Volume 3, Number 4

The State of the Internet

4th Quarter, 2010 Report

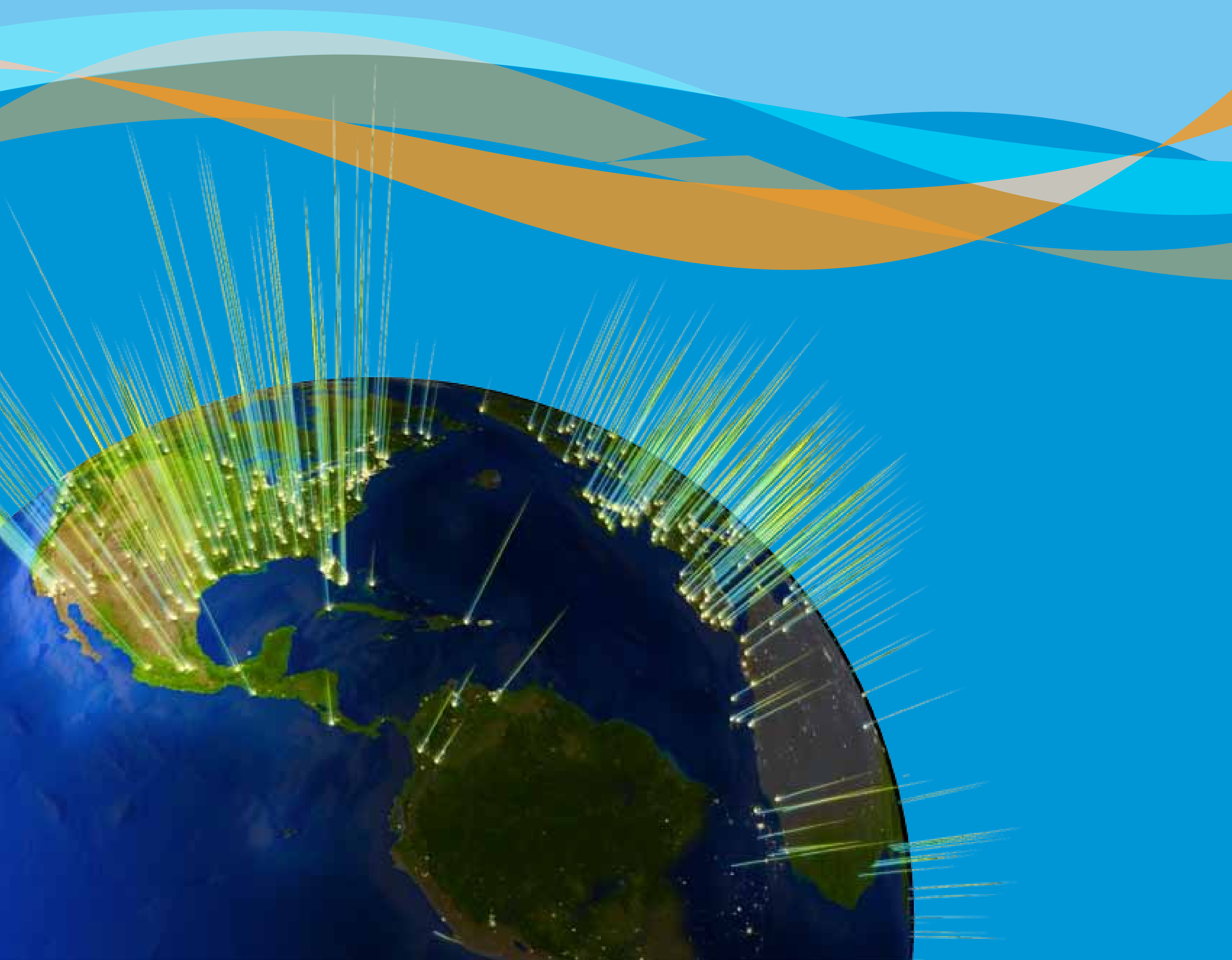

Table of Contents

Executive Summary

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. Each quarter, Akamai publishes a "State of the Internet" report. This report includes data gathered from across Akamai's global server network during the fourth quarter of 2010 about attack traffic, broadband adoption, and mobile connectivity, as well as trends seen in this data over time.

Attack Traffic

During the fourth quarter of 2010, Akamai observed attack traffic originating from 207 unique countries around the world. Russia was the top attack traffic source, accounting for 10% of observed attack traffic in total. Taiwan and Brazil held the second and third place spots respectively, accounting for just over 15% of observed attack traffic combined. Attack traffic concentration was lower than in the third quarter, with the top 10 ports seeing 72% of the observed attack traffic, including traffic likely related to a Koobface variant that resurfaced in China. The fourth quarter also saw a number of Web sites experience Distributed Denial of Service (DDoS) attacks, including one Akamai customer that had a peak request rate over 9,000x normal levels.

Broadband Adoption

Akamai observed a 4.2% increase (from the third quarter of 2010) globally in the number of unique IP addresses connecting to Akamai's network, growing to over 556 million. From a global connection speed perspective, Japan recorded the highest level of "high broadband" (>5 Mbps) connectivity, with 58% of connections to Akamai at speeds above 5 Mbps. However, South Korea maintained the highest average connection speed, at 13.7 Mbps. Hong Kong recorded the highest average peak connection speed, where the per-IP address maximum connection speed was averaged across the IP addresses seen from each country. Cities in South Korea and Japan continued to hold many of the top spots in the rankings of highest average and average peak connection speeds by city. 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, at 7.2 Mbps, as well as the highest average peak connection speed across the United States, at 28.4 Mbps. Riverside, CA was the United States city with the highest average connection speed (7.6 Mbps) and highest average peak connection speed (28.5 Mbps) in the fourth quarter.

Mobile Connectivity

Reviewing fourth quarter attack traffic from known mobile networks, overall attack traffic concentration remained fairly consistent from the prior quarter, with the top two countries responsible for 40% of observed attacks, while the top 10 countries were the source of three-quarters of observed attacks. The targeted ports were largely similar to the overall port list, though Port 445 still accounts for a much higher percentage of attacks when looking at only known mobile networks. In the fourth quarter of 2010, average measured connection speeds on known mobile providers around the world ranged from 4.5 Mbps down to 134 Kbps. Average peak connection speeds on mobile providers around the world ranged from 21.2 Mbps to just barely more than 1 Mbps. Looking at content consumption metrics, consumption grew quarter-over-quarter on 62 of the listed providers, and 89 providers experienced increased content consumption as compared to the end of 2009.

Akamai maintains a distributed set of agents deployed across the Internet that 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 attack traffic, as observed and measured by Akamai, during the fourth quarter of 2010.

At a continental level, Europe had the greatest level of quarterly variability for observed attack traffic volume throughout 2010.

1.1 Attack Traffic, Top Originating Countries

During the fourth quarter of 2010, Akamai observed attack traffic originating from 207 unique countries/regions, down just two from the third quarter. While the list of countries/regions comprising the top five remained constant from quarter-to-quarter, a shift in the rankings clearly occurred, as shown in Figure 1. Most notably, the United States dropped to fifth place globally, the source of 7.3% of the observed attack traffic. Russia shifted into first place, responsible for approximately 12% more of the observed traffic in the fourth quarter than in the prior quarter. For most of the remaining countries, the quarterly changes in attack traffic percentages were mixed, though none of the variations were significant. Romania displaced Peru within the list of the top 10 countries/regions – Peru ranked ninth in the third quarter, but was responsible for just 2% of observed attack traffic this quarter, placing it fifteenth globally.

Aggregating observed attack traffic at a continental level, we find the percentages to be fairly consistent with those seen in the third quarter. In the Asia Pacific region, Africa, and South America, the variations were 1% or less as compared to the third quarter. However, Europe was responsible for just under 4% more attack traffic than last quarter, while North America was responsible for almost 4.5% less. Looking across all of 2010, it appears that Europe had the greatest level of quarterly variability.

	Country/Region	Q4 '10 % Traffic	Q3 '10 %
1	Russia	10%	8.9%
2	Taiwan	7.6%	7.1%
3	Brazil	7.5%	7.9%
4	China	7.4%	8.2%
5	United States	7.3%	12%
6	Egypt	3.6%	3.3%
7	Italy	3.6%	3.0%
8	Turkey	2.8%	3.0%
9	Germany	2.7%	2.6%
10	Romania	2.6%	2.0%
–	Other	45%	42%

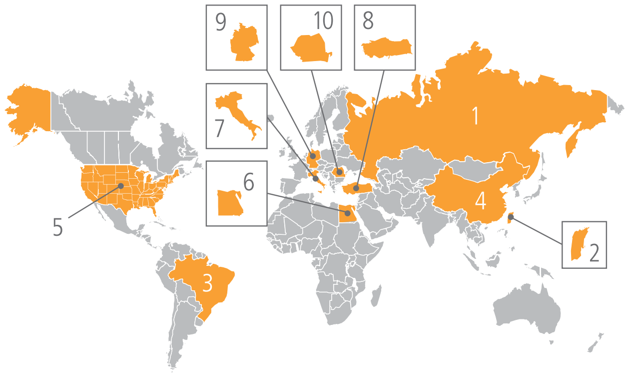

Figure 1: Attack Traffic, Top Originating Countries/Regions

1.2 Attack Traffic, Top Ports

Attack traffic concentration among the top 10 targeted ports dropped significantly from the third quarter, with the top 10 ports responsible for just 72% of the observed attacks (down from 87% in the third quarter of 2010). This difference is mostly accounted for by the continued decline in the percentage of attacks targeted at Port 445 (Microsoft-DS), down from 56% to 47%, and Port 23 (Telnet), down from 17% to 11%, as shown in Figure 2. Although the *McAfee Threats Report: Fourth Quarter 2010*[1] notes that Conficker (historically associated with attacks targeting Port 445) was an active threat in the third quarter, and that it resurfaced in the fourth quarter, the steady decline of attacks on Port 445 is an encouraging sign that efforts to mitigate the threat continue to see success.

As shown in Figure 2, most of the top 10 ports were consistent with past quarters, though in the fourth quarter, Port 5900 (VNC Server) ceded its position on the list to Port 9415, which is officially "unassigned" to any specific application. Researchers have noted, however, that the increase in traffic on that port may be related to a Koobface variant related to a Chinese language instant messaging (IM) client, Tencent QQ, which had been targeted by malware served by Network Solutions Web sites and parked pages.[2]

In looking at the port distribution among the top 10 countries, we see that Port 9415 was among the top five ports for attacks sourced from China, which is in line with the explanation above. Once again, in Turkey and Egypt, attacks targeted at Port 23 were responsible for significantly larger percentages of observed attacks than the second-most targeted port (445, in both countries). Port 22 (SSH) again led the list of targets of attacks sourced in China, with attacks on that port responsible for more than 2x the next most-targeted port (445).

Port	Port Use	Q4 '10 % Traffic	Q3 '10 %
445	Microsoft-DS	47%	56%
23	Telnet	11%	17%
22	SSH	6.2%	5.7%
139	NetBIOS	1.5%	1.5%
80	WWW	1.5%	1.5%
135	Microsoft-RPC	1.1%	3.5%
1433	Microsoft SQL Server	1.1%	0.9%
4899	Remote Administrator	1.1%	0.8%
3389	Microsoft Terminal Services	0.7%	0.5%
9415	[unassigned]	0.4%	0.3%
Various	Other	28%	–

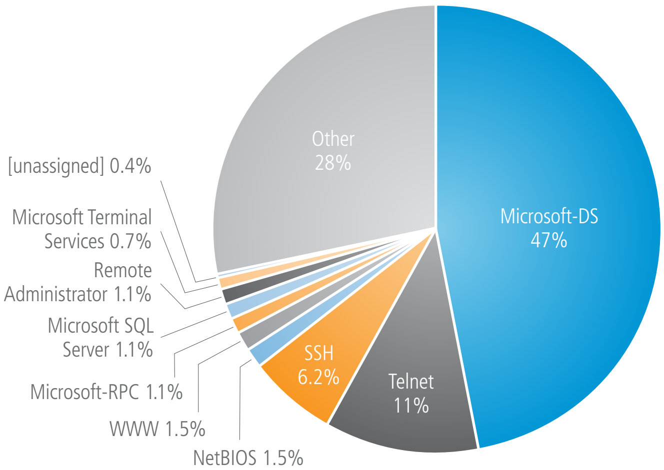

Figure 2: Attack Traffic, Top Ports

1.3 Attack Traffic, Distributed Denial of Service (DDoS) Attacks

October 2010 saw the Web sites for Recording Industry Association of America[3] and the Ministry of Sound[4] targeted with DDoS attacks, as well as the servers for the popular online game Minecraft.[5] (Although, in an unusual twist, the attack on the Minecraft servers was apparently not motivated by politics, but rather by fans of the game demanding more updates from its creator.) In early November, the small-business Web hosting platform from Intuit was unavailable for several hours. The company noted that the service interruption was due to a denial of service attack.[6] Also in early November, most network traffic in and out of Burma was disrupted by a DDoS attack that targeted the country's main Internet provider, the Ministry of Post and Telecommunication.[7] Network security firm Arbor Networks estimated that the attack traffic targeting Burma peaked near 15 Gbps during its two day period. December saw Web sites belonging to Wikileaks, Mastercard, Visa, and PayPal targeted with DDoS attacks, which achieved varying levels of success.[8]

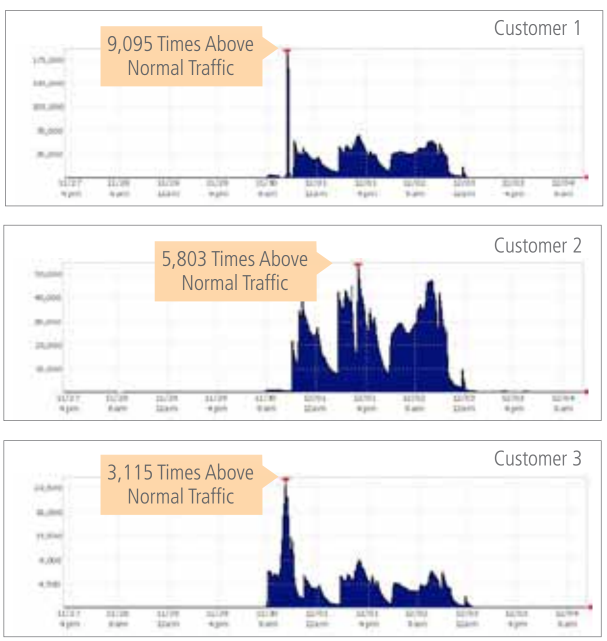

Figure 3: DDoS Traffic Patterns for Selected Akamai Customers

In addition, according to Akamai Chief Scientist and co-founder Tom Leighton, the Akamai network saw more distributed denial of service (DDoS) attacks against our customers' Web sites in the fourth quarter of 2010 than in the first three quarters of the year combined.[9] Of note were a number of DDoS attacks that targeted Akamai eCommerce customers during peak online shopping times. As shown in Figure 3, these customers experienced request traffic volumes that were multiple orders of magnitude higher than those normally seen, even during the holiday season. The first customer highlighted in Figure 3 experienced a peak request rate (requests/second) over 9,000x normal levels, creating a 14 Gbps spike in traffic volumes.

In reviewing these attacks, Akamai observed that they were:

- Coordinated: Start and end times for the attacks were similar across the targeted customer properties
- Concentrated: The attacks were on Internet Retailer 250+ eCommerce retailers located in the United States
- Common: The attack traffic was generated from the same source countries, including Thailand, Brazil, and Russia, and had similar user agent properties and attack methodologies across the targeted customer properties.

Akamai's DDoS defense architecture[10] helps customers to prepare for, monitor, manage and mitigate the impacts of these types of malicious DDoS attacks. In addition to the Akamai network's ability to absorb large-scale attacks and offer fail-over service, Akamai's cloud-based solutions include:

- Cloaking web infrastructure from the public Internet
- IP blocking and rate limiting capabilities at the network layer
- Web application firewalling at Layer 7 (application layer)
- Scalable protection from DNS attacks
- Blocking of traffic by geographic region
- ID suspected bots from real users to de-prioritize or block
- DDoS specialists to assess infrastructure and develop a run-time attack playbook
- 24/7 support with a response SLA
- Capped exposure to bursting fees related to an attack

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 fourth quarter of 2010, over 556 million unique IP addresses, from 234 countries/regions, connected to the Akamai network – 4.2% more IP addresses than in the third quarter of 2010, and over 20% more than in the same quarter a year ago. Although we see more than half a billion unique IP addresses, Akamai believes that we see 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), because they access the Web through a firewall or proxy server. Conversely, individual users can have multiple unique IP addresses associated with them, due to their use of multiple connected devices.

As shown in Figure 4, the top 10 countries remained the same quarter over quarter. Nine of the top 10 countries saw quarterly growth in the number of unique IP addresses observed by Akamai, ranging from an increase of under 1% in France to an 18% increase in South Korea. Yearly growth across all of the top 10 countries was strong, with double digit yearly increases seen in all countries but France. China's growth rate has been consistently strong throughout 2010, with year-over-year changes of 30% or more seen in all quarters.

Concentration among the top 10 remained consistent with the past several quarters, accounting for nearly 70% of the observed IP addresses. In looking at the "long tail," there were 183 countries/regions with fewer than one million unique IP addresses connecting to Akamai in the fourth quarter of 2010, 132 with fewer than 100,000 unique IP addresses, and 30 with fewer than 1,000 unique IP addresses. The counts for all three thresholds were down quarter-over-quarter.

According to an October report[11] from the International Telecommunications Union, the number of Internet users was expected to surpass two billion in 2010, approaching a third of the world's population. However, the report stated that by the end of 2010, 71% of the population in developed countries will be online compared with 21% of people in developing countries. The report highlighted that in developing countries, under 14% of people have home Internet access, relying instead on access to the Internet in schools, at work and in public places; in developed countries, 65% have home Internet access.

	Country/Region	Q4 '10 Unique IP Addresses	QoQ Change	YoY Change
–	Global	556,143,000	4.2%	20%
1	United States	137,214,278	-2.8%	15%
2	China	67,238,493	4.6%	32%
3	Japan	39,551,369	5.4%	24%
4	Germany	33,838,723	7.4%	11%
5	France	23,114,330	0.7%	8.1%
6	United Kingdom	22,186,550	2.4%	12%
7	South Korea	22,035,311	18%	41%
8	Brazil	13,530,942	3.8%	27%
9	Canada	12,513,650	2.5%	11%
10	Spain	12,453,087	4.2%	16%

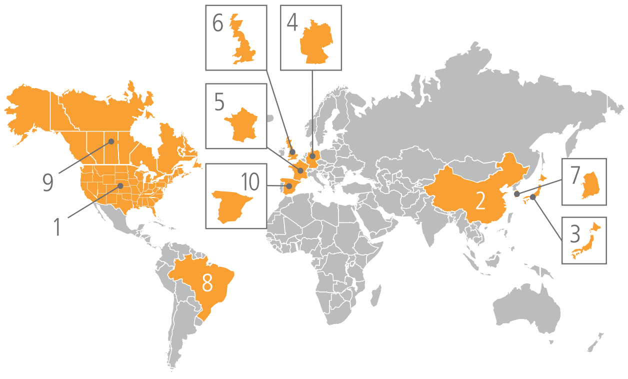

Figure 4: Unique IP Addresses Seen By Akamai

SECTION 3:
Geography – Global

By virtue of the billions of requests for Web content that it serves 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 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[12] or the video explanation at *www.akamai.com/whytheedge.*

The data presented within this section was collected during the fourth 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 fourth quarter. For 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 contrast to the "high broadband" and "broadband" classifications, the "narrowband" data included below is for connections to Akamai that are slower than 256 Kbps. Note that the percentage changes reflected below are relative to the prior quarter(s). (That is, a Q3 value of 50% and a Q4 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 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.[13] In addition to providing data on average connection speeds, we continue to report average peak connection speeds[14] 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 has been done in prior quarters, 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.

3.1 Global Average Connection Speeds

In the fourth quarter of 2010, the global average connection speed remained essentially flat as compared to the third quarter, ending the year approximately 60 Kbps shy of the 2 Mbps "broadband" threshold. However, as shown in Figure 5, average connection speeds among the top 10 countries were not as static, with quarterly growth as high as 14% (in Belgium), though declines were not as significant, with South Korea's 3.0% quarterly decline the worst of the three countries in the list that lost ground. Even with these declines, all of the countries within the top 10, as well as the United States, maintained average connection speeds that exceeded the "high broadband" threshold of 5 Mbps.

Yearly changes among the top 10 countries were somewhat mixed in the fourth quarter. While double digit percentage gains were seen in countries including South Korea, the Netherlands, Switzerland, Belgium, and Canada, year-over-year declines of 6% or less were experienced in Romania, Latvia, and the Czech Republic. On a global basis, 14 countries/regions saw year-over-year growth in excess of 100%, though all but two of them have average connection speeds below 1 Mbps. These countries/regions were predominantly located in Africa, the South Pacific, and Latin America.

During the fourth quarter, 75 countries/regions had average connection speeds below 1 Mbps. Akamai measured average connection speeds below 100 Kbps in three countries – Cuba, the Solomon Islands, and Mayotte. Cuba's average connection speed remained just below the threshold, at 95 Kbps, while Mayotte remained the slowest country, with an average connection speed of just 54 Kbps.

	Country/Region	Q4 '10 Avg. Mbps	QoQ Change	YoY Change
–	Global	1.9	0.0%	6.7%
1	South Korea	13.7	-3.0%	11%
2	Hong Kong	9.4	1.6%	3.8%
3	Japan	8.3	-1.9%	8.1%
4	Romania	7.0	-0.3%	-4.7%
5	Netherlands	7.0	10%	20%
6	Latvia	5.9	-1.6%	-6.0%
7	Czech Republic	5.7	5.0%	-2.4%
8	Switzerland	5.6	5.4%	10%
9	Belgium	5.5	14%	13%
10	Canada	5.5	8.8%	14%
…				
14	United States	5.1	2.0%	9.2%

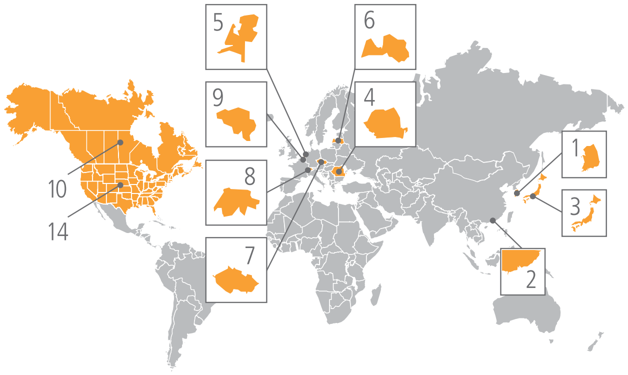

Figure 5: Average Measured Connection Speed by Country/Region

3.2 Global Average Connection Speeds, City View

As we have done in past editions of the State of the Internet report, we again examine average measured connection speeds at a city level. As we have done previously, we have applied "filters" for unique IP address count (50,000 or more seen by Akamai in the fourth quarter) and academic institutions (removing data from known academic networks). In addition, as with the other data sets used in Section 3 of this report, traffic from known mobile networks has been removed as well.

South Korean cities Taegu and Taejon remained at the head of the list of fastest cities in the fourth quarter, as shown in Figure 6, with average connection speeds of 18.4 and 17.2 Mbps respectively. Once again, none of the cities surpassed the 20 Mbps mark, though 29 cities did achieve average connection speeds in excess of 10 Mbps. Of these cities, 15 were in South Korea, and 14 were in Japan. The fastest city in Europe was once again Constanta, Romania, at 8.2 Mbps, and Victoria, British Columbia had the highest average connection speed in North America, at 7.8 Mbps.

As has been the trend throughout 2010, cities in Asia continued to dominate the top 100 list in the fourth quarter, accounting for almost nine-tenths of the list. This included 60 cities in Japan, 16 cities in South Korea, and Hong Kong. Europe accounted for a dozen cities across eight countries. The remaining 11 cities were in North America, with three in Canada and eight in the United States.

Reviewing the full global list of more than 800 cities that qualified for inclusion in this section, the fastest cities in other geographies included Tunis, Tunisia (Africa) with an average connection speed of 2.7 Mbps,; Riverwood, New South Wales, Australia (Oceania) with an average connection speed of 6.0 Mbps; and Campinas, Brazil (South America) with an average connection speed of 2.8 Mbps.

South Korean cities Taegu and Taejon had the highest average connection speeds in Q4 2010 at 18.4 and 17.2 Mbps respectively.

TWEET THIS!

	Country/Region	City	Q4 '10 Avg. Mbps
1	South Korea	Taegu	18.36
2	South Korea	Taejon	17.18
3	South Korea	Poryong	16.16
4	South Korea	Masan	16.14
5	South Korea	Ilsan	15.04
6	South Korea	Samchok	14.95
7	South Korea	Sangamdong	14.87
8	South Korea	Seocho	14.83
9	South Korea	Milyang	14.36
10	South Korea	Kimchon	14.04
11	South Korea	Seoul	13.76
12	Japan	Kanagawa	13.62
13	Japan	Shimotsuma	13.60
14	South Korea	Anyang	13.04
15	South Korea	Pohang	12.62
16	Japan	Urawa	12.57
17	Japan	Yokohama	12.36
18	South Korea	Suwon	12.30
19	Japan	Tokai	12.29
20	Japan	Asahi	12.25
21	South Korea	Yongsan	12.24
22	Japan	Tochigi	12.04
23	Japan	Hiroshima	11.79
24	Japan	Shizuoka	11.25
25	Japan	Ibaraki	10.65
26	Japan	Chiba	10.60
27	Japan	Kyoto	10.25
28	Japan	Marunouchi	10.10
29	Japan	Nagoya	10.02
30	Japan	Kobe	10.00
31	Japan	Gifu	9.99
32	South Korea	Inchon	9.99
33	Japan	Sendai	9.85
34	Japan	Hyogo	9.74
35	Japan	Nagano	9.64
36	Japan	Nara	9.63
37	Japan	Wakayama	9.51
38	Japan	Fukushima	9.27
39	Japan	Otsu	9.19
40	Japan	Hakodate	9.07
41	Hong Kong	Hong Kong	9.02
42	Japan	Yokkaichi	9.00
43	Japan	Fukuoka	8.84
44	Japan	Niho	8.80
45	Japan	Matsuyama	8.79
46	Japan	Hodogaya	8.78
47	Japan	Tokushima	8.63
48	Japan	Fukui	8.61
49	Japan	Soka	8.61
50	Japan	Kochi	8.50
51	Japan	Niigata	8.50
52	Japan	Hamamatsu	8.49
53	Japan	Kanazawa	8.36
54	Japan	Yamaguchi	8.31
55	Japan	Osaka	8.28
56	Romania	Constanta	8.23
57	Japan	Mito	8.21
58	Japan	Utsunomiya	8.16
59	Japan	Iwaki	8.15
60	Japan	Kokuryo	8.04
61	Japan	Yamagata	7.97
62	Japan	Toyonaka	7.95
63	Norway	Lyse	7.95
64	Japan	Yosida	7.91
65	Japan	Okayama	7.85
66	Japan	Miyazaki	7.82
67	Canada	Victoria, BC	7.77
68	Japan	Tokyo	7.74
69	Japan	Kumamoto	7.73
70	Netherlands	Joure	7.73
71	Canada	Oakville, ON	7.70
72	Japan	Kofu	7.70
73	Spain	Valencia	7.65
74	Japan	Kagoshima	7.64
75	Romania	Iasi	7.63
76	Japan	Okidate	7.62
77	United States	Riverside, CA	7.58
78	Japan	Saga	7.50
79	Japan	Nagasaki	7.49
80	Japan	Toyama	7.49
81	Portugal	Porto	7.44
82	Netherlands	S'hertogenbosch	7.40
83	Japan	Morioka	7.31
84	Netherlands	Hengelo	7.23
85	Japan	Kagawa	7.09
86	Japan	Tottori	7.08
87	Japan	Sapporo	7.07
88	Japan	Akita	6.99
89	Netherlands	Kamperland	6.37
90	United States	San Mateo, CA	6.35
91	United States	Hayward, CA	6.33
92	Czech Republic	Brno	6.33
93	United States	Oakland, CA	6.24
94	Austria	Salzburg	6.20
95	Canada	Vancouver, BC	6.18
96	United States	Union, NJ	6.15
97	United States	Saint Paul, MN	6.15
98	United States	Fond du Lac, WI	6.10
99	England	Bradford	6.09
100	United States	Athens, GA	6.04

Figure 6: Average Measured Connection Speed, Top Global Cities

3.3 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 Internet connection capacity. (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, the global average peak connection speed grew to 8.8 Mbps, increasing nearly 10% quarter-over-quarter, and over 30% year-over-year. Among the top 10 countries/regions, and the United States, which placed 11th, eight countries/regions saw quarterly increases. These ranged from respectable 3.7% growth in the United States to a very impressive 68% improvement in the United Arab Emirates. Of the three countries that saw quarterly declines in average peak connection speed, South Korea's was the most significant, at 18%. Looking at year-over-year changes, all of the countries/regions in the top 10, as well as the United States, saw average peak connection speeds increase as compared to the end of 2009. Growth was significant in all of the countries/regions, ranging from South Korea's solid 13% yearly increase to an increase of over 300% in the United Arab Emirates.

Japan was pushed out of the top three by Romania, where the 5.5% quarterly increase pushed them over the 30 Mbps mark, allowing them to join Hong Kong and South Korea at the top of the list. Hong Kong was the fastest country/region for the first time since we began tracking this metric in the first quarter of 2010, as South Korea's decline to an average peak connection speed of just over 32 Mbps put it in second place.

In examining the average peak speed distribution around the world, only four countries/regions had speeds of 30 Mbps or more (the same as in the third quarter), with another seven achieving average peak connection speeds of 20 Mbps or more (up from four in the third quarter), and an additional 58 with speeds of 10 Mbps or more. Only the Solomon Islands had an average peak connection speed below 1 Mbps (936 Kbps), while Tonga and Mayotte just barely exceeded that level, with speeds of 1003 Kbps and 1023 Kbps respectively.

	Country/Region	Q4 '10 Peak Mbps	QoQ Change	YoY Change
–	Global	8.8	9.4%	31%
1	Hong Kong	37.9	5.6%	47%
2	South Korea	32.3	-18%	13%
3	Romania	31.7	5.5%	29%
4	Japan	30.5	-0.7%	29%
5	United Arab Emirates	27.2	68%	309%
6	Portugal	23.0	20%	55%
7	Belgium	22.8	13%	51%
8	Latvia	21.9	-5.0%	29%
9	Netherlands	20.6	13%	53%
10	Monaco	20.5	5.0%	63%
11	United States	20.3	3.7%	34%

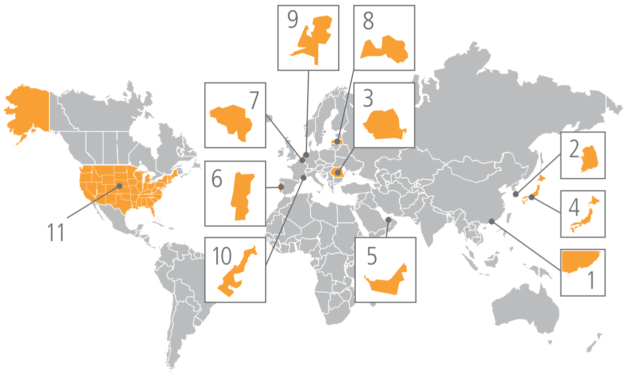

Figure 7: Average Peak Connection Speed by Country/Region

3.4 Global Average Peak Connection Speeds, City View

As we have done in previous editions of the *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 fourth quarter) and academic institutions (removing data from known academic networks). In addition, as with the other data sets used in Section 3 of this report, traffic from known mobile networks has been removed.

As shown in Figure 8, in the fourth quarter of 2010, six cities in Japan moved to the head of the average peak connection speed list, topping Taejon, South Korea, which had moved into first place in the third quarter. In a departure from the prior quarter, none of the listed cities achieved average peak connection speeds above 50 Mbps this quarter – two had made it in the third quarter. However, there were 14 cities with speeds in excess of 40 Mbps, down from 19 in the third quarter. Among the balance of the top 100 cities, 50 more had average peak connection speeds in excess of 30 Mbps (up from 44 in the third quarter). The remaining 36 were all above 20 Mbps.

Cities in Asia continued to dominate this metric, with the top 100 list including Hong Kong, Dubai, 59 cities in Japan, and 16 in South Korea. The top European city remained Constanta, Romania (which moved into the top 10 with a 5 Mbps gain), and it was joined by six other European cities, including an additional three from Romania, as well as one each from Spain, Portugal, and Norway. Sixteen cities from North America made the list, including two from Canada and 14 from the United States.

In looking at the full global list of over 800 cities that qualified for inclusion, the fastest ones in other geographies included Tunis, Tunisia (Africa) with an average peak connection speed of 15.1 Mbps; Canberra, Australian Capital Territory, Australia (Oceania) with an average peak connection speed of 20.7 Mbps; and Curitiba, Brazil (South America) with an average peak connection speed of 12.6 Mbps.

In Q4 2010 there were 14 cities around the world that had average peak connection speeds greater than 40 Mbps.

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	Country/Region	City	Q4 '10 Peak Mbps
1	Japan	Kanagawa	48.06
2	Japan	Marunouchi	47.55
3	Japan	Shimotsuma	46.76
4	Japan	Tokai	46.69
5	Japan	Urawa	45.69
6	Japan	Yokohama	45.02
7	South Korea	Taejon	44.53
8	South Korea	Taegu	43.61
9	Japan	Tochigi	41.93
10	Romania	Constanta	41.88
11	Japan	Chiba	41.82
12	Japan	Asahi	41.71
13	Japan	Hiroshima	41.23
14	Japan	Hodogaya	41.10
15	Japan	Shizuoka	39.84
16	Japan	Soka	38.74
17	South Korea	Masan	38.24
18	Japan	Nagano	38.20
19	Japan	Ibaraki	37.92
20	South Korea	Poryong	37.81
21	Romania	Iasi	37.60
22	Japan	Sendai	36.99
23	Japan	Kobe	36.91
24	Japan	Kyoto	36.80
25	Hong Kong	Hong Kong	36.76
26	Japan	Gifu	36.09
27	Japan	Nagoya	36.05
28	South Korea	Samchok	35.79
29	Japan	Fukuoka	35.09
30	Japan	Kokuryo	34.98
31	South Korea	Kimchon	34.59
32	Romania	Timisoara	34.46
33	Japan	Mito	34.26
34	Japan	Yokkaichi	34.18
35	Japan	Hakodate	34.14
36	South Korea	Seocho	33.93
37	South Korea	Milyang	33.66
38	Japan	Otsu	33.65
39	Japan	Niho	33.55
40	South Korea	Ilsan	33.41
41	Japan	Nara	33.36
42	Japan	Utsunomiya	33.36
43	Japan	Niigata	33.29
44	Japan	Fukui	33.07
45	Japan	Yosida	32.99
46	Japan	Iwaki	32.96
47	Japan	Wakayama	32.80
48	Japan	Fukushima	32.73
49	South Korea	Anyang	32.61
50	Japan	Hamamatsu	32.58
51	South Korea	Seoul	32.28
52	South Korea	Sangamdong	32.15
53	South Korea	Yongsan	32.15
54	Japan	Kanazawa	31.96
55	Japan	Okidate	31.87
56	South Korea	Suwon	31.81
57	Japan	Yamaguchi	31.26
58	Japan	Osaka	31.24
59	South Korea	Anyang	31.21
60	Japan	Matsuyama	30.98
61	Japan	Yamagata	30.81
62	Japan	Kofu	30.75
63	Japan	Tokushima	30.75
64	Japan	Sapporo	30.08
65	Japan	Morioka	29.69
66	Japan	Kochi	29.62
67	Japan	Okayama	29.24
68	Romania	Bucharest	29.20
69	South Korea	Pohang	29.11
70	Portugal	Porto	28.94
71	Norway	Lyse	28.80
72	United States	Riverside, CA	28.49
73	Japan	Toyama	28.30
74	United States	Hollywood, FL	28.22
75	United States	Federal Way, WA	28.15
76	Japan	Hyogo	28.14
77	United States	Saint Paul, MN	28.03
78	United States	Hayward, CA	27.86
79	Japan	Kumamoto	27.83
80	Canada	Kelowna, BC	27.41
81	Japan	Kagawa	27.41
82	United Arab Emirates	Dubai	27.35
83	United States	Staten Island, NY	27.30
84	Japan	Tokyo	27.27
85	Spain	Valencia	27.20
86	United States	San Mateo, CA	27.15
87	Japan	Akita	27.09
88	Canada	Victoria, BC	26.98
89	United States	Jersey City, NJ	26.92
90	Japan	Nagasaki	26.79
91	Japan	Kagoshima	26.72
92	United States	Santa Barbara, CA	26.72
93	United States	Arvada, CO	26.71
94	Japan	Miyazaki	26.66
95	United States	Boston Metro, MA	26.66
96	United States	Fremont, CA	26.60
97	United States	Tallahassee, FL	25.93
98	Japan	Saga	25.81
99	Japan	Naha	25.76
100	United States	Ogden, UT	25.70

Figure 8: Average Peak Connection Speed, Top Global Cities

3.5 Global High Broadband Connectivity

In the fourth quarter of 2010, global high broadband adoption continued to increase slightly, ending the year at 23%. As shown in Figure 9, Japan became the country with the highest level of high broadband adoption, due to a significant quarterly decline seen in South Korea, which dropped it to fifth place globally. Interestingly, Japan and South Korea were the only two countries among the top 10 that saw quarterly declines. Quarterly growth among the other countries/regions in the top 10, as well as the United States, was modest to significant, from 3.6% growth in Romania to a 35% jump in Belgium. Across the rest of the world, six countries saw high broadband adoption rates more than double quarter-over-quarter.

On a year-over-year basis, global high broadband adoption grew 2.6%, and yearly growth was seen in six of the top 10 countries, as well as the United States. Similar to the quarter-over-quarter changes, both Japan and South Korea lost ground year-over-year, as did Denmark and the Czech Republic. In the other countries/regions, yearly growth also ranged from modest to significant, from a 3.2% increase in Romania to a 34% increase in the Netherlands. Across the rest of the world, 15 countries saw high broadband adoption rates more than double year-over-year.

Looking at high broadband adoption on a global basis, there are once again four countries/regions where more than half of the connections to Akamai are at speed greater than 5 Mbps. Beyond that, there are 19 additional countries regions (up from 15 in the third quarter) where more than a quarter of the connections are at high broadband rates, and 21 more (down from 22 in the third quarter) where at least one in ten connections to Akamai are faster than 5 Mbps. There were 13 countries/regions with high broadband adoption rates below 1% – Venezuela had the lowest adoption rate, at 0.2%.

	Country/Region	% Above 5 Mbps	QoQ Change	YoY Change
–	Global	23%	4.3%	2.6%
1	Japan	58%	-3.7%	-2.8%
2	Hong Kong	56%	5.0%	10%
3	Netherlands	56%	14%	34%
4	Romania	52%	3.6%	3.2%
5	South Korea	49%	-32%	-31%
6	Belgium	47%	35%	29%
7	Latvia	44%	3.3%	9.8%
8	Canada	41%	28%	24%
9	Denmark	40%	13%	-1.1%
10	Czech Republic	38%	20%	-6.5%
11	United States	36%	6.5%	12%

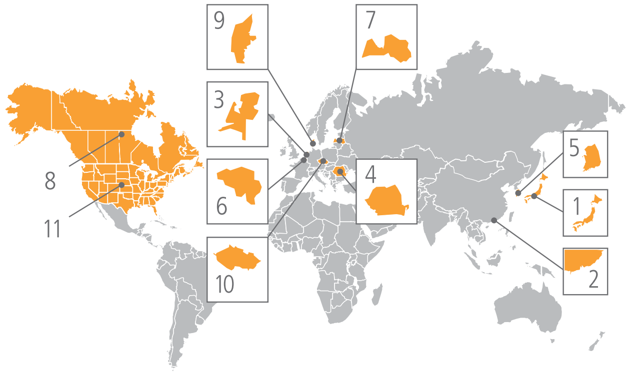

Figure 9: High Broadband Connectivity, Fastest Countries/Regions

3.6 Global Broadband Connectivity

In the fourth quarter of 2010, global broadband adoption continued to increase slightly, ending the year at 61%. As shown in Figure 10, nine of the top 10 countries ended 2010 with broadband adoption levels of 90% or more, and the United States ended the year with three of every four connections to Akamai at speeds above 2 Mbps. However, within the top 10, the Isle of Man, Monaco, and Guernsey all have unique IP counts that are, comparatively, just a few percent of the other countries/regions in the list, so their rank within the top 10 should be considered accordingly.

Quarterly changes across the top 10 countries/regions, as well as the United States (in fortieth place globally), were all positive, but relatively muted, with Belgium's 4.4% increase the largest of the group, and Monaco remaining flat quarter-over-quarter. Globally, a dozen countries more than doubled their levels of broadband adoption from the third quarter, though most were countries with lower unique IP counts and comparatively low levels of broadband adoption.

Yearly changes were positive for broadband adoption levels globally, in the United States, and in nine of the top 10 countries/regions. The only exception was Belgium, which saw 1.4% decline year-over-year. For the gaining countries/regions in the top 10, the changes in most were fairly modest, though Guernsey's 161% yearly gain is unusually high. (In reviewing historical data, it appears that Guernsey's broadband adoption rates have been fairly volatile over time, so their appearance in the top 10 list may be short-lived.) Globally, 26 countries more than doubled their levels of broadband adoption since the end of 2009, ranging from Côte d'Ivoire in Africa, which saw growth in excess of 1300% to Turkey's 101% yearly growth. (However, to be fair, fewer than 2000 broadband IPs were seen by Akamai from Côte d'Ivoire, while nearly 1.7 million broadband IPs were seen by Akamai from Turkey.)

Ending 2010, nine countries/regions (up from seven in the third quarter) saw broadband adoption levels of 90% or better. Another 53 countries/regions had at least of half of their connections to Akamai at 2 Mbps or more, 24 additional countries/regions had broadband adoption of at least 25%, and another 20 countries/regions had at least one in ten connections to Akamai at 2 Mbps or more. Kenya turned in the lowest level of broadband adoption in the fourth quarter, managing a scant 0.6%.

	Country/Region	% Above 2 Mbps	QoQ Change	YoY Change
–	Global	61%	1.3%	3.5%
1	Isle Of Man	96%	1.7%	3.2%
2	Monaco	96%	–	6.3%
3	Hong Kong	93%	0.8%	0.6%
4	Romania	92%	1.3%	5.5%
5	Switzerland	92%	0.6%	0.4%
6	Bulgaria	91%	2.2%	7.1%
7	Czech Republic	91%	1.4%	3.8%
8	Netherlands	90%	2.8%	6.3%
9	Belgium	90%	4.4%	-1.4%
10	Guernsey	89%	2.1%	161%
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40	United States	75%	0.6%	5.8%

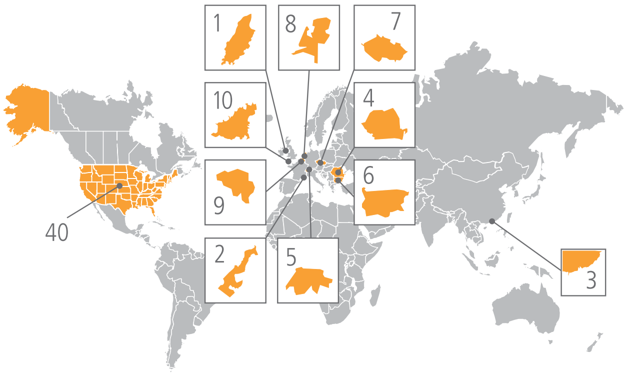

Figure 10: Broadband Connectivity, Fast Countries/Regions

3.7 Global Narrowband Connectivity

As shown in Figure 11, the global level of narrowband adoption increased modestly in the fourth quarter of 2010, gaining nearly 7% to end the year at just below 4%. However, despite this quarterly gain, it is 11% lower than it was at the end of 2009 – as this represents a decline over time in lower-speed connections, this is the right direction for the long-term trend for this metric to be heading in. Among the top 10 countries/regions, quarterly changes were split in the fourth quarter, with five seeing slight declines, while the other five saw nominal increases, with Vanuatu's 8.6% increase the largest. Throughout 2010, Mayotte remained the country with the largest percentage of connections to Akamai at speeds below 256 Kbps, with 98-99% narrowband adoption.

Looking globally, 116 countries/regions saw decreasing levels of narrowband adoption quarter-over-quarter, while 142 saw levels decline year-over-year. Among the top 10, seven countries/regions saw narrowband adoption levels drop as compared to the fourth quarter of 2009, while three saw yearly growth, including a surprising 36% increase in Cameroon.

Sixty countries/regions around the world recorded narrowband adoption levels below the global figure of 3.9% in the fourth quarter. Romania, the Czech Republic, and Bulgaria all recorded aggressive quarterly and yearly declines, ending 2010 with narrowband adoption levels of 0.2% or less.

	Country/Region	% Below 256 Kbps	QoQ Change	YoY Change
–	Global	3.9%	6.9%	-11%
1	Mayotte	98%	-0.1%	-1.5%
2	Solomon Islands	98%	3.5%	17%
3	Wallis And Futuna	94%	-1.7%	-3.1%
4	Tonga	94%	-1.6%	-4.9%
5	Cuba	93%	0.1%	-1.7%
6	Congo	89%	-1.3%	5.1%
7	Vanuatu	86%	8.6%	-2.1%
8	Niger	85%	0.8%	-2.8%
9	Gambia	81%	0.5%	-7.1%
10	Cameroon	79%	-4.9%	36%
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109	United States	2.5%	-3.4%	-22%

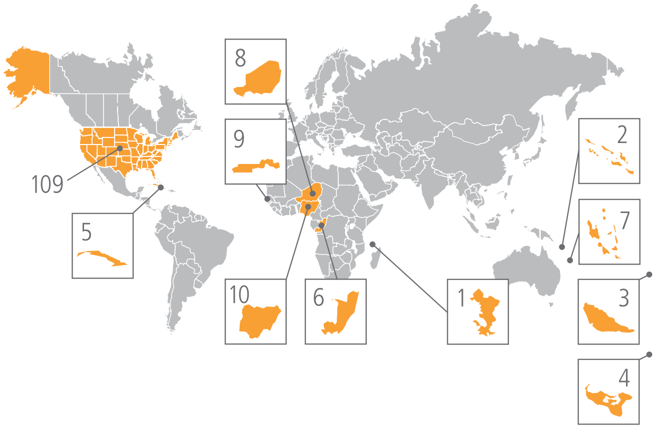

Figure 11: Narrowband Connectivity, Slowest Countries/Regions

SECTION 4:

Geography–United States

The metrics used for the United States presented here are based on a subset of the data used for Section 3, 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[15] geolocation tool.)

4.1 United States Average Connection Speeds

The overall average connection speed for the United States as a whole in the fourth quarter of 2010 was 5.1 Mbps. Consistent with the prior three quarters, this average connection speed was exceeded by 21 states and the District of Columbia. As shown in Figure 12, Delaware remained the state with the highest average connection speed, ending the year at 7.2 Mbps and, along with six of the other states in the top 10 and the District of Columbia, saw higher average connection speeds quarter-over-quarter. Among the top 10, only Vermont and New Hampshire saw average connection speeds decline quarter-over-quarter. Across the whole country, 32 states and the District of Columbia saw positive quarterly change, ranging from 13% growth in North Carolina to 0.3% growth in Montana, while 18 states saw quarterly declines, from a loss of 0.3% in Arkansas to a 6.3% drop in Minnesota.

From a yearly perspective, Delaware was the only state in the top 10 to experience a year-over-year decline, dropping 6.0%, but remaining at the top of the list. The most significant growth among the top 10 states was seen in Rhode Island, which ended 2010 with an average connection speed 27% faster than at the end of 2009. Across the whole country, 43 states and the District of Columbia saw average connection speeds increase year-over-year, with growth rates ranging from a significant 44% increase in Montana to a scant 0.7% increase in New York. For the seven states that saw average connection speeds decline year-over-year, the losses were fairly modest, ranging from a drop of 0.2% in Pennsylvania to a drop of 8.5% in Mississippi.

	State	Q4 '10 Avg. Mbps	QoQ Change	YoY Change
1	Delaware	7.2	1.3%	-6.0%
2	Rhode Island	6.9	9.1%	27%
3	District Of Columbia	6.8	5.9%	12%
4	Utah	6.5	1.3%	17%
5	Vermont	6.0	-2.2%	2.0%
6	Massachusetts	6.0	1.0%	4.3%
7	California	5.9	2.2%	19%
8	Nevada	5.9	5.2%	6.0%
9	New Hampshire	5.8	-4.1%	3.8%
10	Indiana	5.6	1.8%	2.3%

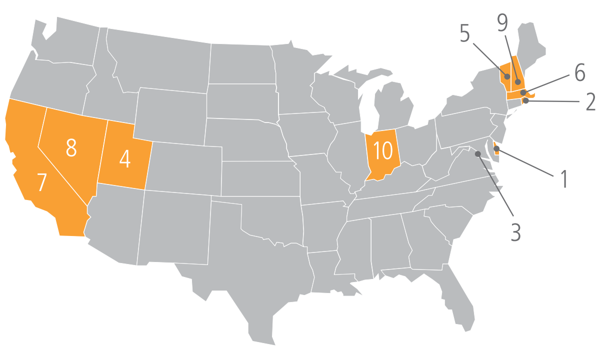

Figure 12: Average Measured Connection Speed by State

4.2 United States Average Connection Speeds, City View

As with the Global Average Connection Speeds, City View presented in Section 3.2, 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.

It appears that there was a fair amount of movement within the top 10 United States cities with the highest average connection speeds during the fourth quarter. As shown in Figure 13, Riverside, CA topped the list, gaining nearly 800 Kbps to move up from fifth place in the third quarter. That was the largest gain, with other cities moving into the top 10 due to smaller quarter-over-quarter increases, and other cities losing a fraction of a Mbps to drop lower in the list.

In the fourth quarter, California took only half of the spots on the top 10 list, no longer dominating it as has been seen in prior quarters. The East Coast held three spots in the fourth quarter, with cities in New York, New Jersey, and Massachusetts making the list. Rounding out the list was Traverse City, Michigan (which was in the top 10 in the third quarter) and Hollywood, Florida (which is new to the list). In reviewing the complete list of cities that qualified for inclusion in the fourth quarter, others from Delaware, Vermont, and North Dakota continue to be absent.

	City	Q4 '10 Avg. Mbps
1	Riverside, CA	7.58
2	Staten Island, NY	6.84
3	Fremont, CA	6.81
4	Santa Barbara, CA	6.75
5	Boston Metro, MA	6.70
6	Jersey City, NJ	6.56
7	Anaheim, CA	6.54
8	Traverse City, MI	6.42
9	Hollywood, FL	6.41
10	San Mateo, CA	6.35

Figure 13: Average Measured Connection Speed, Top United States Cities by Speed

4.3 United States Average Peak Connection Speeds

The overall average peak connection speed calculated by Akamai for the United States as a whole for the fourth quarter was just over 20 Mbps. This was once again met or exceeded by 21 states and the District of Columbia. As shown in Figure 14, among the top 10, seven states and the District of Columbia showed quarterly improvements in average peak connection speeds, while Massachusetts, surprisingly, remained flat quarter-over-quarter, and New Hampshire declined slightly. Across the whole country, the levels of quarterly change were somewhat limited, with North Carolina seeing the largest growth at just under 10%. Lower average peak connection speeds were seen in seven states – those changes were also somewhat limited, from Iowa's 0.1% quarterly decline to a 9.1% loss in West Virginia.

All of the states in the top 10 saw year-over-year growth in average peak connection speeds and very strong growth rates across the group – Delaware's 16% increase was the smallest. Interestingly, Delaware's 16% increase was also the lowest yearly growth rate across the whole country – significant increases were seen here as well. Montana ended 2010 with an average peak connection speed 73% higher than the same period a year earlier – Wyoming, Idaho, and Alaska also ended the year with a year-over-year increase of greater than 50%.

As noted in previous reports, the average peak connection speed metric represents, in essence, the speed that end users' Internet connections are capable of. Given that the long-term trends for this metric were positive across all states, and that average connection speeds across the United States increased over the long-term in the vast majority of states, it is not unreasonable to draw the conclusion that the state of broadband connectivity in the United States has improved over the course of 2010.

	State	Q4 '10 Peak Mbps	QoQ Change	YoY Change
1	Delaware	28.4	1.7%	16%
2	Rhode Island	27.7	9.7%	40%
3	District Of Columbia	26.7	7.9%	40%
4	Hawaii	25.4	3.7%	30%
5	Vermont	24.6	0.5%	28%
6	California	23.7	3.4%	47%
7	Massachusetts	23.4	–	26%
8	New Hampshire	22.9	-3.6%	19%
9	New York	22.4	4.0%	29%
10	Washington	22.2	2.6%	29%

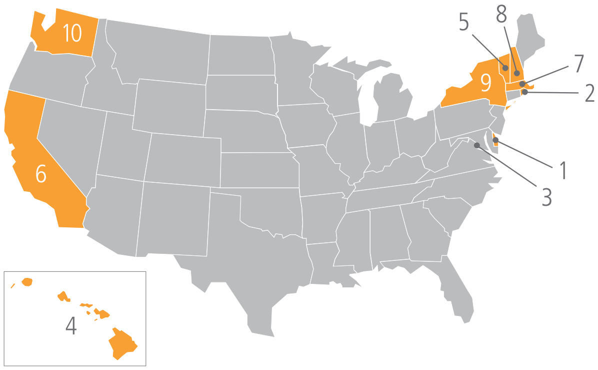

Figure 14: Average Peak Connection Speed by State

4.4 United States Average Peak Connection Speeds, City View

Losing their previously dominant position for this metric, cities from the West Coast only took half of the slots in the fourth quarter top 10, as illustrated in Figure 15. Four cities from California made the list, joining a single city from Washington State. From the East Coast, cities in Florida, New York, and New Jersey appeared on the top 10, with cities in Minnesota and Colorado rounding out the list. Similar to the movement observed in the city view of the average connection speed metric, some cities saw nominal increases that moved them into the top 10, while others saw slight speed declines quarter-over-quarter. While San Jose was the only city with an average peak connection speed over 30 Mbps in the third quarter, none of the cities reached that mark in the fourth quarter.

	City	Q4 '10 Peak Mbps
1	Riverside, CA	28.49
2	Hollywood, FL	28.22
3	Federal Way, WA	28.15
4	Saint Paul, MN	28.03
5	Hayward, CA	27.86
6	Staten Island, NY	27.30
7	San Mateo, CA	27.15
8	Jersey City, NJ	26.92
9	Santa Barbara, CA	26.72
10	Arvada, CO	26.71

Figure 15: Average Peak Connection Speed, Top United States Cities by Speed

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[http://www.speedmatters.org/2010report]]

4.5 United States High Broadband Connectivity

Reflecting the nominal quarter-over-quarter growth seen in the overall figures for the United States for average and average peak connection speeds, quarterly changes among the top 10 states for high broadband adoption were all positive in the fourth quarter, including two states (Rhode Island and Maine) with growth of 20% or more, as shown in Figure 16. Across the entire country, North Dakota also saw quarterly growth of more than 20%, while nine additional states grew in excess of 10% from the prior quarter. However, there were eleven states that saw quarter-over-quarter declines, though none were quite as significant, ranging from a half-percent loss in Mississippi to a 6.6% decline in West Virginia.

As compared to the end of 2009, high broadband adoption levels among the top 10 states was mixed, with significant growth seen in a number of states, and nominal declines seen in others. Yearly growth of 84% in Rhode Island and 27% in Maine led the top 10 list, though across the whole country, Alaska and Montana had the highest year-over-year growth, with adoption rates more than doubling in both states. Delaware's 8.4% decline was the biggest yearly loss seen among the top 10, and it joined a dozen other states in losing ground year-over-year, ranging from extremely minor 0.3% losses in both New Jersey and Oregon to a drop of 24% in Mississippi.

	State	% Above 5 Mbps	QoQ Change	YoY Change
1	Delaware	67%	3.8%	-8.4%
2	Rhode Island	62%	21%	84%
3	New Hampshire	54%	0.5%	4.7%
4	District Of Columbia	52%	12%	17%
5	New Jersey	47%	5.7%	-0.3%
6	Massachusetts	47%	5.1%	3.9%
7	Maryland	45%	4.1%	-5.7%
8	Maine	44%	20%	27%
9	New York	43%	4.9%	-4.4%
10	Nevada	43%	9.1%	3.7%

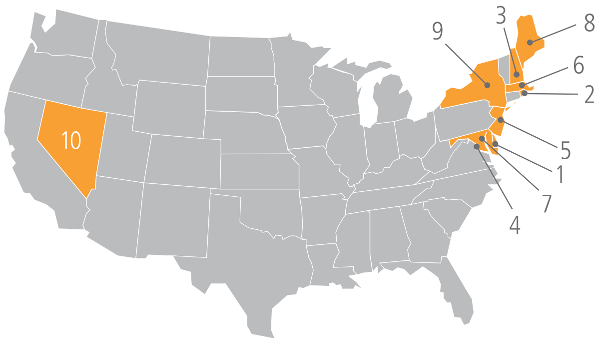

Figure 16: High Broadband Connectivity, Fastest U.S. States

In Q4 2010, four U.S. states had more than half of their connections to Akamai at speeds above 5 Mbps.

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4.6 United States Broadband Connectivity

Broadband adoption rates among the top 10 states remained remarkably consistent in the fourth quarter, with Maine remaining unchanged, and all other quarterly changes coming in at under 1%, as shown in Figure 17. The top 10 states were the same as the prior quarter, and Delaware remained the state with the highest level of broadband adoption, with 97% of connections to Akamai at speeds above 2 Mbps. Iowa was the only state with fewer than half of its connections below the broadband threshold, falling short at 45%. Quarter-over-quarter changes across the country as a whole were fairly muted in the fourth quarter as well, with Wyoming's 10% increase the most significant – 41 states saw shifts in adoption levels of 2% or less.

Looking at year-over-year changes, eight of the top 10 states saw broadband adoption levels grow throughout 2010, while only Delaware and Vermont saw minor declines year-over-year. Those were also the only two states across the whole country that saw negative year-over-year changes. Nebraska's 69% broadband adoption remained flat from the end of 2009, while growth in the other states ranged from 1.4% in Maine to an impressive 63% jump in Montana, which ended 2010 with 61% of their connections to Akamai at speeds above 2 Mbps.

	State	% Above 2 Mbps	QoQ Change	YoY Change
1	Delaware	97%	-0.1%	-0.5%
2	Rhode Island	92%	0.8%	8.4%
3	New Hampshire	92%	0.7%	3.6%
4	Hawaii	89%	-0.9%	3.4%
5	Connecticut	85%	0.4%	2.7%
6	Nevada	84%	-0.4%	7.2%
7	Maine	83%	0.0%	1.4%
8	New York	81%	0.2%	1.9%
9	New Jersey	81%	0.9%	5.2%
10	Vermont	81%	0.8%	-2.8%

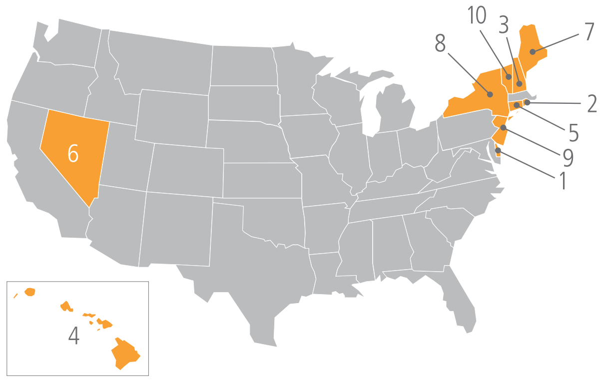

Figure 17: Broadband Connectivity, Fast U.S. States

Delaware led the U.S. for broadband adoption in Q4 2010, with 97% of connections to Akamai at speeds above 2 Mbps.

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4.7 United States Narrowband Connectivity

The percentage of connections to Akamai at speeds below 256 Kbps from U.S. states continued a general decline over both the short- and long-term views, highlighting a shift towards higher speed connectivity. As shown in Figure 18, North Dakota was the only state among the top 10 in the fourth quarter that saw a quarterly increase in narrowband adoption and an unusually high increase at that. Across the country, including North Dakota, just eight states saw narrowband adoption increase in the fourth quarter of 2010. However, with just over 5,000 unique IP addresses from North Dakota observed connecting to Akamai at these low speeds, the state's quarterly growth represents a shift of just over 600 unique IP addresses – less than half a percent of the total number observed from the state. To this end, there are 18 states with fewer than 10,000 unique IP addresses connecting to Akamai at speeds below 256 Kbps – for these states, a shift in just a few hundred IP addresses can potentially represent a significant change.

Looking at year-over-year changes, all of the states among the top 10 experienced healthy declines as compared to the end of 2009, with narrowband adoption rates dropping in excess of 10% in all 10 states. (Note that this metric is the only one for which a decline is considered to be a positive trend.) Across the whole country, only four states saw narrowband adoption grow year-over-year, ranging from a slight 2% increase in West Virginia to Delaware's 86% increase. However, ending the year with a country-leading 0.3% narrowband adoption rate, and less than 1,000 unique IP addresses connecting to Akamai at narrowband speeds, a shift of a comparatively small number of IP addresses can again have a big impact.

In the fourth quarter, 11 states (up from nine in the third quarter) had narrowband adoption rates of 1% or less. As noted above, Delaware remained the lowest at 0.3%, with Nevada less than five-hundredths of a percent behind. Once again, 48 states, inclusive of those 11, had narrowband adoption levels below 5% – only Alaska, Missouri, and the District of Columbia were above 5%.

	State	% Below 256 Kbps	QoQ Change	YoY Change
1	District Of Columbia	5.8%	-6.2%	-22%
2	Missouri	5.5%	-1.9%	-16%
3	Alaska	5.1%	-4.8%	-42%
4	Iowa	4.7%	-1.9%	-32%
5	Georgia	4.3%	-4.0%	-18%
6	Illinois	3.7%	-4.6%	-15%
7	Ohio	3.6%	-4.0%	-23%
8	Colorado	3.6%	-3.5%	-13%
9	North Dakota	3.6%	14%	-13%
10	Texas	3.3%	-5.7%	-21%

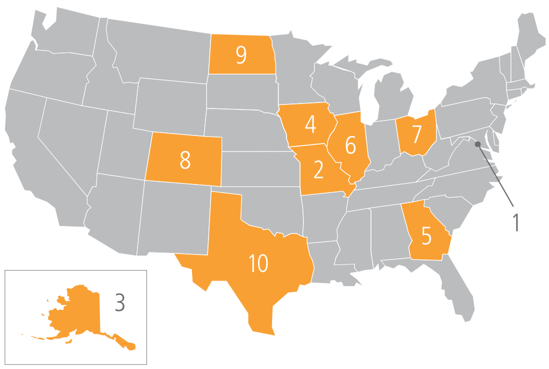

Figure 18: Narrowband Connectivity, Slowest U.S. States

Mobile Connectivity

Building on the data presented in the *State of the Internet* reports over the last year, Akamai continues to identify additional mobile networks for inclusion in the report. The source data for this section encompasses usage not only from smartphones, but also laptops, tablets, and other devices that connect to the Internet through these mobile networks. As has been noted in prior quarters, 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 fourth 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 made anonymous, and providers are 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 geographic assignments.

5.1 Attack Traffic From Mobile Networks, Top Originating Countries

In looking at attack traffic from known mobile network providers observed by Akamai during the fourth quarter of 2010, we see that the list of top countries responsible for the attacks remained fairly consistent quarter-over-quarter. Nine of the top 10 countries, as shown in Figure 19, are the same as in the third quarter – Brazil dropped out of the top 10 list, while Hungary joined it. Italy remained the source of the largest amount of observed attack traffic, up nearly 7% from the third quarter. Of the top 10 countries, the United Kingdom was the only country that saw their percentage drop quarter-over-quarter. Overall attack traffic concentration remained fairly consistent from the prior quarter, with the top two countries responsible for 40% of observed attacks, while the top 10 countries were the source of three-quarters of observed attacks.

We continually work to identify additional mobile network providers around the world. As we do so, the list of top countries may change to reflect attack traffic observed from these newly-included mobile network providers.

	Country/Region	Q4 '10 % Traffic
1	Italy	30%
2	Chile	10%
3	United Kingdom	6.2%
4	Poland	5.7%
5	Malaysia	5.7%
6	China	4.6%
7	Russia	3.7%
8	United States	3.5%
9	Hungary	3.2%
10	Lithuania	3.1%
–	Other	25%

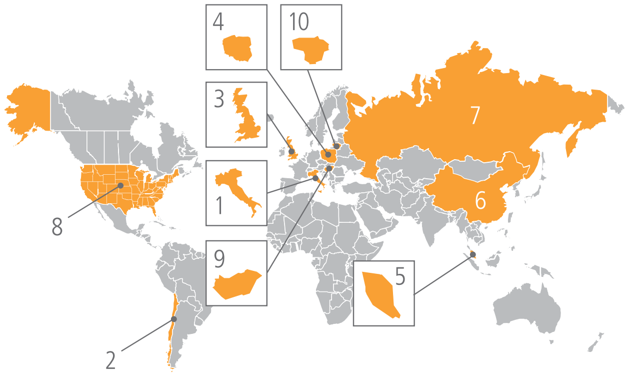

Figure 19: Attack Traffic from Mobile Networks, Top Originating Countries/Regions

5.2 Attack Traffic From Mobile Networks, Top Ports

In the fourth quarter of 2010, nine of the top 10 ports targeted by attack traffic coming from mobile networks were the same as in the third quarter. The lone difference was the appearance of Port 3389 (Microsoft Terminal Services), which replaced Port 6882 (BitTorrent) at the bottom of the list. (And in the third quarter, BitTorrent itself replaced Symantec System Center at the bottom of the list.) As shown in Figure 20, attack concentration grew very slightly in the fourth quarter, with Port 445 responsible for 76% of observed attacks (up from 75% last quarter), and the top 10 ports accounting for almost 96% of observed attacks (up just over 1% from last quarter). 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.

However, the *McAfee Threats Report: Fourth Quarter 2010*[16] observed "During the last several years McAfee Labs has seen steady growth in the number of threats to mobile devices. The numbers cannot match the sheer volume of PC-based malware, but it is steady growth just the same." The McAfee report also highlighted two interesting mobile threats that surfaced during the quarter – one was spyware targeted at the Symbian OS designed to capture financial mobile transaction authentication numbers, the other a Trojan on the Android platform that is inserted into legitimate applications, and is designed to collect personal data from a user's phone and transmit it back to central servers.[17] With the growing ubiquity of smartphone devices and proliferation of applications and so-called "app stores", mobile device malware will likely continue to increase in the future.

Port	Port Use	Q4 '10 % Traffic
445	Microsoft-DS	76%
23	Telnet	9.6%
22	SSH	5.1%
139	NetBIOS	1.0%
4899	Remote Administrator	1.0%
1433	Microsoft SQL Server	0.7%
80	WWW	0.6%
135	Microsoft-RPC	0.6%
5900	VNC Server	0.4%
3389	Microsoft Terminal Services	0.4%
Various	Other	4.2%

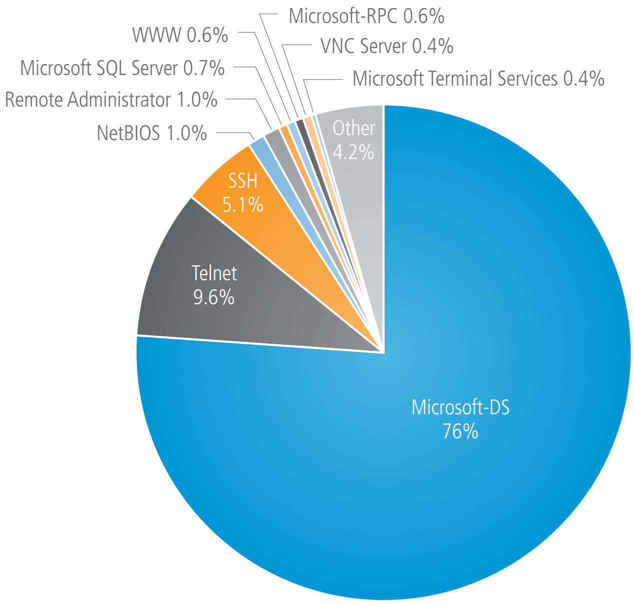

Figure 20: Attack Traffic from Mobile Networks, Top Ports

5.3 Connection Speeds & Data Consumption On Mobile Networks

In the fourth quarter of 2010, a mobile provider in Greece (GR-1) was the provider with the highest average connection speed, at just over 4.5 Mbps. The mobile providers in Slovakia and Russia that had previously been reported as having the highest average connection speeds were removed from consideration in the fourth quarter, as further research determined that their autonomous systems carried a mix of traffic from fixed and mobile connections. In reviewing the average connection speeds of the 105 providers listed in Figure 21, we find that none of the providers had average connection speeds in the "high broadband" (>5 Mbps) range, while 18 providers had average connection speeds in the "broadband" (>2 Mbps) range. An additional 48 providers had average connection speeds in excess of 1 Mbps. The mobile provider with the slowest average connection speed in the fourth quarter was in Slovakia (SK-1), at just 134 Kbps. In reviewing quarterly changes, we find increased average connection speeds at 82 of the listed providers, with three (RU-3, GT-1, GR-1) more than doubling quarter-over-quarter. Quarterly declines were observed at the remaining 23 providers, ranging from a barely noticeable 0.1% drop (CA-2) to a more significant 34% quarter-over quarter loss (SG-4). In looking at yearly trends, growth in average connection speeds was observed at 84 of the listed providers, with aggressive growth in excess of 100% year-over-year seen at 16 of the providers. Interestingly, a mobile provider in Uruguay remained unchanged year-over-year, while the remaining 20 mobile providers saw average connection speeds decline throughout 2010.

In reviewing the average peak connection speed data for the fourth quarter, we find that a mobile provider in the United Kingdom (UK-3) had the highest average peak connection speed, at nearly 21.2 Mbps. As with the average connection speed data, providers in Malaysia, Slovakia, and Russia were removed from qualification due to mixed fixed/mobile traffic. Of the 105 listed mobile providers, average peak connection speeds remained very strong at the end of 2010, with 20 providers having average peak connection speeds above 10 Mbps, while an additional 46 had average peak connection speeds above 5 Mbps, and all delivered average peak speeds of 1 Mbps or more. A mobile provider in Singapore (SG-4) had the lowest average peak connection speed, coming in at just barely over 1 Mbps. In reviewing quarterly changes, none of the providers experienced greater than 100% growth – the highest observed was a 67% increase at a provider in Russia (RU-3). Quarter-over-quarter increases were seen at 74 of the listed providers. Of the 31 providers that saw average peak speeds decline quarter-over-quarter, losses ranged from 0.6% in France (FR-4) to 41% in Indonesia (ID-1). Yearly growth was generally strong, with average peak connection speeds more than doubling at over 30 providers, with 96 providers overall showing year-over-year growth. Only eight providers experienced year-over-year declines, while one provider (UY-2) remained flat.

For the fourth quarter of 2010, we found that users of seven mobile providers consumed, on average, more than one gigabyte (1 GB) of content from Akamai per month. (This discounts a provider in Canada that we believe is using a gateway/proxy architecture.) Users at an addition 78 providers around the world downloaded more than 100 MB of content from Akamai per month during the fourth quarter, while users at 19 providers downloaded less than 100 MB. Consumption grew quarter-over-quarter at 62 of the listed providers, though none saw greater than 100% growth. Yearly growth was somewhat more widespread, with 89 providers experiencing increased content consumption as compared to the end of 2009, with download volumes more than doubling at 53 of the listed mobile providers.

Country/Region	ID	Q4 '10 Avg. Kbps	Q4 '10 Peak Kbps	Q4 '10 Avg. MB/ month
AFRICA				
Egypt	EG-1	488	2927	284
Morocco	MA-1	1037	7891	444
Nigeria	NG-1	304	5258	432
South Africa	ZA-1	515	1286	183
ASIA				
China	CN-1	1830	4347	149
Hong Kong	HK-2	1816	8218	312
Hong Kong	HK-1	2527	13175	2046
Indonesia	ID-1	283	4766	3707
Israel	IL-1	1296	7751	176
Kuwait	KW-1	1951	9877	381
Malaysia	MY-1	477	3159	188
Malaysia	MY-3	709	4477	445
Pakistan	PK-1	927	5929	742
Saudi Arabia	SA-1	1982	10066	300
Singapore	SG-2	680	4778	96
Singapore	SG-3	1416	8765	759
Singapore	SG-4	322	1020	18
South Korea	KR-1	1294	3587	79
Sri Lanka	LK-1	727	3968	224
Taiwan	TW-1	1294	6965	165
Taiwan	TW-2	514	2986	205
Thailand	TH-1	525	5070	105
EUROPE				
Austria	AT-1	2596	11257	205
Austria	AT-2	2087	11434	743
Belgium	BE-1	2556	10066	512

Country/Region	ID	Q4 '10 Avg. Kbps	Q4 '10 Peak Kbps	Q4 '10 Avg. MB/ month
Belgium	BE-3	533	1845	24
Belgium	BE-2	1461	4167	32
Croatia	HR-1	1374	5469	78
Czech Republic	CZ-1	1268	5513	112
Czech Republic	CZ-3	3381	10452	416
Czech Republic	CZ-2	572	3097	232
Estonia	EE-1	1065	5517	442
France	FR-2	2273	7604	1468
France	FR-4	1611	7503	260
France	FR-1	372	2142	144
Germany	DE-1	765	3322	68
Germany	DE-2	3453	11327	2040
Germany	DE-3	1245	4409	106
Greece	GR-2	406	3421	187
Greece	GR-1	4559	18709	659
Hungary	HU-2	1885	8598	135
Hungary	HU-1	1630	8858	268
Ireland	IE-1	2423	11596	536
Ireland	IE-2	1634	11880	689
Ireland	IE-3	1377	10965	841
Italy	IT-3	2899	11577	676
Italy	IT-2	2390	11864	469
Italy	IT-1	1446	10024	447
Italy	IT-4	854	6435	349
Lithuania	LT-2	1367	7611	439
Lithuania	LT-1	1914	9507	575
Moldova	MD-1	1339	4949	146
Netherlands	NL-2	2046	5376	31

Figure 21: Average and Average Peak Connection Speed, Average Megabytes Downloaded per Month by Mobile Provider

"As the performance of the network increases, so does the performance of everything connected to that network, and by extension, the apps built on those device platforms."

[http://gigaom.com/2011/04/11/how-iphone-and-android-are-changing-the-network/]

Country/Region	ID	Q4 '10 Avg. Kbps	Q4 '10 Peak Kbps	Q4 '10 Avg. MB/ month
Netherlands	NL-1	1167	3177	30
Norway	NO-2	1480	5202	74
Norway	NO-1	1248	5253	70
Poland	PL-2	1195	5551	82
Poland	PL-1	3577	11308	192
Poland	PL-3	1119	6026	173
Portugal	PT-1	574	2209	54
Romania	RO-1	598	3081	112
Russia	RU-3	1358	4932	124
Russia	RU-4	2451	9098	300
Slovakia	SK-1	134	1357	46
Slovakia	SK-2	1887	7512	2392
Slovenia	SI-1	1549	7291	99
Spain	ES-1	1869	13782	490
Spain	ES-3	917	5960	206
Turkey	TR-1	1443	6430	266
Ukraine	UA-1	872	2728	60
United Kingdom	UK-3	4004	21174	112
United Kingdom	UK-2	2054	10791	937
United Kingdom	UK-1	1486	10412	761
NORTH AMERICA				
Canada	CA-2	909	2431	719
Canada	CA-1	3015	17991	21593
El Salvador	SV-2	1592	8660	798
El Salvador	SV-1	1141	6218	394
El Salvador	SV-3	963	4399	703
Guatemala	GT-2	1145	7136	865
Guatemala	GT-1	1013	5912	297

Country/Region	ID	Q4 '10 Avg. Kbps	Q4 '10 Peak Kbps	Q4 '10 Avg. MB/ month
Mexico	MX-3	1032	6512	549
Netherlands Antilles	AN-1	536	3645	328
Nicaragua	NI-1	1414	7999	667
Puerto Rico	PR-1	2172	8797	2174
United States	US-2	1029	3598	44
United States	US-1	1176	3305	82
United States	US-3	965	3608	801
OCEANIA				
Australia	AU-3	1534	7326	231
Australia	AU-1	1067	9498	1658
Guam	GU-1	453	2161	80
New Caledonia	NC-1	1010	4359	480
New Zealand	NZ-2	1437	7788	491
SOUTH AMERICA				
Argentina	AR-1	569	3850	174
Argentina	AR-2	747	4760	205
Bolivia	BO-1	241	3225	222
Brazil	BR-1	846	4642	175
Brazil	BR-2	692	5001	195
Chile	CL-4	770	6687	544
Chile	CL-3	1048	6799	370
Colombia	CO-1	910	8012	330
Paraguay	PY-2	347	3851	425
Paraguay	PY-1	568	5643	235
Uruguay	UY-1	1223	9217	387
Uruguay	UY-2	366	4657	112
Venezuela	VE-1	718	5494	322

Of the 105 mobile network providers tracked by Akamai, 66 had average connection speeds above 1 Mbps in Q4 2010.

TWEET THIS!

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%	2,707,456	4.1	14.3	21%	69%	0.4%
Belgium	0.1%	3,634,481	5.5	22.8	47%	90%	0.3%
Czech Republic	0.2%	1,863,347	5.7	18.0	38%	91%	0.2%
Denmark	0.2%	2,402,586	5.3	16.2	40%	87%	0.5%
Finland	0.1%	2,566,196	4.8	15.6	30%	64%	0.6%
France	1.6%	23,114,330	3.5	13.8	12%	77%	0.4%
Germany	2.7%	33,838,723	4.4	16.7	23%	88%	0.7%
Greece	0.2%	2,289,806	3.4	16.2	8.2%	80%	1.1%
Iceland	0.0%	129,348	5.1	19.2	25%	87%	–
Ireland	0.1%	1,497,652	4.9	16.2	23%	76%	2.4%
Italy	3.6%	12,292,015	3.4	14.0	10%	83%	1.1%
Luxembourg	0.0%	166,162	4.1	14.1	18%	86%	1.1%
Netherlands	0.4%	8,145,603	7.0	20.6	56%	90%	0.6%
Norway	0.0%	2,830,190	5.2	17.0	32%	81%	0.8%
Portugal	0.4%	2,583,045	4.8	23.0	34%	84%	0.3%
Spain	1.2%	12,453,087	3.0	14.0	7.6%	71%	0.8%
Sweden	0.2%	5,847,005	5.1	18.9	29%	67%	1.3%
Switzerland	0.1%	2,841,311	5.6	19.2	33%	92%	0.6%
United Kingdom	1.1%	22,186,550	4.3	16.1	22%	87%	0.7%
ASIA/PACIFIC							
Australia	0.4%	11,438,742	3.0	12.6	12%	52%	4.0%
China	7.4%	67,238,493	1.0	3.7	0.3%	8.1%	9.6%
Hong Kong	0.3%	2,362,499	9.4	37.9	56%	93%	0.4%
India	2.1%	5,746,915	0.8	5.1	0.4%	4.5%	35%
Japan	2.0%	39,551,369	8.3	30.5	58%	80%	1.4%
Malaysia	1.1%	2,072,077	1.3	8.1	1.9%	9.9%	4.7%
New Zealand	0.8%	1,485,599	3.4	14.1	13%	77%	5.1%
Singapore	0.3%	1,842,072	3.1	15.4	18%	54%	12%
South Korea	1.6%	22,035,311	13.7	32.3	49%	87%	0.3%
Taiwan	7.6%	6,849,107	4.8	19.3	29%	79%	0.6%
MIDDLE EAST							
Egypt	3.6%	1,212,598	0.7	5.2	0.3%	2.7%	9.8%
Israel	0.8%	2,009,476	3.6	13.7	8.2%	82%	0.2%
Kuwait	0.3%	313,909	1.5	9.9	1.6%	18%	3.7%
Saudi Arabia	0.4%	1,888,422	2.0	7.7	1.4%	37%	0.7%
Sudan	0.0%	26,647	0.6	4.3	–	–	17%
Syria	0.0%	216,525	1.9	3.9	5.0%	45%	25%
United Arab Emirates (UAE)	0.6%	805,050	4.2	27.2	27%	48%	7.0%
LATIN & SOUTH AMERICA							
Argentina	2.3%	4,539,825	2.1	10.5	5.2%	33%	2.7%
Brazil	7.5%	13,530,942	1.7	7.9	3.9%	28%	12%
Chile	0.8%	2,409,083	2.5	12.4	4.1%	57%	0.7%
Colombia	1.0%	2,564,200	1.9	9.1	0.8%	40%	1.5%
Mexico	0.5%	8,506,519	1.8	8.2	0.9%	25%	1.5%
Peru	2.0%	747,176	1.6	8.7	0.7%	26%	1.7%
Venezuela	0.2%	2,139,842	1.0	5.0	0.2%	5.2%	10%
NORTH AMERICA							
Canada	1.1%	12,513,650	5.5	19.5	41%	88%	1.6%
United States	7.3%	137,214,278	5.1	20.3	36%	75%	2.5%

Endnotes

[1] http://www.mcafee.com/us/resources/reports/rp-quarterly-threat-q4-2010.pdf

[2] http:// www.sans.org/reading_room/whitepapers/malicious/tracking-malware-public-proxy-lists_33604

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[10] http://www.akamai.com/html/solutions/security/ddos_defense.html

[11] http://www.reuters.com/article/2010/10/19/us-telecoms-internet-idUSTRE69I24720101019

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

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

[14] 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.)

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

[16] http://www.mcafee.com/us/resources/reports/rp-quarterly-threat-q4-2010.pdf

[17] http://www.tgdaily.com/mobility-features/53287-trojan-can-take-over-android-phones

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