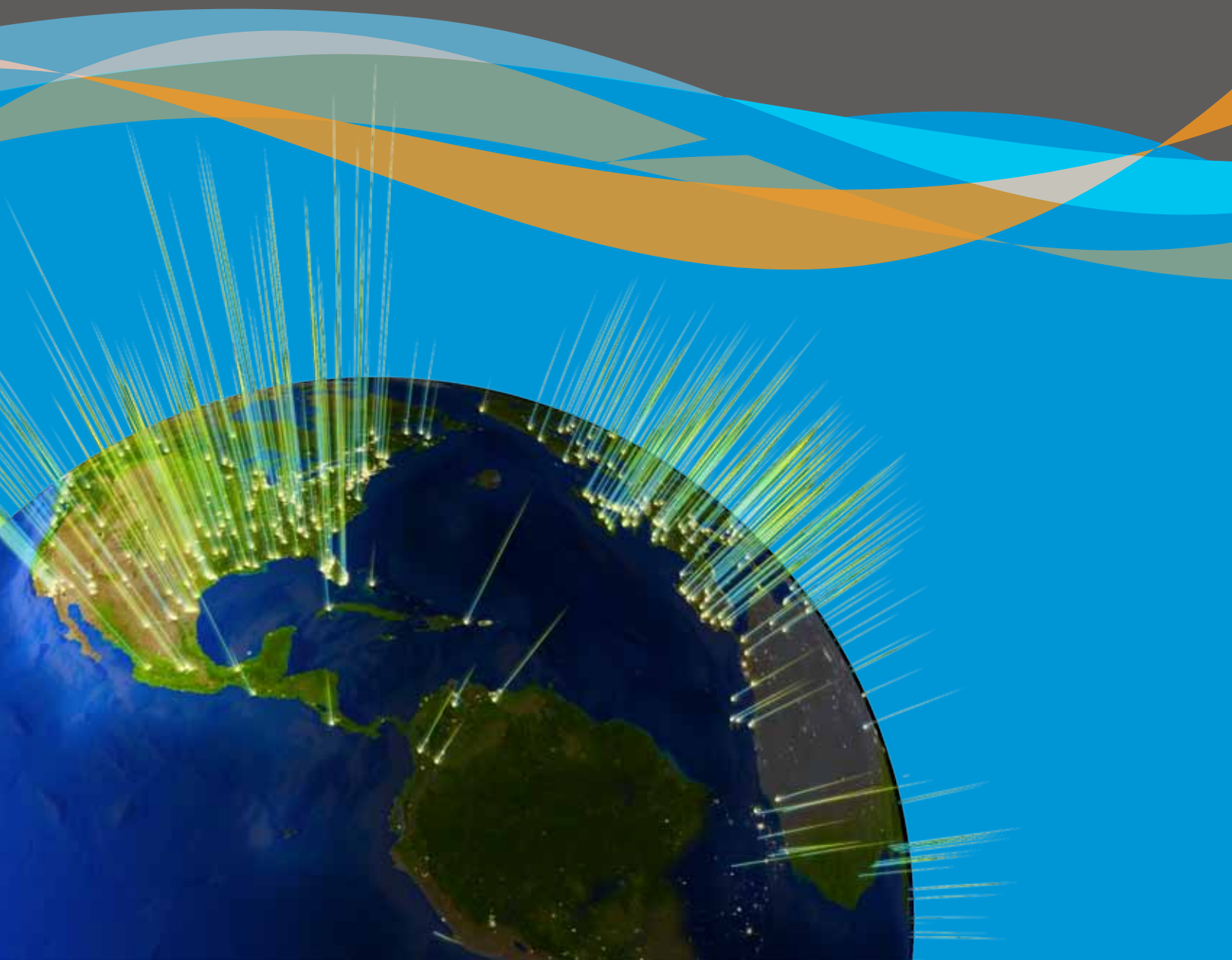
Akamai

Volume 3, Number 2

The State of the Internet

2nd Quarter, 2010 Report



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Executive Summary

Each quarter, Akamai publishes a "State of the Internet" report. This report includes data gathered from across Akamai's global server network about attack traffic, broadband adoption, and mobile connectivity, as well as trends seen in this data over time. Periodically, it also aggregates publicly available news and information about notable events seen throughout the quarter, including Denial of Service attacks, Web site hacks, and network events, including outages and new connections.

During the second quarter of 2010, Akamai observed attack traffic originating from 200 unique countries/regions around the world. The United States was the top attack traffic source, accounting for 11% of observed attack traffic in total. China and Russia held the second and third place spots respectively, accounting for just over 20% of observed attack traffic. Attack traffic concentration was lower in the second quarter, with the top 10 ports seeing just over 86% of the observed attack traffic. Aggregated at a continental level, Europe continued to be responsible for the highest percentage of attacks seen in the second quarter. Port 445 continued to be the most highly targeted port for observed attacks, though attacks targeted at Port 23 (Telnet) and Port 22 (SSH) both grew during the second quarter.

Akamai observed a 2.8% increase (from the first quarter of 2010) globally in the number of unique IP addresses connecting to Akamai's network, pushing past the 500 million mark for the first time. From a global connection speed perspective, South Korea continued to have the highest level of "high broadband" (>5 Mbps) connectivity, with 3 of every 4 connections to Akamai at speeds above 5 Mbps. South Korea also maintained the highest average connection speed, at 17 Mbps (up from 12 Mbps in the first quarter), and recorded the highest average peak[6] connection speed, at 38 Mbps, where the per-IP address peak connection speed was averaged across the IP addresses seen from each country. Cities in South Korea continued to hold many of the top spots in the rankings of highest average and average peak connection speeds by city as well. In the United States, Delaware remained in the top position, with 67% of connections to Akamai occurring at 5 Mbps or greater. Delaware also maintained the highest average connection speed in the United States, though it declined to 7.2 Mbps, and once again recorded the highest average peak connection speed across the United States, at 24 Mbps. Monterey Park, CA was the United States city with the highest average connection speed (6.9 Mbps) and highest average peak connection speed (26 Mbps).

Second quarter attack traffic from known mobile networks was more concentrated than overall observed attack traffic, with half of the observed mobile attacks coming from just the top three countries. Ports targeted by mobile attack traffic were similar to the overall port list, though a higher percentage of attacks targeting Port 445 were observed when looking at just known mobile networks. In the second quarter of 2010, average measured connection speeds on mobile network providers around the world ranged from 6.1 Mbps down to 115 Kbps – once again, both were observed on mobile providers in Slovakia. Of the 109 mobile network providers listed in the report, 95 saw average connection speeds increase in the second quarter. Average peak connection speeds on mobile providers around the world ranged from over 20 Mbps down to just over 700 Kbps. In reviewing content consumption metrics, we found that the amount of content downloaded from Akamai per month per unique IP address showed quarterly growth in 71 of 109 providers, and yearly growth in 85 of those providers.

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Introduction

Akamai's globally distributed network of servers allows us to gather massive amounts of information on many metrics, including connection speeds, attack traffic, and network connectivity/availability/latency problems, as well as traffic patterns on leading Web sites.

In the second quarter of 2010, observed attack traffic continued to target a relatively consistent set of ports, and attacks targeting port 445 continued to be responsible for a significant percentage of the observed attacks, both overall, and for attacks observed to be originating in known mobile networks. The United States was the top source of observed attack traffic, followed closely by China – in aggregate, the two countries were responsible for 22% of observed attack traffic, with the balance originating in a long tail of 198 additional countries/regions. Aggregated at a continental level, Europe was responsible for the highest percentage of observed attacks.

Quarterly growth in the global observed unique IP count continued, up almost 3% from the prior quarter, with over 500 million unique IP addresses making requests to Akamai in the second quarter. Quarterly trending in global average connection speeds was mixed during the second quarter, though quarterly trending in average peak[6] connection speeds was generally positive. The overall global trends for high broadband adoption were generally positive as well, with 1.6x as many countries showing quarterly gains as losses, and 1.7x as many countries showing yearly gains as losses. In looking at broadband adoption levels in the second quarter, 55 countries/regions had broadband adoption levels in excess of 50% -- up from 50 in the prior quarter, and 41 a year earlier. Rates of narrowband adoption were generally lower around the world, with less than five percent of connections to Akamai overall at speeds below 256 Kbps in the second quarter.

In the United States, Delaware continued to maintain its position as the state with the strongest connection speed metrics, placing first for average connection speed (7.2 Mbps) and average peak connection speed (24 Mbps), as well as high broadband (67%) and broadband (98%) adoption.

In response to the growing amount of Internet content being accessed through mobile devices such as smartphones and laptops equipped with mobile broadband connection technologies, and also in response to multiple inquiries for such data, Akamai continues to publish insights into metrics collected from connections to Akamai that have been identified as coming from networks associated with mobile providers. Second quarter attack traffic from known mobile networks was more concentrated than overall observed attack traffic, with half of the observed mobile attacks coming from just the top three countries. Ports targeted by mobile attack traffic were similar to the overall port list, though a higher percentage of attacks targeting Port 445 were observed when looking at just known mobile networks. During the second quarter of 2010, average measured connection speeds on mobile network providers around the world ranged from 6.1 Mbps, down to 115 Kbps – both were observed on mobile providers in Slovakia. Average peak connection speeds on mobile providers around the world ranged from over 20 Mbps down to just over 700 Kbps. Consumption of content from Akamai ranged from close to 15 GB per unique IP per month down to just 14 MB per unique IP per month, nearly a 1000x difference.

Akamai maintains a distributed set of agents deployed across the Internet that serve to monitor attack traffic. Based on the data collected by these agents, Akamai is able to identify the top countries from which attack traffic originates, as well as the top ports targeted by these attacks. (Ports are network layer protocol identifiers.) This section provides insight into Internet attack traffic, as observed and measured by Akamai, during the second quarter of 2010.

2.1 Attack Traffic, Top Originating Countries

During the second quarter of 2010, Akamai observed attack traffic originating from 200 unique countries/regions, up two from the prior quarter. After three consecutive quarters topping the list, Russia fell to third place, generating only 10% of observed attack traffic in the second quarter. As shown in Figure 1, the United States and China moved up to top the list, with both countries originating 11% of observed attack traffic in the second quarter. Taiwan, Brazil, Italy, Germany, Romania, and Japan held steady from quarter-to-quarter, maintaining their placement on the top 10 list, while Turkey replaces Poland in 10th place. Attack concentration among the top 10 countries continued to decline, dropping to 58% in the second quarter.

Once again aggregating the observed attack traffic at a continental level, we find that the percentage of attacks that Europe was responsible for dropped approximately 11% in the second quarter to 39%, while all of the other geographies saw corresponding increases. Aggregating this data over the last two years, as shown in Figure 2, illustrates some interesting trends. Except for Africa, all of the continents within the graph saw their most significant changes occur in the Q2-Q3 2009 time period. This may be related to the rise of the Conficker family of worms – their growth in activity was covered in depth in 2009 editions of the *State of the Internet* report series. Africa's consistently low contribution to the overall set of observed attacks is of little surprise, given the generally poor state of Internet connectivity in most countries on the African continent. (However, it is worth noting that observed attack traffic from Africa more than doubled to 2% from the first quarter to the second quarter of 2010.) During the Q2-Q3 2009 "inflection quarter," Europe's contribution nearly doubled, while the percentage of attacks observed from the Asia Pacific region declined by nearly 40%. Similar changes were seen within the Americas, where South America's percentage more than doubled during that quarter, while North America's contribution dropped by half.

	Country/Region	% Traffic	Q1 '10 %
1	United States	11%	10%
2	China	11%	9.1%
3	Russia	10%	12.0%
4	Taiwan	6.0%	6.1%
5	Brazil	6.0%	6.0%
6	Italy	3.0%	4.4%
7	Germany	3.0%	3.9%
8	Romania	3.0%	3.2%
9	Japan	3.0%	2.9%
10	Turkey	3.0%	1.5%
–	Other	42%	39%

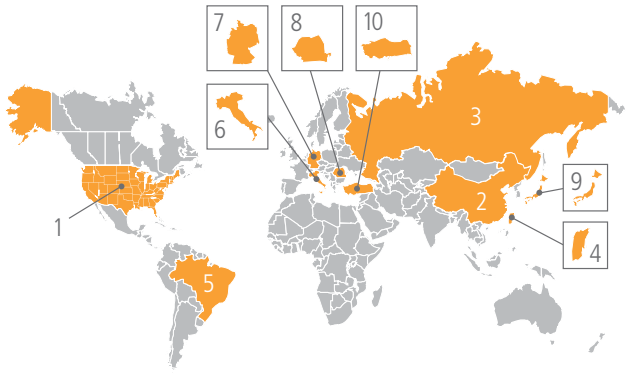


Figure 1: Attack Traffic, Top Originating Countries/Regions

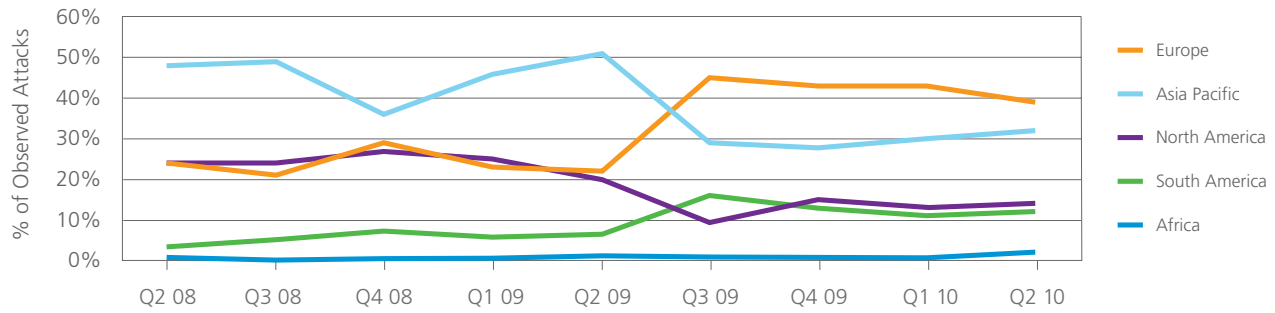


Figure 2: Historical Observed Attack Traffic, Aggregated by Region

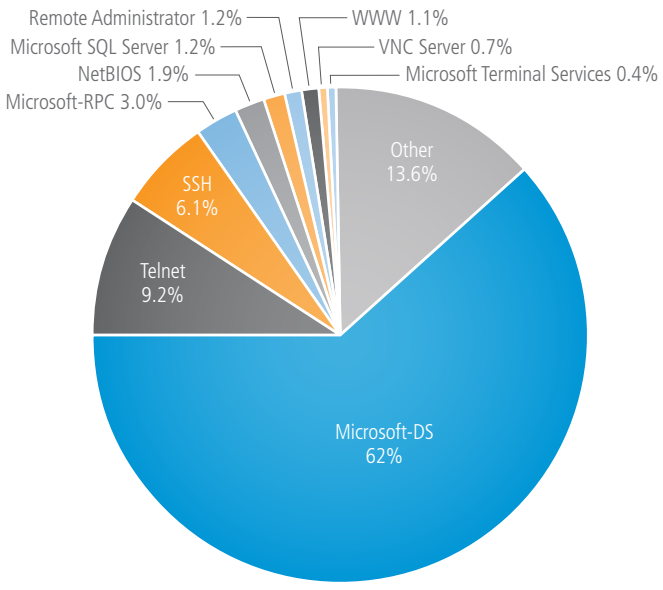
2.2 Attack Traffic, Top Ports

Attack traffic concentration among the top 10 targeted ports declined significantly quarter-over-quarter, with the top 10 ports responsible for just under 87% of observed attacks (down from just under 95% in the first quarter of 2010). Port 445 continued to be the most targeted port, though attack traffic to it declined approximately 12% from the first quarter of 2010. We will continue to watch this metric going forward to determine if attacks targeted at Port 445 are truly declining, or if this was simply a one quarter anomaly. The growth in attacks targeted at Port 23 (Telnet) may be related to similar observations[1] made by others, who noted an increase in unsolicited connections to that port that completed the three-way handshake and then were closed. While traffic targeted at Port 22 (SSH) declined slightly from the first quarter from a percentage perspective, the number of actual observed attacks actually increased. Similar to the growth in Telnet-targeted attacks noted above, this increase is in line with an increase noted[2] by others, who reported that SSH brute-force login attempts appeared to be on the rise again in the second quarter.

In the second quarter, Port 1080 (SOCKS Proxy) was forced from the top 10 list, replaced by newcomer Port 3389 (Microsoft Terminal Services). In looking at the port distribution among the top 10 countries, it is interesting to note that Port 23 was among the top five targeted ports in Brazil, Italy, Russia, and Turkey – in Turkey, it was even responsible for nearly 2.5x the attacks targeted at Port 445. That port continued to be, far and away, the most targeted port in the other countries among the top 10, responsible for anywhere from 1.1x to 64x the number of attacks as the next most targeted port (in China and Romania respectively.)

Port	Port Use	% Traffic	Q1 '10 %
445	Microsoft-DS	62%	74%
23	Telnet	9.2%	2.5%
22	SSH	6.1%	6.3%
135	Microsoft-RPC	3.0%	2.5%
139	NetBIOS	1.9%	3.2%
1433	Microsoft SQL Server	1.2%	1.1%
4899	Remote Administrator	1.2%	1.5%
80	WWW	1.1%	1.7%
5900	VNC Server	0.7%	0.9%
3389	Microsoft Terminal Services	0.4%	0.3%
Various	Other	13.6%	–

Figure 3: Attack Traffic, Top Ports



SECTION 3:
Internet Penetration

Through a globally-deployed server network, and by virtue of the billions of requests for Web content that it services on a daily basis, Akamai has unique visibility into the levels of Internet penetration around the world. In the second quarter of 2010, over 500 million unique IP addresses, from 236 countries/regions, connected to the Akamai network – 2.8% more IP addresses than in the first quarter of 2010, and 18% more than in the same quarter a year ago. Although we see approximately 500 million unique IP addresses, Akamai believes that it sees well over one billion Web users. This is because, in some cases, multiple individuals may be represented by a single IP address (or small number of IP addresses), as they access the World Wide Web through a firewall or proxy server. Conversely, individual users can have multiple unique IP addresses associated with them, due to their use of handheld devices, personal/home computers, business computers, Internet-connected video/gaming systems, etc.

As shown in Figure 4, the top 10 countries remained the same quarter-over-quarter, though Brazil and Canada exchanged places, with Brazil slowly climbing the list over the past several quarters. While the last several *State of the Internet* reports have noted that the United States and Canada have accounted for approximately 40% of the observed IP addresses, it appears that growth in these two countries may be slowing, relative to other countries around the world, as they accounted for a combined 38% of the observed IP addresses in the second quarter. Two of the top ten countries (the United Kingdom and Canada) showed quarterly declines, though each were less than one percent, while the remaining eight countries showed modest quarterly increases.

Globally, 59 countries/regions saw a quarterly decline in IP address counts in the second quarter, although just over a third of those were places where Akamai observed just tens or hundreds of IP addresses. Concentration among the top ten remained fairly consistent as well, accounting for approximately 70% of the observed IP addresses. In looking at the "long tail," there were 186 countries/regions with fewer than one million unique IP addresses connecting to Akamai in the second quarter of 2010, 139 with fewer than 100,000 unique IP addresses, and 34 with fewer than 1,000 unique IP addresses. The country counts for the one million and one thousand unique IP address thresholds were up slightly quarter-over-quarter, while the 100,000 address threshold lost only a single country.

	Country/Region	Q2 '10 Unique IP Addresses	QoQ Change	YoY Change
–	Global	501,047,374	2.8%	18%
1	United States	131,397,342	1.6%	15%
2	China	60,042,886	4.0%	30%
3	Japan	34,833,550	4.9%	14%
4	Germany	31,220,592	0.7%	6.9%
5	France	22,740,013	1.2%	13%
6	United Kingdom	20,042,782	-0.4%	6.6%
7	South Korea	16,795,947	0.5%	15%
8	Brazil	12,003,674	5.5%	19%
9	Canada	11,644,413	-0.7%	8.1%
10	Spain	11,444,687	2.0%	13%

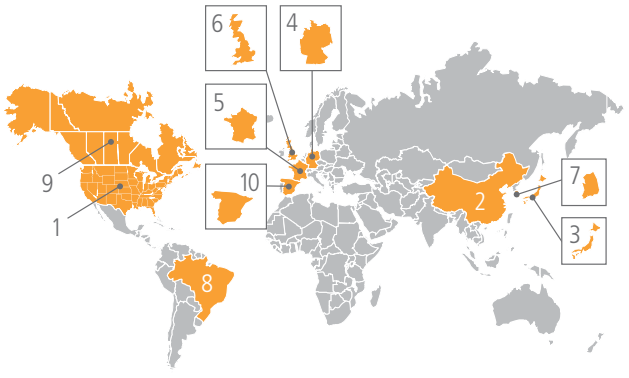


Figure 4: Unique IP Addresses Seen By Akamai

SECTION 4:

Geography – Global

By virtue of the hundreds of billions of requests for Web content that it services on a daily basis through its globally-deployed server network, Akamai has a unique level of visibility into the connection speeds of end-user systems and, consequently, of broadband adoption around the globe. Because Akamai has implemented a distributed network model, deploying servers within edge networks, it can deliver content more reliably and more consistently at those speeds, in contrast to centralized competitors that rely on fewer deployments in large data centers. For more information on why this is possible, please see Akamai's *How Will The Internet Scale?* White Paper[3] or the video explanation at *www.akamai.com/whytheedge.*

The data presented within this section was collected during the second quarter of 2010 through Akamai's globally-deployed server network and includes all countries/regions that had more than 1,000 unique IP addresses make requests to Akamai's network during the second quarter. For the purposes of classification in this report, the "broadband" data included below is for connections greater than 2 Mbps, and "high broadband" is for connections of 5 Mbps or greater. (In July 2010, the United States Federal Communications Commission (FCC) revised its working definition of broadband from services in "excess of 200 kilobits per second (kbps) in both directions" – a standard adopted over a decade ago in the *1999 First Broadband Deployment Report* – to "service offering actual download (i.e., to the customer) speeds of at least 4 Mbps".[4] While we have not adopted this revised definition of broadband for this edition of the *State of the Internet* report, we may consider aligning our definition of broadband with the FCC's in future editions of the report.) In contrast to the "high broadband" and "broadband" classifications, the "narrowband" data included below is for connections to Akamai slower than 256 Kbps. Note that the percentage changes reflected below are not additive – they are relative to the prior quarter(s). (That is, a Q1 value of 50% and a Q2 value of 51% would be reflected here as a 2% change.) A quarter-over-quarter change is shown within the tables in several sections below in an effort to highlight general trends, and year-over-year changes are shown to illustrate longer-term trends.

As the quantity of HD-quality media increases over time, and the consumption of that media increases, end users are likely to require ever-increasing amounts of bandwidth. A connection speed of 2 Mbps is arguably sufficient for standard definition TV-quality video content, and 5 Mbps for standard-definition DVD quality video content, while Blu-Ray (1080p) video content has a maximum video bit rate of 40 Mbps, according to the Blu-Ray FAQ.[5] In addition to average connection speeds, we continue to report average peak[6] connection speeds (formerly referred to as "average maximum" connection speeds) around the world, from a country/region, state, and city perspective. This metric can provide insight into the peak speeds that users can likely expect from their Internet connections.

Finally, as was done last quarter as well, traffic from known mobile network providers will be analyzed and reviewed in a separate section of the report; mobile network data has been removed from the data set used to calculate the metrics reported in the present section.

4.1 Global Average Connection Speeds

Globally, average connection speeds appeared to rebound from the first quarter decline, increasing on both a quarterly and a yearly basis. In addition, as shown in Figure 5, South Korea posted a significant growth in the second quarter, on both a quarterly and a yearly basis as well. (Removal of additional mobile network traffic from South Korea's data set may have influenced these figures.) Among the remainder of the top 10, five other countries/regions saw their average connection speeds decline in second quarter, though three of them exhibited positive long-term trends, with strong year-over-year growth percentages. The quarterly declines seen across those five countries/regions, along with the United States, were fairly modest, and are not considered to be out of line with short-term fluctuations seen in the past. The ongoing observed decline in Sweden's average connection speed is of some concern, given the size of the decline over the last two quarters, and especially given the efforts to deploy high-speed connectivity across the country.[7]

With traffic from known mobile networks now removed from the data set, it is not immediately clear what is causing these observed declines in average connection speeds. The base data set may still include usage from mobile networks not yet identified, or from network providers that are mixing mobile and fixed network traffic on a single autonomous system. Or, it may point to higher usage of network-reliant applications and devices that are consuming some amount of network bandwidth in communicating with non-Akamai systems.

During the second quarter, 92 countries had average connection speeds below 1 Mbps, four fewer than the prior quarter. Akamai measured average connection speeds below 100 Kbps in only three countries (Cuba, Tonga, and Mayotte) in the second quarter – down from five in the first quarter, but consistent with the fourth quarter of 2009. (Note that the slowest countries often have the smallest number of unique IP addresses connecting to Akamai, so it may be the case that a few more countries fell below that 1000 unique IP address threshold than in the first quarter.) Mayotte continued to be the country with the lowest average connection speed, remaining consistent at 40 Kbps.

	Country/Region	Q2 '10 Avg. Mbps	QoQ Change	YoY Change
–	Global	1.8	3.8%	6.1%
1	South Korea	17	38%	47%
2	Hong Kong	8.6	-4.9%	23%
3	Japan	8.0	2.1%	9.9%
4	Romania	6.8	7.4%	8.4%
5	Netherlands	6.5	8.5%	22%
6	Latvia	6.3	-1.0%	24%
7	Sweden	5.5	-11%	-7.7%
8	Czech Republic	5.3	-2.9%	-0.7%
9	Belgium	5.3	10%	11%
10	Denmark	5.2	-2.8%	11%
…				
16	United States	4.6	-1.8%	1.8%

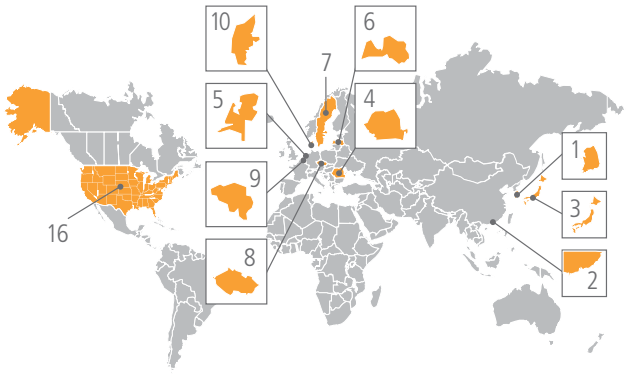


Figure 5: Average Measured Connection Speed by Country/Region

4.2 Global Average Connection Speeds, City View

As we have done in the past three editions of the *State of the Internet* report, we again examine average measured connection speeds at a city level. As we did in the first quarter, we have applied "filters" for unique IP address count (50,000 or more seen by Akamai in the second quarter) and academic institutions (removing data from known academic networks). In addition, as with the other data sets used in Section 4 of this report, traffic from known mobile networks has been removed as well.

Once again, Masan, South Korea held the title as the city with the fastest average connection speed. Masan's average speed increased by more than 5 Mbps quarter-over-quarter, making it the only city in the world with an average connection speed higher than 20 Mbps. Twenty other cities, however, achieved average connection speeds in excess of 10 Mbps. These cities were mostly in South Korea and Japan, though Europe's fastest city (Umea, Sweden) was in that group as well. Yokohama, Japan fell just short, missing the 10 Mbps threshold by just under 1 Kbps. Umea, Sweden, had an average connection speed of 10.3 Mbps, up from 9.8 Mbps in the first quarter. In North America, the fastest city was Victoria, British Columbia at 7.2 Mbps, down from 7.8 Mbps in the first quarter. In the United States, Monterey Park, CA remained the fastest city, with an average connection speed of 6.9 Mbps, down from 7.2 Mbps in the first quarter.

Cities in Asia continued to dominate the top 100 list, accounting for three quarters of the top 100, as shown in Figure 6. This included 62 cities in Japan, and 12 cities in South Korea, and Hong Kong. Europe accounted for 15 cities across eight countries, with Romania ranking highest with five cities in the top 100. North America accounted for the final ten, with two in Canada and the remaining eight in the United States. The span of average connection speeds grew in the second quarter as well, from 9.5 Mbps separating the first and hundredth city in the first quarter to just over 14.7 Mbps separating Masan, South Korea and Riga, Latvia in the second quarter.

Cities in Asia dominate the Global Average Connection Speeds top 100 list, with 62 located in Japan, 12 more in South Korea, and Hong Kong. Ten cities from North America made it into the top 100, along with 15 cities in Europe.

	Country/Region	City	Q2 '10 Avg. Mbps
1	South Korea	Masan	20.9
2	South Korea	Taegu	19.5
3	South Korea	Poryong	18.9
4	South Korea	Seocho	18.0
5	South Korea	Kimchon	17.7
6	South Korea	Milyang	17.3
7	South Korea	Ilsan	17.1
8	South Korea	Seoul	16.0
9	South Korea	Anyang	15.3
10	South Korea	Suwon	14.9
11	Japan	Shimotsuma	12.2
12	Japan	Tokai	12.2
13	Japan	Kanagawa	12.2
14	Japan	Usen	11.8
15	South Korea	Inchon	11.4
16	Japan	Asahi	11.1
17	Japan	Urawa	11.0
18	Japan	Tochigi	10.8
19	Japan	Hiroshima	10.7
20	Sweden	Umea	10.3
21	Japan	Shizuoka	10.1
22	Japan	Yokohama	10.0
23	Japan	Ibaraki	10.0
24	Japan	Kyoto	9.5
25	Japan	Nagoya	9.4
26	Japan	Gifu	9.2
27	Japan	Marunouchi	9.2
28	Japan	Kobe	9.2
29	Japan	Hyogo	9.1
30	Japan	Nara	8.9
31	Japan	Wakayama	8.8
32	Japan	Chiba	8.8
33	Japan	Nagano	8.7
34	Japan	Fukuoka	8.7
35	Japan	Hakodate	8.6
36	Japan	Yokkaichi	8.6
37	Japan	Sendai	8.6
38	Japan	Niho	8.5
39	Romania	Constanta	8.5
40	South Korea	Yongsan	8.5
41	Japan	Otsu	8.4
42	Japan	Hodogaya	8.4
43	Japan	Matsuyama	8.2
44	Japan	Hamamatsu	8.2
45	Switzerland	Geneva	8.2
46	Japan	Soka	8.1
47	Japan	Tokushima	8.1
48	Japan	Kanazawa	8.1
49	Japan	Kagawa	8.1
50	Japan	Fukui	8.1
51	Hong Kong	Hong Kong	8.0
52	Japan	Tokyo	7.9
53	Japan	Niigata	7.9
54	Romania	Iasi	7.9
55	Japan	Mito	7.9
56	Japan	Yamaguchi	7.9
57	Japan	Kochi	7.8
58	Netherlands	Groningen	7.8
59	Japan	Kokuryo	7.8
60	Japan	Utsunomiya	7.7
61	Germany	Baden-Baden	7.6
62	Japan	Yamagata	7.6
63	Japan	Okayama	7.5
64	Japan	Kumamoto	7.5
65	Norway	Lyse	7.5
66	Japan	Kagoshima	7.4
67	Romania	Timisoara	7.4
68	Japan	Yosida	7.4
69	Japan	Toyama	7.3
70	Japan	Osaka	7.3
71	Japan	Kofu	7.2
72	Canada	Victoria, BC	7.2
73	Japan	Miyazaki	7.2
74	Japan	Iwaki	6.9
75	Japan	Tottori	6.9
76	United States	Monterey Park, CA	6.9
77	United States	Riverside, CA	6.8
78	Netherlands	Joure	6.8
79	Japan	Saga	6.7
80	Netherlands	Tilburg	6.7
81	Japan	Oita	6.6
82	Japan	Nagasaki	6.6
83	Portugal	Coimbra	6.5
83	Japan	Naha	6.5
85	Canada	Kelowna, BC	6.5
86	Japan	Otemachi	6.5
87	Japan	Morioka	6.5
88	Japan	Okidate	6.5
89	Japan	Akita	6.4
90	United States	Union, NJ	6.4
91	United States	Oakland, CA	6.4
92	Romania	Clujnapoca	6.3
93	Romania	Bucharest	6.3
94	United States	Fairfield, CA	6.3
95	United States	Walnut Creek, CA	6.2
96	United States	Boston Metro, MA	6.2
97	United States	Hayward, CA	6.2
98	Japan	Sapporo	6.1
99	Netherlands	Kamperland	6.1
100	Latvia	Riga	6.1

Figure 6: Average Measured Connection Speed, Top Global Cities

4.3 Global Average Peak Connection Speeds

The average peak connection speed metric represents an average of the maximum measured connection speeds across all of the unique IP addresses seen by Akamai from a particular geography. The average is used in order to mitigate the impact of unrepresentative maximum measured connection speeds. In contrast to the average measured connection speed, the average peak connection speed metric is more representative of what many end-user Internet connections are capable of. (This includes the application of so-called speed boosting technologies that may be implemented within the network by providers, in order to deliver faster download speeds for some larger files.) Note that data from known mobile networks has also been removed from the source data set for this metric.

As shown in Figure 7, average peak connection speeds demonstrated quarterly growth on a global basis, in nine of the top 10 countries/regions, and in the United States. (The lone exception is Sweden, whose declining average connection speed was also discussed above in Section 4.1.) While the quarterly increases were generally pretty modest, South Korea, Belgium and Monaco turned in impressive double-digit percentage growth. Extremely impressive growth was also seen in the Maldives, which saw its average peak connection speed nearly triple quarter-over-quarter. However, the Maldives only had approximately 12,000 unique IPs connecting to Akamai in the second quarter, so that must be considered in comparison to other countries/regions in the top 10, most of whom had millions of unique IP addresses connecting to Akamai.

Once again, Asia led this metric, with South Korea, Hong Kong, and Japan taking the top three slots, with average peak connection speeds in excess of 30 Mbps observed in South Korea and Hong Kong. European countries took six of the seven remaining top 10 slots, with the United States falling to 11th place (from 8th place in the first quarter). Average peak connection speeds increased year-over-year by at least double digit percentages globally, as well as across the top 10 countries and the United States.

In looking at the average peak speed distribution around the world, only South Korea and Hong Kong exceeded 30 Mbps – it appears that the aggressive pricing for 100 Mbps and 1 Gbps connections in Hong Kong[8] may be seeing commercial success. Four more countries/regions registered average peak connection speeds in excess of 20 Mbps, while 49 others had average peak connection speeds in excess of 10 Mbps. In looking at the "high broadband" threshold of 5 Mbps, 55 additional countries exceeded that. Only six countries saw average peak connection speeds below 1 Mbps, and Mayotte ceded its last-place mantle to Tonga, whose 365 Kbps average peak connection speed was just over 5x its average speed for the second quarter.

	Country/Region	Q2 '10 Peak Mbps	QoQ Change	YoY Change
–	Global	6.8	6.4%	23%
1	South Korea	38	16%	24%
2	Hong Kong	32	7.2%	31%
3	Japan	28	8.1%	11%
4	Romania	27	7.7%	31%
5	Latvia	20	5.3%	57%
6	Maldives	20	287%	790%
7	Belgium	19	15%	49%
8	Sweden	18	-3.7%	15%
9	Monaco	18	25%	59%
10	Portugal	17	5.9%	31%
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11	United States	16	1.2%	18%

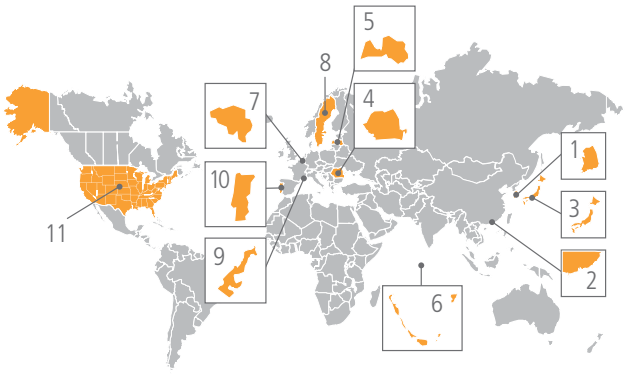

Figure 7: Average Peak Connection Speed by Country/Region

4.4 Global Average Peak Connection Speeds, City View

As we first did in the *1st Quarter, 2010 State of the Internet* report, we again examine average peak connection speeds at a city level, applying "filters" for unique IP address count (50,000 or more seen by Akamai in the second quarter) and academic institutions (removing data from known academic networks). In addition, as with the other data sets used in Section 4 of this report, traffic from known mobile networks has been removed.

In looking at the distribution of average peak speeds seen across the top 100 cities, we found that more than two-thirds of the top 100 cities fell within the 20-30 Mbps range, as shown in the histogram in Figure 8. The largest individual cluster was between 23-24 Mbps, with 16 cities having average peak connection speeds in that band.

With an average peak connection speed of just over 44 Mbps, up approximately 10% from last quarter, Masan, South Korea once again topped the list, as shown in Figure 9. At a city level, it appears that average peak connection speeds generally increased during the second quarter, with eight cities now registering average peak connection speeds above 40 Mbps, up from just three cities in the first quarter. Among the balance of the top 100 cities, 32 additional cities have average peak connection speeds above 30 Mbps, and the remaining 60 cities were all above 20 Mbps. The speed of the last city in the top 100 was up just about 5%, or approximately 1 Mbps, quarter-over-quarter as well.

Cities in Asia dominated this metric as well, with the top 100 list including Hong Kong, 57 cities from Japan and 12 from South Korea. North America charted 21 cities among the top 100, all from the United States. Monterey Park, CA was the United States city with the highest average peak connection speed, measured at nearly 26 Mbps. In Europe, nine cities from six countries rounded out the top 100, with Constanta, Romania the European city with the highest average peak connection speed, at nearly 38 Mbps.

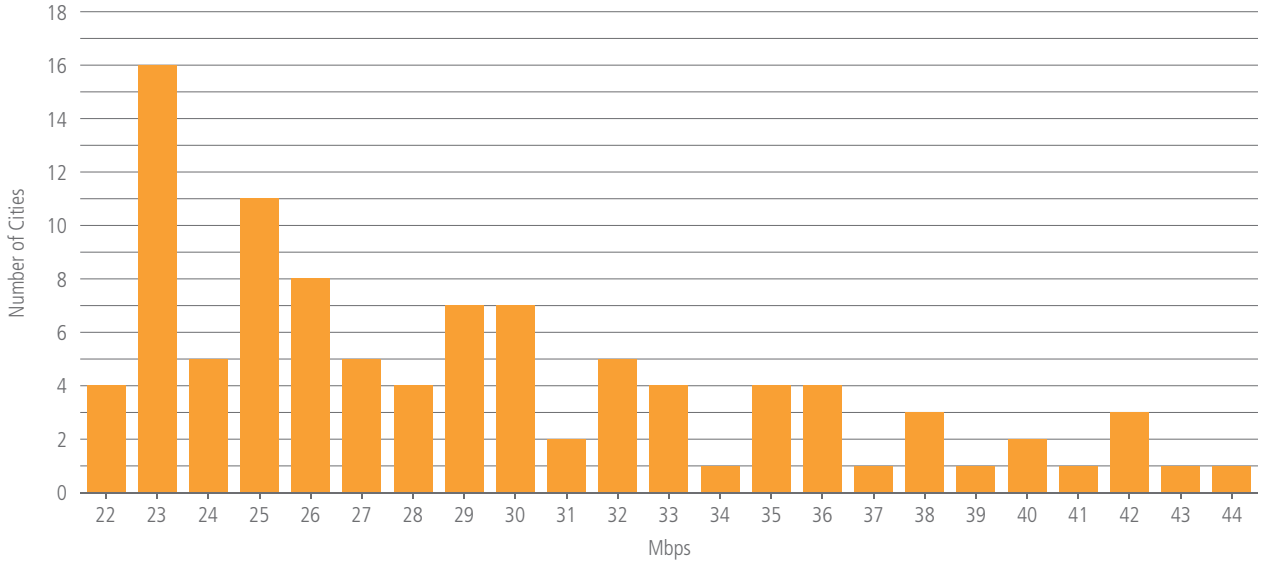

Figure 8: *Distribution of Average Peak Speeds by Mbps Band*

	Country/Region	City	Q2 '10 Peak Mbps
1	South Korea	Masan	44.4
2	South Korea	Taegu	44.0
3	Japan	Tokai	42.3
4	Japan	Kanagawa	42.2
5	South Korea	Poryong	42.0
6	Japan	Marunouchi	41.8
7	South Korea	Kimchon	40.9
8	South Korea	Seocho	40.3
9	Japan	Shimotsuma	39.7
10	South Korea	Milyang	38.2
11	South Korea	Ilsan	38.2
12	Japan	Urawa	38.1
13	Romania	Constanta	37.7
14	Japan	Hiroshima	36.9
15	South Korea	Suwon	36.4
16	South Korea	Seoul	36.3
17	Japan	Yokohama	36.3
18	Japan	Hodogaya	35.7
19	Japan	Tochigi	35.4
20	Japan	Usen	35.4
21	Japan	Asahi	35.3
22	South Korea	Anyang	34.1
23	Romania	Iasi	33.8
24	Japan	Soka	33.8
25	Japan	Kobe	33.2
26	Japan	Nagano	33.2
27	Japan	Kyoto	32.6
28	Japan	Chiba	32.6
29	Japan	Fukuoka	32.3
30	Japan	Nagoya	32.2
31	Japan	Ibaraki	32.2
32	Romania	Timisoara	31.6
33	Japan	Gifu	31.5
34	Japan	Shizuoka	30.7
35	Japan	Yokkaichi	30.7
36	Hong Kong	Hongkong	30.4
37	Japan	Niho	30.4
38	Japan	Wakayama	30.3
39	Japan	Sendai	30.3
40	Japan	Kokuryo	30.0
41	Japan	Nara	29.9
42	Japan	Niigata	29.8
43	Japan	Mito	29.8
44	Japan	Fukui	29.5
45	Japan	Kanazawa	29.3
46	Japan	Utsunomiya	29.2
47	Japan	Otsu	29.2
48	Japan	Yosida	28.9
49	Japan	Hamamatsu	28.9
50	Japan	Hakodate	28.8
51	Japan	Kagawa	28.2
52	Japan	Tokushima	27.7
53	Japan	Yamaguchi	27.5
54	Germany	Baden-Baden	27.3
55	Japan	Matsuyama	27.1
56	South Korea	Inchon	27.0
57	Japan	Iwaki	26.9
58	Portugal	Coimbra	26.8
59	Japan	Tokyo	26.7
60	Japan	Kofu	26.5
61	Japan	Toyama	26.4
62	Japan	Kochi	26.3
63	South Korea	Yongsan	26.1
64	Japan	Osaka	26.1
65	Japan	Yamagata	25.9
66	United States	Monterey Park, CA	25.9
67	United States	Everett, WA	25.7
68	United States	Olympia, WA	25.7
69	United States	Bellevue, WA	25.6
70	United States	Federal Way, WA	25.6
71	Japan	Okayama	25.6
72	Sweden	Umea	25.3
73	Romania	Bucharest	25.3
74	Norway	Lyse	25.2
75	Japan	Okidate	25.1
76	Japan	Hyogo	24.8
77	Japan	Morioka	24.7
78	Japan	Kumamoto	24.4
79	Japan	Sapporo	24.2
80	United States	Hickory, NC	24.0
81	United States	Oakland, CA	24.0
82	Japan	Kagoshima	23.8
83	United States	Fairfield, CA	23.8
84	United States	Hayward, CA	23.6
85	United States	Salem, OR	23.5
86	United States	Traverse City, MI	23.5
87	United States	Vancouver, WA	23.4
88	United States	Beaverton, OR	23.4
89	Japan	Akita	23.3
90	United States	Tacoma, WA	23.3
91	United States	Riverside, CA	23.3
92	United States	Boston Metro, MA	23.3
93	United States	Fond Du Lac, WI	23.2
94	United States	San Jose, CA	23.1
95	Switzerland	Geneva	23.1
96	United States	Walnut Creek, CA	23.0
97	Japan	Naha	22.9
98	United States	Aurora, CO	22.8
99	Japan	Miyazaki	22.8
100	United States	Arvada, CO	22.7

Figure 9: Average Peak Connection Speed, Top Global Cities

4.5 Global High Broadband Connectivity

In the second quarter of 2010, global high broadband adoption continued to grow, reaching 22%. As shown in Figure 10, South Korea again was the country with the highest level of high broadband adoption, with impressive double-digit quarterly growth to 75%, pushing it well ahead of second-place Japan, at 60%. Among the top 10 countries, strong double-digit levels of quarterly growth were also observed in the Netherlands, Belgium, and Moldova. Consistent with the observations in Sections 4.1 and 4.3, Sweden saw a significant decline in high broadband adoption in the second quarter, and was the only country in the top 10 to show a yearly decline as well. The United States experienced a slight decline in the second quarter, though the yearly trend is still positive.

Looking at high broadband adoption on a global basis, South Korea and Japan are the only two countries where more than half of the connections to Akamai are at speeds greater than 5 Mbps. Beyond that, there are 13 additional countries/regions where more than a quarter of the connections are at high broadband rates and 22 more where one in ten connections to Akamai are faster than 5 Mbps. Europe is best represented among this aggregate set of countries, with 31 countries having greater than 10% high broadband adoption – only seven countries are included from the Asia Pacific region. The overall global trends for high broadband adoption are positive as well, with 1.6x as many countries showing quarterly gains as losses, and 1.7x as many countries showing yearly gains as losses.

Data on the speed distribution of high broadband connectivity had been presented in its own sub-section in prior reports, but will be folded into the larger high broadband connectivity discussion starting with this edition of the *State of the Internet* report. In examining the speed distributions on a global basis, as well as for the top 10 countries, it appears that the greatest quarterly shifts occurred, in most cases, among the highest speed 'buckets' (20-25 Mbps and 25+ Mbps). For example, in the second quarter, nearly 21% of South Korea's connections to Akamai were at speeds above 25 Mbps – nearly double the level seen in the prior quarter. Double digit percentage increases for this bucket were also seen for the global figure (27% growth), as well as in the Netherlands (12% growth), Romania (25% growth), and Belgium (21% growth). The United States, unfortunately,

	Country/Region	% Above 5 Mbps	QoQ Change	YoY Change
–	Global	22%	0.7%	6.5%
1	South Korea	75%	12%	8.3%
2	Japan	60%	1.1%	7.6%
3	Netherlands	49%	13%	34%
4	Romania	48%	0.1%	7.5%
5	Hong Kong	46%	-1.0%	19%
6	Latvia	43%	4.5%	75%
7	Belgium	40%	11%	23%
8	Denmark	37%	-8.5%	18%
9	Moldova	34%	27%	101%
10	Sweden	34%	-21%	-21%
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13	United States	30%	-5.1%	3.8%

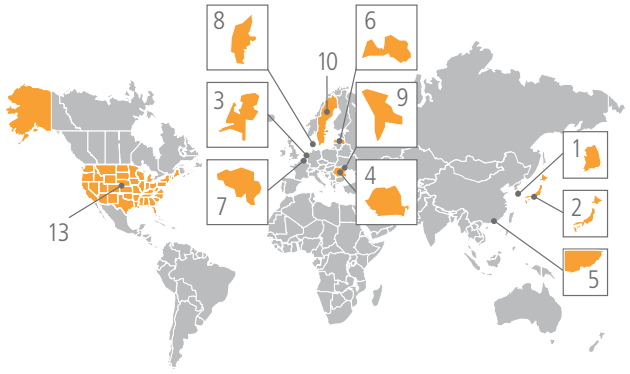

Figure 10: High Broadband Connectivity, Fastest Countries/Regions

appears to have lost some ground here in the second quarter, with less than 1% of connections to Akamai at speeds over 25 Mbps, a decline of nearly 10% from the prior quarter. While the United States posted a long-term year-over-year decline of 15% for this metric, the picture is more positive globally and for other countries in the top 10. Yearly growth in connections to Akamai at speeds over 25 Mbps was seen in the global figure (35% growth), as well as in eight of the top 10 countries, ranging from an anemic 0.8% increase in Sweden to an astonishing increase of over 700% in Moldova. (To be fair, the pool of unique IP addresses from Moldova connecting to Akamai at high broadband speeds was much smaller than other countries in the top 10, so large percentage increases must be considered with that in mind.)

We expect that, on a global basis, as the adoption and rollout of DOCSIS 3.0 technology by cable Internet providers, as well as other FTTH initiatives by telecom providers, become more widespread the percentage of connections in these higher speed 'buckets' will continue to grow over time. Ideally, the growth observed in the 25+ Mbps bucket in the second quarter across the top 10 countries, as well as a number of other countries around the world, is the beginning of a long-term trend, and not simply a one-quarter event.

4.6 Global Broadband Connectivity

As shown in Figure 11, the quarter-over-quarter changes for global broadband connectivity were fairly minor in the second quarter, with Monaco seeing the largest increase, at just under four percent. Broadband adoption rates in Hong Kong and Belgium remained constant from the first quarter, while the Isle of Man and Slovakia had variances of just one-tenth of a percent. (It is worth noting that both Monaco & Isle of Man recorded less than 20,000 unique IPs for this metric, so while their broadband adoption levels are certainly impressive, they need to be considered in that context, as other countries among the top 10 have hundreds of thousands or millions of unique IP addresses connecting to Akamai at speeds in excess of 2 Mbps.) With the exception of an extremely small decline in South Korea, broadband adoption increased year over year at a global level, for nine of the top 10 countries, and in the United States.

The levels of broadband adoption continue to trend ever higher overall as well, with eight countries/regions seeing adoption levels of 90% or better, and nearly three-quarters of the connections to Akamai from the United States at speeds of 2 Mbps or above. In the second quarter of 2010, 55 countries/regions had broadband adoption levels in excess of 50% -- up from 50 countries/regions in the first quarter, and 41 countries/regions in the same period a year earlier.

	Country/Region	% Above 2 Mbps	QoQ Change	YoY Change
–	Global	59%	3.3%	4.1%
1	Monaco	95%	3.8%	8.5%
2	South Korea	93%	2.2%	-0.1%
3	Isle Of Man	93%	0.1%	5.3%
4	Hong Kong	92%	–	0.7%
5	Switzerland	91%	-0.2%	0.3%
6	Belgium	91%	–	0.4%
7	Bulgaria	91%	2.2%	14%
8	Latvia	90%	1.9%	19%
9	Czech Republic	88%	3.2%	5.2%
10	Slovakia	88%	-0.1%	2.9%
…				
37	United States	72%	1.2%	4.8%

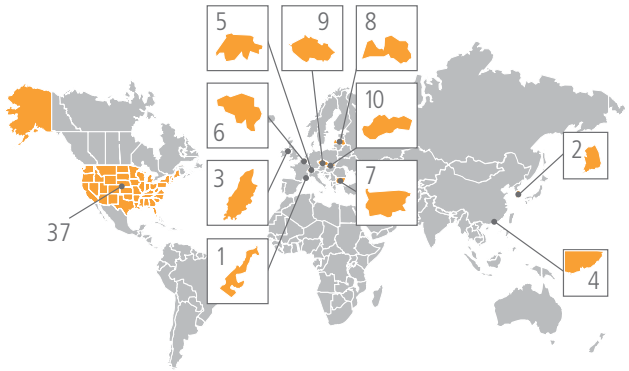

Figure 11: Broadband Connectivity, Fast Countries/Regions

4.7 Global Narrowband Connectivity

In line with the general trends for increased broadband and high broadband adoption that have been discussed in prior sections, it appears that levels of narrowband adoption dropped in many countries around the world during the second quarter. As shown in Figure 12, Cuba was the only country among the top 10 that recorded a quarterly increase, and an almost insignificant one at that. (However, this 95% narrowband adoption rate causes the relatively few Internet users in the country to "suffer through agonizingly long waits to open an e-mail, let alone view a photo or video," according to the United Nations International Telecommunications Union.[9])

In the second quarter, less than five percent of connections to Akamai overall were at speeds below 256 Kbps. This was the case in 65 countries around the world, with South Korea having the lowest levels of narrowband adoption, at 0.2%. In the United States, narrowband adoption dropped 10% in the second quarter to 2.8%, a level 33% lower than the same period a year ago. Globally, over 130 countries had lower levels of narrowband adoption in the second quarter, compared with over 35 that had higher levels.

	Country/Region	% Below 256 Kbps	QoQ Change	YoY Change
–	Global	4.6%	-13%	-12%
1	Mayotte	98%	-0.5%	-1.1%
2	Wallis And Futuna	96%	-2.1%	-3.2%
3	Cuba	95%	0.1%	0.7%
4	Madagascar	90%	-1.8%	-3.2%
5	Vanuatu	89%	-4.7%	-7.2%
6	Guyana	87%	-6.1%	-1.2%
7	Equatorial Guinea	86%	-12%	-12%
8	Niger	86%	-2.7%	1.5%
9	Rwanda	83%	-9.4%	-11%
10	Uzbekistan	82%	-3.4%	2.6%
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119	United States	2.8%	-10%	-33%

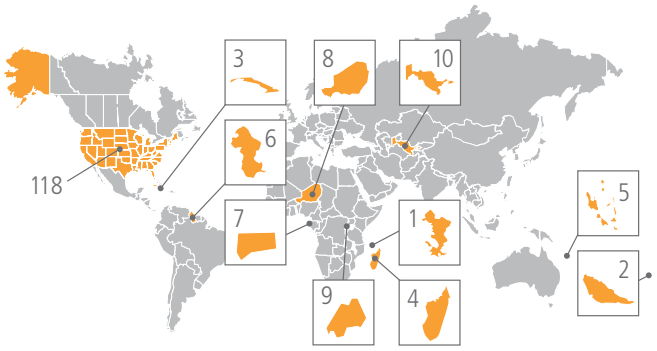


Figure 12: Narrowband Connectivity, Slowest Countries/Regions

There is no broadband in Cuba and the relatively few Internet users in the country suffer through agonizingly long waits to open an e-mail, let alone view a photo or video. This also hampers government and business operations.

[http://www.reuters.com/article/idUSTRE65H3H320100618]

SECTION 5:

Geography–United States

The metrics for the United States presented here are based on a subset of the data used for Section 4, and are subject to the same thresholds and filters discussed within the prior section. (The subset used for this section includes connections identified as coming from networks in the United States, based on classification by Akamai's EdgeScape[10] geolocation tool.)

5.1 United States Average Connection Speeds

The overall average connection speed for the United States as a whole in the second quarter of 2010 was 4.6 Mbps. As in the first quarter, this was exceeded by 22 states, including those in the top 10, as shown in Figure 13. Both across the country and within the top 10, most quarterly changes were relatively minor – the biggest growth was seen in West Virginia and Rhode Island, gaining 11% and 10% respectively, while the biggest losses were seen in Iowa and Arizona, declining 11% and 10% respectively. Year-over-year changes were more significant, with 11 states posting double digit increases, led by Alaska's yearly growth of 44%, and 34 states in total getting faster since the same quarter a year ago. In fact, Alaska's second quarter growth helped it move out of being the state with the slowest average connection speed, ceding that dubious honor this quarter to Iowa, which had an average connection speed of 2.8 Mbps. (Ahead of Iowa by only a mere 96 Kbps, it is certainly possible that Alaska could fall back to the last-place slot again in the future.)

	State	Q2 '10 Avg. Mbps	QoQ Change	YoY Change
1	Delaware	7.2	-4.5%	15%
2	Rhode Island	6.2	10%	16%
3	New Hampshire	5.9	1.3%	-6.4%
4	District Of Columbia	5.6	-5.7%	-1.1%
5	Massachusetts	5.5	-7.1%	-3.2%
6	Nevada	5.5	2.4%	5.8%
7	Maryland	5.3	-5.2%	-7.0%
8	Vermont	5.3	-2.9%	-4.7%
9	California	5.2	-2.3%	8.3%
10	Utah	5.2	-6.4%	2.1%

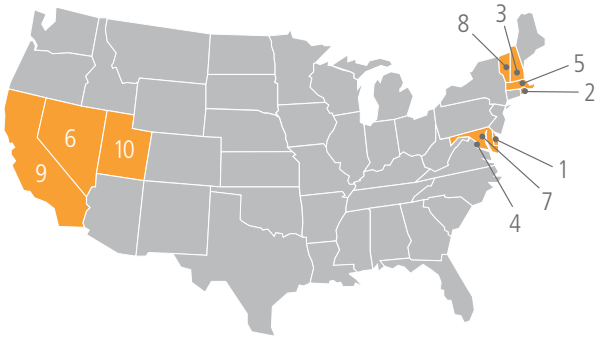


Figure 13: Average Measured Connection Speed by State

5.2 United States Average Connection Speeds, City View

As with the Global Average Connection Speeds, City View presented in Section 4.2, connections from known academic networks were removed from the underlying data set for this metric, and the 50,000 unique IP address filter was used for this view as well.

In reviewing the top 10 cities in the United States with the highest average connection speeds, as shown in Figure 14, we see that cities in California once again dominate the list, holding seven of the top 10 slots. However, we also note that the average connection speeds for these cities in California all suffered quarterly declines, dropping 300-400 Kbps on average. Interestingly, the other three cities in the top 10 list were different than those included in the first quarter list – cities in Maryland, New York, and Washington were replaced by cities in New Jersey, Massachusetts, and Illinois.

	City	Q2 '10 Avg. Mbps
1	Monterey Park, CA	6.9
2	Riverside, CA	6.8
3	Union, NJ	6.4
4	Oakland, CA	6.4
5	Fairfield, CA	6.3
6	Walnut Creek, CA	6.2
7	Boston Metro, MA	6.2
8	Hayward, CA	6.2
9	Mount Prospect, IL	6.1
10	San Mateo, CA	6.1

Figure 14: Average Measured Connection Speed, Top United States Cities by Speed

5.3 United States Average Peak Connection Speeds

The overall average peak connection speed calculated by Akamai for the United States as a whole for the second quarter of 2010 was 16 Mbps. This was exceeded by 18 states and the District of Columbia, including all of those in the top 10, as shown in Figure 15. For this metric, Idaho once again ranked lowest, with an average peak connection speed of 8.9 Mbps, down nearly 5% from the first quarter. In addition, Idaho was the only state to record an average peak connection speed below 10 Mbps in the second quarter – in the first quarter, Wyoming and Arkansas had done so as well.

Quarterly trending of average peak connection speeds was comparatively modest, with the greatest change seen in West Virginia, which had a quarterly loss of 11%. Overall, 28 states and the District of Columbia saw higher average peak connection speeds in the second quarter – in contrast, 48 states and the District of Columbia saw growth in the first quarter. The quarterly increases were more muted as well, as no state saw a quarterly increase greater than 10%, whereas seven states exceeded this level in the first quarter. While quarterly declines were seen in 22 states, in most of them, these declines amounted to a few hundred Kbps or less, so there does not appear to be any reason for concern here, as these variances are within reasonable ranges. The year-over year picture was much rosier, with no observed yearly declines. Forty-five states and the District of Columbia saw yearly growth of 10% or more, with 21 of those states growing 20% or more. Montana was the big gainer for this metric as well, increasing its average peak connection speed by 45% since the second quarter of 2009. Alaska was a close second for yearly growth, increasing its average peak connection speed by 43% year-over-year.

	State	Q2 '10 Peak Mbps	QoQ Change	YoY Change
1	Delaware	24	-5.4%	20%
2	Rhode Island	21	0.1%	23%
3	New Hampshire	21	1.1%	5.3%
4	Hawaii	21	2.8%	10%
5	District Of Columbia	20	0.9%	13%
6	Massachusetts	19	-3.1%	14%
7	California	19	2.3%	27%
8	Washington	19	4.7%	16%
9	Maryland	18	-0.6%	16%
10	Vermont	18	-6.3%	9.0%

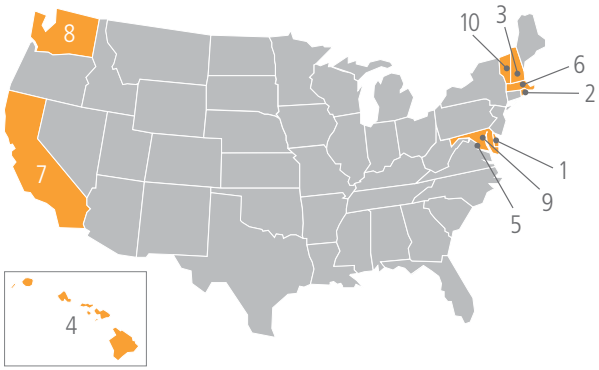


Figure 15: Average Peak Connection Speed by State

5.4 United States Average Peak Connection Speeds, City View

Once again, the city view of average peak connection speeds in the United States was dominated by cities on the West Coast, as illustrated in Figure 16. California saw four cities in the top 10, as did Washington, and one from Oregon made the list as well. Hickory, NC was the lone East Coast city in the top 10. In contrast to the general quarterly declines seen in the top 10 United States cities for the average connection speed metric, it appears that average peak connection speeds among the top 10 cities generally improved from the first quarter – Monterey Park was ~600 Kbps faster than a quarter ago, and last quarter's 10th place city, Fairfield, CA, moved up to 8th place this quarter, adding approximately 300 Kbps.

In looking at the complete list of qualifying cities, we once again note that there were no cities from Delaware, North Dakota, or Vermont on the list. Additionally, we observed that the average peak connection speeds in all of the listed cities exceeded 2 Mbps, though the majority of the cities had average peak connection speeds between 10 and 20 Mbps.

	City	Q2 '10 Avg. Mbps
1	Monterey Park, CA	25.9
2	Everett, WA	25.7
3	Olympia, WA	25.7
4	Bellevue, WA	25.6
5	Federal Way, WA	25.6
6	Hickory, NC	24.0
7	Oakland, CA	24.0
8	Fairfield, CA	23.8
9	Hayward, CA	23.6
10	Salem, OR	23.5

Figure 16: Average Peak Connection Speed, Top United States Cities by Speed

5.5 United States High Broadband Connectivity

In the second quarter of 2010, nine of the top 10 states saw lower levels of high broadband adoption than in the first quarter, as shown in Figure 17. The lone standout was Rhode Island, which increased high broadband adoption by more than a third quarter-over-quarter. Across the whole country, 37 states and the District of Columbia saw high broadband adoption levels decline, with North Dakota, Iowa, and Arizona each losing 20% or more. Of the 12 states that posted quarterly gains, four states saw growth in excess of 10%, and Arkansas joined Rhode Island with a quarterly growth rate of more than 30%. In the first quarter of 2010, we posited that the declines observed may have been due, at least in part, to the delivery of streaming video for the 2010 Winter Olympics over the Akamai HD Network. We believe that increased second quarter consumption of long form video, such as movies and television shows, at bitrates below 5 Mbps, may have contributed to the widespread quarterly declines discussed above. As was discussed in the *1st Quarter, 2010 State of the Internet* report, Akamai plans to implement filtering of such rate-limited content, as appropriate, from future *State of the Internet* data sets.

Year-over-year changes were slightly more positive, with 27 states and the District of Columbia increasing their levels of high broadband adoption. Alaska led the pack here, growing high broadband adoption by 233% over the prior year, while South Dakota achieved a very respectable 93% yearly growth rate. (Both states had posted the highest yearly growth rates in the first quarter as well.) Twenty-one states (including South Dakota and Alaska) increased more than 10% year-over-year. Of the 23 states that lost ground since the second quarter of 2009,14 had declines of 6% or less, while five declined 20% or more.

Similar to section 4.5 above, data on the speed distribution of high broadband connectivity had been presented in its own sub-section in prior reports, but will be folded into the larger high broadband connectivity discussion starting with this edition of the *State of the Internet* report. In looking at a state-level breakdown of speeds above 5 Mbps, it is no surprise that the largest percentage of connections falls within the 5-10 Mbps bucket, accounting for anywhere from 6.3% to 55% of connections to Akamai. At the high end, connections to Akamai in excess of 25 Mbps account for anywhere from 0.1% to just 3.2% of connections

	State	% Above 5 Mbps	QoQ Change	YoY Change
1	Delaware	67%	-6.6%	45%
2	New Hampshire	53%	-2.6%	-5.9%
3	Rhode Island	52%	37%	47%
4	New Jersey	45%	-4.8%	-5.3%
5	Maryland	44%	-5.8%	-5.0%
6	District Of Columbia	44%	-0.7%	5.3%
7	Massachusetts	43%	-8.5%	-0.5%
8	Nevada	40%	-3.3%	8.2%
9	Connecticut	37%	-10%	-3.3%
10	New York	37%	-13%	-22%

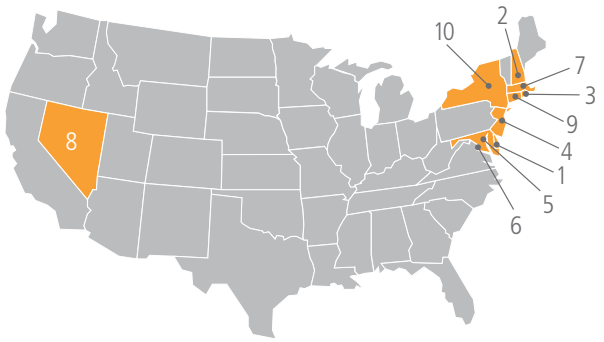


Figure 17: High Broadband Connectivity, Fastest U.S. States

to Akamai. While four states grew their percentage of 25+ Mbps connections to Akamai in excess of 100% in the second quarter, it is important to note that even with that growth rate, their total percentage of 25+ Mbps connections each remained under 1% Of the seven total states that saw yearly growth in the percentage of 25+ Mbps connections in the second quarter, only two of them exceeded 1%.

It is clear that there is still a long way to go in bringing high speed connectivity to a significant portion of the American populace. Of course, one challenge in doing so is the associated cost. A report[11] issued by the United States Federal Communications Commission in May noted that to reach the nation's estimated 14 million un-served citizens with broadband service of at least 4 Mbps, it would cost $23.5 billion to deliver using DSL and fixed wireless, and $62 billion to deploy fiber to the home. Note that this estimate is based on targeting only a portion of the national population, and only at minimum speeds of 4 Mbps – enabling higher speed connectivity for more people would carry a significantly higher price tag.

5.6 United States Broadband Connectivity

Broadband adoption within the United States continues to be strong, with Delaware gradually closing in on the elusive 100% mark, and six other states with broadband adoption of 80% or more, as shown in Figure 18. Across the country, 47 states and the District of Columbia had more than half of their connections to Akamai at speeds in excess of 2 Mbps during the second quarter. The remaining three states (Wyoming, Idaho, and Iowa) were not that far behind, with adoption rates of 49%, 44%, and 41% respectively. In contrast to the quarterly changes discussed above in Section 5.5, quarterly growth was seen in eight of the top 10 states, and 32 states plus the District of Columbia overall. The observed growth was fairly modest, with Delaware inching up just 0.2%, to Mississippi's 8.5% quarter-over-quarter increase. Year-over-year numbers were very positive, with only four states experiencing declining broadband adoption since the second quarter of 2009 – Nebraska, Maine, North Dakota, and Vermont. Montana saw the biggest yearly increase, at 56%, bringing it to a broadband adoption level of 55% in the second quarter.

	State	% Above 2 Mbps	QoQ Change	YoY Change
1	Delaware	98%	0.2%	1.5%
2	New Hampshire	90%	0.5%	2.3%
3	Rhode Island	89%	4.3%	5.3%
4	Hawaii	87%	0.2%	3.1%
5	Connecticut	84%	1.0%	2.6%
6	Nevada	82%	1.7%	5.6%
7	Maryland	80%	1.6%	2.9%
8	Maine	79%	-0.4%	-3.2%
9	New York	79%	-0.1%	0.2%
10	New Jersey	78%	1.1%	3.6%

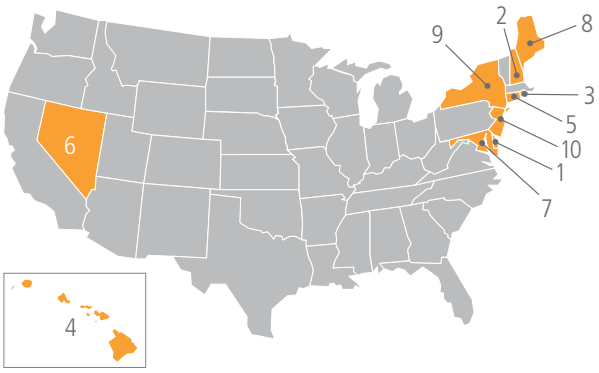


Figure 18: Broadband Connectivity, Fast U.S. States

It is interesting to note the contrasting quarterly trends between the high broadband and broadband adoption metrics in the United States for the second quarter. As noted above, one possible explanation for the observed quarterly trends of declining high broadband adoption and increased broadband adoption is significant growth in the consumption of long-form media content (movies, television shows) at bitrates between 2-5 Mbps, delivered by Akamai using HTTP streaming techniques.

5.7 United States Narrowband Connectivity

The percentage of connections to Akamai at speeds below 256 Kbps from U.S. states continues a general descent, highlighting a trend over time to higher speed connectivity. As shown in Figure 19, nine of the top 10 states with the highest percentages of narrowband (<256 Kbps) connections saw quarter-over-quarter declines, with only North Dakota seeing an increase, and a rather small one at that. Across the whole United States, 42 states and the District of Columbia saw narrowband adoption drop from first quarter levels – Mississippi saw the greatest decline, dropping 46%. Year-over-year trends improved greatly as compared to those observed in the first quarter, with only West Virginia seeing a higher narrowband adoption rate as compared to the second quarter of 2009. (And with a narrowband adoption rate of only 2.5%, it is still doing comparatively well.)

In the second quarter, four states (Hawaii, Rhode Island, Nevada, and Delaware) had narrowband adoption rates of less than 1%. Delaware was the lowest at 0.2%, which is not surprising, given that it also has the highest adoption rates for high broadband and broadband connectivity, as well as the highest average and average peak connection speeds.

	State	% Below 256 Kbps	QoQ Change	YoY Change
1	Alaska	7.7%	-4.0%	-22%
2	District Of Columbia	6.5%	-7.3%	-32%
3	Missouri	5.7%	-6.7%	-30%
4	Iowa	5.5%	-4.0%	-25%
5	Georgia	4.5%	-8.8%	-36%
6	Illinois	4.0%	-5.1%	-28%
7	North Dakota	3.9%	0.7%	-37%
8	Ohio	3.8%	-10%	-30%
9	Colorado	3.8%	-8.2%	-31%
10	Texas	3.7%	-8.4%	-32%

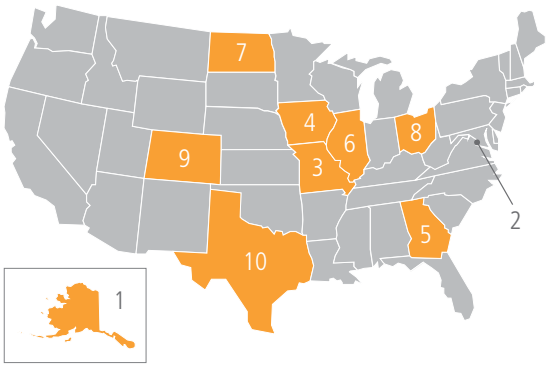


Figure 19: Narrowband Connectivity, Slowest U.S. States

Building on the data presented in the *State of the Internet* reports over the last several quarters, Akamai continues to identify additional mobile networks for inclusion in the report. As we did in the *1st Quarter, 2010 State of the Internet* report, we are including information on the average connection speed and average peak connection speed by provider, as well as insight into the average megabytes (MB) downloaded from Akamai per month per unique IP address associated with mobile networks. In addition, we have moved the discussion of attack traffic originating from mobile networks into this section. As was noted last quarter, the source data set for this section is subject to the following constraints:

- A minimum of 1,000 unique IP addresses connecting to Akamai from the network in the second quarter of 2010 was required for inclusion in the list.
- In countries where Akamai had data for multiple network providers, only the top three are listed, based on unique IP count.
- The names of specific mobile network providers have been anonymized, and providers will be identified by a unique ID.
- Data is included only for networks where Akamai believes that the entire Autonomous System (AS) is mobile – that is, if a network provider mixes traffic from fixed/wireline (DSL, cable, etc.) connections with traffic from mobile connections on a single network identifier, that AS was not included in the source data set.
- Akamai's EdgeScape database was used for the continental assignments.

6.1 Attack Traffic, Top Originating Countries

When the set of attack traffic observed by Akamai during the second quarter of 2010 is limited to that seen from known mobile network providers, the top 10 list of attack sources is rather different in a number of ways. For one, half of the top 10 countries are different – Chile, the United Kingdom, Malaysia, Poland, and Ireland appear in Figure 20, but not in the overall list in Figure 1 (although Poland has been known to be a top 10 attack traffic source at times). Another difference is the concentration – over 40% of the observed mobile attack traffic comes from just the top two countries (as opposed to the top five overall), and the top 10 countries are responsible for nearly 80% of the observed attacks, in contrast to nearly 60% overall.

	Country/Region	% Traffic
1	Italy	25%
2	Brazil	18%
3	Chile	7.5%
4	United Kingdom	6.2%
5	Malaysia	5.0%
6	Poland	4.8%
7	China	3.2%
8	Russia	2.9%
9	United States	2.7%
10	Ireland	2.4%
–	Other	22%

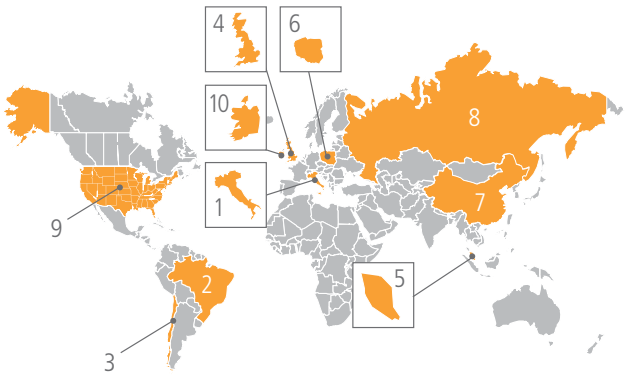


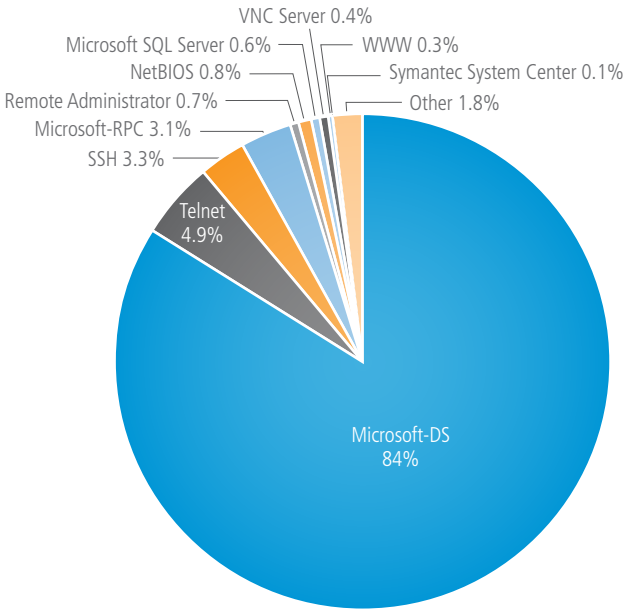
Figure 20: Attack Traffic from Mobile Networks, Top Originating Countries/Regions

6.2 Attack Traffic, Top Ports

Not surprisingly, the top 10 ports targeted by attack traffic coming from mobile networks were fairly similar to overall attack traffic observed by Akamai. As shown in Figure 21, nine of the top 10 ports targeted by mobile attack traffic are the same as in Figure 3, which highlights the ports targeted by all attack traffic observed by Akamai. The lone standout here is Port 2967 (Symantec System Center), instead of Port 3389 (Microsoft Terminal Services), at the bottom of the top 10 list. Attack traffic coming from mobile networks also appears to be more concentrated than the overall set of attack traffic, with Port 445 accounting for 84% of mobile attacks (vs. only 62% overall), and the top 10 ports accounting for more than 98% of observed mobile attacks (vs. just over 86% overall). As noted previously, we believe that the observed attack traffic that is originating from known mobile networks is likely being generated by infected PC-type clients connecting to wireless networks through mobile broadband technologies, and not by infected smartphones or similar mobile devices.

Port	Port Use	% Traffic
445	Microsoft-DS	84%
23	Telnet	4.9%
22	SSH	3.3%
135	Microsoft-RPC	3.1%
139	NetBIOS	0.8%
4899	Remote Administrator	0.7%
1433	Microsoft SQL Server	0.6%
5900	VNC Server	0.4%
80	WWW	0.3%
2967	Symantec System Center	0.1%
Various	Other	1.8%

Figure 21: Attack Traffic from Mobile Networks, Top Ports



6.3 Mobile Connection Speeds & Data Consumption

In examining the data shown in Figure 22, we see that there is once again an extremely wide range of average connection speeds, and curiously, the fastest (6.1 Mbps) and slowest (115 Kbps) were once again seen on mobile providers in Slovakia. Of the 109 mobile providers listed, 19 had average connection speeds in the broadband (2 Mbps or above) range (up from 14 in the first quarter), while 29 more had average measured connection speeds of 1 Mbps or more (up from 21 in the first quarter). On a quarter-over-quarter basis, mobile connectivity appeared to improve in many places, with users on 95 of the 109 listed mobile providers experiencing higher connection speeds in the second quarter. These improvements ranged from a 0.9% increase on a provider in Singapore to doubled speeds on a provider in Saudi Arabia. Quarterly losses were fairly nominal, with the worst a 31% average connection speed decline on a Nigerian mobile provider. Year-over-year changes were also very positive, ranging from connection speeds that more than quadrupled on the aforementioned Saudi Arabian provider, to the slight 0.3% growth seen from a provider in the Czech Republic. There were three providers across Japan, France, and Hong Kong that showed no change year-over-year – the Hong Kong provider also showed no quarterly change, which is unusual.

In reviewing the average peak connection speed data, we observed that the Slovakian provider with the highest average connection speed topped this metric as well, with an average peak connection speed of just over 20 Mbps. Note that this excludes the United Kingdom mobile provider listed as having an average peak connection speed in excess of 36 Mbps – we believe that this provider uses a mobile gateway/proxy architecture that reflects gateway/proxy-to-Akamai communication speeds, rather than mobile device-to-Akamai communication speeds. Akamai continues to investigate methods of mitigating the impact of these gateways/proxies on the source data sets that will be used for future editions of the *State of the Internet* report. Average peak connection speeds proved to be very strong in the second quarter, with all but six of the listed providers exceeding 1 Mbps. Trends over time were very positive as well, with only 11 providers seeing quarterly declines in average peak connection speeds, and only 11 seeing yearly declines as well. Interestingly, those same providers in Japan, Hong Kong, and France remained flat quarter-over-quarter and year-over-year for this metric as well.

As we did in the first quarter, we are again examining the average amount (MB) of data downloaded from Akamai per month per unique IP address seen from that mobile provider. Not including two providers where we believe proxy/gateway architectures are in use, we found five providers in Canada, Puerto Rico, Slovakia, Germany, and Austria whose users, on average, consumed more than one gigabyte (1 GB) of content from Akamai per month during the second quarter. An additional 80 mobile providers around the world had more than 100 MB of data downloaded from Akamai per unique IP address per month during the second quarter of 2010. The two providers whose users downloaded the least data from Akamai during the second quarter were located in Belgium, consuming 16 MB and 14 MB per unique IP address per month respectively. In contrast to the speed metrics discussed above, 71 mobile providers saw measured consumption grow on a quarterly basis, while it declined on 37 providers. Year-over-year changes were more aggressive, however, with 85 providers increasing the average amount (MB) of data downloaded from Akamai per month per unique IP address as compared to the second quarter of 2009.

Country/Region	ID	Q2 '10 Avg. Kbps	Q2 '10 Peak Kbps	Q2 '10 Avg. MB/ month
AFRICA				
Egypt	EG-1	420	2172	149
Morocco	MA-1	657	5420	422
Nigeria	NG-1	167	3478	237
South Africa	ZA-1	522	959	216
ASIA				
China	CN-1	1972	5138	128
Hong Kong	HK-1	2534	11721	849
Hong Kong	HK-2	2154	8892	229
Hong Kong	HK-3	1929	4802	19
Indonesia	ID-1	269	7730	14879
Israel	IL-1	1107	5328	82
Japan	JP-1	1546	6145	113
Kuwait	KW-1	1933	10306	306
Malaysia	MY-1	354	2004	147
Malaysia	MY-2	2286	n/a	565
Malaysia	MY-3	729	4307	461
Pakistan	PK-1	815	4684	394
Saudi Arabia	SA-1	1927	7003	222
Singapore	SG-2	654	6359	101
Singapore	SG-3	1265	5046	299
South Korea	KR-1	1482	2957	34
Sri Lanka	LK-1	630	3348	183
Taiwan	TW-1	988	4073	104
Taiwan	TW-2	501	2650	133
Thailand	TH-1	733	6514	105
EUROPE				
Austria	AT-1	2745	10427	133
Austria	AT-2	2208	7598	1119

Country/Region	ID	Q2 '10 Avg. Kbps	Q2 '10 Peak Kbps	Q2 '10 Avg. MB/ month
Belgium	BE-1	2435	8353	303
Belgium	BE-2	954	2358	16
Belgium	BE-3	298	749	14
Croatia	HR-1	1050	4137	45
Czech Republic	CZ-1	1066	4268	78
Czech Republic	CZ-2	462	2292	118
Czech Republic	CZ-3	2604	8416	140
Estonia	EE-1	825	3626	197
France	FR-1	489	2424	140
France	FR-2	1742	5391	609
France	FR-3	579	3821	200
Germany	DE-1	486	2258	61
Germany	DE-2	2447	8503	1246
Greece	GR-1	1207	7851	512
Greece	GR-2	575	4129	119
Hungary	HU-1	1423	6798	145
Hungary	HU-2	1862	7887	106
Ireland	IE-1	2104	8897	357
Ireland	IE-2	1302	8020	357
Ireland	IE-3	1129	8409	514
Italy	IT-1	1131	7144	358
Italy	IT-2	2007	7343	286
Italy	IT-3	2739	10292	423
Italy I	T-4	594	4453	248
Lithuania	LT-1	1616	7987	280
Lithuania	LT-2	944	4083	205
Moldova	MD-1	1100	4073	72
Moldova	MD-2	1418	5528	120
Netherlands	NL-1	917	2067	20

Figure 22: Average and Average Peak Connection Speed, Average Megabytes Downloaded per Month by Mobile Provider

It is clear that as digital media consumption grows; mobile will be the front and center of this evolution.

[http://www.chetansharma.com/blog/2009/06/03/silicon-india-article-mobile-media-evolution]

Country/Region	ID	Q2 '10 Avg. Kbps	Q2 '10 Peak Kbps	Q2 '10 Avg. MB/ month
Netherlands	NL-2	1698	3347	19
Norway	NO-1	977	3850	56
Norway	NO-2	1287	4382	65
Poland	PL-1	3675	10583	111
Poland	PL-2	1005	3869	40
Poland	PL-3	682	3581	121
Portugal	PT-1	376	1514	32
Romania	RO-1	471	2467	79
Russia	RU-1	5287	18979	129
Russia	RU-2	773	2813	57
Russia	RU-3	571	2378	104
Slovakia	SK-1	115	726	33
Slovakia	SK-2	2166	6485	1703
Slovakia	SK-3	6129	20203	625
Slovenia	SI-1	1274	5114	48
Spain	ES-1	1358	7951	274
Spain	ES-3	891	5032	168
Ukraine	UA-1	441	1303	34
United Kingdom	UK-1	1285	7529	386
United Kingdom	UK-2	2115	9446	526
United Kingdom	UK-3	3650	36549	12787
NORTH AMERICA				
Canada	CA-1	2788	13338	7363
Canada	CA-2	826	2166	499
El Salvador	SV-1	536	3465	203
El Salvador	SV-2	880	6047	470
El Salvador	SV-3	763	4097	721
Guatemala	GT-1	392	2655	119
Guatemala	GT-2	496	4148	474
Mexico	MX-2	767	5837	474
Mexico	MX-3	459	4119	354
Netherlands Antilles	AN-1	403	2544	192
Nicaragua	NI-1	704	4680	279
Puerto Rico	PR-1	2306	9021	2326
United States	US-1	967	2282	28
United States	US-2	980	2838	27
United States	US-3	910	3011	351
OCEANIA				
Australia	AU-1	974	7741	819
Australia	AU-3	1457	6199	137
Guam	GU-1	327	852	177
New Caledonia	NC-1	656	2526	268
New Zealand	NZ-2	1098	6018	303
SOUTH AMERICA				
Argentina	AR-1	358	3206	116
Argentina	AR-2	463	3425	165
Bolivia	BO-1	156	2269	166
Brazil	BR-1	600	3104	108
Brazil	BR-2	501	4338	126
Chile	CL-3	612	5453	382
Chile	CL-4	730	4939	446
Colombia	CO-1	570	5249	193
Paraguay	PY-1	297	2209	113
Paraguay	PY-2	312	2844	278
Uruguay	UY-1	727	5357	245
Venezuela	VE-1	575	3668	367

*Kids of the **now** generation are growing with connected electronics that is fundamentally altering the behaviors and expectations of interaction, communication, consumption, and monetization.*

[http://www.chetansharma.com/usmarketupdateq22010.htm]

Country/Region	% Attack Traffic	Unique IP Addresses	Avg. Connection Speed (Mbps)	Peak Connection Speed (Mbps)	% Above 5 Mbps	% Above 2 Mbps	% Below 256 Kbps
EUROPE							
Austria	0.2%	2,296,675	3.8	11.4	18%	65%	1.0%
Belgium	0.1%	3,513,996	5.3	19.0	40%	91%	0.3%
Czech Republic	0.2%	1,674,706	5.3	14.5	34%	88%	0.3%
Denmark	0.2%	2,160,122	5.2	14.0	37%	87%	0.7%
Finland	0.1%	2,338,594	4.1	11.5	23%	56%	1.3%
France	1.8%	22,740,013	3.4	11.8	12%	73%	0.8%
Germany	2.9%	31,220,592	4.1	13.8	20%	85%	0.8%
Greece	0.3%	2,124,500	3.0	12.8	5.2%	71%	1.5%
Iceland	0.0%	121,363	4.3	14.7	16%	81%	--
Ireland	0.1%	1,307,681	5.1	13.7	15%	65%	3.1%
Italy	3.5%	10,845,562	3.0	11.5	6.0%	76%	3.1%
Luxembourg	0.0%	160,771	3.8	12.2	14%	82%	1.2%
Netherlands	0.4%	6,983,247	6.5	16.0	49%	88%	0.6%
Norway	0.4%	2,377,412	4.7	13.7	24%	80%	0.8%
Portugal	0.8%	2,263,510	3.9	17.0	24%	78%	0.3%
Spain	1.8%	11,444,687	2.7	10.7	5.8%	63%	1.0%
Sweden	0.2%	4,406,626	5.5	18.5	34%	73%	1.6%
Switzerland	0.2%	2,629,299	5.0	15.4	24%	91%	0.6%
United Kingdom	1.2%	20,042,782	3.9	13.4	17%	83%	1.0%
ASIA/PACIFIC							
Australia	0.4%	8,842,180	2.8	11.0	12%	50%	4.9%
China	0.5%	60,042,886	0.9	3.4	0.3%	6.6%	13%
Hong Kong	0.4%	2,242,583	8.6	31.7	46%	92%	0.5%
India	1.9%	4,634,437	0.8	4.7	0.5%	4.3%	30%
Japan	2.6%	34,833,550	8.0	27.9	60%	86%	1.4%
Malaysia	1.0%	1,530,039	1.2	6.7	0.8%	6.0%	6.6%
New Zealand	0.3%	1,347,976	3.3	12.7	12%	71%	6.3%
Singapore	0.3%	1,602,979	3.1	12.8	17%	55%	4.9%
South Korea	1.5%	16,795,947	16.6	38.0	75%	93%	0.2%
Taiwan	6.0%	6,251,406	4.1	14.0	23%	66%	1.1%
MIDDLE EAST							
Egypt	1.6%	1,077,113	0.8	5.3	0.5%	6.4%	9.4%
Israel	0.7%	1,960,429	3.3	11.2	6.0%	76%	0.3%
Kuwait	0.2%	245,545	1.3	7.5	1.4%	17%	7.1%
Saudi Arabia	0.5%	1,495,923	1.8	6.6	0.5%	33%	1.0%
Sudan	0.0%	25,900	0.5	3.2	--	--	21%
Syria	0.0%	90,045	2.0	3.6	7.6%	45%	28%
United Arab Emirates (UAE)	0.2%	763,650	1.5	7.4	4.3%	18%	7.2%
LATIN & SOUTH AMERICA							
Argentina	2.3%	3,933,382	1.5	6.8	0.7%	23%	3.4%
Brazil	5.7%	12,003,674	1.4	5.6	2.3%	19%	16%
Chile	0.5%	2,019,604	2.2	10.1	2.6%	44%	1.4%
Colombia	1.0%	2,408,231	1.6	7.2	0.4%	27%	2.8%
Mexico	0.4%	8,001,433	1.5	6.4	0.5%	16%	1.8%
Peru	1.5%	664,123	1.2	6.5	0.7%	8.3%	2.6%
Venezuela	0.3%	2,183,054	0.7	3.8	--	1.6%	15%
NORTH AMERICA							
Canada	1.7%	11,644,413	4.7	15.1	31%	84%	1.9%
United States	11%	131,397,342	4.6	16.4	30%	72%	2.8%

SECTION 8:
Endnotes

[1] The http://isc.sans.edu/diary.html?storyid=8881

[2] http://isc.sans.edu/diary.html?storyid=9031

[3] http://www.akamai.com/dl/whitepapers/How_will_the_internet_scale.pdf

[4] http://www.fcc.gov/Daily_Releases/Daily_Business/2010/db0720/FCC-10-129A1.pdf

[5] http://www.blu-ray.com/faq/

[6] The "average peak connection speed" metric represents an average of the peak measured connection speeds across all of the unique IP addresses seen by Akamai from a particular geography. The average is used in order to mitigate the impact of unrepresentative peak measured connection speeds. In contrast to the average measured connection speed, the average peak connection speed metric is more representative of what many end-user Internet connections are capable of. (This includes the application of so-called speed boosting technologies that may be implemented within the network by providers, in order to deliver faster download speeds for some larger files.)

[7] http://www.telegraph.co.uk/technology/broadband/6500162/Swedish-government-pledges-super-fast-broadband-for-all.html

[8] http://arstechnica.com/tech-policy/news/2010/04/1gbps-symmetric-fiber-us26-in-hong-kong.ars

[9] http://www.reuters.com/article/idUSTRE65H3H320100618

[10] http://www.akamai.com/html/technology/products/edgescape.html

[11] http://download.broadband.gov/plan/the-broadband-availability-gap-obi-technical-paper-no-1.pdf

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