VOLUME 4, NUMBER 4

The State of the Internet

4TH QUARTER, 2011 REPORT

INCLUDES INSIGHT ON MOBILE TRAFFIC AND CONNECTED DEVICES FROM ERICSSON

Akamai
FASTER FORWARD

AKAMAI TECHNOLOGIES PUTS THE INTERNET IN YOUR HANDS

Akamai's *Internet Visualization App* gives you a custom view of traffic carried by our more than 100,000 servers, located in countries all over the world. The *Internet Visualization App* also enables you to view threat traffic as it happens, on a global or local scale.

To download, search for "Akamai Internet Visualization App" on iTunes, or go to http://bit.ly/akamaiapp

Letter From the Editor

This issue of the *State of the Internet* report marks the completion of the fourth year of the report's publication. In addition to the expected fourth-quarter coverage, we have also taken an opportunity to look back at trends we have seen throughout 2011, as well as over the four years during which the report has been published. You can find this historical perspective towards the end of the report in Section 8.

After spending multiple weeks each quarter knee-deep in the data that provides a perspective on the trends seen in key Internet metrics, we thought it would also be interesting to provide a historical perspective on the report itself with a few 'meta' statistics:

- Total word count: Over 208,000
- Total page count: 600
- Total number of charts and figures: 431
- Total number of footnotes/endnotes: 771
- Total number of downloads: Over 70,000
- Growth in the usage of the term "broadband": Nearly 4x (38 in Q1 2008 to over 140 in Q4 2011)
- Total occurrences of the words "security" or "secure": Over 200
- Number of languages translated into: Four (Japanese, Chinese, French and Spanish)

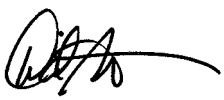
Over the last four years, the report has also been covered by the mainstream media and technology/network-centric media outlets, as well as in radio interviews for Boston's WBZ, Dubai Eye 103.8, and American Public Media's Marketplace Tech Report. In addition, data from the report has been used by a number of people and organizations involved in developing broadband policies for nations around the world, in addition to being cited several times in the United States National Broadband Plan.

Looking forward into 2012 (and beyond), there is a laundry list of enhancements to the report that we will be working towards implementing. These include, but are not limited to:

- More granular insight into existing attack traffic data, as well as the addition of data on DDoS and Web-based attacks as seen by Akamai
- Additional mobile insight, including a goal of expanding the network providers list, as well as adding data on device usage as seen by Akamai
- Additional insight into IPv6 adoption as seen by Akamai
- Identifying additional collaboration partners that will enable us to present a wider, more holistic perspective within the report
- Changes to the data tiers reviewed within the report (such as possibly eliminating the 'narrowband' tier, but adding a >10 Mbps tier)
- Updated look and feel of the report

In addition, we have a long-term goal of shifting the *State of the Internet* from a printed/PDF model to a primarily online model, with the underlying data made available through visualizations, APIs, and downloadable data sets, supplemented by blog posts and Tweets that provide context for, and commentary on, the data and observed trends.

How do you use the *State of the Internet* report? What sort of data would you like to see us include in it? Let us know via e-mail at stateoftheinternet@akamai.com, or on Twitter at @akamai_soti.



–David Belson

Table of Contents

EXECUTIVE SUMMARY	**5**
SECTION 1: SECURITY	**6**
1.1 Attack Traffic, Top Originating Countries	6
1.2 Attack Traffic, Top Ports	6
1.3 SSL Insight, Client-Side Ciphers	7
SECTION 2: INTERNET PENETRATION	**8**
2.1 Unique IPv4 Addresses	8
2.2 IPv4 Exhaustion	9
2.3 IPv6 Adoption	10
SECTION 3: GEOGRAPHY – GLOBAL	**12**
3.1 Global Average Connection Speeds	12
3.2 Global Average Connection Speeds, City View	12
3.3 Global Average Peak Connection Speeds	13
3.4 Global Average Peak Connection Speeds, City View	16
3.5 Global High Broadband Connectivity	18
3.6 Global Broadband Connectivity	18
3.7 Global Narrowband Connectivity	20
SECTION 4: GEOGRAPHY – UNITED STATES	**21**
4.1 United States Average Connection Speeds	21
4.2 United States Average Connection Speeds, City View	21
4.3 United States Average Peak Connection Speeds	22
4.4 United States Average Peak Connection Speeds, City View	22
4.5 United States High Broadband Connectivity	23
4.6 United States Broadband Connectivity	23
4.7 United States Narrowband Connectivity	25
SECTION 5: GEOGRAPHY – ASIA PACIFIC REGION	**26**
5.1 Asia Pacific Average Connection Speeds	26
5.2 Asia Pacific Average Connection Speeds, City View	27
5.3 Asia Pacific Average Peak Connection Speeds	27
5.4 Asia Pacific Average Peak Connection Speeds, City View	28
5.5 Asia Pacific High Broadband Connectivity	28
5.6 Asia Pacific Broadband Connectivity	29
5.7 Asia Pacific Narrowband Connectivity	30
SECTION 6: GEOGRAPHY – EUROPE	**31**
6.1 Europe Average Connection Speeds	31
6.2 Europe Average Connection Speeds, City View	32
6.3 Europe Average Peak Connection Speeds	33
6.4 Europe Average Peak Connection Speeds, City View	34
6.5 Europe High Broadband Connectivity	34
6.6 Europe Broadband Connectivity	35
6.7 Europe Narrowband Connectivity	36
SECTION 7: MOBILE CONNECTIVITY	**37**
7.1 Attack Traffic from Mobile Networks, Top Originating Countries	37
7.2 Attack Traffic from Mobile Networks, Top Ports	38
7.3 Connection Speeds & Data Consumption on Mobile Networks	38
7.4 Mobile Traffic Growth As Observed By Ericsson	40
7.5 Smartphone Usage as Observed by Ericsson	41
SECTION 8: HISTORICAL PERSPECTIVE	**45**
8.1 Client-Side SSL Ciphers	45
8.2 IPv4 Address Exhaustion	45
8.3 IPv6 Adoption	46
8.4 Average Connection Speeds	48
8.5 Average Peak Connection Speeds	48
8.6 High Broadband Adoption	50
8.7 Broadband Adoption	50
8.8 Narrowband Adoption	51
SECTION 9: APPENDIX	**52**
SECTION 10: ENDNOTES	**53**

Executive Summary

Akamai's globally distributed Intelligent Platform allows us to gather massive amounts of information on many metrics, including connection speeds, attack traffic, network connectivity/availability/latency problems and IPv6 growth/transition progress, as well as traffic patterns across leading Web sites and digital media providers. Each quarter, Akamai publishes a *"State of the Internet"* report. This report includes data gathered from across the Akamai Intelligent Platform during the fourth quarter of 2011 about attack traffic, broadband adoption, and mobile connectivity, as well as trends seen in this data over time. In addition, this quarter's report also includes insight into SSL, the state of IPv6 adoption as measured by Hurricane Electric, and observations from Akamai partner Ericsson regarding application usage distribution for PCs and Apple iPhone devices. Additionally, as the final edition of the report for 2011, it also reviews trends seen in key metrics across 2011, as well as comparing them to prior years.

Security

During the fourth quarter of 2011, Akamai observed attack traffic originating from 187 unique countries/regions. China became the top attack traffic source, responsible for 13% of observed traffic in total. The United States and Indonesia held the second and third place spots respectively, accounting for over 17% of observed attack traffic combined. Attack traffic concentration declined slightly from the third quarter, with the top 10 ports seeing 62% of observed attack traffic. Attacks targeting Port 1433 (Microsoft SQL Server) grew by more than 3x quarter-over-quarter, while attacks targeting Ports 8080 and 9415 increased by over 4x as compared to the third quarter.

Internet and Broadband Adoption

Akamai observed a 2.1% increase (from the third quarter of 2011) globally in the number of unique IPv4 addresses connecting to Akamai's network, growing to over 628 million. Looking at connection speeds, the global average connection speed was 2.3 Mbps, and the global average peak connection speed remained 11.7 Mbps. At a country level, South Korea had the highest average connection speed at 17.5 Mbps, as well as the highest average peak connection speed, at 47.9 Mbps. At a city level, 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. Globally, high broadband (>5 Mbps) adoption declined slightly to 27% in the fourth quarter, and South Korea continued to have the highest level of high broadband adoption, growing to 83%. Global broadband (>2 Mbps) adoption remained at 66%, with the Isle of Man having the highest level of broadband adoption, at 97%. Global narrowband (<256 kbps) adoption continued to decline, losing a bit more than one percent quarter-over-quarter, but staying at 2.5%. Libya remained the country with the highest level of connections in this speed range, ending 2011 with a 52% narrowband adoption rate.

Mobile Connectivity

Reviewing fourth quarter observed attack traffic from known mobile networks, overall attack traffic concentration increased slightly, with the top 10 countries generating 78% of observed attacks. The list of top targeted ports remained mostly consistent with the third quarter— Port 8080 (HTTP Alternate) replaced Port 4899 (Remote Administrator) among the top 10. Port 445 remained the target of an overwhelming majority of observed attacks as compared to other ports in the top 10. In the fourth quarter of 2011, average connection speeds on known mobile providers ranged from 5.2 Mbps down to 163 kbps. Average peak connection speeds during the quarter ranged from 23.4 Mbps to 1.6 Mbps. Looking at mobile content consumption, users on eight mobile providers consumed, on average, more than one gigabyte (1 GB) of content from Akamai per month, while users on an additional 75 mobile providers downloaded more than 100 MB of content from Akamai per month during the fourth quarter. In addition, based on data collected by Ericsson, mobile data traffic continued to double on a year-over-year basis, and grew 28% between the third and fourth quarters of 2011.

Akamai maintains a distributed set of agents deployed across the Internet that monitor attack traffic. Based on 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-level protocol identifiers.) This section provides insight into port-level attack traffic, as observed and measured by Akamai, during the fourth quarter of 2011. It also provides insight into trends related to the usage of client-side ciphers for SSL connections to Akamai.

1.1 Attack Traffic, Top Originating Countries

During the fourth quarter of 2011, Akamai observed attack traffic originating from 187 unique countries/regions, down from 195 in the third quarter. After vaulting to the top of the list last quarter, responsible for 14% of observed attack traffic, Indonesia fell to third place in the fourth quarter, with its traffic percentage falling by almost half, as shown in Figure 1. Egypt dropped from the list in the fourth quarter (falling to #20 globally), replaced by Turkey, which tripled its percentage of observed attack traffic, but had otherwise not been seen in the top 10 during 2011. Quarterly changes in observed attack traffic volume among the top 10 were evenly split in the fourth quarter, with China, the United States, Turkey, South Korea, and Romania all responsible for higher percentages of attack traffic as compared to the prior quarter, while Indonesia, Taiwan, Russia, Brazil, and India all saw percentages drop relative to the third quarter.

In examining the continental distribution of observed attack traffic in the fourth quarter, we found that just over 45% originated in the Asia Pacific/Oceania region, Europe originated nearly 33%, North & South America originated just under 20%, and the remaining 2% came from Africa.

1.2 Attack Traffic, Top Ports

As shown in Figure 2, attack traffic concentration among the top 10 ports continued to decline, with the top 10 ports accounting for 65% of the observed attacks (down from 68% in the third quarter and 70% in the second quarter). Port 445's traffic percentage has continued to decline—it will be interesting to see if it continues throughout 2012 and finally cedes the top spot on the list to another port. In addition to Port 445, Port 23 (Telnet), Port 443 (HTTPS/SSL), and Port 135 (Microsoft-RPC) also saw quarterly declines in their traffic percentages, though none were quite as significant as that seen by Port 445. Port 1433 (Microsoft SQL Server) saw a significant (>3x) quarterly increase in its traffic percentage, while Ports 8080 and 9415 both saw an increase of 4x or more.

It appears that Port 8080 is associated with vulnerabilities in the Cisco Unified Communications Manager and Cisco Unified Contact Center Express[1] products, as well as in unpatched or unsecured JBoss Application Servers and variant products.[2] While we do not have specific insight into whether the observed attacks were definitively associated with these vulnerabilities, they do represent two high profile targets. Although Port 9415 is not officially associated with a specific protocol or application according to IANA, it appears to be associated with

	Country/Region	Q4 '11 % Traffic	Q3 '11 %
1	China	13%	8.6%
2	United States	10%	7.3%
3	Indonesia	7.6%	14%
4	Taiwan	7.5%	11%
5	Russia	6.8%	7.2%
6	Turkey	5.6%	1.8%
7	South Korea	5.2%	3.8%
8	Brazil	4.4%	5.5%
9	India	3.0%	3.7%
10	Romania	2.6%	2.4%
–	Other	35%	33%

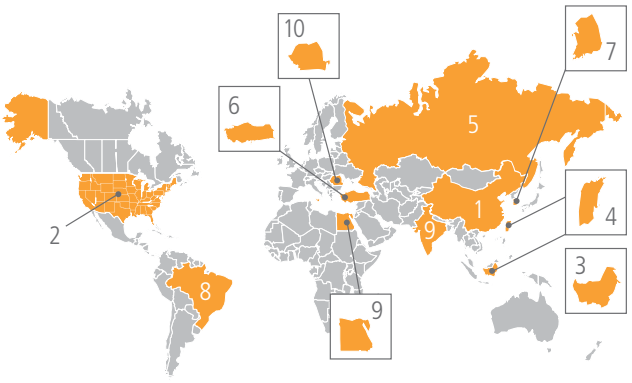
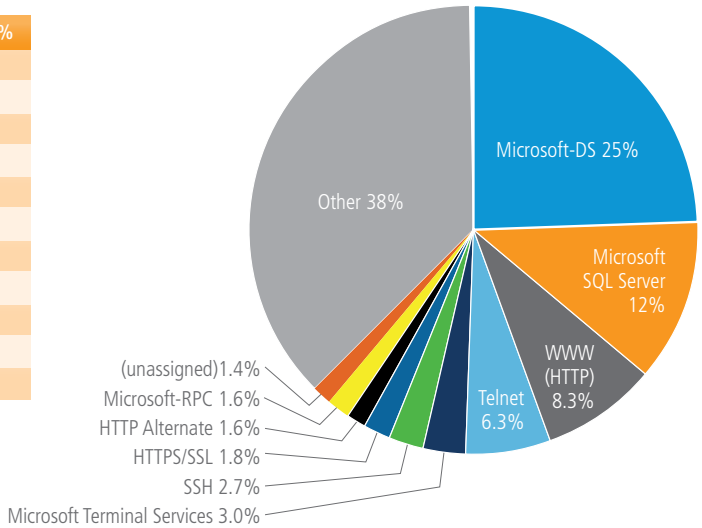


Figure 1: Attack Traffic, Top Originating Countries/Regions

Port	Port Use	Q4 '11 % Traffic	Q3 '11 %
445	Microsoft-DS	25%	38%
1433	Microsoft SQL Server	12%	3.5%
80	WWW (HTTP)	8.3%	7.1%
23	Telnet	6.3%	7.3%
3389	Microsoft Terminal Services	3.0%	1.5%
22	SSH	2.7%	1.9%
443	HTTPS/SSL	1.8%	5.0%
8080	HTTP Alternate	1.6%	0.4%
135	Microsoft-RPC	1.6%	2.0%
9415	(unassigned)	1.4%	0.3%
Various	Other	38%	–

Figure 2: Attack Traffic, Top Ports



a proxy used by the Chinese PPLive video streaming software. A flaw in the software[3] allowed it to be used as an open proxy on Port 9415, so the increase in observed attacks targeting that port may be malware searching for open proxies on this port that can be used to hide its tracks.

Although the percentage of attacks targeting Port 23 (Telnet) was slightly lower than in the third quarter, it was still far and away the top port targeted by attacks observed to be originating from South Korea and Turkey, where it accounted for more than 5x the number of attacks targeting the next most popular port (445 in both countries). In China, Port 1433 (Microsoft SQL Server) accounted for more than 2x the number of attacks targeting the next most popular port, while in Indonesia, Port 80 (WWW/HTTP) saw over 3x as many attacks as the next most popular port.

1.3 SSL Insight, Client-Side Ciphers

In addition to the large number of requests for content that Akamai serves over HTTP (Port 80), the Akamai Intelligent Platform also services millions of requests per second for secure content over HTTPS/SSL (Port 443). This massive volume of encrypted traffic provides Akamai with a unique perspective on the client-side SSL ciphers that are in popular use, as well as their usage trends over time. The statistics presented in this section are for SSLv3 and TLSv1.

Figure 3 illustrates the breakdown of SSL ciphers presented by Web clients (generally browsers) to Akamai's Secure Content Delivery Network during the fourth quarter of 2011. While minor changes can be observed throughout the course of the quarter, the quarterly trends observed for the five highlighted SSL ciphers remained in line with those observed in prior quarters. The use of AES256-SHA-1 and AES128-SHA-1, considered to be more secure ciphers due to being harder to decrypt, both increased slightly during the fourth quarter, with AES256-SHA-1 growing from 47.9% to 48.7%, and AES128-SHA-1 growing from 32.5% to 33.4%. The rate of increase for both was lower than that observed in the third quarter. The use of DES-CBC-SHA-168, RC4-SHA-128, and RC4-MD5-128 all declined, dropping 15%, 7.5%, and 5.6% respectively.

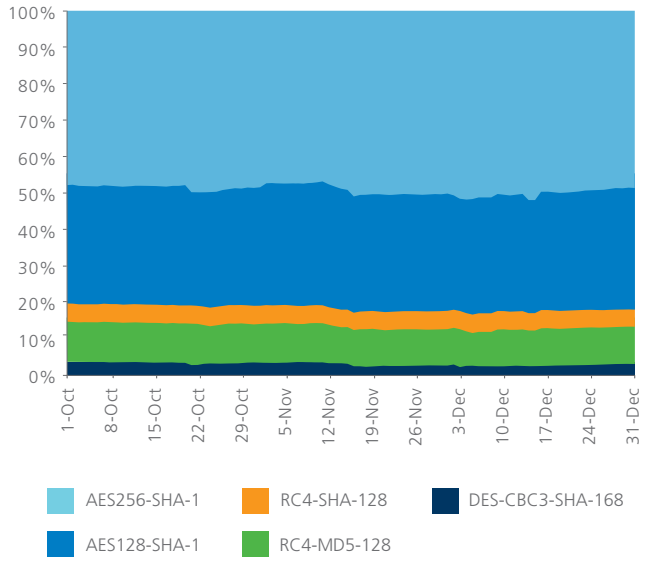


Figure 3: Client-Side SSL Ciphers Observed by Akamai, Q4 2011

Internet Penetration

2.1 Unique IPv4 Addresses

Through its globally-deployed Intelligent Platform, and by virtue of the more than one trillion requests for Web content that it services on a daily basis, Akamai has unique visibility into levels of Internet penetration around the world. In the fourth quarter of 2011, over 628 million unique IPv4 addresses, from 236 countries/regions, connected to the Akamai Intelligent Platform – 2.1% more than in the third quarter of 2011, and nearly 13% more than in the fourth quarter of 2010. Although we see more than 600 million unique IPv4 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 IPv4 address (or a small number of IPv4 addresses), because they access the Web through a firewall or proxy server. Conversely, individual users can have multiple IPv4 addresses associated with them, due to their use of multiple connected devices. Unless otherwise specified, the use of "IP address" within Section 2.1 refers to IPv4 addresses.

As shown in Figure 4, quarterly changes among the top 10 countries were generally positive in the fourth quarter, with seven seeing quarterly increases in unique IP address counts, while the United States, Japan, and South Korea saw minor quarterly declines. We do not believe that these quarterly declines are any cause for concern, as they represent short-term trends and could be due to a number of possible causes, including shifts in IP address block utilization by local network service providers, increased use of proxies, or deployment of so-called "large scale NAT" (network address translation) infrastructure by carriers in an effort to conserve limited available IPv4 address space Globally, quarterly growth was seen in a majority of countries/regions around the world in the fourth quarter.

Looking at year-over-year changes, we see that China, Brazil, Italy, and Russia all experienced yearly growth in excess of 20%. Globally, nearly 200 countries/regions saw year-over-year growth, with declines mostly seen in smaller countries/regions. Last quarter, we observed that the rate of yearly change across the top countries may have been slowing. In comparing year-over-year changes observed this quarter to those observed last quarter, we found that half of the top 10 countries saw higher rates of yearly change in the fourth quarter.

The unique IP address count across the top 10 countries represented approximately 67% of the global figure, a concentration level approximately one percent lower than in the third quarter. In looking at the "long tail", there were 180 countries/regions with fewer than one million unique IP addresses connecting to Akamai in the fourth quarter of 2011, 131 with fewer than 100,000 unique IP addresses, and just 27 with fewer than 1,000 unique IP addresses connecting to Akamai. Counts for all three thresholds were down as compared to the third quarter.

In November 2011, United States managed services operator Comcast claimed to be the "first large ISP in North America to start deploying IPv6", announcing[4] that it had started the pilot market deployment of IPv6 to customers in selected markets, after a year of IPv6 technical trials in its production network. Time Warner Cable plans to have 100,000 customers on IPv6-capable networks ahead of the World IPv6 Launch event on June 6, 2012.[5] As more end-user networks roll out native IPv6 connectivity to their subscribers, and as more popular content is made available over IPv6, the number of unique IPv4 addresses making requests to Akamai from a given network provider may decline. Over the long-term, we expect measurements to show movement of unique addresses from IPv4-based to IPv6-based.

	Country/Region	Q4 '11 Unique IP Addresses	QoQ Change	YoY Change
–	Global	628,358,806	2.1%	13%
1	United States	145,069,663	-0.3%	5.7%
2	China	84,405,405	3.4%	26%
3	Japan	40,254,398	-8.5%	1.8%
4	Germany	35,608,453	3.2%	5.2%
5	United Kingdom	25,383,604	13%	14%
6	France	24,797,259	2.5%	7.3%
7	South Korea	18,948,552	-4.7%	-14%
8	Brazil	17,116,579	5.3%	27%
9	Italy	15,093,132	5.2%	23%
10	Russia	13,889,458	6.9%	20%

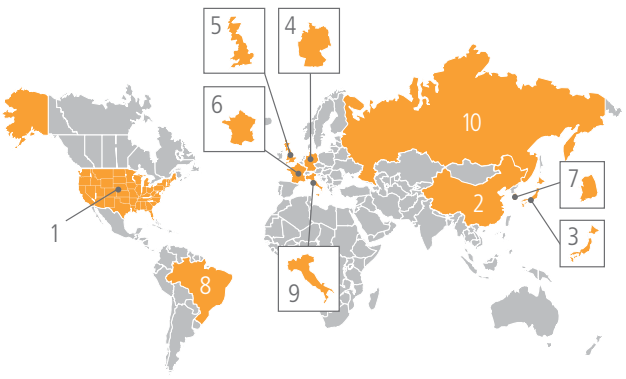


Figure 4: Unique IPv4 Addresses Seen By Akamai

2.2 IPv4 Exhaustion

During the fourth quarter, the number of available IPv4 addresses continued to decline, as Regional Internet Registries (RIRs) allocated/assigned blocks of addresses to requesting organizations within their respective territories.[6] Based on data published by the RIRs,[7] Figure 5 illustrates the volume of IPv4 addresses allocated/assigned, and the rate at which that took place during the fourth quarter of 2011.

Due to austerity measures implemented by APNIC upon reaching its final /8 (16.8 million IPv4 addresses) block on April 15, APNIC account holders are only eligible to request and receive delegations totaling a maximum of 1,024 IPv4 addresses ("/22") from the APNIC IPv4 address pool. As such, APNIC saw the lowest volume of IPv4 addresses assigned during the fourth quarter, reaching peaks of 23,808 and 18,432 IPv4 addresses on December 23 and 29 respectively, and allocating/assigning only 239,872 total IPv4 addresses during the quarter.

AFRINIC's IPv4 exhaustion proceeded slowly during the fourth quarter as well, with only 405,670 IPv4 addresses allocated, and peaks in excess of 65,536 addresses (a "/16") allocated/assigned seen on only three days. LACNIC allocated/assigned over 2.5 million IPv4 addresses during the quarter, with over half a million allocated on November 7. In contrast, RIPE was significantly more active, assigning or allocating more than 200,000 IPv4 addresses on many days during the quarter, peaking at 883,968 IPv4 addresses on December 1. However, in comparison, ARIN's activity was much more subdued during the quarter, with comparatively smaller allocations and assignments being made throughout the fourth quarter. The two days that clearly stand out as seeing the highest level of activity are October 17, when 276,992 IPv4 addresses were allocated/assigned, and December 9, when just over one million were allocated. This allocation of a /12 block[8] (to Amazon Technologies, Inc.) and two /22 blocks represents the largest consumption of IPv4 addresses during the fourth quarter of 2011 across all of the RIRs.

Recognizing that IPv4 address space is a valuable commodity, bankrupt bookseller Borders announced a plan in December 2011 to sell 65,536 IPv4 addresses (a "/16") to Cerner, a healthcare software vendor for $786,432, or $12 per address.[9] It was believed to be the second publicly announced sale of IPv4 space, after Nortel's sale of $7.5 million worth of addresses to Microsoft in April.

The size of the IPv4 "available pool" and the consumption rates vary by RIR, which ultimately means that they will reach a point of exhaustion at different times. For example, RIPE had over 55 million IPv4 addresses in its available pool at the end of 2011,[10] while ARIN had over 90 million.[11] Projected exhaustion dates for the various registries range from August 2012 for RIPE to all the way out in October 2014 for AFRINIC.[12]

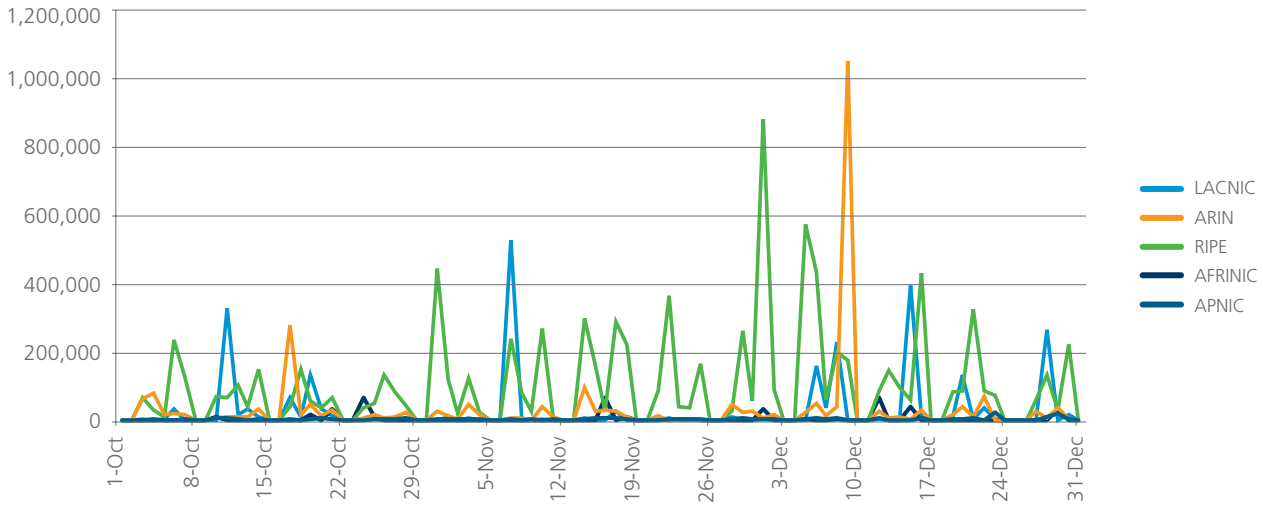


Figure 5: Number of IPv4 Adresses Allocated/Assigned by RIRs, Q4 2011

2.3 IPv6 Adoption

As Akamai rolls out IPv6 support across its solution portfolio throughout 2012, we will endeavor to include data in the *State of the Internet* report on IPv6 adoption based on the analysis of IPv6 requests to, and traffic delivered by, the Akamai Intelligent Platform. However, until such time that we can include comprehensive Akamai data on IPv6 adoption, we will continue to look to third-party data.

One helpful source of IPv6 information is Hurricane Electric, which provides Internet transit, Web hosting, and collocation services and notes that it is "considered the largest IPv6 backbone in the world as measured by number of networks connected."[13] A white paper[14] available from Hurricane Electric notes that it has operated IPv6 network elements since 2000 and that it implemented extensive native IPv6 peering in early 2006 as a result of a core router and backbone upgrade. Hurricane Electric also publishes the output of a set of measurement tools on its "Global IPv6 Deployment Progress Report" page, available at *http://bgp.he.net/ipv6-progress-report.cgi*.

As we did in the *3rd Quarter, 2011 State of the Internet* report, we are reviewing two key metrics: "IPv6 ASes" and "ASes using only IPv6". The "IPv6 ASes" metric tracks the total number of autonomous systems (network identifiers) in the IPv6 routing table, whereas "ASes using only IPv6" tracks the total number of autonomous systems using only IPv6. Note that the count of "IPv6 ASes" is a superset of "ASes using only IPv6". While these counts provide some perspective around IPv6 adoption, it is also important to recognize that not all autonomous systems are equivalent. That is, IPv6 adoption on an autonomous system that is associated with a large number of end users/subscribers is ultimately more meaningful and impactful for measuring the ultimate success of IPv6 than adoption by an autonomous system that is not directly associated with end user connectivity/traffic.

Figure 6 tracks the growth in the number of ASes in the global IPv6 routing table during the fourth quarters of 2009, 2010, and 2011. The highest rate of fourth-quarter growth for this metric was seen in 2010, when 355 ASes were added to the IPv6 routing table, resulting in a growth rate of 13.7%. In 2011, 267 ASes were added, amounting to just 5.7% growth, while the 185 ASes added in the fourth quarter of 2009 accounted for 11% growth.

Growth trends in the total number of IPv6-only ASes during the fourth quarters of 2009, 2010, and 2011 are shown in Figure 7. Though it was only a net add of three ASes, amounting to an increase of just over 4%, 2010 saw the highest rate of fourth-quarter growth for this metric as well. The growth rate during that quarter was as high as 15%, as seen in the "hump" that occurred in the last week of November. 2011 also saw a net add of just three IPv6-only ASes, amounting to an increase of just 2.8%. A net loss of 12 IPv6-only ASes translated into a 20% decline in the fourth quarter of 2009, though that trend reversed itself heading into the first quarter of 2010.

As noted in last quarter's report, the higher growth rates seen across both metrics during the second quarter of 2011, and the commensurately lower growth rates seen in the third and fourth quarters, may be related to preparations for World IPv6 Day (June 8, 2011), organized by the Internet Society as a 24-hour "test flight" of IPv6 for real-world use under controlled conditions. Building on the success of this event, the Internet Society is coordinating World IPv6 Launch on June 6, 2012. In advance of this event, Internet service providers, home networking equipment manufacturers, and Web companies around the world will come together to permanently enable IPv6 for their products and services. As such, we expect to see IPv6 adoption growth rates re-accelerate in the first and second quarters of 2012.

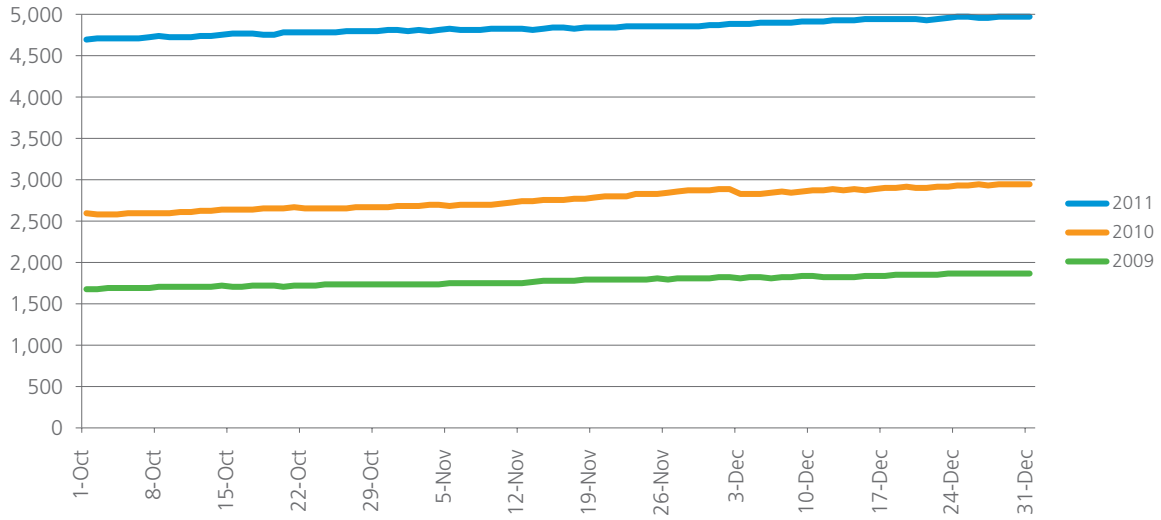


Figure 6: Total Number of Autonomous Systems in the IPv6 Routing Table

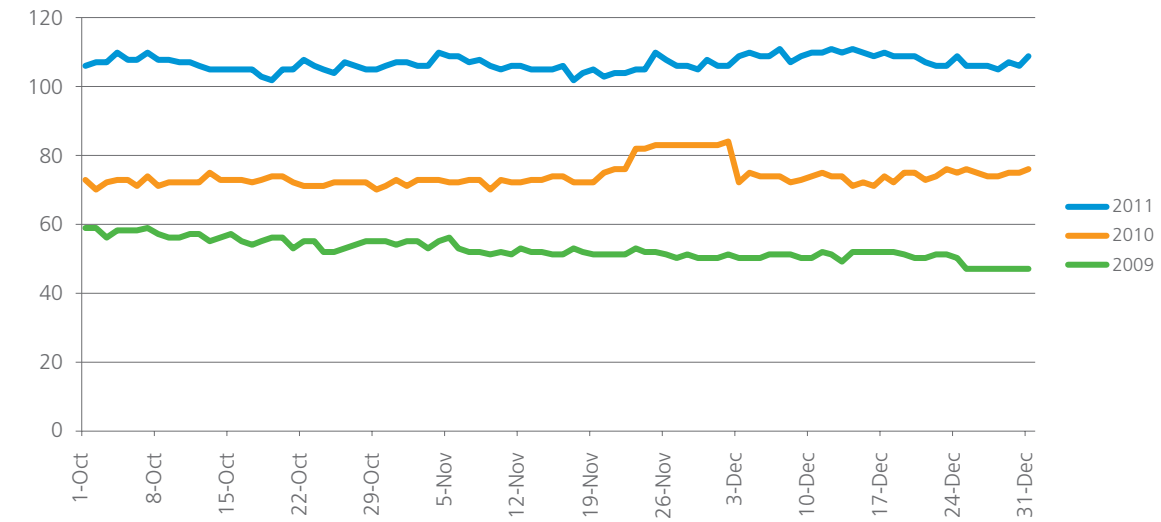


Figure 7: Total Number of IPv6-Only Autonomous Systems

SECTION 3:

Geography – Global

By virtue of the over one trillion requests for Web content that it services on a daily basis through its globally-deployed Intelligent Platform, Akamai has a unique level of visibility into the connection speeds of end-user systems and, consequently, into broadband adoption around the globe. Because Akamai has implemented a distributed platform model, deploying servers within edge networks, it can deliver content more reliably and consistently, in contrast to centralized providers 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[15] or the video explanation at *http://www.akamai.com/whytheedge.*

The data presented within this section was collected during the fourth quarter of 2011 through Akamai's globally deployed Intelligent Platform, and includes all countries/regions that had more than 25,000 unique IP addresses make requests for content to Akamai during the quarter. (Note that the threshold for inclusion was increased to 25,000 unique IP addresses starting with the *1st Quarter, 2011 State of the Internet* report, up from the 1,000 that was used from 2008-2010.) For purposes of classification within this report, the "high broadband" data included below is for connections at greater than 5 Mbps, and "broadband" is for connections of 2 Mbps or greater. In contrast, the "narrowband" data included below is for connections to Akamai that are slower than 256 kbps.

In addition to providing data on average connection speeds, we continue to report on average peak connection speeds around the world, from a country, state, and city perspective. This metric provides insight into the peak speeds that users can likely expect from their Internet connections.

Finally, 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 in the present section.

3.1 Global Average Connection Speeds

The global average connection speed saw an unusual, and fairly significant, decline in the fourth quarter of 2011, dropping to 2.3 Mbps, as shown in Figure 8. It was reflected in declines in eight of the top 10 countries, as well as the United States. Globally, 93 countries/regions that qualified for inclusion saw average connection speeds decline, ranging from a loss of just 0.3% in Kyrgyzstan to a 31% drop in Kuwait. On the flip side, perennial strongholds South Korea and Japan both experienced quarterly increases in average connection speeds, growing to 17.5 Mbps and 9.1 Mbps respectively. Around the world, 41 countries/regions grew average connection speeds quarter-over-quarter, ranging from 120% growth in Lebanon to just 0.1% growth in Kenya – both countries had an average connection speed of 1.0 Mbps in the fourth quarter. It is not clear what drove the observed widespread decline in average connection speeds during the quarter.

While the short-term (quarterly) trends may not have been particularly positive, long-term (yearly) trends tell a much better story. For the year, the global average connection speed was up a solid 19%, with double-digit percentage growth seen in eight of the top 10 countries and the United States. Globally, a total of 111 qualifying countries/regions saw year-over-year growth in average connection speeds for the fourth quarter, ranging from just over 200% in the small French territory of New Caledonia (to 3.0 Mbps) to Uruguay improving just 0.6% (to 1.1 Mbps). Declines in average connection speeds were seen in 21 countries/regions that qualified for inclusion.

In the fourth quarter, 31 countries/regions had average connection speeds of 1 Mbps or less, consistent with the third quarter. Libya remained the country with the lowest average connection speed, staying constant at 0.3 Mbps.

3.2 Global Average Connection Speeds, City View

As we have done in previous editions of the *State of the Internet* report, in examining average measured connection speeds at a city level, we have applied filters for unique IP address count (50,000 or more seen by Akamai in the fourth quarter of 2011) and academic institutions (removing data from known academic networks). As with the other data sets used in Section 3 of this report, traffic from known mobile networks has been removed as well.

	Country/Region	Q4 '11 Avg. Mbps	QoQ Change	YoY Change
–	Global	2.3	-14%	19%
1	South Korea	17.5	4.7%	28%
2	Japan	9.1	2.3%	10%
3	Hong Kong	9.1	-14%	-2.6%
4	Netherlands	8.2	-3.2%	18%
5	Latvia	7.8	-12%	31%
6	Switzerland	7.3	-2.9%	29%
7	Ireland	6.8	-3.6%	39%
8	Czech Republic	6.7	-7.3%	18%
9	Romania	6.4	-3.4%	-8.5%
10	Belgium	6.1	-1.6%	10%
…				
13	United States	5.8	-5.3%	14%

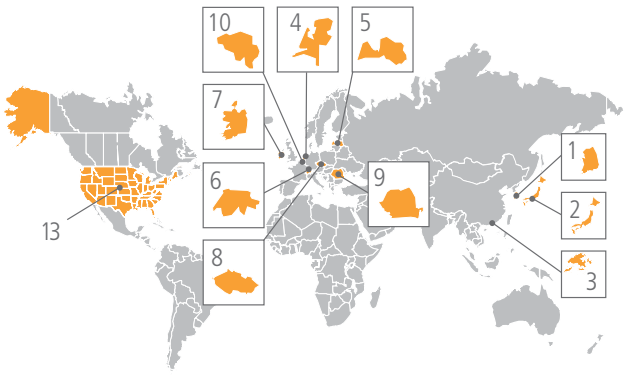


Figure 8: Average Measured Connection Speed by Country/Region

As shown in Figure 9, South Korean cities Taegu and Taejon were once again at the top of the list of the fastest cities in the world. Both cities added a fraction of a Mbps from the third quarter, and remained the only two cities with average connection speeds above 20 Mbps. No United States city placed in the top half of the list, with the Boston Metro area ranked 51st globally, at 8.4 Mbps. Umea, Sweden re-entered the top 100 list as the top European city, ranked 15th globally at 11.3 Mbps.

Twenty-six cities among the top 100 achieved average connection speeds of 10 Mbps or more in the fourth quarter, down one from the prior quarter. The slowest speed on the list (7.0 Mbps in Aurora, CO) was slightly lower than that seen in the third quarter (7.2 Mbps in Timisoara, Romania).

Cities in the Asia Pacific region again constituted the majority among the top 100 in the fourth quarter, holding 69 spots on the list, including Hong Kong, one in Australia, six in South Korea, and 61 in Japan. Twenty-four cities in North America made the list, including two in Canada and 22 in the United States. The remaining seven cities were from four countries in Europe, including one each in Romania and Latvia, two in Switzerland, and three in Sweden.

In reviewing the full list of over 900 cities that qualified for inclusion in this section, the fastest cities in other geographies included Randburg, South Africa (Africa), with an average connection speed of 1.7 Mbps, and Munro, Argentina (South America) with an average connection speed of 3.6 Mbps.

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.

In contrast to the decline seen in the average connection speed metric, the global average peak connection speed eked out a slight increase in the fourth quarter, growing 0.4% to 11.7 Mbps, as shown in Figure 10. Six of the top 10 countries also managed slight increases, with Japan's 2.4% growth the largest. As compared to the third quarter, quarterly growth rates among the top countries/regions were significantly more muted in the fourth quarter. Declines were seen in the remaining four of the top 10 countries, with the most significant decline see in Latvia, which lost 10% quarter-over-quarter. However, on a global basis, 74 countries/regions that qualified for inclusion saw quarterly increases in average peak connection speeds from a 49% increase in Lebanon (to 6.5 Mbps) and a 25% increase in Australia (to 21.7 Mbps) to barely perceptible quarterly growth of 0.1% in Macedonia and Germany (to 13.6 Mbps and 20.6 Mbps respectively.)

	Country/Region	City	Q4 '11 Avg. Mbps
1	South Korea	Taegu	21.8
2	South Korea	Taejon	20.7
3	South Korea	Kimchon	18.5
4	South Korea	Anyang	18.3
5	South Korea	Seoul	17.8
6	South Korea	Suwon	14.8
7	Japan	Shimotsuma	14.4
8	Japan	Tokai	14.1
9	Japan	Kanagawa	13.3
10	Japan	Yokohama	12.8
11	Japan	Asahi	12.7
12	Japan	Urawa	12.7
13	Japan	Hiroshima	11.8
14	Japan	Tochigi	11.4
15	Sweden	Umea	11.3
16	Japan	Nagano	11.2
17	Japan	Shizuoka	11.2
18	Japan	Nagoya	11.0
19	Japan	Ibaraki	10.8
20	Japan	Gifu	10.6
21	Japan	Chiba	10.5
22	Japan	Kyoto	10.4
23	Japan	Kobe	10.2
24	Japan	Nara	10.1
25	Japan	Marunouchi	10.1
26	Japan	Wakayama	10.0
27	Japan	Sendai	9.8
28	Japan	Osaka	9.8
29	Japan	Fukui	9.6
30	Japan	Fukushima	9.5
31	Japan	Hyogo	9.5
32	Japan	Tokushima	9.4
33	Japan	Hamamatsu	9.4
34	Japan	Yokkaichi	9.4
35	Japan	Otsu	9.3
36	Japan	Kanazawa	9.3
37	Japan	Toyonaka	9.2
38	Japan	Hakodate	9.2
39	Japan	Yosida	9.2
40	Japan	Fukuoka	9.1
41	Japan	Kochi	9.1
42	Japan	Niho	9.0
43	Japan	Niigata	9.0
44	Japan	Soka	8.8
45	Japan	Matsuyama	8.8
46	Japan	Hodogaya	8.8
47	Japan	Yamaguchi	8.8
48	Hong Kong	Hong Kong	8.7
49	Japan	Utsunomiya	8.5
50	Sweden	Goteborg	8.5
51	United States	Boston Metro, MA	8.4
52	United States	North Bergen, NJ	8.4
53	Japan	Mito	8.4
54	Japan	Kokuryo	8.4
55	Japan	Saga	8.3
56	Japan	Okayama	8.3
57	Japan	Tokyo	8.3
58	United States	Jersey City, NJ	8.3
59	United States	Monterey Park, CA	8.2
60	Switzerland	Geneva	8.2
61	Japan	Kumamoto	8.0
62	Japan	Tottori	8.0
63	United States	Clifton, NJ	8.0
64	Japan	Otemachi	8.0
65	Japan	Miyazaki	7.9
66	Japan	Kagoshima	7.9
67	Japan	Kofu	7.9
68	United States	Manchester, NH	7.8
69	Switzerland	Zurich	7.8
70	Japan	Iwaki	7.8
71	United States	San Jose, CA	7.7
72	United States	Fremont, CA	7.7
73	Japan	Yamagata	7.7
74	Japan	Toyama	7.7
75	United States	Cambridge, MA	7.7
76	Latvia	Riga	7.6
77	United States	Fredericksburg, VA	7.6
78	Australia	Canberra	7.6
79	United States	Staten Island, NY	7.5
80	Japan	Kagawa	7.5
81	Canada	Victoria, BC	7.5
82	United States	Union, NJ	7.5
83	United States	Hollywood, FL	7.5
84	Japan	Morioka	7.4
85	United States	Riverside, CA	7.4
86	United States	Fairfield, CA	7.4
87	Japan	Sapporo	7.4
88	United States	Cherry Hill, NJ	7.4
89	Romania	Timisoara	7.4
90	Japan	Akita	7.3
91	Sweden	Boras	7.3
92	Japan	Okidate	7.3
93	Japan	Nagasaki	7.2
94	United States	Oakland, CA	7.2
95	United States	San Mateo, CA	7.2
96	United States	Trenton, NJ	7.2
97	Canada	Oakville, ON	7.1
98	United States	Muncie, IN	7.1
99	United States	Hartford, CT	7.0
100	United States	Aurora, CO	7.0

Figure 9: Average Connection Speed, Top Global Cities

Looking at year-over-year changes, the global average peak connection speed was up by a quarter as compared to the fourth quarter of 2010. All of the top 10 countries/regions saw long-term growth in average peak connection speeds; Japan was once again the only one to see a year-over-year change below 10%. Globally, yearly growth was seen in 123 qualifying countries/regions, with just nine posting declines. Here again, growth was much more muted as compared to the third quarter, as no country/region had yearly growth in excess of 100%—New Caledonia's 71% increase to 13.8 Mbps was the largest observed year-over-year percentage increase. Observed year-over-year losses ranged from a decline of just 1.1% in Kuwait (to 9.8 Mbps) to Tunisia dropping significantly, declining 82% year-over-year (to 8.3 Mbps).

South Korea remained the country with the highest average peak connection speed, coming in just shy of 49 Mbps. Hong Kong also had an average peak connection speed above 40 Mbps, while only Romania and Japan were above 30 Mbps. The remaining countries in the top 10, as well as 17 others around the world, saw average peak connection speeds above 20 Mbps in the fourth quarter. Guinea-Bissau's average peak connection speed vaulted past 2 Mbps in the fourth quarter, with 22% quarterly growth and 44% yearly growth, but it remained the lowest among countries/regions that qualified for consideration.

The positive short- and long-term trends for average peak connection speeds, and especially the very solid year-over-year growth numbers, indicate that the state of Internet connectivity is generally improving around the world. Since these figures were first tracked in the *1st Quarter, 2010 State of the Internet* report, many countries/regions have grown 50% or more.

	Country/Region	Q4 '11 Peak Mbps	QoQ Change	YoY Change
–	Global	11.7	0.4%	25%
1	South Korea	47.9	2.2%	33%
2	Hong Kong	45.9	-0.2%	17%
3	Romania	35.2	1.9%	10%
4	Japan	33.8	2.4%	9.7%
5	Latvia	29.2	-10%	25%
6	Belgium	26.7	-0.7%	14%
7	Portugal	25.2	0.9%	8.8%
8	Switzerland	25.1	0.7%	24%
9	Netherlands	25.0	-2.1%	18%
10	United States	24.2	0.2%	16%

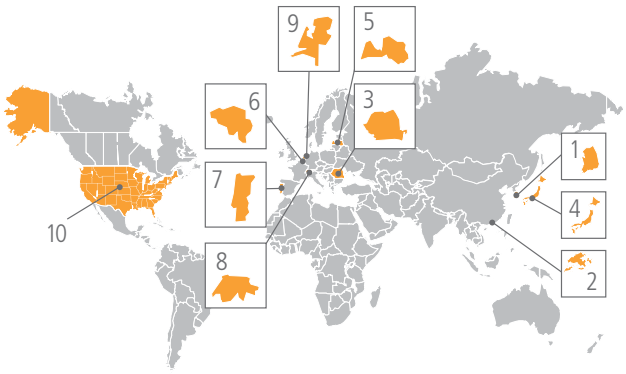


Figure 10: Average Peak Connection Speed by Country/Region

DID YOU KNOW?

- *In New Caledonia, a massive rollout of Fiber-to-the-Home (FTTH) connectivity will begin later in 2012.*
  [Source: http://www.pacnog.org/pacnog10/presentations/opt-pacnog.pdf]

- *In November 2011, the European Commission approved a funding plan in Latvia worth around LVL71.5 million (USD $139 million) for the deployment of superfast broadband networks in the country. The plan aims to bring Internet access at speeds between 30 Mbps and 100 MBps to both consumers and businesses.*
  [Source: http://www.telegeography.com/products/commsupdate/articles/2011/11/10/ec-approves-latvian-support-scheme-for-superfast-broadband-infrastructure]

3.4 Global Average Peak Connection Speeds, City View

As we have done in previous editions of the *State of the Internet* report, in examining average measured connection speeds at a city level, we have applied filters or unique IP address count (50,000 or more seen by Akamai in the fourth quarter of 2011) and academic institutions (removing data from known academic networks). As with the other data sets used in Section 3 of this report, traffic from known mobile networks has been removed as well.

As shown in Figure 11, South Korean cities Taejon and Taegu topped this list as well, with average peak connection speeds of 59.2 Mbps and 56.7 Mbps, respectively, and were two of five cities with average peak connection speeds greater than 50 Mbps in the fourth quarter. Tokai, Japan and Yokahama, Japan fell just shy of 50 Mbps, but are joined by 19 other cities that had average connection speeds above 40 Mbps. Fifty-five more cities among the top 100 had average peak connection speeds above 30 Mbps, and the remaining 19 cities all had average peak connection speeds above 20 Mbps.

Cities in the Asia Pacific region remained in the majority among the top 100 in the fourth quarter, holding 63 spots on the list, including Hong Kong, one in Australia, six in South Korea, and 55 in Japan. Thirty cities in North America made the list, all in the United States, with the fastest once again being North Bergen, NJ, ranking 24th globally at 40.7 Mbps. The remaining seven cities were from five countries in Europe, including three cities in Romania. The fastest European city was Timisoara, Romania, which ranked 18th globally with an average peak connection speed of 43.9 Mbps.

In reviewing the full global list of over 900 cities that qualified for inclusion in this section, the fastest cities in other geographies included Casablanca, Morocco (Africa) with an average peak connection speed of 8.8 Mbps, and Munro, Argentina (South America) with an average peak connection speed of 22.6 Mbps.

DID YOU **KNOW?**

- *Fully one quarter of Moroccan households boast a broadband connection - up from just two percent in 2004.*
  [Source: http://www.infodev.org/en/Article.768.html]
- *Argentina has one of the most developed broadband markets in Latin America, with some of the fastest and least expensive plans on offer.*
  [Source: http://www.budde.com.au/Research/Argentina-Broadband-and-Broadcasting-Market-Overview-Statistics-and-Forecasts.html]
- *Romania is one of the leading countries in the world in terms of high speed internet access in larger cities, but fixed broadband internet penetration is still low in Romanian regions and rural areas.*
  [Source: http://www.ebrd.com/pages/news/press/2012/120403c.shtml]

	Country/Region	City	Q4 '11 Peak Mbps
1	South Korea	Taejon	59.2
2	South Korea	Taegu	56.7
3	Japan	Shimotsuma	54.1
4	Japan	Kanagawa	51.3
5	Japan	Marunouchi	50.7
6	Japan	Tokai	49.8
7	Japan	Yokohama	49.3
8	South Korea	Anyang	48.8
9	Japan	Urawa	48.7
10	South Korea	Seoul	48.5
11	South Korea	Kimchon	46.8
12	Japan	Nagano	46.8
13	Japan	Hodogaya	45.2
14	South Korea	Suwon	45.0
15	Japan	Chiba	44.8
16	Japan	Asahi	44.3
17	Hong Kong	Hong Kong	43.9
18	Romania	Timisoara	43.9
19	Japan	Soka	43.1
20	Japan	Tochigi	42.7
21	Japan	Yosida	42.0
22	Japan	Hiroshima	41.5
23	Japan	Ibaraki	41.1
24	United States	North Bergen, NJ	40.7
25	Japan	Sendai	40.4
26	Japan	Shizuoka	40.1
27	Romania	Iasi	39.6
28	Japan	Nagoya	39.6
29	Japan	Kokuryo	38.7
30	Japan	Utsunomiya	38.6
31	Japan	Gifu	37.9
32	Japan	Kyoto	37.8
33	Japan	Niigata	37.5
34	Japan	Osaka	36.9
35	Japan	Mito	36.9
36	Japan	Kobe	36.6
37	Japan	Fukuoka	36.4
38	United States	Monterey Park, CA	36.3
39	Japan	Hakodate	36.2
40	Japan	Yokkaichi	35.8
41	Japan	Hamamatsu	35.4
42	Japan	Kanazawa	35.1
43	United States	Cambridge, MA	35.1
44	Japan	Fukushima	34.9
45	Japan	Nara	34.5
46	Japan	Niho	34.2
47	Japan	Fukui	34.0
48	United States	Staten Island, NY	34.0
49	Japan	Wakayama	33.9
50	United States	Fairfield, CA	33.8
51	Japan	Iwaki	33.8
52	Japan	Otsu	33.7
53	Sweden	Umea	33.7
54	United States	Ogden, UT	33.2
55	Japan	Sapporo	33.2
56	Japan	Tokushima	33.0
57	United States	Fayetteville, NC	33.0
58	United States	Jersey City, NJ	32.8
59	United States	Arvada, CO	32.8
60	United States	Aurora, CO	32.8
61	Japan	Yamaguchi	32.6
62	United States	Oakland, CA	32.5
63	Japan	Kofu	32.5
64	Japan	Okidate	32.3
65	United States	Van Nuys, CA	32.3
66	United States	Hollywood, FL	32.3
67	Japan	Matsuyama	32.1
68	Japan	Morioka	32.0
69	Romania	Bucharest	31.9
70	United States	Riverside, CA	31.9
71	United States	San Mateo, CA	31.6
72	United States	Boston Metro, MA	31.5
73	Australia	Canberra	31.5
74	Japan	Yamagata	31.3
75	Japan	Okayama	31.1
76	United States	Fremont, CA	31.0
77	United States	Cherry Hill, NJ	30.9
78	United States	Tallahassee, FL	30.8
79	United States	Union, NJ	30.8
80	Japan	Kochi	30.3
81	United States	Waco, TX	30.0
82	United States	Muncie, IN	29.7
83	Japan	Akita	29.7
84	United States	Manchester, NH	29.6
85	United States	Winston-Salem, NC	29.4
86	Switzerland	Zurich	29.2
87	United States	Federal Way, WA	29.1
88	Japan	Tokyo	29.0
89	Japan	Kumamoto	29.0
90	Japan	Hyogo	28.7
91	Latvia	Riga	28.7
92	Czech Republic	Brno	28.6
93	United States	Clifton, NJ	28.6
94	United States	Fredericksburg, VA	28.5
95	United States	Hartford, CT	28.4
96	Japan	Toyonaka	28.4
97	Japan	Otemachi	28.4
98	United States	Lancaster, PA	28.3
99	United States	Chattanooga, TN	28.2
100	Japan	Kagoshima	28.1

Figure 11: Average Peak Connection Speed, Top Global Cities

3.5 Global High Broadband Connectivity

In line with the observed quarterly decline in average connection speed, the level of global high broadband adoption declined slightly in the fourth quarter of 2011, dropping 4.6% to 27%, as shown in Figure 12. Seven of the top 10 countries/regions, as well as the United States, also saw quarterly declines in high broadband adoption levels, with Latvia and Denmark both seeing unusually high losses, in excess of 10%. South Korea maintained a clear lead, remaining in first place with 83% high broadband adoption, growing just over 5% quarter-over-quarter. Japan also added more than 5% from the third quarter, while Switzerland continued to have over half of its connections to Akamai at speeds over 5 Mbps, growing 0.4% in the fourth quarter. Levels of quarterly change in other qualifying countries/regions around the world were less aggressive than those seen in the third quarter, with only three countries (China, Indonesia, Finland) seeing double-digit percentage increases, in contrast to four countries with quarterly growth above 100% in the third quarter.

On a year-over-year basis, the story is much more positive, with the global high broadband adoption rate increasing 17% as compared to the fourth quarter of 2010. Nine of the top 10 countries/regions saw year-over-year growth, with South Korea and Switzerland both growing more than 50%. Among the top 10, only Japan and Hong Kong had yearly growth below 10%, and Romania was the lone outlier, declining 5.5% year-over-year. Despite the comparatively small level of growth, Japan's positive year-over-year change in the fourth quarter reverses the pattern of year-over-year losses that were seen throughout the rest of 2011. Across the rest of the world, 10 countries had high broadband rates more than double year-over-year, including 380% growth in China (to 1.5%) and 214% in Indonesia (to 1.1%). Nine countries/regions saw yearly growth rates below 10%, and just five countries/regions (Romania, Saudi Arabia, Brazil, Taiwan, and Argentina) had lower high broadband adoption rates year-over-year.

Looking at high broadband adoption on a global basis, only seven of the top 10 countries/regions had half or more of their connections to Akamai at speeds greater than 5 Mbps, down from all of the top 10 countries/regions in the third quarter. There were an additional 22 countries/regions (even with the prior quarter) where more than a quarter of connections were at high broadband rates, and 14 more (up from 13 in the third quarter) where at least one in 10 connections was faster than 5 Mbps. India was the only country with high broadband adoption below 1%—after seeing strong growth in the third quarter, it lost 26% in the fourth quarter, ending the year at 0.5% high broadband adoption.

3.6 Global Broadband Connectivity

In the fourth quarter of 2011, global broadband adoption decreased very slightly, losing 0.3%, but stayed at 66%. As shown in Figure 13, among the top 10 countries/regions, just the Isle of Man and South Korea saw quarterly increases in broadband adoption rates, pushing them into first and second place respectively. Minor quarterly declines were seen in the

	Country/Region	% Above 5 Mbps	QoQ Change	YoY Change
–	Global	27%	-4.6%	17%
1	South Korea	83%	5.2%	63%
2	Netherlands	67%	-1.3%	20%
3	Japan	60%	5.9%	3.6%
4	Hong Kong	57%	-5.1%	2.5%
5	Belgium	52%	-3.5%	11%
6	Switzerland	51%	0.4%	56%
7	Latvia	51%	-12%	16%
8	Romania	49%	-2.3%	-5.5%
9	Czech Republic	47%	-6.4%	23%
10	Denmark	44%	-14%	11%
…				
12	United States	44%	-2.4%	23%

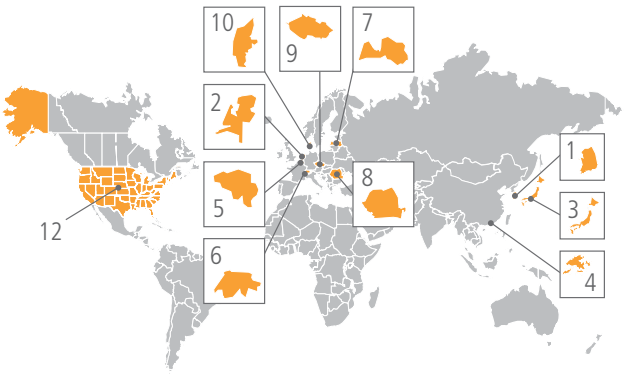


Figure 12: High Broadband Connectivity, Fastest Countries/Regions

other eight countries/regions in the top 10, as well as the United States, which ranked number 35 globally. All of the top 10 countries once again had more than 90% of their connections to Akamai at speeds above 2 Mbps, and Europe continued to have some of the highest levels of broadband adoption, holding eight of the top 10 slots. Around the world, only 28 countries/regions that qualified for inclusion experienced quarterly increases in broadband adoption rates, led by a solid 37% increase (to 22%) in Armenia. Quarterly declines were seen in 65 qualifying countries, with Syria's 47% decline (to 14%) the most significant.

Consistent with the other metrics covered earlier in Section 3, the real story is how broadband adoption is increasing over the long-term. At a global level, broadband adoption was up 7.5% year-over-year, and all but one of the top 10 countries/regions, as well as the United States, saw yearly growth in broadband adoption, from just 0.7% in the Isle of Man to 10% in South Korea. Around the rest of the world, 78 qualifying countries/regions saw year-over-year growth, from just 0.1% in Malta and Iceland (to 88% and 87%, respectively) to over 900% in New Caledonia (to 71%) and over 500% in Armenia (to just 22%). Growth more than doubled in 14 countries/regions. Interestingly, broadband adoption levels stayed the same year-over-year in Curacao and Argentina, while just 13 countries/regions saw declines. The largest losses were seen in Syria (down 69% to 14% adoption) and Tunisia (down 93% to 5.9% adoption). Tunisia's decline would seem to be unusual, as a leading telecommunications research firm notes[16] that "As a result of heavy investments in the telecom sector since the mid-1990s, Tunisia has one of the most developed telecommunications infrastructures in Northern Africa and sports some of the continent's highest market penetration rates." While this could have been attributable to widespread Internet filtering and censorship in the past, Internet censorship in Tunisia[17] reportedly decreased significantly in January 2011, so it is not clear exactly what drove this massive decline over the course of 2011.

In the fourth quarter of 2011, 16 countries/regions (down from 18 in the third quarter) saw broadband adoption levels of 90% or more. Another 45 (up from 43 in the third quarter) had at least half of their connections to Akamai at 2 Mbps or better, 10 additional countries/regions (down from 15 in the third quarter) had broadband adoption of at least 25%, and another 14 (up from 13 in the third quarter) had at least one in 10 connections to Akamai at speeds of at least 2 Mbps. Of the countries/regions that qualified for inclusion, Venezuela remained the one with the lowest level of broadband adoption, at only 2.6%. This fourth quarter level was down 4.8% quarter-over-quarter, and down a surprising 50% year-over-year. It is not clear whether the 2011 adoption of legislation that could potentially restrict Internet freedom[18] is related any way to this significant drop in broadband adoption levels over the course of the year.

Over time, we expect that a growing number of countries/regions will qualify for inclusion within this section, and that broadband adoption rates within qualifying countries/regions will also continue to grow over the long term. In October 2011, the International Telecommunications Union issued a global

	Country/Region	% Above 2 Mbps	QoQ Change	YoY Change
–	Global	66%	-0.3%	7.5%
1	Isle Of Man	97%	1.9%	0.7%
2	South Korea	96%	2.4%	10%
3	Switzerland	96%	-0.1%	3.9%
4	Bulgaria	95%	-0.6%	5.3%
5	Romania	95%	-0.4%	2.8%
6	Netherlands	94%	-0.3%	4.8%
7	Hungary	94%	-0.3%	6.4%
8	Czech Republic	93%	-1.4%	2.2%
9	Hong Kong	92%	-0.9%	-1.1%
10	Germany	92%	-2.1%	4.3%
…				
35	United States	80%	-0.5%	7.4%

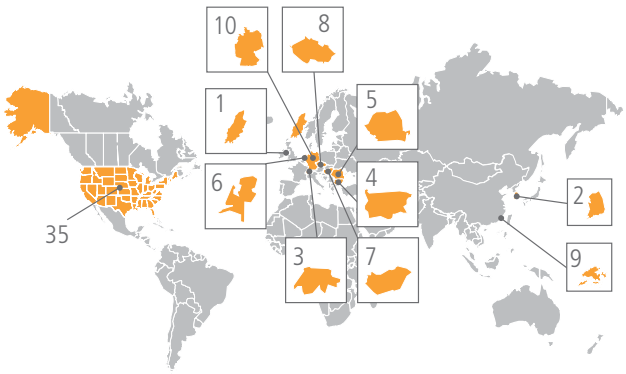


Figure 13: Broadband Connectivity, Fast Countries/Regions

Broadband Challenge[19] that, according to published coverage,[20] calls upon all countries to meet its four "ambitious but achievable" targets, listed below, for high-speed Internet access policy, affordability and uptake. While these goals are certainly laudable, they do not include a specific definition of "broadband", potentially making measurement of progress problematic, nor do they suggest how to achieve the second target, as many of the world's poorest ("developing") countries have broadband penetration below 1% at a cost of more than 100% of the average monthly income.[21]

3.7 Global Narrowband Connectivity

While the short-term trends (quarter-over-quarter changes) for global high broadband and broadband adoption headed in the "wrong" direction in the fourth quarter, global narrowband adoption continued to head in the "right" direction, declining 1.2% from the third quarter, staying at an adoption level of 2.5%, as shown in Figure 14. Eight of the top 10 countries, as well as the United States, saw quarterly declines, ranging from Bolivia's 22% drop to a loss of 4.0% in Nepal. Syria and Vietnam were the only two countries among the top 10 to experience quarterly growth in narrowband adoption in the fourth quarter.

In last quarter's report, we noted that Lebanon would likely continue to see lower narrowband adoption levels going forward. Interestingly, Lebanon did not qualify for inclusion in this metric in the fourth quarter, as Akamai only saw ~8,500 unique IP addresses connecting to Akamai at speeds below 256 kbps, down from over 75,000 in the third quarter. Additionally, Lebanon's calculated narrowband adoption rate dropped 90% in the fourth quarter to just below 5%. These two significant changes may indicate that Lebanon's use of the IMEWE undersea cable has removed a significant connectivity bottleneck that had limited speeds for Internet users within the country in the past.

Only 39 countries/regions around the world qualified for inclusion in this section in the fourth quarter. Of these, 30 had lower narrowband adoption rates than in the third quarter—losses ranged from just 0.2% in Turkey (to 0.4% narrowband adoption) to a 34% decline in South Korea (to 0.2% narrowband adoption). Just nine qualifying countries/regions saw increases, from 1.2% growth in the Ukraine (to 9.8% narrowband adoption) to an unusually high 47% jump in Thailand (to 3.9% narrowband adoption).

From a year-over-year perspective, 34 countries/regions around the world saw lower narrowband adoption levels than at the end of 2010. Of the five qualifying countries where narrowband adoption increased year-over-year, three saw unusually large increases—Vietnam was up over 750%, Morocco was up over 500%, and Libya was up 250%. Extremely high yearly growth in all three countries was noted in last quarter's report as well. Looking at the full list of over 230 countries/regions, over 200 of them saw narrowband adoption decline year-over-year. So although they did not have enough unique IP addresses connecting to Akamai at narrowband rates to qualify for inclusion in the section, it is encouraging to see that the overall long-term trend around the world is towards a lower percentage of "slower" connections—this maps to the general long-term growth observed in the high broadband and broadband metrics.

	Country/Region	% Below 256 kbps	QoQ Change	YoY Change
–	Global	2.5%	-1.2%	-37%
1	Libya	52%	-5.7%	250%
2	Nepal	32%	-4.0%	-46%
3	Nigeria	31%	-16%	-28%
4	Iran	30%	-6.0%	-25%
5	India	27%	-5.6%	-22%
6	Bolivia	25%	-22%	-57%
7	Syria	19%	10%	-24%
8	Indonesia	19%	-13%	-56%
9	Kazakhstan	16%	-4.2%	-28%
10	Vietnam	13%	1.7%	751%
…				
27	United States	1.6%	-5.1%	-36%

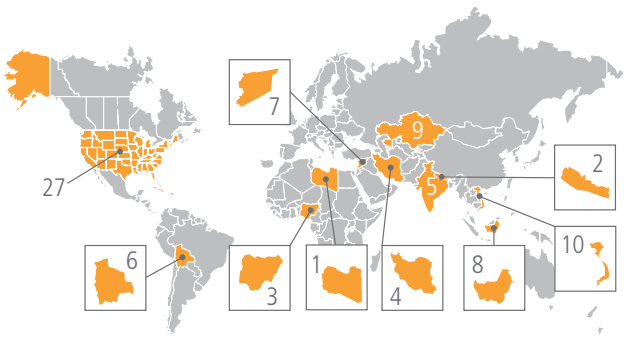


Figure 14: Narrowband Connectivity, Slowest Countries/Regions

SECTION 4:
Geography–United States

The metrics presented here for the United States are based on a subset of data used for Section 3 and are subject to the same thresholds and filters discussed within that section. (The subset used for this section includes connections identified as coming from networks in the United States, based on classification by Akamai's EdgeScape geolocation tool.)

4.1 United States Average Connection Speeds

In the fourth quarter of 2011, Delaware regained its position as the fastest state in the union, with an average connection speed of 8.0 Mbps. With a quarter-over-quarter decline of nearly 10%, Rhode Island fell to third place. As shown in Figure 15, Rhode Island was not the only state with a quarterly loss, as eight of the top 10 saw average connection speeds decline in the fourth quarter. Among the top 10, only New Hampshire and the District of Columbia had higher average connection speeds than in the prior quarter, though growth was limited, with increases of 1.3% and 0.2% respectively. Across the country, only three additional states saw quarterly growth in average connection speeds—Mississippi, New Jersey, and Tennessee, and increases among these three were very muted as well. The remaining states all saw lower average connection speeds, with losses ranging from 0.4% in Pennsylvania to 11% in North Dakota. The lowest average connection speed observed in the fourth quarter was in Arkansas, at 3.2 Mbps, down 6.4% from the third quarter.

Looking at year-over-year changes, the trends observed in the United States generally mirror those observed globally. All of the states in the top 10 had higher average connection speeds as compared to the fourth quarter of 2010. Across the whole country, a total of 47 states and the District of Columbia saw positive year-over-year changes, ranging from growth of 4.3% in Nevada (to 6.2 Mbps) to New Hampshire's 35% increase (to 7.8 Mbps).

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 mobile and academic networks were removed from the underlying data for this metric, and the 50,000 unique IP address filter was used as well.

As shown in Figure 16, San Jose fell to seventh place after holding the top spot in the prior couple of quarters. The Boston Metro area saw its average connection speed increase enough to move it into first place in the fourth quarter, slightly ahead of North Bergen, NJ. It appears that quarterly changes among the average connection speeds in the top 10 cities were mixed in the fourth quarter, as some saw increases large enough to move them up, or onto, the list, while others stayed on the list but dropped several places. Cities new to the top 10 in the fourth quarter include Clifton, NJ, Manchester, NH, and Cambridge, MA. Plano, TX, Staten Island, NY, and Fairfield, CA all dropped off the top 10 list in the fourth quarter.

California's representation among the top 10 cities has been steadily declining, holding only three spots in the fourth quarter. The balance of the list is comprised of East Coast cities from Massachusetts, New Jersey, New Hampshire, and Virginia.

	State	Q4 '11 Avg. Mbps	QoQ Change	YoY Change
1	Delaware	8.0	-5.8%	11%
2	New Hampshire	7.8	1.3%	35%
3	Rhode Island	7.7	-9.7%	13%
4	Utah	7.5	-5.6%	15%
5	Vermont	7.5	-5.2%	24%
6	District Of Columbia	7.2	0.2%	5.9%
7	Massachusetts	7.2	-1.9%	19%
8	Connecticut	7.0	-5.5%	27%
9	California	6.6	-6.7%	12%
10	Maryland	6.6	-1.6%	22%

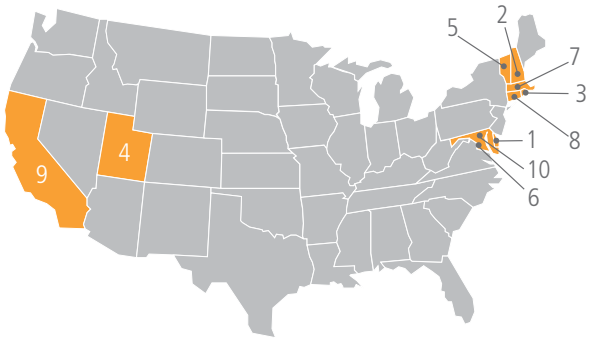


Figure 15: Average Measured Connection Speed by State

	City	Q4 '11 Avg. Mbps
1	Boston Metro, MA	8.4
2	North Bergen, NJ	8.4
3	Jersey City, NJ	8.3
4	Monterey Park, CA	8.2
5	Clifton, NJ	8.0
6	Manchester, NH	7.8
7	San Jose, CA	7.7
8	Fremont, CA	7.7
9	Cambridge, MA	7.7
10	Fredericksburg, VA	7.6

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

4.3 United States Average Peak Connection Speeds

Delaware remained solidly in first place among the top 10 states with the highest average peak connection speeds in the fourth quarter of 2011, at 36 Mbps, well ahead of Vermont, which moved into second place with an average peak connection speed of 30.4 Mbps, as shown in Figure 17. Seven of the top 10 states saw average peak connection speeds grow in the fourth quarter, though the increases were fairly modest. Once again, there were only two states above 30 Mbps, while the remainder were clustered in the 29 Mbps and 27 Mbps ranges.

Across the whole country, average peak connection speeds ranged from 36 Mbps in Delaware down to 13.3 Mbps in Arkansas. Quarterly changes were split fairly evenly, with growth in 24 states and the District of Columbia, and declines in 26 states. New Hampshire had the highest quarter-over-quarter increase, at 7.2%, while Rhode Island had the largest decrease, losing 8.6%. Yearly changes were overwhelmingly more positive, with Hawaii the only state showing a long-term decline, losing 2.3%. Year-over-year gains of more than 10% were seen in 43 states and the District of Columbia, led by a 37% increase in Alaska (to 18.6 Mbps). The smallest yearly gain was seen in Oklahoma, which improved just 0.6% to 20 Mbps.

4.4 United States Average Peak Connection Speeds, City View

North Bergen, NJ and Monterey Park, CA remained the two cities with the highest average peak connection speeds in the fourth quarter, with North Bergen's average peak connection speed increasing nearly 4 Mbps to 40.7 Mbps. As shown in Figure 18, San Jose, CA, which held the third spot last quarter, was pushed off the list, replaced by Cambridge, MA. Kingsport, TN, Oakland, CA, and Spartanburg, SC also all saw declines sufficient to be dropped from the top 10. Conversely, Ogden, UT, Arvada, CO, and Aurora, CO all saw large enough quarterly growth to place them on the list.

Similar to the average connection speed metric, California continues to lose ground in this metric as well, with only two cities on the list in the fourth quarter—down from four cities in the third quarter and four cities at the end of 2010. The top 10 list for this metric is not quite as East Coast-centric as the average connection speed list, holding only half the spots on the list. In a sign that average peak connection speeds may be generally increasing, the speed of the 10th city on the list once again increased—last quarter, it was 32.3 Mbps, while at the end of 2010, it was 26.7 Mbps.

	State	Q4 '11 Peak Mbps	QoQ Change	YoY Change
1	Delaware	36.0	0.3%	27%
2	Vermont	30.4	2.5%	23%
3	Rhode Island	29.6	-8.6%	6.5%
4	District Of Columbia	29.4	4.8%	10%
5	New Hampshire	29.0	7.2%	26%
6	Massachusetts	28.6	5.4%	22%
7	New York	27.7	-0.7%	23%
8	Connecticut	27.0	2.5%	29%
9	Indiana	27.0	-2.0%	22%
10	Utah	27.0	1.6%	22%

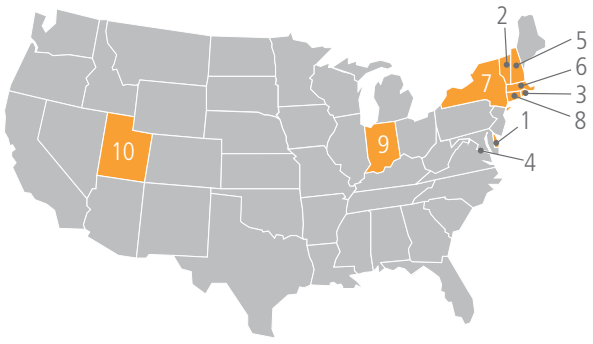


Figure 17: Average Peak Connection Speed by State

4.5 United States High Broadband Connectivity

As shown in Figure 19, quarter-over-quarter changes in high broadband adoption rates among the top 10 states were mixed in the fourth quarter. Six states saw quarterly growth, though it was fairly limited, with New Jersey's 3.3% increase the largest of the group. Four states saw quarterly declines, including Delaware, which remained in first place with 80% of connections to Akamai at speeds above 5 Mbps. All of the top 10 states experienced positive year-over-year changes, with a 49% increase in Vermont the largest of the group. High broadband adoption rates across the top 10 states spanned a fairly large range, from 80% in Delaware down to 52% in New York. However, the range was even wider across the whole country, as Arkansas' 10% adoption level was lowest seen in the fourth quarter.

Looking at quarterly changes across the whole country, 17 states and the District of Columbia saw high broadband adoption increase as compared to the third quarter. The largest increase was seen in Mississippi, at 15%, while North Dakota's 0.1% increase was the lowest in the country. Within the set of states that saw lower levels of high broadband adoption, the smallest decline occurred in Louisiana, at 0.2%, while the most significant loss was in Hawaii, at 30%.

Comparing high broadband adoption levels across the whole country to the fourth quarter of 2010, we find a positive growth trend in 48 states and the District of Columbia. Both Mississippi and Iowa grew more than 70% year-over-year, while 42 more states grew in excess of 10%. The lowest level of yearly growth was seen in Arkansas, at 3.7%. Only Maine and Hawaii declined year-over-year, and the observed losses were unusually high, at 23% and 32% respectively.

	City	Q4 '11 Peak Mbps
1	North Bergen, NJ	40.7
2	Monterey Park, CA	36.3
3	Cambridge, MA	35.1
4	Staten Island, NY	34.0
5	Fairfield, CA	33.8
6	Ogden, UT	33.2
7	Fayetteville, NC	33.0
8	Jersey City, NJ	32.8
9	Arvada, CO	32.8
10	Aurora, CO	32.8

Figure 18: Average Peak Connection Speed, Top United States Cities by Speed

4.6 United States Broadband Connectivity

Delaware remained the state with the highest level of broadband adoption, holding steady at 98%, as shown in Figure 20. Among the top 10 states, only three (Vermont, Maine, and New Jersey) saw quarterly increases, and these increases were very minor. The other seven states in the group saw broadband adoption levels decline quarter-over-quarter; on the upside, the declines were also very minor. Quarterly changes across the whole country were also fairly minor in the fourth quarter— Alaska's 2.2% increase was the largest gain, while Arkansas' 3.2% loss was the largest decline. Nine states and the District of Columbia posted short term gains, while 38 states posted short-term losses, and three states (New Mexico, Minnesota, and Maryland) remained unchanged quarter-over-quarter.

Looking at year-over-year changes, all of the states among the top 10 saw broadband adoption levels increase as compared to the fourth quarter of 2010, with growth ranging from 0.5% increases in perennial leaders Delaware and Rhode Island to a

	State	% Above 5 Mbps	QoQ Change	YoY Change
1	Delaware	80%	-1.0%	19%
2	New Hampshire	72%	0.9%	33%
3	Rhode Island	69%	-4.7%	11%
4	New Jersey	63%	3.3%	34%
5	Vermont	62%	1.1%	49%
6	Massachusetts	58%	1.5%	23%
7	Maryland	58%	0.6%	28%
8	District Of Columbia	56%	2.5%	8.0%
9	Connecticut	54%	-1.1%	34%
10	New York	52%	-5.0%	21%

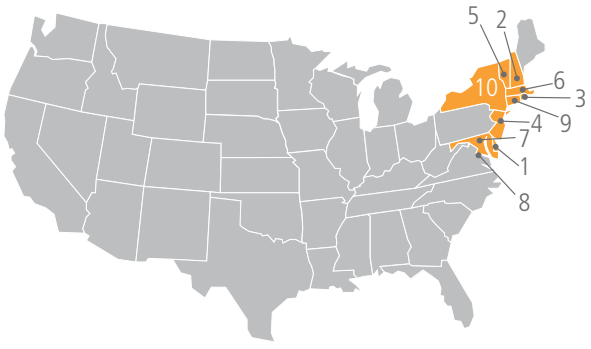


Figure 19: High Broadband Connectivity, Fastest U.S. States

9.3% jump in Vermont. Across the whole country, North Dakota remained unchanged year-over-year, while the remaining states all saw long-term increases in the percentage of connections to Akamai at speeds over 2 Mbps. Iowa's 39% increase was the largest increase seen in the fourth quarter.

The top four states all had more than 90% of their connections to Akamai at speeds above 2 Mbps; Connecticut's quarterly loss dropped it just below that threshold this quarter. The remainder of the states all had broadband adoption levels of 60% or more in the fourth quarter.

In spite of short-term declines, it is likely that broadband adoption levels around the United States will continue to improve in the future, as greater investments are made in bringing high-speed Internet access to rural areas. In October 2011, the United States Federal Communications Commission (FCC) voted unanimously to shift roughly $4.5 billion spent annually to subsidize rural telephone service over to providing broadband in rural and costly-to-serve areas.[22] Regulators noted that broadband build out to unserved areas could begin in early 2012 under the plan, helping bring high-speed Internet to the 18 million Americans who have no access to broadband where they live and work.

	State	% Above 2 Mbps	QoQ Change	YoY Change
1	Delaware	98%	-0.4%	0.5%
2	New Hampshire	93%	-0.1%	1.7%
3	Rhode Island	93%	-0.8%	0.5%
4	Hawaii	92%	-1.2%	3.4%
5	Connecticut	89%	-1.6%	4.7%
6	Vermont	88%	1.1%	9.3%
7	Maine	87%	0.6%	4.4%
8	Nevada	86%	-0.9%	2.4%
9	New Jersey	86%	0.6%	6.3%
10	Florida	85%	-0.2%	6.3%

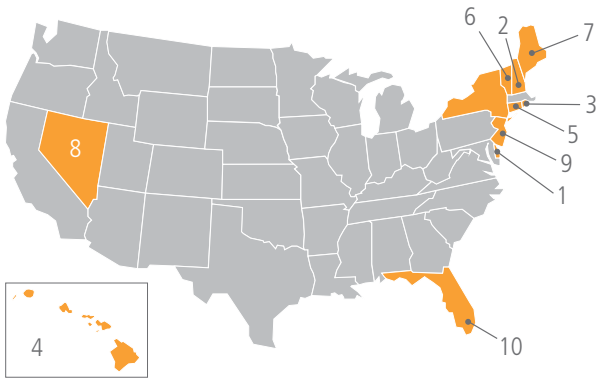


Figure 20: Broadband Connectivity, Fast U.S. States

DID YOU KNOW?

- *According to Calix, a global provider of broadband communications access systems and software, for the fourth quarter of 2011, service providers that delivered broadband services exclusively over fiber saw their subscriber endpoints generate over 2.67 times as much downstream traffic as their copper-based peers, and fiber access subscribers generated over 1.8times more upstream traffic than copper-based subscribers.*
  [Source: http://www.calix.com/compass/flow_analyzer/calix_us_rural_broadband_report_download.html]

- *A United States Commerce Department report on U.S. broadband adoption found that only 43 percent of households with annual incomes below $25,000 had broadband access at home, while 93 percent of households with incomes exceeding $100,000 had broadband.*
  [Source: http://www.reuters.com/article/2011/11/09/usa-broadband-adoption-idUSN1E7A81MZ20111109]

4.7 United States Narrowband Connectivity

Figure 21 shows that all of the states in the top 10 saw modest quarterly declines in the percentage of connections to Akamai at speeds below 256 kbps during the fourth quarter. While changes in high broadband (>5 Mbps) and broadband (>2 Mbps) adoption were mixed during the quarter, this shows that among the top states, there is a clear trend away from extremely low-speed connections. This is largely the case across the whole country as well, as only three states (North and South Carolina and Delaware) saw increased levels of narrowband adoption in the fourth quarter. Changes among declining states ranged from a loss of just 0.1% in New Jersey to Idaho and Wyoming declining more than 25%. (Although Delaware had only 190 unique IP addresses connecting to Akamai at these speeds in the fourth quarter, and narrowband adoption of just 0.1%, so changes in just two or three IP addresses can drive a measurable decline, whereas in other states, such a small shift would not register.) Including Delaware, 25 states around the country ended 2011 with narrowband adoption levels of 1% or less.

The long-term trend across the whole country also clearly supports a continuing move to higher speed connections, with Virginia remaining the only state experiencing a year-over-year increase. (As noted previously, however, this change may be due to shifts in underlying IP address geolocation data.) Otherwise, year-over-year declines remained extremely strong in the fourth quarter, ranging from a loss of 15% in West Virginia (to 1.8% narrowband adoption) to a massive 73% decline in Nebraska (to 0.7% narrowband adoption).

As noted in Section 4.6, increased investment in bringing broadband connectivity to rural and underserved areas within the United States should continue to drive down the number of unique IP addresses connecting to Akamai at speeds under 256 kbps, as well as overall levels of narrowband adoption over the long-term.

	State	% below 256 kbps	QoQ Change	YoY Change
1	District Of Columbia	4.4%	-5.3%	-24%
2	Missouri	4.1%	-3.7%	-26%
3	Georgia	2.9%	-3.4%	-32%
4	Alaska	2.8%	-9.1%	-45%
5	Illinois	2.8%	-4.1%	-25%
6	Iowa	2.5%	-6.0%	-47%
7	Colorado	2.4%	-4.1%	-32%
8	Ohio	2.3%	-3.7%	-37%
9	Texas	2.3%	-2.2%	-32%
10	Washington	2.2%	-7.3%	-34%

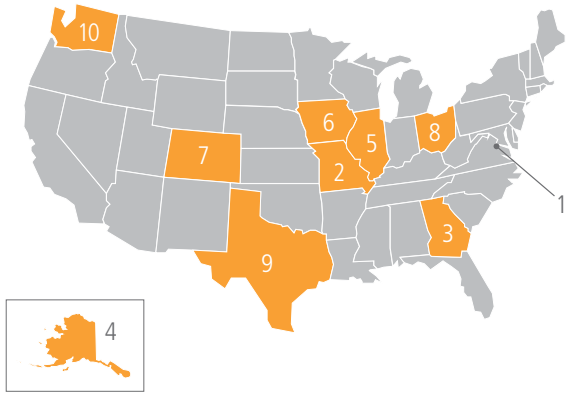


Figure 21: Narrowband Connectivity, Slowest U.S. States

Geography – Asia Pacific Region

The metrics presented here for the Asia Pacific region are based on a subset of data used for Section 3 and are subject to the same thresholds and filters discussed within that section. (The subset used for this section includes connections identified as coming from networks in the Asia Pacific region, based on classification by Akamai's EdgeScape geolocation tool.)

5.1 Asia Pacific Average Connection Speeds

In the fourth quarter of 2011, the top three countries in the Asia Pacific region remained South Korea, Japan, and Hong Kong, as shown in Figure 22. South Korea remained a distant first, with an average connection speed of 17.5 Mbps leading both Japan and Hong Kong by over 8 Mbps. As we saw globally, and in the other regions, quarterly changes were mixed, and also (generally) somewhat modest in comparison to prior quarters. Five Asia Pacific countries/regions increased average connection speeds quarter over quarter, led by an unusually high 37% increase in Australia. Conversely, seven countries/regions posted declines in average connection speeds, with both Hong Kong and Thailand losing more than 10% quarter-over-quarter. After impressive third quarter growth, China saw lower growth in the fourth quarter as well, remaining at 1.5 Mbps. However, India gave back some of the gains seen in the third quarter, losing 6.0%, and finished 2011 with an average connection speed of 0.9 Mbps.

Similar to the long-term trends seen globally, and in the other regions, year-over-year changes among Asia Pacific countries/regions was generally positive in the fourth quarter. Strong yearly growth, in excess of 10%, was seen in eight countries/regions, ranging from a 66% increase in Australia to 10% growth in Japan. Year-over-year changes in New Zealand and the Philippines were not quite as strong, though average connection speeds increased 7.4% (to 3.7 Mbps) and 8.6% (to 1.1 Mbps) respectively. Hong Kong and Taiwan were the only two surveyed Asia Pacific countries that got slower year-over-year, with Taiwan dropping 22%. It is not clear what drove the large decrease observed in Taiwan.

The fourth quarter of 2011 once again saw three Asia Pacific countries/regions with average connection speeds that exceeded the "high broadband" (5 Mbps) threshold, and an additional five once again had average connection speeds that exceeded the "broadband" (2 Mbps) threshold. As previously noted, India remained the only surveyed country within the region that has an average connection speed below 1 Mbps.

Global Rank	Country/Region	Q4 '11 Avg. Mbps	QoQ Change	YoY Change
1	South Korea	17.5	4.7%	28%
2	Japan	9.1	2.3%	10%
3	Hong Kong	9.1	-14%	-2.6%
24	Australia	4.9	37%	66%
29	Singapore	4.6	3.3%	49%
43	Taiwan	3.7	-8.8%	-22%
44	New Zealand	3.7	-7.2%	7.4%
50	Thailand	3.1	-11%	13%
73	Malaysia	1.8	-4.3%	37%
86	China	1.5	5.1%	53%
103	Philippines	1.1	-4.9%	8.6%
114	India	0.9	-6.0%	13%

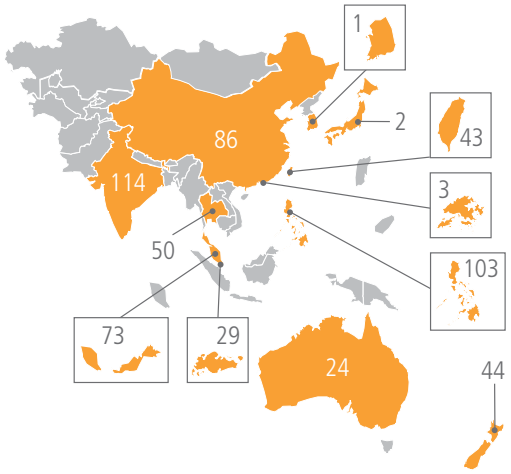


Figure 22: Average Measured Connection Speed by Asia Pacific Country/Region

5.2 Asia Pacific Average Connection Speeds, City View

As with the Global Average Connection Speeds, City View presented in Section 3.2, connections from known mobile and academic networks were removed from the underlying data for this metric, and the 50,000 unique IP address filter was used as well.

In reviewing the top 10 cities in the Asia Pacific region with the highest average connection speeds, as shown in Figure 23, we see that cities in South Korea remained at the top of the list, holding the top six slots. These cities all saw nominal (<1 Mbps) growth in average connection speeds quarter-over-quarter. Japanese cities Shimotsuma, Tokai, and Kanagawa all saw nominal quarterly declines in average connection speed, while Yokohama supplanted Urawa at the bottom of the top 10 list.

From a global perspective, the majority of the fastest cities in the world were in the Asia Pacific region, with the top 100 list including Hong Kong, one in Australia, six in South Korea, and 61 in Japan.

	Country/Region	City	Q4 '11 Avg. Mbps
1	South Korea	Taegu	21.8
2	South Korea	Taejon	20.7
3	South Korea	Kimchon	18.5
4	South Korea	Anyang	18.3
5	South Korea	Seoul	17.8
6	South Korea	Suwon	14.8
7	Japan	Shimotsuma	14.4
8	Japan	Tokai	14.1
9	Japan	Kanagawa	13.3
10	Japan	Yokohama	12.8

Figure 23: Average Measured Connection Speed, Top Asia Pacific Cities by Speed

5.3 Asia Pacific Average Peak Connection Speeds

After quarterly gains of more than 10% seen in a number of Asia Pacific countries/regions in the third quarter, growth rates settled back down in the fourth quarter of 2011, with only Australia seeing an increase of more than 10%, in line with its large jump in average connection speed. Figure 24 shows that eight of the surveyed Asia Pacific countries/regions, including Australia, experienced positive short-term changes, though growth rates certainly slowed as compared to the prior quarter. Separated by less than 1 Mbps in the third quarter, South Korea pulled further ahead of second place Hong Kong, leading it by 2 Mbps, though the gap between South Korea and Japan narrowed from nearly 16 Mbps to just over 14 Mbps. Beyond that, just over 10 Mbps separates Japan and Singapore, with smaller gaps separating the remainder of the surveyed countries/regions from one another. Of the four countries/regions that saw average peak connection speeds decline, the losses were rather minimal and not of significant concern.

In looking at year-over-year changes in average peak connection speeds, a similar trend reveals itself here as well, with long-term growth solidly in place, allaying any potential concerns about short term losses. Average peak connection speeds grew by more than 10% from the end of 2010 in all but one country. Japan recorded the lowest level of yearly growth in the fourth quarter, though its 9.7% gain is certainly strong, and is larger than the year-over-year growth seen in the third quarter. Australia and Malaysia both saw the largest gains, percentage-wise, at 42%, with South Korea, Singapore, and China all growing in excess of 30% year-over-year.

Global Rank	Country/Region	Q4 '11 Peak Mbps	QoQ Change	YoY Change
1	South Korea	47.9	2.2%	33%
2	Hong Kong	45.9	-0.2%	17%
4	Japan	33.8	2.4%	9.7%
12	Singapore	23.7	8.2%	35%
17	Taiwan	22.4	-0.1%	14%
20	Australia	21.7	25%	42%
38	Thailand	17.5	-2.9%	25%
44	New Zealand	16.1	-3.8%	12%
52	Malaysia	13.8	7.5%	42%
83	Philippines	9.1	8.5%	22%
114	India	5.9	1.8%	13%
118	China	5.7	2.5%	35%

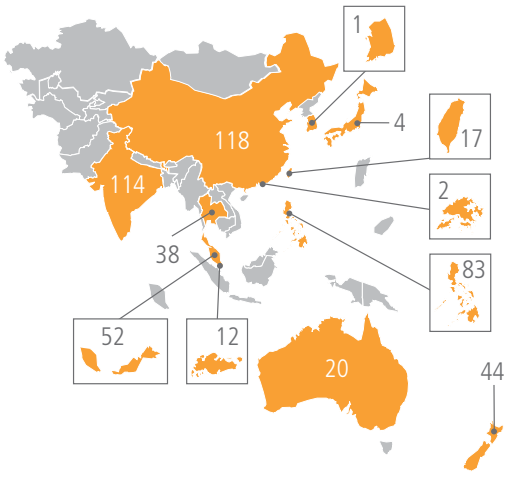


Figure 24: Average Peak Connection Speed by Asia Pacific Country/Region

5.4 Asia Pacific Average Peak Connection Speeds, City View

The list of the top 10 Asia Pacific cities with the highest average peak connection speeds, as shown in Figure 25, has the reverse distribution of the average connection speed list. Here, Japan holds six spots among the top 10, and South Korea holds the remaining four, including Taejon and Taegu in the top two places. Only five cities on the list recorded average peak connection speeds above 50 Mbps in the fourth quarter, down from eight in the third quarter. Among the top 10 cities, Taejon grew slightly from the third quarter, as did Seoul, which replaced Nagano, Japan in the 10th place spot. The remaining cities in the list all saw average peak connection speeds decline as compared to the third quarter.

	Country/Region	City	Q4 '11 Avg. Mbps
1	South Korea	Taejon	59.2
2	South Korea	Taegu	56.7
3	Japan	Shimotsuma	54.1
4	Japan	Kanagawa	51.3
5	Japan	Marunouchi	50.7
6	Japan	Tokai	49.8
7	Japan	Yokohama	49.3
8	South Korea	Anyang	48.8
9	Japan	Urawa	48.7
10	South Korea	Seoul	48.5

Figure 25: Average Peak Connection Speed, Top Asia Pacific Cities by Speed

5.5 Asia Pacific High Broadband Connectivity

In the fourth quarter of 2011, only five of the surveyed Asia Pacific countries/regions saw quarter-over-quarter growth in the percentage of connections to Akamai at speeds over 5 Mbps. As shown in Figure 26, China's 45% quarterly increase was the largest of the bunch, and followed a 78% gain in the prior quarter. Growth in the remaining four countries/regions was all below 6%. In contrast to the significant quarterly growth seen in the average and average peak connection speed metrics, Australia managed only a 1.5% quarter-over-quarter change in its high broadband adoption level. The quarterly losses in high broadband adoption levels seen across the Asia Pacific countries/regions in the fourth quarter were unusually high, for reasons that are not entirely clear. The 5.1% decline seen in Hong Kong was the smallest of the group, while the 40% drop in Thailand was the largest.

The year-over-year changes were generally more positive, with yearly growth ranging from just 2.5% in Hong Kong (to 57% high broadband adoption) to 103% in Malaysia (to 3.8% adoption) and a solidly reassuring 380% in China (although to just 1.5% adoption). With solid quarterly and yearly growth throughout 2011, it is clear that connectivity is improving throughout China. India was one of three surveyed countries/regions that saw less than 10% yearly growth, though at 0.5% high broadband adoption, it ends 2011 nearly 10% higher than at the end of 2010, though still well under 1%.

5.6 Asia Pacific Broadband Connectivity

There continues to be a massive range of broadband adoption levels across surveyed Asia Pacific countries/regions. As shown in Figure 27, there is nearly 90% separating South Korea, with 96% of connections to Akamai at speeds over 2 Mbps, and the

Global Rank	Country/Region	% Above 5 Mbps	QoQ Change	YoY Change
1	South Korea	83%	5.2%	63%
3	Japan	60%	5.9%	3.6%
4	Hong Kong	57%	-5.1%	2.5%
21	Singapore	32%	3.8%	83%
31	Taiwan	23%	-19%	-21%
37	Australia	19%	1.5%	49%
38	New Zealand	18%	-20%	41%
45	Thailand	6.7%	-40%	70%
48	Malaysia	3.8%	-18%	103%
57	China	1.5%	45%	380%
60	India	0.5%	-26%	9.4%
–	Philippines	0.5%	-19%	21%

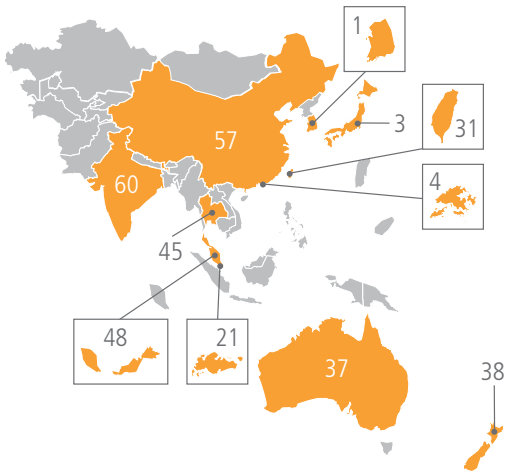


Figure 26: High Broadband Connectivity, Fastest Asia Pacific Countries/Regions

Philippines, with just 7.1%. Having said that, broadband adoption levels remain fairly strong in the Asia Pacific region, with eight of the twelve surveyed countries/regions having adoption rates above 50% in the fourth quarter. Both Malaysia and China have broadband adoption of 20% or more, while India and the Philippines were the only two below 10%. (India achieved 10% broadband adoption in the third quarter, but an 18% quarterly decline dropped it back to 8.4% in the fourth quarter.)

As with many other metrics reviewed within this quarter's report, quarterly changes in broadband adoption levels were mixed across the Asia Pacific region in the fourth quarter. Seven countries/regions saw positive quarter-over-quarter changes, the largest of which was in China, which grew 12% (to 20% broadband adoption). Five countries/regions saw broadband adoption levels decline quarter-over-quarter. The losses in Hong Kong, Taiwan, and Thailand were fairly limited, but the double-digit percentage losses in India and the Philippines are of greater concern, as they have the lowest broadband adoption rates among the surveyed countries/regions.

Year-over-year changes in the Asia Pacific region were also mixed, as just eight of the surveyed countries/regions saw yearly growth in the percentage of connections to Akamai at speeds over 2 Mbps. Increases ranged from just 3.8% in Japan (to 83% broadband adoption) to more than 100% in Malaysia and China, which echoes the massive growth in high broad-

DID YOU KNOW?

- *The extensive rollout of sophisticated telecommunications infrastructure has allowed Hong Kong to move quickly in providing 85% of all households with access to high-speed broadband connectivity.*
  [Source: http://www.budde.com.au/Research/Hong-Kong-Broadband-Overview-Statistics-and-Forecasts.html]
- *More than 65% of homes in Taiwan have fixed-line broadband connections, and the proportion of the country's population who are Internet users has exceeded 70%.*
  [Source: http://www.budde.com.au/Research/Taiwan-Broadband-Market-Overview-Statistics-and-Forecasts.html]

Global Rank	Country/Region	% Above 2 Mbps	QoQ Change	YoY Change
2	South Korea	96%	2.4%	10%
9	Hong Kong	92%	-0.9%	-1.1%
30	Japan	83%	6.3%	3.8%
45	New Zealand	74%	2.6%	-3.4%
50	Taiwan	71%	-3.7%	-10%
51	Thailand	70%	-4.3%	30%
53	Singapore	67%	5.7%	23%
57	Australia	59%	8.4%	15%
72	Malaysia	22%	4.7%	128%
78	China	20%	12%	152%
88	India	8.4%	-18%	85%
89	Philippines	7.1%	-23%	-9.1%

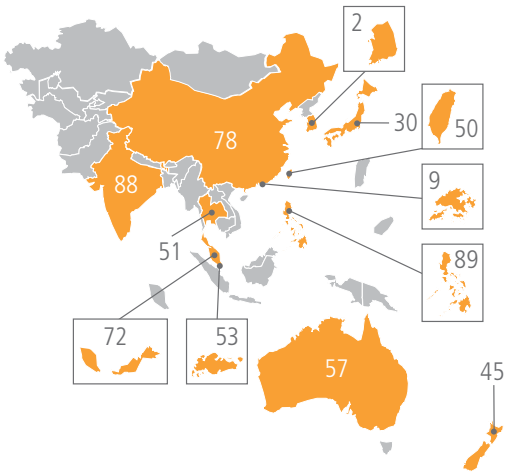


Figure 27: Broadband Connectivity, Fast Asia Pacific Countries/Regions

band adoption seen in these countries in the fourth quarter as well. Of the countries/regions that saw year-over-year declines, losses were fairly limited in Hong Kong (down 1.1%) and New Zealand (down 3.4%), though Taiwan and the Philippines saw losses in the 10% range. New Zealand and Taiwan had also seen slight year-over-year declines in the third quarter, but the Philippines had seen a strong 32% yearly increase in broadband adoption.

5.7 Asia Pacific Narrowband Connectivity

In reviewing Figure 28, we see that once again, with the exception of India, narrowband adoption among surveyed countries/regions in the Asia Pacific region continued to be below 10%. However, continued quarterly and yearly declines in narrowband adoption within India represent encouraging short- and long-term trends, though it will obviously be quite some time before the country's narrowband adoption levels are more closely aligned with the rest of the surveyed Asia Pacific countries/regions. In contrast, South Korea's narrowband adoption rate dropped to just 0.2% in the fourth quarter, with just over 38,000 unique IP addresses connecting to Akamai at speeds below 256 kbps (down from just over 61,000 in the prior quarter).

Among the countries/regions that qualified for inclusion, five (including India) saw quarterly declines in narrowband adoption levels in the fourth quarter, including losses of more than 10% in the Philippines and South Korea. Three qualifying countries saw narrowband adoption levels grow quarter-over-quarter—China gave back some of the large decline it saw in the third quarter, while connectivity in Thailand likely continued to suffer as the result of massive and widespread flooding that occurred in the country in the third quarter. Japan also grew 3.8%, though overall narrowband adoption in the country remains around 1%, so this increase is not of significant concern.

Long-term trends across the region were significantly more encouraging, with strong yearly declines seen in the percentage of connections to Akamai at speeds below 256 kbps in all of the Asia Pacific countries/regions. Among qualifying countries/regions, China, the Philippines, and Australia all saw narro band adoption decline around 60% year-over-year, while New Zealand, Japan, and South Korea all lost 30% or more year-over-year.

(Note that Malaysia, Singapore, Taiwan, and Hong Kong continue to be included in the list for the sake of completeness, though remain unranked as these countries/regions did not have the requisite 25,000 unique IP addresses for this metric to qualify for inclusion.)

Global Rank	Country/Region	% Below 256 kbps	QoQ Change	YoY Change
5	India	27%	-5.6%	-22%
18	Thailand	3.9%	47%	-9.7%
20	China	3.8%	14%	-61%
22	New Zealand	3.2%	-3.5%	-37%
25	Philippines	2.3%	-14%	-61%
26	Australia	1.6%	-7.2%	-59%
29	Japan	1.0%	3.8%	-30%
39	South Korea	0.2%	-34%	-37%
-	Malaysia	1.5%	-14%	-69%
-	Singapore	0.4%	60%	-97%
-	Taiwan	0.3%	28%	-49%
-	Hong Kong	0.2%	4.9%	-42%

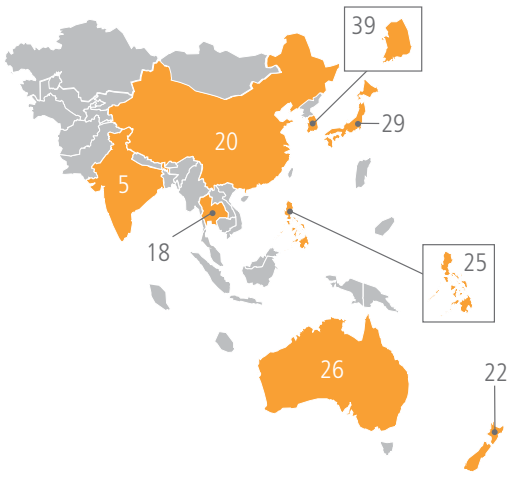


Figure 28: Narrowband Connectivity, Slowest Asia Pacific Countries/Regions

SECTION 6:

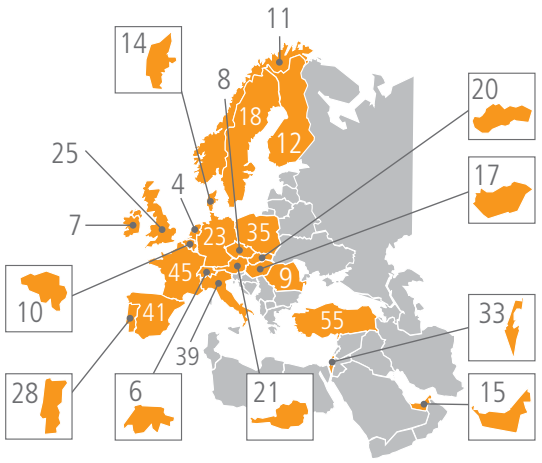
Geography – Europe

The metrics presented here for Europe are based on a subset of data used for Section 3 and are subject to the same thresholds and filters discussed within that section. (The subset used for this section includes connections identified as coming from networks in Europe, based on classification by Akamai's EdgeScape geolocation tool.) In addition, for the purposes of this report, we are including the United Arab Emirates and Israel among the selected countries within Europe. (Going forward, we may reclassify this section as "EMEA", expanding its scope from continental Europe.)

6.1 Europe Average Connection Speeds

The Netherlands closed out 2011 as the European country with the highest average connection speed, once again holding the top spot with an average speed of 8.2 Mbps. As Figure 29 shows, the fourth quarter was not a good one for average connection speeds across Europe, as only two of the surveyed countries/regions saw higher speeds than in the prior quarter — quarterly losses were obviously more widespread across Europe than the Asia Pacific region or the United States. Finland's average connection speed grew by 4.6% to 5.9 Mbps, while Sweden added 3.7% quarter-over-quarter, growing to 5.5 Mbps. Of the 21 countries/regions that experienced quarter-over-quarter declines, the most significant was seen in Israel, which lost 13%, dropping to an average connection speed of 4.2 Mbps. Quarterly losses across most of the other countries/regions were relatively nominal, with all other losses remaining below 10%. Reviewing the short-term trends observed in prior quarters, the fourth quarter seems to be the most negative — quarterly changes observed in the third quarter were mixed, while average connection speeds mostly increased in the second quarter. We will continue to observe quarterly changes to average connection speeds in Europe to see if this trend of declining speeds becomes a long-term issue, or if it is simply a shorter-term anomaly.

While most of the surveyed European countries/regions saw quarterly declines in average connection speeds, the yearly changes were significantly more positive, with 19 of the 21 surveyed countries/regions ending 2011 with higher average connection speeds than at the end of 2010. Only Romania saw a year-over-year decline in the fourth quarter, ending the year down 8.5% at 6.4 Mbps; Portugal was unchanged year-over-year. Strong growth in excess of 10% was seen in 18 countries/regions, led by Turkey's 45% year-over-year change, though it still had the lowest average connection speed among surveyed countries/regions, at 2.7 Mbps. Just three grew less than 10%



Global Rank	Country/Region	Q4 '11 Avg. Mbps	QoQ Change	YoY Change
4	Netherlands	8.2	-3.2%	18%
6	Switzerland	7.3	-2.9%	29%
7	Ireland	6.8	-3.6%	39%
8	Czech Republic	6.7	-7.3%	18%
9	Romania	6.4	-3.4%	-8.5%
10	Belgium	6.1	-1.6%	10%
11	Norway	5.9	-4.7%	14%
12	Finland	5.9	4.6%	22%
14	Denmark	5.7	-9.0%	7.4%
15	United Arab Emirates	5.7	-5.4%	36%
17	Hungary	5.6	-5.3%	20%
18	Sweden	5.5	3.7%	9.4%
20	Slovakia	5.2	-5.9%	20%
21	Austria	5.2	-2.9%	28%
23	Germany	5.0	-4.4%	15%
25	United Kingdom	4.9	-3.5%	14%
28	Portugal	4.8	-7.0%	–
33	Israel	4.2	-13%	17%
35	Poland	4.1	-3.8%	27%
39	Italy	3.9	-3.8%	12%
41	Spain	3.8	-5.3%	27%
45	France	3.7	-3.8%	5.1%
55	Turkey	2.7	-7.6%	45%

Figure 29: Average Measured Connection Speed by European Country/Region

year-over-year: Denmark (up 7.4%, to 5.7 Mbps), Sweden (up 9.4%, to 5.5 Mbps), and France (up 5.1%, to 3.7 Mbps).

In the fourth quarter, 15 of the listed countries/regions had average connection speeds that exceeded the "high broadband" (5 Mbps) threshold, while the remaining eight had average connection speeds that exceeded the "broadband" (2 Mbps) threshold.

As with the trends observed across this and other metrics, both globally and in the other regions, we should be most concerned with the direction of the trends over the long term. By and large, these long-term trends are heading in the right direction, pointing to ongoing growth in connection speeds and adoption rates over time. It is not clear what drove the widespread declines in average connection speeds during the fourth quarter, but a survey released in November 2011 found that broadband ISP download speeds in the United Kingdom fell by an average of 35% during periods of peak usage (between 7–9 PM), when most people go online; peak speeds were observed between 2–3 AM.[23] While this is not necessarily "new news", it may be the case that greater congestion at the last mile due to heavier usage occurred in the fourth quarter, driving down observed average connection speeds.

6.2 Europe Average Connection Speeds, City View

As with the Global Average Connection Speeds, City View presented in Section 3.2, connections from known academic and mobile networks were removed from the underlying data set for this metric, and the 50,000 unique IP address feature was used as well.

In reviewing the top 10 cities in Europe with the highest average connection speeds, shown in Figure 30, we see that Amsterdam tops the list at 9.5 Mbps, improving by 1.4 Mbps from the second quarter. No other city had an average connection speed above 9 Mbps, with Riga the closest at 8.7 Mbps. Former top city Brno saw a speed decline of 0.4 Mbps, dropping it to sixth place, and placing it among seven cities that saw average connection speeds between 7-8 Mbps. The list of the 10 fastest cities in Europe included a number of new ones that did not appear in the second quarter, including Dublin, Kyyiv, Ceska, and Valencia – these cities saw big enough increases in average connection speeds to push Constanta, Liege, Salzburg, and Porto off the list.

DID YOU KNOW?

- *According to figures released at the Broadband World Forum in October 2011, Lithuania and Norway are the most "fibred up" countries and that both Hungary and the Ukraine are joining the world's leading 'fibre to the home' (FTTH) economies, with a sudden burst of deployment activity.*
  [Source: http://www.theregister.co.uk/2011/10/03/broadband_world_forum/]

- *In November 2011, The European Commission noted that around 95 percent of citizens are now covered by broadband access, although only about 80 per cent of rural areas have access. The European Commission aims to achieve universal coverage by 2013.*
  [Source: http://www.v3.co.uk/v3-uk/news/2125034/european-commission-claims-cent-citizens-broadband-access]

	Country/Region	City	Q4 '11 Avg. Mbps
1	Sweden	Umea	11.3
2	Sweden	Goteborg	8.5
3	Switzerland	Geneva	8.2
4	Switzerland	Zurich	7.8
5	Latvia	Riga	7.6
6	Romania	Timisoara	7.4
7	Sweden	Boras	7.3
8	Czech Republic	Brno	6.9
9	Austria	Salzburg	6.6
10	Ukraine	Kyyiv	6.6

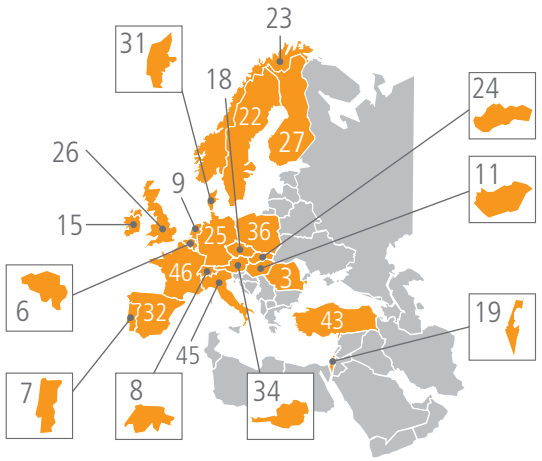
Figure 30: Average Measured Connection Speed, Top European Cities by Speed

6.3 Europe Average Peak Connection Speeds

As shown in Figure 31, the average peak connection speed across all of the surveyed European countries/regions remained above 15 Mbps in the fourth quarter of 2011, and Romania continued to have the highest average peak connection speed, growing nearly 2% to end the year at 35.2 Mbps. Romania also remained the only country in the region with an average peak connection speed in excess of 30 Mbps. (As noted last quarter, the United Arab Emirates is again not included in Figure 31, due to anomalies in the data likely related to changes in network architecture.) Once again, the largest clustering was seen in the 20–30 Mbps range, with 14 countries/regions falling within that range.

Quarterly changes were split, with 11 countries/regions seeing average peak connection speeds increase quarter-over-quarter, and 11 seeing declines. (While not overwhelmingly positive, it is at least better than what was seen with the average connection speed metric.) Quarterly increases were fairly muted, however, with a 4.7% increase in Poland the largest of the set. The quarterly declines were also fairly muted, ranging from 0.7% losses seen in several countries/regions to a 7.6% loss in Denmark.

In contrast, year-over-year changes were very strong, ranging from 8.8% in Portugal (the only country with yearly growth of less than 10%) to a 40% increase in Turkey. These positive long-term trends are encouraging, and continue to point to improving high-speed Internet connectivity within these surveyed European countries.



Global Rank	Country/Region	Q4 '11 Peak Mbps	QoQ Change	YoY Change
3	Romania	35.2	1.9%	10%
6	Belgium	26.7	-0.7%	14%
7	Portugal	25.2	0.9%	8.8%
8	Switzerland	25.1	0.7%	24%
9	Netherlands	25.0	-2.1%	18%
11	Hungary	24.1	-2.3%	23%
15	Ireland	23.3	-0.7%	30%
18	Czech Republic	22.4	0.5%	20%
19	Israel	21.9	-2.1%	37%
22	Sweden	21.5	3.3%	12%
23	Norway	21.3	-3.9%	20%
24	Slovakia	20.8	2.5%	15%
25	Germany	20.6	0.1%	19%
26	United Kingdom	20.4	2.2%	21%
27	Finland	20.2	1.8%	23%
31	Denmark	18.7	-7.6%	13%
32	Spain	18.7	-0.7%	25%
34	Austria	18.2	-0.9%	21%
36	Poland	17.6	4.7%	32%
43	Turkey	16.2	0.4%	40%
45	Italy	16.0	-1.2%	13%
46	France	15.5	-1.7%	11%

Figure 31: Average Peak Connection Speed by European Country/Region

DID YOU **KNOW?**

- *The Danish government established a broadband goal of all homes and enterprises having access to a broadband connection of at least 100 Mbps by 2020, while Estonia targets at least 100 Mbps availability for the whole population by 2015.*

[Source: http://erg.eu.int/doc/berec/bor11_70_broadbandpromo.pdf]

6.4 Europe Average Peak Connection Speeds, City View

Timisoara, Romania stayed at the head of the list of the top 10 European cities with the highest average peak connection speeds in the third quarter, adding nearly 2.5 Mbps, and remaining the only European city with an average peak connection speed over 40 Mbps. While there was nearly 10 Mbps separating the top two cities in the third quarter, the gap was significantly smaller this quarter, narrowing to just over 4 Mbps. Movement among the top 10 cities was mixed—among the six cities that were consistent quarter-over-quarter, Timisoara, Bucharest, and Zurich saw higher average peak connection speeds in the fourth quarter, while the speeds in Riga, Brno, and Valencia were lower. Amsterdam, Boras, Oviedo, and Southampton gave up their spots in the top 10 list, supplanted by Iasi, Umea, Acton, and Geneva, as listed in Figure 32.

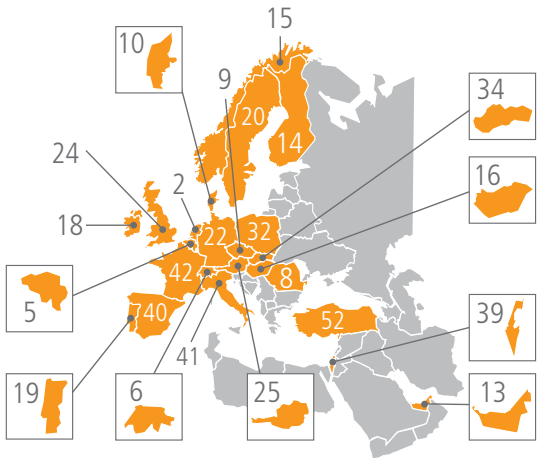
	Country/Region	City	Q4 '11 Peak Mbps
1	Romania	Timisoara	43.9
2	Romania	Iasi	39.6
3	Sweden	Umea	33.7
4	Romania	Bucharest	31.9
5	Switzerland	Zurich	29.2
6	Latvia	Riga	28.7
7	Czech Republic	Brno	28.6
8	Spain	Valencia	27.8
9	England	Acton	27.8
10	Switzerland	Geneva	26.8

Figure 32: Average Peak Connection Speed, Top European Cities by Speed

6.5 Europe High Broadband Connectivity

In the fourth quarter of 2011, just three countries/regions (the Netherlands, Belgium, and Switzerland) had more than half of their connections to Akamai at speeds of 5 Mbps or above—this is half as many as in the third quarter. As shown in Figure 33, Romania, the Czech Republic, and Denmark all experienced quarterly declines that dropped them below the 50% high broadband adoption threshold. Across Europe, these three were joined by 15 other countries/regions that all saw lower levels of high broadband adoption than in the third quarter. The largest percentage loss was seen in Turkey, which lost 21%, declining to a high broadband adoption level of just under 3%. Five other countries/regions also saw quarter-over-quarter declines of more than 10%. Finland saw the biggest increase (10% growth, to 40% high broadband adoption) across the five countries/regions that posted gains, while Switzerland and Italy both saw quarterly growth below 1%.

As with the other metrics across the report, year-over-year changes tell a far more positive story, with all but one country (Romania) seeing greater high broadband adoption at the end of 2011 than in the fourth quarter of 2010. Spain, Israel, and Turkey all saw high broadband adoption rates more than double year-over-year, while Switzerland, the United Arab Emirates, Ireland, and Poland all grew high broadband adoption rates by



Global Rank	Country/Region	% Above 5 Mbps	QoQ Change	YoY Change
2	Netherlands	67%	-1.3%	20%
5	Belgium	52%	-3.5%	11%
6	Switzerland	51%	0.4%	56%
8	Romania	49%	-2.3%	-5.5%
9	Czech Republic	47%	-6.4%	23%
10	Denmark	44%	-14%	11%
13	United Arab Emirates	43%	-8.3%	60%
14	Finland	40%	10%	34%
15	Norway	38%	-5.2%	21%
16	Hungary	37%	-8.3%	29%
18	Ireland	35%	-1.8%	58%
19	Portugal	34%	-15%	1.1%
20	Sweden	32%	4.2%	9.5%
22	Germany	30%	-8.5%	34%
24	United Kingdom	30%	-3.1%	37%
25	Austria	29%	-2.2%	36%
32	Poland	23%	-2.6%	62%
34	Slovakia	23%	1.2%	42%
39	Israel	17%	-18%	104%
40	Spain	15%	-15%	102%
41	Italy	14%	0.5%	33%
42	France	13%	-15%	4.4%
52	Turkey	2.9%	-21%	125%

Figure 33: High Broadband Connectivity, Fastest European Countries

more than half year-over-year. Portugal had the lowest rate of yearly growth (1.1%, to 34% adoption) and joined France and Sweden as the only three surveyed European countries/regions that had yearly growth rates below 10%.

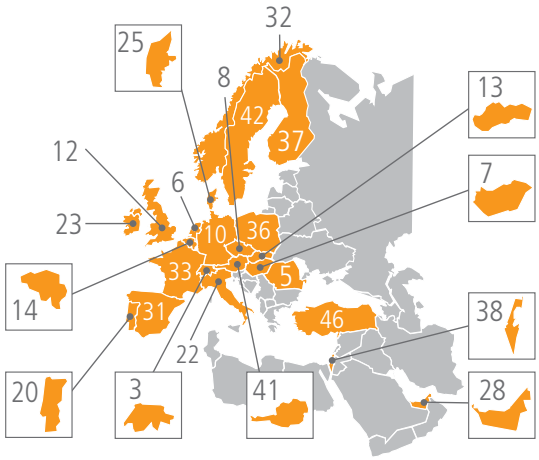
Yearly changes in high broadband adoption spanned a huge range, from the scant 0.2% increase in Romania to increases of greater than 100% in Turkey, Spain, Slovakia, Ireland, and the United Arab Emirates. In the second quarter, Switzerland had grown more than 100% year-over-year as well, but this quarter, growth slowed slightly, with the country seeing a yearly increase of "just" 98%.

6.6 Europe Broadband Connectivity

As illustrated in Figure 34, broadband adoption rates across Europe remained extremely strong at the close of 2011, with all but one country seeing 75% or more of connections to Akamai at speeds of 2 Mbps or above. The lone outlier was Turkey, which had a still very respectable broadband adoption level of 72%. Once again, nine countries had broadband adoption rates of 90% or more, consistent with the third quarter.

Quarterly changes in broadband adoption were similar to those seen for the high broadband metric, with just six of the 23 surveyed countries/regions seeing an increase in the fourth quarter. Of these six, the largest growth was seen in Sweden, growing 8.8% to 75% adoption. The United Kingdom had the lowest observed rate of growth, adding just 0.1% to end 2011 at 91% broadband adoption. Of the 17 countries/regions that experienced a quarter-over-quarter decline, eight of them lost less than 1%. Losses across the balance of countries/regions were nominal, with Israel's 5.8% decline (to 79% adoption) the largest.

Year-over-year, broadband adoption grew in all of the surveyed European countries/regions except for Denmark (down 2.0%) and Israel (down 3.4%). Turkey's 138% yearly increase placed it as the only country that saw adoption more than double year-over-year, while seven other countries had double-digit percentage increases. The smallest change was seen in Belgium, with a yearly increase of just 0.4%.



Global Rank	Country/Region	% Above 2 Mbps	QoQ Change	YoY Change
3	Switzerland	96%	-0.1%	3.9%
5	Romania	95%	-0.4%	2.8%
6	Netherlands	94%	-0.3%	4.8%
7	Hungary	94%	-0.3%	6.4%
8	Czech Republic	93%	-1.4%	2.2%
10	Germany	92%	-2.1%	4.3%
12	United Kingdom	91%	0.1%	4.7%
13	Slovakia	91%	-0.7%	4.1%
14	Belgium	90%	-0.8%	0.4%
20	Portugal	87%	1.7%	4.2%
22	Italy	87%	-2.4%	3.9%
23	Ireland	86%	1.3%	14%
25	Denmark	85%	-3.1%	-2.0%
28	United Arab Emirates	84%	6.2%	73%
31	Spain	83%	-1.8%	17%
32	Norway	83%	-1.8%	2.3%
33	France	81%	-0.3%	5.3%
36	Poland	80%	-1.7%	42%
37	Finland	80%	4.2%	24%
38	Israel	79%	-5.8%	-3.4%
41	Austria	77%	-0.6%	12%
42	Sweden	75%	8.8%	12%
46	Turkey	72%	-3.9%	138%

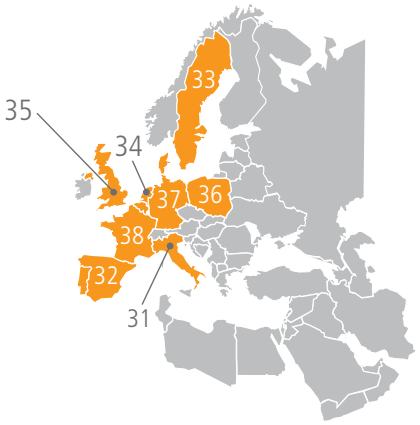
Figure 34: Broadband Connectivity, Fast European Countries

6.7 Europe Narrowband Connectivity

In reviewing Figure 35, it is clear that once again, nearly two-thirds of the surveyed countries in Europe did not qualify for inclusion in this metric because Akamai did not see the requisite 25,000 unique IP addresses making requests for content at speeds below 256 kbps. Given that several more of the remaining eight countries regions may leave the list for the same reason in the coming quarters, this will be the last quarter that the *State of the Internet* report will include an overview of broadband adoption levels in Europe. However, the data will still be available through the data visualization tools at *http://www.akamai.com/stateoftheinternet*.

Suffice it to say, narrowband adoption across the surveyed countries/regions in Europe is extremely low, remaining well below 1%. Seven of the eight qualifying countries saw narrowband adoption rates decrease in the fourth quarter, with only Spain seeing an increase, unexpectedly high at 16%. Year-over-year changes across qualifying countries also reflected a widespread decrease in narrowband adoption, with only Turkey seeing yearly growth, also unexpectedly high at 30%.

Among the countries/regions that did not qualify for inclusion, Slovakia again had the highest narrowband adoption rate, at 0.7%, while three countries again showed narrowband adoption of just 0.1%. Quarterly changes were mixed across this set, while all but one (Belgium) had lower levels of broadband adoption as compared to the fourth quarter of 2010.



	Country/Region	% Below 256 Kbps	QoQ Change	YoY Change
31	Italy	0.7%	-7.9%	-30%
32	Spain	0.6%	16%	-17%
33	Sweden	0.6%	-26%	-59%
34	Netherlands	0.5%	-4.3%	-13%
35	United Kingdom	0.5%	-11%	-34%
36	Turkey	0.4%	-0.2%	30%
37	Germany	0.4%	-9.3%	-51%
38	France	0.2%	-12%	-40%
–	Slovakia	0.7%	-35%	-48%
–	Ireland	0.7%	-16%	-70%
–	United Arab Emirates	0.6%	-29%	-92%
–	Denmark	0.5%	108%	-9.0%
–	Norway	0.4%	-28%	-48%
–	Switzerland	0.3%	-4.0%	-45%
–	Finland	0.3%	-19%	-55%
–	Belgium	0.3%	35%	0.3%
–	Austria	0.3%	0.4%	-40%
–	Poland	0.2%	-8.5%	-69%
–	Portugal	0.2%	7.2%	-37%
–	Czech Republic	0.2%	78%	-10%
–	Israel	0.1%	1.8%	-50%
–	Hungary	0.1%	-6.7%	-57%
–	Romania	0.1%	-15%	-56%

Figure 35: Narrowband Connectivity, Slowest European Countries

Building on the data presented in previous editions of the *State of the Internet* report, Akamai continues to attempt to identify additional mobile networks for inclusion in the report, as well as filtering out networks subsequently identified as having proxy/gateway configurations that could skew results. The source data in this section encompasses usage not only from smartphones, but also laptops, tablets, and other devices that connect to the Internet through these mobile networks. In addition, this edition of the *State of the Internet* report once again includes insight into mobile traffic growth and data traffic patterns contributed by Ericsson, a leading provider of telecommunications equipment and related services to mobile and fixed network operators globally. Akamai and Ericsson have partnered to develop the first ever end-to-end solution to address performance, scalability, and availability of mobile content and applications on a global scale.[24]

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 2011 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 address 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.

7.1 Attack Traffic from Mobile Networks, Top Originating Countries/Regions

In reviewing the data presented in Figure 36, we find that in the fourth quarter of 2011, Italy remained the country responsible for the highest level of observed attack traffic originating in known mobile networks. Italy's percentage dropped by nearly 25% quarter-over-quarter, while Chile's dropped by approximately 20%. The remaining countries in the top 10 all saw their percentages of observed attack traffic increase on a quarterly basis, with China's 77% increase the largest increase of the group.

The list of the top 10 countries/regions remained consistent with those seen in the third quarter. In addition, with 78% of observed attack traffic coming from the top 10 countries, it was slightly more concentrated than in the third quarter; the top three countries were responsible for just 42% of observed attack traffic, down from nearly half in the prior quarter.

	Country/Region	Q4 '11 % Traffic
1	Italy	24%
2	China	9.2%
3	Chile	8.7%
4	Australia	8.2%
5	United States	6.3%
6	Poland	6.2%
7	Ukraine	4.6%
8	Lithuania	4.4%
9	Malaysia	3.5%
10	Russia	3.4%
--	Other	22%

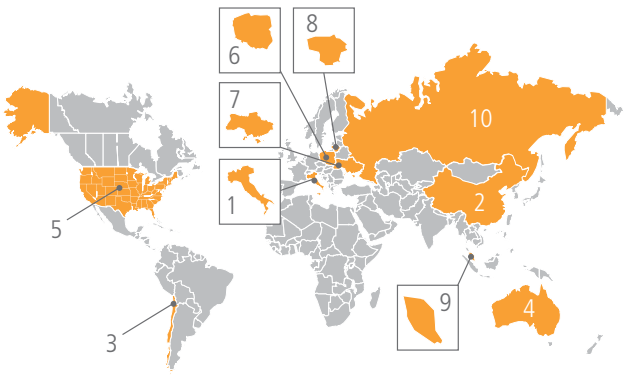


Figure 36: Attack Traffic from Mobile Networks, Top Originating Countries/Regions

7.2 Attack Traffic from Mobile Networks, Top Ports

In the fourth quarter of 2011, the list of top ports targeted by attack traffic from known mobile networks remained mostly consistent with the third quarter—Port 8080 (HTTP Alternate) replaced Port 4899 (Remote Administrator) among the top 10. As shown in Figure 37, Port 445 (Microsoft-DS) remained the target of an overwhelming majority of observed attacks as compared to other ports in the top 10, though it has been losing ground over the last several quarters – this is similar to the trend seen across the global attack traffic data in Section 1.2 as well. Other quarter-over-quarter declines were seen by Port 23 (Telnet), losing approximately 10%, and by Port 5900 (VNC Server), which lost approximately 25%. Overall attack concentration rose slightly in the fourth quarter, with over 97% of attacks targeting the top 10 ports—down slightly from the third quarter, but closer to the level seen in the second quarter of 2011.

As we have observed in prior reports, we believe that the observed attack traffic 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 connected devices.

7.3 Connection Speeds & Data Consumption on Mobile Networks

In the fourth quarter of 2011, German mobile provider DE-2 had the highest average connection speed, at 5.2 Mbps. In reviewing the full list of more than 100 mobile providers listed in Figure 38, we find that provider DE-2 was the only mobile provider with an average connection speed in the "high broadband" (>5 Mbps) range. An additional 27 mobile providers has average connection speeds in the "broadband" (>2 Mbps) range, while another 48 achieved average connection speeds above 1 Mbps in the fourth quarter. The mobile provider with the lowest average connection speeds was TH-1 in Thailand, at 163 kbps—up just slightly from the third quarter. As was noted last quarter, and in prior sections of this quarter's report, this may be related to the devastating flooding that took place within the country in the third quarter. As infrastructure within the country is rebuilt, the average connection speed will likely increase over time.

Examining the average peak connection speed data for the fourth quarter of 2011, we find that German mobile provider DE-2 topped this list as well, with an average peak connection speed of 23.4 Mbps. This is approximately 0.5 Mbps faster than second-place mobile provider AT-2, which held the same spot in the second quarter. Once again, DE-2, AT-2 and CA-1 all had average peak connection speeds above 20 Mbps. (Last quarter's fastest provider, ES-1, saw a decline in average peak connection speed of approximately 3.3 Mbps, dropping it below 20 Mbps.) Including ES-1, 32 additional mobile providers had average peak connection speeds above 10 Mbps, while average peak connection speeds above 5 Mbps were seen in 48 more mobile

Port	Port Use	Q4 '11 % Traffic
445	Microsoft-DS	75%
23	Telnet	5.1%
1433	Microsoft SQL Server	4.1%
135	Microsoft-RPC	4.0%
80	WWW (HTTP)	3.4%
3389	Microsoft Terminal Services	2.0%
22	SSH	1.1%
139	NetBIOS	1.1%
8080	HTTP Alternate	1.0%
5900	VNC Server	0.9%
Various	Other	2.3%

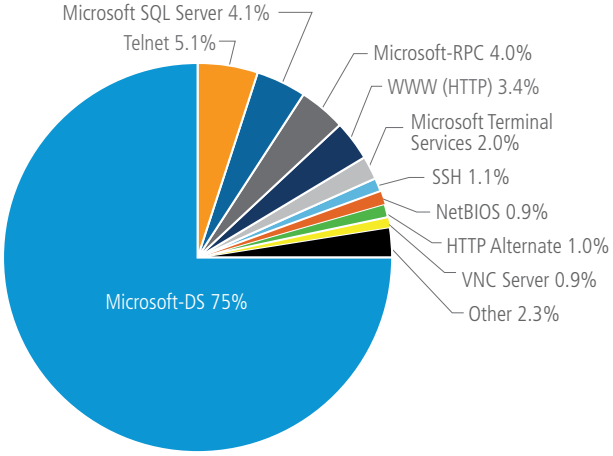


Figure 37: Attack Traffic from Mobile Networks, Top Ports

Country/Region	ID	Q4 '11 Avg. kbps	Q4 '11 Peak kbps	Q4 '11 Avg. MB/ month
AFRICA				
Egypt	EG-1	539	3413	123
Morocco	MA-1	1125	7947	246
Nigeria	NG-1	286	4871	462
South Africa	ZA-1	442	1654	197
ASIA				
China	CN-1	2095	5719	269
Hong Kong	HK-2	1872	10610	648
Hong Kong	HK-1	2017	10689	3308
India	IN-1	1664	9651	204
Indonesia	ID-1	465	6134	6351
Israel	IL-1	1357	5709	72
Kuwait	KW-1	1617	7805	205
Malaysia	MY-3	898	7170	380
Malaysia	MY-1	671	7847	627
Pakistan	PK-1	967	5406	197
Qatar	QA-1	1637	9057	215
Saudi Arabia	SA-1	1820	8906	248
Singapore	SG-3	1708	9070	693
Singapore	SG-4	1667	8995	221
Sri Lanka	LK-1	844	7144	230
Taiwan	TW-1	1625	7487	130
Taiwan	TW-2	1044	6100	97
Thailand	TH-1	163	1553	161
EUROPE				
Austria	AT-1	2860	11404	163
Austria	AT-2	4053	22948	6072
Belgium	BE-1	3175	12527	479
Belgium	BE-3	1144	10025	62
Belgium	BE-2	1974	5227	18
Bulgaria	BG-1	1754	7526	98
Czech Republic	CZ-1	1712	8791	91
Czech Republic	CZ-3	4069	12452	319
Czech Republic	CZ-2	1213	6263	188
Estonia	EE-1	1418	7222	256
France	FR-2	2629	9506	1639
Germany	DE-1	1093	4350	92
Germany	DE-2	5209	23395	1680
Germany	DE-3	1735	7469	183
Greece	GR-1	4628	16389	609
Hungary	HU-2	2473	13027	129
Hungary	HU-1	1834	10027	154
Ireland	IE-1	2845	13873	745
Ireland	IE-2	1808	14859	843
Ireland	IE-3	1986	14478	954
Italy	IT-3	3259	15142	719
Italy	IT-2	3284	17426	441
Italy	IT-4	1484	9924	229
Lithuania	LT-2	1996	13305	429
Lithuania	LT-1	3006	16980	734
Moldova	MD-1	1679	7145	148
Netherlands	NL-2	3716	8889	77
Netherlands	NL-1	1955	5266	31
Norway	NO-2	2150	6747	55
Norway	NO-1	2270	9003	73
Poland	PL-1	3637	19128	166
Poland	PL-2	1494	7584	83
Poland	PL-4	4823	19217	127
Poland	PL-3	1638	10128	174
Romania	RO-1	973	4750	118
Russian	RU-3	780	4279	141
Russian	RU-4	2867	12428	488
Slovakia	SK-1	386	2385	39
Slovakia	SK-2	2373	11088	2000
Slovenia	SI-1	2153	8337	60
Spain	ES-1	4757	18872	403
Spain	ES-3	1145	3046	11
Spain	ES-2	920	4319	58
Turkey	TR-1	1857	8607	146
Ukraine	UA-1	2873	10564	167
Ukraine	UA-2	1665	6912	139
United Kingdom	UK-3	4165	16388	64
United Kingdom	UK-2	3249	10106	272
United Kingdom	UK-1	1976	18567	881
NORTH AMERICA				
Canada	CA-2	1133	2758	625
Canada	CA-1	4393	21368	31129
Curacao	CW-1	892	5023	319
El Salvador	SV-2	1727	9061	578
El Salvador	SV-1	1545	8180	379
El Salvador	SV-3	923	4791	314
Guatemala	GT-2	999	6684	732
Guatemala	GT-1	1521	8055	434
Mexico	MX-1	901	4854	888
Nicaragua	NI-1	1582	8989	830
Puerto Rico	PR-1	2520	11627	3210
United States	US-2	1126	4425	57
United States	US-1	1974	5646	165
United States	US-3	1066	3373	636
OCEANIA				
Australia	AU-3	1383	7317	211
Australia	AU-1	1192	12064	1850
Guam	GU-1	1011	4450	129
New Caledonia	NC-1	918	4442	604
New Zealand	NZ-2	1732	9918	722
SOUTH AMERICA				
Argentina	AR-1	834	5676	116
Argentina	AR-2	1842	13089	198
Bolivia	BO-1	382	2918	126
Brazil	BR-1	753	5545	143
Brazil	BR-2	961	5605	250
Chile	CL-4	1079	10852	475
Chile	CL-3	1352	10894	138
Colombia	CO-1	946	5430	127
Paraguay	PY-2	502	5523	469
Paraguay	PY-1	501	4654	142
Uruguay	UY-1	1714	13156	136
Uruguay	UY-2	610	4689	48
Venezuela	VE-1	938	6961	144

Figure 38: Average and Average Peak Connection Speed, Average Megabytes Downloaded per Month by Mobile Provider

providers. Once again, all but two mobile providers (ZA-1 in South Africa and TH-1 in Thailand) had average peak connection speeds above 2 Mbps. The provider with the lowest average peak connection speed in the fourth quarter was Thailand's TH-1, at 1.6 Mbps. (South African provider ZA-1, which had the lowest average peak connection speed in the third quarter, saw its speed increase by approximately 0.25 Mbps quarter-over-quarter.)

For the fourth quarter of 2011, we found that users on eight mobile providers consumed, on average, one gigabyte (1 GB) or more of content from Akamai per month. (Note that this does not include Canadian provider CA-1, which has been confirmed to be using a proxy architecture.) Users on an additional 75 mobile providers around the world downloaded more than 100 MB of content from Akamai per month during the fourth quarter, while users on 19 other providers downloaded fewer than 100 MB. While Thai provider TH-1 was highlighted as having the lowest average and average peak connection speeds in the fourth quarter, it was in the middle of the pack for download volumes, with users consuming over 160 MB/month of content from Akamai. Spanish provider ES-3 had the lowest consumption rates, at just 11 MB/month.

7.4 Mobile Traffic Growth As Observed By Ericsson

In mobile networks, the access medium (spectrum) is being shared by different users in the same cell. It is important to understand traffic volumes and usage patterns in order to enable a good customer experience. Ericsson's presence in more than 180 countries and its customer base representing more than 1,000 networks enables it to measure mobile voice and data volumes. The result is a representative base for calculating world total mobile traffic in 2G, 3G, and 4G networks (not including DVB-H, WiFi, and Mobile WiMax).

These measurements have been performed for several years, and the seasonal slowdown in growth observed in Q2 has been replaced by continued strong growth in the last 2 quarters. However, the measurements of data and voice traffic in these networks (2G, 3G, 4G/LTE) around the world show large differences in traffic levels between markets and regions, and also between operators due to their different customer profiles.

As illustrated in Figure 39, the volume of mobile data traffic doubled from the fourth quarter of 2010 to the fourth quarter of 2011, and grew 28% between the third and the fourth quarters of 2011.

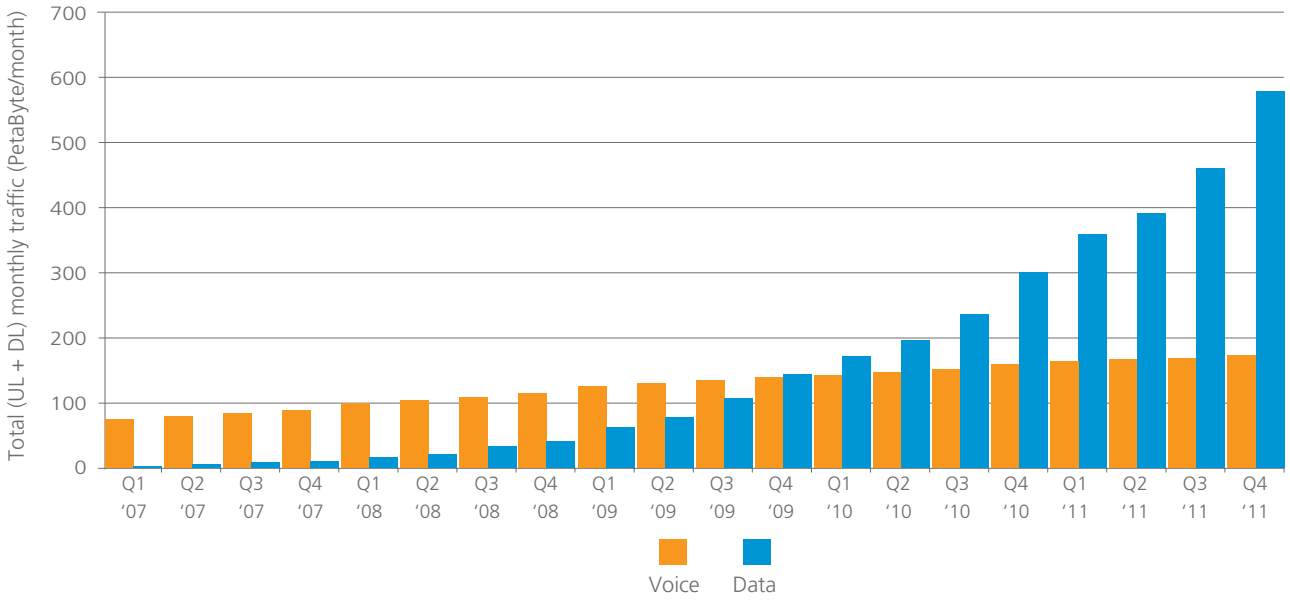


Figure 39: Total Monthly Mobile Voice and Data as Measured by Ericsson

7.5 Smartphone Usage As Observed by Ericsson

Mobile broadband traffic characteristics and network load depend heavily on the availability and popularity of different 'over-the-top' applications. Understanding how application usage is distributed among heavy, medium and light users is a key input for mobile operators to optimize their mobile broadband offerings and traffic management policies.

Based on recent mobile broadband traffic measurements (Q2 2011– Q1 2012) from Europe (three network providers) and Asia (three network providers), this section provides an overview of application usage distribution separately for PC (dongle) devices and Apple iPhone devices. Each of these measurements covers one full week and includes 2G fallback traffic, but does not include WiFi offload traffic. (While three providers is not necessarily a representative sample of European and Asian operators, we do not believe that the application usage of both heavy and light users would be significantly different with a larger sample.)

For each of these measurements, PC and iPhone devices were each classified separately into 10 equally sized clusters based on their total measured traffic volume (including both uplink and downlink). The 90% – 100% clusters contain the heaviest 10% of PC / iPhone subscribers while the 0% – 10% clusters include the lightest subscribers. Charts show typical regional and worldwide average values averaging results from each of these individual measurements.

Figure 40 and Figure 41 show the volume share of different applications per subscriber cluster for PC (dongle) devices while Figure 42 shows absolute values of per subscription weekly traffic volumes for the same subscriber clusters and applications. Both volume shares and absolute traffic volumes are shown separately for Europe and Asia since there are significant regional differences in PC traffic mix.

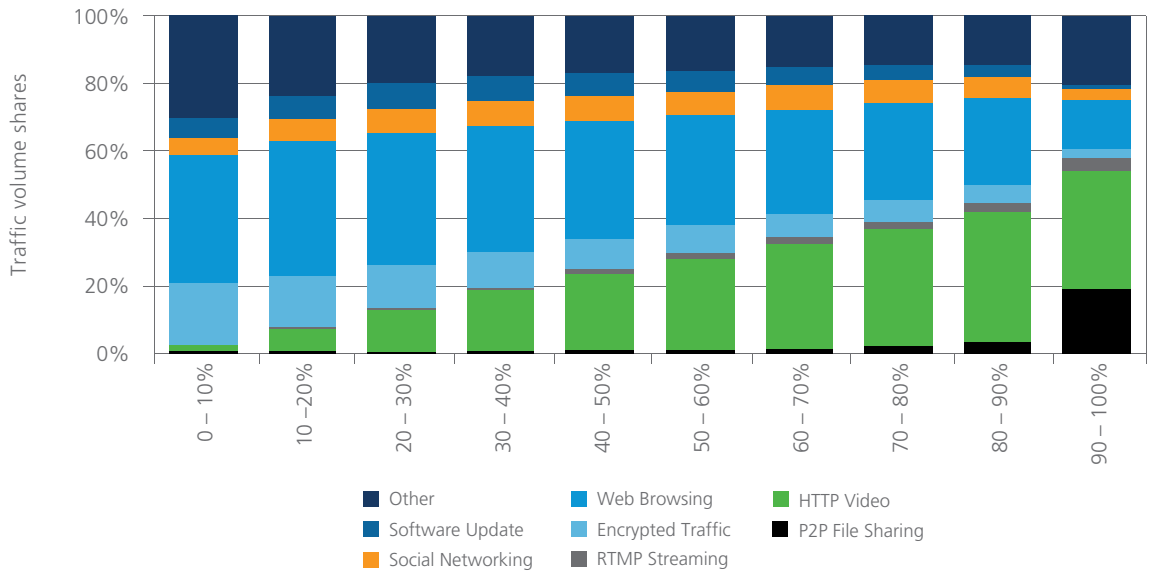


Figure 40: Application volume shares per subscriber cluster for PC (dongle) devices in Europe

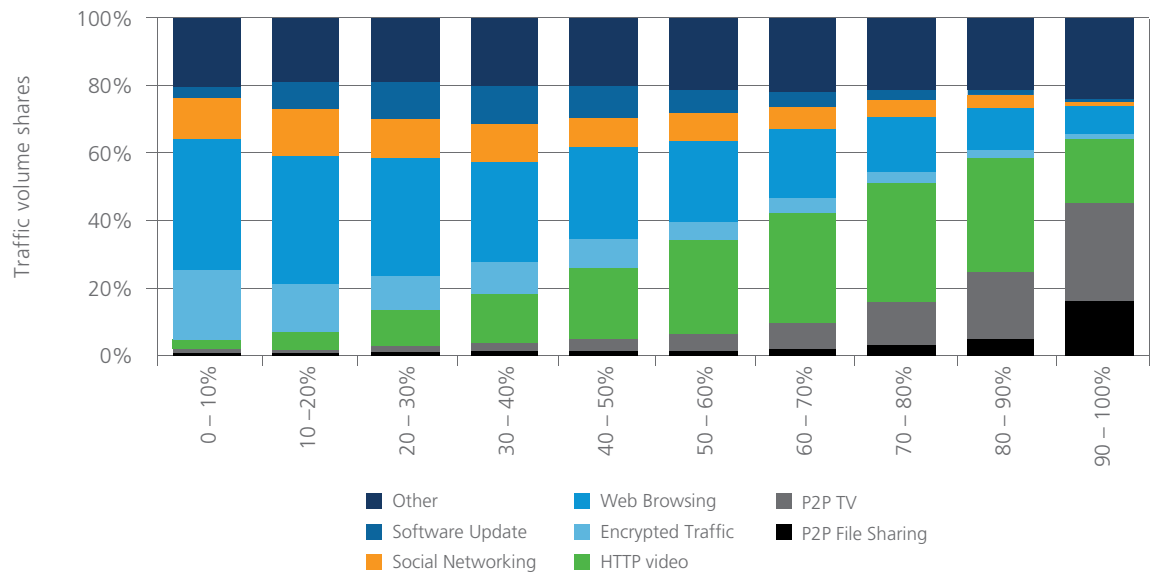


Figure 41: Application volume shares per subscriber cluster for PC (dongle) devices in Asia

Traffic of light users is dominated by web browsing in both Europe and Asia. Going from light users towards heavy users, the ratio of HTTP video (e.g. YouTube) gradually increases and becomes dominant for the top 30% of PC subscribers. P2P file sharing traffic volume is negligible for all subscriber clusters, except for the heaviest 10% of PC subscribers, where P2P file sharing traffic volume suddenly explodes and generates on average 20% of total traffic volume. P2P TV applications (e.g. PPStream) are not very popular in Europe, however, in certain Asian countries, they are the largest traffic volume contributors for the top 10% of PC subscribers.

It is also interesting to analyze the contribution of different subscriber clusters to overall application traffic volumes (see Figure 42). P2P file sharing traffic is generated almost exclusively by the heaviest 10% of subscribers. In contrast, HTTP video and web browsing traffic volumes are more evenly distributed among medium and heavy PC users. Figures 43 & 44 show the same analysis results for iPhone devices. Differences between application usage across regions is less significant on iPhones than on PCs, therefore only worldwide average values are shown instead of regional splits.

Traffic of light iPhone users is dominated by miscellaneous smartphone apps (included within the encrypted traffic and the other categories). Going from light users to medium users, web browsing, social networking, email and iTunes traffic shares increase gradually. HTTP video also increases gradually, and appears to explode for the heaviest 10% of subscribers.

Similarly to P2P file sharing traffic on PC devices, most HTTP video traffic on iPhone devices is generated by the heaviest 10% of iPhone subscribers, as shown in Figure 44.

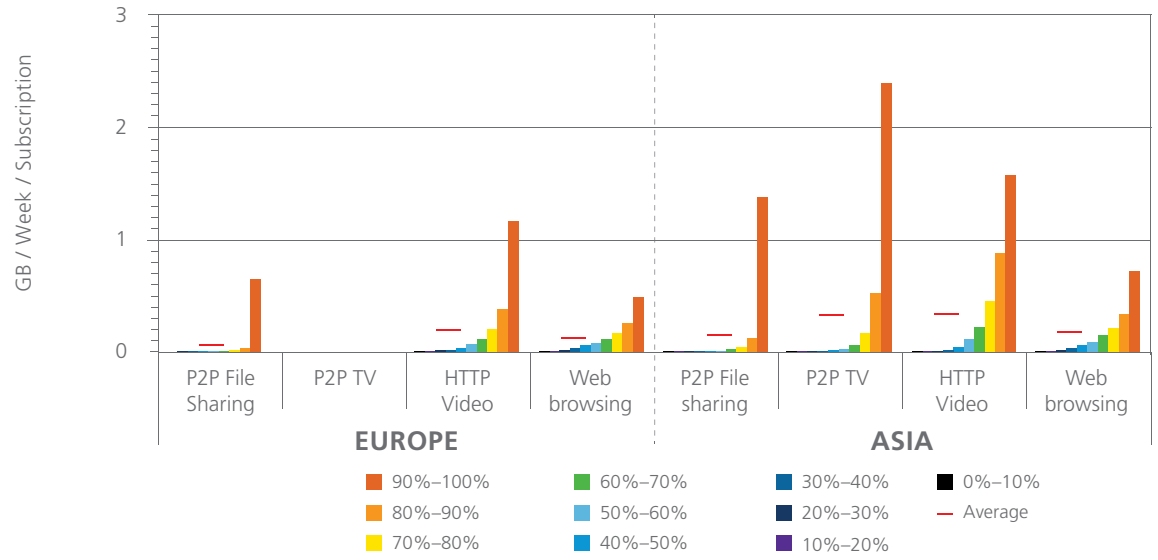


Figure 42: Average weekly application usage per subscriber cluster for PC (dongle) devices in Europe and Asia

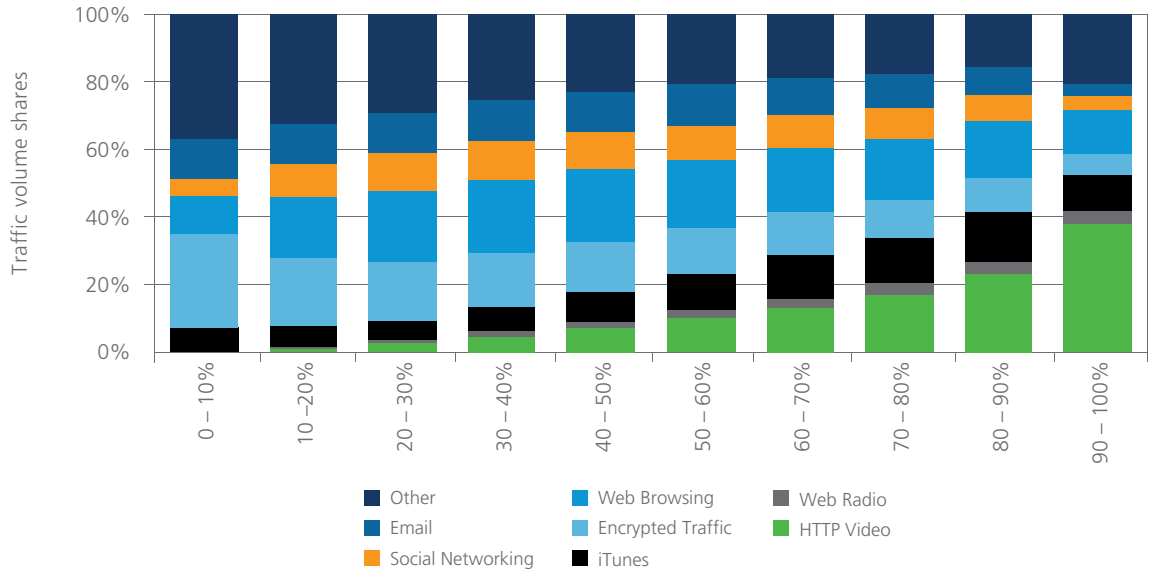


Figure 43: Application volume shares per subscriber cluster for Apple iPhone devices

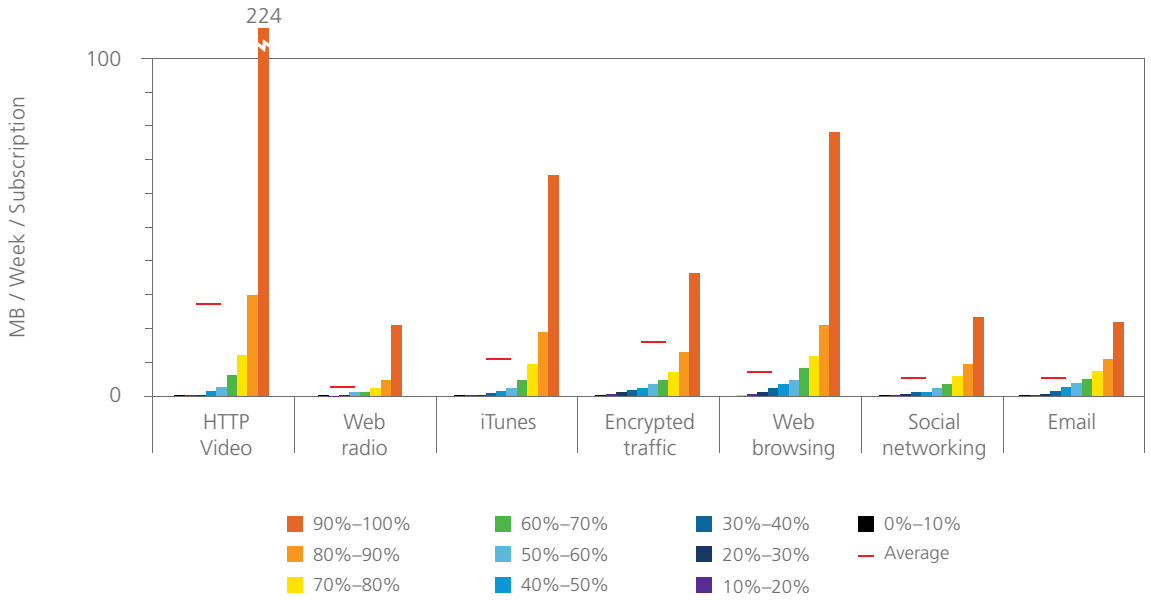


Figure 44: Average weekly application traffic volumes per subscriber cluster for Apple iPhone devices

LEGEND FOR APPLICATION CATEGORIES:

P2P file sharing: Peer-to-peer file sharing applications (e.g. BitTorrent, Gnutella, etc.)

P2P TV: Online TV or video-on-demand applications using P2P content delivery networks, e.g., PPStream, PPlive, Funshion, etc.

HTTP video: Progressive download online video traffic over HTTP (e.g., YouTube)

Encrypted traffic: Any traffic using SSL (Secure Sockets Layer) or TLS (Transport Layer Security), e.g. HTTPS. Note that due to the encryption, it's generally not possible to identify the underlying application.

Web browsing: Umbrella category for all activities performed from a browser (e.g., viewing news sites, etc.) Please note that media applications used from within a Web browser, such as viewing YouTube videos or Web TV are classified separately and are not included into Web browsing traffic. The same applies for social networking traffic.

Social networking: Social networking sites (e.g., Facebook, Twitter) accessed from within a browser or via a separate application.

Email: Email traffic sent and received using the following protocols: SMTP, POP3 or IMAP. Web-mail from the most popular sites (Gmail, Yahoo, etc.) is also included.

iTunes: software or media downloads from Apple iTunes

Software update: Operating system (e.g., Windows) update, anti-virus update on PC devices.

8.1 Client-Side SSL Ciphers

As noted in last quarter's report, the year-over-year changes in cipher usage have been fairly significant, and are clearly illustrated by Figure 45. During calendar year 2011, usage of AES256-SHA-1 grew by 24%, ending the year at 48.6% of requests. Companion cipher AES128-SHA-1 grew by 18% during 2011, ending the year at 33.4% of requests. Usage of EXP-DES-CBC-SHA-40 dropped the most over the year, declining 85% and ending the year responsible for less than one-hundredth of one percent of requests.

When examined over a three-year period, the changes are even more striking. From the beginning of 2009 to the end of 2011, use of AES128-SHA-1 grew 162%, while use of AES256-SHA-1 grew only 35%. (Note that the starting point for AES256-SHA-1 was higher.) Usage of RC4-SHA-128 increased by 20% over the three year period, though one-year trending sees it declining. As noted above, usage of EXP-DES-CBC-SHA-40 has almost completely disappeared over the last three years, though it accounted for only 0.7% of requests at the start of 2009 anyway. However, as seen at the bottom of the graph, it did appear to enjoy a 10-month period of resurgence, from December 2009 until October 2010, accounting for as much as 5.8% of requests at its peak. It is not clear what drove this behavior, as the increase does not appear to align with the release of an update or upgrade for any of the major Web browsers.

8.2 IPv4 Address Exhaustion

As discussed in the *1st Quarter, 2011 State of the Internet* report, the central pool of available IPv4 address space maintained by the Internet Assigned Numbers Authority was exhausted on February 3, when the five remaining /8 blocks of IPv4 addresses were distributed to representatives of the five RIRs—one to each. On April 15, APNIC announced that it had reached its final /8 address block, implementing austerity measures that ultimately limit the size of address blocks delegated in response to future requests. This is dramatically illustrated in Figure 46, which shows that millions of IPv4 addresses were allocated/assigned by APNIC in the months and days approaching April 15, while the line is essentially flat thereafter, when activity was counted in the low thousands. Compared to previous years, the spiky demand seen ahead of April 15 was similar to that seen in 2009 and 2010, though the most active days in those two years were in the four to five million address range, in contrast to the 9.6 million delegated on April 12.

IPv4 delegation activity at RIPE remained fairly consistent throughout 2011, with the exception of a few spikes in early February, early May, and early July—two of those days (February & July) saw total delegations in excess of four million IPv4 addresses, while May's peak day was in excess of two million. Activity in 2010 was markedly more spiky, punctuated by days of high activity in late November and late December, with delegations of over four and five million respectively. A plot of

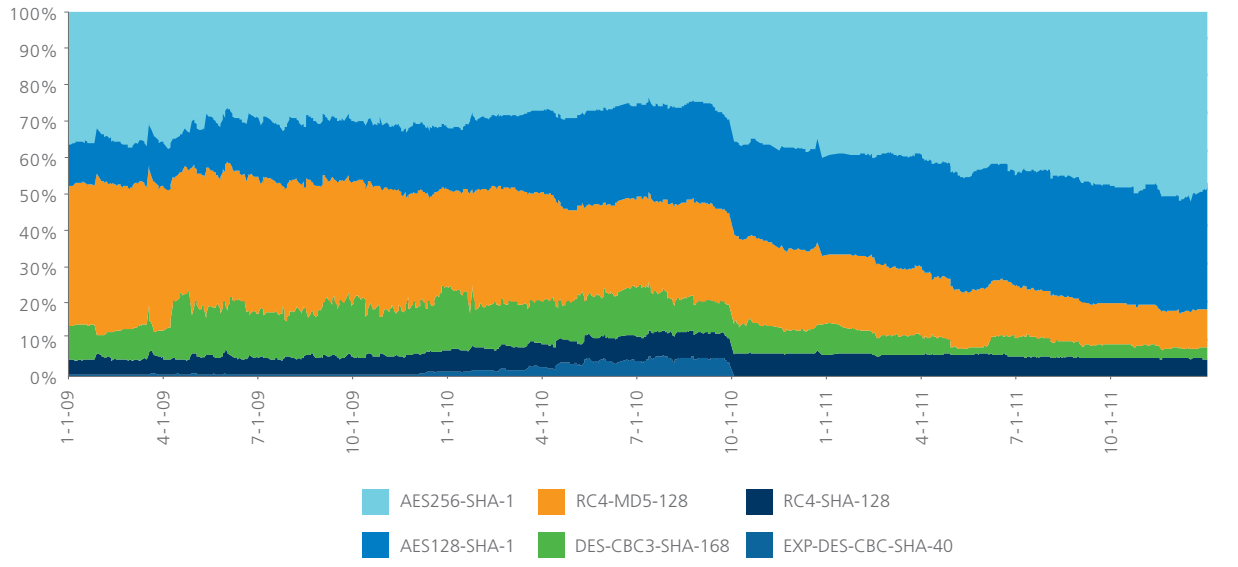


Figure 45: Client-Side SSL Ciphers Observed by Akamai, 2009–2011

activity across 2009 more closely resembled that seen in 2011, though peaks were much lower, with two days in excess of two million IPv4 addresses delegated.

Early 2011 was the most active period for ARIN, with total delegations of more than four million IPv4 addresses made on both January 12 and February 4, with the remainder of the year remaining relatively flat, save for a two million address day in May, and a couple of one million address days in September and December. 2010 saw quite a few smaller spikes throughout the year, though a total delegation of over eight million on October 21 was a clear outlier. A number of smaller spikes were seen across 2009 as well, with a single peak approaching four million addresses in June, and three other days throughout the year that each saw more than two million addresses delegated.

IPv4 delegation activity by LACNIC saw minor spikiness across 2009, 2010, and 2011, though each year saw multiple days (two, three, and four days, respectively) where more than two million addresses were delegated. In 2011, AFRINIC saw its largest spikes in May and June, while delegation activity across the second half of the year remained comparatively flat. Activity was also relatively flat across most of 2009, with just three days where more than one million addresses were delegated. There were seven days in 2010 where a total of more than a half million IPv4 addresses were delegated, with the largest in early May, at more than two million addresses.

8.3 IPv6 Adoption

As the "available pools" of IPv4 addresses continued to get smaller, adopting IPv6 became a clear priority in 2011. As shown in Figure 47, the total number of ASes in the global IPv6 routing table grew by nearly two-thirds in 2011, ending the year just shy of 5,000. Clearly evident is a "knee" in early June, as the number of IPv6-capable ASes increased rapidly in advance of World IPv6 Day. While growth was steady through 2009 and 2010, it clearly accelerated through 2011.

After the number of IPv6-only ASes declined towards the end of 2009, growth returned in 2010 and clearly accelerated throughout 2011, as illustrated in Figure 48. After a rocky start to the year, the number of IPv6-only ASes began to grow aggressively in early April, reaching an initial peak in June, just after World IPv6 Day. After a summertime decline, growth returned in September, ending the year up over 40%, significantly higher than the yearly growth rates seen in 2010 and 2009. We expect that both the total number of ASes in the IPv6 routing table and the total number of IPv6-only ASes will continue to grow during 2012, and we expect that this growth will accelerate as the World IPv6 Launch event approaches on June 6.

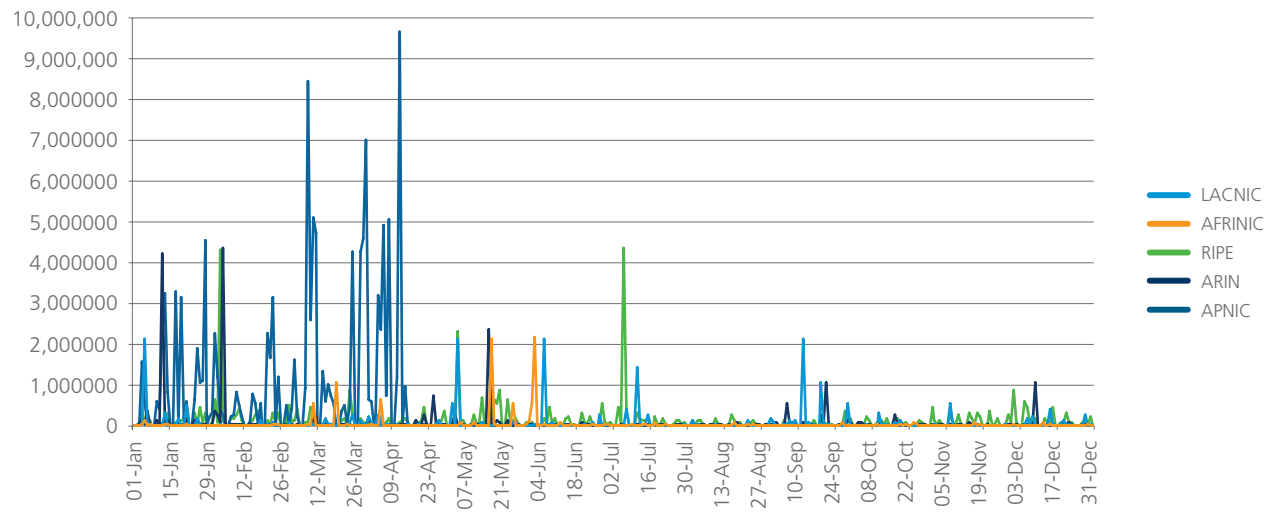


Figure 46: Number of IPv4 Addresses Allocated/Assigned During 2011

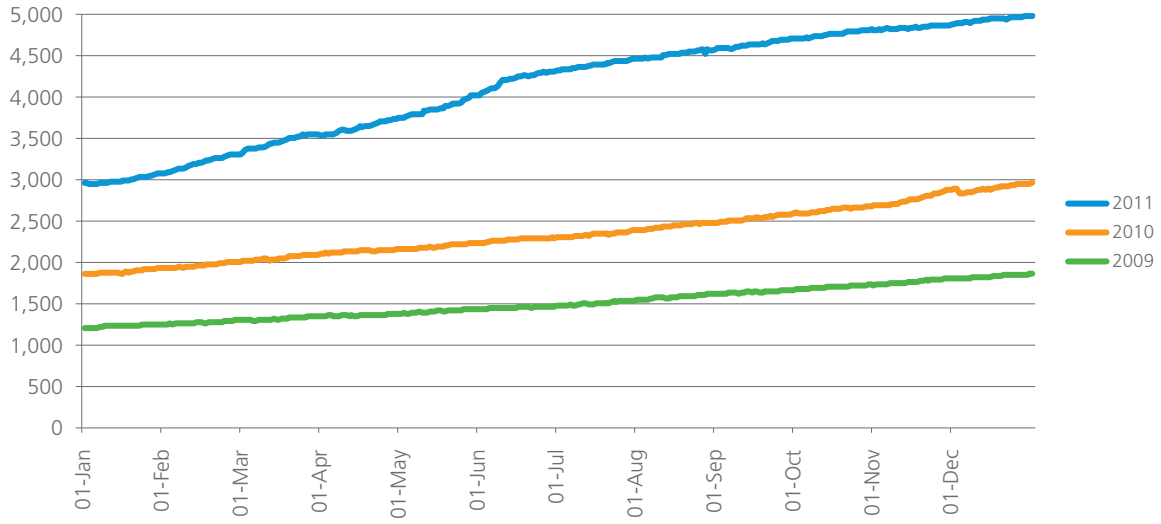


Figure 47: Total Number of Autonomous Systems in the IPv6 Routing Table

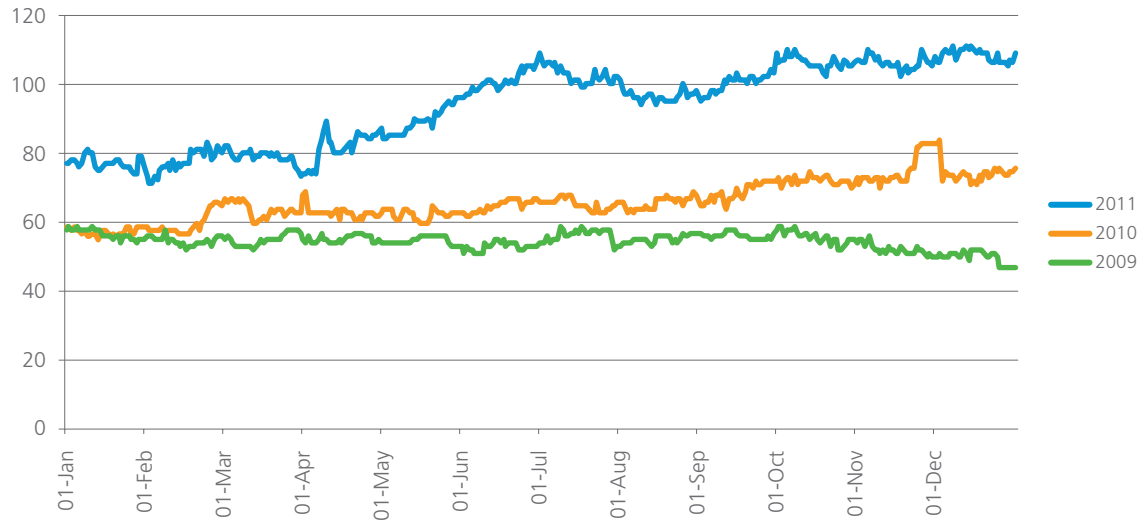


Figure 48: Total Number of IPv6-Only Autonomous Systems

8.4 Average Connection Speeds

In looking at the weighted average connection speeds, aggregated at a continental level, over the four-year history of the *State of the Internet* report, it is apparent that in most regions, the average connection speed has increased over time, as illustrated in Figure 49. Significant relative increases were seen in Oceania (Australia & New Zealand) and South America, while Europe and North America posted strong levels of growth as well. The weighted average connection speed also grew in Africa, though the increase over time was fairly nominal. In spite of some quarterly gyrations, the weighted average connection speed in Asia also grew over the four year period. While Asia has several countries, including South Korea and Japan, that have some of the highest average connection speeds in the world, it also has some fairly large countries, like India and China, with some of the lowest speeds. These larger, slower countries likely weighed more heavily on Asia's average connection speed, limiting the growth seen over time.

8.5 Average Peak Connection Speeds

Average peak connection speeds, which more closely represent the peak speed an Internet connection is capable of reaching, saw significant growth over time, as shown in Figure 50. The lowest rate of growth, unsurprisingly, was seen in Africa, where broadband penetration levels are relatively low, and where Internet connectivity has been cut or limited in some countries in attempts to control political uprisings. However, the weighted average connection speed across the continent was up approximately 50% over the four year period. The next lowest rate of growth over the last four years was seen in Asia, though the ~75% growth rate there is clearly a solid increase, and a very positive trend. (Although, again, it was likely limited by some of the larger, slower countries in the region.) Among the other regions, Oceania and South America both saw weighted average connection speeds more than triple over the period, while in North America and Europe, the weighted average connection speeds more than doubled. This strong growth is likely related, at least in part, to the investment in high speed connectivity being made in countries across these regions.

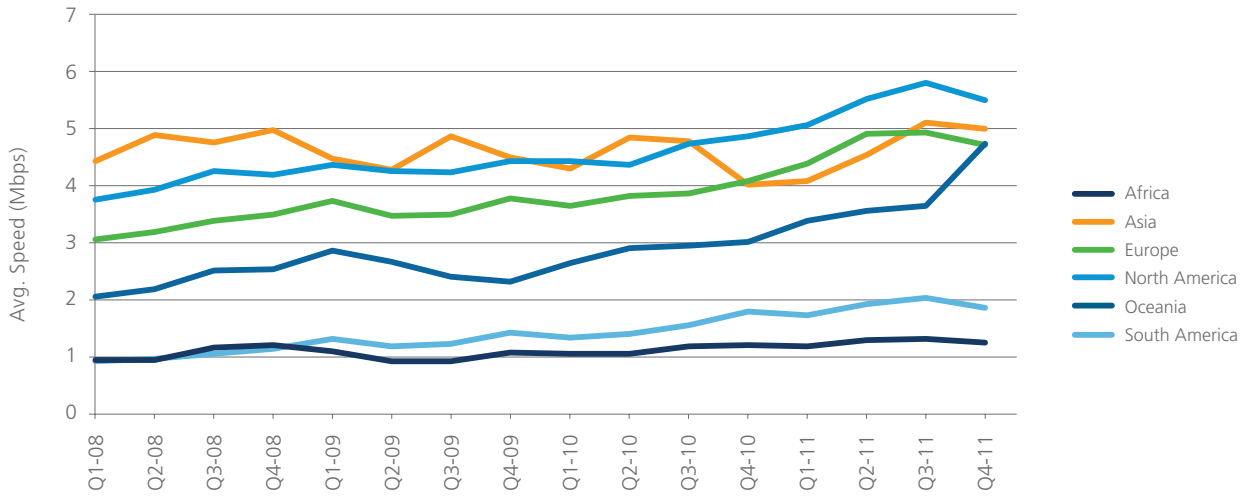


Figure 49: Weighted Average Connection Speed, Q1 2008–Q4 2011

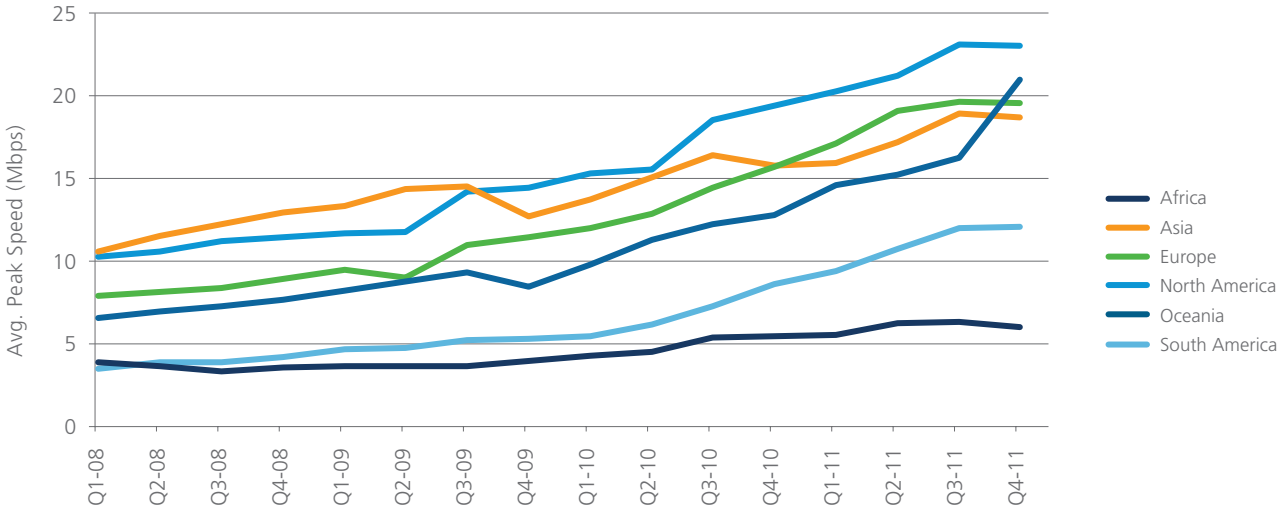


Figure 50: Weighted Average Peak Connection Speed, Q1 2008–Q4 2011

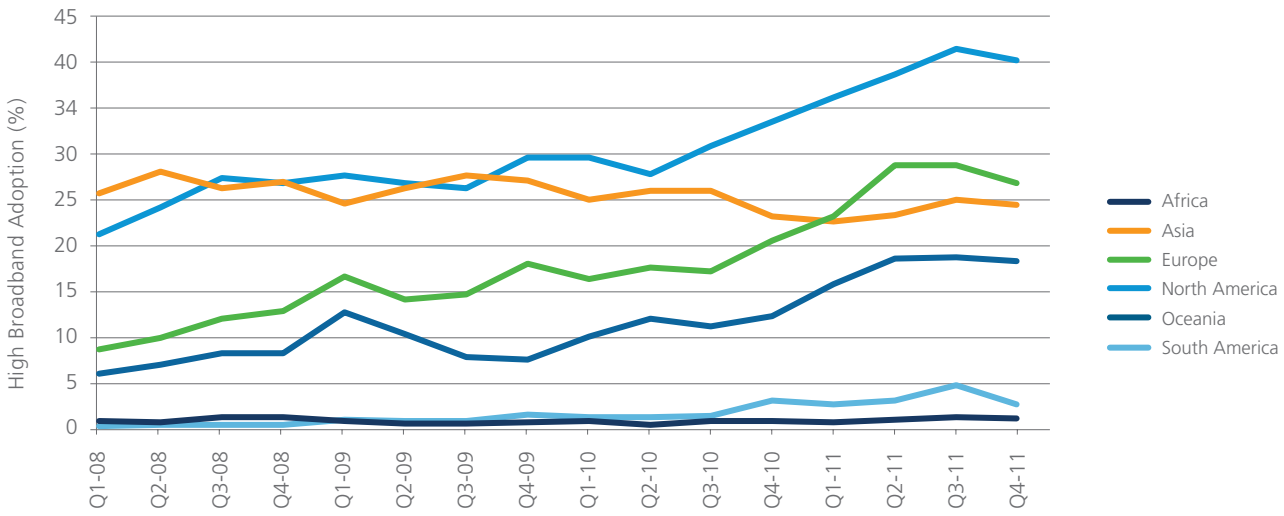


Figure 51: Weighted Average High Broadband Adoption, Q1 2008–Q4 2011

8.6 High Broadband Adoption

While not immediately evident from Figure 51, the most significant relative growth in high broadband adoption levels over the last four years was seen in South America, at nearly 6.6x, although the weighted average adoption level remains below 5%. Europe's high broadband adoption levels more than tripled over the same period, and Oceania nearly achieved the same increase. The weighted average high broadband adoption rate in North America grew nearly 90% from the first quarter of 2008, and at just over 40%, is the highest in the world. Africa posted a nominal gain, growing nearly 30% — while not as significant as the other regions, it is still a sign that higher-speed Internet connections are becoming more available. Asia was the sole outlier for high broadband adoption — the weighted average adoption level ended 2011 down nearly 5% from where it was at the beginning of 2008. It is likely the case that, while Internet adoption increased in the region over time, the connection speeds in developing countries fell well short of the 5 Mbps high broadband threshold, and were more likely in the 256 kbps to 2 Mbps range — between the narrowband and broadband thresholds.

8.7 Broadband Adoption

Similar to the high broadband adoption metric, South America saw the largest rate of growth for the weighted average broadband adoption level. As shown in Figure 52, the adoption level in South America grew approximately 4x over the last four years, from just under 8% in the first quarter of 2008 to over 33% in the fourth quarter of 2011. Growth rates were not nearly as aggressive across the rest of the world — Oceania's 75% increase was the next largest seen. Weighted average broadband adoption levels in North America and Europe both grew between 20-30% over the last four years, while Africa's grew approximately 15%. Once again, similar to the high broadband metric, Asia's weighted average broadband adoption level remained essentially flat during the four-year period, up less than 1%. As higher speed connectivity becomes more widely available throughout developing countries within the region, especially in larger countries like India and China, we expect that the weighted average broadband adoption level will grow in the future.

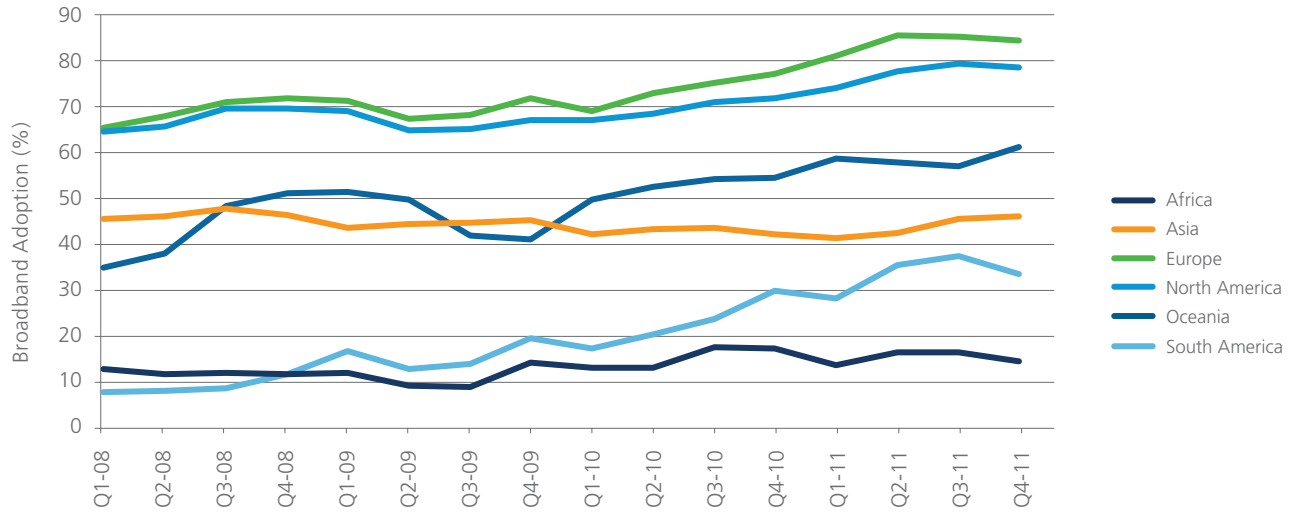


Figure 52: Weighted Average Broadband Adoption, Q1 2008 – Q4 2011

8.8 Narrowband Adoption

In contrast to the growth shown in the previous figures, weighted average narrowband adoption levels have declined across all regions from the first quarter of 2008 to the fourth quarter of 2011, as Figure 53 shows. This trend is extremely encouraging, as it shows that fewer connections at speeds below 256 kbps are being made to Akamai over time, reflecting the wider availability, and adoption, of higher speed Internet connections. Oceania saw the largest relative decline over time, decreasing nearly 80%. North America and Africa saw narrowband adoption rates drop 73% over the last four years, while adoption in South America and Europe declined 70%. In line with the other metrics, Asia's decline over time was the smallest, though its narrowband adoption rate at the end of 2011 was just 36% of what it was at the beginning of 2008.

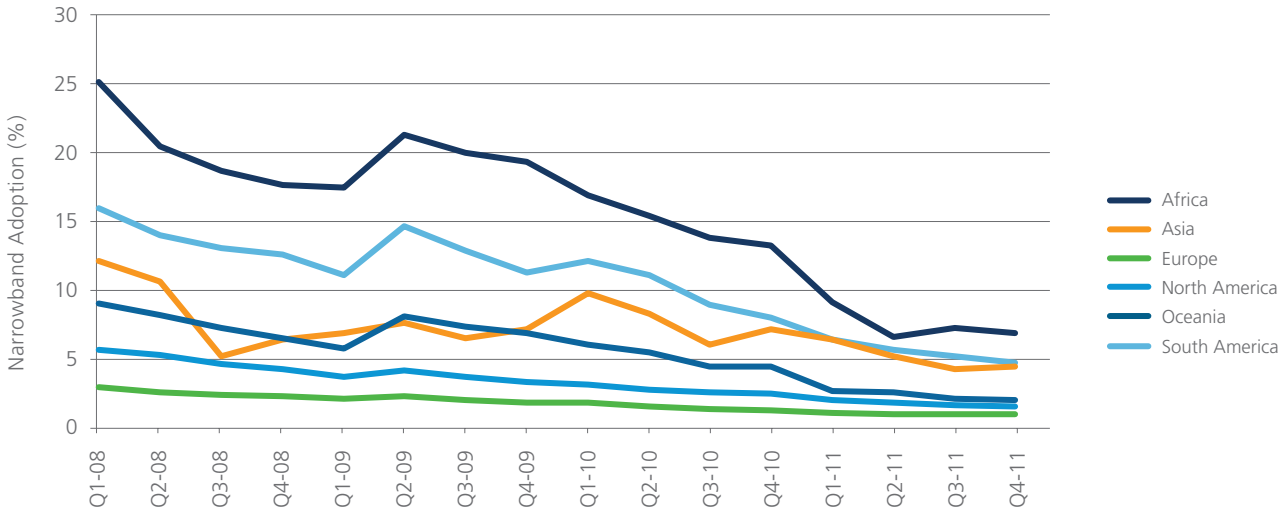


Figure 53: Weighted Average Narrowband Adoption, Q1 2008–Q4 2011

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%	3,040,134	5.2	18.2	29%	77%	--
Belgium	0.1%	4,083,138	6.1	26.7	52%	90%	--
Czech Republic	0.5%	2,164,845	6.7	22.4	47%	93%	--
Denmark	0.1%	3,011,840	5.7	18.7	44%	85%	--
Finland	0.1%	2,898,637	5.9	20.2	40%	80%	--
France	1.4%	24,797,259	3.7	15.5	13%	81%	0.2%
Germany	1.8%	35,608,453	5.0	20.6	30%	92%	0.4%
Greece	0.2%	2,682,710	3.8	19.1	13%	86%	--
Hungary	1.4%	2,290,199	5.6	24.1	37%	94%	--
Iceland	<0.1%	142,184	5.1	23.5	26%	87%	--
Ireland	0.1%	1,533,778	6.8	23.3	36%	86%	--
Italy	1.9%	15,093,132	3.9	16.0	14%	87%	0.7%
Luxembourg	<0.1%	174,365	4.4	15.3	20%	89%	--
Netherlands	0.5%	7,859,835	8.2	25.0	67%	94%	0.5%
Norway	0.1%	3,518,008	5.9	21.3	38%	83%	--
Poland	1.7%	7,270,187	4.1	17.6	23%	80%	--
Portugal	0.2%	2,810,872	4.8	25.2	34%	87%	--
Romania	2.6%	2,539,894	6.4	35.2	49%	95%	--
Slovakia	0.1%	829,926	5.2	20.8	23%	91%	--
Spain	0.8%	13,435,704	3.8	18.7	15%	83%	0.6%
Sweden	0.2%	6,159,878	5.5	21.5	32%	75%	0.6%
Switzerland	0.3%	3,175,009	7.3	25.1	51%	96%	--
United Kingdom	0.9%	25,383,604	4.9	20.4	30%	91%	0.5%
ASIA/PACIFIC							
Australia	0.5%	12,568,493	4.9	21.7	19%	59%	1.6%
China	13%	84,405,405	1.5	5.7	1.5%	20%	3.8%
Hong Kong	0.6%	2,735,892	9.1	45.9	57%	92%	–
India	3.0%	9,602,386	0.9	5.9	0.5%	8.3%	27%
Japan	2.0%	40,254,398	9.1	33.8	60%	83%	1.0%
Malaysia	0.4%	1,915,888	1.8	13.8	3.8%	22%	–
New Zealand	0.3%	1,884,969	3.7	16.1	18%	74%	3.2%
Singapore	0.2%	1,463,157	4.6	23.7	32%	67%	–
South Korea	5.2%	18,948,552	17.5	47.9	83%	96%	0.2%
Taiwan	7.5%	9,494,759	3.7	22.4	23%	71%	–
MIDDLE EAST							
Egypt	1.4%	1,604,003	0.9	7.4	–	6.0%	3.9%
Israel	0.6%	2,613,127	4.2	21.9	17%	79%	–
Kuwait	0.1%	600,962	1.7	9.8	--	22%	–
Saudi Arabia	0.3%	2,609,502	2.0	9.3	1.3%	38%	–
Sudan	<0.1%	46,983	0.7	6.1	–	–	–
Syria	<0.1%	390,546	1.1	3.0	–	14%	19%
United Arab Emirates (UAE)	0.1%	1,092,066	5.7	n/a	43%	84%	–
LATIN & SOUTH AMERICA							
Argentina	1.4%	5,787,119	1.9	12.6	3.3%	33%	2.5%
Brazil	4.4%	17,116,579	1.8	12.2	3.2%	29%	6.5%
Chile	0.5%	3,215,323	2.8	16.4	4.6%	74%	–
Colombia	0.6%	3,484,366	2.4	12.3	2.3%	57%	–
Mexico	0.5%	9,811,863	2.4	12.1	2.4%	56%	0.9%
Peru	0.5%	895,790	1.3	10.1	–	9.5%	–
Venezuela	0.4%	2,195,455	0.9	5.8	–	2.6%	6.2%
NORTH AMERICA							
Canada	1.0%	13,222,355	5.6	21.7	44%	90%	1.0%
United States	10%	145,069,663	5.8	24.2	44%	80%	1.6%

** Countries listed with "—" had fewer than 25,000 unique IP addresses connecting to Akamai during the fourth quarter at this speed. Based on the revised threshold for inclusion, they were not included in the global ranking.*

SECTION 10:
Endnotes

[1] http://tools.cisco.com/security/center/content/CiscoAppliedMitigationBulletin/cisco-amb-20111026-cucm-uccx

[2] http://aws.amazon.com/security/security-bulletins/jboss-worm-spreading-via-unpatched-or-unsecured-jboss-application-server/

[3] http://resources.infosecinstitute.com/tcp-port-9415/

[4] http://blog.comcast.com/2011/11/ipv6-deployment.html

[5] http://www.lightreading.com/document.asp?doc_id=218942

[6] https://www.arin.net/knowledge/rirs.html

[7] ftp://ftp.arin.net/pub/stats/arin/delegated-arin-latest

ftp://ftp.apnic.net/apnic/stats/apnic/delegated-apnic-extended-latest

ftp://ftp.ripe.net/pub/stats/ripencc/delegated-ripencc-latest

ftp://ftp.afrinic.net/pub/stats/afrinic/delegated-afrinic-latest

ftp://ftp.lacnic.net/pub/stats/lacnic/delegated-lacnic-latest

[8] http://whois.domaintools.com/54.240.0.0

[9] http://www.circleid.com/posts/201112_borders_in_bankruptcy_aims_to_sell_65536_ipv4_addresses/

[10] http://www.ripe.net/internet-coordination/ipv4-exhaustion/ipv4-available-pool-graph (retrieved March 16, 2012)

[11] https://twitter.com/#!/TeamARIN/status/159748154969952258

[12] http://www.potaroo.net/tools/ipv4/index.html (retrieved March 16, 2012)

[13] http://he.net/about_us.html

[14] http://bgp.he.net/going-native.pdf

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

[16] https://www.budde.com.au/Research/Tunisia-Telecoms-Mobile-and-Broadband.html

[17] http://en.wikipedia.org/wiki/Internet_censorship_in_Tunisia

[18] http://www.upi.com/Top_News/World-News/2012/03/12/Group-lists-2012-enemies-of-the-Internet/UPI-96581331571514/

[19] http://www.broadbandcommission.org/Documents/Broadband_Challenge.pdf

[20] http://www.ispreview.co.uk/story/2011/10/26/united-nations-sets-tough-broadband-targets-for-every-country-in-the-world.html

[21] Ibid.

[22] http://www.reuters.com/article/2011/10/27/us-fcc-usf-reform-idUSTRE79Q6IC20111027

[23] http://www.ispreview.co.uk/story/2011/11/16/study-shows-huge-decline-in-broadband-isp-speeds-during-uk-peak-usage-periods.html

[24] http://www.akamai.com/ericsson/index1.html

THE FUTURE IS FOREVER
6 JUNE 2012

Major Internet service providers (ISPs), home networking equipment manufacturers, and web companies around the world are coming together to permanently enable IPv6 for their products and services by 6 June 2012.

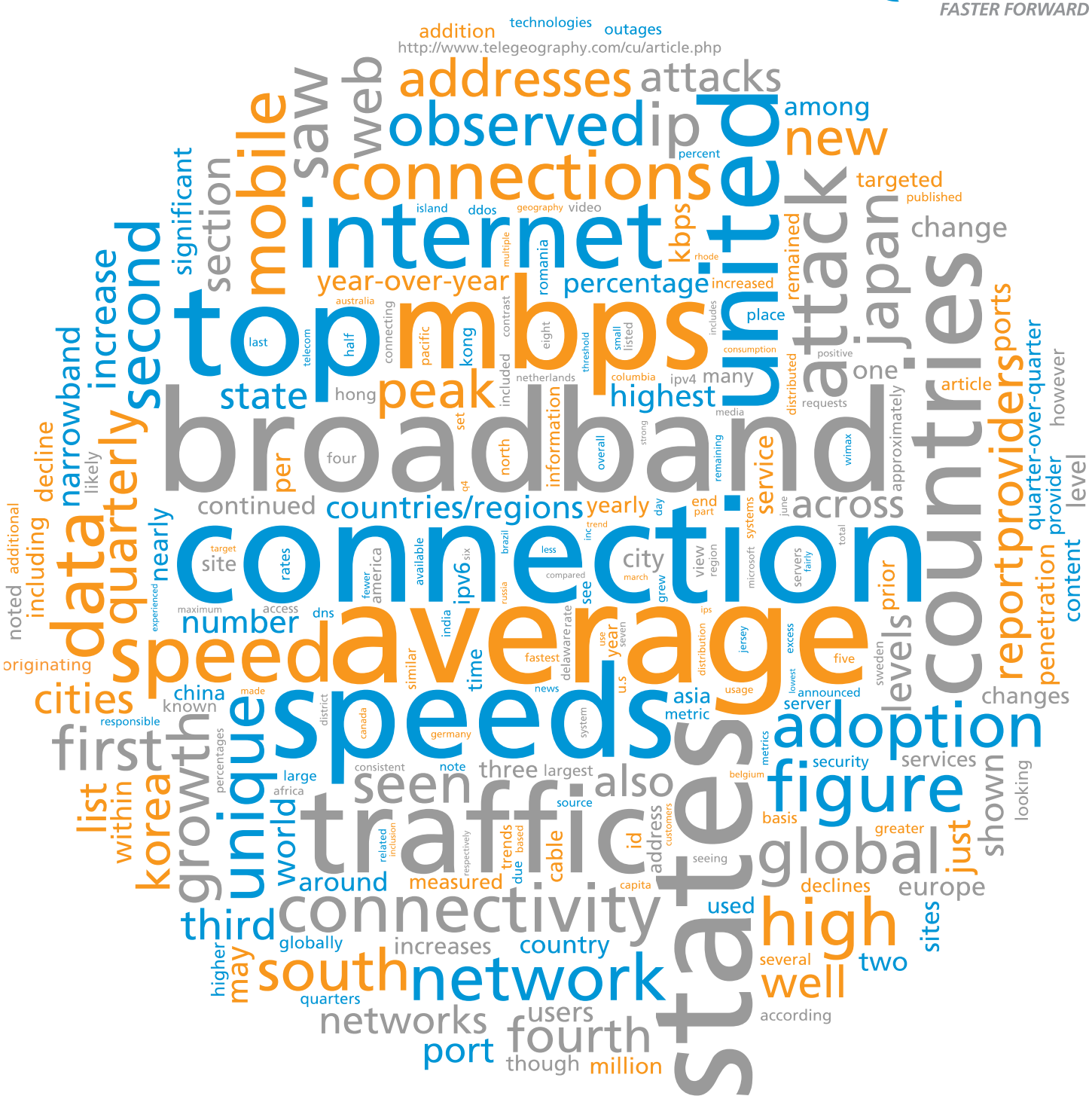
Organized by the Internet Society, and building on the sucessful one-day World IPv6 Day event held on 8 June 2011, World IPv6 Launch represents a major milestone in the global deployment of IPv6. As the successor to the current Internet Protocol, IPv4, IPv6 is critical to the Internet's continued growth as a platform for innovation and economic development.

For more information on World IPv6 Launch, go to www.worldipv6launch.org

For more information on Akamai's support for IPv6, go to www.akamai.com/ipv6

Akamai

Akamai
FASTER FORWARD



This word cloud visualizes the top 250 words from the first four volumes (Q1 2008 – Q4 2011) of the Akamai State of the Internet report series.

www.akamai.com/stateoftheinternet | @akamai_soti | stateoftheinternet@akamai.com

Acknowledgements

EDITOR: David Belson
EXECUTIVE EDITOR: Brad Rinklin
EXECUTIVE EDITOR: Tom Leighton
CONTRIBUTOR: Jon Thompson
CONTRIBUTOR: Stephen Ludin
CONTRIBUTOR: Péter Kersch (Ericsson)
CONTRIBUTOR: Richard Möller (Ericsson)
CONTRIBUTOR: Svante Bergqvist (Ericsson)
CONTRIBUTOR: Mathias Sintorn (Ericsson)
CONTRIBUTOR: Martin Levy (Hurricane Electric)

Please send comments, questions, and corrections to stateoftheinternet@akamai.com
Follow @akamai and @akamai_soti on twitter

Akamai® is the leading cloud platform for helping enterprises provide secure, high-performing user experiences on any device, anywhere. At the core of the company's solutions is the Akamai Intelligent Platform™ providing extensive reach, coupled with unmatched reliability, security, visibility and expertise. Akamai removes the complexities of connecting the increasingly mobile world, supporting 24/7 consumer demand, and enabling enterprises to securely leverage the cloud. To learn more about how Akamai is accelerating the pace of innovation in a hyperconnected world, please visit www.akamai.com and follow @Akamai on Twitter.

Asia Pacific Headquarters	1 Raffles Place, #16 – 61 One Raffles Place, Singapore 048616	Tel +011.65.6593.8700	Fax +011.65.6593.8799
European Headquarters	Pfingstweidstrasse 60, 8005, Zurich, Switzerland	Tel +41.43.210.91.00	Fax +41.43.210.91.01
North American Headquarters	8 Cambridge Center, Cambridge, Massachusetts, United States 02142	Tel +1.617.444.3000	Fax +1.617.444.3001