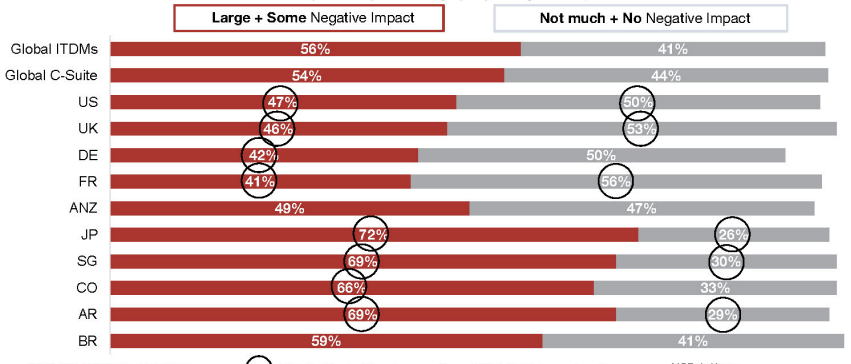


QUADRANT STRATEGIES MOEs in Notes 99

F11
Source: Quadrant Strategies, April 2021

Over half of Global ITDMs say the lack of orchestration between IT infrastructure and applications negatively impacts the operational agility of their organizations

How much does the lack of orchestration between IT infrastructure and applications negatively impact the operational agility of your organization, if at all?



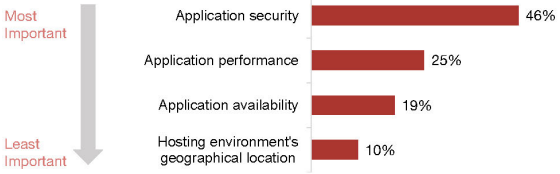
QUADRANT STRATEGIES Statistically significant nuance from Global All % (up or down) MOEs in Notes 96

F12
Source: Quadrant Strategies, April 2021

Nearly half (46%) of Global ITDMs rank Application Security as most important to their organizations' application hosting platform

Application security is seen as nearly 2x as important as application performance

Please rank the following in order of how important they are to your organization's application hosting platform
Showing % Selected Rank #1 for Each Option



Showing % Selected #1 for each option	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Application security	44%	46%	46%	41%	49%	36%	45%	37%	50%	50%	60%
Application performance	26%	25%	31%	23%	19%	24%	22%	22%	30%	29%	26%
Application availability	20%	18%	16%	29%	23%	23%	18%	24%	13%	14%	7%
Hosting environment's geographical location	10%	11%	7%	7%	9%	17%	15%	17%	7%	7%	7%

QUADRANT STRATEGIES Statistically significant nuance from Global All % (up or down) MOEs in Notes 97

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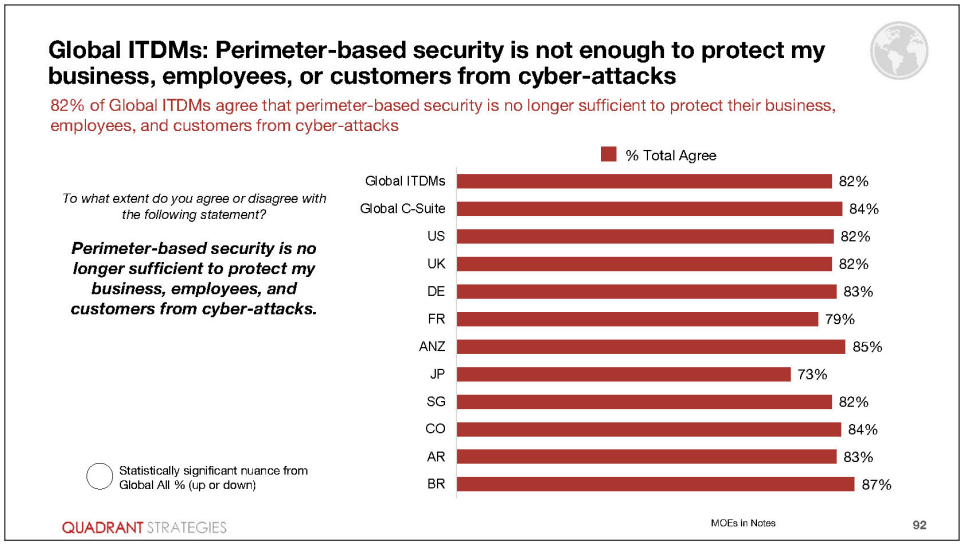
Source: Quadrant Strategies, April 2021



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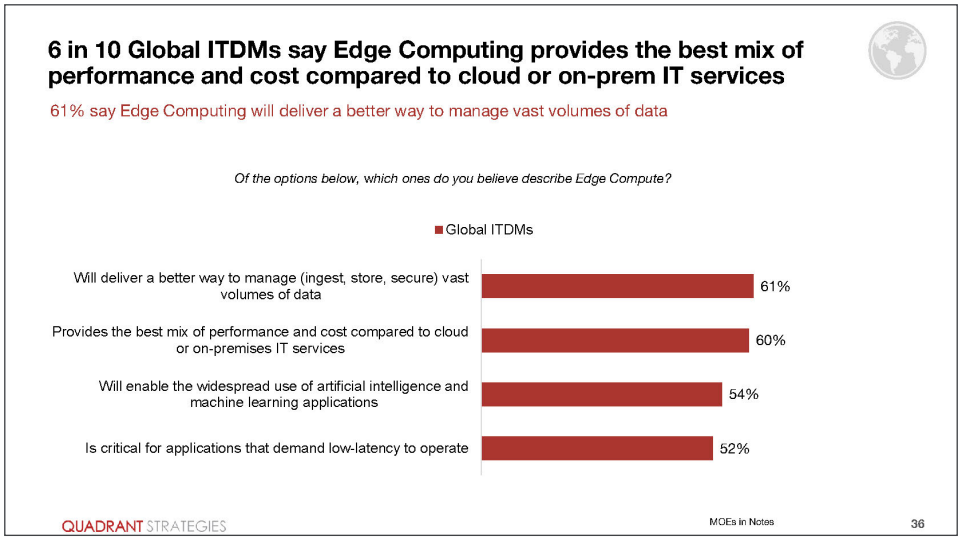
Source: Quadrant Strategies, April 2021



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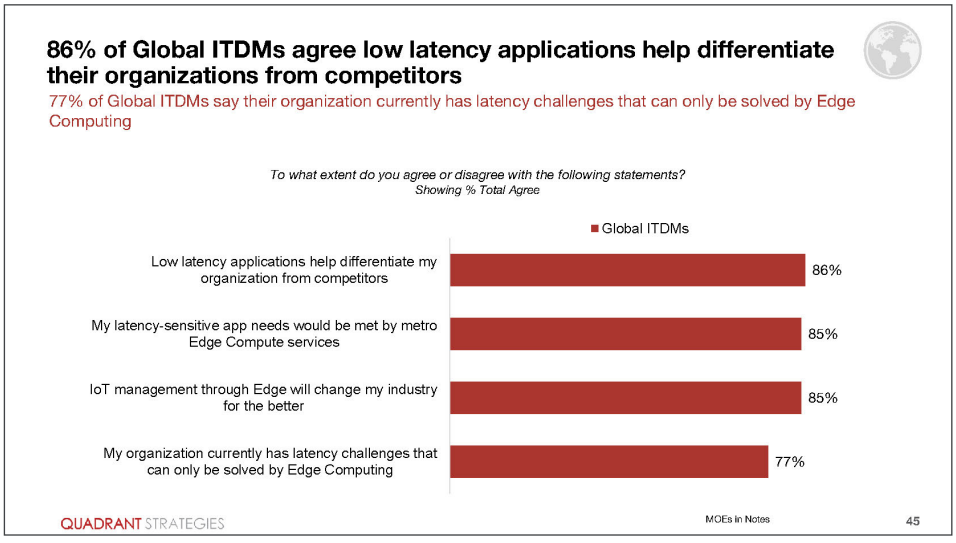
Source: Quadrant Strategies, April 2021



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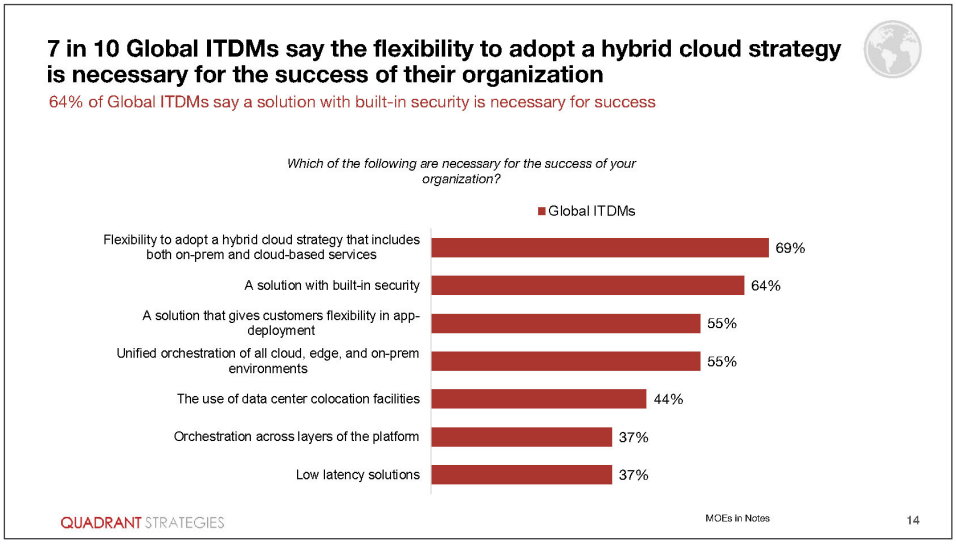
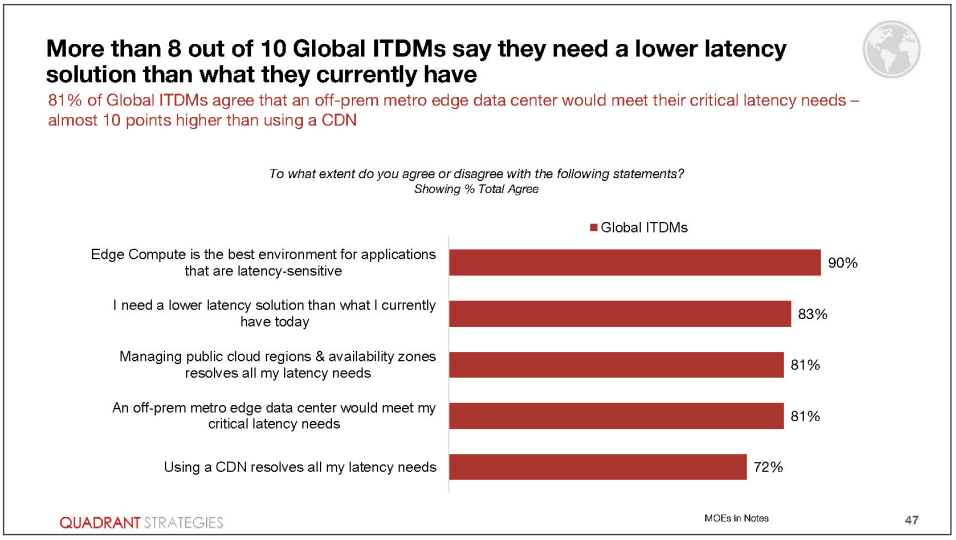
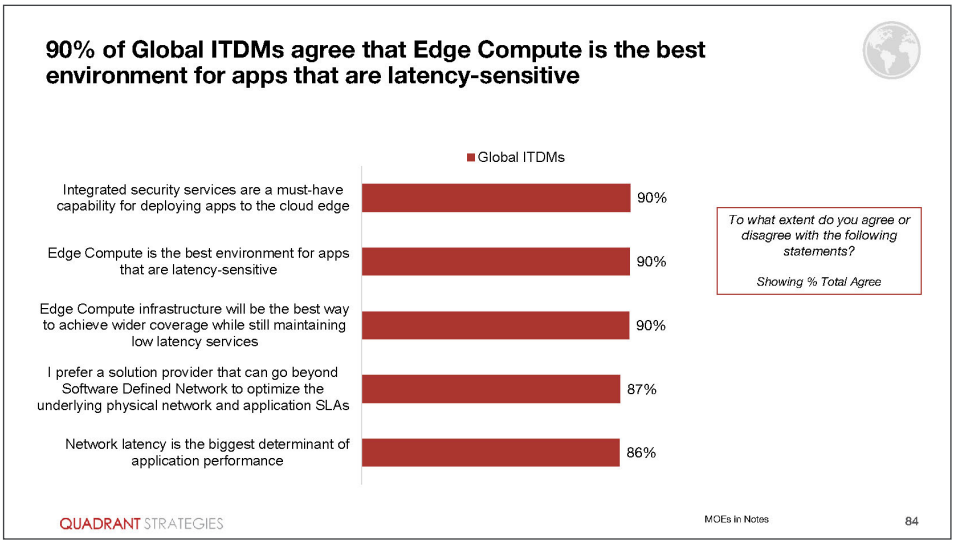
F16
Source: Quadrant Strategies, April 2021



F17
Source: Quadrant Strategies, April 2021



F18
Source: Quadrant Strategies, April 2021



LUMEN® TECHNOLOGIES

F19
Source: Quadrant Strategies, April 2021

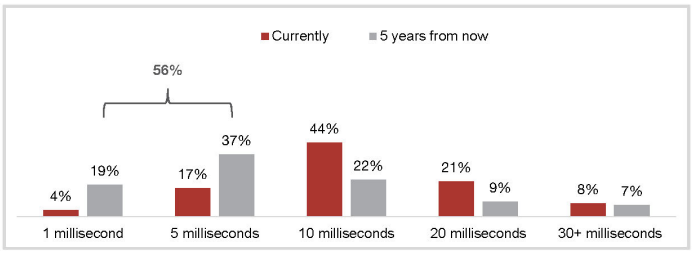
More than half of Global ITDMs say that, in 5 years, their most mission-critical application will require 5 milliseconds of latency or less

1 in 5 Global ITDMS say they'll need 1 millisecond or less 5 years from now

What is currently the minimum latency required by your most mission-critical application?

What is the minimum latency you expect to be required by your most mission-critical application 5 years from now?

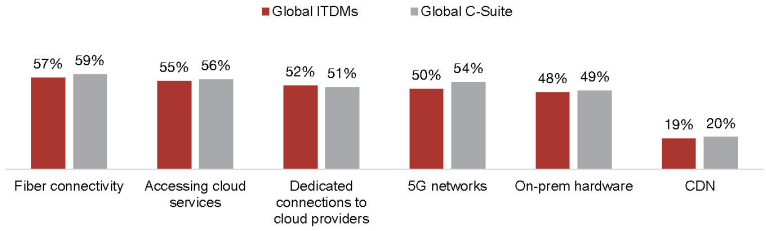
Showing Global ITDMs



F20
Source: Quadrant Strategies, April 2021

57% of Global ITDMs use fiber connectivity to achieve low latency

How does your organization maintain/achieve low latencies when necessary?

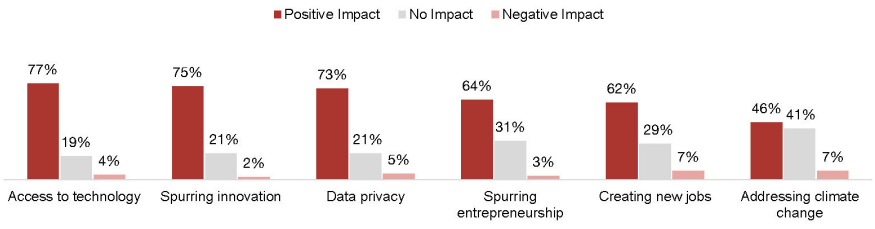


F21
Source: Quadrant Strategies, April 2021

77% of Global ITDMs say Edge Computing will have a positive impact on expanding access to technology

75% of Global ITDMs say Edge Computing will have a positive impact on spurring innovation

*Do you think **Edge Computing** will have a positive, negative, or no impact on each of the following issues?*
Showing Global ITDMs



LUMEN® TECHNOLOGIES

F22
Source: Quadrant Strategies, April 2021

US ITDMs are particularly likely to say that Edge Computing will have a significant impact on the future of business

*Which of the following statements apply to **Edge Computing**?*

Showing % Selected	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Will advance technologies that will become essential for businesses to adopt moving forward	60%	60%	57%	50%	50%	76%	78%	51%	64%	58%	60%
Will have a significant impact on the future of business	54%	62%	60%	43%	39%	66%	56%	45%	52%	59%	63%
Will have a significant impact on the future of my industry	52%	53%	51%	50%	52%	63%	50%	48%	47%	38%	61%
Will become more important in the wake of COVID-19	49%	41%	45%	47%	52%	62%	48%	63%	39%	41%	51%
Will have a significant impact on society	40%	42%	31%	30%	40%	43%	38%	40%	37%	47%	44%

QUADRANT STRATEGIES

Statistically significant nuance from Global All % (up or down)

MOEs in Notes

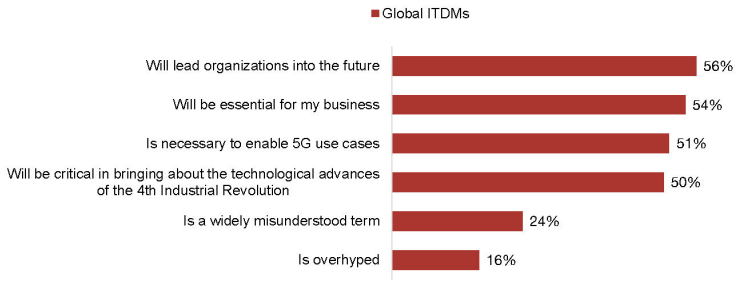
29

F23
Source: Quadrant Strategies, April 2021

56% of Global ITDMs say Edge Compute will lead organizations into the future

More than half of Global ITDMs say Edge Compute will be essential for their business, while half say it will be critical in bringing about the technological advances of the 4IR

Of the options below, which ones do you believe describe Edge Compute?



QUADRANT STRATEGIES

MOEs in Notes

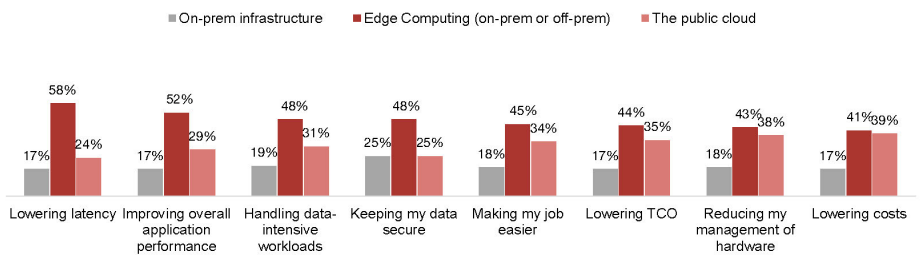
33

F24
Source: Quadrant Strategies, April 2021

Global ITDMs are twice as likely to say Edge Computing would do a better job of lowering latency and improving overall application performance than the public cloud

On-prem is the lowest across potential benefits with the exception of *Keeping my data secure*, highlighting what decision makers perceive to be its strength

Which of the following would do a better job at ____?



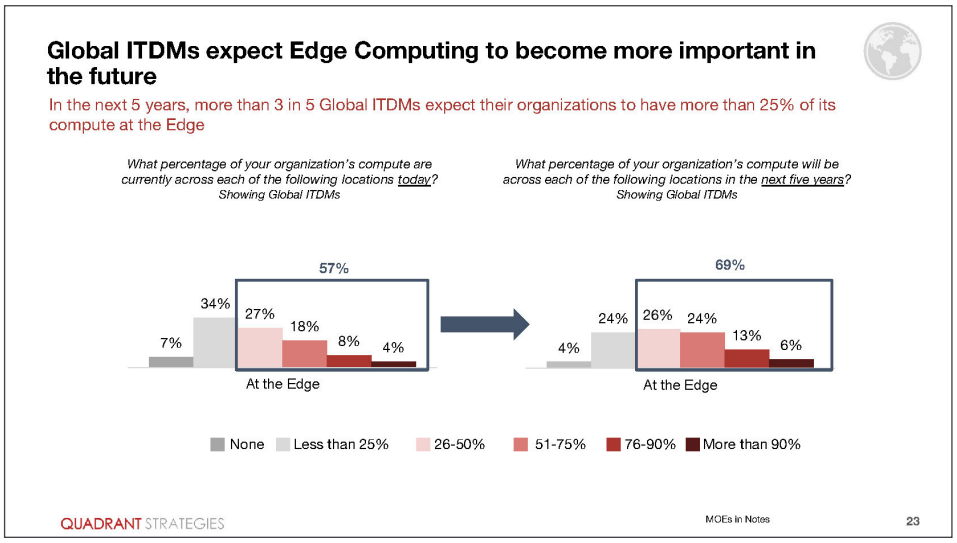
QUADRANT STRATEGIES

MOEs in Notes

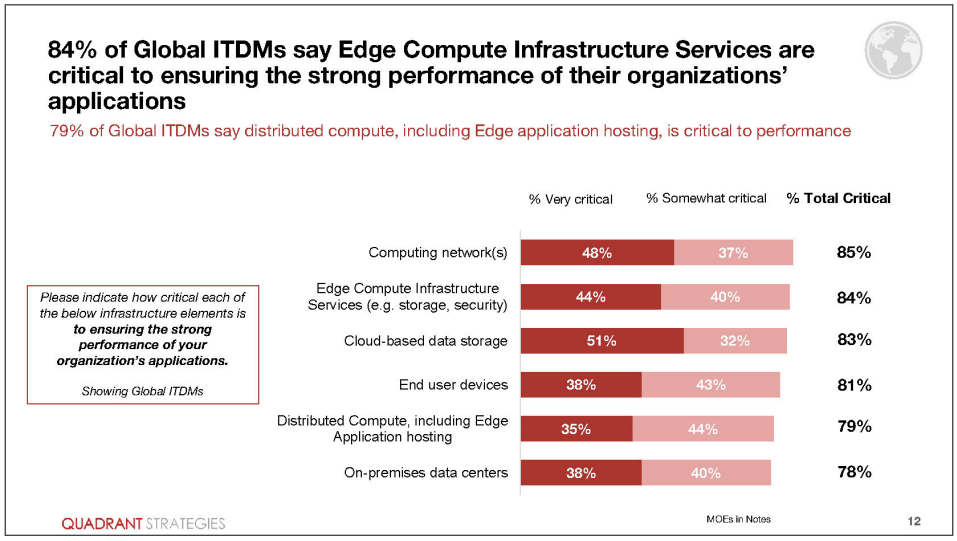
61

LUMEN® TECHNOLOGIES

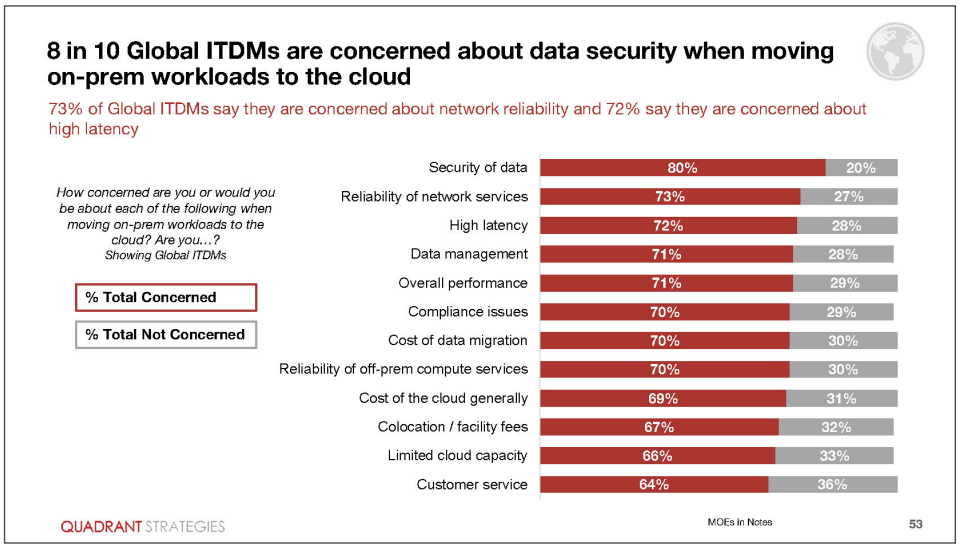
F25
Source: Quadrant Strategies, April 2021



F26
Source: Quadrant Strategies, April 2021



F27
Source: Quadrant Strategies, April 2021



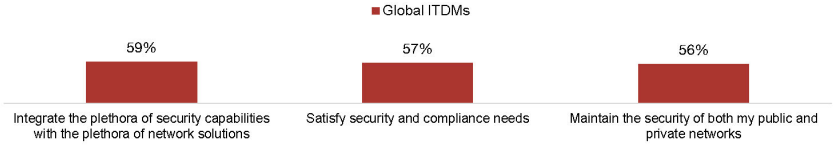
LUMEN® TECHNOLOGIES

F28
Source: Quadrant Strategies, April 2021

57% of Global ITDMs struggle to satisfy security and compliance needs with their current data solutions

More that 2 out of 3 ITDMs in ANZ and Japan currently struggle to maintain the security of both their public and private networks

Of the options below, which do you think finish the following sentence?
"With my current data solutions, I struggle to …"



Showing % Selected	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Integrate the plethora of security capabilities with the plethora of network solutions	59%	50%	52%	59%	55%	68%	63%	62%	58%	58%	62%
Satisfy security and compliance needs	61%	58%	55%	42%	65%	69%	58%	58%	52%	53%	62%
Maintain the security of both my public and private networks	59%	54%	47%	45%	53%	70%	66%	52%	55%	57%	59%

Statistically significant nuance from Global All % (up or down)

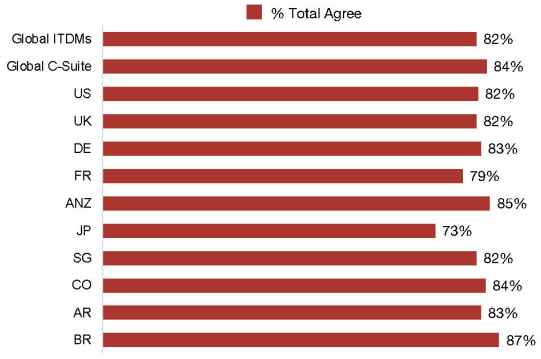
F29
Source: Quadrant Strategies, April 2021

Global ITDMs: Perimeter-based security is not enough to protect my business, employees, or customers from cyber-attacks

82% of Global ITDMs agree that perimeter-based security is no longer sufficient to protect their business, employees, and customers from cyber-attacks

To what extent do you agree or disagree with the following statement?

Perimeter-based security is no longer sufficient to protect my business, employees, and customers from cyber-attacks.



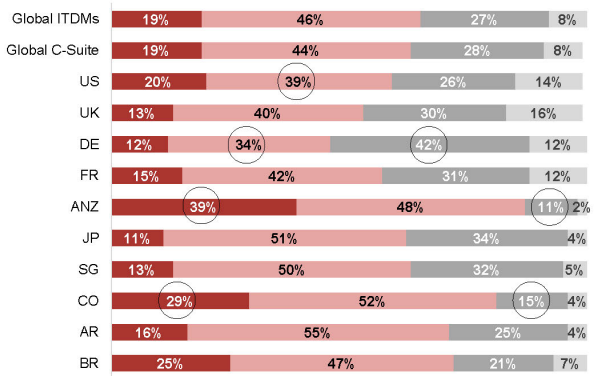
Statistically significant nuance from Global All % (up or down)

F30
Source: Quadrant Strategies, April 2021

65% of Global ITDMs are concerned about using public cloud solutions over a long period of time

How concerned are you about using ***public cloud*** *solutions over a long period of time?*

- Very concerned
- Somewhat concerned
- Not very concerned
- Not at all concerned

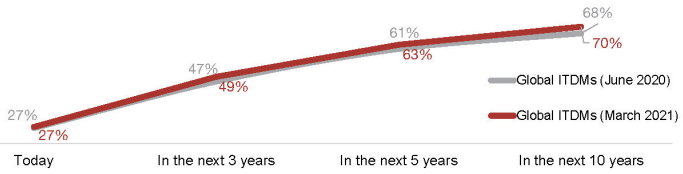


Statistically significant nuance from Global All % (up or down)

F31
Source: Quadrant Strategies, April 2021

Global ITDMs expect to double their use of distributed applications in the next five years

What percentage of your company's applications are or will be distributed (e.g. exist in more than one place) in the following time periods?
Showing % Selected more than 50% Distributed



Showing % Selected more than 50% distributed – March 2021	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Today	28%	30%	23%	20%	22%	37%	22%	26%	32%	30%	30%
In the next 3 years	50%	52%	39%	37%	43%	59%	37%	38%	59%	55%	70%
In the next 5 years	66%	65%	63%	56%	58%	69%	51%	47%	75%	62%	81%
In the next 10 years	73%	69%	65%	69%	68%	76%	68%	59%	78%	67%	86%

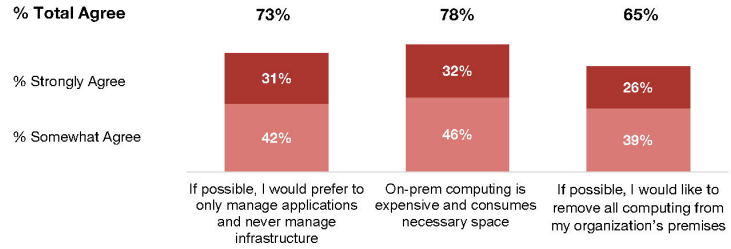
QUADRANT STRATEGIES
Statistically significant nuance from Global All % (up or down)
MOEs in Notes
89

F32
Source: Quadrant Strategies, April 2021

Nearly 4 in 5 Global ITDMs agree that on-prem computing is expensive and consumes necessary space

73% of US ITDMs say they would prefer to only manage applications and never manage infrastructure

To what extent do you agree or disagree with the following statements?

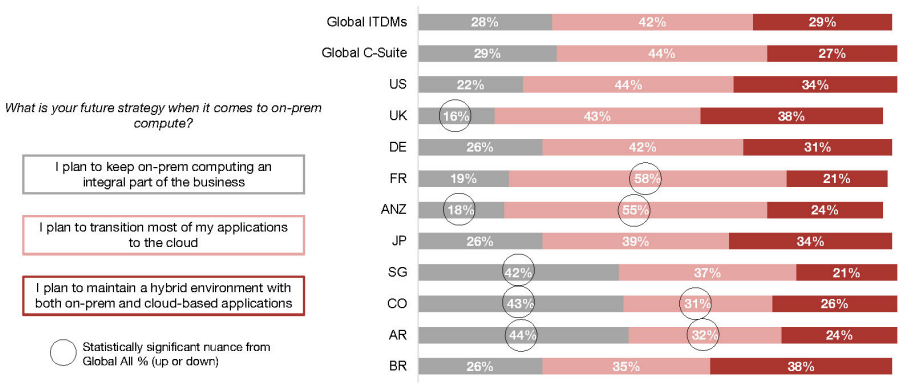


QUADRANT STRATEGIES
MOEs in Notes
63

F33
Source: Quadrant Strategies, April 2021

Only 28% of Global ITDMs say they plan to keep on-prem computing as an integral part of their business

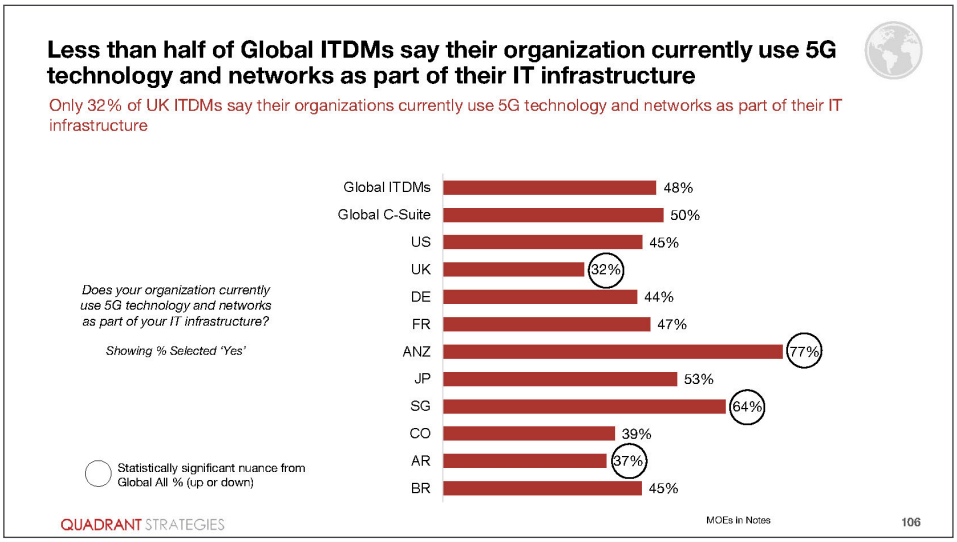
What is your future strategy when it comes to on-prem compute?



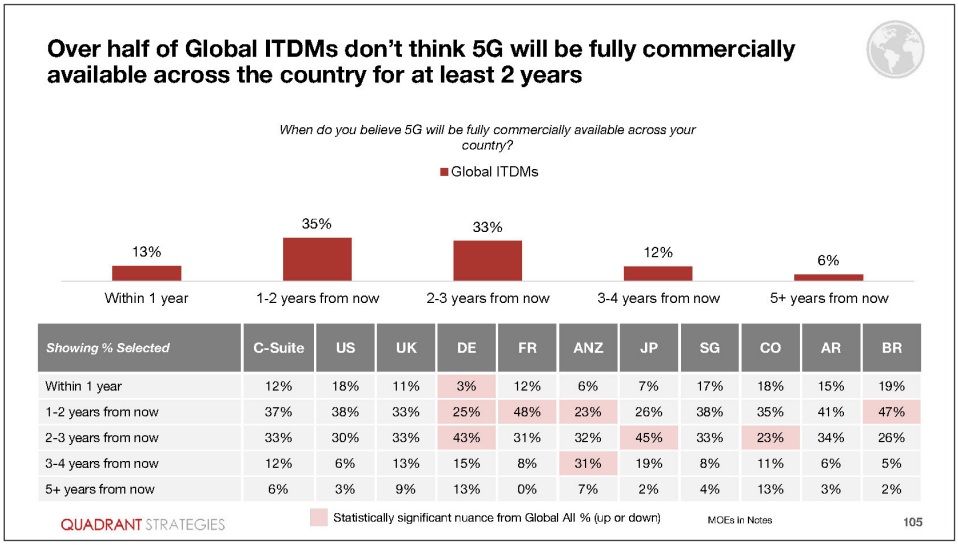
QUADRANT STRATEGIES
MOEs in Notes
51

LUMEN TECHNOLOGIES

F34
Source: Quadrant Strategies, April 2021

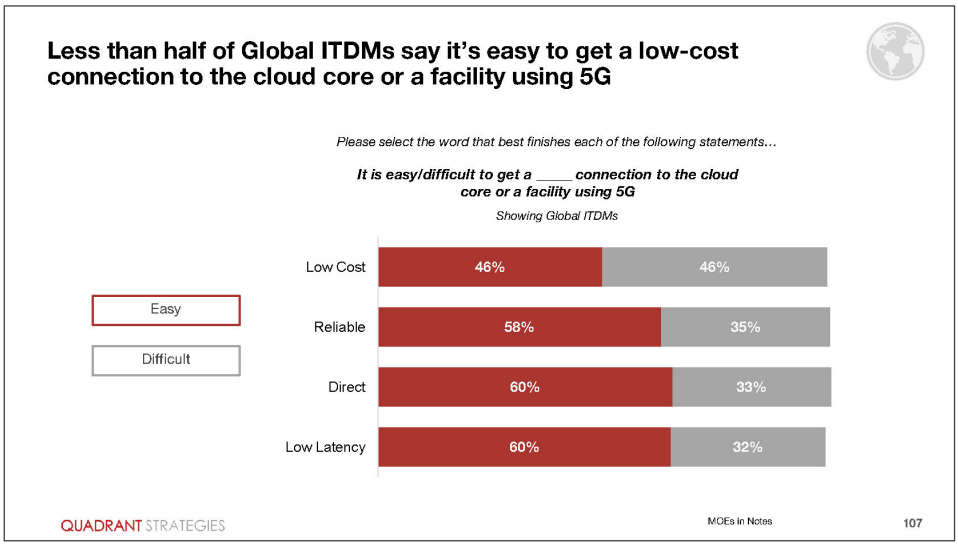


F35
Source: Quadrant Strategies, April 2021



Showing % Selected	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Within 1 year	12%	18%	11%	3%	12%	6%	7%	17%	18%	15%	19%
1-2 years from now	37%	38%	33%	25%	48%	23%	26%	38%	35%	41%	47%
2-3 years from now	33%	30%	33%	43%	31%	32%	45%	33%	23%	34%	26%
3-4 years from now	12%	6%	13%	15%	8%	31%	19%	8%	11%	6%	5%
5+ years from now	6%	3%	9%	13%	0%	7%	2%	4%	13%	3%	2%

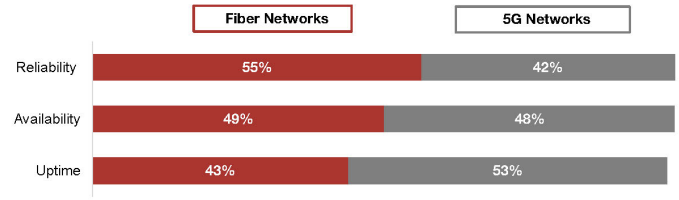
F36
Source: Quadrant Strategies, April 2021



F37
Source: Quadrant Strategies, April 2021

Global ITDMs trust fiber networks more for reliability than 5G networks

*Which of the following do you **trust more** for ____?*
Showing Global ITDMs



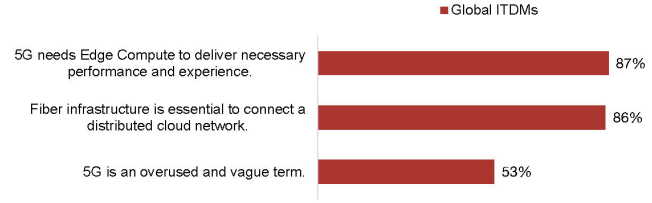
Showing % Selected 'Fiber Networks'	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Reliability	56%	47%	72%	68%	57%	44%	51%	45%	46%	67%	52%
Availability	49%	52%	66%	56%	49%	43%	29%	37%	50%	49%	56%
Uptime	42%	46%	58%	56%	48%	28%	34%	43%	41%	37%	36%

QUADRANT STRATEGIES
Statistically significant nuance from Global All % (up or down)
MOEs in Notes
116

F38
Source: Quadrant Strategies, April 2021

87% of Global ITDMs agree that 5G needs Edge Compute to deliver the necessary performance and experience

To what extent do you agree or disagree with the following statements?
Showing % Total Agree



Showing % Total Agree	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
5G needs Edge Compute to deliver necessary performance and experience	89%	78%	85%	79%	85%	89%	87%	89%	93%	92%	90%
Fiber infrastructure is essential to connect a distributed cloud network	85%	84%	87%	81%	85%	87%	91%	81%	88%	79%	94%
5G is an overused and vague term	52%	54%	50%	57%	40%	72%	49%	65%	57%	48%	34%

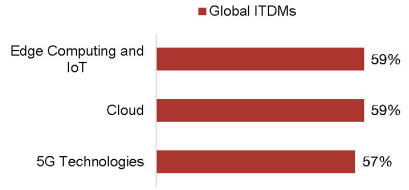
QUADRANT STRATEGIES
Statistically significant nuance from Global All % (up or down)
MOEs in Notes
114

F39
Source: Quadrant Strategies, April 2021

More Global ITDMs say Edge Computing and IoT are mission critical needs for their organization than they say so of 5G

Please fill in the blank with the option or options that best reflect your organization's current needs.

"____ is a mission critical need for my organization."

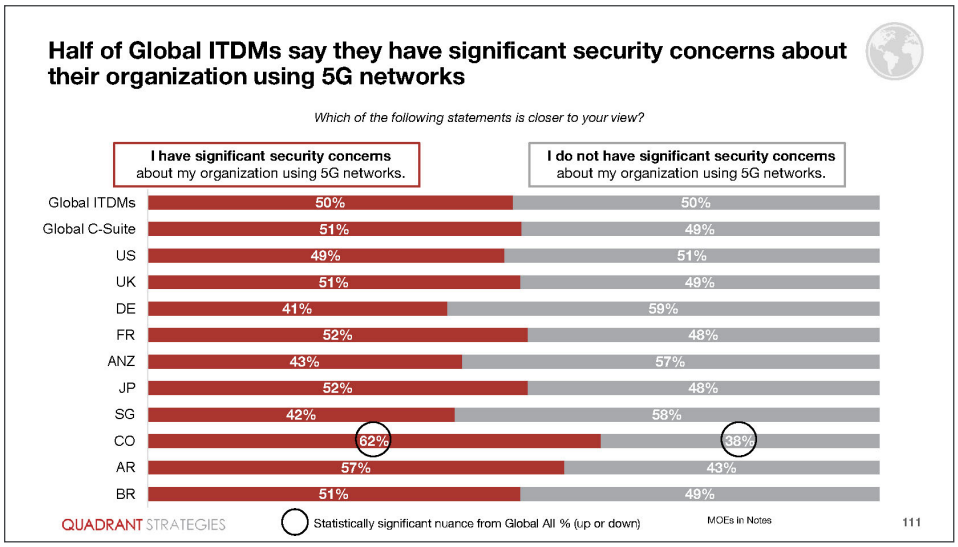


Showing % Selected	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Edge Computing and IoT	60%	60%	60%	44%	49%	75%	75%	55%	54%	61%	62%
Cloud	58%	64%	68%	61%	66%	63%	60%	62%	44%	56%	50%
5G Technologies	61%	50%	42%	42%	57%	77%	54%	69%	67%	52%	60%

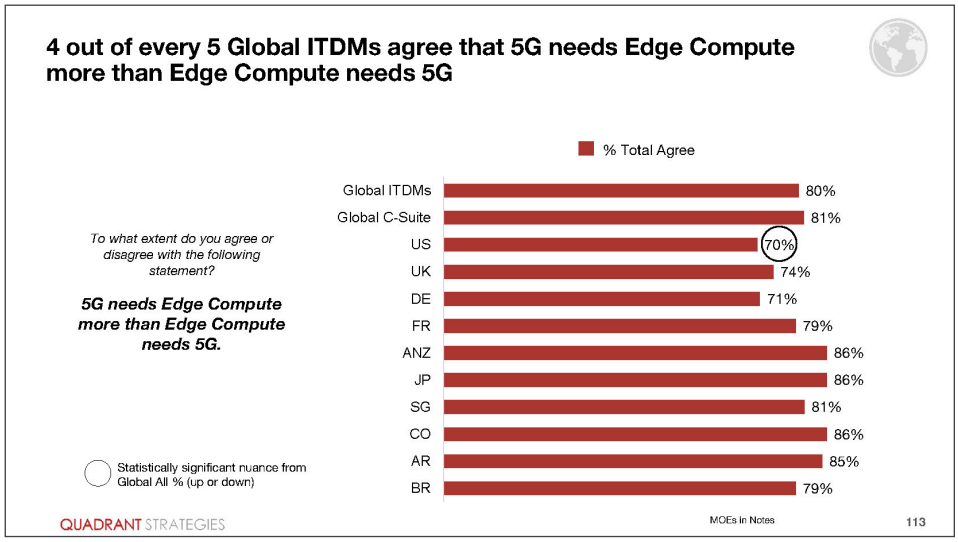
QUADRANT STRATEGIES
Statistically significant nuance from Global All % (up or down)
MOEs in Notes
110

LUMEN® TECHNOLOGIES

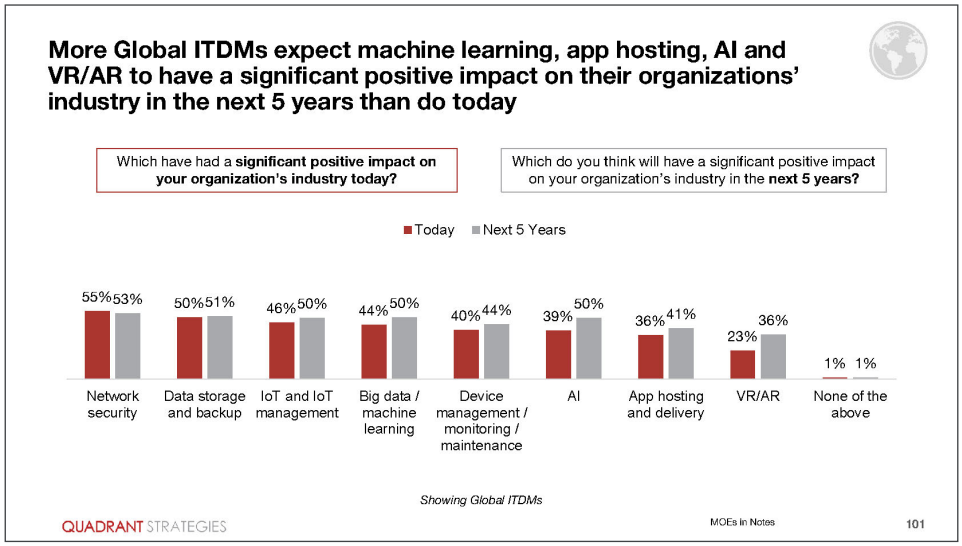
F40
Source: Quadrant Strategies, April 2021



F41
Source: Quadrant Strategies, April 2021



F42
Source: Quadrant Strategies, April 2021

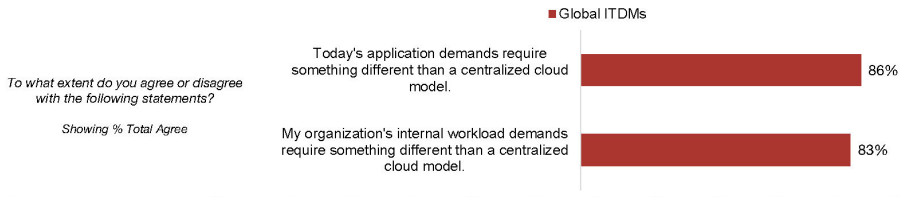


LUMEN TECHNOLOGIES

F43
Source: Quadrant Strategies, April 2021

86% of Global ITDMs agree that today's application demands require something different than a centralized cloud model

83% of Global ITDMs agree that their organizations' internal workload demands require something different than a centralized cloud model

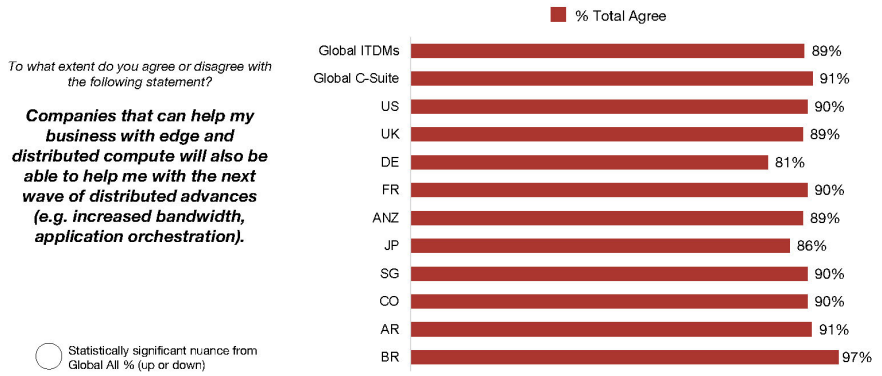


Showing % Total Agree	C-Suite	US	UK	DE	FR	ANZ	JP	SG	CO	AR	BR
Today's application demands require something other than a centralized cloud model	86%	84%	86%	83%	74%	89%	87%	82%	93%	85%	95%
My organization's internal workload demands require something different than a centralized cloud model	83%	82%	79%	73%	82%	89%	84%	84%	86%	77%	89%

QUADRANT STRATEGIES — Statistically significant nuance from Global All % (up or down) — MOEs in Notes — 90

F44
Source: Quadrant Strategies, April 2021

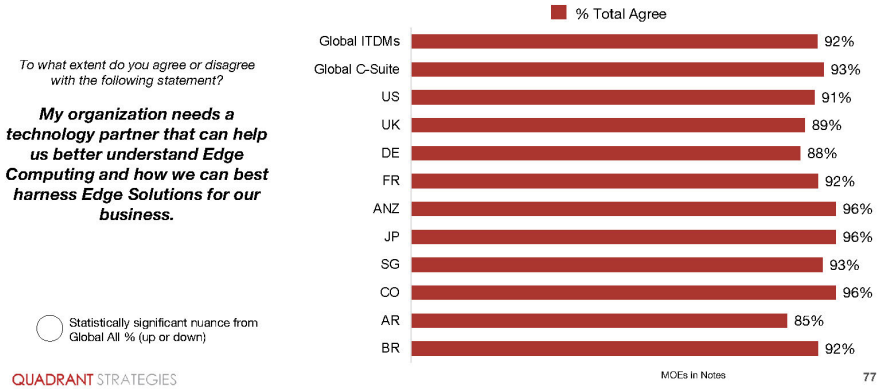
9 in 10 Global ITDMs agree that companies that can help their business with edge and distributed compute will also be able to help them with the next wave of distributed advances



QUADRANT STRATEGIES — MOEs in Notes — 91

F45
Source: Quadrant Strategies, April 2021

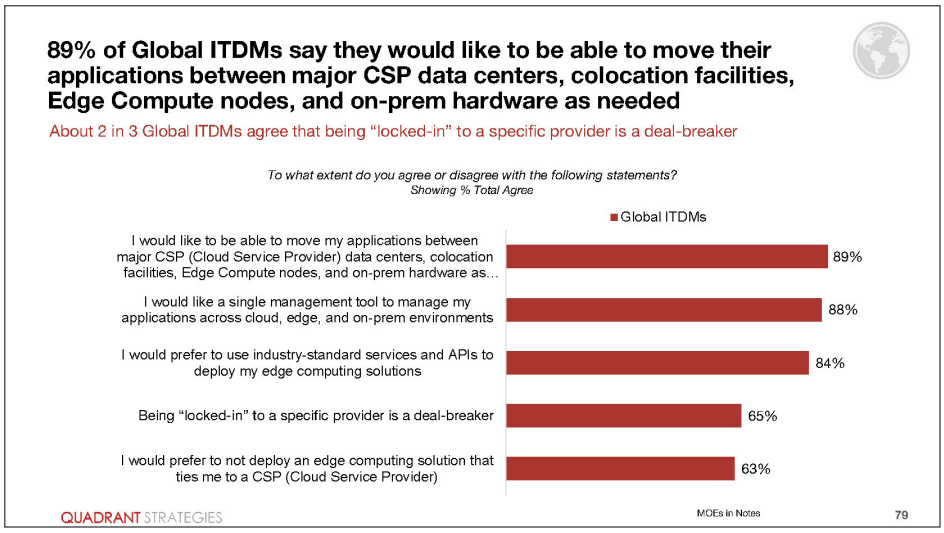
92% of Global ITDMs agree that their organization needs a technology partner that can help them better understand Edge Computing and how to best harness Edge Solutions for their business



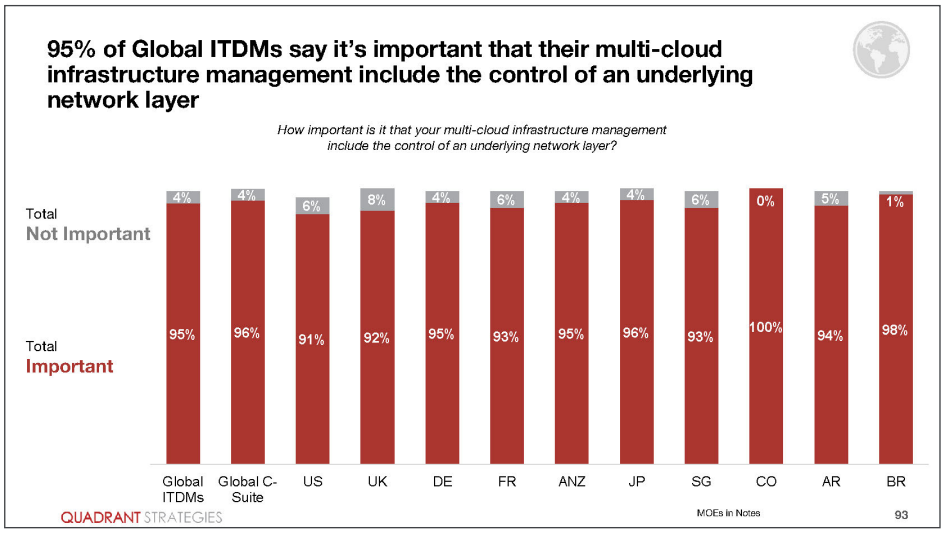
QUADRANT STRATEGIES — MOEs in Notes — 77

LUMEN® TECHNOLOGIES

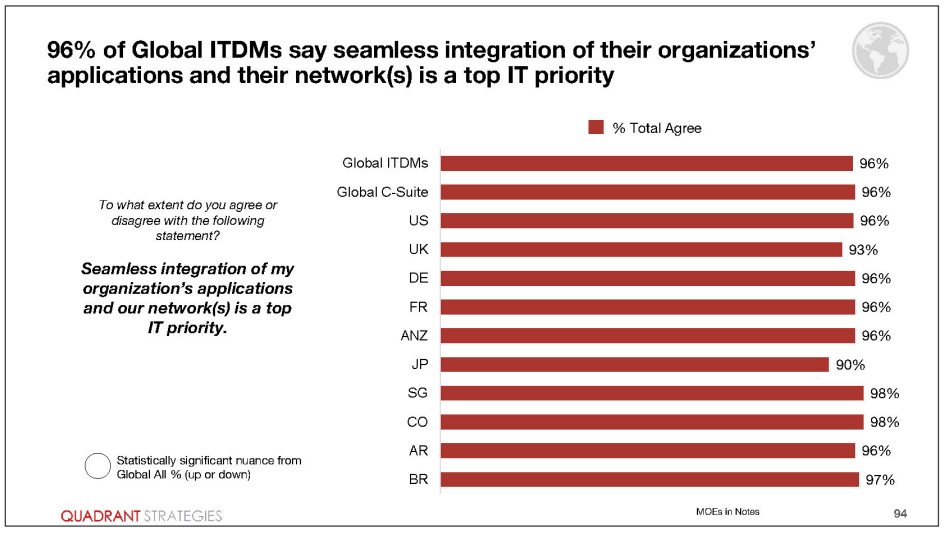
F46
Source: Quadrant Strategies, April 2021



F47
Source: Quadrant Strategies, April 2021



F48
Source: Quadrant Strategies, April 2021



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