[Volume 9 / Number 3]

akamai's [state of the internet]

Q3 2016 report

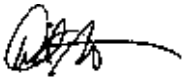
If you're reading this note in mid-December before the 2016 holidays arrive in full force, you may have visions of connected devices and digital media players dancing in your heads, with plans to binge watch the latest hot series on your new 4K television set or explore new worlds and play immersive games on your cutting-edge Virtual Reality setup. If it's early 2017 by the time you read this, then you've probably already set up these devices and media players, including connecting them to the Internet, updating and applying the latest patches, changing any default usernames and passwords (you ***did*** do that, right?), creating associated accounts and signing in to existing ones, and finally actually using them for their intended purpose. And of course, not just for one device or player, but for all the ones that your spouses, children, and relatives got as gifts as well. (I'm going to go out on a limb and assume that if you're reading the *State of the Internet Report*, there's a high likelihood that you probably serve as your family's IT resource as well.)

Gone are the days of making sure you have enough batteries on hand for all of the holiday gifts — now you need to have enough bandwidth so everyone can watch and play at once. With 4K streams requiring on the order of 15 Mbps and VR streams estimated to require at least an order of magnitude more, it won't take much until home connections get congested, everyone gets frustrated with a poor user experience, and the new gadgets are relegated to an overflowing junk drawer or the back of the hall closet. However, the good news is that both average and average peak connection speeds have continued to show positive long-term trends around the world, with some countries showing gradual improvements over time while others have seen more significant jumps as new broadband services are turned up or as speed tiers for existing customers get increased. In addition, more and more broadband providers are rolling out native IPv6 connectivity to their subscribers, enabling more and more devices to be connected to the Internet. (You ***did*** make sure that your connected device or media player supported IPv6 before buying it, right?) Ongoing improvements to broadband speeds and more widely available IPv6 connectivity will help support the concurrent use of multiple connected devices and media players on a single subscriber connection, supporting optimal user experiences for everyone.

Kind of makes you nostalgic for trying to figure out how to set the time on your VCR, doesn't it?

As noted in previous quarters, for readers who like to consume the *State of the Internet Report* on a tablet or e-reader device, we are now making the report available for download in ePub format from online bookstores including ***amazon.com***, ***Barnes & Noble***, ***Google Play***, ***Apple iBooks***, and ***Kobo***. Specific download links are available upon registration at ***https://www.akamai.com/stateoftheinternet***, and we encourage you to leave positive reviews of the report at your online bookstore of choice.

As always, if you have comments, questions, or suggestions regarding the *State of the Internet Report*, the website, or the mobile applications, please reach out to us via email at ***stateoftheinternet@akamai.com*** or on Twitter at ***@akamai_soti***. You can also interact with us in the *State of the Internet* subspace on the Akamai Community at ***https://community.akamai.com/***.



—David Belson

Akamai's globally distributed Intelligent Platform™ allows us to gather enormous amounts of data on many metrics including Internet connection speeds, network connectivity/availability issues, and IPv6 adoption progress as well as traffic patterns across leading web properties and digital media providers. Each quarter, Akamai publishes the *State of the Internet Report* based on this data.

This quarter's report includes data gathered from across the Akamai Intelligent Platform during the third quarter of 2016, covering Internet connection speeds and broadband adoption metrics across both fixed and mobile networks as well as trends seen in this data over time. In addition, the report includes insight into the state of IPv4 exhaustion and IPv6 adoption, Internet events and disruptions that occurred during the quarter, mobile browser usage trends, and observations from Akamai partner Ericsson regarding data- and voice-traffic growth on mobile networks.

Data on attack traffic seen across the Akamai platform and insights into high-profile security vulnerabilities and attacks are now published in a separate *State of the Internet/Security Report*. The quarterly security report provides timely information about the origins, tactics, types, and targets of cyberattacks, including quarter-over-quarter and year-over-year attack traffic trends as well as case studies highlighting emerging cybersecurity issues. The *State of the Internet/Security Report* can be found at ***https://www.akamai.com/stateoftheinternet-security***.

Internet Connectivity / In the third quarter of 2016, Akamai observed a 0.7% quarterly increase in the number of unique IPv4 addresses connecting to the Akamai Intelligent Platform, rising to just over 806 million — about 6 million more than in the second quarter. In all, just under 6 million IPv4 addresses were depleted from available pools at the Regional Internet Registries in the third quarter, leaving approximately 45 million addresses remaining. Belgium remained the clear global leader in IPv6 adoption with 39% of its connections for dual-stacked content to Akamai happening over IPv6, up 3.3% from the previous quarter.

Connection Speeds & Broadband Adoption / The global average connection speed increased 2.3% quarter over quarter to 6.3 Mbps, while the global average peak connection speed increased 3.4% to 37.2 Mbps. At a country/region level, South Korea continued to have the highest average connection speed in the world at 26.3 Mbps, despite a 2.5% decline compared with the second quarter, while Singapore maintained its position as the country with the highest average peak connection speed at 162.0 Mbps, after a 3.0% quarterly increase.

Globally, 4 Mbps broadband adoption was 77% in the third quarter, up 1.2% from the second quarter, with Guernsey having with the highest level of adoption worldwide at 97% (followed closely by the Isle of Man and South Korea, also with 97% adoption rates). Globally, the 10 Mbps, 15 Mbps, and 25 Mbps adoption rates all grew quarter over quarter as well, increasing 5.4%, 6.5%, and 5.3% to adoption levels of 37%, 22%, and 8.7%, respectively. As it has for many quarters, South Korea continued to lead the world in all three broadband tiers, with adoption rates of 78%, 61%, and 34% respectively, after moderate quarterly declines in adoption across all three tiers.

Mobile / Average mobile connection speeds (aggregated at a country/region level) ranged from a high of 23.7 Mbps in the United Kingdom to a low of 2.2 Mbps in Venezuela in the third quarter of 2016. Based on traffic data collected by Ericsson, the volume of mobile data traffic grew by 11% over the previous quarter.

Analysis of Akamai IO data collected during the third quarter from a sample of requests to the Akamai Intelligent Platform indicates that for traffic from mobile devices on cellular networks, Apple Mobile Safari accounted for roughly 31% of requests, while Android Webkit and Chrome Mobile (the two primary Android browser bases) together accounted for approximately 59% of requests. For traffic from mobile devices across all networks, Apple Mobile Safari was responsible for about 38% of requests, while Android Webkit and Chrome Mobile made up 51% of requests.

[SECTION][1] INTERNET PENETRATION

Through its globally deployed Intelligent Platform, and by virtue of the over 2 trillion requests for web content that it serves on a daily basis, Akamai has unique visibility into levels of Internet penetration around the world. In the third quarter of 2016, over 806 million unique IPv4 addresses from 242 unique countries/regions connected to the Akamai Intelligent Platform. This is a 0.3% decrease in the number of unique IPv4 addresses seen by Akamai as compared with the third quarter of 2015 and a 0.7% increase from the number seen in the second quarter.

We believe the 806 million IPv4 addresses seen by Akamai represent well over 1 billion web users. In some cases, multiple individuals may be represented by a single IPv4 address (or a small number of IPv4 addresses) due to the fact that they access the web through a firewall or proxy server. In other cases, individual users may have multiple IPv4 addresses associated with them due to their use of multiple connected devices.

1.1 Unique IPv4 Addresses / The number of unique IPv4 addresses worldwide connecting to Akamai increased by about 6 million in the third quarter of 2016, mostly offsetting the 8 million address decrease seen in the previous quarter. As noted previously, we expect that the unique global IPv4 addresses seen by Akamai may continue to level off or decline modestly in the future as carriers increase the availability of native IPv6 connectivity for subscribers and implement Carrier-Grade Network Address Translation (CGNAT) solutions more broadly in an effort to conserve limited IPv4 address space.

In the third quarter of 2016, 6 of the top 10 countries/regions saw modest quarterly gains in unique IPv4 counts, three saw modest decreases, and the United Kingdom remained virtually unchanged, as seen in Figure 1. Gains ranged from 0.1% in Japan to 5.3% in India, while declines ranged from 0.6% in Germany to 1.8% in China. Across the globe, approximately 55% of the countries/regions surveyed saw a quarter-over-quarter increase in unique IPv4 address counts in the third quarter, up from approximately 45% in the second. Twenty-four countries/regions saw IPv4 address counts grow 10% or more, while fourteen saw counts decline 10% or more as compared with the previous quarter.

Year-over-year changes among the top 10 countries/regions were mixed as well, with six seeing IPv4 address counts rise while four saw them drop. South Korea posted the largest increase at 6.2%, while Russia had the smallest at 0.4%. Among the countries/regions to see a yearly decrease in unique IPv4 address counts, the United States again had the largest decline with a drop of 6.6%, while the United Kingdom had the smallest at 0.1%. As noted previously, the declines seen in these countries are not indicative of long-term declines in Internet usage but are more likely related to changes in IP address management/conservation practices and/or increased IPv6 adoption.

Globally, more than 60% of the countries/regions surveyed had higher unique IPv4 address counts in the third quarter compared with one year ago. Yearly growth rates of 100% or more were seen in 11 countries/regions, although most of them had a relatively small number of unique IPv4 addresses — five of them had fewer than 2,000 — so small changes can result in deceptively large percentage shifts in these countries. In all, 23 countries/regions saw yearly growth rates of at least 50%, while one country — Botswana — saw its IPv4 address count decline at least 50%. These trends are similar to those seen in the preceding quarter.

1.2 IPv4 Exhaustion / As expected, in the third quarter of 2016, available IPv4 address space continued to decrease as Regional Internet Registries (RIRs) assigned and allocated blocks of IPv4 address space to organizations within their respective territories. A reference table translating the /nn notations used below to identify unique IP address counts can be found at ***https://www.arin.net/knowledge/cidr.pdf***.

Leveraging data[1] collected by Geoff Huston, Chief Scientist at APNIC,[2] the *State of the Internet Report* provides a perspective on the size of the available IPv4 address pool at each RIR and how the sizes of the available pools have been shrinking over time. In addition, the report uses data provided by the individual RIRs to highlight IPv4 address space delegation activity within each region over the course of the quarter.

Figure 2 illustrates how the size of available IPv4 address pools at each RIR changed during the third quarter of 2016 based on data made available by Mr. Huston. As noted in the *Third Quarter, 2015 State of the Internet Report*, ARIN fully depleted its pool of available addresses after allocating its final IPv4 address block on September 24, 2015. Its reported available pool has remained at zero since then. LACNIC handed out nearly 730,000 addresses — about 90,000 more than in the second quarter — representing almost half of the addresses it had available in its pool at the beginning of the quarter. AFRINIC distributed almost 3.7 million addresses — about 14% of its available pool and more than twice the number it handed out in the second quarter, while APNIC distributed about 580,000 addresses — 7% of its available pool and roughly half the number given out in the second quarter. Finally, RIPE handed out about 830,000 addresses — more than 5% of its pool, similar to its first- and second-quarter numbers.

	Country/Region	Q3 2016 Unique IPv4 Addresses	QoQ Change	YoY Change
–	Global	806,237,084	0.7%	-0.3%
1	United States	138,195,375	2.4%	-6.6%
2	China	122,293,850	-1.8%	-3.0%
3	Brazil	49,006,468	1.3%	3.9%
4	Japan	45,514,634	0.1%	-1.2%
5	Germany	36,982,426	-0.6%	1.9%
6	United Kingdom	30,947,119	<0.1%	-0.1%
7	France	30,734,190	-0.9%	4.5%
8	South Korea	25,341,547	2.3%	6.2%
9	Russia	19,077,529	1.0%	0.4%
10	India	18,267,607	5.3%	2.0%

Figure 1: Unique IPv4 Addresses Seen by Akamai

With just under 23 million addresses available at the end of the third quarter, AFRINIC was again the RIR with the most substantial pool of IPv4 addresses remaining; however this number represents less than one-fifth of its original IPv4 address pool.[3] At the end of the third quarter, RIPE and APNIC had roughly 14 million and 7.6 million available IPv4 addresses respectively, and LACNIC, with the smallest remaining pool, had just under 740,000 available addresses remaining.

Figure 3 illustrates the IPv4 allocation/assignment activity across each of the RIRs during the third quarter of 2016. Overall, there was a significant uptick in activity, as 16 million addresses were allocated/assigned in the third quarter as compared with 7.1 million in the second quarter. As noted in previous *State of the Internet Reports*, as available address pools dwindle, sizeable portions of these transactions — most notably ARIN's assignment/allocation of 10 million addresses — are likely to be third-party transfers instead of direct RIR allocations.

Based on the data below, the most significant transaction at ARIN in the third quarter occurred on August 9, when a /12 and several /13s, /14s, and /17s — totaling nearly 5.4 million addresses — were assigned to Amazon Technologies.[4] The other significant ARIN transaction took place on September 12, as Amazon Technologies acquired an additional /10.[5] As noted in last quarter's *State of the Internet Report*, these transactions were mostly likely IP address block transfers between third-party companies, but they appear as ARIN assignments in this data set because of the administrative logistics of the transfer process.

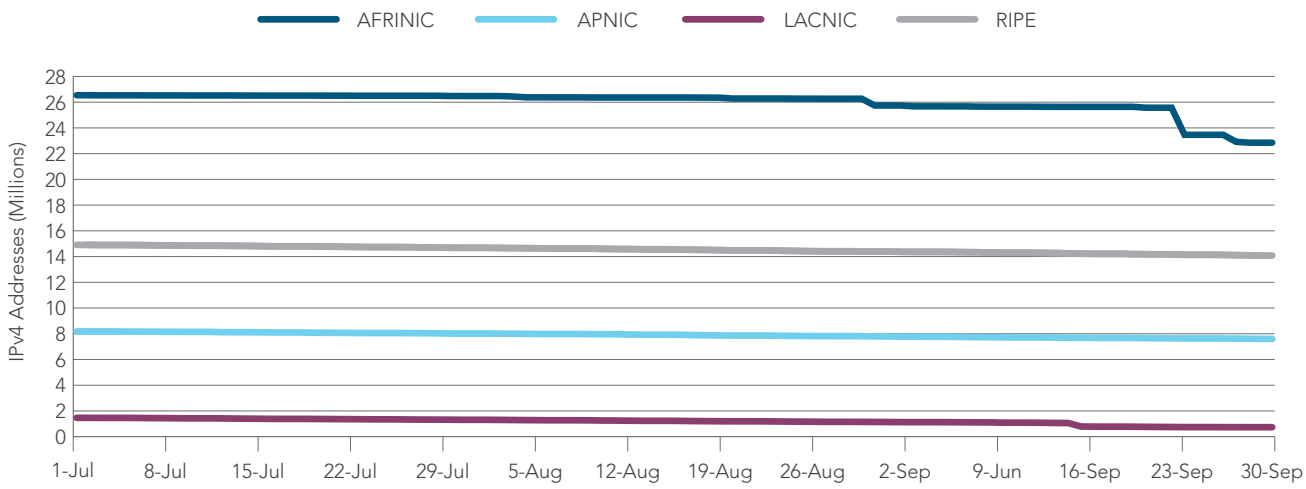


Figure 2: Available IPv4 Address Pool Size by RIR, Q3 2016

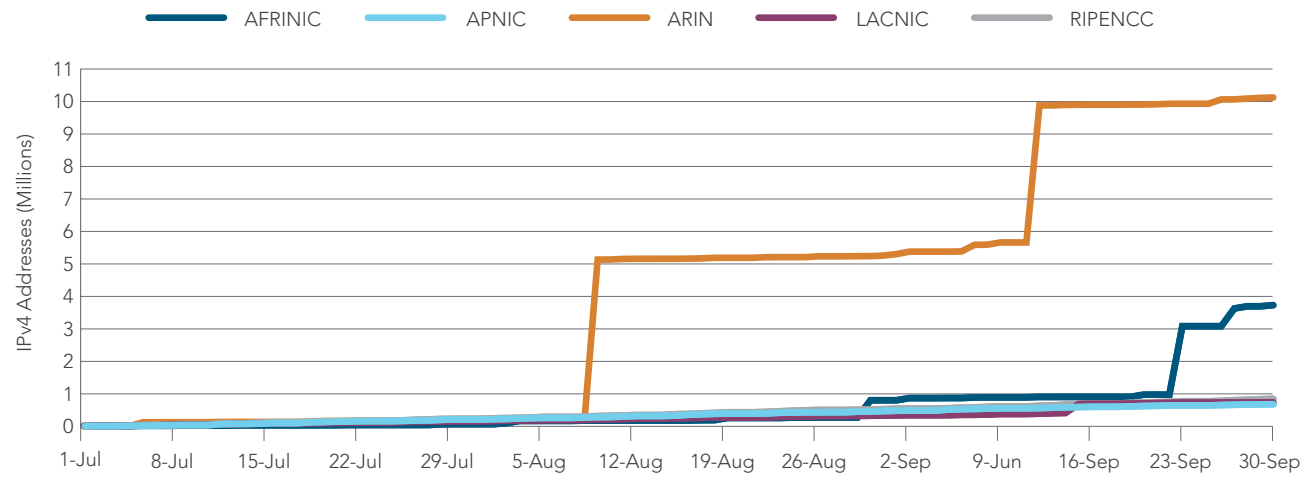


Figure 3: Total Number of IPv4 Addresses Allocated/Assigned by RIR, Q3 2016

As available IPv4 address space becomes scarce and transfers become more frequent, we expect to see third-party IPv4 transfers more often and possibly at other RIRs as well. In the year since its available pool of IPv4 addresses ran out, ARIN's waiting list for unmet requests has grown to nearly 400 requests, of which only 13 have been filled.[6] This has led to an active IPv4 transfer market, where prices have risen from $5 per address to roughly double that within 18 months.[7] Reports suggest that prices could continue to rise in the near term, although they are expected to drop eventually as IPv6 becomes more widely adopted. There have even been reports of a black market for the addresses due to the current scarcity of IPv4 addresses, although ARIN has recently tightened security to prevent such fraud.[8]

In the meantime, the remaining RIRs still have IPv4 addresses available to assign. AFRNIC's largest allocation in the third quarter occurred on September 23, when Cloud Innovation Limited, a Seychelles corporation, received a /11.[9] In addition, on August 30, AFRNIC allocated a /13 to South African Wi-Fi provider Vast Networks,[10] and on September 27, it allocated another /13 to Airtel Uganda.[11] Other than these three transactions, AFRINIC, APNIC, RIPE, and LACNIC all saw slow, consistent delegation activity in the third quarter, much like the second, with no specific days seeing assignments or allocations larger than a /15.

1.3 IPv6 Adoption / This section includes insight into IPv6 adoption based on data gathered from the Akamai Intelligent Platform. The traffic percentages cited in Figure 4 and Figure 5 are calculated by dividing the number of content requests made to Akamai over IPv6 by the total number of requests made to Akamai (over both IPv4 and IPv6) for customer web properties that have enabled Akamai Edge delivery via IPv6 — in other words, for dual-stacked hostnames. This reporting methodology provides something of a lower bound for IPv6 adoption, as some dual-stacked clients — such as Safari on Mac OS X Lion and Mountain Lion — will only use IPv6 for a portion of possible requests. While new versions of Mac OS X have addressed this issue, we are now finding that lack of IPv6 support in some consumer electronics (such as smart TVs and stand-alone digital media player devices) is presenting a barrier to growth in adoption, especially as the amount of content consumed on these devices grows over time. While not all of Akamai's customers have chosen to implement IPv6 delivery yet, the data set used for this section includes traffic from a number of leading web properties and software providers, so we believe it is sufficiently representative. Note that in compiling the data for the figures in this section, a minimum of 90 million total requests to Akamai during the third quarter was required to qualify for inclusion.

A regularly updated view into the metrics discussed below can be found in the "IPv6 Adoption Trends by Country and Network" visualization on the *State of the Internet* website at ***https://www.akamai.com/stateoftheinternet/ipv6***.

Figure 4 highlights the 10 countries/regions with the largest percentage of content requests made to Akamai over IPv6 in the third quarter. With a 3.3% quarter-over-quarter increase in IPv6 adoption, Belgium again maintained a clear global lead, as 39% of its content requests to Akamai were made over IPv6. Belgium's IPv6 percentage was 14 points higher than Greece, the country in second place. Unlike the second quarter, where Portugal was the only country/region in the top 10 to see a drop in IPv6 adoption, in the third quarter, four countries/regions saw declines, ranging from 0.3% in Greece to 13% in Portugal. India joined the top 10 for the first time in the third quarter — boasting the largest quarterly gain by far amongst the group as its IPv6 adoption rate rose 715%, from 2.1% adoption to 17% adoption. This tremendous rise may be due in part to a significant increase in IPv6 support across the networks of several major Indian mobile operators including Reliance Jio Infocomm, MTS India, and Idea Cellular. The remaining five countries in the top 10 saw more modest increases in IPv6 adoption, with growth rates ranging from 2.4% in Germany to 13% in the United States.

	Country/Region	Q3 2016 IPv6 %	QoQ Change
1	Belgium	39%	3.3%
2	Greece	25%	-0.3%
3	Germany	22%	2.4%
4	United States	21%	13%
5	Switzerland	21%	-2.6%
6	Ecuador	20%	12%
7	India	17%	715%
8	Portugal	16%	-13%
9	Estonia	15%	3.2%
10	Peru	12%	-7.3%

Figure 4: IPv6 Traffic Percentage, Top Countries/Regions

Figure 5 lists the top 20 network providers by the number of IPv6 requests made to Akamai during the third quarter. Once again, cable and wireless/mobile providers continued to drive the largest volumes of IPv6 requests, as many are leading the way for IPv6 adoption in their respective countries.

In the third quarter, Verizon Wireless again led the pack with 80% of its requests to Akamai being made over IPv6, up from 74% in the second quarter, followed by T-Mobile with 75% of requests, up from 61%. In the third quarter, 15 providers in the top 20 had at least one in four requests for dual-stacked content to Akamai take place over IPv6 — up from 12 providers in the second quarter and 8 in the first. All of the top 20 — up from 19 in the previous quarter — had at least 10% of requests to Akamai occur over IPv6.

These consistent increases all point to the continued advancement of IPv6 adoption, a trend that appears to be accelerating. The World IPv6 Launch blog noted that in July, the major U.S. mobile networks passed a significant milestone, reaching IPv6 adoption levels of greater than 50%.[12] At the same time, Comcast Cable announced

Country/Region	Network Provider	Q3 2016 IPv6 %
United States	Comcast Cable	44%
United States	AT&T	43%
United States	Verizon Wireless	80%
United States	Time Warner Cable	25%
India	Reliance Jio Infocomm Ltd.	74%
United States	T-Mobile	75%
United Kingdom	Sky Broadband	58%
Germany	Deutsche Telekom	29%
United States	Cox Communications	22%
Pan-European	Liberty Global B.V. (UPC)	18%
Belgium	TELENET	56%
Brazil	NET Serviços de Comunicação S.A.	15%
Ecuador	CNT Ecuador	36%
France	Orange	13%
Japan	KDDI Corporation	34%
Canada	Telus Communications	41%
Canada	Rogers Cable	32%
United States	Sprint Communications	28%
France	Proxad/Free	24%
Belgium	Belgacom Skynet	33%

Figure 5: IPv6 Traffic Percentage, Top Network Providers by IPv6 Request Volume

that 50% of its traffic would be on IPv6 by the end of the year.[13] Networks around the globe are pushing IPv6 adoption forward as well. Major U.K. Internet provider Sky announced in September that 90% of its broadband customers were IPv6 enabled, with all eligible customers becoming IPv6 enabled by the end of the year.[14] Meanwhile, leading Australian provider Telstra, which reported in March that it had run out of IPv4 addresses, announced that it had added dual-stack support across its mobile network, with a plan to deploy an end-to-end IPv6 network in the longer term.[15]

[SECTION]2 GEOGRAPHY *GLOBAL*

The data presented within this section was collected during the third quarter of 2016 through Akamai's globally deployed Intelligent Platform and includes all countries/regions that had more than 25,000 unique IPv4 addresses request content from Akamai during the third quarter. This report features data on average and average peak connection speeds—the latter provides insight into the peak speeds that users can likely expect from their Internet connections. In addition, it also provides insight into adoption levels at different broadband threshold speeds; references to broadband tiers throughout this report refer to speeds greater than or equal to the specified threshold. In order to qualify for inclusion in a speed tier, a country or region must have more than 25,000 unique IPv4 addresses that meet the given speed threshold. Note that connection speeds published within the *State of the Internet Report* are guidance based on the reach of Akamai's platform. See the blog post at ***http://akamai.me/sotimetrics2016***, as well as previous posts referenced within, for more information on how these metrics are calculated.

Traffic from known mobile networks is analyzed and reviewed in Section 8 of the report. Therefore, mobile network data has been removed from the data set used to calculate the metrics in the present section as well as subsequent regional "Geography" sections. However, a small number of networks offer both fixed and mobile broadband service, and in some cases it may not be possible to accurately separate the two types of traffic within that network. This may result in the inclusion of some data in this section that is based on connections

from mobile devices and/or mobile gateways. In the vast majority of cases, we do not expect this data to have a significant bearing on the results presented below, but we will note instances where we feel the speeds presented may be substantively affected.

Beginning with the *Second Quarter, 2015 State of the Internet Report*, we have also removed traffic identified as coming from major cloud hosting providers, as cloud-services data centers typically have extremely fast Internet connections that can skew connection speed metrics. We believe that removing this data from our calculations provides a more accurate picture of the end-user experience.

Finally, note that some countries, such as Luxembourg, have chosen to roll out new high-speed broadband services using native IPv6 connectivity, and as such, this section — and subsequent regional "Geography" sections — may under-report the connection speeds available to and achieved by broadband subscribers within these countries, as these sections are limited to IPv4 addresses only.

2.1 Global Average Connection Speeds (IPv4) / In the third quarter of 2016, the global average connection speed was 6.3 Mbps, a 2.3% increase from the second quarter, as seen in Figure 6. Among the top 10 countries/regions, quarter-over-quarter changes were more positive than in the previous quarter, with 6 of the top 10 seeing gains. Singapore, the only country/region to see a quarterly increase in the second quarter, led the top 10 again with a 5.3% increase in average connection speeds over the second quarter. Japan was close behind with a 5.1% quarterly increase, while Switzerland had the smallest increase among the top 10 with a 0.5% rise. Three countries — Latvia, South Korea, and Norway — posted quarterly decreases of 3.5%, 2.5%, and 0.2% respectively, and Finland saw average connection speeds remain unchanged compared with the second quarter.

The Netherlands rejoined the top 10 in the third quarter with a 2.1% quarterly increase in speeds, while Iceland's 5.4% decrease caused it to give up its top 10 position, slipping into 14th place worldwide. Despite posting a quarterly decline of 2.5%, South Korea remained firmly in the lead globally as the only country/region with an average connection speed above the 25 Mbps threshold. Once again, all of the top 10 countries/regions enjoyed speeds well above the 15 Mbps threshold; in fact, 17 countries/regions worldwide posted average speeds of at least 15 Mbps.

	Country/Region	Q3 2016 Avg. Mbps	QoQ Change	YoY Change
–	Global	6.3	2.3%	21%
1	South Korea	26.3	-2.5%	28%
2	Hong Kong	20.1	3.4%	27%
3	Norway	20.0	-0.2%	22%
4	Sweden	19.7	4.6%	13%
5	Switzerland	18.4	0.5%	14%
6	Singapore	18.2	5.3%	45%
7	Japan	18.0	5.1%	20%
8	Finland	17.6	0%	19%
9	Netherlands	17.3	2.1%	11%
10	Latvia	16.9	-3.5%	16%

Figure 6: Average Connection Speed (IPv4) by Country/Region

Quarterly changes across the globe were generally more positive than in the previous quarter, with 87 of 147 qualifying countries/regions seeing average connection speeds go up. In the second quarter, only 53 countries/regions saw quarterly increases. Growth rates ranged from a modest 0.1% in Kazakhstan (to 7.9 Mbps) to a robust 44% in Fiji (to 6.6 Mbps). Seventeen countries/regions enjoyed double-digit gains, compared with thirteen in the previous quarter. Quarter-over-quarter declines were seen 58 qualifying countries/regions, compared with 95 countries/regions in the second quarter. Declines in connection speeds ranged from 0.1% in the Isle of Man (to 11.5 Mbps) to 33% in Egypt (to 2.7 Mbps). In addition to Finland, New Caledonia also saw average connection speeds remain virtually unchanged compared with the previous quarter.

Year over year, on a global basis, the average connection speed increased 21%. All of the top 10 countries/regions saw increases in the third quarter, just like the second. Gains ranged from 11% in the Netherlands to 45% in Singapore. Worldwide, average connection speed improvements were seen in 137 countries/regions, compared with 132 in the preceding quarter, and yearly increases ranged from 0.1% in the Bahamas (to 7.6 Mbps) to 335% in Kenya (to 11.0 Mbps). Three additional countries — Indonesia, Réunion, and Libya — also saw average connection speeds more than double from the prior year. Yearly declines were seen in 10 countries/regions, with drops ranging from 2.3% in Pakistan (to 2.0 Mbps) to 23% in Yemen (to 0.7 Mbps).

Yemen, with an average connection speed of 0.7 Mbps (down 5.9% from the previous quarter), was again the only country to have an average speed below 1.0 Mbps. Syria and Libya were not far ahead, however, with average connection speeds of 1.1 Mbps and 1.2 Mbps, respectively.

2.2 Global Average Peak Connection Speeds (IPv4) / Extending its upward trend from the previous quarters, the global average peak connection speed increased 3.4% to 37.2 Mbps in the third quarter of 2016, as shown in Figure 7. Seven of the countries/regions in the top 10 posted quarterly gains, though increases were fairly modest, ranging from 1.0% in Romania to 8.1% in Indonesia. The other three countries/regions saw modest declines, ranging from 0.7% in Taiwan to 3.6% in Qatar. With a 3.0% gain in the third quarter, Singapore again remained firmly in first place across the world in this metric, posting an average peak connection speed of 162.0 Mbps, nearly twice as fast as 10th place Romania.

Looking across the world, 76 of the 144 qualifying countries/regions saw quarterly increases in average peak connection speeds, compared with 105 in the previous quarter. Growth rates ranged from 0.1% in Malta (to 57.2 Mbps) to 23% in Nepal (to 24.2 Mbps), with 6 countries posting double-digit growth (compared with

34 in the second quarter). On the declining side, 66 qualifying countries/regions saw lower average peak connection speeds in the third quarter, compared with 43 in the preceding quarter. Declines ranged from 0.1% in Senegal, the Philippines, Saudi Arabia, and the Ukraine (to average peak speeds of 14.2 Mbps, 32.8 Mbps, 39.6 Mbps, and 55.7 Mbps respectively) to 34% in Egypt (to 13.2 Mbps). Puerto Rico and Slovakia saw average peak speeds remain steady compared with the previous quarter.

Year over year, average peak connection speeds increased 16% on a global basis in the third quarter of 2016, compared with just 2.5% in the prior quarter. All of the top 10 countries/regions saw increases in average peak connection speed, led again by Indonesia with a 220% increase. As noted in the previous two quarters' reports, Indonesia's recent large gains in this and other broadband metrics are likely due in part to improved Akamai connectivity to a leading network provider within the country. Remaining increases among the top 10 were more modest, ranging from 12% in Japan to 32% in South Korea.

Across the globe, 126 countries/regions saw yearly increases in average peak connection speeds as compared with 124 in the preceding quarter. Israel posted the smallest increase at 0.3% (to 70.2 Mbps), while Indonesia had the largest increase. In addition to Indonesia, three other countries — Réunion, Kuwait, and Kenya — saw average peak connection speeds more than double compared with the previous year, while an additional eight countries/regions saw speeds increase by at least 50%. In all, 106 countries/regions enjoyed double-digit yearly growth. Eighteen countries/regions saw a yearly decline in average peak speeds, with Egypt experiencing the largest drop at 34% (to 13.2 Mbps) and Morocco seeing the smallest at 0.6% (to 21.6 Mbps).

In the third quarter of 2016, Zambia was once again the country/region with the lowest average peak connection speed (at 6.1 Mbps after a 4.2% quarterly drop). Paraguay and Yemen, along with Zambia, were the only qualifying countries/regions to see average peak connection speeds below 10 Mbps in the third quarter.

	Country/Region	Q3 2016 Peak Mbps	QoQ Change	YoY Change
–	Global	37.2	3.4%	16%
1	Singapore	162.0	3.0%	20%
2	Hong Kong	116.2	1.6%	15%
3	South Korea	114.2	3.7%	32%
4	Indonesia	99.3	8.1%	220%
5	Bahrain	98.0	-2.9%	23%
6	Macao	96.0	1.6%	30%
7	Qatar	94.3	-3.6%	25%
8	Taiwan	88.2	-0.7%	13%
9	Japan	88.1	3.3%	12%
10	Romania	85.0	1.0%	17%

Figure 7: Average Peak Connection Speed (IPv4) by Country/Region

2.3 Global 4 Mbps Broadband Adoption (IPv4) / In the third quarter of 2016, the global percentage of unique IPv4 addresses connecting to Akamai that met the 4 Mbps broadband speed threshold increased by 1.2% to 77%, as seen in Figure 8. Andorra, which led the world in the second quarter, failed to qualify in the third. On the other hand, Guernsey qualified for inclusion for the first time in the third quarter, leading the world with a 97% adoption rate. The rest of the top 10 followed closely behind, with seven of them having at least 95% of their unique IPv4 addresses connecting to Akamai at average speeds of 4 Mbps or faster.

Quarterly changes were small across the top 10 countries/regions, with 4 out of the 10 showing gains, ranging from 0.2% in Guernsey to 1.4% in Bulgaria. Declines ranged from 0.1% in South Korea to 1.3% in Latvia. Because adoption rates among the top 10 are so closely spaced, modest declines in Romania, Switzerland, and Denmark were enough to push them out of the top 10 in the third quarter, making room from Bulgaria, Iceland, and Israel.

Globally, a total of 118 countries/regions qualified for inclusion within this metric, down from 119 in the preceding quarter. In total, 52 countries/regions saw quarterly growth in 4 Mbps broadband adoption rates, up from 41 in the previous quarter. Increases ranged from Guernsey's 0.2% to the Palestinian Territories' 89% (to 38% adoption), with 20 countries posting double-digit growth. Quarter-over-quarter declines were seen in 62 qualifying countries/regions, compared with 78 in the previous quarter. Decreases ranged from 0.1% in South Korea to 54% in Egypt (to a 9.0% adoption rate). Five countries/regions in all posted double-digit declines, while four saw adoption rates remain unchanged.

Year over year, the percentage of unique IPv4 addresses connecting to Akamai at average speeds of at least 4 Mbps increased by 18%, continuing the positive trend of the past several quarters. Adoption rates for 4 Mbps broadband were up on a yearly basis across all of the top 10 countries/regions in the third quarter but were again modest, as would be expected given such high rates of adoption. Gains ranged from 0.1% in Bulgaria to 4.5% in Latvia.

	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
–	Global	77%	1.2%	18%
1	Guernsey	97%	0.2%	4.1%
2	Isle Of Man	97%	0.5%	2.8%
3	South Korea	97%	-0.1%	1.1%
4	Malta	96%	-0.3%	2.4%
5	Bulgaria	96%	1.4%	0.1%
6	Thailand	95%	-1.0%	2.6%
7	Netherlands	95%	-0.9%	0.1%
8	Iceland	94%	1.3%	3.0%
9	Israel	94%	-0.3%	0.5%
10	Latvia	94%	-1.3%	4.5%

Figure 8: 4 Mbps Broadband Adoption (IPv4) by Country/Region

Across the globe, 109 of the qualifying countries/regions saw 4 Mbps broadband adoption levels increase year over year, compared with 104 in the prior quarter. Growth rates ranged from a mere 0.3% in Israel to an incredible 1,313% in Tanzania (to 64% adoption), although Tanzania had a fairly small number of unique IPv4 addresses connecting to Akamai and thus is prone to larger percentage swings. Egypt saw the second-largest annual increase at 593% (to 9.0% adoption), while 19 additional countries/regions posted 4 Mbps adoption-rate gains of 100% or more. Denmark, with a 94% adoption rate, held steady compared with one year prior, while eight countries/regions saw adoption rates fall. Declines ranged from 0.2% in Romania (to 94% adoption) to 62% in Iraq (to 16% adoption).

In the third quarter of 2016, Algeria, Pakistan, and Venezuela were again the only three countries with 4 Mbps broadband adoption rates below 5%. All three saw modest quarterly changes in the third quarter, as Algeria fell 3.4% (to 2.5% adoption) and Pakistan and Venezuela gained 0.8% and 0.2% respectively (to adoption levels of 2.9% and 3.4%).

2.4 Global 10 Mbps Broadband Adoption (IPv4) / In the third quarter of 2016, 37% of unique IPv4 addresses around the world connected to Akamai at average speeds above 10 Mbps, a 5.4% increase over the second quarter, as shown in Figure 9. Among the top 10 countries/regions, quarterly declines outnumbered gains in the third quarter, similar to the second quarter. Seven countries posted declines, but all were very modest, ranging from 0.1% in Singapore to 1.4% in Iceland. Hong Kong, the Netherlands, and Japan posted gains, as adoption levels in these countries rose 2.5%, 2.9%, and 4.9%, respectively, over the previous quarter. Despite a 1.3% quarterly decline, South Korea remained the world leader with an adoption rate of 78% — 10 percentage points higher than second-place Japan. Six of the top 10 countries/regions enjoyed 10 Mbps adoption rates of at least 65%, the same as in the previous quarter.

Eighty-three countries/regions qualified for this metric, down from 79 in the preceding quarter. Forty-nine countries posted quarterly gains in adoption, with increases ranging from 0.6% in Canada and the United Kingdom (to adoption levels of 52% and 53% respectively) to 115% in Panama (to an adoption level of 7.2%). Twenty-four countries posted double-digit gains. Among the 34 declining countries, quarterly drops ranged from 0.1% in Singapore and Kazakhstan (to adoption levels of 67% and 25% respectively) to 51% in Egypt (to 4.7% adoption). Seven countries suffered double-digit losses.

Globally, in the third quarter there was a 35% increase in the percentage of unique IPv4 addresses connecting to Akamai at average speeds above 10 Mbps compared with one year prior, and once again, all of the top 10 countries/regions enjoyed year-over-year growth in adoption rates. Increases ranged from 6.2% in Switzerland to 39% in Iceland. Yearly changes were positive across the globe as well, with the exception of Trinidad and Tobago, where adoption rates fell to 16%, a 6.7% decline compared with the previous year. Growth rates varied significantly, with Romania seeing the smallest yearly growth at 2.8% (to 59% adoption), and Kenya and Egypt seeing the largest at 6,566% and 6,133% (to 41% and 4.7% adoption), respectively. As noted in last quarter's report, however, neither Egypt nor Kenya qualified for inclusion in this metric one year ago, as they had too few IPv4 addresses connecting to Akamai at threshold speeds. Thus, although it is still very likely that there was strong growth in 10 Mbps adoption in these countries over the past year, the year-over-year percentage changes here are based on prior-year numbers calculated from data sets that were likely too small to be informative and could easily result in disproportionately large percentage changes. In total, 36 qualifying countries saw their adoption rates more than double compared with one year prior, while an additional 39 posted double-digit gains.

	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
–	Global	37%	5.4%	35%
1	South Korea	78%	-1.3%	16%
2	Japan	68%	4.9%	25%
3	Hong Kong	67%	2.5%	13%
4	Singapore	67%	-0.1%	32%
5	Iceland	65%	-1.4%	39%
6	Netherlands	65%	2.9%	8.7%
7	Switzerland	64%	-0.8%	6.2%
8	Belgium	64%	-0.3%	22%
9	Norway	64%	-1.1%	18%
10	Bulgaria	63%	-0.7%	26%

Figure 9: 10 Mbps Broadband Adoption (IPv4) by Country/Region

With just 0.4% of its IPv4 addresses connecting to Akamai at average speeds of 10 Mbps or more, Iran was the qualifying country with the lowest 10 Mbps broadband adoption rate in the third quarter, despite seeing a 58% quarterly increase. Iran did not qualify for inclusion in this metric in the second quarter. Tunisia held the second-to-last place globally with a 1.2% adoption rate, while Morocco, which held the bottom spot in the second quarter, came in third-to-last with a 3.5% adoption rate. Sixteen countries/regions in all had less than 1 in 10 IPv4 addresses connecting to Akamai at speeds of 10 Mbps or more in the third quarter, compared with 13 in the second.

2.5 Global 15 Mbps Broadband Adoption (IPv4) / As Figure 10 shows, 22% of unique IPv4 addresses globally connected to Akamai at average connection speeds of 15 Mbps or above in the third quarter of 2016, up 6.5% from the second quarter. In contrast to the second quarter, the top 10 countries/regions saw more quarter-over-quarter gains than declines in the third quarter, with seven countries posting adoption rate increases. Gains varied between Switzerland's modest 0.4% and the United States' solid 14%. Japan was the only other country/region in the top 10 to see a double-digit increase, as its adoption level rose 10% over the previous quarter. The declining countries — Latvia, South Korea, and Norway — saw

	Country/Region	% Above 15 Mbps	QoQ Change	YoY Change
–	Global	22%	6.5%	54%
1	South Korea	61%	-2.6%	36%
2	Hong Kong	49%	6.2%	38%
3	Norway	48%	-1.0%	29%
4	Singapore	46%	3.7%	74%
5	Japan	46%	10%	45%
6	Sweden	43%	5.3%	14%
7	Switzerland	42%	0.4%	18%
8	Netherlands	41%	6.6%	22%
9	Latvia	40%	-3.4%	27%
10	United States	39%	14%	62%

Figure 10: 15 Mbps Broadband Adoption (IPv4) by Country/Region

adoption levels fall 3.4%, 2.6%, and 1.0%, respectively. Despite its decrease, South Korea remained solidly in the lead worldwide with a 15 Mbps broadband adoption rate of 61%, 12 percentage points above second-place Hong Kong.

Seventy-two countries/regions qualified for inclusion in this metric in the third quarter, up from 69 in the second. Quarterly gains were seen in 43 qualifying countries/regions, compared with 33 in the prior quarter, though increases were smaller overall. Switzerland saw the smallest rate of growth at 0.4%, while Kenya — as the only country/region to see adoption levels more than double — enjoyed the biggest increase at 116% (to 24% adoption). Twenty-five countries/regions enjoyed double-digit growth in their 15 Mbps adoption rates compared with the second quarter. Slovenia saw its adoption level remain steady at 24%, while 28 countries posted quarterly declines, ranging from 0.9% in Hungary (to 27% adoption) to 43% in Egypt to (2.7% adoption). China again had the lowest 15 Mbps broadband adoption rate at 1.0%, despite a healthy 59% quarterly increase.

Year over year, the global 15 Mbps adoption rate grew 54%, with positive growth across the board among all qualifying countries. Among the top 10, Singapore had the largest yearly increase at 74%, while Sweden had the smallest at 14%. Looking across all of the qualifying countries, yearly increases in the third quarter ranged from 11% in Slovakia (to 18% adoption) to a massive 7,660% in Egypt (to 2.7% adoption) and 13,867% in Kenya (to 24% adoption). However, just as with the 10 Mbps metric, neither Egypt nor Kenya qualified for inclusion in the 15 Mbps metric a year ago, so their yearly percentage-change calculations may overstate the magnitude of their actual gains. In all, 31 countries/regions saw adoption levels more than double year over year in the third quarter.

2.6 Global 25 Mbps Broadband Adoption (IPv4) / Globally, 8.7% of unique IPv4 addresses connected to Akamai at average connection speeds of at least 25 Mbps — a 5.3% increase compared with the previous quarter, as shown in Figure 11. Seven of the top 10 countries/regions enjoyed quarterly gains in adoption rates, with Switzerland's 0.2% being the smallest and Singapore's 14% being the largest. Latvia, South Korea, and Norway — the same three countries to see 15 Mbps adoption levels fall in the third quarter — also saw 25 Mbps adoption levels fall, with drops of 7.9%, 5.8%, and 0.1%, respectively. Despite South Korea's quarterly decline, it retained its position well above the rest of the world with a 34% adoption rate, 9 percentage points above second-place Norway. In all, 12 countries/regions had 25 Mbps adoption rates of at least 15%, down from 13 in the previous quarter.

The number of countries/regions that qualified for inclusion in the 15 Mbps metric rose from 52 to 53 in the third quarter. Quarterly changes in adoption levels were mixed, with 25 countries/regions seeing gains and 28 seeing declines. Gains varied from a mere 0.2% in Switzerland to a robust 115% in Vietnam (to 0.4% adoption). Note that Vietnam had relatively few IP addresses (just over the minimum cutoff) connecting to Akamai at the threshold speed, so it is more susceptible to large percentage swings. Kenya also more than doubled its adoption levels, with a 101% increase to 7.2% adoption, while 13 countries/regions enjoyed double-digit quarterly gains. On the declining side, Norway had the smallest loss at 0.1%, while Egypt posted the largest at 51% (to 0.9% adoption). Egypt also had relatively few IP addresses connecting to Akamai at requisite speeds, so it is also subject to larger percentage swings.

Year over year, the global 25 Mbps broadband adoption rate increased by a robust 68%. Among the top 10, gains were strong, ranging from 24% in Sweden to 197% in Singapore. Yearly increases were robust across the remaining qualifying countries/regions as well, with only Turkey posting a yearly drop as its adoption rate declined 2.9% (to 0.9% adoption) compared with a year prior. Once again, outsized gains were posted by Kenya and Egypt (jumping 15,873% and 6,053% to adoption levels of 7.2% and 0.9% respectively), but, as noted previously, neither country qualified for inclusion one year ago. Clearly, both have seen tremendous growth in high-speed connections in the past year, but the year-over-year growth rates calculated for these two countries may not be fully representative. In all, 20 qualifying countries saw adoption rates more than double.

	Country/Region	% Above 25 Mbps	QoQ Change	YoY Change
–	Global	8.7%	5.3%	68%
1	South Korea	34%	-5.8%	46%
2	Norway	25%	-0.1%	51%
3	Hong Kong	24%	8.8%	78%
4	Sweden	23%	5.5%	24%
5	Singapore	20%	14%	197%
6	Japan	19%	12%	45%
7	Switzerland	18%	0.2%	41%
8	Finland	18%	0.8%	47%
9	Latvia	17%	-7.9%	28%
10	Denmark	17%	6.4%	66%

Figure 11: 25 Mbps Broadband Adoption (IPv4) by Country/Region

[SECTION]3 GEOGRAPHY *UNITED STATES*

The metrics presented here for the United States are based on a subset of data used for Section 2 and are subject to the same thresholds and filters discussed within that section. The subset used for this section includes connections identified as coming from the United States, based on classification by Akamai's EdgeScape™ geolocation tool. For the purposes of this section, the District of Columbia is treated as a state.

3.1 United States Average Connection Speeds (IPv4) / In the third quarter of 2016, average connection speeds showed quarterly increases among all of the top 10 states, in contrast to the second quarter, when 7 of the 10 showed declines. As seen in Figure 12, the District of Columbia held onto the top spot in the country, although it had the smallest quarterly gain among the top 10 with an increase of 1.8%. Rhode Island posted the next-smallest gain at 5.4%, while two states—Utah and Massachusetts—posted double-digit increases of 13% and 11% respectively. None of the top 10 had average connection speeds reaching the FCC's 25 Mbps broadband threshold, but the District of Columbia was just 0.2 Mbps shy.

	State	Q3 2016 Avg. Mbps	QoQ Change	YoY Change
1	District Of Columbia	24.8	1.8%	27%
2	Delaware	21.4	9.8%	16%
3	Utah	21.4	13%	32%
4	Massachusetts	21.1	11%	30%
5	Rhode Island	20.7	5.4%	32%
6	Maryland	19.7	5.9%	31%
7	New Jersey	19.4	5.5%	29%
8	New York	19.0	6.9%	28%
9	Virginia	19.0	5.5%	27%
10	Pennsylvania	17.8	8.3%	28%

Figure 12: Average Connection Speed (IPv4) by State

	State	Q3 2016 Peak Mbps	QoQ Change	YoY Change
1	Maryland	90.6	2.5%	24%
2	Massachusetts	89.2	4.3%	18%
3	District Of Columbia	88.5	-7.4%	10%
4	Virginia	88.1	2.9%	22%
5	Delaware	88.0	3.2%	1.7%
6	Rhode Island	87.7	3.9%	17%
7	New Jersey	87.6	1.8%	23%
8	New York	81.7	3.2%	19%
9	Washington	81.0	0.5%	17%
10	Utah	79.0	0.2%	4.3%

Figure 13: Average Peak Connection Speed (IPv4) by State

Across the country, all 51 states once again saw average connection speeds above the 10 Mbps threshold in the third quarter, with 30 states seeing speeds above the 15 Mbps threshold. Idaho and Mississippi had the slowest speeds in the nation, both connecting to Akamai at average speeds of 11.3 Mbps, up 11% and 4.8% respectively from the second quarter. Only one state saw a quarterly decline in speeds, as Nevada's average connection speed fell a slight 1.3% to 15.1 Mbps. Among the other 50 states, quarter-over-quarter increases ranged from 0.8% in Wyoming (to 13.9 Mbps) to 13% in Utah. Seven states in all posted double-digit gains.

On a year-over-year basis, all 51 states enjoyed gains, again led by Alaska with a 43% increase. Once again, Wisconsin and Nevada had the smallest yearly increases at 13% each (to 15.5 Mbps and 15.1 Mbps respectively), while 10 states saw gains of at least 30% compared with the preceding year.

3.2 United States Average Peak Connection Speeds (IPv4) / Quarterly changes in average peak connection speeds were positive across the top 10 states with the exception of the District of Columbia, which saw a 7.4% decline in the third quarter, dropping it out of the top spot in the country. As seen in Figure 13, the other nine states saw small gains, ranging from 0.2% in Utah to 4.3% in Massachusetts, and Maryland led the country as the only state with an average peak connection speed above 90 Mbps.

Across the nation, quarterly changes were mostly positive as well, with only five states seeing speeds drop in the third quarter. Declines ranged from 0.4% in West Virginia (to 53.8 Mbps) to 7.4% in the District of Columbia. The other 46 states posted modest gains, with Oklahoma's 5.3% increase (to 62.6 Mbps) being the largest. Utah and Nevada had the smallest increases at 0.2% (to 79.0 Mbps and 69.8 Mbps, respectively).

Like the second quarter, year-over-year changes were positive across all 51 states in the third quarter. At 1.7%, Delaware had the smallest yearly increase in the nation (and the top 10), while New Mexico and Alaska had the largest gains at 31% (to 57.3 Mbps and 59.8 Mbps respectively). Maryland again had the biggest increase among the top 10 at 24%. Forty-two states in all enjoyed double-digit growth in average peak speeds over the prior year, compared with 50 states in the second quarter.

In the third quarter, Maine held the spot for lowest average peak connection speed in the country at 47.4 Mbps, up 1.6% from the previous quarter. Arkansas, which held the bottom spot in the second quarter, just beat out Maine with a 47.6 Mbps average peak connection speed, up 2.9% quarter over quarter.

Continuing the trend of the past several quarters, u.s. telecommunications companies have remained active in deploying new gigabit services throughout the country. Announcements in the third quarter included the expansion of AT&T Gigapower service into several communities across northeastern Ohio[16] as well as AT&T Business Fiber service in 23 communities in Louisiana;[17] the launch of Cox Communications' G1GABLAST service in Wichita, KS;[18] WOW! Internet Cable & Phone's plans to offer gigabit service by year end in several towns across Alabama, Illinois, Tennessee, and Michigan;[19] and Ting's impending launch of gigabit service in Centennial, CO in 2017.[20] Comcast also began trials of its DOCSIS 3.1-based offering in Chicago — the third city to enjoy its gigabit offering — with Detroit and Miami to follow later in the year.[21] DOCSIS 3.1 works over Comcast's existing network and wiring, meaning the gigabit speeds can be made available to nearly every Comcast customer without laying new fiber.

Google Fiber went live in Salt Lake City, Utah[22] and Morrisville, North Carolina[23] in the third quarter and the company also announced a partnership with local real-estate management company Irvine Company to accelerate availability of their gigabit offerings in the town of Irvine, California by leveraging existing infrastructure in Irvine Co.'s buildings.[24] However, after spending millions of dollars laying fiber to connect a small number of cities, Google Fiber has reportedly suspended its buildouts in some cities and is also looking into wireless technologies as a faster and more economically feasible way to achieve its goals.[25] A recent FCC filing

indicates that Google is looking to test the viability of a wireless high-speed Internet service using newly available spectrum in up to 24 cities around the country.[26] As noted in the *Second Quarter, 2016 State of the Internet Report*, Google's acquisition of Webpass Inc. is likely part of this strategy as well.

Meanwhile, Kansas City, Kansas — the first city to get Google Fiber's gigabit-speed Internet service back in 2012 — announced in September that it would further leverage its ultra-high-speed capabilities by pioneering a smart city infrastructure called Digital Town Square. The initiative involves installing hardware that eliminates delays in the current town infrastructure, allowing for true gigabit-speed applications for things like smart city traffic lights. As one of 15 inaugural "Smart Gigabit Communities" supported by US Ignite, the National Science Foundation, and the White House Smart Cities Initiative, Kansas City has committed to developing and sharing at least two gigabit-powered services intended to address community problems.[27]

3.3 United States 4 Mbps Broadband Adoption (IPv4) / With a 3.2% quarterly increase to 98% adoption, Delaware regained the top spot in the country for 4 Mbps broadband adoption in the third quarter, edging out second-quarter leader Rhode Island. Unlike the second quarter, when 8 of the top 10 states saw modest declines, the third quarter brought modest gains across all of the top 10, as seen in Figure 14. Increases ranged from 0.4% in Rhode Island to 3.5% in Utah.

Quarterly changes were positive throughout the nation as well, with the exception of Nevada, which posted a negligible 0.1% decline (to 89% adoption). Increases in adoption levels were modest, varying between 0.1% in Vermont (to 79% adoption) and 4.5% in in West Virginia (to 72% adoption). Fourteen states nationwide had 4 Mbps adoption levels of 90% or more.

Yearly changes were positive across all 51 states in the third quarter, compared with 49 in the second quarter. Wisconsin posted the smallest gain at 0.3% (to 84% adoption), while Alaska posted the largest at 15% (to 83% adoption). Five states in all had yearly gains of more than 10%. Among the top 10, increases ranged from 0.9% in Rhode Island to 6.4% in the District of Columbia. Forty-seven states had 4 Mbps broadband adoption rates of at least 80%, up from 45 states in the second quarter.

	State	% Above 4 Mbps	QoQ Change	YoY Change
1	Delaware	98%	3.2%	2.0%
2	Rhode Island	97%	0.4%	0.9%
3	New Jersey	95%	0.9%	2.4%
4	Hawaii	93%	0.7%	2.5%
5	Massachusetts	93%	1.4%	3.1%
6	New York	92%	1.2%	3.9%
7	Utah	92%	3.5%	5.4%
8	Maryland	92%	0.7%	3.1%
9	Florida	92%	1.2%	4.7%
10	District Of Columbia	91%	1.7%	6.4%

Figure 14: 4 Mbps Broadband Adoption (IPv4) by State

Despite a 4.5% quarterly gain, West Virginia continued to lag the country in 4 Mbps broadband adoption with an adoption rate of 72%, five percentage points below the next-lowest state, Arkansas.

As has been noted in previous *State of the Internet* reports, federal, state, and local government-sponsored initiatives have continued to push for the expansion of broadband access in communities across the United States, with a particular focus on reaching underserved areas. At the national level, in September, the United States Federal Communications Commission (FCC) announced it would offer up to $1 billion in incentives for Alaskan telecommunications companies to expand broadband service (with minimum speeds of 10 Mbps down / 1 Mbps up) across the state over the next decade. Roughly half of all Alaskans have access to such service today, and the FCC hopes to raise that percentage to 90%.[28]

At the state level, the third quarter brought several announcements as well. In August, California approved a grant to bring fiber-to-the-home broadband access to the roughly 500 homes in the rural town of Occidental, CA.[29] Massachusetts announced it is paying Comcast $4 million (as part of a $50 million state program) to connect over 1,000 new customers to its Xfinity high-speed Internet in nine rural Western Massachusetts towns — a buildout that would not have been economically viable without the state subsidy.[30] Finally, West Virginia, a state that currently has one of the lowest average connection speeds in the nation — as well as the lowest 4 Mbps adoption rate in the nation — may adopt the ambitious goal of making gigabit Internet available statewide. The goal is being proposed by Rob Hinton, chairman of the governor-appointed West Virginia Broadband Enhancement Council, although other council members have suggested that it may not make financial sense for providers to do the work needed to install the required high-speed fiber connections.[31]

At the municipal level, the city of Madison, Wisconsin is considering a $200 million plan to make broadband Internet service available to every business and residence in the city. The plan includes $150 million in costs to build a city-owned fiber network, plus an additional $50 to $60 million to connect the network to homes and businesses.[32]

3.4 United States 10 Mbps Broadband Adoption (IPv4) / Rhode Island and Delaware led the nation for 10 Mbps broadband adoption in the third quarter with adoption levels of 80%, as seen in Figure 15. All of the top 10 states enjoyed quarter-over-quarter growth, ranging from 4.2% in New Jersey to 8.6% in Delaware. Eight of the top 10 had at least 70% of their unique IPv4 addresses connecting to Akamai at average speeds above 10 Mbps, up from five in the previous quarter.

	State	% Above 10 Mbps	QoQ Change	YoY Change
1	Rhode Island	80%	4.7%	18%
2	Delaware	80%	8.6%	12%
3	New Jersey	77%	4.2%	17%
4	Massachusetts	75%	6.9%	18%
5	Maryland	74%	5.1%	21%
6	New York	72%	7.2%	25%
7	District Of Columbia	72%	7.9%	18%
8	Virginia	70%	5.1%	20%
9	Connecticut	66%	6.4%	17%
10	Florida	65%	5.5%	24%

Figure 15: 10 Mbps Broadband Adoption (IPv4) by State

	State	% Above 15 Mbps	QoQ Change	YoY Change
1	Delaware	58%	16%	32%
2	Rhode Island	58%	10%	62%
3	New Jersey	55%	9.4%	53%
4	District Of Columbia	55%	10%	30%
5	Massachusetts	54%	15%	49%
6	Maryland	53%	10%	53%
7	Virginia	50%	10%	51%
8	New York	49%	15%	59%
9	Pennsylvania	45%	14%	51%
10	Connecticut	44%	14%	50%

Figure 16: 15 Mbps Broadband Adoption (IPv4) by State

Quarterly changes were positive across the country in the third quarter, unlike the second, when 43 states saw adoption rates drop. Nevada posted the smallest gain at 1.4% (to 58% adoption), while Idaho posted the largest at 20% (to 41% adoption), and 15 states in all had double-digit gains. Forty-three states had at least half of their unique IPv4 addresses connecting to Akamai at average speeds of 10 Mbps or more, up from 37 states in the second quarter.

Year-over-year changes in 10 Mbps broadband adoption were positive across all 51 states, just as in the second quarter, and Alaska led the nation with a 63% gain (to 48% adoption), followed by Hawaii with a 60% improvement (to 63% adoption). At the other end of the spectrum, Nevada saw the smallest increase, with a 10% gain (to 58% adoption). Among the top 10 states, gains in 10 Mbps adoption levels ranged from 12% in Delaware to 25% in New York.

Despite strong quarterly increases of 11% and 20% respectively, Idaho and Arkansas both posted 41% adoption rates for 10 Mbps broadband in the third quarter — the lowest levels of adoption in the country.

3.5 United States 15 Mbps Broadband Adoption (IPv4) / With adoption levels of 58%, Delaware and Rhode Island led the country for 15 Mbps broadband adoption in the third quarter, as seen in Figure 16. All of the top 10 states enjoyed robust growth in adoption levels, as increases ranged from 9.4% in New Jersey to 16% in Delaware. Seven states maintained a 15 Mbps adoption level of at least 50%, compared with four states in the preceding quarter.

Across the country, third-quarter growth in 15 Mbps adoption rates reversed the mostly-negative changes seen during the second quarter. Nevada saw the only quarterly decline, as its adoption level fell a mere 0.5% (to 37% adoption). Among the remaining states, gains ranged from 3.4% in Oregon (to 39% adoption) to 31% in Hawaii (to 32% adoption), with 43 states seeing gains of at least 10%. In all, 48 states had at least one-quarter of their unique IPv4 addresses connecting to Akamai at average speeds of 15 Mbps or faster, up from 40 in the second quarter.

Like the second quarter, year-over-year changes in 15 Mbps access were positive throughout the country in the third quarter. Nevada posted the smallest gain in the country at 23%, while Kentucky led the nation with a 139% jump (to 25% adoption). Alaska and Hawaii also saw adoption rates grow by at least 100% (to adoption levels of 28% and 32% respectively), and 35 additional states saw adoption increase by at least 50% compared with a year prior. Among the top 10, Rhode Island led in yearly increases with a 62% increase, while the District of Columbia saw the smallest year-over-year gain at 30%.

Despite seeing adoption levels grow 27% during the third quarter, Idaho was once again the state with the lowest 15 Mbps adoption rate at 20%. Mississippi was in second-to-last place with a 22% adoption rate, up 11% quarter over quarter, followed by Arkansas with a 23% adoption rate, up 19% quarter over quarter.

3.6 United States 25 Mbps Broadband Adoption (IPv4) / In the third quarter, the District of Columbia held on to the top spot in the nation in 25 Mbps broadband adoption with an adoption rate of 30%, as seen in Figure 17. However, with a robust 27% quarterly increase in adoption, second-place Delaware managed to close the gap with the District of Columbia from seven percentage points to four. All of the top 10 states enjoyed quarter-over-quarter gains in adoption during the third quarter, with the District of Columbia's being the smallest at 8.3% and Utah's being the largest at 32%. Delaware joined the District of Columbia as the only states in the nation to have at least one in four unique IPv4 addresses connecting to Akamai at average speeds of at least 25 Mbps.

Across the nation, quarterly changes in adoption were positive with the exception of Nevada, which saw adoption rates drop 9.6% (to 12% adoption). Gains among the 50 states ranged from 0.5% in Oregon (to 15% adoption) to 32% in Utah, and 44 states in all posted double-digit gains in the third quarter, as compared with only 6 states in the second.

	State	% Above 25 Mbps	QoQ Change	YoY Change
1	District Of Columbia	30%	8.3%	40%
2	Delaware	26%	27%	52%
3	Rhode Island	24%	16%	137%
4	Massachusetts	24%	23%	88%
5	Maryland	22%	13%	101%
6	Utah	22%	32%	60%
7	New Jersey	22%	15%	117%
8	Virginia	22%	16%	96%
9	New York	19%	19%	88%
10	Pennsylvania	19%	19%	87%

Figure 17: 25 Mbps Broadband Adoption (IPv4) by State

Year-over-year changes were positive across all 51 states, continuing the trend. Among the top 10, gains were again robust, ranging from the District of Columbia's 40% to Rhode Island's 137%, with 3 of the top 10 seeing adoption rates more than double compared with the third quarter of 2015. Gains across the rest of the nation were strong as well, ranging from 25% in Idaho (to 5.9% adoption) to 214% in Alaska (to 7.4% adoption). Ten states in all saw adoption rates more than double year over year in the third quarter, down from fourteen in the preceding quarter.

Nationwide, 25 Mbps broadband adoption rates remained fairly low nationwide but continued to improve. In all, 15 states saw adoption levels below 10%, down from 17 in the second quarter. Idaho and Kentucky again had the lowest adoption rates in the country at 5.9% and 6.1%, despite robust quarterly growth of 19% and 31% respectively.

[SECTION]4
GEOGRAPHY
AMERICAS

The metrics presented here for the Americas region (North and South America) are based on a subset of data used for Section 2 and are subject to the same thresholds and filters discussed within that section. The subset used for this section includes connections identified as coming from networks within North and South America, based on classification by Akamai's EdgeScape geolocation tool.

4.1 Americas Average Connection Speeds (IPv4) / In the third quarter of 2016, the United States again had the fastest average connection speed among surveyed Americas countries at 16.3 Mbps, with Canada just 2.5 Mbps behind, as shown in Figure 18. As the only two countries in the region with average connection speeds above the 10 Mbps broadband threshold, the United States and Canada remained well ahead of the other countries in the region, with Canada having an average connection speed more than 6 Mbps faster than third-place Mexico. The gap in average connection speeds between the fastest and slowest countries in the

Global Rank	Country/Region	Q3 2016 Avg. Mbps	QoQ Change	YoY Change
12	United States	16.3	6.8%	30%
25	Canada	13.8	0.7%	16%
64	Chile	7.3	4.8%	29%
65	Mexico	7.2	-1.9%	30%
67	Uruguay	7.0	7.2%	19%
87	Brazil	5.5	15%	51%
89	Peru	5.3	-4.0%	20%
90	Ecuador	5.2	2.0%	26%
91	Panama	5.2	14%	48%
92	Argentina	5.0	-3.2%	20%
96	Colombia	4.8	4.3%	12%
109	Costa Rica	3.9	12%	23%
130	Bolivia	2.4	1.9%	35%
139	Venezuela	1.8	2.7%	25%
144	Paraguay	1.7	-16%	12%

Figure 18: Average Connection Speed (IPv4) by Americas Country

Global Rank	Country/Region	Q3 2016 Peak Mbps	QoQ Change	YoY Change
20	United States	70.8	1.6%	23%
30	Canada	62.0	2.4%	18%
33	Uruguay	61.1	-4.3%	1.4%
54	Chile	51.2	1.5%	22%
82	Peru	35.9	6.6%	18%
86	Mexico	35.6	0.9%	30%
87	Brazil	34.4	2.1%	19%
93	Ecuador	32.8	1.9%	29%
97	Argentina	31.3	-1.8%	16%
112	Colombia	23.9	1.7%	-15%
114	Panama	22.8	8.9%	35%
120	Costa Rica	19.5	2.9%	19%
132	Bolivia	13.8	-0.7%	-0.7%
136	Venezuela	11.1	-7.6%	-6.2%
143	Paraguay	8.5	-32%	-36%

Figure 19: Average Peak Connection Speed (IPv4) by Americas Country

region also widened ever so slightly in the third quarter, from 13.5 Mbps to 14.6 Mbps. Eleven surveyed Americas countries saw quarterly increases in connection speeds and four saw declines. Brazil had the biggest gain at 15%, while Canada posted the smallest at 0.7%. Among the Americas countries that saw declines, average connection speeds fell anywhere from 1.9% in Mexico to 16% in Paraguay.

All of the surveyed countries saw positive growth on a yearly basis, ranging from 12% in Colombia to 51% in Brazil. Eleven of the surveyed Americas countries had an average connection speed at or above the 4 Mbps threshold — the same as in the second quarter — with Costa Rica not far behind, with a 3.9 Mbps average connection speed.

4.2 Americas Average Peak Connection Speeds (IPv4) / In the third quarter of 2016, the United States again held the top spot among the surveyed Americas countries for average peak connection speeds, as it posted a 1.6% quarterly gain to 70.8 Mbps. As shown in Figure 19, 10 of the 15 surveyed countries saw gains in the third quarter. Increases were modest, ranging from Mexico's 0.9% to Panama's 8.9%. Among countries seeing declines, Paraguay was the only one with a double-digit drop, as its average peak speed declined 32%. The remaining drops were modest, varying between 0.7% in Bolivia and 7.6% in Venezuela. The difference between the average peak connection speeds of the fastest and slowest Americas countries increased somewhat, from 57.7 Mbps in the second quarter to 62.2 Mbps in the third quarter.

Year-over-year changes were mixed as well, with four countries seeing declines. The smallest drop was in Bolivia at 0.7%, while the largest was in Paraguay at 36%. On the gaining side, Uruguay had the smallest yearly increase at 1.4%, while the remaining countries enjoyed double-digit growth, led by Panama with a 35% yearly gain.

4.3 Americas 4 Mbps Broadband Adoption (IPv4) / With 88% adoption rates, the United States and Canada led the Americas region for 4 Mbps broadband adoption in the third quarter of 2016, as seen in Figure 20. The difference in adoption rates between the top and bottom qualifying Americas countries was a sizeable 85 percentage

Global Rank	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
34	United States	88%	1.8%	9.3%
37	Canada	88%	-2.2%	0.4%
59	Mexico	77%	-3.6%	20%
62	Chile	77%	-5.5%	23%
66	Uruguay	74%	0.5%	9.1%
80	Peru	59%	-8.4%	28%
83	Ecuador	54%	-0.4%	48%
84	Panama	53%	12%	63%
85	Brazil	52%	8.4%	61%
88	Colombia	51%	4.8%	7.7%
92	Argentina	50%	-2.8%	29%
100	Costa Rica	34%	27%	73%
116	Venezuela	3.4%	0.2%	60%
–	Bolivia	7.1%	2.8%	158%
—	Paraguay	4.3%	-34%	103%

Figure 20: 4 Mbps Broadband Adoption (IPv4) by Americas Country

points, down slightly from 86 points in the second quarter. As noted previously, this gap is likely to remain large for the foreseeable future. Changes in adoption rates were again mixed in the third quarter, with 7 of the 15 surveyed countries seeing increases. Costa Rica enjoyed the largest gain among the qualifying surveyed countries at 27%, while Venezuela saw the smallest at 0.2%.

Looking at year-over-year changes, all 13 of the qualifying Americas countries saw gains, though widely varying in magnitude. Canada again saw the smallest gain at 0.4%, followed by Colombia with a 7.7% increase over the third quarter of 2015. Costa Rica posted the largest yearly gain among the qualifying countries with a 73% jump. Three other qualifying Americas countries saw 4 Mbps broadband adoption levels grow by more than 50%, and five more posted double-digit increases compared with one year prior.

4.4 Americas 10 Mbps Broadband Adoption (IPv4) / As shown in Figure 21, the United States and Canada once again remained the clear leaders in 10 Mbps broadband adoption among the qualifying surveyed Americas countries. The United States led with a 61% adoption rate, followed by Canada with 52% adoption. The gap between Canada and the next-highest country narrowed slightly from 35 percentage points to 34 in the third quarter, while the gap between the top and bottom qualifying countries widened from 53 points to 56. Third-quarter changes in adoption rates were mostly positive across the Americas, with only two countries, Argentina and Peru, showing declines, of 12% and 0.7%, respectively. Among the remaining countries, Canada had the smallest quarterly increase in adoption at 0.6%, while Panama had the largest at 115%. Five countries posted double-digit gains.

From a yearly perspective, all of the qualifying surveyed countries saw 10 Mbps broadband adoption rise, led by Panama with a 390% jump. Nine of the eleven saw adoption rates more than double, while Canada and the United States — the region's leaders in 10 Mbps adoption — saw the smallest yearly gains at 20% and 31% respectively.

4.5 Americas 15 Mbps Broadband Adoption (IPv4) / As Figure 22 shows, only 8 of the 15 surveyed countries in the Americas region qualified for inclusion in the 15 Mbps broadband adoption metric in the third quarter — the same as in the second. Just as with the other broadband adoption metrics we have examined thus far, the United States and Canada continued to have adoption levels well above those seen in the remaining Americas countries, although the gap between the United States and Canada widened from 5 percentage points in the second quarter to 8 in the third while the gap between Canada and the next-highest country stayed the same at 24 points. The gap between the top- and bottom-ranking countries also widened in the third quarter, from 34 to 38 points. All of the qualifying surveyed countries posted quarterly gains in adoption with the exception of Argentina, which saw a 15% decline. Increases among the other seven countries ranged from Mexico's 2.2% to Brazil's 82%, with five countries seeing strong double-digit gains.

Year-over-year numbers were robustly positive across the qualifying surveyed Americas countries in the third quarter, just as they were in the second. Brazil posted the largest yearly increase in 15 Mbps adoption rates at 353%, and five other countries saw adoption levels more than double compared with one year prior. Canada and the United States had the smallest yearly increases — but both were still robust, at 48% and 62% respectively.

Global Rank	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
12	United States	61%	8.1%	31%
19	Canada	52%	0.6%	20%
57	Chile	18%	30%	160%
59	Uruguay	17%	52%	122%
60	Mexico	17%	1.0%	161%
67	Brazil	10%	99%	361%
70	Peru	7.3%	-0.7%	153%
71	Panama	7.2%	115%	390%
73	Argentina	6.7%	-12%	112%
75	Ecuador	6.2%	11%	145%
80	Colombia	4.2%	33%	148%
–	Costa Rica	2.3%	76%	110%
–	Bolivia	0.5%	2.8%	143%
–	Venezuela	0.2%	1.1%	-18%
–	Paraguay	0.2%	-57%	14%

Figure 21: 10 Mbps Broadband Adoption (IPv4) by Americas Country

Global Rank	Country/Region	% Above 15 Mbps	QoQ Change	YoY Change
10	United States	39%	14%	62%
21	Canada	31%	2.7%	48%
54	Chile	6.3%	54%	301%
59	Uruguay	5.4%	78%	227%
60	Mexico	4.6%	2.2%	166%
64	Brazil	2.9%	82%	353%
69	Argentina	1.5%	-15%	199%
71	Colombia	1.2%	38%	218%
–	Panama	2.1%	126%	473%
–	Peru	1.9%	-14%	195%
–	Ecuador	1.7%	26%	197%
–	Costa Rica	0.6%	50%	35%
–	Bolivia	0.2%	-1.1%	91%
–	Venezuela	0.1%	5.6%	-33%
–	Paraguay	0.1%	-47%	-9.2%

Figure 22: 15 Mbps Broadband Adoption (IPv4) by Americas Country

[SECTION]5 GEOGRAPHY *ASIA PACIFIC (APAC)*

The metrics presented here for the Asia Pacific region are based on a subset of data used for Section 2 and are subject to the same thresholds and filters discussed within that section. The subset used for this section includes connections identified as coming from networks in the Asia Pacific region, based on classification by Akamai's EdgeScape geolocation tool.

5.1 Asia Pacific Average Connection Speeds (IPv4) / As shown in Figure 23, in the third quarter of 2016, South Korea was again the top country/region in the world for the average connection speed metric, despite a 2.5% quarter-over-quarter drop in average connection speeds that narrowed the gap between it and lowest-ranked India from 23 Mbps to 22 Mbps. Like the second quarter, the third quarter saw quarterly gains across 11 of the 15 surveyed Asia Pacific countries/regions, ranging from 3.4% in Hong Kong to 22% in Vietnam. Three countries enjoyed double-digit quarterly gains, compared with four in

Global Rank	Country/Region	Q3 2016 Avg. Mbps	QoQ Change	YoY Change
1	South Korea	26.3	-2.5%	28%
2	Hong Kong	20.1	3.4%	27%
6	Singapore	18.2	5.3%	45%
7	Japan	18.0	5.1%	20%
18	Taiwan	14.9	-4.3%	48%
36	Thailand	11.7	-15%	42%
40	New Zealand	11.3	6.6%	30%
50	Australia	9.6	13%	23%
63	Malaysia	7.5	9.3%	53%
76	Indonesia	6.4	9.1%	115%
77	Vietnam	6.3	22%	85%
79	Sri Lanka	6.0	5.9%	18%
85	China	5.7	9.5%	55%
103	Philippines	4.2	-2.8%	49%
105	India	4.1	14%	62%

Figure 23: Average Connection Speed (IPv4) by APAC Country/Region

the second quarter. Among the countries/regions seeing declines, Thailand had the largest drop at 15%, while the remaining three countries/regions had modest declines of less than 5%.

In the third quarter, for the first time, all 15 of the surveyed Asia Pacific countries/regions had average connection speeds above the 4 Mbps broadband threshold. Seven of these exceeded the 10 Mbps threshold — the same as in the second quarter. India and the Philippines once again had the lowest average connection speeds among surveyed countries/regions in Asia Pacific, at 4.1 Mbps and 4.2 Mbps respectively.

All of the surveyed countries/regions in the Asia Pacific region showed year-over-year growth in observed average connection speeds in the third quarter, up from 11 in the second quarter. Indonesia, with a 115% gain, was again the only country to see its average connection speed more than double compared with the year prior. Increases in the remaining countries/regions ranged from 18% in Sri Lanka to 85% in Vietnam.

According to telecommunications research firm Point Topic, the number of broadband subscribers worldwide will grow to exceed 1 billion by 2020, with the bulk of the growth coming from South and East Asia, in areas where broadband access currently lags the rest of the more developed world.[33] The third quarter saw some announcements supporting this trend. The China Academy of Telecommunications Research reported that fiber-to-the-home (FTTH) rollouts by the country's three biggest telecommunications providers — China Telecom, China Unicom, and China Mobile — had reached over 700 million households nationwide, providing 90% coverage in most cities and 80% coverage of administrative villages. It expects China will gain 100 million new FTTH subscriptions in 2016.[34] Also, the new administration of the Philippines — a nation with one of the lowest broadband speeds and adoption rates in the region — looks to be prioritizing faster connectivity throughout the country, including the announcement of a new Department of Information and Communication Technology responsible for planning the deployment of fiber and wireless technologies nationwide.[35]

Google is also making infrastructure investments in the region. On June 30, FASTER — a 60 Tbps submarine cable linking Japan and the United States deployed by Google in partnership with five major Asian telecommunications companies — went live.[36] On September 6, Google announced that an extension of the cable linking Japan and Taiwan was ready for service. The cable is expected to boost speeds for Google services throughout Asia.[37] In addition, Google Station announced that, in partnership with RailTel and Indian Railways, it has brought public Wi-Fi to more than 50 train stations across India, with more than 3.5 million users accessing it each month. Google Station intends to expand, partnering with organizations — including large venues, mobile providers, and network operators — to deliver public Wi-Fi in communities across the globe.[38]

5.2 Asia Pacific Average Peak Connection Speeds (IPv4) / As seen in Figure 24, the Asia Pacific region continued to lead the world in average peak connection speeds in the third quarter, with the top four global leaders all found in the region. Singapore, Hong Kong, and South Korea all had average peak connection speeds above 100 Mbps again, with Indonesia close behind at 99.3 Mbps. In all, 9 of the surveyed countries/regions saw average peak speeds above 50 Mbps, down from 10 in the second quarter. Quarterly changes were mixed and modest in the third quarter, with nine countries seeing speeds increase and six seeing them decrease. Gains ranged between 1.3% in Malaysia and 8.1% in Indonesia, while declines varied from 0.1% in the Philippines to 8.2% in Australia.

Global Rank	Country/Region	Q3 2016 Peak Mbps	QoQ Change	YoY Change
1	Singapore	162.0	3.0%	20%
2	Hong Kong	116.2	1.6%	15%
3	South Korea	114.2	3.7%	32%
4	Indonesia	99.3	8.1%	220%
8	Taiwan	88.2	-0.7%	13%
9	Japan	88.1	3.3%	12%
15	Thailand	75.3	-2.9%	29%
41	New Zealand	55.9	3.8%	33%
52	Malaysia	51.7	1.3%	35%
57	Australia	46.9	-8.2%	12%
63	Sri Lanka	42.2	-3.8%	26%
77	Vietnam	39.2	5.8%	54%
88	China	34.4	-2.8%	49%
92	Philippines	32.8	-0.1%	30%
107	India	27.0	3.2%	45%

Figure 24: Average Peak Connection Speed (IPv4) by APAC Country/Region

The gap between average peak connection speeds in the top- and bottom-ranked countries/regions in the region continued to widen, increasing from 131 Mbps in the second quarter to 135 Mbps in the third.

As in the previous quarter, year-over-year changes were consistently positive throughout the Asia Pacific region in the third quarter. Australia and Japan had the smallest gains at 12% each, while Indonesia again had by far the largest at 220%. The country with the next-highest increase was Vietnam, where average peak speeds rose 54% compared with the previous year.

5.3 Asia Pacific 4 Mbps Broadband Adoption (IPv4) / In the third quarter, South Korea once again led the Asia Pacific region in 4 Mbps broadband adoption, with 97% of its IPv4 addresses connecting to Akamai at average connection speeds above this threshold, as shown in Figure 25. Quarterly changes were again mixed, with six countries seeing gains in adoption, eight countries seeing declines, and one country — Japan — remaining unchanged. Vietnam and India enjoyed the strongest growth in the region, as adoption levels rose 23% and 19% respectively, while the remaining gaining countries posted single-digit increases ranging from 3.0% in Australia to 5.4% in China. On the declining side, the Philippines had the largest quarterly decline at 13%, while the remaining decreases were all below 3%.

Six of the surveyed Asia Pacific countries/regions enjoyed 4 Mbps broadband adoption rates of 90% or higher — down from seven in the second quarter — and the difference in adoption levels between the top- and bottom-ranked countries/regions in Asia Pacific continued to narrow, dropping from 72 to 68 percentage points in the third quarter.

Looking at year-over-year changes, all 15 surveyed countries/regions saw improvements in the third quarter, although growth rates varied from a mere 0.4% in Hong Kong to a robust 298% in Indonesia. Eight of the countries/regions saw modest, single-digit increases, while five countries more than doubled their adoption rates compared with one year prior.

5.4 Asia Pacific 10 Mbps Broadband Adoption (IPv4) / The leading four countries/regions in the world for 10 Mbps broadband adoption were all found in the Asia Pacific region in the third quarter, with South Korea holding on to the top spot in both the region and the world, despite a 1.3% quarterly decline in adoption levels. As seen in Figure 26, South Korea had 78% of its IPv4 addresses connecting to Akamai at average connection speeds above the 10 Mbps threshold — 10 percentage points above second-place Japan. The gap between South Korea and the qualifying Asia Pacific country/region with the lowest adoption levels continued to narrow from 82 percentage points in the first quarter to 75 in the second and 73 in the third.

Ten of the fourteen qualifying countries/regions saw quarterly rises in adoption rates in the third quarter, with Vietnam having the biggest gain at 71%. Seven countries/regions saw double-digit increases, while Hong Kong posted the smallest gain in Asia Pacific at 2.5%. Among countries/regions with declining adoption rates, Thailand had the largest decrease at 22%, while the others posted more modest declines, ranging from 0.1% in Singapore to 5.5% in Taiwan.

Year-over-year changes in 10 Mbps adoption were positive across the board, consistent with the previous quarter. Seven qualifying Asia Pacific countries/regions saw double-digit increases in adoption rates, and five saw triple-digit jumps, while Indonesia

Global Rank	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
3	South Korea	97%	-0.1%	1.1%
6	Thailand	95%	-1.0%	2.6%
17	Hong Kong	93%	-0.9%	0.4%
19	Singapore	93%	-0.2%	6.9%
21	Taiwan	92%	-1.5%	3.8%
22	Japan	92%	0%	1.9%
33	New Zealand	89%	-1.4%	1.5%
47	Sri Lanka	81%	-2.5%	6.8%
58	Australia	77%	3.0%	7.7%
70	Vietnam	70%	23%	126%
71	Indonesia	69%	5.2%	298%
74	Malaysia	68%	3.5%	32%
76	China	67%	5.4%	102%
103	India	30%	19%	116%
105	Philippines	29%	-13%	187%

Figure 25: 4 Mbps Broadband Adoption (IPv4) by APAC Country/Region

Global Rank	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
1	South Korea	78%	-1.3%	16%
2	Japan	68%	4.9%	25%
3	Hong Kong	67%	2.5%	13%
4	Singapore	67%	-0.1%	32%
17	Taiwan	55%	-5.5%	90%
29	Thailand	46%	-22%	150%
40	New Zealand	37%	11%	69%
47	Australia	28%	30%	57%
53	Malaysia	22%	37%	444%
65	Indonesia	12%	44%	1140%
66	Vietnam	11%	71%	1623%
72	China	7.1%	64%	350%
74	India	6.6%	23%	189%
77	Philippines	5.4%	9.1%	517%
–	Sri Lanka	9.4%	52%	332%

Figure 26: 10 Mbps Broadband Adoption (IPv4) by APAC Country/Region

and Vietnam posted astounding gains of 1,140% and 1,623% respectively. Hong Kong had the smallest yearly gain in the region at 13%.

5.5 Asia Pacific 15 Mbps Broadband Adoption (IPv4) / As seen in Figure 27, South Korea continued to lead the region (and the world) in the 15 Mbps broadband adoption metric, with 61% of its IPv4 addresses connecting to Akamai at average connection speeds above 15 Mbps, down 2.6% from the second quarter. The spread between it and China, the Asia Pacific country/region with the lowest adoption rate, narrowed from 62 percentage points in the second quarter to 60 in the third, as China's adoption level rose to 1% — a 59% increase over the second quarter.

In the third quarter, 11 of the 14 qualifying surveyed Asia Pacific countries/regions posted increases in 15 Mbps adoption, ranging from 3.7% in Singapore to 94% in Vietnam. Nine countries/regions saw double-digit quarterly gains. On the declining side, Thailand saw the largest drop in adoption rates with a 35% decline, while Taiwan and South Korea posted more modest drops of 8.9% and 2.6% respectively.

Yearly growth in the Asia-Pacific region was robust and positive across the board in the third quarter, just as it was in the second quarter. South Korea posted the smallest increase in 15 Mbps adoption at 36%, and 9 of the 14 qualifying surveyed countries/regions more than doubled their adoption levels compared with the preceding year. Vietnam once again saw the biggest yearly growth, with adoption levels rising an impressive 1,685% compared with one year prior.

The third quarter saw significant progress for ultra-fast Internet in New Zealand. Chorus, Enable, Northpower Fibre, and Ultrafast Fibre — the four wholesale telecommunications providers working as part of the public-private partnership to build the New Zealand government-owned Ultra-Fast Broadband (UFB) network — all announced that gigabit FTTH services would be available throughout the UFB network starting October 1.[39] Once completed in 2022, the UFB is expected to service 80% of New Zealand's population, while the already complete Rural Broadband Initiative delivers speeds of 50 Mbps to the remainder of the population. Shortly following this announcement, local ISP Bigpipe declared that all of its customers who were then on the fastest plan of 200 Mbps would receive free upgrades to gigabit speeds.[40]

In neighboring Australia, the National Broadband Network (NBN) announced it was on track to roll out universal broadband access at minimum speeds of 25 Mbps, with 40% of the country having gigabit-speed access by 2020.[41] The state-run NBN is a wholesale network that provides access to retail ISPs. It faced protests in the third quarter for its high fees, which include both a per-user access fee and a usage-based fee — the latter being priced at roughly $12 ($15.75 AUD) per Mbps. Local telecommunications executives have warned that the high fees would cause customers to avoid high-speed Internet plans and could also make the retail ISP business economically unviable.[42]

Global Rank	Country/Region	% Above 15 Mbps	QoQ Change	YoY Change
1	South Korea	61%	-2.6%	36%
2	Hong Kong	49%	6.2%	38%
4	Singapore	46%	3.7%	74%
5	Japan	46%	10%	45%
20	Taiwan	31%	-8.9%	139%
38	Thailand	20%	-35%	241%
40	New Zealand	19%	14%	126%
46	Australia	14%	48%	92%
53	Malaysia	7.5%	49%	711%
62	Indonesia	3.1%	48%	778%
66	India	2.6%	30%	215%
67	Vietnam	2.6%	94%	1685%
68	Philippines	2.4%	11%	645%
72	China	1.0%	59%	231%
–	Sri Lanka	2.5%	56%	299%

Figure 27: 15 Mbps Broadband Adoption (IPv4) by APAC Country/Region

[SECTION]6 GEOGRAPHY *EUROPE*

Beginning with the *First Quarter, 2016 State of the Internet Report*, broadband metrics are presented separately for the European region and the Middle East/Africa region (previously presented together as the EMEA region), with expanded coverage to include more countries in both regions. The metrics presented here for the European region are based on a subset of data used for Section 2 and are subject to the same thresholds and filters discussed within that section. The subset used for this section includes connections identified as coming from networks in the European region, based on classification by Akamai's EdgeScape geolocation tool.

6.1 European Average Connection Speeds (IPv4) / Despite a slight 0.2% quarter-over-quarter decrease in average connection speeds to 20.0 Mbps, Norway retained the top spot among the surveyed European countries in the third quarter of 2016. As seen in Figure 28, the difference in average connection speeds between Norway and Cyprus, the slowest country in the region, was 13 Mbps in the third quarter — the same as in the second. Also, like the second quarter, 26 of the 31 surveyed countries had average connection speeds at or above the 10 Mbps threshold in the third quarter. Quarter-over-quarter changes in average speeds were mixed but modest, with 17 countries seeing declines, 13 seeing gains, and one country — Finland — remaining unchanged. Increases ranged from 0.2% in Cyprus to 4.6% in Sweden and declines ranged from 0.2% in Norway to 8.0% in Greece.

Year-over-year changes in average connection speeds were positive for all of the surveyed European countries during the third quarter, with Slovakia posting the smallest yearly increase at 8.0% and Slovenia posting the largest at 45%. Twenty-eight surveyed countries in all enjoyed double-digit gains, with six seeing average connection speeds rise at least 25% compared with one year prior.

Global Rank	Country/Region	Q3 2016 Avg. Mbps	QoQ Change	YoY Change
3	Norway	20.0	-0.2%	22%
4	Sweden	19.7	4.6%	13%
5	Switzerland	18.4	0.5%	14%
8	Finland	17.6	0%	19%
9	Netherlands	17.3	2.1%	11%
10	Latvia	16.9	-3.5%	16%
11	Denmark	16.6	1.6%	19%
15	Czech Republic	15.9	-3.7%	9.5%
16	Belgium	15.5	2.2%	21%
17	Bulgaria	15.5	0.6%	28%
19	Romania	14.9	-6.0%	14%
20	United Kingdom	14.9	-0.9%	15%
21	Spain	14.5	2.5%	40%
22	Lithuania	14.3	-2.9%	17%
23	Slovenia	14.1	-3.4%	45%
24	Ireland	14.0	0.7%	13%
26	Germany	13.7	-2.5%	19%
27	Hungary	13.2	-0.9%	24%
29	Austria	12.7	-0.3%	12%
30	Portugal	12.6	-2.0%	20%
33	Malta	12.1	-5.3%	25%
34	Slovakia	12.1	-1.9%	8.0%
37	Poland	11.7	-4.6%	10%
38	Russia	11.6	-6.0%	13%
41	Estonia	11.2	-3.3%	20%
46	Luxembourg	10.5	4.0%	15%
49	France	9.7	1.5%	19%
54	Italy	8.2	0.4%	26%
58	Croatia	7.8	1.6%	41%
69	Greece	6.9	-8.0%	9.7%
71	Cyprus	6.7	0.2%	21%

Figure 28: Average Connection Speed (IPv4) by European Country

Global Rank	Country/Region	Q3 2016 Peak Mbps	QoQ Change	YoY Change
10	Romania	85.0	1.0%	17%
12	Latvia	79.2	1.9%	23%
14	Sweden	79.0	1.1%	15%
16	Switzerland	75.2	-1.3%	20%
17	Spain	72.0	1.9%	35%
18	Netherlands	71.3	-1.6%	12%
19	Belgium	70.9	-0.3%	19%
24	Luxembourg	66.0	12%	33%
25	Norway	65.4	-5.2%	17%
26	Hungary	65.3	0.4%	21%
27	Russia	64.2	-0.3%	11%
28	United Kingdom	62.9	1.3%	16%
29	Czech Republic	62.3	-1.8%	22%
31	Ireland	62.0	4.2%	19%
36	Bulgaria	60.0	1.0%	17%
37	Denmark	59.2	-0.8%	18%
38	Finland	58.8	-2.2%	2.4%
40	Malta	57.2	0.1%	33%
43	Germany	55.5	-0.4%	13%
44	Poland	54.8	1.4%	20%
45	Portugal	54.7	2.4%	14%
46	Slovakia	54.4	0%	11%
47	Estonia	54.3	0.5%	23%
51	Lithuania	51.8	-0.9%	8.2%
53	Slovenia	51.2	-3.2%	36%
55	Austria	49.3	-5.1%	12%
64	France	42.2	4.1%	8.3%
69	Croatia	40.6	-1.4%	38%
78	Italy	38.9	-1.3%	29%
95	Greece	31.3	-3.6%	8.6%
99	Cyprus	30.1	8.3%	27%

Figure 29: Average Peak Connection Speed (IPv4) by European Country

6.2 European Average Peak Connection Speeds (IPv4) / In the third quarter, Romania again led the European region in average peak connection speeds, seeing a 1.0% quarterly increase to 85.0 Mbps. Meanwhile, lowest-ranked Cyprus posted an 8.3% increase to 30.1 Mbps, narrowing the gap between the two from 56 Mbps in the second quarter to 55 Mbps in the third. As seen in Figure 29, quarterly changes were again mixed, with 15 surveyed countries seeing increases, 15 seeing decreases, and one — Slovakia — remaining unchanged. Gains ranged between 0.1% in Malta and 12% in Luxembourg, while declines ranged between 0.3% in Belgium and 5.2% in Norway. Twenty-five countries had average peak connection speeds of at least 50 Mbps, down from twenty-six in the second quarter.

Year-over-year changes were positive across the board for the surveyed European countries in the third quarter, led again by Croatia with a 38% yearly increase. In all, 27 of the 31 surveyed countries enjoyed double-digit growth in average peak connection speeds, while Finland posted the smallest gain at 2.4%.

6.3 European 4 Mbps Broadband Adoption (IPv4) / In the third quarter, Malta and Bulgaria led the European region in 4 Mbps adoption, with 96% of their unique IPv4 addresses connecting to Akamai at average speeds of at least 4 Mbps. As seen in Figure 30, many countries in the region have adoption rates that are not far behind the leaders. Changes in adoption rates were modest in the third quarter, although 26 countries posted declines, ranging from 0.2% in Finland to 6.5% in Greece. Two countries — Sweden

and Ireland — saw adoption levels remain steady, while three countries — the United Kingdom, Luxembourg, and Bulgaria — saw modest increases of 0.3%, 0.9%, and 1.4%, respectively. A total of 16 surveyed European countries enjoyed 4 Mbps broadband adoption rates of at least 90% in the third quarter, down from 20 in the second quarter, although several countries remain in close range. France and Cyprus had the lowest adoption rates in the region at 75% — more than 21 percentage points lower than the regional leaders.

On a year-over-year basis, three of the surveyed European countries — Poland, Slovakia, and Romania — saw slight drops in 4 Mbps broadband adoption, although the declines were all below 1%. Croatia again led the gainers with a 22% yearly increase in adoption, with two additional countries — Cyprus and Italy — seeing double-digit growth. Twenty-four countries saw modest, single-digit growth, while Denmark saw its adoption rate hold steady as compared with the third quarter of 2015.

6.4 European 10 Mbps Broadband Adoption (IPv4) / With an adoption rate of 65%, the Netherlands overtook Switzerland to gain the top spot among surveyed European countries for 10 Mbps adoption in the third quarter, as seen in Figure 31. Fifteen European countries had at least half of their unique IPv4 addresses connecting to Akamai at average speeds of at least 10 Mbps in the third quarter, down from 16 in the second, and the gap between the highest and lowest adoption rates in the region widened slightly from 54 Mbps to 55 Mbps. Quarterly changes in adoption rates were mixed, with 14 of the 31 countries posting increases. These ranged from 0.6% in the United Kingdom to 15% in Cyprus. Greece had

Global Rank	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
4	Malta	96%	-0.3%	2.4%
5	Bulgaria	96%	1.4%	0.1%
7	Netherlands	95%	-0.9%	0.1%
10	Latvia	94%	-1.3%	4.5%
11	Denmark	94%	-0.8%	0%
12	Romania	94%	-1.6%	-0.2%
13	Sweden	93%	0%	1.7%
14	Switzerland	93%	-1.5%	0.3%
15	Belgium	93%	-1.1%	2.4%
16	Hungary	93%	-1.2%	3.5%
20	Finland	92%	-0.2%	1.6%
23	Austria	91%	-1.7%	1.1%
25	Norway	91%	-0.9%	3.3%
26	Lithuania	91%	-0.8%	6.0%
27	United Kingdom	90%	0.3%	3.8%
29	Spain	90%	-1.0%	6.1%
30	Russia	89%	-2.1%	2.9%
31	Germany	89%	-1.4%	2.6%
32	Luxembourg	89%	0.9%	1.3%
36	Poland	88%	-2.7%	-0.5%
38	Czech Republic	87%	-2.8%	1.0%
39	Portugal	87%	-1.5%	1.5%
41	Estonia	86%	-3.8%	6.1%
42	Slovenia	85%	-4.2%	6.4%
43	Slovakia	84%	-3.5%	-0.4%
44	Croatia	83%	-2.3%	22%
48	Ireland	81%	0%	6.1%
50	Greece	81%	-6.5%	7.7%
54	Italy	79%	-2.0%	11%
63	Cyprus	75%	-5.7%	15%
64	France	75%	-2.1%	0.1%

Figure 30: 4 Mbps Broadband Adoption (IPv4) by European Country

Global Rank	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
6	Netherlands	65%	2.9%	8.7%
7	Switzerland	64%	-0.8%	6.2%
8	Belgium	64%	-0.3%	22%
9	Norway	64%	-1.1%	18%
10	Bulgaria	63%	-0.7%	26%
11	Latvia	61%	-0.9%	27%
13	Sweden	60%	5.1%	8.7%
14	Denmark	60%	1.2%	18%
15	Finland	60%	2.9%	17%
16	Romania	59%	-5.0%	2.8%
18	United Kingdom	53%	0.6%	16%
20	Spain	52%	3.6%	51%
21	Hungary	50%	-0.8%	37%
22	Czech Republic	50%	-5.7%	7.6%
23	Lithuania	50%	4.9%	26%
24	Malta	48%	-12%	42%
26	Portugal	47%	-2.0%	25%
27	Germany	47%	-1.0%	25%
28	Russia	46%	-8.3%	23%
31	Ireland	45%	2.5%	11%
33	Slovenia	41%	-2.5%	76%
36	Austria	40%	1.7%	22%
37	Estonia	39%	-1.9%	43%
38	Poland	39%	-5.2%	14%
42	Slovakia	33%	-2.1%	16%
45	Luxembourg	31%	9.4%	42%
48	France	27%	1.9%	29%
55	Italy	19%	4.8%	111%
58	Croatia	18%	12%	323%
64	Cyprus	12%	15%	157%
68	Greece	9.9%	-29%	25%

Figure 31: 10 Mbps Broadband Adoption (IPv4) by European Country

the largest quarterly drop at 29%, while the remaining countries posted more moderate declines, ranging from 0.3% in Belgium to 12% in Malta.

All 31 surveyed European countries posted yearly gains in the third quarter, just as in the second. Three countries — Croatia, Cyprus, and Italy — saw adoption rates more than double compared with the third quarter of 2015, with increases of 323%, 157%, and 111% respectively. The remaining European countries saw gains ranging from 2.8% in Romania to 76% in Slovenia.

6.5 European 15 Mbps Broadband Adoption (IPv4) / As seen in Figure 32, Norway held on to the top spot for 15 Mbps broadband adoption among surveyed European countries in the third quarter with an adoption rate of 48%, down 1.0% from the second quarter. Luxembourg, which did not have enough unique IPv4 addresses connecting to Akamai at average speeds of at least 15 Mbps to qualify for inclusion in the second quarter, just made the cutoff in the third quarter, increasing the total number of qualifying countries in the region to 30. As previously noted, Luxembourg's new high-speed broadband services leverage native IPv6 connectivity, so its percentage of high-speed connections may be understated here. Thirteen of the qualifying countries saw quarterly gains in adoption, led by Croatia with a 12% increase, while Switzerland posted the smallest gain at 0.4%. On the flip side, quarterly losses were seen in 16 countries, with declines ranging from 0.9% in Hungary to 27% in Greece. Slovenia saw adoption rates hold steady compared with the previous quarter.

In the third quarter, 23 of the 30 qualifying surveyed European countries had at least one in five IPv4 addresses connecting to Akamai at average speeds above 15 Mbps — down from 24 in the previous quarter — while three surveyed countries had adoption rates below 10%. Greece, the country with the lowest adoption level in the region, lagged nearly 45 percentage points behind top-performing Norway.

Year-over-year changes were positive across the European region in the third quarter, with Croatia again posting the largest increase in 15 Mbps adoption at 226%. Two additional countries in the region — Italy and Slovenia — saw adoption rates more than double, while Slovakia posted the smallest yearly gain among the qualifying surveyed European countries at 11%.

The third quarter saw a flurry of announcements across Europe that point to significantly increased broadband adoption and speeds over the coming years. In September, the European Commission (EC) announced its goal of achieving universal broadband at speeds of at least 100 Mbps across the European Union by 2025, with businesses having access to speeds of over 1 Gbps. In addition, the EC wants all urban areas and major roads and railways to have 5G wireless coverage by 2025. It estimates that these goals will require a $550 billion investment over the next decade, much of which would need to come from private sources.[43] The EC also announced a Wi-Fi4EU plan that proposes a $130 million investment to provide free Wi-Fi access in parks, squares, libraries, and other public areas in at least 6,000 to 8,000 communities across the EU.[44]

Germany declared the availability of an additional $1.4 billion in funding to enable broadband access in underserved regions of the country, augmenting the $3.0 billion announced in October 2015 to implement universal broadband access at speeds of 50 Mbps or more by 2018.[45] In Italy, Telecom Italia and Fastweb announced a partnership to build a $1.3 billion fiber-to-the-home network serving 3 million customers in 29 cities in Italy. The buildout is expected to be completed by 2020.[46] In Spain, Vodafone expanded its fiber-to-the-home offering through a partnership with Telefonica, enabling it to indirectly reach an additional 4.2 million homes, providing them with 30 Mbps broadband services.[47]

Global Rank	Country/Region	% Above 15 Mbps	QoQ Change	YoY Change
3	Norway	48%	-1.0%	29%
6	Sweden	43%	5.3%	14%
7	Switzerland	42%	0.4%	18%
8	Netherlands	41%	6.6%	22%
9	Latvia	40%	-3.4%	27%
11	Bulgaria	39%	-1.3%	77%
12	Denmark	39%	2.3%	35%
13	Belgium	38%	4.1%	50%
15	Finland	37%	2.9%	32%
16	Romania	37%	-12%	35%
17	United Kingdom	35%	-1.8%	26%
18	Spain	33%	5.7%	92%
19	Lithuania	31%	-3.2%	25%
22	Czech Republic	30%	-4.9%	12%
23	Ireland	29%	3.5%	27%
24	Portugal	29%	-4.6%	51%
25	Germany	27%	-1.1%	45%
26	Hungary	27%	-0.9%	53%
28	Slovenia	24%	0%	109%
31	Malta	23%	-13%	99%
33	Russia	22%	-12%	40%
34	Poland	21%	-5.4%	24%
36	Austria	21%	2.3%	22%
39	Estonia	19%	-5.1%	47%
41	Slovakia	18%	-5.6%	11%
43	Luxembourg	15%	11%	58%
45	France	14%	5.1%	67%
51	Italy	8.0%	0.8%	138%
57	Croatia	5.8%	12%	226%
63	Greece	3.0%	-27%	31%
–	Cyprus	4.2%	35%	168%

Figure 32: 15 Mbps Broadband Adoption (IPv4) by European Country

The United Kingdom saw significant broadband activity in the third quarter as well, as business secretary Greg Clark called for an upgrade to the country's broadband and mobile infrastructure.[48] Scotland launched the initial planning phase for reaching the last 5% of premises with 30 Mbps Internet access by 2021. It is already executing on the $500 million Digital Scotland project, which aims to reach 95% of premises by March 2018; however, the remaining homes and businesses are expected be disproportionately costly to reach due to their remote rural nature.[49] Meanwhile, the Irish government's ambitious National Broadband Plan, set to begin deployment in 2017, aims for future-proofed universal coverage at speeds of at least 30 Mbps by 2022, at a cost of approximately €275 million.[50] On a municipal level, the Broadband for South Westmorland project announced the roll out of a gigabit-speed fiber-to-the-premise (FTTP) network to more than 500 homes across rural communities in South Westmorland, England. The project will be completed in part with the help of local volunteers as well as an investment of more than $340,000.[51] The Superfast Worcestershire project successfully completed its first contract, partnering with British Telecom to provide Internet access to 90% of the English county at speeds of at least 24 Mbps. The second contract, to be completed by the fall of 2017, would reach 95% of the county.[52] Finally, the Superfast North Yorkshire project (England) presented a revised plan to bring broadband at speeds of at least 30 Mbps to 96% of local premises by 2019.[53]

In Ireland, SIRO announced a $500 million investment to expand its fiber network to six Irish towns, with a plan to reach a total of 50 Irish towns in its first phase and an additional 300 towns in a second phase.[54] In Britain, British Telecom (BT) announced significant updates to its nationwide broadband plans, including increased speeds of up to 1 Gbps for its FTTP offering; successful trials of its "Long Reach VDSL" technology, capable of delivering 10 Mbps speeds throughout much of the U.K.; and a large expansion of its G.fast pilot, which enables speeds of up to 300 Mbps through its existing network. By 2020, BT expects to expand its FTTP offering to 2 million premises and its G.fast service to 10 million premises.[55] Rural villages got good news as well: Virgin Media announced the expansion of its FTTP offering to 30 additional villages across the U.K., delivering speeds of 152 Mbps or more by the spring of 2017,[56] and Wessex Internet announced service for 119 villages in England with its wired and wireless broadband offerings.[57]

Finally, there were a number of gigabit-speed FTTP network rollouts in the third quarter – including Cityfibre in Glasgow, Scotland[58] and MS3 in East Yorkshire, England[59] — as well as FTTP gigabit service launches — including Cityfibre in Northampton, England[60] and WightFibre in Isle of Wight.[61] Hyperoptic, which claims to be the first ISP to offer gigabit speeds in the U.K., announced in July that it was expanding its gigabit network to reach 300,000 more homes across the United Kingdom over the next 3 years, supported by a £21 million loan by the European Investment Bank.[62] Finally, Bristol City, England had its first customers go live with ultra-fast 10 Gbps service on the Bristol Network, a municipally-owned fiber optic network that is currently being commercialized by two local ISPs.[63]

[SECTION]7 GEOGRAPHY *MIDDLE EAST + AFRICA (MEA)*

Beginning with the *First Quarter, 2016 State of the Internet Report*, broadband metrics are presented separately for the European region and the Middle East / Africa (MEA) region (previously presented together as the EMEA region), with expanded coverage to include more countries in both regions. The metrics presented here for the MEA region are based on a subset of data used for Section 2 and are subject to the same thresholds and filters discussed within that section. The subset used for this section includes connections identified as coming from networks in the Middle East and Africa region, based on classification by Akamai's EdgeScape geolocation tool.

7.1 MEA Average Conection Speeds (IPv4) / With an average connection speed of 12.8 Mbps in the third quarter — down 4.4% from the second quarter — Israel again held the top spot among the surveyed MEA countries, as seen in Figure 33. Kenya posted a strong quarterly gain of 43% – the highest in the region — to join Israel and Qatar as the only surveyed countries in the region to have an average connection

Global Rank	Country/Region	Q3 2016 Avg. Mbps	QoQ Change	YoY Change
28	Israel	12.8	-4.4%	15%
43	Kenya	11.0	43%	335%
44	Qatar	10.9	-16%	81%
53	United Arab Emirates	8.3	3.8%	23%
56	Kuwait	8.0	18%	52%
72	Turkey	6.7	-4.5%	7.4%
80	South Africa	6.0	6.1%	62%
93	Saudi Arabia	4.9	3.7%	56%
99	Morocco	4.7	6.8%	48%
112	Iran	3.7	14%	83%
121	Nigeria	3.0	3.8%	17%
127	Egypt	2.7	-33%	54%
129	Namibia	2.5	4.8%	38%

Figure 33: Average Connection Speed (IPv4) by MEA Country

speed above 10 Mbps. In contrast, Namibia posted an average connection speed of 2.5 Mbps — up 4.8% from the second quarter but still more than 10 Mbps below the regional leader. Four of the thirteen countries saw average connection speeds below 4 Mbps in the third quarter, up from three in the second.

Nine of the thirteen MEA countries posted quarterly gains in the third quarter, with Kenya's being the largest. The remaining increases were more moderate, ranging from 3.7% in Saudi Arabia to 18% in Kuwait. After seeing the largest quarterly increase in the region in the second quarter (64%), Egypt posted the largest decline in the third at 33%. The other three declining countries saw more modest drops, with average speeds falling between 4.4% in Israel and 16% in Qatar.

Year-over-year changes were positive across the board in MEA but varied widely in magnitude. Turkey saw the smallest change with a 7.4% increase, while Kenya again had the largest with a 335% jump. The remaining 11 countries all posted double-digit yearly gains.

Although broadband adoption and speeds in many MEA countries tend to lag that of many other parts of the world, the third quarter saw news reports that promise improvement in the region. The AAE-1 cable, a 25,000 km submarine cable connecting nearly 20 hubs across Asia, Africa, and Europe, is expected to be complete by the end of the year, with the third quarter seeing landing announcements by Ooredo in Qatar [64] and Mobily in Saudi Arabia.[65] Taking a different approach, Gondwana International Networks announced a partnership with satellite provider Intelsat to provide cost-effective broadband service to sub-Saharan Africa.[66] Intelsat also launched a new broadband satellite expected to serve a number of mobile operators across Africa, with the aim of enabling them to extend their networks into hard-to-reach rural communities.[67]

Some MEA countries are seeing significant pushes in their fiber buildout as well. In August, the Zimbabwe government announced it had received a $98 million loan from China's Exim Bank for state-owned TelOne to expand its fiber network.[68] Just days earlier, TelOne had announced a partnership with Chinese telecommunications equipment provider FibreHome Technologies to connect 100,000 homes in Zimbabwe by the end of 2018 — a $25 million project that targets underserved rural areas and is expected to reach 10,000 homes by the end of the year.[69] Meanwhile, Mauritius Telecom, a major telecommunications provider for its namesake island nation, is reported to be investing more than $140 million to deploy FTTP nationally by the end of 2017, offering speeds of up to 100 Mbps to homes and 1 Gbps to businesses.[70] Hopefully, these announcements are indicative of a broader trend of broadband investment in the region.

7.2 MEA Average Peak Connection Speeds (IPv4) / Despite posting a 3.6% quarterly decrease, Qatar led the MEA region once again with an average peak connection speed of 94.3 Mbps — more than 24 Mbps higher than second-place Israel, as shown in Figure 34. On the other end of the spectrum, Egypt posted a 34% quarterly decrease, dropping to last place in the region with an average peak speed of 13.2 Mbps, more than 81 Mbps below Qatar. Five of the thirteen surveyed MEA countries saw speeds rise in the third quarter compared with the second, though quarterly increases were modest, ranging from 0.6% in Nigeria to 8.8% in Morocco. On the declining side, with the exception of Egypt, quarterly decreases were modest, varying between 0.1% in Saudi Arabia and 4.5% in Iran. Like the previous quarter, four of the surveyed MEA countries had average peak connection speeds of at least 50 Mbps, and eight had speeds of at least 25 Mbps.

Global Rank	Country/Region	Q3 2016 Peak Mbps	QoQ Change	YoY Change
7	Qatar	94.3	-3.6%	25%
21	Israel	70.2	-1.9%	0.3%
22	United Arab Emirates	67.6	2.3%	48%
23	Kuwait	67.6	-1.1%	110%
75	Turkey	39.6	-0.3%	2.8%
76	Saudi Arabia	39.6	-0.1%	43%
101	South Africa	29.8	0.6%	58%
105	Kenya	27.3	3.5%	100%
109	Nigeria	24.6	1.5%	12%
116	Morocco	21.6	8.8%	-0.6%
124	Iran	16.9	-4.5%	37%
130	Namibia	14.1	-1.5%	17%
134	Egypt	13.2	-34%	-38%

Figure 34: Average Peak Connection Speed (IPv4) by MEA Country

Year-over-year changes were mostly positive in the third quarter, but Egypt posted a significant yearly decline of 38%. Morocco saw a decline as well, but a much more modest one of 0.6%. On the other end of the spectrum, Kuwait and Kenya had the largest yearly gains in the MEA region, as their average peak connection speeds rose 110% and 100% respectively. The remaining countries posted increases ranging between 0.3% in Israel and 58% in South Africa, with seven countries in total seeing double-digit gains.

7.3 / MEA 4 Mbps Broadband Adoption (IPv4) / Israel maintained the top spot in the MEA region for 4 Mbps adoption in the third quarter with a 94% adoption rate, down 0.3% from the second quarter, as seen in Figure 35. Seven of the twelve qualifying surveyed countries in the region had at least half of their unique IPv4 addresses connecting to Akamai at average speeds of at least 4 Mbps — compared with six in the previous quarter. However, the gap between the top- and bottom-ranked MEA countries widened from 81 percentage points to 85, as Egypt, the bottom-ranked country, saw adoption rates fall 54% quarter over quarter, offsetting some of the 101% gain it posted in the previous quarter. Three other MEA countries saw 4 Mbps broad adoption fall in the third quarter as well, though their drops were far more modest, ranging from 0.3% in Israel to 7.3% in Turkey. On the flip side, eight countries saw gains, with the United Arab Emirates posting the smallest at 1.4% and Iran posting the largest at 40%. Five countries in all saw double-digit increases, while one country — Qatar — saw 4 Mbps adoption levels hold steady compared with the previous quarter.

On a year-over-year basis, most of the surveyed MEA countries saw gains in 4 Mbps broadband adoption in the third quarter, but Kuwait and Turkey posted declines of 20% and 4.0% respectively. Egypt led the gaining countries with a sizeable 593% yearly increase, and five additional countries saw adoption more than double compared with the third quarter of 2015. Israel again had the smallest year-over-year increase in adoption at 0.5%.

Global Rank	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
9	Israel	94%	-0.3%	0.5%
24	United Arab Emirates	91%	1.4%	7.0%
45	Qatar	83%	0%	39%
53	Kenya	79%	24%	331%
65	Turkey	74%	-7.3%	-4.0%
86	Morocco	52%	8.8%	342%
87	Saudi Arabia	52%	6.4%	214%
93	Kuwait	48%	-3.4%	-20%
96	South Africa	42%	11%	90%
97	Iran	39%	40%	433%
110	Nigeria	18%	25%	53%
114	Namibia	14%	10%	243%
115	Egypt	9.0%	-54%	593%

Figure 35: 4 Mbps Broadband Adoption (IPv4) by MEA Country

7.4 / MEA 10 Mbps Broadband Adoption (IPv4) / As seen in Figure 36, 10 MEA surveyed countries qualified for inclusion in the 10 Mbps broadband adoption metric in the third quarter, up from nine in the second. With 46% of its unique IPv4 addresses connecting to Akamai at average speeds of 10 Mbps or higher, Israel had the highest adoption level among the qualifying surveyed MEA countries in the third quarter, overtaking second-quarter leader Qatar. Qatar and Israel were the only two countries in the region with adoption rates above 50% in the second quarter, but both suffered declines in adoption — of 22% and 8.8% respectively — causing them to fall below the 50% threshold in the third quarter. Their drops meant the gap between the top- and bottom-ranked MEA countries narrowed to 46 percentage points in the third quarter from 53 in the second.

Global Rank	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
30	Israel	46%	-8.8%	27%
32	Qatar	43%	-22%	293%
34	Kenya	41%	91%	6566%
52	United Arab Emirates	22%	12%	125%
63	Turkey	13%	-6.1%	64%
69	South Africa	9.7%	-2.9%	231%
78	Saudi Arabia	4.9%	8.6%	1238%
79	Egypt	4.7%	-51%	6133%
81	Morocco	3.5%	40%	2034%
83	Iran	0.4%	58%	312%
–	Kuwait	9.7%	2.9%	160%
–	Namibia	1.1%	20%	345%
–	Nigeria	1.1%	21%	119%

Figure 36: 10 Mbps Broadband Adoption (IPv4) by MEA Country

Five of the nine qualifying surveyed countries had at least 1 in 10 of their unique IPv4 addresses connecting to Akamai at average speeds of 10 Mbps or higher in the third quarter, down from seven in the second.

Quarterly changes were highly mixed in the third quarter, with five countries seeing gains that ranged between 8.6% (in Saudi Arabia) and 91% (in Kenya) and five seeing declines that spanned from 2.9% (in South Africa) to 51% (in Egypt). However, yearly changes were positive across the board, with Kenya and Egypt seeing outsized gains of 6,566% and 6,133%. Morocco and Saudi Arabia also posted tremendous gains of 2,304% and 1,238% respectively. However, as previously noted, none of these four countries qualified for inclusion in this metric one year ago, so their yearly percentage-change calculations can be misleading. Four additional MEA countries saw adoption levels more than double compared with the third quarter of 2015, while Israel had the smallest gain in the region at 27%.

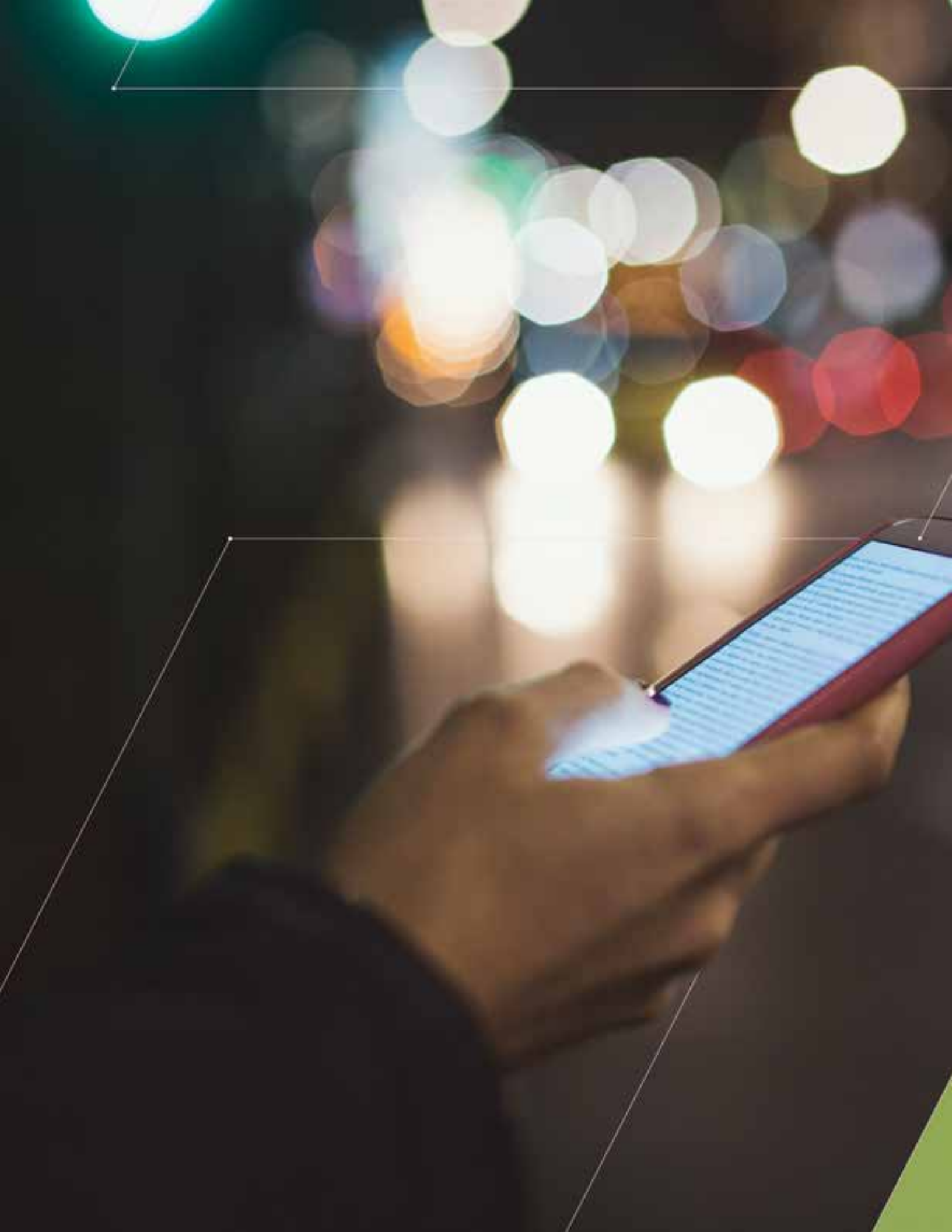
7.5 / MEA 15 Mbps Broadband Adoption (IPv4) / As seen in Figure 37, eight MEA countries qualified for inclusion in this metric in the third quarter, the same as in the second. Kenya and Israel each had 15 Mbps adoption rates of 24% — the highest in the region — as second-quarter leader Qatar saw its adoption rate fall 35%, dropping Qatar to third place in the region and narrowing the gap between the top and bottom adoption rates in MEA to 22.5 percentage points in the third quarter, down from 30 points in the second. Saudi Arabia had the lowest adoption rate in the region at just 1.4%.

Quarterly changes in 15 Mbps adoption were highly varied, with half of the qualifying surveyed countries seeing gains while the other half saw decreases. Gains ranged from a mere 1.0% in South Africa to a sizeable 116% in Kenya, while declines ranged from 4.3% in Turkey to 43% in Egypt. Like the previous quarter, only three MEA countries had more than 1 in 10 unique IPv4 addresses connecting to Akamai at average speeds of at 15 Mbps or more.

On a yearly basis, changes were strongly positive across the region, although, as previously noted, the four countries with the largest yearly gains — Kenya, Egypt, Saudi Arabia, and Qatar (with gains ranging from 515% to 13,867%) — were all countries that did not qualify for inclusion in this metric in the third quarter of 2015, so their data from one year ago was likely too small to be informative. Increases among the remaining countries ranged from 37% in Turkey to 240% in South Africa.

Global Rank	Country/Region	% Above 15 Mbps	QoQ Change	YoY Change
29	Kenya	24%	116%	13867%
30	Israel	24%	-8.1%	65%
37	Qatar	20%	-35%	515%
55	United Arab Emirates	6.2%	21%	167%
58	South Africa	5.8%	1.0%	240%
61	Turkey	4.0%	-4.3%	37%
65	Egypt	2.7%	-43%	7660%
70	Saudi Arabia	1.4%	27%	1510%
–	Kuwait	6.6%	21%	203%
–	Morocco	0.8%	78%	1788%
–	Nigeria	0.4%	1.7%	150%
–	Namibia	0.2%	24%	346%
–	Iran	<0.1%	-31%	47%

Figure 37: 15 Mbps Broadband Adoption (IPv4) by MEA Country



[SECTION]8 MOBILE CONNECTIVITY

The source data in this section encompasses usage from smartphones, tablets, computers, and other devices that connect to the Internet through mobile network providers. In addition, this section includes insight into mobile voice- and data-traffic trends contributed by Ericsson, a leading provider of telecommunications equipment and related services to mobile and fixed operators globally. Mobile connectivity metrics are aggregated at a country/region level.

8.1 Connection Speeds on Mobile Networks (IPv4) / Beginning with the *Second Quarter, 2016 State of the Internet Report*, the countries/regions covered in this section, along with their categorization, have been altered slightly to align with the rest of the *State of the Internet Report*. This section will now provide mobile data and analysis for the same surveyed countries/regions covered in Sections 4 through 7 of this report, and the countries/regions will be categorized in the same way: Americas, Asia Pacific, Europe, and Middle East/Africa. Countries/regions marked with an asterisk in Figure 38 have not met the minimum requirement of 25,000 unique IPv4 addresses seen by Akamai and identified as coming from a mobile network during the quarter. These countries/regions do not qualify for inclusion this quarter and are not included in this section's analysis, although their data is included in Figure 38 for reference.

As mentioned in previous reports, all mobile speed measurements collected — particularly average peak connection speeds — can be influenced by the use and location of proxies within mobile networks. If a country's major mobile carriers make heavy use of such proxies, peak connection speeds recorded for that country are likely to be more representative of the speeds achieved between Akamai and the proxies (residing in data centers) rather than speeds achieved between Akamai and the mobile devices themselves. Because we believe the apparent impact of these proxies is becoming more significant, leading to

measured peak speeds that are unrepresentative of the capabilities of current mobile connectivity technologies, we have removed average peak connection speed measurements from this section of the report. Note that average connection speed measurements may also be influenced by the use of proxies within mobile networks, but the effect is expected to be less pronounced.

In the third quarter of 2016, 61 surveyed countries/regions around the world qualified for inclusion in the mobile section, up from 58 in the second quarter. Figure 38 shows that across these countries/regions, the United Kingdom once again had the fastest average mobile connection speed at 23.7 Mbps (up from 23.1 Mbps in the second quarter), with Belgium in second place at 19.3 Mbps (down from 21.1 Mbps). Venezuela again had the lowest average connection speed at 2.2 Mbps (same as in the second quarter), followed by Argentina, with an average connection speed of 3.0 Mbps (up from 2.8 Mbps).

Among the qualifying surveyed countries/regions, 24 in total had an average mobile connection speed at or exceeding the 10 Mbps broadband threshold (up from 17 in the previous quarter), while 52 achieved average speeds at or above the 4 Mbps broadband level (up from 48). Within the individual continental regions, the following qualifying surveyed countries/regions had the highest average mobile connection speeds:

- **Americas:** Canada, 8.9 Mbps
- **Asia Pacific:** Australia, 12.8 Mbps
- **Europe:** United Kingdom, 23.7 Mbps
- **Middle East/Africa:** United Arab Emirates, 13.3 Mbps

The mobile broadband market has continued to grow in leaps and bounds, and the third quarter saw its fair share of activity and announcements. In 4G-related news, market research firm Ovum reported that LTE usage is growing nearly 90% a year worldwide. As of the third quarter of 2016, Ovum estimated that in North America roughly 60% of mobile users are on LTE services (out of 74% who have coverage); in Europe, 30%; in Latin America, 12%; and in Oceania and Southeast Asia, 34%.[71] Industry site BuddeBlog[72] reports that Australia has particularly high LTE coverage, with service availability for roughly 98% of the country's population by the end of 2016 — although only about half of the population is actually using LTE services, according to analyst firm Telsyte.[73]

Third quarter announcements also heralded upcoming 4G improvements in underserved areas. Philippine operator Globe Telecom revealed plans to offer mobile broadband coverage to 95% of the towns and cities in the Philippines by 2018.[74] Afrimax and Vodafone are expanding an existing partnership — one that has already brought 4G coverage to Uganda and Zambia — to rollout 4G services in Cameroon.[75] Vodafone New Zealand announced that it is increasing its 4G broadband download speed commitment under the country's Rural Broadband Initiative from 5 Mbps to 30 Mbps, with customers in some areas seeing speeds of up to 75 Mbps.[76] Finally, after upgrading its 3G network in partnership with Nokia, Ooredoo Myanmar launched the country's first 4G service in a number of Myanmar's largest cities.[77]

There were a number of announcements relating to LTE Advanced (LTE-A) in the third quarter as well, as operators continue to expand and upgrade their LTE-A offerings. A number of carriers – including Verizon in 461 cities across the United States;[78] Megafon in Krasnodar, Russia;[79] and Menatelecom in Bahrain[80] – announced LTE-A launches supporting theoretical speeds of up to 300 Mbps (although real-life speeds are generally much lower, and only a limited set of LTE-A-capable devices are supported). In addition, U.K. operator EE, which already offers LTE-A with two-carrier aggregation in 150 cities, revealed an upgrade plan to support three-carrier aggregation services — enabling even faster speeds — by the end of 2017.[81] EE also aims to increase its network coverage to 95% of the U.K. by 2020.[82] U.S. operator Sprint – which already supports two-carrier LTE-A in 237 U.S. markets — announced it has been testing three-carrier aggregation as well.[83] U.S. carrier T-Mobile also revealed planned LTE-A network upgrades that would enable its customers to enjoy real-world peak speeds of up to 190 Mbps (with theoretical peak speeds of 400 Mbps). The Samsung S7 and S7 Edge were slated to be the first supported phones (in October 2016), with other phones to be added in the near future.[84] Finally, Japanese operator NTT Docomo announced it would be upgrading its LTE network, with the goal of launching 500 Mbps services by the end of 2016 and 5G services around 2020.[85]

Research towards pushing speed boundaries with LTE-A continues as well. In September, Telstra, Ericsson, and Qualcomm reported achieving download speeds of nearly 1 Gbps on a live LTE network test using carrier aggregation, QAM, and 4x4 MIMO technologies along with Ericsson and Qualcomm hardware.[86] Shortly thereafter, Deutsche Telekom and Huawei announced successfully achieving speeds of 1.2 Gbps using a 5-carrier aggregation and 4x4 MIMO on a live network in Berlin.[87]

The third quarter also saw a number of developments related to 5G, which is slated to deliver speeds 30 to 100 times greater than users are getting through 4G LTE, along with greater power efficiency, allowing device battery life to last much longer. While 5G standards have not been finalized and broad commercial availability is expected to be at least a few years away, many 5G efforts are well underway. In the U.S., both AT&T and Verizon already have already announced field trials in several communities. In early September, Verizon revealed that it may even begin commercial deployments as early as next year, ahead of industry expectations, making it the first major carrier worldwide to move seriously into 5G.[88] Shortly after Verizon's announcement, AT&T unveiled Project AirGig, a millimeter-wave technology it has been developing to deliver low-cost multi-gigabit wireless service along existing power lines.[89] Due to its ability to be deployed without laying new fiber or building new towers, AT&T touted the technology as transformative, potentially enabling cost-effective multi-gigabit Internet access in urban, rural, and other underserved communities around the globe. AT&T said it expects its first AirGig field trials in 2017.[90] Pushing the speed envelope, Ericsson and T-Mobile reported achieving ultra-fast speeds of 12 Gbps in 5G lab trials.[91] Meanwhile, the European Commission is advocating for a coordinated Europe-wide launch of 5G mobile broadband in the year 2020 using common spectrum bands — along with the goal of having all urban areas and major travel ways enjoy seamless coverage by 2025.[92]

Country/Region	Q3 2016 Avg. Mbps
AMERICAS	
Argentina	3.0
Bolivia	3.4
Brazil	4.0
Canada	8.9
Chile	4.2
Colombia	5.0
Costa Rica *	3.8
Ecuador *	3.4
Mexico *	6.7
Panama	3.1
Paraguay	5.3
Peru	7.1
United States	7.5
Uruguay	3.4
Venezuela	2.2
ASIA PACIFIC	
Australia	12.8
China	8.9
Hong Kong	6.1
India	3.5
Indonesia	10.9
Japan	11.6
Malaysia	3.5
New Zealand	10.8
Philippines *	13.9
Singapore	8.5
South Korea	11.2
Sri Lanka	5.4
Taiwan	9.4
Thailand	6.1
Vietnam	3.4
EUROPE	
Austria	13.0
Belgium	19.3
Bulgaria *	7.8
Croatia	7.6
Cyprus *	23.3
Czech Republic	7.3
Denmark	12.4
Estonia	10.5
Finland	16.9
France	12.4
Germany	13.1
Greece	7.7
Hungary	10.6
Ireland	13.2
Italy	11.0
Latvia *	13.2
Lithuania	8.8
Luxembourg *	9.7
Malta *	8.1
Netherlands	11.5
Norway	17.4
Poland	9.7
Portugal	7.0
Romania *	10.9
Russia	9.9
Slovakia	12.6
Slovenia	9.1
Spain	13.4
Sweden	12.1
Switzerland *	30.0
United Kingdom	23.7
MIDDLE EAST/AFRICA	
Egypt	8.0
Iran	7.3
Israel	7.1
Kenya	9.5
Kuwait	8.0
Morocco	10.2
Namibia	3.5
Nigeria *	3.1
Qatar *	10.5
Saudi Arabia	4.7
South Africa	5.0
Turkey	11.8
United Arab Emirates	13.3

Figure 38: Average Connection Speeds (IPv4) for Mobile Connections by Country/Region

** Fewer than 25,000 unique IPv4 addresses classified as mobile observed in Q3 2016*

8.2 Mobile Browser Usage Data / In June 2012, Akamai launched the "Akamai 10" destination site (***http://www.akamai.com/io***) with an initial data set that highlighted browser usage across PCs and other devices connecting to Akamai via fixed and mobile networks. The data and graphs below are derived from Akamai 10.

As seen in Figure 39 and Figure 40 below, on September 30 there was a noticeable, sharp downtick in Mobile Safari percentages (and an accompanying uptick in the percentages for Webkit and Others), which was due to an Akamai configuration update. As the

one-day change skews the trends for the quarter, for all analysis involving end-of-quarter data in this section, we use data collected on September 29 instead of September 30.

Figure 39 illustrates mobile browser usage by users identified to be on cellular networks in the third quarter of 2016. As of Android version 4.4 (KitKat), Chrome has replaced Webkit as the default Android browser engine, so when comparing Android versus iOS platforms, we combine metrics from Android Webkit and Chrome for mobile to calculate an Android platform number. In the third quarter, like other recent quarters, we saw Webkit traffic continue to decline gradually and Chrome traffic continue to increase gradually as older Android versions are retired.

As Figure 39 shows, Chrome Mobile retained its position as the leading browser in the third quarter, widening its lead slightly. Mobile Safari requests comprised approximately 32% of requests over cellular at the beginning of the quarter, trailing Chrome Mobile by approximately 12.5 percentage points. Chrome also held more than a 30-point lead over Android Webkit. Over the quarter, Safari gained one percentage point, while Chrome gained more than four and Webkit lost four. At the end of the quarter, Chrome was beating Safari by approximately 15.5 percentage points and besting Webkit by nearly 39 percentage points.

In comparing iOS versus Android platforms, Android started with a large lead of nearly 27 points over iOS in the third quarter. That lead narrowed slightly, to under 26 points, by the end of the quarter. Overall, iOS comprised approximately 31% of requests in the third quarter, while Android was responsible for 59%.

Expanding the set of data to all networks (not just those defined as cellular), we see in Figure 40 that Mobile Safari commanded more share than Chrome at the beginning of the quarter, but the

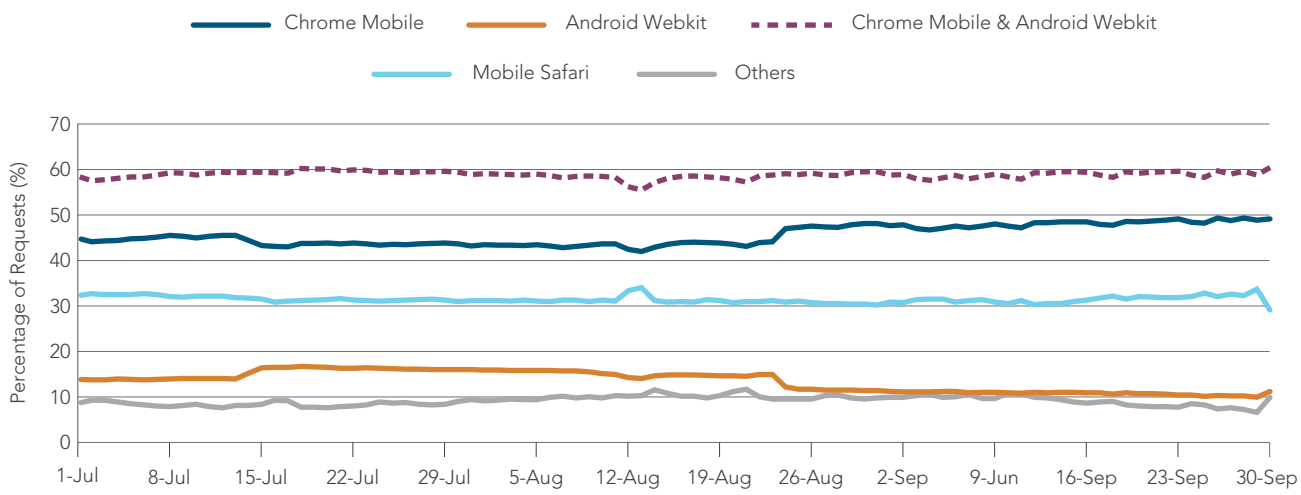


Figure 39: Leading Mobile Browsers Seen Across Cellular Networks, Q3 2016

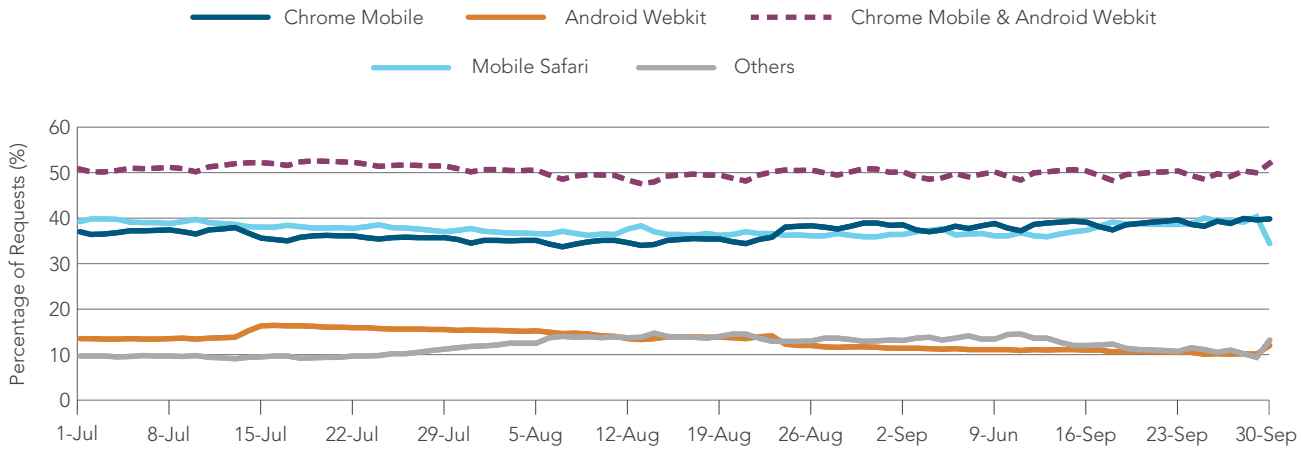


Figure 40: Leading Mobile Browsers Seen Across All Networks, Q3 2016

roles reversed several times during the quarter, ending with the two virtually neck-and-neck. At the start of the quarter, Mobile Safari usage was 2 percentage points higher than Chrome Mobile, and it ended less than one point higher at the end of the quarter. Chrome Mobile began the quarter with a 23.5 percentage-point lead over Android Webkit and ended nearly 29.5 points ahead, continuing the previous quarter's trend. Most of this change was due to Webkit's downward trend.

In comparing platforms, iOS started the third quarter with a 12 percentage-point deficit compared with Android and ended it with more than a 10-point deficit. Averaged across the third quarter, iOS accounted for just over 38% of requests while Android accounted for 51% of requests.

8.3 Mobile Traffic Growth Observed by Ericsson / In mobile networks, the access medium (spectrum) is shared by different users in the same cell. It is important to understand traffic volumes and usage patterns in order to enable a good customer experience. Ericsson's presence in more than 180 countries and its customer base representing more than 1,000 networks enable it to measure mobile voice and data volumes. The result is a representative base for calculating world total mobile traffic in 2G, 3G, and 4G networks (not including DVB-H, Wi-Fi, and Mobile WiMAX). These measurements have been performed for several years. It is important to note that the measurements of data and voice traffic in these networks (2G, 3G, 4G/LTE) around the world show large differences in traffic levels between markets and regions and also between operators, due to their different customer profiles.

Mobile data traffic has continued to grow, and Figure 41 shows total global monthly data and voice traffic from the third quarter of 2011 to the third quarter of 2016. It depicts a continued strong increase in data-traffic and voice-traffic growth in the mid-single digits per year. The growth in data traffic is being driven both by increased smartphone subscriptions and a continued increase in average data volume per subscription, fueled primarily by increased viewing of video content. In the third quarter, data traffic grew more than 11% quarter over quarter and more than 51% year over year. Looking at the full five-year period shown in Figure 41, cumulative voice-traffic growth was only 38%, while cumulative data-traffic growth was over 1,450%.

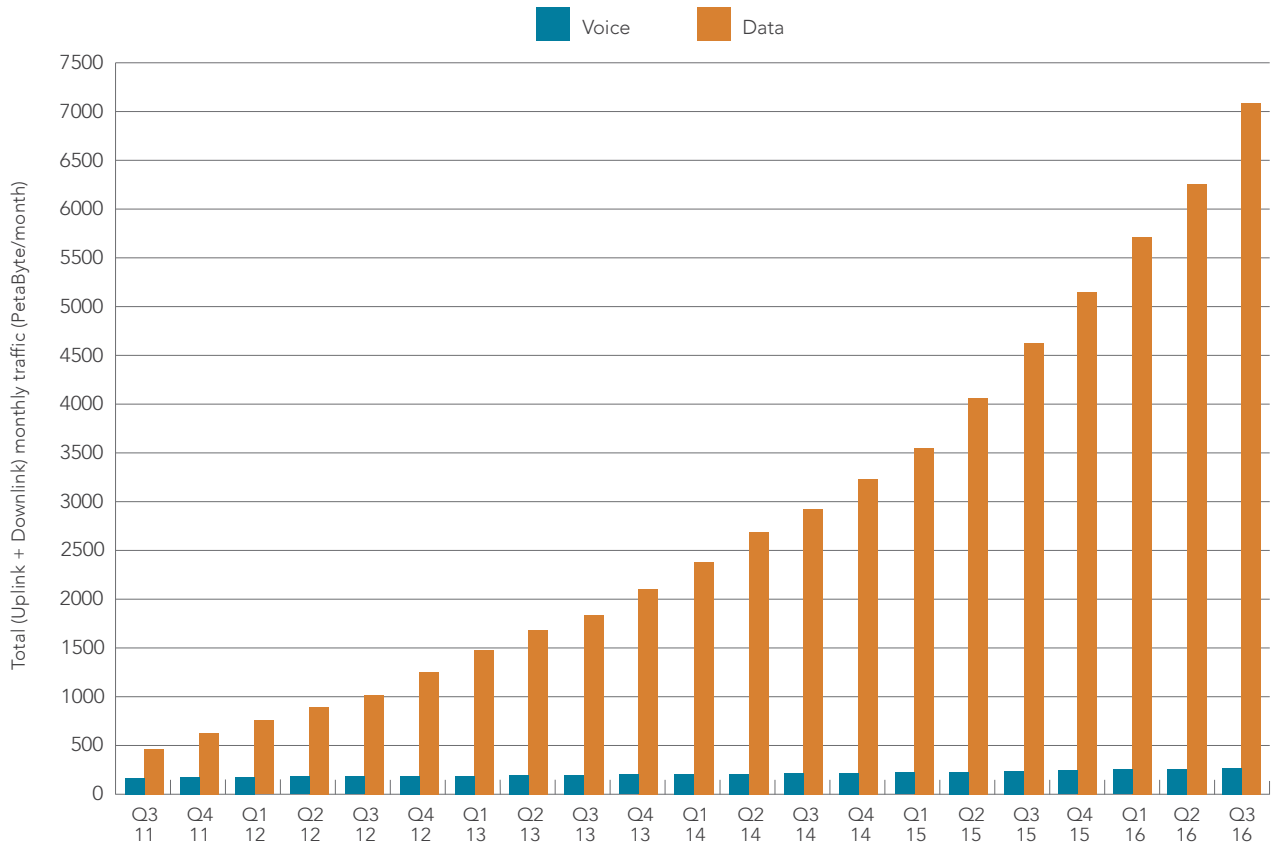


Figure 41: Total Monthly Mobile Voice and Data Traffic as Measured by Ericsson

[SECTION]9 SITUATIONAL PERFORMANCE

The metrics presented here are based on data collected through Akamai's Real User Monitoring (RUM) capabilities, which take passive performance measurements from actual users of a web experience in order to provide insight into performance across devices and networks. RUM is a complementary capability to synthetic testing, and the two can and should be used together to gain a comprehensive picture of user experiences. Note that no personally identifiable information ("PII") is used to generate this data.

Figure 42 shows average page load times for users on both broadband and mobile connections based on RUM data collected by Akamai during the third quarter of 2016. The underlying data was collected using navigation timing[93] (or "navtiming"), which allows JavaScript to collect page load time information directly from the user agent (browser) through an API. Navtiming is supported by most — but not all — of the browsers currently in use.[94] In particular, navtiming is not supported by Safari prior to version 8 on OS X and version 9.0 on iOS,

Android before version 4.0, Internet Explorer before version 9, or any version of the Opera Mini browser, so data from these devices will not be included below.

Beginning with the *Second Quarter, 2016 State of the Internet Report*, the countries/regions covered in this section, along with their categorization, have been aligned with the rest of the *State of the Internet Report*. This section now includes the same countries/regions surveyed in Sections 4 through 7 of this report, categorized in the same way: Americas, Asia Pacific, Europe, and Middle East/Africa.

Countries/regions marked with an asterisk in Figure 42 have not met the minimum requirement of having more than 90,000 measurements from mobile networks during the quarterly data collection period and do not qualify for inclusion. In the third quarter of 2016, 73 of the 74 surveyed countries/regions worldwide qualified for inclusion in this section, with Cyprus being the only exception. The inclusion criteria are subject to change in the future as we expand the scope of RUM measurements included within the *State of the Internet Report*.

In reviewing the average page load time measurements for broadband connections shown in Figure 42, we find the lowest (i.e., fastest page load times) to again be in Israel, with a 1.8-second average load time. The country with the slowest broadband page load time was Venezuela, where pages took 7.0 seconds to load on average — almost four times as long as Israel — a slightly larger multiplier than that seen between the fastest and slowest broadband page load times in the second quarter. Namibia and Nigeria had the next-slowest broadband page load times, at 6.5 and 6.0 seconds respectively. Note that these measurements do not just reflect broadband network speeds but are also influenced by factors such as average page weight, page composition, and the Akamai customer content consumed by users within these countries.

Israel again had the fastest average page load time for mobile networks as well, with pages loading in under 1.0 second. The next-fastest country, Iran, was significantly slower with an average page load time of 2.2 seconds. At the other end of the spectrum, Namibia had the highest average load times for mobile connections at 8.7 seconds, followed by Nigeria and Venezuela at 8.5 and 8.1 seconds respectively. Note again that all of these page load time measurements are affected by average page weight and page composition as well as mobile network speeds and may include content that is mobile-optimized.

In comparing the average broadband page load times to those observed on mobile connections, we again find significant variance in what we have dubbed the "mobile penalty" — that is, the ratio of average page load times on mobile connections versus average load times on broadband connections. As stated previously, this ratio should not be taken as a pure comparison of mobile versus broadband network speeds, as these speeds are just one factor in the overall user experience. Average page weight — which is dependent both on the type of content requested as well as potential mobile-specific content optimizations — is another significant factor.

In the third quarter, the mobile penalty across surveyed countries ranged from 0.5x in Israel to 2.1x in New Zealand, a variance similar to that seen in the previous quarter. Of the 73 qualifying surveyed countries/regions, only six had a mobile penalty lower than 1.0x, meaning that average page load times were faster on mobile connections than on broadband connections. Note that many of the countries with lower mobile penalties are countries which may have underdeveloped fixed broadband infrastructure and depend heavily on mobile; as such, the content its citizens are consuming may also be heavily optimized for the mobile experience, with aggressively slimmed-down content being delivered to mobile devices. On the other end of the spectrum, New Zealand was again the only country to have a mobile penalty above 2.0x, while several countries share the next-highest penalty at 1.6x. The average mobile penalty across all 74 qualifying countries was 1.3x, the same as in the second quarter.

Country/Region	Avg. Page Load Time Broadband (ms)	Avg. Page Load Time Mobile (ms)	Mobile Penalty
AMERICAS			
Argentina	4599	7260	1.6x
Bolivia	5248	5324	1.0x
Brazil	4949	7512	1.5x
Canada	2948	3940	1.3x
Chile	3633	4058	1.1x
Colombia	4283	6036	1.4x
Costa Rica	3372	4853	1.4x
Ecuador	3836	5353	1.4x
Mexico	2886	3403	1.2x
Panama	3419	5141	1.5x
Paraguay	5482	5305	1.0x
Peru	4413	6951	1.6x
United States	2721	3705	1.4x
Uruguay	3918	4615	1.2x
Venezuela	6959	8113	1.2x
ASIA PACIFIC			
Australia	3776	4765	1.3x
China	2645	2392	0.9x
Hong Kong	2385	3680	1.5x
India	4131	5909	1.4x
Indonesia	3829	4836	1.3x
Japan	2108	3368	1.6x
Malaysia	3510	3720	1.1x
New Zealand	2321	4862	2.1x
Philippines	4634	7285	1.6x
Singapore	2198	2788	1.3x
South Korea	2055	3051	1.5x
Sri Lanka	4006	4771	1.2x
Taiwan	2263	3100	1.4x
Thailand	3127	3792	1.2x
Vietnam	3017	4167	1.4x
EUROPE			
Austria	2747	3507	1.3x
Belgium	2353	2775	1.2x
Bulgaria	2325	3614	1.6x
Croatia	2990	4042	1.4x
Cyprus*	3374	4795	1.4x
Czech Republic	1962	2411	1.2x
Denmark	1919	2823	1.5x
Estonia	2297	2972	1.3x
Finland	2740	3826	1.4x
France	3457	3697	1.1x
Germany	2754	2752	1.0x
Greece	3754	4101	1.1x
Hungary	2169	2779	1.3x
Ireland	2581	3299	1.3x
Italy	5312	6636	1.2x
Latvia	2496	3060	1.2x
Lithuania	2254	2981	1.3x
Luxembourg	2717	2892	1.1x
Malta	2887	4645	1.6x
Netherlands	2315	2725	1.2x
Norway	2380	2933	1.2x
Poland	2982	3688	1.2x
Portugal	2759	3766	1.4x
Romania	2426	3597	1.5x
Russia	2571	3028	1.2x
Slovakia	2128	2468	1.2x
Slovenia	2258	3244	1.4x
Spain	3008	3777	1.3x
Sweden	1943	2580	1.3x
Switzerland	2633	2678	1.0x
United Kingdom	2918	3375	1.2x
MIDDLE EAST & AFRICA			
Egypt	3842	3158	0.8x
Iran	3170	2247	0.7x
Israel	1799	982	0.5x
Kenya	5576	7802	1.4x
Kuwait	5078	3262	0.6x
Morocco	4561	4457	1.0x
Namibia	6506	8678	1.3x
Nigeria	6026	8502	1.4x
Qatar	4405	4910	1.1x
Saudi Arabia	3543	3584	1.0x
South Africa	3581	3699	1.0x
Turkey	2815	4110	1.5x
United Arab Emirates	4499	4169	0.9x

Figure 42: Average Page Load Times Based On Real User Monitoring

** Fewer than 90,000 measurements from mobile networks observed in Q3 2016.*

[SECTION]10 INTERNET DISRUPTIONS +EVENTS

Internet disruptions are unfortunately still all too common — occurring in some countries/regions on a frequent basis. These disruptions may be accidental (backhoes or ship anchors severing buried fiber), natural (hurricanes or earthquakes), or political (governments shutting off Internet access in response to unrest or other local events, such as student testing). Because Akamai customer content is consumed by users around the world, the effect of these disruptions is evident in the levels of Akamai traffic delivered to the affected country/region.

The content presented in this section provides insight into how Akamai traffic was impacted by major Internet disruptions and other events during the third quarter of 2016.

10.1 Gabon / Beginning around 8:40 p.m. UTC on August 31, Akamai saw traffic levels to Gabon fall to nearly zero for more than four days (104 hours), as seen in Figure 43. This was the result of a government-controlled Internet shutdown after the highly controversial re-election of President Ali Bongo sparked massive protests in which hundreds were detained and three were killed.[95] Following this prolonged Internet shutdown — which was condemned by the UN Secretary General — the government began instituting an unprecedented "Internet curfew" — an Internet blackout running roughly from 6 p.m. to 6 a.m. local time (5 a.m. to 5 p.m. UTC).[96] The suspected rationale behind the curfew was to allow businesses to continue to function during the work day, while dampening the spread of news and hindering the organization of protests after work hours. Some reports also noted that social media sites were sometimes also blocked during the day when other connectivity was present. The curfew lasted for 23 nights, from September 5 to September 28, as seen below and corroborated by Dyn Research.[97]

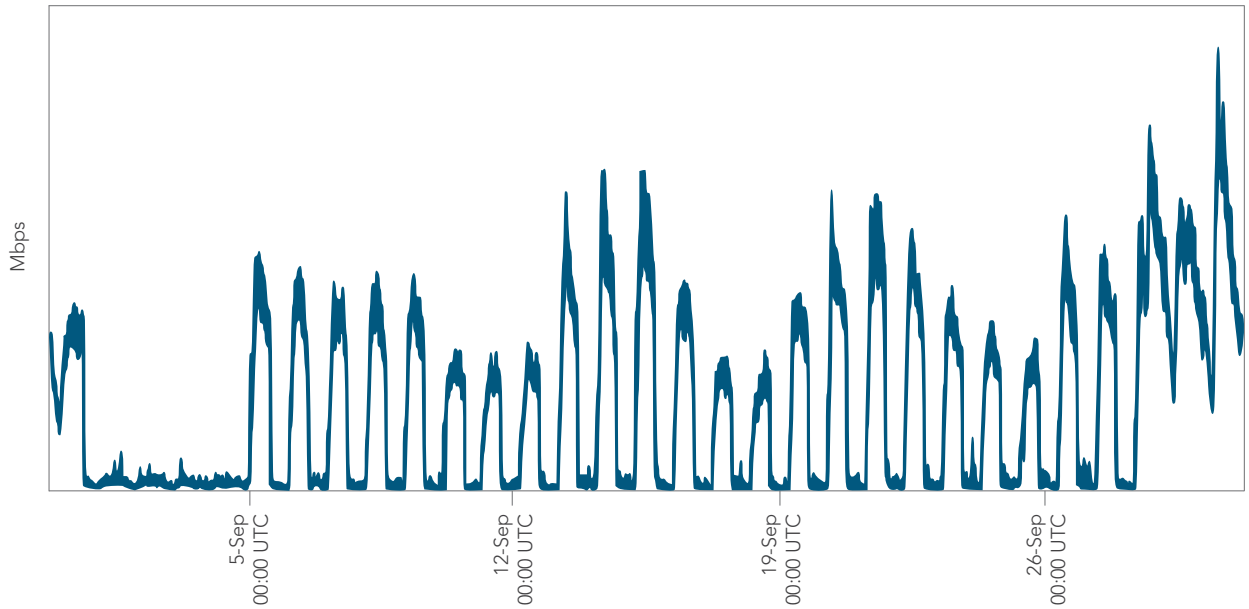


Figure 43: Akamai Traffic to Gabon, August 31 – September 30, 2016

10.2 Iraq / Similar to many previous quarters, in the third quarter of 2016, Akamai saw significant drops in traffic to Iraq on several dates. On July 15 at approximately 3:45 a.m. UTC, Akamai-delivered traffic to Iraq fell to roughly 15% of previous levels, as seen in Figure 44. Levels stayed suppressed until approximately 7:20 a.m. UTC before returning to normal. The Iraqi government is reported to have shut down Internet access throughout the country — except in the independent region of Kurdistan — following protests in which thousands marched in Baghdad against government corruption.[98] The other outages shown in Figure 44 — including the eight days from August 15 to August 23 as well as Sept 29 — reflect a continuation of the Iraqi government's policy of blocking Internet access across the

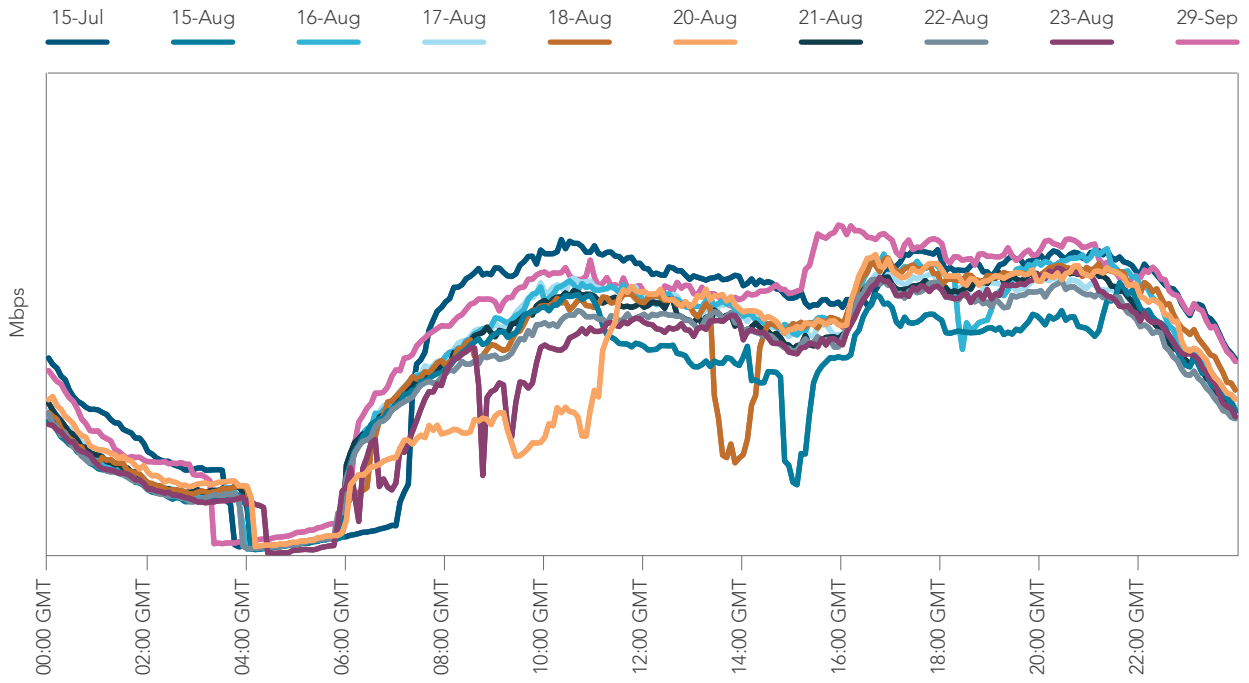


Figure 44: Akamai Traffic to Iraq, multiple days in July/August/September 2016

country (again, with the exception of Kurdistan) during middle and high school exams to prevent cheating. Dyn Research confirms the outages, noting the specific exams taking place on each date.[99] These extreme measures have also been discussed in several previous issues of the *State of the Internet Report*.

10.3 Libya / On July 19 and July 20 from approximately 3:40 a.m. to 6:25 a.m. UTC, Akamai saw traffic levels to Libya drop to less than one-tenth of normal levels, as shown in Figure 45. Dyn Research corroborated the outage, the cause of which is unknown; however, the local telecommunications company reported the issue as an act of sabotage and vandalism.[100]

10.4 Puerto Rico / At approximately 6:30 p.m. UTC on September 21, Akamai saw traffic levels to Puerto Rico fall suddenly to less than one-fifth of previous levels, as shown in Figure 46. Traffic levels remained low throughout the following day, appearing to recover somewhat but remaining suppressed towards the latter half of September 22 before recovering more fully on September 23. The drop in traffic was a result of a widespread power outage, as a fire at a local power plant caused a loss in service for about 1.5 million people across several towns on the island.[101] Although the fire was extinguished within hours, it took several days to restore power throughout the island.[102]

10.5 Sudan / As seen in Figure 47, Akamai traffic levels in Sudan saw a sudden drop to one-fourth their previous levels at approximately 5:20 a.m. UTC on August 2. Although traffic levels began climbing immediately after the drop, they remained lower than usual until about 8:50 a.m., when they suddenly jumped back to normal levels. Dyn Research noted that Sudatel, a major and partly government-owned telecommunications provider in Sudan, went offline during this period, taking down 72% of Internet routes in the country.[103]

10.6 Syria / Syria is no stranger to Internet outages, many of which have been reported on in previous *State of the Internet Reports*. As shown in the *Second Quarter, 2016 State of the Internet Report*, multi-hour outages, occurring primarily between the hours of 2:00 a.m. and 6:00 a.m. UTC, were seen during 8 days in June, but the cause was unknown at the time. Figure 48 shows a similar pattern across nine dates in late July and early August, with Akamai seeing traffic levels in Syria drop to zero from 1 a.m. to 5 a.m. UTC on each of the 9 dates: July 31 and August 1, 2, 4, 7, 9, 10, and 11. According to Dyn Research, the four-hour blackouts are reportedly followed by three hours of mobile network blackouts. Similar to what has been taking place in Iraq in recent quarters, the Syrian government has purportedly ordered the nationwide Internet shutdowns to prevent cheating on national high school exams. The four-hour Internet outage occurs during exam distribution time to prevent questions from being leaked, while the subsequent three-hour mobile outage occurs during test-taking time itself to prevent students from cheating during the exams.[104]

10.7 Summer Olympic Games / The Summer Olympic Games were held in Rio de Janeiro, Brazil in August 2016. The data provided below is based on traffic delivered by Akamai on behalf of approximately 50 customers holding broadcast rights in approximately 60 countries around the world. An aggregate of 258 Petabytes (PB) of traffic was delivered, the equivalent of 1.25 Tbps of traffic nonstop for the full 19-day duration of the games.

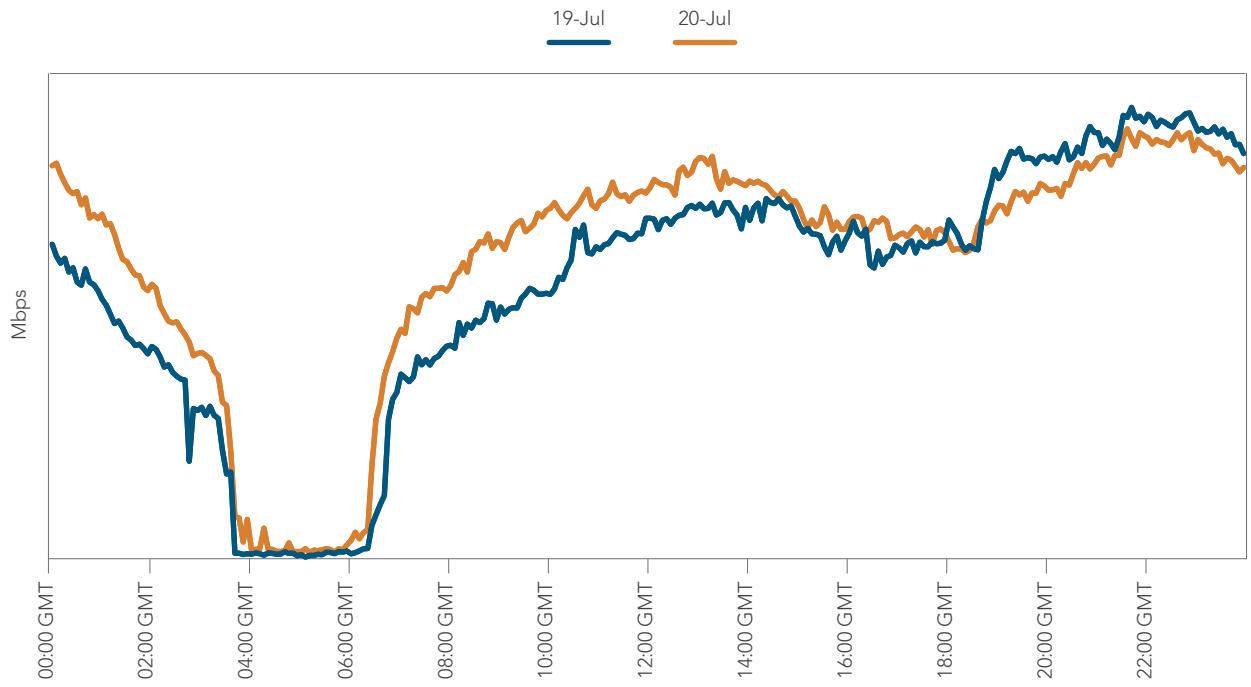


Figure 45: Akamai Traffic to Libya, July 19 & 20, 2016

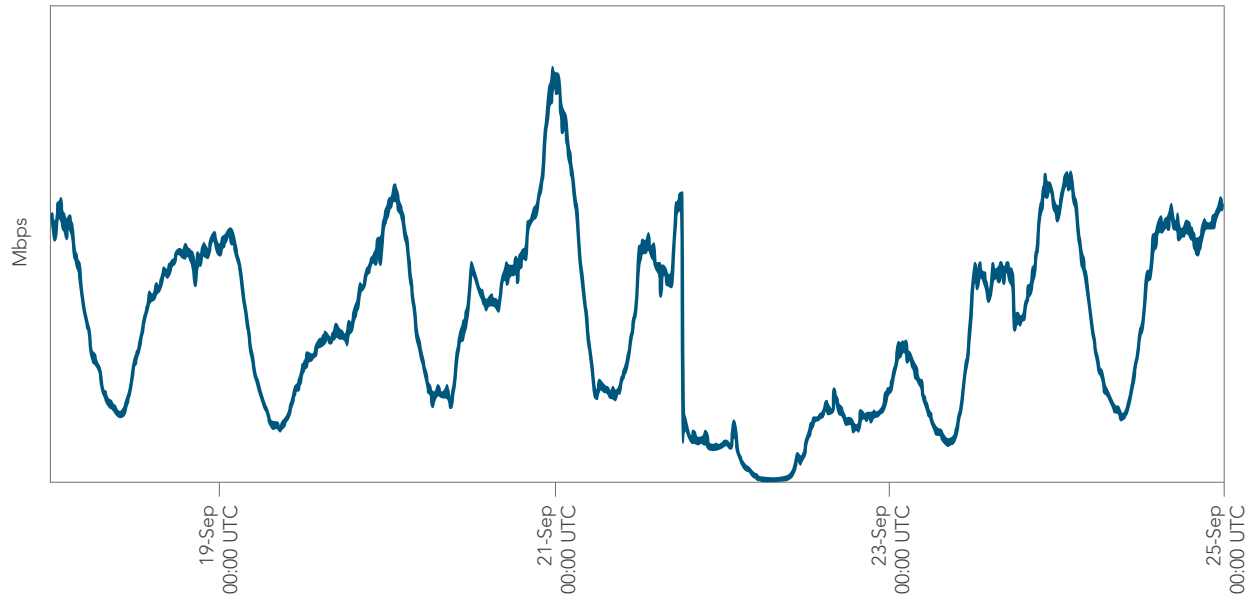


Figure 46: Akamai Traffic to Puerto Rico, September 18–25, 2016

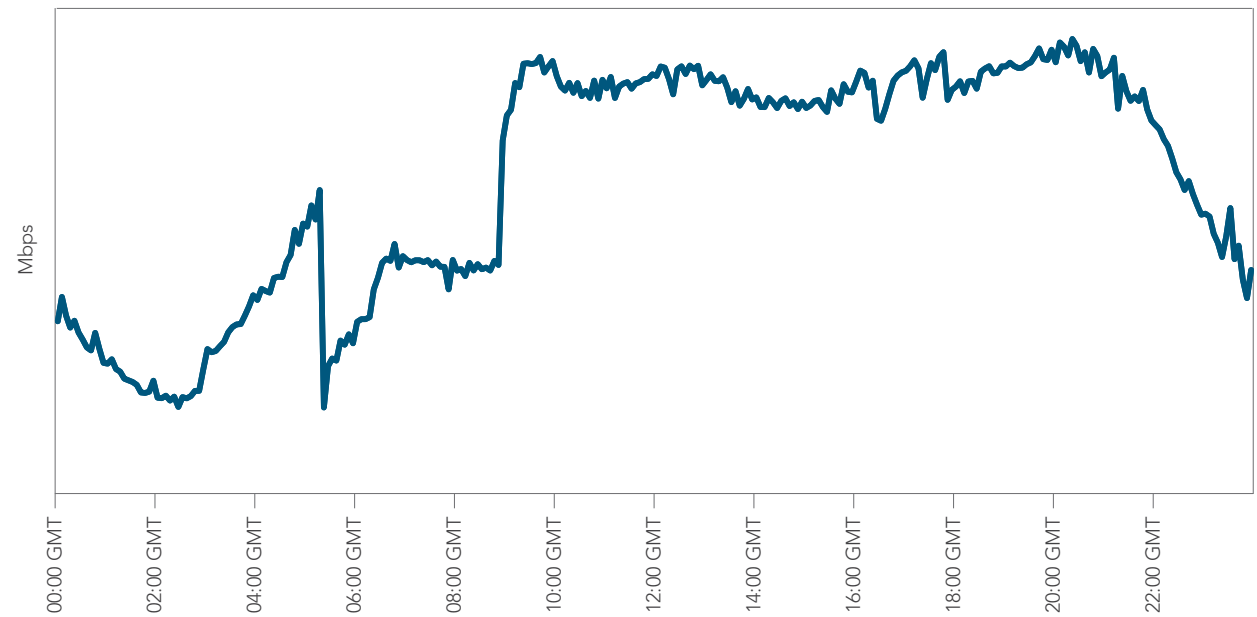


Figure 47: Akamai Traffic to Sudan, August 2, 2016

The average bitrate across the video delivered by Akamai was 2.6 Mbps, up from an average of 1.8 Mbps for the 2014 Olympics in Sochi and more than double the 1.2 Mbps average from the 2012 Olympics in London. By Day 5 (August 10), traffic for the summer games exceeded the entirety of the 2014 winter games, highlighting that the amount of content viewed online as primary or secondary screens has continued to increase at an aggressive pace over the last two years, as has the quality of the video being delivered.

As Figure 49 shows, peak event-related streaming traffic levels ramped quickly after the Opening Ceremonies on August 5 and hit their highest point on Day 4 (August 9), at 4.53 Tbps. Events that day included[105] the early exit of Serena Williams in the Women's Singles Tennis event, losing to Ukraine's Elina Svitolina, Team USA winning the gold medal in Women's Gymnastics, Michael Phelps winning his 20th and 21st gold medals in the Men's 200-meter Butterfly and the 4x200 Freestyle Relay, and Katie Ledecky winning a gold medal

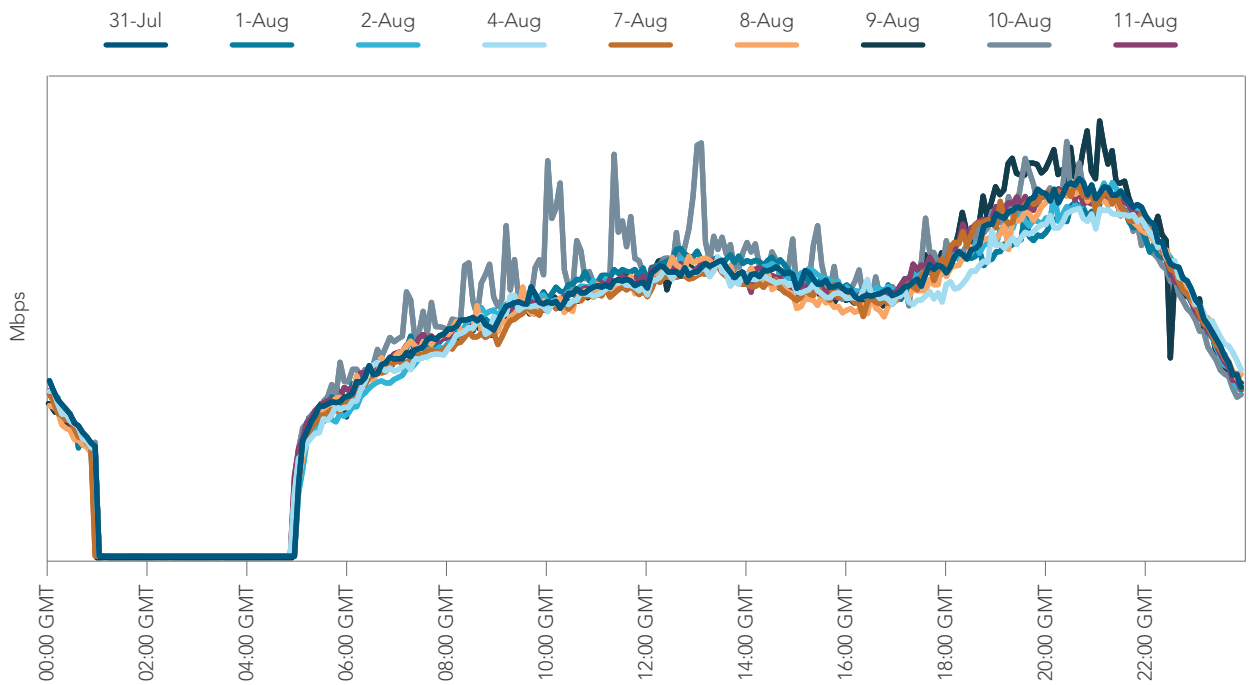


Figure 48: Akamai Traffic to Syria, multiple days in July & August 2016

in the Women's 200-meter Freestyle. Peak traffic levels on August 12 and 15 approached, but fell short of, the traffic seen on August 9. (Note that Figure 49 does not show the full 4.53 Tbps peak traffic level on August 9 due to hourly granularity of the underlying data used to produce the graph.)

Additional statistics about traffic for the Brazil games on the Akamai Intelligent Platform can be found at ***https://www.akamai.com/everysecondcounts.***

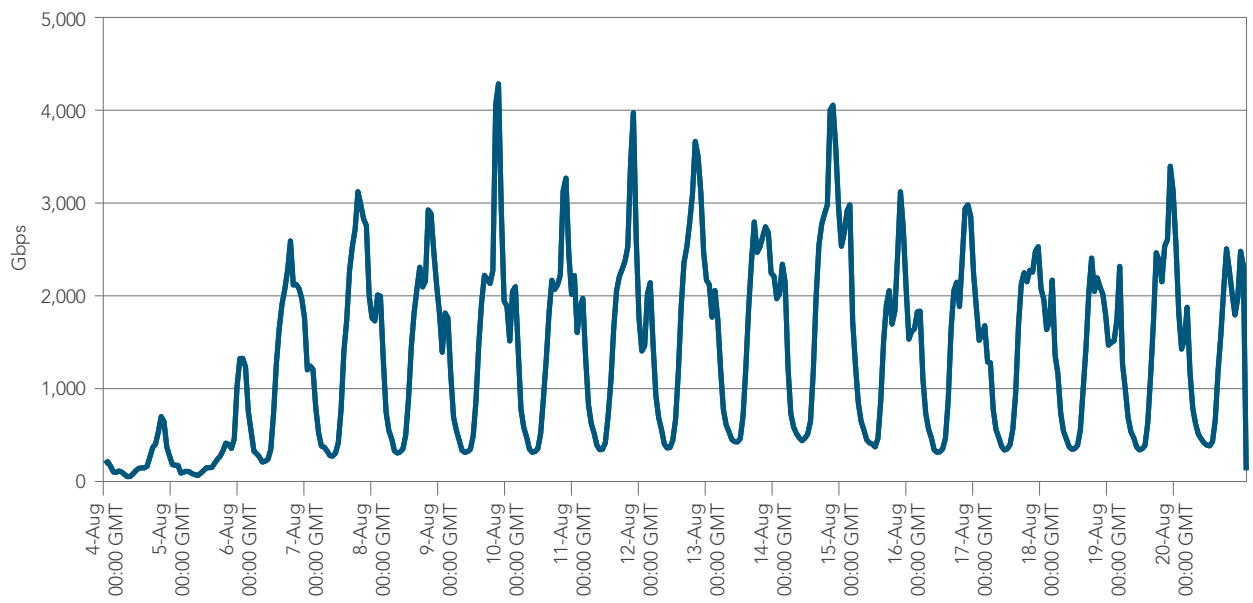


Figure 49: Akamai traffic volumes associated with Rio 2016 streaming video

Region	Unique IPv4 Addresses	Average Connection Speed (Mbps)	Average Peak Connection Speed (Mbps)	% Above 4 Mbps	% Above 10 Mbps	% Above 15 Mbps
AMERICAS						
Argentina	8,590,991	5.0	31.3	50%	6.7%	1.5%
Bolivia	578,297	2.4	13.8	7.1%	0.5%	0.2%
Brazil	49,006,468	5.5	34.4	52%	10%	2.9%
Canada	15,551,765	13.8	62.0	88%	52%	31%
Chile	4,675,852	7.3	51.2	77%	18%	6.3%
Colombia	9,682,782	4.8	23.9	51%	4.2%	1.2%
Costa Rica	517,206	3.9	19.5	34%	2.3%	0.6%
Ecuador	754,426	5.2	32.8	54%	6.2%	1.7%
Mexico	13,876,394	7.2	35.6	77%	17%	4.6%
Panama	529,448	5.2	22.8	53%	7.2%	2.1%
Paraguay	351,851	1.7	8.5	4.3%	0.2%	0.1%
Peru	1,030,340	5.3	35.9	59%	7.3%	1.9%
United States	138,195,375	16.3	70.8	88%	61%	39%
Uruguay	990,855	7.0	61.1	74%	17%	5.4%
Venezuela	2,771,870	1.8	11.1	3.4%	0.2%	0.1%
ASIA PACIFIC						
Australia	10,160,007	9.6	46.9	77%	28%	14%
China	122,293,850	5.7	34.4	67%	7.1%	1.0%
Hong Kong	3,143,314	20.1	116.2	93%	67%	49%
India	18,267,607	4.1	27.0	30%	6.6%	2.6%
Indonesia	3,003,754	6.4	99.3	69%	12%	3.1%
Japan	45,514,634	18.0	88.1	92%	68%	46%
Malaysia	1,994,371	7.5	51.7	68%	22%	7.5%
New Zealand	2,105,922	11.3	55.9	89%	37%	19%
Philippines	1,485,506	4.2	32.8	29%	5.4%	2.4%
Singapore	1,820,226	18.2	162.0	93%	67%	46%
South Korea	25,341,547	26.3	114.2	97%	78%	61%
Sri Lanka	164,222	6.0	42.2	81%	9.4%	2.5%
Taiwan	9,940,964	14.9	88.2	92%	55%	31%
Thailand	3,098,819	11.7	75.3	95%	46%	20%
Vietnam	7,682,257	6.3	39.2	70%	11%	2.6%
EUROPE						
Austria	3,180,932	12.7	49.3	91%	40%	21%
Belgium	4,922,482	15.5	70.9	93%	64%	38%
Bulgaria	1,673,343	15.5	60.0	96%	63%	39%
Croatia	1,604,324	7.8	40.6	83%	18%	5.8%
Cyprus	377,186	6.7	30.1	75%	12%	4.2%
Czech Republic	1,848,142	15.9	62.3	87%	50%	30%

Region	Unique IPv4 Addresses	Average Connection Speed (Mbps)	Average Peak Connection Speed (Mbps)	% Above 4 Mbps	% Above 10 Mbps	% Above 15 Mbps
Denmark	3,079,819	16.6	59.2	94%	60%	39%
Estonia	546,035	11.2	54.3	86%	39%	19%
Finland	2,642,580	17.6	58.8	92%	60%	37%
France	30,734,190	9.7	42.2	75%	27%	14%
Germany	36,982,426	13.7	55.5	89%	47%	27%
Greece	3,388,858	6.9	31.3	81%	10%	3.0%
Hungary	2,838,952	13.2	65.3	93%	50%	27%
Ireland	2,169,878	14.0	62.0	81%	45%	29%
Italy	16,539,932	8.2	38.9	79%	19%	8.0%
Latvia	816,292	16.9	79.2	94%	61%	40%
Lithuania	1,343,965	14.3	51.8	91%	50%	31%
Luxembourg	176,006	10.5	66.0	89%	31%	15%
Malta	179,440	12.1	57.2	96%	48%	23%
Netherlands	9,117,075	17.3	71.3	95%	65%	41%
Norway	3,264,268	20.0	65.4	91%	64%	48%
Poland	7,675,461	11.7	54.8	88%	39%	21%
Portugal	3,722,579	12.6	54.7	87%	47%	29%
Romania	3,584,775	14.9	85.0	94%	59%	37%
Russia	19,077,529	11.6	64.2	89%	46%	22%
Slovakia	1,029,026	12.1	54.4	84%	33%	18%
Slovenia	1,135,216	14.1	51.2	85%	41%	24%
Spain	15,851,394	14.5	72.0	90%	52%	33%
Sweden	6,029,970	19.7	79.0	93%	60%	43%
Switzerland	3,662,719	18.4	75.2	93%	64%	42%
United Kingdom	30,947,119	14.9	62.9	90%	53%	35%
MIDDLE EAST & AFRICA						
Egypt	9,814,088	2.7	13.2	9.0%	4.7%	2.7%
Iran	8,527,285	3.7	16.9	39%	0.4%	<0.1%
Israel	2,338,181	12.8	70.2	94%	46%	24%
Kenya	2,598,320	11.0	27.3	79%	41%	24%
Kuwait	698,320	8.0	67.6	48%	9.7%	6.6%
Morocco	4,586,482	4.7	21.6	52%	3.5%	0.8%
Namibia	224,638	2.5	14.1	14%	1.1%	0.2%
Nigeria	227,225	3.0	24.6	18%	1.1%	0.4%
Qatar	329,492	10.9	94.3	83%	43%	20%
Saudi Arabia	4,121,839	4.9	39.6	52%	4.9%	1.4%
South Africa	6,194,610	6.0	29.8	42%	9.7%	5.8%
Turkey	8,737,218	6.7	39.6	74%	13%	4.0%
United Arab Emirates	1,462,914	8.3	67.6	91%	22%	6.2%

[1] *http://www.potaroo.net/tools/ipv4/*

[2] *https://www.apnic.net/events/apnic-speakers/geoff-huston*

[3] *https://twitter.com/IPv4Countdown/status/780293480044199936*

[4] *http://www.whois.com/whois/35.160.0.0*

[5] *http://www.whois.com/whois/34.192.0.0*

[6] *http://www.networkcomputing.com/networking/arin-ipv4-depletion-aftermath/972365998?_mc=sm_nwc_editor_marciasavage&hootPostID=4a5c716d4f5b22241aafab9702e1eb37*

[7] *http://ipv4marketgroup.com/q42016-update/, http://avenue4llc.com/q3-2016-market-report/*

[8] *http://www.theregister.co.uk/2016/06/16/ipv4_hijacking/*

[9] *http://www.whois.com/whois/154.192.0.0*

[10] *http://www.whois.com/whois/196.160.0.0*

[11] *http://www.whois.com/whois/154.224.0.0*

[12] *http://www.worldipv6launch.org/major-mobile-us-networks-pass-50-ipv6-threshold/*

[13] *http://www.fiercecable.com/cable/comcast-50-percent-our-traffic-will-be-ipv6-enabled-by-end-2016*

[14] *https://corporate.sky.com/media-centre/news-page/2016/sky-completes-roll-out-of-ipv6-becoming-the-first-major-uk-internet-provider-to-future-proof-its-service-for-customers*

[15] *http://www.itnews.com.au/news/telstra-activates-ipv6-addressing-for-mobile-network-437009*

[16] *http://www.crainscleveland.com/article/20160816/NEWS/160819864/att-launches-gigabit-speed-fiber-internet-service-in-northeast-ohio*

[17] *http://finance.yahoo.com/news/t-expands-access-gigabit-speeds-204300858.html*

[18] *http://bbpmag.com/wordpress2/2016/08/cox-launches-gigablast-in-wichita/*

[19] *http://bbpmag.com/wordpress2/2016/08/wow-announces-1-gig-availability-in-five-national-markets/*

[20] *http://www.dslreports.com/shownews/Ting-to-Bring-Gigabit-Speeds-to-Centennial-Colorado-137937*

[21] *http://corporate.comcast.com/news-information/news-feed/comcast-to-deliver-gigabit-internet-service-over-its-existing-network-infrastructure-chicago-area-trial-begins-today*

[22] *http://www.capacitymedia.com/Article/3581272/Google-Fiber-lands-in-Salt-Lake-City.html*

[23] *http://wraltechwire.com/google-fiber-goes-live-in-morrisville-more-triangle-access-coming/16009787/*

[24] *http://www.ocregister.com/articles/google-724326-irvine-fiber.html*

[25] *http://www.wsj.com/articles/googles-high-speed-web-plans-hit-snags-1471193165*

[26] *http://www.businessinsider.com/google-fiber-new-fcc-filing-expanding-wireless-tests-2016-8*

[27] *http://www.startlandnews.com/2016/09/kansas-city-become-gigabit-testbed-first-u-s-infrastructure/*

[28] *http://fm.kuac.org/post/feds-offer-1-billion-improve-broadband-access-rural-remote-alaskan-communities*

[29] *http://www.sonomacountygazette.com/cms/pages/sonoma-county-news-article-5624.html*

[30] *http://www.bostonglobe.com/business/2016/08/22/state-pay-comcast-for-more-rural-broadband/Zb8bq4q5qGlpKfQ0RErgDHM/story.html*

[31] *http://www.govtech.com/network/West-Virginia-Broadband-Enhancement-Council-Chairman-Seeks-Gigabit-Internet-Statewide.html*

[32] *http://host.madison.com/wsj/news/local/govt-and-politics/citywide-broadband-service-could-cost-over-million-study-says/article_02a076fc-8664-558d-947e-9f4dbd43ece4.html*

[33] *http://www.telecompetitor.com/report-global-broadband-subscribers-will-exceed-one-billion-by-2020/*

[34] *https://www.telegeography.com/products/commsupdate/articles/2016/09/08/big-three-extend-ftth-coverage-to-704m-chinese-homes/*

[35] *http://www.oxfordbusinessgroup.com/news/philippines-aims-fast-track-national-broadband*

[36] *http://www.submarinenetworks.com/systems/trans-pacific/faster/faster-cable-system-is-ready-for-service*

[37] *http://www.submarinenetworks.com/systems/trans-pacific/faster/faster-taiwan-extension-ready-for-service*

[38] *http://thenextweb.com/google/2016/09/27/google-wants-to-bring-wi-fi-to-public-spaces-across-the-world-with-its-new-initiative/*

[39] *http://www.zdnet.com/article/chorus-announces-gigabit-speed-broadband-across-new-zealand,*
http://www.scoop.co.nz/stories/BU1609/S00283/myrepublic-launches-nationwide-gigabit-fibre.htm

[40] *http://www.zdnet.com/article/kiwis-to-see-free-upgrades-from-200mbps-plans-to-1gbps/#ftag=RSSbaffb68*

[41] *http://www.zdnet.com/article/kiwis-to-see-free-upgrades-from-200mbps-plans-to-1gbps/#ftag=RSSbaffb68*

[42] *http://www.afr.com/business/telecommunications/australias-internet-moves-into-the-slow-lane-20160923-grmqvt*

[43] *http://www.ispreview.co.uk/index.php/2016/09/eu-confirms-goal-universal-100mbps-broadband-2025.html*

[44] *https://ec.europa.eu/digital-single-market/en/news/factsheet-wifi4eu*

[45] *http://www.reuters.com/article/us-germany-broadband-idUSKCN0ZH4PR*

[46] *http://www.capacitymedia.com/Article/3573708/Fastweb-and-Telecom-Italia-to-build-wholesale-FTTH-network.html*

[47] *http://www.capacitymedia.com/Article/3574155/Vodafone-Spain-launches-indirect-fibre-to-42m-homes.html*

[48] *http://www.computerweekly.com/news/450305169/Business-secretary-calls-for-national-broadband-upgrade*

[49] *http://www.ispreview.co.uk/index.php/2016/09/scotland-starts-planning-30mbps-broadband-2021-goal.html*

[50] *http://www.theregister.co.uk/2016/08/29/is_ireland_outpacing_blighty_for_broadband/*

[51] *http://www.ispreview.co.uk/index.php/2016/08/b4sw-start-roll-1gbps-fttp-broadband-south-westmorland.html*

[52] *http://www.ispreview.co.uk/index.php/2016/08/worcestershire-uk-achieve-90-coverage-superfast-broadband.html*

[53] *http://www.ispreview.co.uk/index.php/2016/07/north-yorkshire-uk-sets-revised-superfast-broadband-plan.html*

[54] *http://www.capacitymedia.com/Article/3587514/SIRO-invests-40m-to-boost-Irish-fibre-rollout.html*

[55] *http://www.ispreview.co.uk/index.php/2016/09/bt-reveal-massive-uk-g-fast-pilot-lr-vdsl-broadband-trial-areas.html*

[56] *http://www.capacitymedia.com/Article/3569624/Thirty-more-UK-communities-get-ultrafast-FTTH.html*

[57] *http://www.ispreview.co.uk/index.php/2016/08/wessex-internets-superfast-broadband-covers-119-villages-england.html*

[58] *http://www.ispreview.co.uk/index.php/2016/08/cityfibre-begin-delayed-build-glasgows-gigabit-fttp-broadband-network.html*

[59] *http://www.ispreview.co.uk/index.php/2016/09/ms3-confirm-first-trial-areas-ultrafast-ftth-broadband-hull-uk.html*

[60] *http://www.ispreview.co.uk/index.php/2016/09/cityfibre-deploys-gigabit-fttp-broadband-network-northampton-uk.html*

[61] *http://www.ispreview.co.uk/index.php/2016/09/ms3-confirm-first-trial-areas-ultrafast-ftth-broadband-hull-uk.html*

[62] *http://www.capacitymedia.com/Article/3571462/UKs-Hyperoptic-to-expand-1Gbps-FTTP-network.html*

[63] *http://www.ispreview.co.uk/index.php/2016/07/first-customers-live-bristols-new-10gbps-fibre-optic-network.html*

[64] *http://www.capacitymedia.com/Article/3572305/Ooredoo-launches-new-Asia-Africa-Europe-subsea-cable.html*

[65] *http://www.capacitymedia.com/Article/3573000/Mobily-launches-AAE1-in-Jeddah.html*

[66] *http://www.capacitymedia.com/Article/3568815/Intelsat-and-AfricaOnline-partner-for-broadband-in-the-sub-Saharan.html*

[67] *http://www.capacitymedia.com/Article/3581029/Intelsat-plans-broadband-over-Africa-by-November-from-new-satellite.html*

[68] *http://www.capacitymedia.com/Article/3575363/Zimbabwe-minister-wins-China-loan-for-national-broadband.html?utm_source=Editor%27s%20Newsletter&utm_medium=email%20editorial&utm_content=Editorial&utm_campaign=636056494804819167&utm_term=Zimbabwe%20minister%20wins%20China%20loan%20for%20national%20broadband*

[69] *http://www.capacitymedia.com/Article/3573371/TelOne-announces-25m-FTTH-project-in-Zimbabwe.html*

[70] *http://www.buddeblog.com.au/frompaulsdesk/mauritius-telecom-to-fast-track-national-fibre-coverage-by-2017*

[71] *http://www.capacitymedia.com/Article/3584379/LTE-penetration-in-North-America-hits-60-of-users.html*

[72] *http://www.buddeblog.com.au/frompaulsdesk/australias-mvnos-now-accessing-the-worlds-fastest-lte-networks/*

[73] *http://www.zdnet.com/article/4g-now-connects-52-percent-of-australian-mobile-users/*

[74] *http://www.capacitymedia.com/Article/3575374/Globe-promises-95-Philippines-mobile-broadband-coverage-by-end-of-2018.html?utm_source=Editor%27s%20Newsletter&utm_medium=email%20editorial&utm_content=Editorial&utm_campaign=636056494804819167&utm_term=Globe%20promises%2095%25%20Philippines%20mobile%20broadband%20coverage%20by%20end%20of%202018*

[75] *http://www.capacitymedia.com/Article/3585509/Commission-president-calls-for-Europe-wide-5G-launch-in-2020.html*

[76] *http://www.capacitymedia.com/Article/3578620/Vodafone-NZ-to-boost-4G-rural-wireless-speeds-to-30Mbps.html*

[77] *http://www.capacitymedia.com/Article/3580538/Nokia-and-Ooredoo-launch-4G-service-in-Myanmar.html?utm_source=Editor%27s%20Newsletter&utm_medium=email%20editorial&utm_content=Editorial&utm_campaign=636075510537889516&utm_term=Nokia%20and%20Ooredoo%20launch%204G%20service%20in%20Myanmar*

[78] *http://www.verizon.com/about/news/mobile-users-461-cities-today-get-50-percent-faster-peak-speeds-no-extra-cost-introducing*

[79] *http://www.capacitymedia.com/Article/3583408/Megafon-launches-LTE-Advanced-servicesin-Krasnodar.html*

[80] *http://www.capacitymedia.com/Article/3584862/Bahrains-Menatelecom-in-LTE-A-broadband-upgrade.html*

[81] *http://www.ispreview.co.uk/index.php/2016/09/ee-uk-deploys-4g-mobile-speed-boost-450mbps-cat-9-lte-tech.html*

[82] *http://www.capacitymedia.com/Article/3584049/EE-launches-next-phase-of-its-UK-4G-network.html*

[83] *http://www.capacitymedia.com/Article/3578316/Sprint-pushes-mobile-download-speeds-to-295Mbps-in-lab-tests.html*

[84] *http://thenextweb.com/mobile/2016/09/06/t-mobile-boosting-lte-speeds-400-mbps-soon/*

[85] *http://www.capacitymedia.com/Article/3575974/NTT-expands-Japanese-LTE-Network.html*

[86] *http://www.zdnet.com/article/telstra-ericsson-qualcomm-attain-1gbps-aggregate-speeds-in-live-4g-network-test/*

[87] *http://www.capacitymedia.com/Article/3585226/Deutsche-Telekom-pushes-LTE-speed-to-12Gbps-with-Huawei.html*

[88] *https://www.cnet.com/news/verizon-to-hold-worlds-first-crazy-fast-5g-wireless-field-tests-next-year/*

[89] *http://arstechnica.com/information-technology/2016/09/atts-airgig-uses-power-lines-for-multi-gigabit-wireless-broadband/*

[90] *http://about.att.com/newsroom/att_to_test_delivering_multi_gigabit_wireless_internet_speeds_using_power_lines.html*

[91] *http://www.capacitymedia.com/Article/3587792/Ericsson-hits-12Gbps-download-speeds-in-5G-tests-with-T-Mobile.html*

[92] *http://www.capacitymedia.com/Article/3585509/Commission-president-calls-for-Europe-wide-5G-launch-in-2020.html*

[93] *http://www.w3.org/TR/navigation-timing/*

[94] *http://caniuse.com/nav-timing*

[95] *http://bigstory.ap.org/article/de6d5bca612a4d95a2f62ac4d4d8b510/gabon-opposition-says-hq-attacked-presidential-guard, http://motherboard.vice.com/read/gabon-internet-censorship-election-outage*

[96] *http://moseskaranja.com/gabon-and-its-invention-of-internet-curfew, http://qz.com/781752/gabon-has-been-imposing-a-12-hour-a-day-internet-curfew-as-its-political-crisis-grows*

[97] *https://twitter.com/dynresearch/status/781483184445882368*

[98] *http://www.techweekeurope.co.uk/cloud/iraq-shuts-down-internet-195163*

[99] *https://twitter.com/DynResearch/status/768191634966216704, https://twitter.com/DynResearch/status/783017734481256448*

[100] *https://twitter.com/DynResearch/status/755396501141094401*

[101] *http://www.nbcnews.com/news/latino/puerto-rico-power-plant-fire-causes-massive-blackout-n652216*

[102] *https://www.washingtonpost.com/world/the_americas/cheers-groans-as-puerto-rico-struggles-with-power-outage/2016/09/24/0bea5886-820c-11e6-9578-558cc125c7ba_story.html*

[103] *https://twitter.com/dynresearch/status/760474263493218304*

[104] *http://www.ibtimes.co.uk/syrias-mysterious-internet-outages-may-have-finally-been-solved-1575750, http://research.dyn.com/2016/08/syria-goes-to-extremes-to-foil-cheaters*

[105] *http://www.usatoday.com/story/sports/olympics/rio-2016/2016/08/10/rio-olympics-day-4-highlights-michael-phelps-gymnastics-serena-williams-nbc/88504896/*

Notes

Editor
David Belson

Design
Shawn Doughty, Creative Direction
Brendan O'Hara, Art Direction/Design

Contact
stateoftheinternet@akamai.com
Twitter: @akamai_soti / @akamai
www.akamai.com/stateoftheinternet

Contributors
Jon Thompson
Jennifer Sun
Richard Möller (Ericsson)
Mathias Sintorn (Ericsson)
Geoff Huston (APNIC)

Akamai FASTER FORWARD

As the global leader in Content Delivery Network (CDN) services, Akamai makes the Internet fast, reliable and secure for its customers. The company's advanced web performance, mobile performance, cloud security and media delivery solutions are revolutionizing how businesses optimize consumer, enterprise and entertainment experiences for any device, anywhere. To learn how Akamai solutions and its team of Internet experts are helping businesses move *faster forward*, please visit *www.akamai.com* or *blogs.akamai.com*, and follow *@Akamai* on Twitter.

Akamai is headquartered in Cambridge, Massachusetts in the United States with operations in more than 57 offices around the world. Our services and renowned customer care are designed to enable businesses to provide an unparalleled Internet experience for their customers worldwide. Addresses, phone numbers and contact information for all locations are listed on *www.akamai.com/locations*.

Akamai FASTER FORWARD