AKAMAI'S STATE OF THE INTERNET

Q4 2013 REPORT | VOLUME 6 NUMBER 4

Includes insight on mobile traffic and connected devices from Ericsson

Prolexic Quarterly Global DDoS Attack Report

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Letter From the Editor

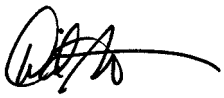
This issue of the *State of the Internet Report* closes out its sixth year of publication, encompassing hundreds of thousands of words written and the development of several hundred tables, graphs, and maps. All of this content, and the valuable insight that it represents, have established the report as a key and definitive resource on Internet connection speeds, broadband adoption, mobile usage, Internet outages, and attack traffic.

Over this last year, we have added additional information on IPv6 adoption, sourced from an ever-growing customer base that leverages Akamai's solutions to dual-stack their Web sites and applications. We also started to include insight into "situational performance," a term used to describe the challenges of optimizing both the desktop and mobile Web experience. The situational performance data presented within the report is derived from the Real User Monitoring component of Akamai's Aqua Ion solution, which passively gathers performance measurements from actual users of a Web site/application. The 2013 edition of the *State of the Internet Report* has also seen continued coverage of DDoS attacks reported by Akamai customers, as well as an ongoing exploration of significant targeted attack activity that took place in the relevant quarters.

Within the fourth quarter issue of the *State of the Internet Report* over the last several years, we have included a "Historical Lookback" section, including graphs highlighting long-term (full year or longer) trends across various metrics covered within the report, along with a discussion of those trends. This year, you'll find this historical insight on the Akamai blog as a series of posts that include interactive graphs. The blog posts can be found at *https://blogs.akamai.com/state-of-the-internet/*, and will cover topics including connection speeds, broadband adoption, IPv4 and IPv6, and attack traffic.

Finally, as you may be aware, Akamai completed the acquisition of Prolexic, a leader in DDoS mitigation services, in February 2014. Prolexic also published a quarterly report series, focused on DDoS attacks, as well as related trends and statistics. The most recent *Prolexic Quarterly Global DDoS Attack Report*, covering the first quarter of 2014, was recently published and is available for download at *http://www.prolexic.com/attack-reports.* We are very excited to announce that over the coming quarters, we will be working together to consolidate the *Prolexic Quarterly Global DDoS Attack Report* and Akamai's *State of the Internet Report,* with the goal of publishing a combined report that delivers an unparalleled level of insight into the Internet threat landscape. Watch this space, and follow @akamai_soti on Twitter for more information.

As always, if you have questions, comments, or suggestions regarding the *State of the Internet Report*, connect with us via e-mail at stateoftheinternet@akamai.com or on Twitter at @akamai_soti.



–David Belson

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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 issues, and IPv6 growth/transition progress, as well as traffic patterns across leading Web properties and digital media providers. Each quarter, Akamai publishes the *State of the Internet Report*.

This quarter's report includes data gathered from across the Akamai Intelligent Platform in the fourth quarter of 2013, covering attack traffic, Internet connection speeds and broadband adoption, and mobile connectivity, as well as trends seen in this data over time. In addition, this edition of the report includes insight into attacks generated by vulnerability scanning tools, the states of IPv4 exhaustion and IPv6 adoption, Internet disruptions that occurred during the quarter, and observations from Akamai partner Ericsson regarding data and voice traffic growth on mobile networks.

Security

During the fourth quarter of 2013, Akamai observed attack traffic originating from source IP addresses in 188 unique countries/regions. Note that our methodology captures the source IP address of an observed attack and cannot determine attribution of an attacker. China remained in the top slot, growing to 43% of observed attack traffic. The United States also saw significant growth in observed attack traffic, while Indonesia's contribution continued to decline after spiking earlier in the year. Overall attack traffic concentration across the top 10 countries/regions was up slightly from the third quarter, growing to 88% of observed attacks. Port 445 remained the most targeted port, growing once again and reaching 30% of observed attacks. The volume of attacks targeting Port 80 remained steady at 14%. During the fourth quarter, Akamai customers reported being targeted by 346 DDoS attacks, 23% more than in the prior quarter, and nearly 75% more than in the fourth quarter of 2012. Enterprise and Commerce customers together accounted for just under 70% of the reported attacks during the quarter, while just under half of the total attacks were reported by customers in the Americas. In addition, the fourth quarter saw the rise of a set of attacks in which the Skipfish and Vega Web application vulnerability scanners were used to target a variety of organizations, looking for Remote File Inclusion (RFI) vulnerabilities.

Internet and Broadband Adoption

In the fourth quarter, Akamai observed a 2.9% increase in the number of unique IPv4 addresses connecting to the Akamai Intelligent Platform, growing to just under 783 million, or about 22 million more than were seen in the third quarter of 2013. Looking at connection speeds, the global average connection speed grew 5.5% to 3.8 Mbps and the global average peak connection speed added an impressive 30%, ending 2013 at 23.2 Mbps. At a country/region level, South Korea continued to have the highest average connection speed at 21.9 Mbps, and Hong Kong continued to have the highest average peak connection speed at 68.0 Mbps. Globally, high broadband (>10 Mbps) adoption grew just 1.6%, remaining at 19%, and South Korea remained the country with the highest level of high broadband adoption, growing slightly to 71%. Global broadband (>4 Mbps) adoption grew 4.3% quarter-over-quarter to 55%, and South Korea inched ever closer to universal broadband, with a 94% adoption rate in the fourth quarter.

Mobile Connectivity

In the fourth quarter of 2013, average connection speeds on surveyed mobile network providers ranged from a high of 8.9 Mbps down to a low of 0.6 Mbps. Average peak connection speeds above 100 Mbps were observed at several providers, while 3.1 Mbps was the slowest seen. Based on traffic data collected by Ericsson, the volume of mobile data traffic increased by 70% from the fourth quarter of 2012 to the fourth quarter of 2013, and grew approximately 15% between the third and fourth quarters of 2013. Analysis of Akamai IO data collected across the fourth quarter from a sample of requests to the Akamai Intelligent Platform indicates that for traffic from mobile devices on cellular networks, Android Webkit accounted for approximately 35% of requests, with Apple Mobile Safari trailing at just over 29%. However, for traffic from mobile devices on all networks, Apple Mobile Safari was responsible for just over 47% of requests, while Android Webkit drove only 32% of requests.

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. Note that the originating country as identified by the source IP address is not attribution—for example, a criminal in Russia may be launching attacks from compromised systems in China. This section provides insight into port-level attack traffic, as observed and measured by Akamai, during the fourth quarter of 2013.

It also includes insight into DDoS attacks that targeted Akamai customers during the fourth quarter of 2013, as well as information about the rise of attacks powered by freely available Web application vulnerability scanning tools. Within this report, all representations represent our view of the best and most consistent ways of attributing attacks we have been seeing, based not only on published claims, but on analysis of the tools, tactics, and methods that tend to provide a consistent signature for different adversaries.

1.1 Attack Traffic, Top Originating Countries

During the fourth quarter of 2013, Akamai observed attack traffic originating from 188 unique countries/regions, up three from the third quarter. As shown in Figure 1, China remained squarely in first place, responsible for 43% of observed attacks, more than double the percentage seen from the United States. After vaulting to the top of the list earlier in 2013, Indonesia's share of observed attack traffic continued to decline in the fourth quarter, falling to 5.7%, or almost a quarter of third-quarter volume. However, in contrast, Canada saw massive growth in the percentage of attacks observed to be originating from the country, growing 25x quarter-over-quarter to 10%. As previously mentioned, China also saw a quarterly increase, as did the United States and the Netherlands. Quarterly declines in observed attack traffic percentages among the top 10 countries/regions were seen in Indonesia (as mentioned above), as well as Taiwan, Russia, Brazil, Romania, and Germany. The overall concentration of attacks increased as compared to the third quarter, with the top 10 countries/regions originating 88% of observed attacks, up from 83% in the prior quarter.

Responsible for just over 56% of observed attacks, the Asia Pacific region continued to originate more observed attack traffic than any other region. However, over three-quarters of the attacks from the region originated in China in the fourth quarter. Asia Pacific regional concentration continued its quarterly decline, down from 68% in the third quarter, and 79% in the second quarter. However, related to the large increases seen in the United States and Canada, North America and South America originated 32% of observed attacks, while Europe's contribution dropped to just over 11%, down from over 13% last quarter. Africa's share of attacks remained consistent at 0.4% in the fourth quarter.

	Country/Region	Q4 '13 Traffic %	Q3 '13 %
1	China	43%	35%
2	United States	19%	11%
3	Canada	10%	0.4%
4	Indonesia	5.7%	20%
5	Taiwan	3.4%	5.2%
6	Netherlands	2.7%	0.5%
7	Russia	1.5%	2.6%
8	Brazil	1.1%	2.1%
9	Romania	0.9%	1.7%
10	Germany	0.8%	0.9%
–	Other	12%	17%

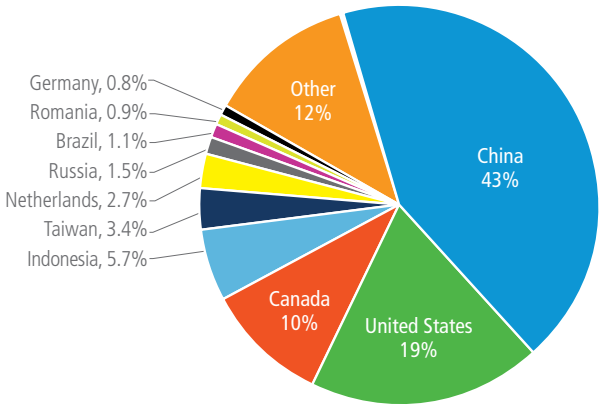

Figure 1: Attack Traffic, Top Originating Countries (by source IP address, not attribution)

Port	Port Use	Q4 '13 Traffic %	Q3 '13 %
445	Microsoft-DS	30%	23%
80	WWW (HTTP)	14%	14%
443	SSL (HTTPS)	8.2%	13%
1433	Microsoft SQL Server	4.9%	8.6%
3389	Microsoft Terminal Services	4.9%	5.1%
22	SSH	3.6%	2.2%
23	Telnet	3.0%	3.8%
8080	HTTP Alternate	2.7%	2.0%
135	Microsoft-RPC	2.0%	2.8%
4899	Remote Administrator	1.3%	1.1%
Various	Other	25%	–

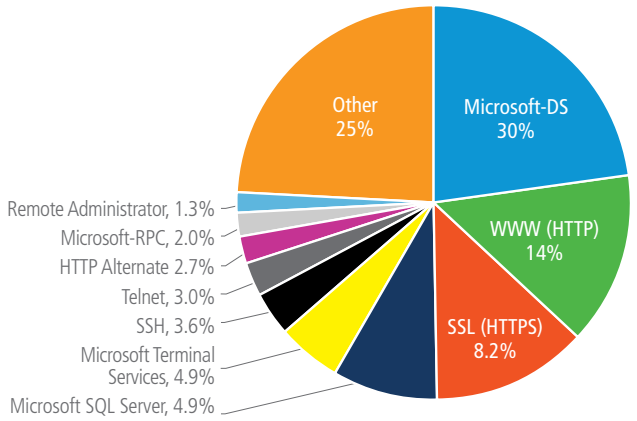

Figure 2: Attack Traffic, Top Ports

1.2 Attack Traffic, Top Ports

As shown in Figure 2, Port 445 (Microsoft-DS) remained the most targeted port in the fourth quarter, growing to 30% of observed attacks. After leading the list earlier in the year, Port 80 (WWW/HTTP) remained in second place, with the volume of attacks targeting the port remaining consistent quarter-over-quarter at 14%. However, attack volume targeting Port 443 (SSL/HTTPS) dropped sharply in the fourth quarter, after tracking close behind Port 80 in the third quarter. Nine of the top 10 ports remained consistent from the third quarter, with Port 1998 (Cisco X.25 Over TCP) dropping off, replaced by Port 4899 (Remote Administrator), which has frequently appeared among the top 10 in the past. Overall, the concentration of attacks among the top 10 ports remained fairly close to the prior quarter, dropping from 76% to 75% in the fourth quarter.

As the most targeted port overall in the fourth quarter, Port 445 was the top target port in six of the top 10 countries/regions—Germany, Romania, Russia, Taiwan, Canada, and the United States. In Russia, it was targeted more than 15x more frequently than the next most targeted port (Port 80), while in Romania, the difference was even higher, at 30x the next most targeted port (also Port 80). In addition to Russia and Romania, Port 80 was also the second-most targeted port for observed attacks originating from the United States, Canada, Indonesia, and Germany, indicating that Web-based attack vectors remain extremely popular. Within China, Port 1433 remained the top target of attacks observed to originate in that country, with 1.5x as many attacks targeting that port as Port 3389, which remained the second most targeted port for the country.

1.3 Observations on DDoS Attacks

Akamai has been analyzing Distributed Denial of Service (DDoS) attacks aimed at our customers for *the State of the Internet Report* since the end of 2012. The Akamai Intelligent Platform is a massively distributed network of servers that is designed to serve Internet traffic from as close to the end user as possible. Part of the value of the Akamai platform is its ability to enable our clients to deal with the sudden spikes in Web site requests, such as during holiday sales or flash crowds created by news events. Malicious traffic often attempts to overload sites by mimicking this type of occurrence, and the difference is often only distinguishable through human analysis and intervention. Akamai combats these attacks by serving the traffic for the customer while the analysis is being performed, and creating specific Web Application Firewall (WAF) rules or implementing other protections such as blocking specific regions or IP address ranges as necessary.

An additional benefit of the Akamai Intelligent Platform is that some of the most common methodologies that are used in DDoS attacks are simply ignored. Attacks that target the lower levels of the TCP/IP stack, such as UDP floods and SYN floods, hit the edge of the Akamai platform and are dropped. Specifically, Layer 1–4 traffic does not contain the information needed by Akamai to route it to a specific customer and is automatically assumed to be either malicious or malformed traffic.

The vast majority of the attacks that Akamai discusses in this section are based on traffic in layers 5–7 of the TCP stack, such as volumetric attacks like HTTP GET floods and repeated file

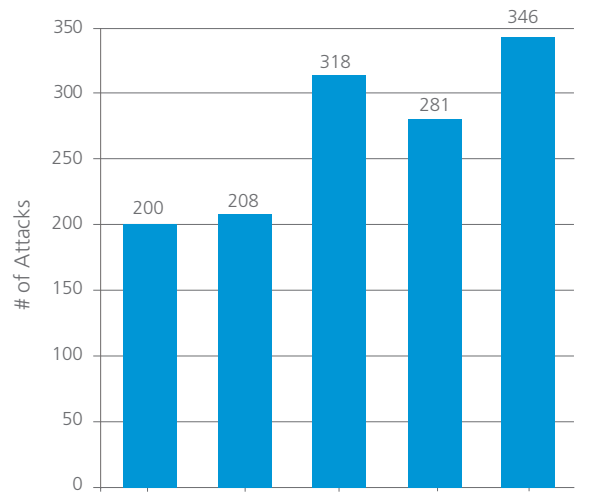

Figure 3: DDoS Attacks Reported by Akamai Customers by Quarter

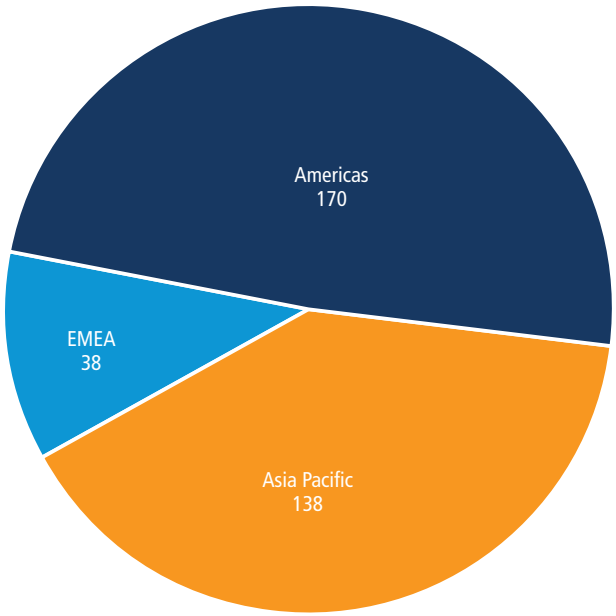

Figure 4: Q4 2013 DDoS Attacks by Region

downloads, or application and logical layer attacks, which require much less traffic to be effective. These statistics are based on the higher level attacks reported by our customers.

In the fourth quarter of 2013, the number of attacks reported to Akamai resumed the growth seen early in the year, with 346 attacks seen in the quarter, for a total of 1,153 attacks reported across the entirety of 2013. As shown in Figure 3, this marks a 23% quarter-over-quarter increase between the third and fourth quarters of the year, and a 50% increase in the number of attacks from 2012 to 2013. If this trend continues, Akamai is likely to see in excess of 380 attacks in the first quarter of 2014, and at least 1,700 attacks in total in 2014.

Much of the growth in attacks reported in the fourth quarter of 2013 can be traced to the Asia Pacific region, in large part due to a series of attacks against sites in Singapore that occurred after the government there enacted an Internet licensing framework. This framework would require some sites to register themselves if they have more than 50,000 unique visitors, and the requirement was met with extreme resistance from Internet activists. Figure 4 shows that the number of DDoS attacks within the region nearly doubled from the previous quarter, jumping from 71 attacks to 138 attacks, a 94% increase. The Americas saw a modest increase (3%) over the third quarter, with 170 attacks, while the EMEA region saw its attack count recede slightly in the fourth quarter, to 38 reported attacks.

In looking at full year 2013, as shown in Figure 5, the Americas saw the majority (58%) of the attacks around the globe, with 671 attacks reported by customers in North and South America. Customers in the Asia Pacific region suffered from 315 attacks in 2013, or slightly over 27% of all attacks worldwide. While EMEA continues to see a steady stream of attacks, it accounted for 14%, or 167, of all reported attacks in 2013.

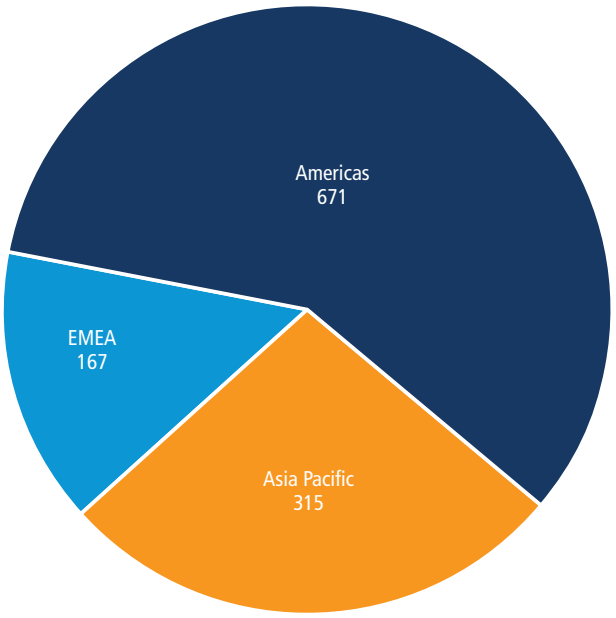

Figure 5: Full Year 2013 DDoS Attacks by Region

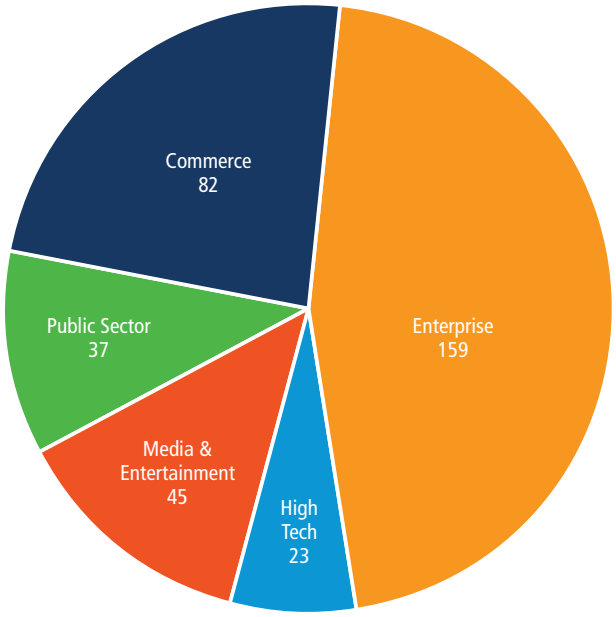

Figure 6: Q4 2013 DDoS Attacks by Sector

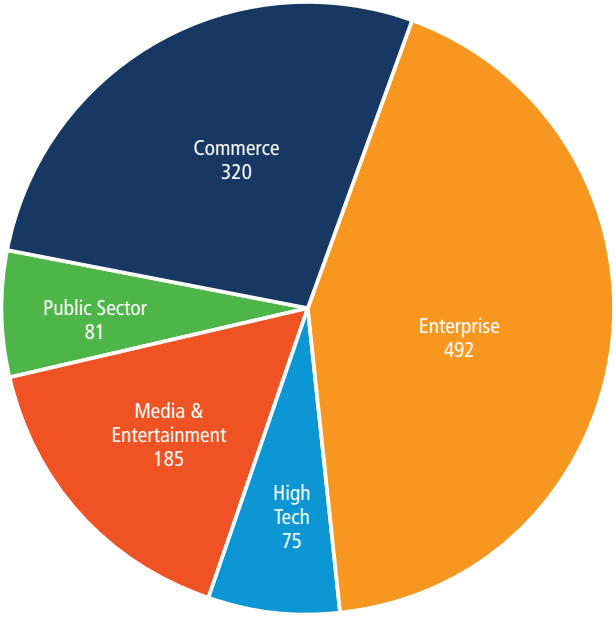

Figure 7: Full Year 2013 Attacks by Sector

The distribution of attacks by industry shifted slightly in the fourth quarter in response to the attacks in Singapore, with Public Sector and Enterprise targets accounting for the majority of the increase in attacks. Figure 6 shows that as in previous quarters, Enterprise and Commerce targets received a significant majority (70%) of all attacks. Media & Entertainment and High Tech targets maintained their role as a small but significant proportion of the attacks in this quarter. In looking at Figure 7, we can see that these ratios have held relatively unchanged throughout 2013, and are not likely to experience a large shift unless there is a significant event drawing attackers to a specific industry in the future.

In the *Third Quarter, 2013 State of the Internet Report*, Akamai started looking at the probability of a company coming under subsequent attacks after it suffered an initial DDoS attack. In the third quarter, this likelihood turned out to be nearly a one in four chance. In the fourth quarter of 2013, Akamai saw the probability of a repeated attack increase significantly; there were a total of 162 unique targets in the quarter, with 56 organizations suffering from repeated attacks. This means that any target that experienced a DDoS attack had slightly more than a one in three chance (35%) of being attacked again in the same quarter. In looking at the full year 2013, the chances of a repeated attack increase a negligible amount, just over a 1% greater chance than in the fourth quarter.

In total, 177 organizations faced repeated attacks in 2013, as Figure 8 illustrates. Nearly half of them, 85, only suffered a second attack, but 69 faced three-to-five attacks each, 10 faced six-to-10 attacks, 12 dealt with between 11 and 20 attacks throughout the year, and one organization was attacked nearly every other day throughout the entire year. Whatever their motivations, attackers who use DDoS as their tool of choice show little compunction against repeatedly attacking the same targets.

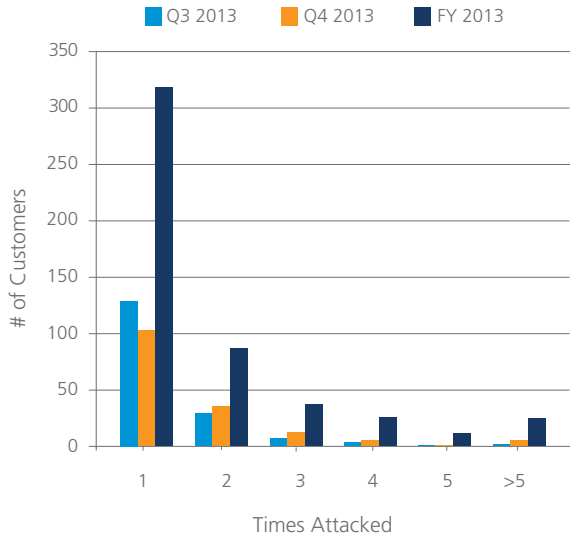

Figure 8: Frequency of Repeated DDoS Attacks

The fourth quarter of 2013 saw a significant increase in DDoS attacks over the third quarter, consistent with earlier projections that such attacks would continue to grow quarter-over-quarter at a rate of approximately 10%. This makes it likely that 2014 will see over 1700 reported attacks. It appears that some of this growth is dependent upon specific events, but those are not the only impetus for growth.

1.4 Skipfish, Vega Used for Massive RFI Scanning

The fourth quarter of 2013 saw the rise of a set of attacks in which Web application vulnerability scanners were used to target a variety of organizations. During the final month of the fourth quarter, Akamai's Computer Security Incident Response Team (CSIRT) team began tracking a series of attacks against the financial services industry in which attackers exploited the Skipfish and Vega Web application vulnerability scanners to probe defenses of target Web sites.

Skipfish and Vega are freely downloadable automated Web application vulnerability scanners—Skipfish is available at Google's Code Web site[1] and Vega is available from Subgraph.[2] These scanners are intended for security professionals to evaluate the security profile of their own Web sites. While Skipfish was built and is maintained by independent developers, and not Google, the source code is hosted on Google's downloads site and Google's Information Security engineering team is mentioned in the Skipfish project's acknowledgements. Vega is a Java application that runs on Linux, Apple OS X and Microsoft Windows. The most recent release of Skipfish was December 2012, and Vega was August 2013.

Akamai observed these scanners attacking financial sites looking for Remote File Inclusion (RFI) vulnerabilities with the specific string *www.google.com/humans.txt* within the requested URL. An RFI vulnerability is created when a site accepts a URL from another domain and loads its contents within the site. This can happen when a site owner wants content from one site to be displayed on its own site, but fails to validate which URL is allowed to load. If a malicious URL can be loaded into a site, an attacker can trick a user into believing they are using a valid and trusted site. The site visitor may then inadvertently give sensitive and personal information to the attacker.

Further inspection revealed that the observed attacks were part of a much larger attack. Over a two-week period, Akamai researchers discovered more than two million RFI attack attempts, targeting mostly PHP applications. Figure 9 depicts the distribution of attacks per hour.

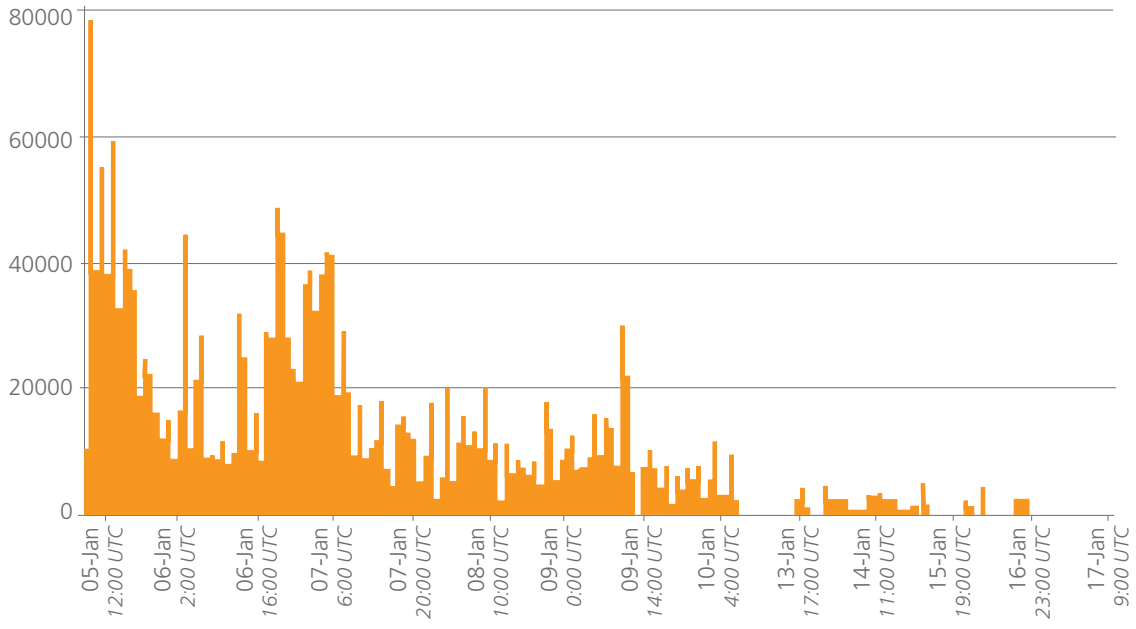

Figure 9: Number of Attacks per Hour

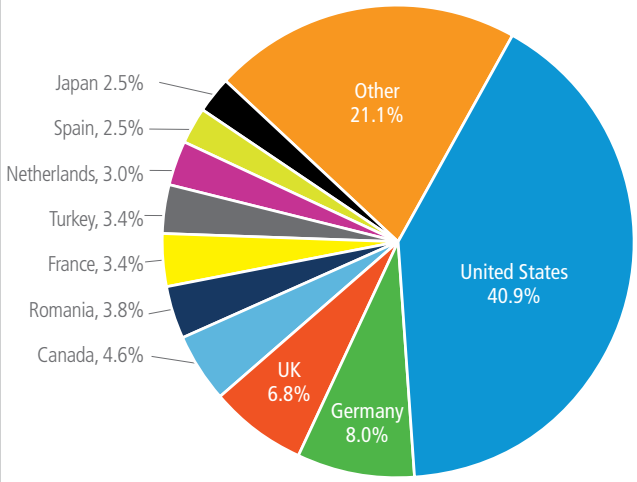

Figure 10: Distribution of Attackers per County

Data showed that at its peak, 80,000 attacks were launched per hour. In total, Akamai saw 237 unique attackers during the two-week period, with the majority of attacks originating in the United States, as shown in Figure 10.

In addition, researchers saw that the most "active" attacker performed attacks against 86 different Web sites, and sent more than 73,000 attacks. On average, an attacker targeted 10 Web sites, and launched over 8,700 attacks.

When closely inspecting the top attack source IP addresses, Akamai researchers discovered that most of them were associated with Web servers and appeared to belong to Web hosting providers running the cPanel management application. Using Web servers for launching massive scale attacks is becoming of choice approach for hackers who are looking for high bandwidth.

Depending on the attacker and target application, the attack itself seemed to look for 2,000 to 2,500 different known RFI attacks, mostly in PHP applications. Akamai's data also shows that when the Web server failed to respond according to the scanner's expected behavior (e.g. HTTP authentication was required or an HTTP 5XX error was raised), scanning activity stopped after only a few attempts.

During the two-week period, over 1800 Web sites were attacked. Figure 11 shows the number of target sites attacked per day, clearly demonstrating how the attacks subsided over time.

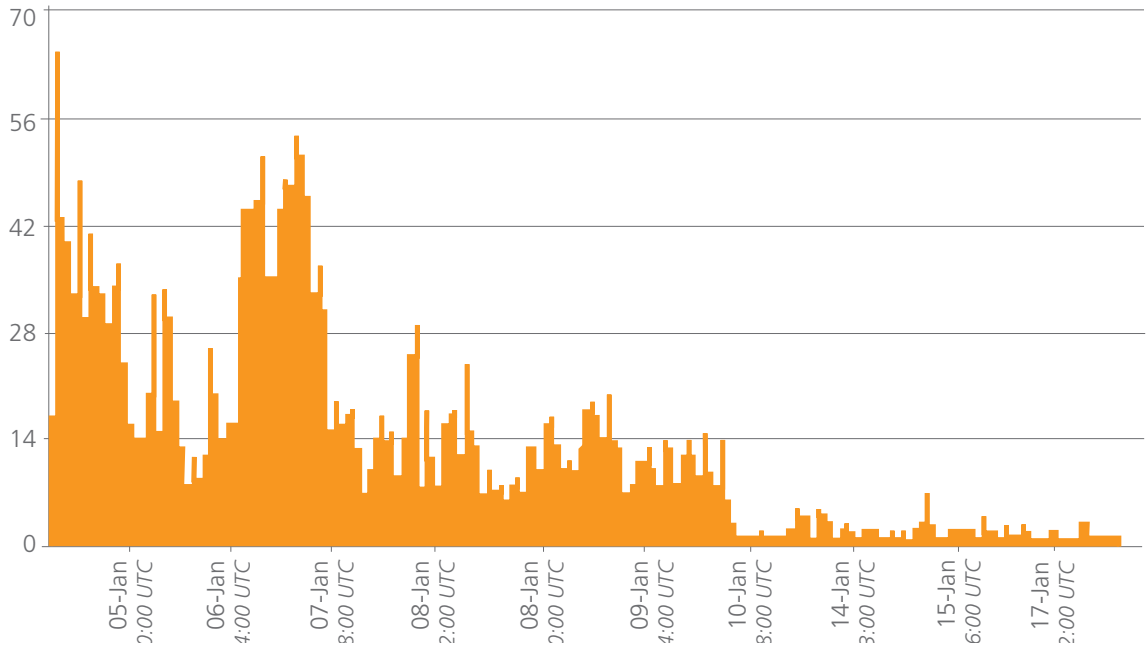

Figure 11: Number of Target Sites per Hour

It is clear from the top-level domains of the sites that attackers were not only interested in .com Web sites but also targeted government and military Web properties, as the distribution in Figure 12 demonstrates.

Of the more than two million attacks registered during the sample period, more than 99% of HTTP requests were extremely basic and stripped of almost all HTTP headers except the mandatory 'Host' header - this leads us to believe that a very rudimentary script performed the attacks, since sophisticated scanners usually perform more deep crawling and usually support cookie-setting and session token refresh and will submit more HTTP headers in order to mimic browser interaction. The attacks sent by the script used the following HTTP request format:

GET /page.php?param=http://www.google.com/humans.txt HTTP/1.0
Host: www.target.site

The '/page.php' component of the URL is representative of the 2,000 to 2,500 unique attack paths and 'param' represents the name of the injected parameter. Having the injected resource location always point to a known file on Google.com might be an attempt to bypass Web application firewalls and anti-malware protections.

Akamai's data showed that each scanning instance did not concurrently scan multiple target hosts but rather focused on a single target and then went on to the next. This behavior might be driven by the attack orchestrator's desire to "stay under the radar" and to avoid drawing the attention of the legitimate owner of each Web server used for running the attacks. It may also hint on the unsophisticated nature of the script itself. In addition, based on the fact that the same target hosts were scanned multiple times by different attack sources, at different times, we conclude that different scanning instances (i.e. the bots in the botnet) were not well synchronized, or possibly not synchronized at all.

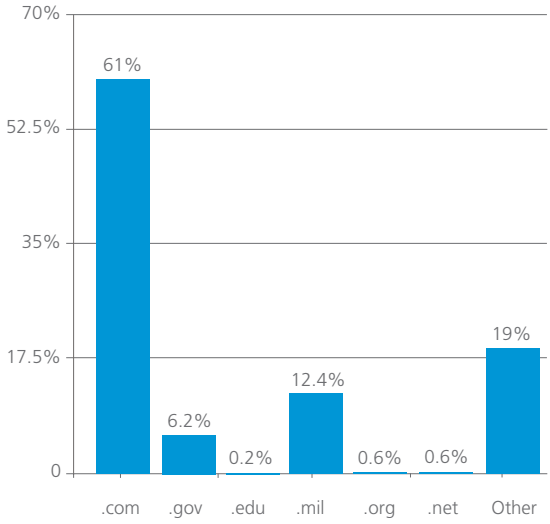

Figure 12: Target Distribution by Top-Level Domain

Looking at a sample of the top-attacking sources, Akamai researchers did not find any other kind of activity such as reconnaissance gathering or site crawling/indexing from these sources in the month prior to the attack, leading them to conclude that the scanning activity was performed by dedicated machines that were operated for the sole purpose of widely scanning for PHP RFI vulnerabilities.

The vulnerabilities being sought included both known issues that were recently published, as well as issues that were reported many years ago—for example, the 'In-Link ADODB Remote File Inclusion',[3] which was published back in 2006. This, in conjunction with the tremendous scale of the attack, likely points to a crude brute-force attempt to massively harvest any kind of server for the purpose of building a bot network by breaking into as many machines as possible in a short period of time.

Internet Penetration

2.1 Unique IPv4 Addresses

Through its globally-deployed Intelligent Platform, and by virtue of the approximately two trillion requests for Web content that it serves on a daily basis, Akamai has unique visibility into levels of Internet penetration around the world. In the fourth quarter of 2013, over 780 million IPv4 addresses, from 238 unique countries/regions, connected to the Akamai Intelligent Platform—nearly 3% more than in the third quarter, and 10% more than in the fourth quarter of 2012. Although we saw more than 780 million unique IPv4 addresses, Akamai believes that this represents well over one billion Web users. 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; in other cases, 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 13, the global number of unique IPv4 addresses seen by Akamai grew by nearly 22 million quarter-over-quarter. Quarterly growth was also seen in eight of the top 10 countries/regions, with the greatest increase once again seen in Brazil, which added nearly 8% (or approximately 2.7 million IPv4 addresses). Just two countries (South Korea and the United Kingdom) saw IPv4 address counts decline quarter-over-quarter, but the losses were fairly minimal and were likely due to updates to the underlying database used by Akamai for IP address geolocation. In other words, given prior trends, it is unlikely that these losses represent a reduction in Internet penetration/usage in these countries. Looking at the full set of global countries/regions, nearly 68% of them saw a quarterly increase in unique IPv4 address counts, with 37 countries/regions growing 10% or more. Of the 29% of countries/regions that saw unique IPv4 address counts decline, just 11 countries/regions lost 10% or more from the third quarter. Eight countries/regions saw no change from the prior quarter.

	Country/Region	Q4 '13 Unique IPv4 Addresses	QoQ Change	YoY Change
–	Global	782,939,383	2.9%	10%
1	United States	164,904,690	4.0%	15%
2	China	120,626,188	4.6%	15%
3	Japan	40,370,608	0.9%	-2.4%
4	Germany	37,178,908	1.1%	-1.1%
5	Brazil	37,012,238	7.9%	47%
6	United Kingdom	28,679,676	-1.6%	3.9%
7	France	27,772,161	2.2%	4.9%
8	South Korea	20,382,592	-3.7%	-2.5%
9	Italy	19,815,167	3.3%	-0.5%
10	Russia	18,369,348	4.4%	3.8%

Figure 13: Unique IPv4 Addresses Seen by Akamai

Looking at year-over-year changes, Brazil, China, and the United States saw the most aggressive growth rates as compared to the fourth quarter of 2012, with unique IPv4 address counts increasing a whopping 47% in Brazil, and 15% in both the United States and China. According to a report published[4] by Cisco and the International Telecommunications Union, after the finalization of Brazil's National Broadband Plan in 2010, infrastructure deployment has accelerated, leading to broader availability of both fixed and mobile broadband services, which may be a driver of the significant growth in the IPv4 address counts seen from the country over the last year. In addition, the report notes that legislation provided a tax exemption on smartphone handsets, and that an entry-level tax-exempt fixed and mobile broadband service plan is now available from all major telecom operators. These factors also likely drove increased Internet adoption in Brazil. On a global basis, nearly 74% of countries/regions around the world had higher unique IPv4 address counts year-over-year, with growth rates above 100% seen in eight countries.

2.2 IPv4 Exhaustion

The overall pool of available IPv4 address space continued to shrink in the fourth quarter of 2013, as Regional Internet Registries (RIRs) allocated/assigned blocks of IPv4 address space to organizations within their respective territories.[5] In the Americas, this ongoing delegation of address space further depleted ARIN's IPv4 free pool, as it announced at the end of the quarter that it had reached just 1.5 "/8s" (blocks of ~16.7 million IPv4 addresses) of available space in its inventory.[6] Leveraging data[7] collected by Geoff Huston,[8] Chief Scientist at APNIC, the *State of the Internet Report* provides a perspective on the size of the available IPv4 address pool at each RIR, and how the sizes of the available pools are shrinking over time. In addition, the report also uses data published by the RIRs to highlight IPv4 address space assignment/allocation activity by the individual RIRs over the course of the quarter.

Figure 14 illustrates the data provided by Mr. Huston, showing how the size of the available IPv4 address pools at each of the RIRs changed during the fourth quarter of 2013. As expected, depletion at both APNIC and RIPE was minimal in comparison to the other RIRs, as both are delegating from their final "/8" blocks of IPv4 address space. During the quarter, APNIC delegated just under 300,000 IPv4 addresses, or 2.1% of its available pool space, while RIPE delegated just over 570,000 IPv4 addresses, or 3.8% of its available pool space. AFRINIC was the next most active RIR, delegating just over three million IPv4 addresses, amounting to 5.1% of its available pool space. ARIN ended the quarter with just under 25 million available IPv4 addresses, after having delegated over 7.6 million, or 23.5%, of them during the quarter. LACNIC saw the most activity during the quarter, delegating nearly 30%, of its available pool, amounting to just over nine million IPv4 addresses.

Figure 15 illustrates the IPv4 allocation/assignment activity across each of the RIRs during the fourth quarter. In line with the "austerity" rules in place at the European and Asia Pacific RIRs, activity within RIPE and APNIC was slow and steady during the quarter. Close inspection of the activity at RIPE indicates that the largest single assignment made during the quarter was a "/16" (65,536 IPv4 addresses), but the associated WHOIS information[9] does not indicate to whom the block of addresses was assigned. At AFRINIC, the two most active days were November 18 and December 23. On the former day, a number of large allocations were made, the largest of which were a "/12" (1,048,576 IPv4 addresses) to Telecom Algeria[10] and a "/14" (262,144 IPv4 addresses) to Telkom SA Ltd,[11] a South African telecommunications provider. On the latter day, a "/12" allocation was made to Etisalat,[12] a leading Middle East telecommunications operator. Delegation activity at LACNIC again showed a stairstep-type pattern during the fourth quarter. Large swaths of address space, in the form of multiple "/14" blocks, were allocated on October 23 and 24, November 14 and 18, and December 16. In addition, a "/12" block was allocated to Colombian provider Comcel S.A.[13] on November 27, and a "/13" (524,288 IPv4 addresses) was allocated to Colombia Móvil[14] on December 17. The most active day at ARIN was clearly November 25. On that day, a "/13" and two "/12" blocks of addresses[15,16,17] were allocated to Amazon Technologies Inc.

2.3 IPv6 Adoption

Starting with the *Third Quarter, 2013 State of the Internet Report,* Akamai began including insight into IPv6 adoption across a number of vectors based on data gathered across the

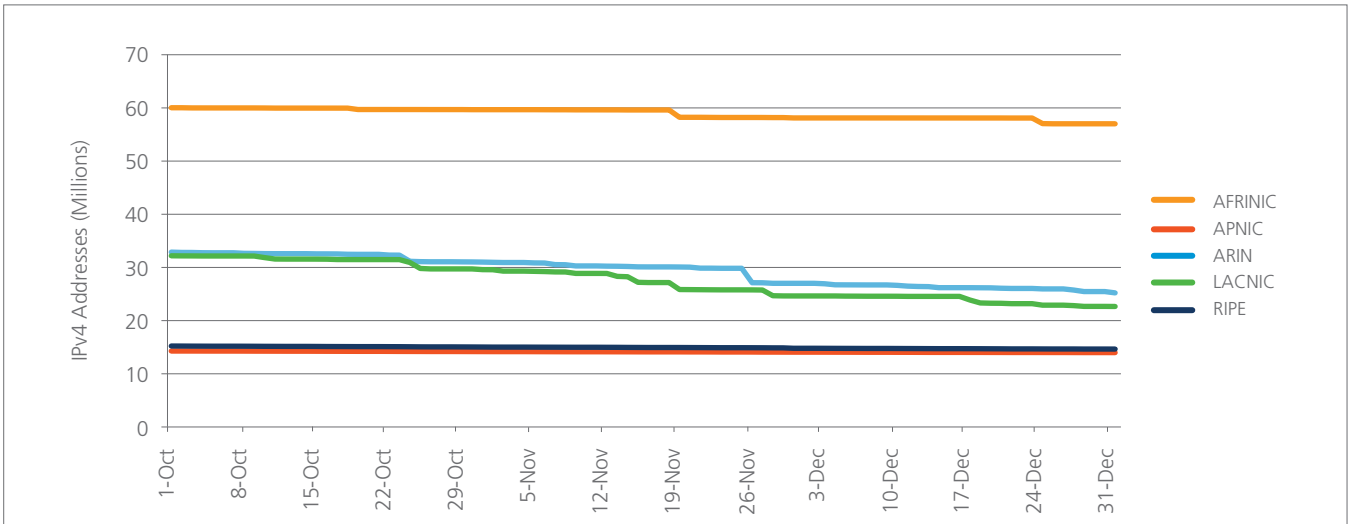

Figure 14: Available IPv4 Address Pool Size by RIR, Q4 2013

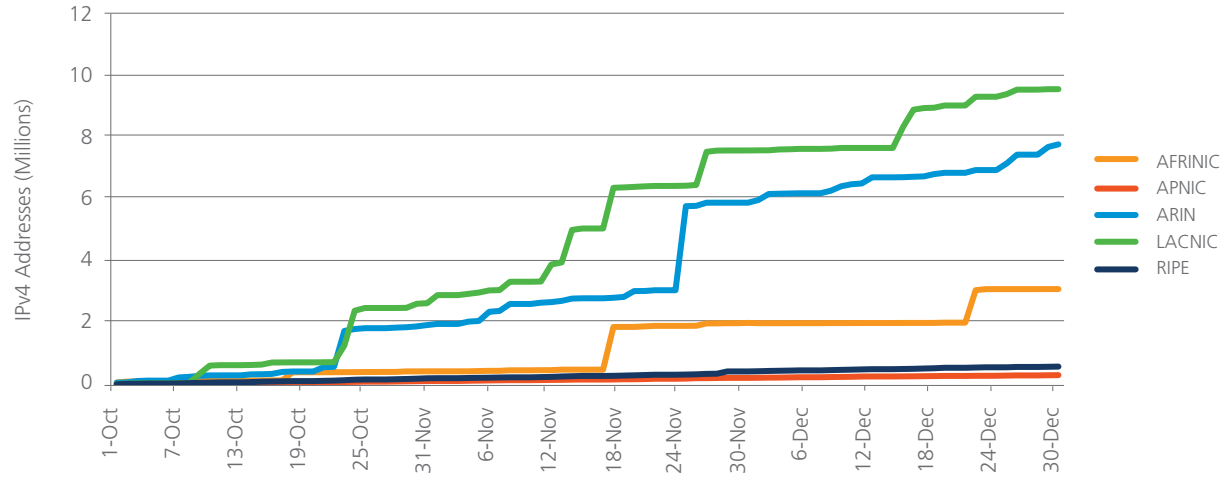

Figure 15: Total Number of IPv4 Addresses Assigned/Allocated by RIR, Q4 2013

Akamai Intelligent Platform. The traffic percentages cited in Figure 16, Figure 17, and Figure 18 are calculated by dividing the number of content requests made to Akamai over IPv6 by the total number of requests made to Akamai (over both IPv4 and IPv6) for customer Web properties that have enabled Akamai edge delivery via IPv6—in other words, for dual-stacked hostnames. As explained in last quarter's report, this reporting methodology provides something of a lower bound for IPv6 adoption, as some dual-stacked clients, such as Safari on Apple's Mac OS X Lion and Mountain Lion will only use IPv6 for a portion of possible requests.[18] While not all of Akamai's customers have yet chosen to enable IPv6 delivery, the data set used for this section includes traffic from a number of leading Web properties and software providers, so we believe that it is sufficiently representative. Note that in compiling the data for the figures in this section, a minimum of 90 million total requests to Akamai during the fourth quarter was required to qualify for inclusion.

Figure 16 provides insight into the countries/regions that had the largest percentage of content requests made to Akamai over IPv6 during the fourth quarter. Consistent with the observations made in the third quarter, the United States and select European countries continue to lead the world in terms of IPv6 adoption, with Europe again having seven of the top 10 countries. Japan remained the only Asia Pacific country within the top 10, while Peru was the only country from South America to make the list. As we noted last quarter, we expect to see IPv6 adoption increase over time, and the quarter-over-quarter changes seen highlight that growth across most of the countries in the top 10. Double-digit percentage growth rates were seen in eight of the top 10 countries, with Peru and Germany seeing the largest increases, at 41% and 43% respectively. The lowest rate of growth was seen in Romania,

	Country/Region	Q4'13 IPv6 Traffic %	QoQ Change
1	Switzerland	9.3%	33%
2	Romania	7.9%	7.8%
3	Luxembourg	6.7%	35%
4	Germany	5.8%	43%
5	Peru	5.5%	41%
6	United States	5.2%	25%
7	Belgium	4.7%	23%
8	France	4.5%	-11%
9	Ireland	4.3%	14%
10	Japan	2.2%	11%

Figure 16: IPv6 Traffic Percentage, Top Countries/Regions

which grew nearly 8% quarter-over-quarter. The only quarterly decline was seen in France, but it is worth noting that the number of IPv4 requests from the country increased by 21% during the fourth quarter, while IPv6 requests increased by only 7%. So while the ratio indicates a decline in the percentage of IPv6 traffic, the number of IPv6 requests grew quarter-over-quarter, which is encouraging.

Colleges and universities remain early adopters of IPv6, with moderate to large quarterly increases seen across most of the top 10, as shown in Figure 17. The largest increases were seen at Iowa State, the University of Vienna Austria, and the University of Saskatchewan, which all saw double-digit quarterly percentage increases. In contrast, Brno University of Technology and Rensselaer Polytechnic Institute both saw nominal quarterly declines, but this is likely due to an imbalance in the growth rates of IPv4 requests to Akamai as compared to IPv6 requests to Akamai, similar to the situation described above that was observed in France. Interestingly, North American institutions of higher learning dominated the top 10 list, with only two European universities in the group. The University of Hong Kong and Curtin University in Australia had the highest levels of IPv6 adoption among schools in the Asia Pacific region, at 38% and 25% respectively. The Universidade Federal de São Carlos in Brazil had 26% of its requests to Akamai over IPv6 in the fourth quarter, ranking it as the school with the highest level of IPv6 adoption in South America.

	College/University	Q4'13 IPv6 Traffic %	QoQ Change
1	Gustavus Adolphus College (U.S.)	67%	3.5%
2	Brno University of Technology (Czech Republic)	66%	-0.2%
3	Iowa State University (U.S.)	53%	50%
4	University of Saskatchewan (Canada)	52%	17%
5	University of Waterloo (Canada)	51%	6.8%
6	Virginia Tech (U.S.)	48%	1.0%
7	Marist College (U.S.)	46%	2.0%
8	Rensselaer Polytechnic Institute (U.S.)	44%	-8.6%
9	University of Vienna Austria (Austria)	43%	30%
10	University of Vermont (U.S.)	41%	3.8%

Figure 17: IPv6 Traffic Percentage, Top Colleges/Universities

Network Provider	Q4'13 IPv6 Traffic %	QoQ Change
Google Fiber (U.S.)	54%	6.4%
Verizon Wireless (U.S.)	41%	5.1%
Brutele (Belgium)	26%	-13%
Proxad/Free (France)	19%	-5.9%
RCS & RDS (Romania)	18%	7.1%
Swisscom (Switzerland)	21%	30%
KDDI (Japan)	11%	19%
AT&T (U.S.)	9.1%	11%
Comcast (U.S.)	10%	49%
Deutsche Telekom (Germany)	6.8%	37%
Telefónica Perú (Peru)	6.3%	52%
Time Warner Cable (U.S.)	2.9%	56%

Figure 18: IPv6 Traffic Percentage, Selected Networks

Figure 18 shows IPv6 traffic percentages across a selected set of network providers and is not intended to represent an absolute ranking of such providers. The selection criteria for inclusion were described in Section 2.3 of the *Third Quarter, 2013 State of the Internet Report*, and the list will likely evolve in future issues of the report to include a ranking of top network providers in major geographies around the world. As the figure shows, Google Fiber remains the only network provider where more than half of the requests to Akamai during the fourth quarter came in over IPv6, with a 6.4% quarter-over-quarter increase. Strong quarterly increases were also seen across the other selected network providers in the United States, including a 56% increase at Time Warner cable and a 49% increase at Comcast. Measurements published[19] in November by the Internet Society support these observed fourth quarter growth rates, while Comcast also announced[20] in November that "Today, over 25% (and growing) of Comcast's Xfinity Internet customers are actively provisioned with native dual stack broadband Internet service. Native IPv6 support has been deployed to over 75% of our broadband network, and our goal is 100% in early 2014." Strong quarterly increases were also seen in Europe at Swisscom and Deutsche Telekom, as well as at KDDI in Japan and at Telefónica Perú.

Since mid-2012, the *State of the Internet Report* has also been tracking IPv6 traffic levels on the Akamai Intelligent Platform. The graph in Figure 19 is based on data taken from *http://www.akamai.com/IPv6,* (which provides both rolling 24-hour and historical views of IPv6 request volume seen by Akamai in hits/second) and shows peak traffic volume on a daily basis across the fourth quarter of 2013. Looking at IPv6 traffic levels over the course of the quarter, we see two cycles. Traffic volume grew slightly during the first half of October, but then retreated to starting levels by the end of the month. Another increase starts in mid-November, but then receded during the week before Christmas. This second November/December cycle aligns well with the holiday shopping season, possibly indicating that more retailers are IPv6-enabling their e-commerce sites and that more consumers are shopping online with IPv6-enabled devices. The post-Christmas increase in IPv6 traffic volume appears to have continued into 2014. For the first time, the figure also shows the total number of IPv6 requests per day seen by Akamai over the course of the quarter. As seen in the figure, this metric aligns fairly closely with the peak daily hits/second metric. This metric also saw a sharp decline the week before Christmas, indicating a lower total IPv6 traffic volume heading into the holiday.

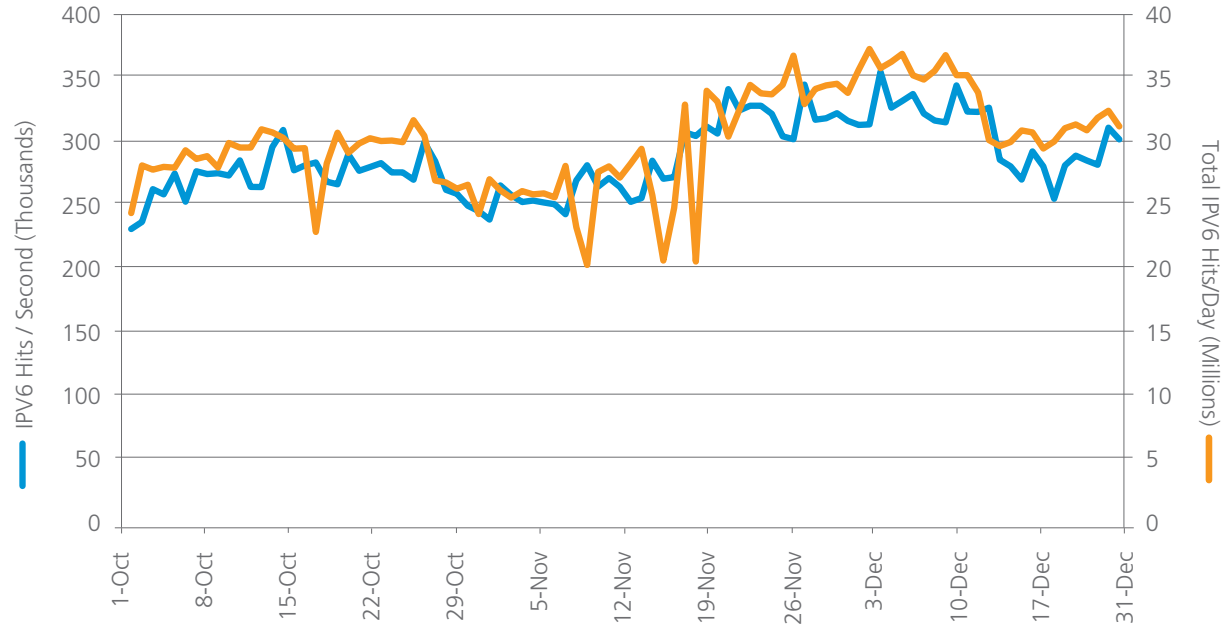

Figure 19: IPv6 Traffic to the Akamai Intelligent Platform, Q4 2013

SECTION 3:
Geography – Global

The data presented within this section was collected during the fourth quarter of 2013 through Akamai's globally-deployed Intelligent Platform and includes all countries that had more than 25,000 unique IP addresses make requests for content to Akamai during the quarter. For the purposes of classification within this report, the "high broadband" data included below is for connections to Akamai at speeds greater than 10 Mbps, and "broadband" is for connections of 4 Mbps or greater.

In addition to providing insight into high broadband and broadband adoption levels, the report also includes data on average and average peak connection speeds the latter provides insight into the peak speeds that users can likely expect from their Internet connections. (See the blog post at *https://blogs.akamai.com/2013/04/clarifying-state-of-the-internet-report-metrics.html* for more information on how these metrics are calculated.)

Finally, traffic from known mobile networks is 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, as well as subsequent regional "Geography" sections.

3.1 Global Average Connection Speeds

The global average connection speed ended the year with another increase, reaching 3.8 Mbps in the fourth quarter with 5.5% quarterly growth. However, quarterly growth was not seen across all of the countries/regions among the top 10. Half of the listed countries did see increases in the fourth quarter, ranging from just 0.7% in the Czech Republic to 13% in Sweden. The other half of the listed countries saw nominal declines quarter-over-quarter, ranging from a loss of 0.7% in the Netherlands to a drop of 6.7% in Latvia. However, the increases seen in Ireland and the United States helped push both countries to average connection speeds of 10 Mbps or more, marking the first time that all of the top 10 countries/regions had average connection speeds at/above the "high broadband" threshold. At the end of 2012, only South Korea and Japan could make that claim, with Finland's 7.1 Mbps average connection speed rounding out the top 10. Globally, a total of 78 qualifying countries/regions saw average connection speeds grow in the fourth quarter, ranging from an increase of just 0.2% in Brazil (to 2.7 Mbps) to a 50% increase in Kenya (to 1.9 Mbps). Sixty-one qualifying countries/regions saw quarterly declines in average connection speed, with losses ranging from just 0.1% in the Dominican Republic and Oman (to 1.8 Mbps and 2.0 Mbps respectively) to a drop of 24% in Tanzania (to 1.0 Mbps).

Long-term trends remained extremely positive among the top 10 in the fourth quarter, with all of the listed countries/regions seeing strong year-over-year increases. At a global level, the average connection speed was 27% higher than at the end of 2012. Yearly growth of over 50% was seen in South Korea, which was up 57%, and in Ireland, which was up 59%. The smallest yearly increase among the top 10 was seen in Latvia, which added 11% during the course of 2013. Very strong long-term growth was also seen around the world, with 133 qualifying countries/regions ending the year with higher average connection speeds than a year before. Year-over-year increases ranged from 0.7% in Lebanon (to 1.3 Mbps) to 164% in Réunion (to 6.4 Mbps). Six countries saw average connection speeds more than double year-over-year, and 118 more saw double-digit percentage growth rates. Just seven qualifying countries saw average connection speeds decline year-over year, with Guatemala and Bahrain both losing just 0.4% (to 1.9 Mbps and 2.2 Mbps respectively), while Lesotho, Syria, and the United Arab Emirates all dropped more than 20% (to 1.4 Mbps, 1.4 Mbps, and 4.2 Mbps respectively.)

In the fourth quarter, six qualifying countries/regions had average connection speeds of 1 Mbps or less, up from four in the third quarter, but much lower than the 14 seen in the first quarter of 2013. Bolivia, Bangladesh, and Tanzania all had average connection speeds of 1.0 Mbps, while Cameroon and Yemen clocked in at 0.9 Mbps, with Libya again remaining the country with the lowest average connection speed at 0.6 Mbps, consistent with the prior two quarters.

	Country/Region	Q4'13 Avg. Mbps	QoQ Change	YoY Change
–	Global	3.8	5.5%	27%
1	South Korea	21.9	-1.1%	57%
2	Japan	12.8	-4.4%	14%
3	Netherlands	12.4	-0.7%	38%
4	Hong Kong	12.2	-2.6%	22%
5	Switzerland	12.0	3.8%	27%
6	Czech Republic	11.4	0.7%	30%
7	Sweden	10.5	13%	30%
8	Latvia	10.4	-6.7%	11%
9	Ireland	10.4	8.4%	59%
10	United States	10.0	2.0%	25%

Figure 20: Average Connection Speed by Country/Region

	Country/Region	Q4 '13 Peak Mbps	QoQ Change	YoY Change
–	Global	23.2	30%	38%
1	Hong Kong	68.0	3.9%	16%
2	South Korea	64.4	1.3%	31%
3	Singapore	59.1	18%	56%
4	Israel	54.6	14%	68%
5	Japan	53.7	3.4%	22%
6	Taiwan	50.9	19%	74%
7	Romania	50.6	11%	15%
8	Latvia	48.8	13%	22%
9	Switzerland	44.2	15%	23%
10	United States	43.7	18%	32%

Figure 21: Average Peak Connection Speed by Country/Region

3.2 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 for a particular geography and is more representative of Internet connection capacity. The average is used to mitigate the impact of unrepresentative maximum measured connection speeds.

As shown in Figure 21, the global average peak connection speed increased significantly in the fourth quarter, growing 30% to 23.2 Mbps—a very nice recovery after a nominal decline in the third quarter. All of the top 10 countries/regions also saw higher average peak connection speeds, with Hong Kong and South Korea remaining the only two above 60 Mbps after 3.9% and 1.3% quarterly increases respectively. South Korea's 1.3% quarterly increase was also the smallest seen among the top 10, while Taiwan's 19% growth to 50.9 Mbps was the largest seen. On a global basis, quarter-over-quarter changes were overwhelmingly positive, with 138 qualifying countries/regions seeing higher average peak connection speeds than in the third quarter. Growth rates ranged from 1.3% in South Korea to 179% in Libya, which grew to 15.8 Mbps. Uruguay, the Philippines, and Kenya also saw average peak connection speeds more than double quarter-over-quarter. Only two countries saw declines from the third quarter—Réunion lost 5.9% (to 13.3 Mbps) and Kuwait lost 8.4% (to 33.3 Mbps).

Examining the longer-term trends, the story is also very positive as the global average peak increased 38% as compared to the fourth quarter of 2012, and all of the top 10 countries/regions saw double-digit percentage year-over-year growth rates. Among the group, the smallest increase was 15%, seen in Romania, while Taiwan added an impressive 74% from the same period a year before. Around the world, a total of 134 qualifying countries/regions saw yearly growth in average peak connection speeds, with increases ranging from 2.5% in Chile (to 20.3 Mbps) to 163% in Uruguay (to 36.7 Mbps). In addition to Uruguay, another 13 countries/regions also saw average peak connection speeds more than double over the course of 2013. Six countries (Indonesia, El Salvador, Lebanon, Mozambique, Lesotho, and the United Arab Emirates) saw yearly declines in average peak connection speeds. Indonesia had the smallest decline, losing just 2.3% (to 12.5 Mbps), while the largest decline was seen in the United Arab Emirates, which lost 63% year-over-year (to 41.7 Mbps). However, as noted in prior issues of this report, the large decline observed in the United Arab Emirates is related to the "correction" from the abnormally high average peak connection speeds that had been observed in the country in 2012.

Thanks to extremely strong quarterly and yearly growth rates, Kenya was not the country with the lowest average peak connection speed in the fourth quarter. The last place spot was ceded to Iran, with an average peak connection speed of 5.5 Mbps (up 20% quarter-over–quarter, and 103% year-over-year).

	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
–	Global	19%	1.6%	56%
1	South Korea	71%	2.1%	83%
2	Japan	47%	-3.7%	15%
3	Netherlands	45%	1.0%	91%
4	Switzerland	42%	7.2%	58%
5	Czech Republic	37%	5.2%	75%
6	Hong Kong	37%	-3.1%	21%
7	Belgium	35%	3.4%	123%
8	United States	34%	2.1%	56%
9	Latvia	32%	-6.4%	11%
10	Denmark	31%	7.3%	86%

Figure 22: High Broadband (>10 Mbps) Connectivity

3.3 Global High Broadband Connectivity

In the fourth quarter, the global high broadband adoption rate saw a nominal 1.6% increase, staying at 19%, as shown in Figure 22. This quarterly growth rate is significantly lower than those seen in the prior quarters of 2013, which each saw double-digit percentage increases. Quarterly growth among the top 10 countries/regions was also fairly nominal, with seven seeing quarterly increases, all below 10%. The Netherlands had the smallest quarter-over-quarter change, at 1.0%, while Denmark's 7.3% increase was the largest, narrowly edging out the 7.2% increase seen in Switzerland. Japan, Hong Kong, and Latvia all saw minor quarterly declines, losing 3.7%, 3.1%, and 6.4% respectively. This quarter also marks the first time that all of the top 10 countries/regions had a high broadband adoption rate above 30%. Among the 54 countries/regions that qualified for inclusion, 37 saw high broadband adoption rates increase from the third quarter, with growth ranging from 1.0% in the Netherlands to 72% in Kazakhstan (to 4.0% adoption). Of the 17 countries/regions that saw high broadband adoption rates drop quarter-over-quarter, losses ranged from 0.2% in Hungary (to 15% adoption) to 36% in the United Arab Emirates (to 3.5% adoption).

Looking at year-over-year changes, the global high broadband adoption rate once again saw strong growth, increasing 56% from the fourth quarter of 2012. Each of the top 10 countries/regions also saw strong growth, led by Belgium's 123% year-over-year increase. All of the other countries/regions in the group saw yearly growth above 10%, with Latvia's 11% increase the smallest. When looking at the full set of qualifying countries/regions, Latvia's 11% increase was the smallest seen across the whole group, while Réunion experienced the most significant increase, growing 5037% (to 20% adoption). Kazakhstan also saw a particularly high year-over-year increase in the fourth quarter, adding 3,281%. An additional 15 countries/regions saw high broadband adoption rates more than double from the end of 2012. Only South Africa (down 6.8% to 1.3% adoption), Romania (down 13% to 15% adoption), and the United Arab Emirates (down 64%) saw lower levels of high broadband adoption year-over-year.

Despite a 31% quarterly increase and a 131% yearly increase, India's 0.4% adoption rate once again placed it as the country with the lowest level of high broadband adoption among qualifying countries/regions. Brazil was the only other country below 1%, with a 0.8% high broadband adoption rate in the fourth quarter.

3.4 Global Broadband Connectivity

In the fourth quarter, the global broadband adoption rate grew 4.3% quarter-over-quarter to reach 55% of all connections to Akamai taking place at speeds of 4 Mbps or above. Among the top 10 countries/regions, all but one saw positive quarterly changes, as shown in Figure 23. Increases were fairly muted and ranged from 0.3% in the Netherlands to 3.4% in Israel. Only Curaçao saw its broadband adoption rate decline, dropping 0.2%. Switzerland and South Korea remained the only two countries among the top 10 to have broadband adoption rates above 90%, and all of the top 10 had at least eight of every 10 connections to Akamai at broadband rates during the fourth quarter. Globally, a total of 58 countries/regions that qualified for inclusion had higher levels of broadband adoption quarter-over-quarter, with growth ranging from just 0.1% in Armenia (to 18% adoption) to an impressive 345% in Uruguay (to 20% adoption). Kenya joined Uruguay in more than doubling its broadband adoption rate from the third quarter, adding 124% (to 4.7% adoption). Among the 27 countries/regions that saw broadband adoption rates decline from the third quarter, losses ranged from just 0.1% in Latvia (to 76% adoption) to 33% in Vietnam (to 2.7% adoption).

The global broadband adoption level increased 27% from the fourth quarter of 2012, a growth rate consistent with that seen in the third quarter. Adoption rates were also up year-over-year in all of the top 10 countries/regions, with growth

	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
–	Global	55%	4.3%	27%
1	South Korea	94%	0.9%	17%
2	Switzerland	91%	1.0%	5.0%
3	Netherlands	87%	0.3%	5.1%
4	Curaçao	87%	-0.2%	44%
5	Czech Republic	84%	1.6%	13%
6	Japan	83%	0.6%	9.3%
7	Israel	83%	3.4%	23%
8	Canada	82%	0.6%	11%
9	Denmark	82%	1.5%	19%
10	Bulgaria	82%	1.5%	26%

Figure 23: Broadband (>4 Mbps) Connectivity

ranging from 5.0% in Switzerland to 44% in Curaçao. Double-digit percentage increases were seen in seven of the top 10 countries, consistent with the third quarter. Looking across the whole world, a total of 83 countries/regions that qualified for inclusion saw higher broadband adoption levels year-over-year—also the same count as in the third quarter. Yearly growth rates ranged from just 1.6% in South Africa (to 7.4% adoption) to 2,485% in Uruguay. Iraq and Kenya also had aggressively large increases, growing 1,321% (to 11% adoption) and 1,030% respectively. An additional 20 countries/regions saw broadband adoption rates more than double year-over-year. Only the United Arab Emirates and Indonesia experienced yearly declines in broadband adoption, dropping 34% (to 39% adoption) and 49% (to 1.8% adoption) respectively.

Venezuela once again remained the country with the lowest level of broadband adoption, ending 2013 at 1.4% (down 3.0% quarter-over-quarter, but up 25% year-over-year). It narrowly edged out Iran, which had a broadband adoption rate of 1.5% in the fourth quarter (down 22% quarter-over-quarter, but up 645% year-over-year).

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 within the United States, based on classification by Akamai's EdgeScape geolocation tool. For the purposes of this section, the District of Columbia is treated as a state.

4.1 United States Average Connection Speeds

The fourth quarter of 2013 saw generally minor, and mixed, changes among the top 10 states, as shown in Figure 24. Virginia had the highest average connection speed, at 14.4 Mbps, and also had the largest quarter-over-quarter change, adding 11%. Changes among the other six states that saw quarterly increases ranged from 0.6% in Washington to 2.6% in Maryland. Delaware saw a 3.1% decline from the third quarter, to 12.3 Mbps, while New Hampshire and Rhode Island both dropped 0.9%, to 11.8 Mbps and 11.7 Mbps respectively. Across the whole country, average connection speeds rose quarter-over-quarter in just 28 states, with increases ranging from 0.1% in Kansas (to 8.0 Mbps) to 11% in Virginia and Ohio (to 8.3 Mbps). In the 21 states that saw average connection speeds decline from the prior quarter, losses ranged from 0.1% in Michigan (to 10.5 Mbps) to 14% in Nevada (to 8.7 Mbps). Wisconsin and Idaho saw average connection speeds remain unchanged quarter-over-quarter.

On a year-over-year basis, all of the top 10 states saw higher average connection speeds as compared to the fourth quarter of 2012. New Hampshire saw the smallest year-over-year change, at 8.7%, while Virginia's 53% increase was the largest. Across the whole United States, Vermont was the only state to see a yearly decline in average connection speed, dropping 9.1% (to 9.7 Mbps). The remaining states in the country saw generally strong year-over-year increases, ranging from New Hampshire's 8.7% to a 69% jump in Arkansas (to 6.7 Mbps). In addition, New Hampshire was the only state that grew less than 10% year-over-year.

	State	Q4 '13 Avg. Mbps	QoQ Change	YoY Change
1	Virginia	14.4	11%	53%
2	District Of Columbia	13.8	2.5%	28%
3	Massachusetts	13.5	2.3%	35%
4	Maryland	12.3	2.6%	23%
5	Delaware	12.3	-3.1%	17%
6	New Jersey	12.0	2.4%	22%
7	New Hampshire	11.8	-0.9%	8.7%
8	Rhode Island	11.7	-0.9%	19%
9	New York	11.5	1.9%	21%
10	Washington	11.5	0.6%	27%

Figure 24: Average Connection Speed by State

The quarterly and yearly increases seen in Arkansas in the fourth quarter pushed it out of the last place slot, placing just 6 kbps ahead of Montana, and 246 kbps ahead of Alaska, which was the state with the lowest average connection speed in the fourth quarter, at 6.5 Mbps (down 0.3% quarter-over-quarter, and up 33% year-over-year).

4.2 United States Average Peak Connection Speeds

In the fourth quarter of 2013, the average peak connection speed was up more than 10% in nine of the top 10 states, as seen in Figure 25. Only Delaware grew less than 10% quarter-over-quarter, adding 9.7% to 52.8 Mbps. Quarterly changes in the remaining nine states ranged from 14% in the District of Columbia (to 54.8 Mbps) to 33% in Connecticut (to 56.9 Mbps). This quarter also marks the first time that all of the top 10 states achieved average peak connection speeds above 50 Mbps, led by Massachusetts' 63.8 Mbps. Interestingly, it was just a quarter ago that Massachusetts became the first state to achieve an average peak connection speed above 50 Mbps. Looking across the whole country, quarterly increases were seen in every state, ranging from 9.4% in North Dakota (to 43.0 Mbps) to 37% in Oklahoma (to 38.0 Mbps). Quarterly growth was generally strong as well, with only Delaware, Wyoming, and North Dakota seeing average peak speeds grew less than 10%. Six states grew more than 30% quarter-over-quarter, an additional 19 states added more than 20%, and the remaining 23 states saw increases above 10%.

Year-over-year increases among the top 10 states were extremely strong in the fourth quarter. The lowest rate of growth in the group was seen in the District of Columbia, which

	State	Q4 '13 Peak Mbps	QoQ Change	YoY Change
1	Massachusetts	63.8	23%	60%
2	New Jersey	60.8	24%	48%
3	Virginia	59.2	21%	54%
4	Washington	57.7	24%	62%
5	Maryland	57.0	15%	44%
6	Connecticut	56.9	33%	57%
7	New Hampshire	56.7	24%	43%
8	District Of Columbia	54.8	14%	26%
9	New York	54.2	20%	38%
10	Delaware	52.8	9.7%	38%

Figure 25: Average Peak Connection Speed by State

added a very solid 26%. The highest rate of growth was seen in Washington, with an increase of 62%. With the exception of a yearly decline seen in Ohio, extremely strong year-over-year increases were also seen across the rest of the United States. Vermont had the smallest yearly increase at 14%, while Arkansas added an impressive 87% from the fourth quarter of 2012. In addition to Arkansas, another dozen states saw yearly growth rates above 50%, while another 18 added 40% or more year-over-year. Thirteen more states saw yearly increases above 30%, while another five grew by more than 20%.

In the fourth quarter, Ohio remained the state with the lowest average peak connection speed at 19.4 Mbps. Despite being up 12% quarter-over-quarter, its speed was 30% lower than at the end of 2012.

The strong quarterly and yearly growth seen exiting 2013 is certainly encouraging, and points to ongoing improvements in Internet connection speeds across the United States. Ideally, this trend will continue into 2014 and beyond, if announcements made during the fourth quarter are any indication:

- In early October, AT&T said that its planned gigabit network in Austin, Texas would start operating on December 1, initially with symmetrical 300 Mbps connectivity, with symmetrical gigabit connections coming to "GigaPower" subscribers by the middle of 2014.[21]
- In early October, CenturyLink announced[22] that it would expand its gigabit network pilot to Las Vegas, bringing Fiber-to-the-Home (FttH) service to select neighborhoods in the city during the fall of 2013, with plans to add more areas in 2014.
- In late October, Time Warner Cable said that it had doubled the speed of its Ultimate Internet tier to 100 Mbps in Los Angeles, and that it would offer "Ultimate 100" in New York City and Hawaii by the end of the year. It had doubled the speed of its Ultimate Tier to 100 Mbps in Kansas City earlier in 2013, and claimed that it will expand Ultimate 100 to more markets in 2014.[23]
- In November, residents of Longmont, Colorado approved a ballot measure to allow the city to issue $45.3 million in bonds to pay for a city-wide deployment of fiber, with the goal of connecting all 27,000 homes, and every private business, to public fiber within the next three years.[24]
- Los Angeles issued an RFP in December to require fiber in "every residence, every business, and every government entity within the city limits of Los Angeles," with the fiber network also powering Wi-Fi hotspots in public areas, providing free Internet access of 2 Mbps to 5 Mbps to residents, and offering paid access for Gbps connectivity.[25]

4.3 United States High Broadband Connectivity

As shown in Figure 26, quarterly changes in high broadband adoption among the top 10 states were generally positive, if relatively limited. Eight of the states saw growth quarter-over-quarter, ranging from just 0.9% in the District of Columbia to 5.5% in New Jersey. Rhode Island and Delaware both saw high broadband adoption rates decline from the third quarter, losing 0.8% and 4.1% respectively. Although Delaware's decline dropped it below a 50% adoption rate, four other states continued to have more than half of their connections to Akamai at speeds above 10 Mbps, marking a second consecutive quarter where multiple states had high broadband adoption rates above 50%. In looking at the whole United States, overall quarterly changes were mixed, with 33 total states seeing a quarterly increase, while 18 saw high broadband

	State	% Above 10 Mbps	QoQ Change	YoY Change
1	Massachusetts	57%	4.9%	53%
2	New Jersey	56%	5.5%	42%
3	Maryland	52%	2.5%	48%
4	Rhode Island	52%	-0.8%	47%
5	New Hampshire	49%	3.1%	19%
6	Delaware	48%	-4.1%	40%
7	New York	46%	1.1%	44%
8	Virginia	45%	1.4%	70%
9	Connecticut	43%	3.2%	40%
10	District Of Columbia	43%	0.9%	11%

Figure 26: High Broadband (>10 Mbps) Connectivity, U.S. States

adoption levels decline. Observed growth rates ranged from 0.2% in Wisconsin (to 34% adoption) to 17% in Nebraska (to 26% adoption). High broadband adoption rate drops ranged from Rhode Island's previously mentioned 0.8% loss to a surprisingly high 20% in Maine (to 21% adoption). In looking at some of the larger changes, we find that six states saw quarterly increases of 10% or more, while just three states saw quarterly declines of 10% or more. One of those seeing a significant increase was Arkansas, which was the state with the lowest high broadband adoption rate in the third quarter. With a 12% quarterly increase, it moved out of last place, ceding the spot to Idaho, which ended 2013 with 15% high broadband adoption, after a 5.3% quarter-over-quarter change.

In contrast to the mixed and muted quarterly changes, year-over-year changes across the top 10 states were all positive, and generally strong. The District of Columbia saw the smallest yearly growth rate, at 11%, while Virginia's 70% yearly increase was the largest among the group. Massachusetts also grew by more than 50% year-over-year, while another half-dozen states in the group added 40% or more. Looking across the whole country, Vermont was the only state to see a year-over-year decline in high broadband adoption, losing 4.8% (to 35% adoption), while the District of Columbia's 11% bump was the smallest yearly increase; it was joined by New Hampshire (up 19% to 49% adoption) as the only other state with a yearly increase of less than 20%. At the other end of the spectrum, a total of 10 states saw adoption rates more than double year-over-year, from the 310% increase seen in Arkansas (to 15% adoption) down to the 103% increase seen in Wisconsin. An additional 23 states had year-over-year changes of 50% or more.

4.4 United States Broadband Connectivity

As shown in Figure 27, broadband adoption rates among the top 10 states changed little from the third quarter. Delaware remained the top state, with 95% of connections to Akamai at speeds over 4 Mbps. Rhode Island also had more than nine of every 10 connections to Akamai at that rate in the fourth quarter. Among the states in the top 10, New York's 0.8% quarterly increase was the lowest seen, while Rhode Island, New Jersey, and Maryland all grew 0.9%. The largest quarterly increase was seen in Hawaii, at 6.2% — the state also had the largest increase among the top 10 in the third quarter, at 14%. New Hampshire was the only state in the group to see a quarterly decline, losing a scant 0.4%. The fourth quarter

	State	% Above 4 Mbps	QoQ Change	YoY Change
1	Delaware	95%	1.1%	8.3%
2	Rhode Island	92%	0.9%	8.7%
3	New Jersey	89%	0.9%	7.2%
4	Massachusetts	88%	1.2%	15%
5	Maryland	88%	0.9%	7.1%
6	Hawaii	86%	6.2%	32%
7	New York	86%	0.8%	8.7%
8	New Hampshire	85%	-0.4%	-3.6%
9	Connecticut	85%	1.5%	9.3%
10	Florida	82%	2.8%	13%

Figure 27: Broadband (>4 Mbps) Connectivity, U.S. States

marked the second time that all of the states in the country had a broadband adoption rate higher than 50%. In looking across all states, we find that broadband adoption rates also changed little from the third quarter across the larger group. South Carolina and Pennsylvania both had quarterly increases of just 0.1% (to 77% adoption in both states), while Hawaii saw the largest increase among the 41 states where growth was observed. Among the 10 states where broadband adoption rates fell, losses ranged from 0.1% in Indiana and Maine (to 72% and 71% adoption respectively) to 2.9% in Wyoming (to 68% adoption). With a 3.2% quarter-over-change (to 56% adoption), Arkansas moved out of the last place slot, replaced by West Virginia, which lost 0.2% quarter-over-quarter, falling to 56% adoption. (Both states had similar adoption levels due to rounding, but Arkansas' adoption rate was 0.4% higher than West Virginia's.)

With the exception of a slight 3.6% decline seen in New Hampshire, year-over-year changes among the top 10 states were positive. Yearly growth rates ranged from 7.1% in Maryland to a very solid 32% in Hawaii. Massachusetts and Florida joined Hawaii in having double-digit yearly growth rates. Looking at yearly changes across the whole country, Arkansas was the clear leader, doubling its broadband adoption rate. Another 38 states saw growth rates above 10%, while the smallest year-over-year change was seen in Ohio, at 0.9% (to 62% adoption). Just four states saw broadband adoption rates move lower as compared to the fourth quarter of 2012: Maine (down 1.2% top 71% adoption), the District of Columbia (down 2.1% to 72% adoption), New Hampshire, and Vermont (down 20% to 65% adoption).

Geography – Americas

The metrics presented here for the Americas region (North and South America) 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 within North and South America, based on classification by Akamai's EdgeScape geolocation tool.

5.1 Americas Average Connection Speeds

In the fourth quarter of 2013, average connection speeds in the United States and Canada remained more than double the average speed seen in Mexico, as shown in Figure 28. Increasing 2.0% from the previous quarter, the average connection speed in the United States reached 10.0 Mbps, followed closely by Canada, which reached 9.0 Mbps after a 1.5% quarterly increase. Mexico's 4.0 Mbps average connection speed was the highest among the remaining surveyed countries in the region, after growing 2.9% quarter over quarter. Across the region, nine of the surveyed countries saw quarter-over-quarter increases, ranging from 0.2% in Brazil to 43% in Uruguay. Uruguay was the only country to see a quarterly increase above 10%—the other increases seen in the fourth quarter were fairly limited. The quarterly declines in average connection speed seen in the remaining five surveyed countries were also fairly limited, with losses ranging from 3.1% in Bolivia and Colombia to 5.6% in Ecuador.

On a year-over-year basis, changes across the surveyed countries in the Americas region were generally positive, with increases seen across all countries; only Colombia and Costa Rica saw yearly growth rates below 10%. Among the other countries, growth rates ranged from 14% in Chile to 90% in Uruguay. Argentina joined Uruguay in improving by more than 50% year-over-year, while Ecuador and Venezuela saw average connection speeds increase by more than 40% from the fourth quarter of 2012.

5.2 Americas Average Peak Connection Speeds

While quarterly changes in average connection speeds in the Americas were fairly muted and somewhat mixed in the fourth quarter, the quarterly changes observed for the average peak connection speed metric were much stronger, and positive across all surveyed countries, as shown in Figure 29. The fastest two countries in the region, the United States and Canada, both had average peak connection speeds above 40 Mbps, and saw solid quarterly increases of 18% and 16% respectively. Interestingly, these countries were two of just four in the Americas region that saw quarterly growth rates below 20% in the fourth quarter—Chile added 18% quarter-over-quarter (to 20.3 Mbps), while the smallest quarterly change was seen in Colombia, which grew 9.0% (to 16.8 Mbps). In contrast, the largest quarterly change was seen in Uruguay, which

Global Rank	Country/Region	Q4 '13 Avg. Mbps	QoQ Change	YoY Change
10	United States	10.0	2.0%	25%
16	Canada	9.0	1.5%	23%
58	Mexico	4.0	2.9%	32%
68	Ecuador	3.4	-5.6%	49%
70	Chile	3.4	1.6%	14%
72	Uruguay	3.1	43%	90%
73	Argentina	3.1	8.7%	52%
79	Colombia	2.9	-3.1%	6.5%
83	Brazil	2.7	0.2%	21%
84	Peru	2.7	9.7%	39%
101	Costa Rica	2.1	-3.5%	2.1%
121	Venezuela	1.5	0.3%	45%
125	Paraguay	1.4	-4.4%	24%
135	Bolivia	1.0	-3.1%	19%

Figure 28: Average Connection Speed by Americas Country

Global Rank	Country/Region	Q4 '13 Peak Mbps	QoQ Change	YoY Change
10	United States	43.7	18%	32%
18	Canada	40.5	16%	34%
25	Uruguay	36.7	172%	163%
66	Ecuador	22.3	20%	31%
72	Mexico	21.2	24%	41%
76	Brazil	20.4	22%	23%
77	Chile	20.3	18%	2.5%
79	Argentina	19.7	24%	39%
85	Peru	18.3	38%	32%
92	Colombia	16.8	9.0%	12%
112	Costa Rica	13.1	31%	15%
126	Bolivia	10.8	31%	28%
128	Paraguay	10.5	25%	8.0%
129	Venezuela	10.4	30%	38%

Figure 29: Average Peak Connection Speed by Americas Country

improved by 172% as compared to the third quarter of 2013, ending the year at 36.7 Mbps. An additional four countries saw speeds above 20 Mbps, while the rest of the surveyed Americas countries were above 10 Mbps for the first time.

Year-over-year changes across the Americas were also all positive in the fourth quarter, and had an extremely wide range. Only Paraguay and Chile saw yearly growth rates below 10%, with Chile's 2.5% increase the smallest seen across the surveyed countries in the region. The highest yearly increase was seen in Chile, at 163%, and the country was the only one to see average peak connection speeds more than double year-over-year. One country (Mexico) saw a yearly change above 40%, while six countries grew more than 30%, and an additional two had year-over-year growth above 20%.

5.3 Americas High Broadband Connectivity

Figure 30 shows that the wide gap in high broadband adoption across surveyed Americas countries remained squarely in place at the end of 2013. In the fourth quarter, the United States had one of every three connections to Akamai at speeds above 10 Mbps, while one of every four connections from Canada was at those speeds. Only four other surveyed countries from the region qualified for inclusion in the global rankings, all of which had adoption rates of 2.0% or less. Among the surveyed countries that did not qualify for inclusion, high broadband adoption rates ranged from 2.1% in Uruguay to less than 0.1% in Paraguay. Among the half-dozen qualifying countries, only Brazil saw a quarterly decline in adoption, losing 2.8% from the third quarter. The United States and Canada both added less than 10% from the prior quarter, while Chile, Mexico, and Argentina all saw double-digit percentage growth, with Argentina's 59% the largest. Among the countries that did not qualify for inclusion, there was a very wide range of quarter-over-quarter changes, ranging from a loss of 58% in Paraguay to an increase of 810% in Uruguay.

Among the six surveyed Americas countries that qualified for inclusion in the global rankings, the year-over-year changes were all positive, and all very strong. Mexico had the largest yearly increase, at 232%, and Argentina grew 187% from the fourth quarter of 2012. The smallest increase was seen in Brazil, which grew 40%. Among the surveyed countries that did not qualify for inclusion, just Costa Rica and Paraguay saw year-over-year losses. Sizable yearly increases were seen in the other countries, with Bolivia, Ecuador, and Peru more than doubling high broadband adoption rates during 2013, while adoption in Uruguay was up over 5,000%. However, as these countries did not qualify for inclusion, these particularly high rates of change, coupled with their extremely low adoption rates, should be considered inconclusive and not taken as evidence of significant improvement in Internet connectivity within the country.

5.4 Americas Broadband Connectivity

As shown in Figure 31, 11 of the 14 surveyed countries in the Americas region qualified for inclusion in the broadband adoption rankings, consistent with the third quarter. Among the countries that qualified for inclusion, Canada maintained its position as the country with the highest level of broadband adoption, gaining 0.6% quarter-over-quarter, but remaining

Global Rank	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
8	United States	34%	2.1%	56%
14	Canada	26%	8.3%	72%
46	Mexico	2.0%	17%	232%
50	Argentina	1.4%	59%	187%
52	Chile	1.2%	16%	61%
53	Brazil	0.8%	-2.8%	40%
–	Uruguay	2.1%	810%	5287%
–	Ecuador	1.2%	-25%	129%
–	Costa Rica	0.4%	-21%	-8.9%
–	Colombia	0.3%	-36%	24%
–	Peru	0.2%	84%	178%
–	Venezuela	0.1%	-26%	35%
–	Bolivia	0.1%	-1.5%	100%
–	Paraguay	<0.1%	-58%	-21%

Figure 30: High Broadband (>10 Mbps) Connectivity by Americas Country

Global Rank	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
8	Canada	82%	0.6%	11%
18	United States	75%	1.0%	12%
56	Mexico	35%	6.5%	134%
61	Chile	26%	9.2%	74%
64	Ecuador	23%	-7.7%	95%
65	Argentina	23%	25%	147%
66	Brazil	22%	6.0%	71%
67	Uruguay	20%	345%	2485%
70	Colombia	15%	-17%	26%
79	Peru	6.0%	66%	290%
86	Venezuela	1.4%	-3.0%	25%
–	Costa Rica	4.0%	-4.3%	35%
–	Bolivia	0.7%	-2.8%	68%
–	Paraguay	0.4%	-38%	36%

Figure 31: Broadband (>4 Mbps) Connectivity by Americas Country

at 82%. It was followed by the United States, which again had three of every four connections to Akamai at speeds over 4 Mbps, up just 1.0% from the third quarter. Among the remaining qualifying surveyed countries, broadband adoption ranged from 1.4% in Venezuela (after a 3.0% quarterly decline) to 35% in Mexico (after a 6.5% quarterly increase). In addition to Venezuela, Colombia and Ecuador also saw quarterly declines (of 17% and 7.7% respectively), while quarterly increases among the qualifying countries ranged from 0.6% in Canada to 345% in Uruguay. The three countries that did not qualify for inclusion in the global rankings all saw broadband adoption rates decline from the previous quarter.

Year-over-year changes among qualifying countries covered an extremely broad range in the fourth quarter, led by the nearly 2,500% increase seen in Uruguay. Peru, Argentina, and Mexico also saw broadband adoption rates more than double over the course of 2013, growing 290%, 147%, and 134% respectively. Double-digit percentage growth rates were also seen across the remaining countries, with the Canada's 11% increase and the 12% increase seen in the United States the lowest among the group. Among the three non-qualifying countries, all saw strong year-over-year growth.

SECTION 6:

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 within the Asia Pacific region, based on classification by Akamai's EdgeScape geolocation tool.

6.1 Asia Pacific Average Connection Speeds

Despite small quarterly declines, the triumvirate of South Korea, Japan, and Hong Kong continued to have the highest average connection speeds among surveyed Asia Pacific countries/regions in the fourth quarter of 2013. South Korea was once again the only country with an average connection speed over 20 Mbps, while the speeds seen in Japan and Hong Kong were on the order of 50% higher than Taiwan's, which was the next fastest at 8.3 Mbps. Among the remaining surveyed countries/regions, the lowest average connection speed was seen in India, at 1.5 Mbps. Overall, quarterly changes within the region were mixed and fairly nominal, with Malaysia and Vietnam joining the top three countries in seeing speeds drop quarter-over-quarter, while increases among the other countries/regions ranged from 1.9% in Singapore, to 11% in the Philippines and 18% in China, with the latter two being the only surveyed countries in the region to see growth of more than 10% in the quarter.

Looking at year-over-year changes seen across the Asia Pacific region in the fourth quarter, we see that all of the surveyed countries/regions experienced solid growth in average connection speeds. All of the yearly increases were above 10%, with Thailand's 14% growth the smallest, followed closely by the 14% increases seen in Japan and Indonesia. The largest yearly increase was again seen in Taiwan, which added 102% from the fourth quarter of 2012, and it was joined by South Korea and China in having a year-over-year increase above 50%.

6.2 Asia Pacific Average Peak Connection Speeds

As shown in Figure 33, Hong Kong and South Korea remained the only two surveyed Asia Pacific countries/regions with average peak connection speeds above 60 Mbps, followed closely by Singapore, at 59.1 Mbps, after an 18% quarterly increase. Taiwan also saw a sizable (19%) quarterly increase, making it the fifth country in the region with an average peak connection speed above 50 Mbps. However, the solid increases seen in Singapore and Taiwan were by no means the largest—that was seen in the Philippines, which doubled its average peak connection speed from the third quarter, to 32.6 Mbps. Most of the smallest quarterly increases were seen in some of the fastest countries/regions, with Hong Kong, South Korea, and Japan all seeing quarter-over-quarter changes below 10%, as did New Zealand, which added just 5.5%. Among the slower surveyed countries within the Asia/Pacific region,

Global Rank	Country/Region	Q4 '13 Avg. Mbps	QoQ Change	YoY Change
1	South Korea	21.9	-1.1%	57%
2	Japan	12.8	-4.4%	14%
4	Hong Kong	12.2	-2.6%	22%
18	Taiwan	8.3	3.2%	102%
20	Singapore	7.9	1.9%	26%
44	Australia	5.8	6.0%	27%
45	New Zealand	5.3	2.9%	27%
49	Thailand	4.8	2.4%	13%
66	China	3.4	18%	86%
74	Malaysia	3.0	-4.8%	21%
108	Philippines	2.0	11%	42%
113	Vietnam	1.8	-7.9%	20%
118	Indonesia	1.6	8.7%	14%
123	India	1.5	4.4%	31%

Figure 32: Average Connection Speed by Asia Pacific Country/Region

Global Rank	Country/Region	Q4 '13 Peak Mbps	QoQ Change	YoY Change
1	Hong Kong	68.0	3.9%	16%
2	South Korea	64.4	1.3%	31%
3	Singapore	59.1	18%	56%
5	Japan	53.7	3.4%	22%
6	Taiwan	50.9	19%	74%
20	Thailand	38.7	27%	36%
32	Australia	35.2	17%	46%
36	Philippines	32.6	103%	144%
46	Malaysia	30.0	21%	41%
70	New Zealand	21.6	5.5%	18%
110	China	13.8	22%	72%
116	Vietnam	12.6	11%	17%
117	Indonesia	12.5	29%	-2.3%
125	India	10.9	21%	30%

Figure 33: Average Peak Connection Speed by Asia Pacific Country/Region

India rebounded from a 15% loss seen in the third quarter, which pushed it below 10 Mbps—in the fourth quarter, a 21% quarterly gain allowed the country to end the year with an average peak connection speed just below 11 Mbps.

Year-over-year changes in the surveyed Asia Pacific countries/regions were all positive, and very strong, with the exception of a very small yearly decline seen in Indonesia. Similar to the quarter-over-quarter changes, the largest yearly increase was seen in the Philippines, which grew 144% from the fourth quarter of 2012. While it was the only country to see its speed double on a yearly basis, an additional three countries grew average peak connection speeds more than 50%, while another five had speeds 25% higher than the same period a year prior. All of the surveyed Asia Pacific countries/regions (excepting Indonesia) saw year-over-year changes above 10%.

6.3 Asia Pacific High Broadband Connectivity

With all but three of the surveyed Asia Pacific countries/regions qualifying for inclusion in the global ranking in the fourth quarter, there was an extremely broad spread of high broadband adoption rates seen. As seen in Figure 34, South Korea had the highest level of high broadband adoption, with 71% of connections to Akamai at speeds above 10 Mbps. Its adoption rate was approximately 50% higher than Japan's, which ended 2013 at 47% high broadband adoption. Including these two countries, five of the surveyed countries/regions had high broadband adoption rates above 10%, while the other six had less than one in 10 connections to Akamai above 10 Mbps. The lowest rate of high broadband adoption among qualifying countries/regions was seen in India, at 0.4%, after a 31% quarterly increase. This increase was one of the largest in the fourth quarter, bested only by China's impressive 69% growth. The smallest increase was seen in South Korea, at just 2.1%. Japan, Hong Kong, Singapore, and Malaysia all experienced quarterly losses, with Malaysia's 20% decline the largest. The Philippines, Indonesia, and Vietnam all missed qualifying for the global rankings for this metric, and all had high broadband adoption rates well below 1%.

Global Rank	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
1	South Korea	71%	2.1%	83%
2	Japan	47%	-3.7%	15%
6	Hong Kong	37%	-3.1%	21%
17	Taiwan	23%	12%	467%
25	Singapore	19%	-3.5%	47%
37	Australia	9.7%	19%	104%
38	New Zealand	6.7%	7.7%	133%
44	Thailand	3.0%	26%	11%
48	China	1.8%	69%	586%
49	Malaysia	1.7%	-20%	42%
54	India	0.4%	31%	131%
–	Philippines	0.2%	45%	62%
–	Indonesia	0.1%	-5.1%	-35%
–	Vietnam	0.1%	-30%	30%

Figure 34: High Broadband (>10 Mbps) Connectivity by Asia Pacific Country/Region

Year-over-year changes across the qualifying Asia Pacific countries/regions were all extremely strong, with China seeing an increase of more than 500% for the second consecutive quarter. In addition, Taiwan, Australia, New Zealand, and India all saw high broadband adoption rates more than double from the fourth quarter of 2012. The smallest yearly increases were seen in Japan and Thailand, which grew 15% and 11% respectively. The Philippines and Vietnam both saw strong yearly increases, while Indonesia saw a fairly sizable yearly decrease. However, with such low high broadband adoption rates and fewer than 25,000 unique IP addresses connecting to Akamai at speeds above 10 Mbps in the fourth quarter, these large changes do not reflect significant changes to connectivity within the countries.

6.4 Asia Pacific Broadband Connectivity

In the fourth quarter, South Korea continued inching towards near-universal broadband adoption, as a 0.9% quarterly increase pushed it up to a 94% adoption rate. Seven additional Asia Pacific countries/regions had more than half of their connections to Akamai at speeds above 4 Mbps in the fourth quarter, while at least one of every four connections from China and Malaysia were at those speeds, as shown in Figure 35. In contrast, broadband adoption rates in India, the Philippines, Vietnam, and Indonesia are all stuck well below 10%, even with the significant quarterly increases seen in India and the Philippines. Quarterly changes in China and Taiwan were also above 10%, at 46% and 12% respectively. The other quarterly increases observed were all below 1%, with Thailand's 0.2% growth the smallest. Four surveyed countries/regions saw broadband adoption rates drop in the fourth quarter, with losses ranging from 0.4% in Hong Kong to 33% in Vietnam.

Once again, with the exception of Indonesia, the surveyed Asia Pacific countries/regions all saw long-term growth in broadband adoption rates (in contrast to last quarter, when Indonesia saw a nominal 1.9% yearly decline, the country saw an unusually

Geography – Asia Pacific Region (Continued)

large 49% drop in the fourth quarter). In looking at yearly increases, we find that the largest was in China, which grew 382% year-over-year, with the Philippines and Taiwan also more than doubling, as they improved by 136% and 111% respectively. Not far behind was India, which has grown its broadband adoption rate to 3.6%, nearly double the level seen at the end of 2012. Japan and Hong Kong were the only two surveyed Asia Pacific countries/regions to see year-over-year changes below 10%. Following up on an observation made in last quarter's report, China saw year-over-year growth rates above 100% during all four quarters in 2013, pointing to ongoing improvements in the quality and availability of higher speed Internet connectivity within the country.

Global Rank	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
1	South Korea	94%	0.9%	17%
6	Japan	83%	0.6%	9.3%
12	Hong Kong	81%	-0.4%	6.5%
31	Taiwan	68%	12%	111%
33	Singapore	67%	-0.5%	18%
41	New Zealand	55%	1.3%	43%
42	Thailand	54%	0.2%	19%
44	Australia	54%	6.2%	36%
60	China	29%	46%	382%
62	Malaysia	25%	-7.2%	40%
81	India	3.6%	20%	97%
82	Philippines	3.6%	38%	136%
83	Vietnam	2.7%	-33%	39%
84	Indonesia	1.8%	2.1%	-49%

Figure 35: Broadband (>4 Mbps) Connectivity by Asia Pacific Country/Region

Geography – Europe/Middle East/Africa (EMEA)

The metrics presented here for the EMEA 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 within the EMEA region, based on classification by Akamai's EdgeScape geolocation tool.

7.1 EMEA Average Connection Speeds

Despite a slight quarterly decline to 12.4 Mbps, the Netherlands' average connection speed remained just ahead of Switzerland's 12.0 Mbps in the fourth quarter, as Figure 36 shows. In addition to these two countries, the Czech Republic, Sweden, and Ireland also had average connections speeds above the "high broadband" 10 Mbps threshold. Looking beyond these top countries, the quarter-over-quarter changes across the balance of the surveyed countries in the EMEA region were mixed and fairly minimal. Among the 17 countries that saw quarterly growth, increases ranged from 0.6% in Belgium to 13% in Sweden. In addition to Belgium, three other countries added 1% or less from the previous quarter. Across the eight surveyed countries where average connection speeds declined quarter-over-quarter, decreases ranged from just 0.5% in Israel to 8.0% in Romania. Once again, with the exception of South Africa, all of the surveyed countries in the EMEA region had an average connection speed higher than the 4 Mbps "broadband" threshold in the fourth quarter.

Looking at year-over-year changes, all but two of the surveyed countries in the EMEA region saw long-term growth in average connection speeds. Slovakia had the smallest yearly increase, at 9.6%, and was the only surveyed country with a growth rate below 10%. Ireland had the largest yearly increase, growing 59%, and Turkey's 53% jump made it the only other country in the region to grow more than 50% from the fourth quarter of 2012. Romania saw a slight year-over-year decline in its average connection speed, losing 1.5%, while the United Arab Emirates dropped 27%. (This significant drop is related to the "correction" discussed in the *Second Quarter, 2013 State of the Internet Report*.)

Global Rank	Country/Region	Q4 '13 Avg. Mbps	QoQ Change	YoY Change
3	Netherlands	12.4	-0.7%	38%
5	Switzerland	12.0	3.8%	27%
6	Czech Republic	11.4	0.7%	30%
7	Sweden	10.5	13%	30%
9	Ireland	10.4	8.4%	59%
11	Belgium	9.8	0.6%	42%
12	Denmark	9.5	4.0%	31%
13	United Kingdom	9.4	3.3%	29%
14	Finland	9.1	6.7%	24%
15	Austria	9.0	-3.0%	30%
17	Norway	8.7	4.1%	24%
19	Israel	8.2	-0.5%	26%
21	Germany	7.7	1.0%	20%
23	Poland	7.5	1.4%	31%
24	Russia	7.4	-5.4%	34%
29	Romania	7.2	-8.0%	-1.5%
30	Hungary	6.9	3.1%	10%
32	Spain	6.6	-3.8%	32%
33	Slovakia	6.6	-2.8%	9.6%
35	France	6.6	0.8%	35%
42	Portugal	6.0	2.8%	18%
46	Italy	5.2	7.7%	25%
53	Turkey	4.3	8.2%	53%
56	United Arab Emirates	4.2	-7.8%	-27%
97	South Africa	2.3	3.7%	14%

Figure 36: Average Connection Speed by EMEA Country

7.2 EMEA Average Peak Connection Speeds

As seen in Figure 37, a second strong quarterly increase helped Israel to maintain its position as the surveyed EMEA country with the highest average peak connection speed, at 54.6 Mbps. Romania's 11% quarterly increase to 50.6 Mbps enabled it to join Israel as the first two EMEA countries with average peak connection speeds above 50 Mbps. Across the region, another six countries had average peak connection speeds above 40 Mbps, 13 were above 30 Mbps, and three more were above 20 Mbps. South Africa was the only surveyed EMEA country with an average peak connection speed below 10 Mbps in the fourth quarter, and at 9.6 Mbps, it was the slowest in the region. However, its 33% quarter-over-quarter change was one of the

largest increases seen, topped only by Turkey's 38% growth. Russia's 9.7% quarterly increase was the smallest seen in the region, and was the only one below 10%. In a marked difference from the third quarter, average peak connection speeds were up in all surveyed EMEA countries in the fourth quarter.

Year-over-year changes were widespread and fairly strong among EMEA countries in the fourth quarter. Italy had the smallest increase, and the only one below 10%, growing 8.7% during 2013. The largest change was seen in Israel, which improved by 68% during the year. The United Arab Emirates saw a fairly significant decline of 63%, and was the only country in the region where average peak connection speeds dropped from the fourth quarter of 2012.

A number of announcements made during the fourth quarter point towards continued strong future growth of average peak connection speeds among EMEA countries:

- In October, French telecommunications provider Illiad, which offers broadband services under the "Free" brand, launched a gigabit network service and is upgrading its highest tier of users to it at no additional charge. It offers 1 Gbps down and 200 Mbps up, and is priced at €35 (~$48 USD) per month.[26]
- In November, Swisscom announced that a 1 Gbps subscription tier was now available to over 650,000 residential customers at a price of 100 CHF (~$115 USD) per month.[27]
- In November, Google revealed that it was installing a fiber-optic backbone to dramatically improve connectivity in Kampala, Uganda. The new network would "enable as many as 10 mobile carriers and Internet service providers to boost data rates by a factor of 100 in most areas of the city."[28]
- In November, Finland's government announced a project to upgrade the country's international data transfer capacity through a new €100 million submarine cable between it and Germany, with a target implementation date of 2015.[29]

Global Rank	Country/Region	Q4 '13 Peak Mbps	QoQ Change	YoY Change
4	Israel	54.6	14%	68%
7	Romania	50.6	11%	15%
9	Switzerland	44.2	15%	23%
11	Netherlands	43.6	10%	32%
12	United Kingdom	43.5	22%	35%
13	Belgium	43.2	12%	30%
15	Sweden	42.1	27%	44%
16	United Arab Emirates	41.7	16%	-63%
21	Czech Republic	38.4	10%	20%
22	Ireland	38.1	20%	42%
23	Hungary	38.0	22%	18%
24	Portugal	37.2	14%	15%
27	Austria	36.4	20%	38%
28	Germany	35.8	18%	30%
29	Russia	35.8	9.7%	44%
33	Denmark	34.3	15%	34%
34	Finland	33.8	14%	27%
37	Norway	32.1	14%	27%
39	Slovakia	31.7	17%	19%
42	Poland	31.3	13%	14%
43	Spain	31.2	17%	13%
50	Turkey	28.9	38%	40%
57	France	26.7	21%	25%
69	Italy	21.6	19%	8.7%
133	South Africa	9.1	33%	34%

Figure 37: Average Peak Connection Speed by EMEA Country

7.3 EMEA High Broadband Connectivity

As Figure 38 shows, the Netherlands and Switzerland led the EMEA region in high broadband adoption as the only two countries with adoption rates above 40%, reaching 45% and 42% respectively. Five additional countries saw more than 30% of connections to Akamai at speeds of 10 Mbps or above, while another six had adoption rates of 20% or greater. Eight more countries had at least one of every 10 connections to Akamai at high broadband rates, while the remaining four surveyed EMEA countries had high broadband adoption below 10%, with South Africa's 1.7% the lowest. Quarter-over-quarter changes across the EMEA region show nearly three times as many countries seeing increases as seeing declines. Quarterly growth rates among the surveyed countries ranged from 1.0% in the Netherlands up to an impressive 30% in Italy. Five other countries in addition to Italy also saw double-digit percentage growth in adoption rates. Among the countries where high broadband adoption dropped from the third quarter, losses ranged from a scant 0.2% in Hungary to a rather significant 36% in the United Arab Emirates.

Turkey, which had the largest year-over-year change in high broadband adoption in the third quarter, accomplished the same feat in the fourth quarter, growing 234% from the fourth quarter of 2012. Joining Turkey in seeing adoption rates more than double during 2013 were Belgium, Ireland, Russia, Spain, and France. Very strong year-over-year increases were also seen in 16 additional surveyed EMEA countries, with all of them

Global Rank	Country/Region	% Above 10 Mbps	QoQ Change	YoY Change
3	Netherlands	45%	1.0%	91%
4	Switzerland	42%	7.2%	58%
5	Czech Republic	37%	5.2%	75%
7	Belgium	35%	3.4%	123%
10	Denmark	31%	7.3%	86%
11	United Kingdom	30%	11%	75%
12	Sweden	30%	19%	41%
13	Finland	29%	18%	54%
15	Ireland	26%	3.7%	178%
16	Norway	25%	7.3%	32%
18	Austria	23%	-0.3%	79%
21	Israel	21%	1.1%	79%
22	Russia	21%	-13%	112%
26	Poland	19%	3.1%	79%
27	Germany	18%	5.0%	69%
29	Hungary	15%	-0.2%	49%
30	Romania	15%	-24%	-13%
31	Slovakia	13%	4.0%	45%
32	Spain	13%	-9.0%	127%
33	France	12%	1.1%	144%
36	Portugal	10%	6.1%	81%
40	Italy	4.9%	30%	63%
43	United Arab Emirates	3.5%	-36%	-64%
47	Turkey	2.0%	14%	234%
51	South Africa	1.3%	17%	-6.8%

Figure 38: High Broadband (>10 Mbps) Connectivity by EMEA Country

Global Rank	Country/Region	% Above 4 Mbps	QoQ Change	YoY Change
2	Switzerland	91%	1.0%	5.0%
3	Netherlands	87%	0.3%	5.1%
5	Czech Republic	84%	1.6%	13%
7	Israel	83%	3.4%	23%
9	Denmark	82%	1.5%	19%
11	Austria	81%	<0.1%	21%
13	Belgium	79%	1.8%	8.7%
14	United Kingdom	79%	1.9%	14%
15	Romania	76%	-2.0%	8.2%
17	Germany	75%	0.7%	14%
20	Sweden	73%	14%	33%
21	Russia	73%	0.4%	28%
24	Poland	71%	4.5%	34%
25	Spain	70%	-0.7%	42%
26	Finland	70%	3.9%	11%
28	France	69%	1.2%	44%
29	Hungary	69%	6.1%	<0.1%
34	Portugal	66%	3.3%	17%
35	Ireland	64%	-1.9%	24%
37	Slovakia	60%	4.6%	20%
38	Italy	57%	17%	78%
43	Norway	54%	4.0%	12%
50	Turkey	44%	27%	311%
53	United Arab Emirates	39%	-8.6%	-34%
77	South Africa	7.4%	-3.2%	1.6%

Figure 39: Broadband (>4 Mbps) Connectivity by EMEA Country

seeing growth rates above 10%. However, year-over-year declines were seen in three countries, with South Africa losing 6.8%, Romania dropping 13%, and the United Arab Emirates shedding 64%.

7.4 EMEA Broadband Connectivity

In October, the European Commission declared that the race to achieve 100% coverage of basic broadband services had been achieved thanks to the help of pan-European satellite availability.[30] The Digital Agenda strategy set out by Europe aimed to achieve a number of goals, including 100% coverage of basic broadband services (0.5-4Mbps) by the end of 2013, as well as 100% availability of "superfast" broadband (>30Mbps) by the end of 2020 (with >100 Mbps connections to be within reach of 50% of homes). While the EC may have achieved full coverage, broadband adoption rates still fall short of 100% in most countries. Switzerland came closest, with 91% of connections to Akamai at speeds of 4 Mbps or more in the fourth quarter. Although Turkey's membership in the European Union is still pending,[31] its 44% broadband adoption rate was the lowest among the surveyed European countries.

Among the full set of surveyed EMEA countries, just the United Arab Emirates and South Africa had smaller percentages of connections to Akamai at speeds under 4 Mbps, with South Africa the only country below 10%. Quarterly changes were generally positive, though somewhat limited, seen in 80% of the surveyed countries. Quarter-over-quarter growth rates ranged from an increase of less than 0.1% in Austria to 27% in Turkey. In addition to Turkey, Sweden and Italy also saw quarterly growth rates above 10%. Among the five countries that saw quarterly declines, losses ranged from 0.7% in Spain to 8.6% in the United Arab Emirates.

Turkey once again remained the only surveyed EMEA country to see broadband adoption grow more than 100% year-over-year, adding 311% from the end of 2012. Strong growth was also seen in 17 other countries where adoption rates saw double-digit percentage increases during 2013. Six surveyed countries saw year-over-year increases below 10%, with Hungary adding less than 0.1% as compared to the year before. In line with what it saw in other metrics, the broadband adoption rate in the United Arab Emirates declined 34% year-over-year.

SECTION 8:
Mobile Connectivity

The source data in this section encompasses usage not only from smartphones and tablets, but also laptops and other connected devices that connect to the Internet through 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 operators globally.

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 provider in the fourth quarter of 2013 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 connections with traffic from mobile connections on a single autonomous system, that AS was excluded from the source data set.
- Akamai's EdgeScape database was used for the geographic assignments.

8.1 Connection Speeds on Mobile Networks

In the fourth quarter of 2013, Russian mobile provider RU-1 once again maintained its position as the mobile provider with the highest average connection speed, at 8.9 Mbps. Provider US-4, from the United States, had the second fastest average connection speed among surveyed providers, at 8.5 Mbps. In reviewing the full list of mobile providers, as shown in Figure 40, we find that there are a total of 22 providers that had average connection speeds in the "broadband" (>4 Mbps) range, up from 18 providers in the third quarter, and double the number seen in the second quarter of 2013. A total of 68 providers had average connection speeds above 1 Mbps, down from 74 in the third quarter. Only five of the surveyed mobile providers (AR-1, AR-2, ID-1, NC-1, ZA-1) had average connection speeds below 1 Mbps, with mobile provider ZA-1 in South Africa once again having the lowest connection speed at 0.6 Mbps, consistent with the third quarter.

Observed quarter-over-quarter increases in average connection speeds ranged from just an eighth of a percent at Lithuanian provider LT-2 to the massive 196% jump at provider VE-1 in Venezuela. Observed declines in average connection speeds among surveyed providers ranged from a loss of a quarter of a percent at FR-2 in France to a drop of 21% at provider NC-1 in New Caledonia. Yearly increases were seen across a larger number of providers and were generally larger, ranging from just 3.1% at South African provider ZA-1 to 291% at Venezuelan provider VE-1. Yearly declines were seen across just five of the surveyed providers, with losses ranging from 0.9% at Pakistani provider PK-1 to 59% at provider AR-2 in Argentina.

Examining the average peak connection speed data for the fourth quarter of 2013, we find that providers AU-1 in Australia and HK-3 in Hong Kong both recorded average peak connection speeds greater than 100 Mbps. These speeds may indicate that providers are starting to roll out "LTE Advanced" technology, which can enable peak data rates of 150 Mbps (Cat 4) or 300 Mbps (Cat 6).[32] An e-mail exchange with representatives at one of these carriers indicates that this is, in fact, the path that the provider is heading down. (Thai provider TH-1 had an average peak connection speed of 208 Mbps, but as this is on the order of 7x the speed seen in the third quarter, we believe that this measurement may be an anomaly, especially as research indicates that they will not be rolling out LTE support until later in 2014.) Across the other surveyed providers, Malaysian provider MY-2 and Russian provider RU-1 both had average peak connection speeds above 50 Mbps. An additional 53 providers saw average peak connection speeds above 10 Mbps during the quarter, while 15 mobile providers had average peak speeds below 10 Mbps. Similar to the average connection speed metric, South African provider ZA-1 also had the lowest average peak connection speed, coming in at 3.1 Mbps in the fourth quarter.

Observed quarter-over-quarter increases in average peak connection speeds ranged from just 1.3% at Argentinian provider AR-1to a surprisingly large 743% at Australian

provider AU-3. Quarterly declines in average peak connection speeds were observed at only three surveyed providers—New Caledonian provider NC-1 lost 4.8%, Saudi Arabian provider SA-1 dropped 8.4%, and provider HK-1 in Hong Kong fell 13%. Yearly increases were seen across fewer providers, but the increases seen were fairly strong across most. A total of 16 providers saw average peak connection speeds more than double from the end of 2012, including an increase of 794% at AU-3 in Australia. An additional 46 surveyed providers saw year-over-year changes above 10%, while the smallest increase was seen at Czech provider CZ-2, which grew just 0.7% during 2013. Yearly declines in average peak connection speeds were seen at just a handful of providers, ranging from 1.5% at ES-1 in Spain to 60% at provider AR-2 in Argentina.

Country/Region	ID	Q4 '13 Avg. Mbps	Q4 '13 Peak Mbps
AFRICA			
Egypt	EG-1	1.7	11.8
Morocco	MA-1	1.7	15.5
South Africa	ZA-1	0.6	3.1
ASIA			
China	CN-1	4.1	10.5
Hong Kong	HK-2	4.7	28.6
Hong Kong	HK-1	2.8	25.0
Hong Kong	HK-3	4.1	111.2
Indonesia	ID-1	0.9	36.1
Kuwait	KW-1	3.2	32.4
Malaysia	MY-3	1.9	14.2
Malaysia	MY-2	3.6	58.4
Pakistan	PK-1	1.4	14.7
Saudi Arabia	SA-1	3.3	26.2
Singapore	SG-3	2.7	18.4
Sri Lanka	LK-1	1.9	22.1
Taiwan	TW-1	3.5	31.2
Taiwan	TW-2	2.2	21.3
Thailand	TH-1	1.3	208.1
EUROPE			
Austria	AT-1	6.7	33.7
Austria	AT-2	7.9	37.5
Belgium	BE-3	2.8	16.7
Belgium	BE-2	3.3	14.0
Czech Republic	CZ-3	6.6	21.9
Czech Republic	CZ-1	1.7	8.1
Czech Republic	CZ-2	1.4	7.6
Estonia	EE-1	1.6	8.5
France	FR-2	3.2	13.8
Germany	DE-1	2.4	13.7
Hungary	HU-1	2.9	16.7
Ireland	IE-1	5.4	30.8
Ireland	IE-2	2.2	17.9
Ireland	IE-4	3.4	24.0
Italy	IT-2	4.8	38.4
Italy	IT-3	5.0	23.7
Italy	IT-4	3.3	21.5
Lithuania	LT-2	3.0	23.2
Moldova	MD-1	3.4	16.7
Netherlands	NL-2	3.0	16.1
Norway	NO-1	5.8	28.9
Poland	PL-2	5.2	30.1
Poland	PL-4	4.3	30.1
Poland	PL-3	2.6	15.2
Russia	RU-4	6.0	32.4
Russia	RU-1	8.9	55.5
Russia	RU-3	1.2	7.1
Slovenia	SI-1	3.1	12.7
Spain	ES-1	5.5	28.8
Turkey	TR-1	2.2	17.2
Ukraine	UA-1	7.8	28.9
United Arab Emirates	AE-1	2.4	12.5
United Kingdom	UK-2	4.9	28.6
NORTH AMERICA			
Canada	CA-2	2.8	7.1
El Salvador	SV-1	2.3	16.3
Puerto Rico	PR-1	7.0	15.2
United States	US-2	5.9	27.7
United States	US-1	4.3	16.5
United States	US-4	8.5	16.1
United States	US-3	2.2	8.8
OCEANIA			
Australia	AU-3	5.4	135.6
New Caledonia	NC-1	0.7	5.7
New Zealand	NZ-2	2.5	11.9
SOUTH AMERICA			
Argentina	AR-1	0.9	3.9
Argentina	AR-2	0.9	8.7
Bolivia	BO-1	1.2	8.3
Brazil	BR-1	1.1	9.8
Brazil	BR-2	1.7	13.1
Chile	CL-3	1.2	9.0
Chile	CL-4	1.8	19.5
Colombia	CO-1	1.6	9.6
Paraguay	PY-2	1.3	9.6
Uruguay	UY-1	1.7	12.8
Uruguay	UY-2	1.2	10.8
Venezuela	VE-1	3.9	19.7

Figure 40: Average and Average Peak Connection Speeds by Mobile Provider

8.2 Mobile Browser Usage Data

In June 2012, Akamai launched the "Akamai IO" destination site *(http://www.akamai.com/io)*, with an initial data set that highlighted browser usage across PC and mobile devices, connecting via fixed and mobile networks. The original Akamai IO data set came from sampling traffic across several hundred top-tier sites delivering content through Akamai, most of which were focused on a U.S. audience, biasing the data presented in favor of U.S. users. However, the initial release of an updated data source in mid-February 2013 expanded the sample set, providing us with a more global view of the data. The data and graphs included below are derived from Akamai IO.

Figure 41 illustrates mobile browser usage by users identified to be on cellular networks in the fourth quarter of 2013.[33] As in prior issues of this report, the figure focuses on the usage of Android Webkit and Apple Mobile Safari with other browsers designated as "Others" in the graph. As the graph shows, a gap of approximately 7-8% separated Android Webkit and Apple Mobile Safari throughout most of the quarter, though it narrowed to 2-4% during much of November, and widened again during the second week of December. Overall, Android trended to an average of 35.1% of requests throughout the quarter, while Apple Mobile Safari saw 29.1% of requests.[34] Other mobile browsers connecting to Akamai from cellular networks in the fourth quarter included Opera Mini, Google's Chrome Mobile, Access Netfront, the Openwave Mobile Browser, Microsoft Internet Explorer Mobile, and the Blackberry browser.[35]

Expanding the data set to include all networks[36] (not just those identified as "cellular"), consistent with the prior quarters in 2013, we again see a fairly significant gap between usage of Apple Mobile Safari and Android Webkit. As shown in Figure 42, a difference of 13-14% separated usage of the two browsers throughout the fourth quarter. Throughout much of November, there is a clear increase in the percentage of requests that "Other" browsers account for, with a corresponding decline in the percentage assigned to Android Webkit. The start of this shift roughly aligns with the release of Android 4.4 ("KitKat") at the end of October,[37] indicating that there may have been a delay in properly classifying the associated user agent as Android Webkit. Aside from this multi-week period in November, usage of "Other" browsers remained fairly consistent throughout the fourth quarter, at approximately 9%. Averaged across the entire quarter, Apple Mobile Safari drove about 50% more traffic than Android Webkit, with Safari responsible for 47.4% of usage, while Webkit accounted for 32% of overall usage.[38]

8.3 Mobile Traffic Growth 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, Wi-Fi, and Mobile WiMAX).

These measurements have been performed for several years. It is important to note that the measurements of data and voice traffic in these networks (2G, 3G, 4G/LTE) around the world show large differences in traffic levels between markets and regions, and also between operators due to their different customer profiles.

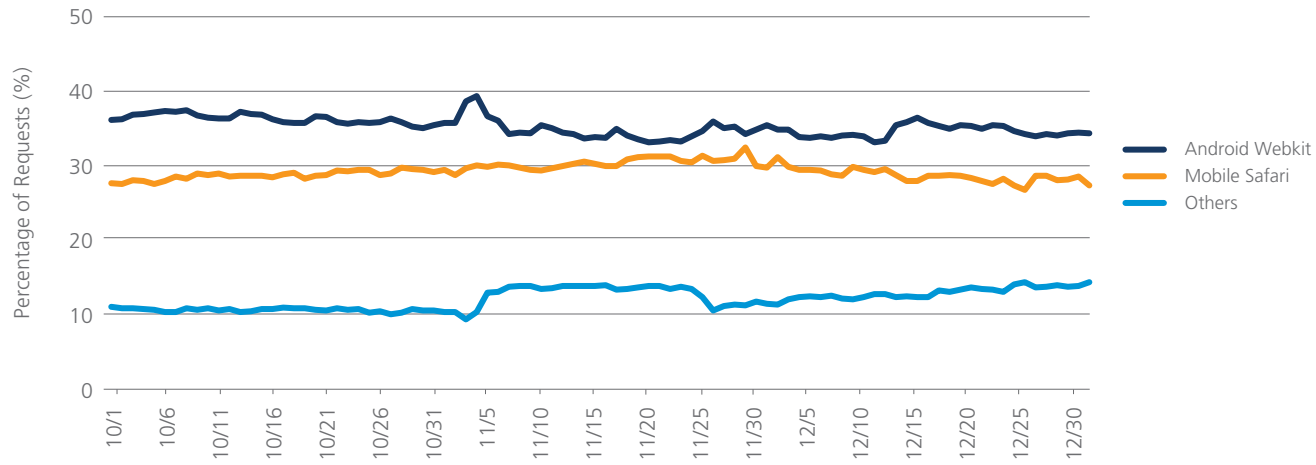

Figure 41: Mobile Browsers Seen Across Cellular Networks, Q4 2013

The graph in Figure 43 shows total global monthly data and voice traffic. It depicts a strong increase in data traffic growth with moderating rate of growth and flat voice traffic development. The number of mobile data subscriptions is increasing rapidly, and driving growth in data traffic along with a continuous increase in the average data volume per subscription. Data traffic grew around 15% between the third and fourth quarters of 2013.

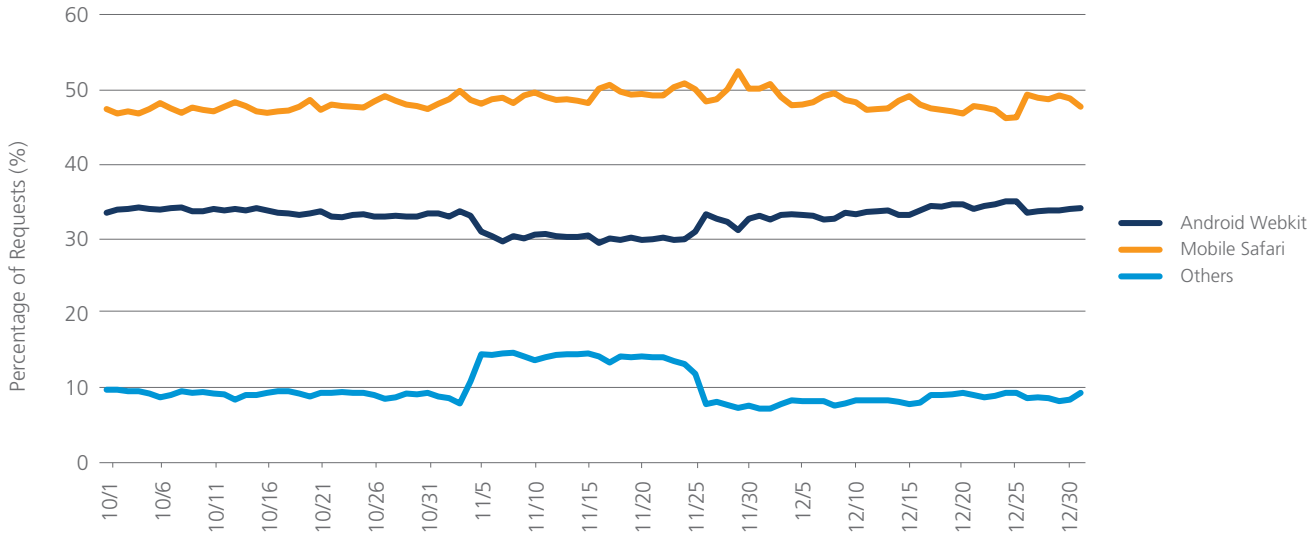

Figure 42: Mobile Browsers Seen Across All Networks, Q4 2013

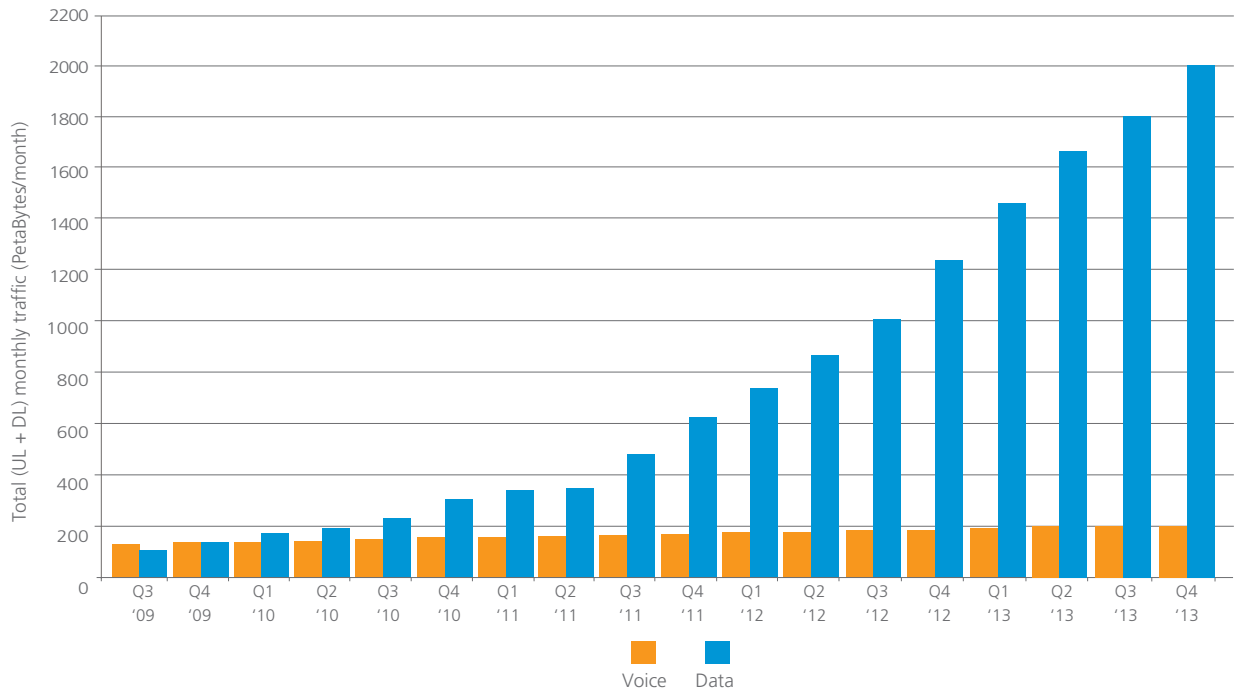

Figure 43: Total Monthly Mobile Voice and Data as Measured by Ericsson

Situational Performance

In June 2013, Akamai announced[39] the latest release of Aqua Ion, a solution designed to meet the unique challenges of optimizing both the desktop and mobile Web experience. This need to optimize differently for each situation presented by an individual user, known as "situational performance," requires new thinking about how to measure the user experience and apply this insight to the delivery process as seamlessly and efficiently as possible. One component of Aqua Ion is a capability known as Real User Monitoring (RUM), which takes passive performance measurements from actual users of a Web experience to provide insight into performance across devices and networks. The intelligence gained through the use of RUM offers key insight for content providers who can respond accordingly—and deliver smarter optimizations—when challenges are uncovered. RUM is a complementary capability to synthetic testing, and the two can and should be used to gain a comprehensive picture of user experience.

Note that there are a few different RUM measurement methodologies. The first is using what is known as "navigation timing"[40] ("navtiming"), which allows JavaScript to collect page load time component information directly from the user agent (browser) through an API. The second is to use a framework for timing Web pages, like Web Episodes,[41] which leverages JavaScript events such as "onload." While navtiming is the preferred methodology for collecting RUM measurements, note that not every user agent supports it at this time.[42] One key observation is the current lack of support in Apple's Safari browser, both on OSX and iOS. In addition, Android first added support starting with v4.0 of the operating system, and Microsoft's Internet Explorer in v9 of the browser.

Figure 44 shows average page load times for users on both broadband and mobile connections, based on Akamai's RUM capabilities. The underlying data was collected with navtiming, so as noted above, it does not include measurements from users of Safari on iOS devices or OSX systems, users on older versions of Android, or users on older versions of Internet Explorer. The countries included within the table were selected based on several criteria, including the availability of measurements from users on networks identified as broadband as well as networks identified as mobile, and more than 90,000 measurements (1,000 per day, on average) from mobile networks having been made across the quarter. Note that these criteria are subject to change in the future as we expand the scope of RUM measurements included within the *State of the Internet Report*.

Region	Country	Avg. Page Load Time-Broadband	Avg. Page Load Time-Mobile	Mobile Penalty
Asia Pacific	Australia	3927 ms	4515 ms	1.1x
Asia Pacific	China	4714 ms	4662 ms	1.0x
Asia Pacific	Hong Kong	2336 ms	6137 ms	2.6x
Asia Pacific	India	5134 ms	9123 ms	1.8x
Asia Pacific	Indonesia	6357 ms	8970 ms	1.4x
Asia Pacific	Japan	2529 ms	4408 ms	1.7x
Asia Pacific	Malaysia	5097 ms	7335 ms	1.4x
Asia Pacific	South Korea	2662 ms	3050 ms	1.1x
Asia Pacific	Taiwan	3145 ms	5096 ms	1.6x
Asia Pacific	Thailand	4863 ms	7355 ms	1.5x
EMEA	France	4407 ms	5641 ms	1.3x
EMEA	Germany	3267 ms	5104 ms	1.6x
EMEA	Ireland	4601 ms	7178 ms	1.6x
EMEA	Italy	4505 ms	5142 ms	1.1x
EMEA	Kuwait	5651 ms	6619 ms	1.2x
EMEA	Spain	4087 ms	7114 ms	1.7x
EMEA	U.K	4887 ms	8085 ms	1.7x
North America	U.S	3426 ms	5571 ms	1.6x
South America	Argentina	4504 ms	10264 ms	2.3x
South America	Brazil	7269 ms	12137 ms	1.7x

Figure 44: Average Page Load Times Based on Real User Monitoring

As the number and breadth of Akamai customers implementing RUM grew across the fourth quarter, so did the number of countries that met the criteria for inclusion within the report. In reviewing the average page load time measurements shown in Figure 44, we find the lowest values for broadband connections in Hong Kong, Japan, and South Korea—no surprise given that these countries have the fastest average connection speeds in the world. The lowest average page load times for mobile connections were seen in South Korea, Japan, and Australia

In comparing the average broadband page load times to those observed on mobile, we find a broad variance in what we've dubbed the "mobile penalty"—that is, how much slower does a page load for mobile users than for users on a broadband connection? In China, the load times were once again nearly equivalent, while Hong Kong had the largest mobile penalty among the Asia Pacific countries. In the EMEA region, mobile penalties ranged from 1.1x in Italy to 1.7x in the United Kingdom and Spain.

As more customers integrate Akamai's RUM capabilities, and as more devices support the Navigation Timing API, we expect that we will be able to expand the scope of the Situational Performance measurements presented within future issues of the *State of the Internet Report*.

10.1 Syria

Disruptions to Internet connectivity within Syria seem to have occurred with alarming frequency over the past year, with at least two significant outages occurring during the fourth quarter of 2013. However, these observed issues were only hours long, in contrast to the multi-day disruptions observed earlier in 2013. In addition, a number of localized Internet disruptions were reported to have occurred in Aleppo during the quarter.

On October 15, a country-wide disruption lasting just under an hour occurred at 3:40AM UTC,[43] as shown in Figure 45. However, it was not a complete outage, as Akamai traffic to the region did not drop to zero—a Tweet[44] from Internet monitoring firm Renesys indicated that a new Internet connection through Turkey remained available. Continued availability of this connection through Turkey also prevented a complete disruption of Internet services in Syria on December 9. As illustrated in Figure 46, Akamai traffic to users in Syria declined sharply starting around 9:30 AM UTC, recovering at around 1:00 PM UTC. The disruption was also noted in Tweets from Renesys[45] as well as Internet monitoring firm BGPmon.[46] No specific reasons for either disruption were publicly determined or disclosed.

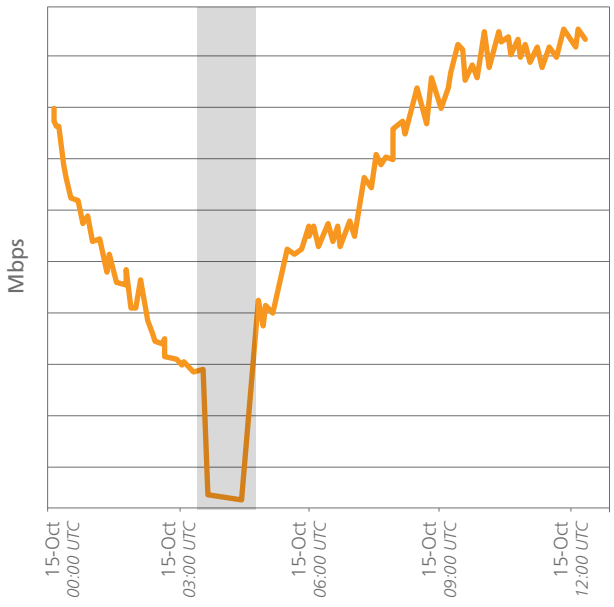

Figure 45: HTTP Traffic Served to Syria, October 15, 2013

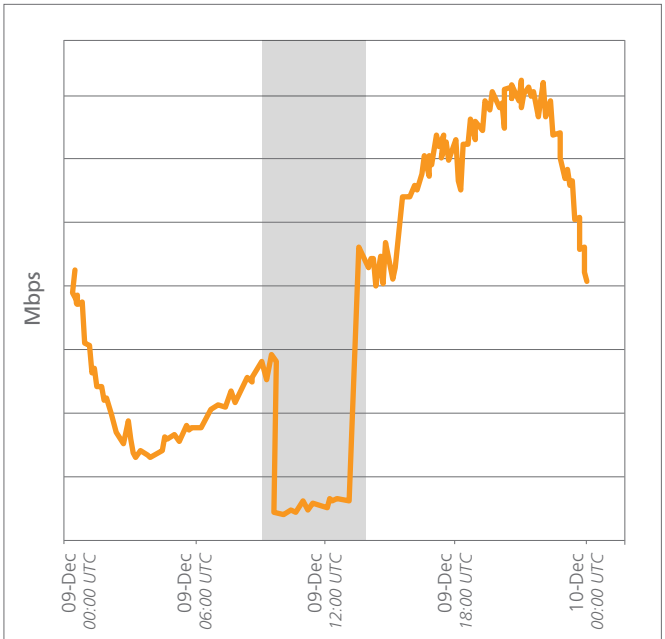

Figure 46: HTTP Traffic Served to Syria, December 9, 2013

10.2 Suriname & Guyana

On November 6, the Suriname Guyana Submarine Cable System (SGSCS) suffered a "marine disruption,"[47] which caused significant disruptions to Internet service in both Suriname and Guyana. The cable is owned by Guyana Telephone and Telegraph, and connects Suriname, Guyana, and Trinidad & Tobago.[48] As shown in Figure 47, Akamai traffic to users in

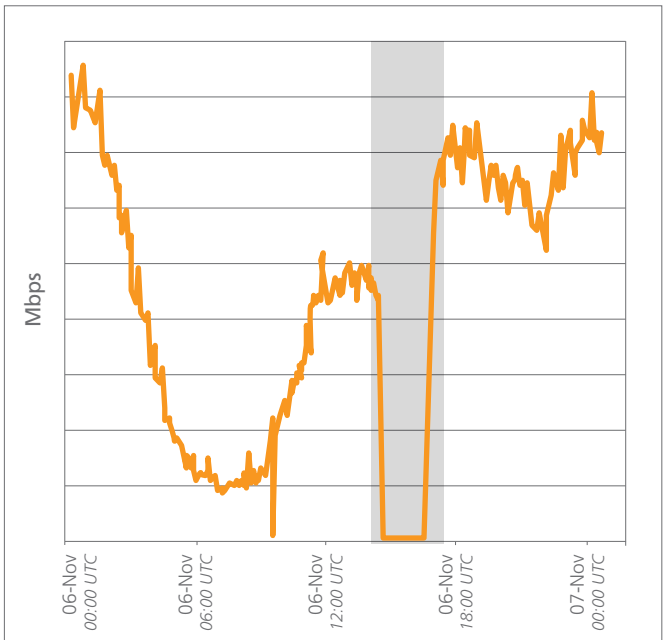

Figure 47: HTTP Traffic Served to Suriname, November 6, 2013

Suriname dropped to zero at approximately 2:00 PM UTC, recovering two hours later. Akamai traffic to Guyana, shown in Figure 48, dropped to near zero just after 9:00 AM UTC, and remained minimal until recovering at approximately 4:00 PM UTC, with the exception of a spike around 11:00 AM UTC. The timing and duration of these observed disruptions were corroborated in graphs posted in a Tweet from Renesys that showed the number of available networks in each country.[49] In addition, published reports[50] indicate that service was restored at 12:30 PM Guyana Time, which roughly aligns with the traffic ramps seen after 4:00 PM UTC in both figures.

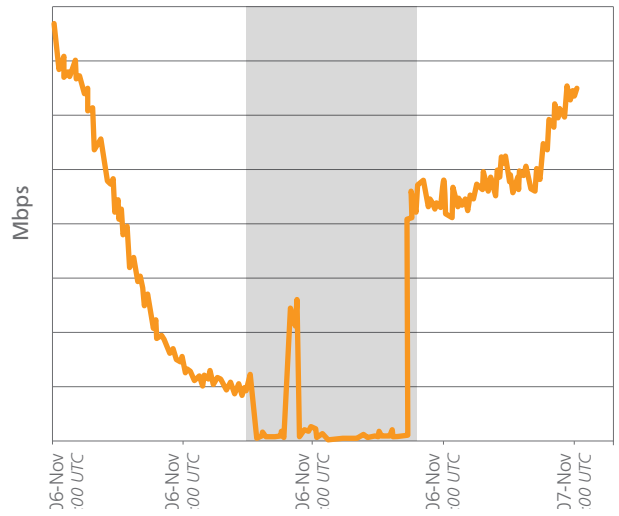

Figure 48: HTTP Traffic Served to Guyana, November 6, 2013

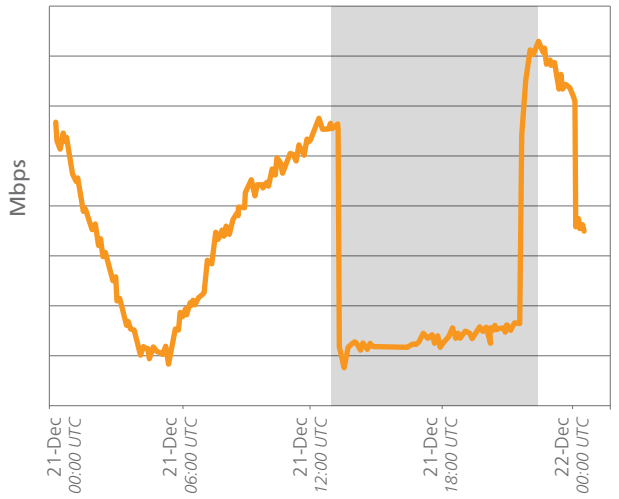

Figure 49: HTTP Traffic Served to Libya, December 21, 2013

10.3 Libya

On December 21, the BBC reported[51] that protesters armed with knives and sticks stormed the building of Libya's largest Internet provider in the capital, Tripoli, forcing employees of the state-owned Internet provider, the Libyan Telecoms and Technology Company (LTT), to switch off its service for much of the day. As shown in Figure 49, Akamai traffic to users in Libya declined sharply just before 1:00 PM UTC, and remained minimal until just after 7:00 PM UTC. The BBC report indicated that LTT was able to restore Internet service using a "backup system."

10.4 Cuba

Although international Internet connectivity from Cuba has been limited in the past, it took steps towards improving during 2013, with submarine cables to Venezuela[52] and Jamaica[53] both starting to carry traffic. However, despite these submarine cables, as well as the traditional satellite connectivity, Cuban Internet connectivity suffered an hour-long disruption on December 1. As shown in Figure 50, Akamai traffic to users in Cuba dropped to zero just after 5:00 AM UTC, returning approximately an hour later. No public explanation was available for the observed outage. Its impact may have ultimately been fairly limited, as most citizens do not currently have Internet access at home, and are restricted to expensive online time at "Internet establishments" for e-mail and Web usage. This situation may be improving, though, as Cuba's state-run telecommunications company, ETECSA, reportedly plans to begin offering in-home Internet connections by late 2014, with service first being made available in areas of the country that have the "right technical facilities to make the connection."[54]

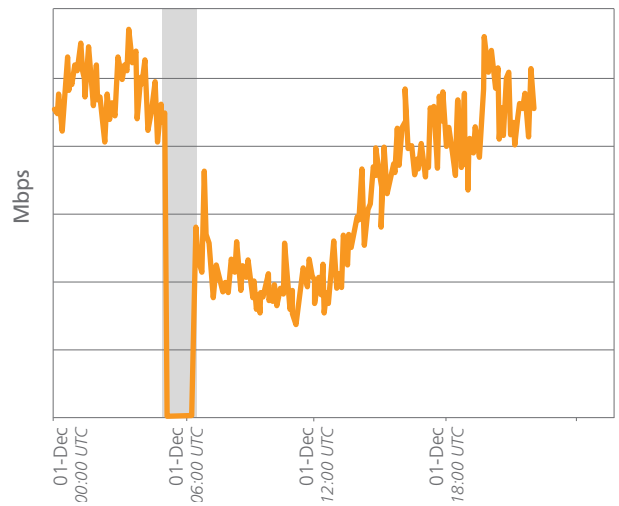

Figure 50: HTTP Traffic to Cuba, December 1, 2013

Region	% Attack Traffic	Unique IP Addresses	Avg. Connection Speed (Mbps)	Peak Connection Speed (Mbps)	% Above 10 Mbps	% Above 4 Mbps
Europe						
Austria	0.1%	2,722,255	9.0	36.4	23%	81%
Belgium	<0.1%	4,764,823	9.8	43.2	35%	79%
Czech Republic	0.1%	1,905,482	11.4	38.4	37%	84%
Denmark	<0.1%	2,966,817	9.5	34.3	31%	82%
Finland	<0.1%	2,825,467	9.1	33.8	29%	70%
France	0.4%	27,772,161	6.6	26.7	12%	69%
Germany	0.8%	37,178,908	7.7	35.8	18%	75%
Greece	<0.1%	3,181,381	4.9	24.7	3.6%	51%
Hungary	0.4%	2,873,654	6.9	38.0	15%	69%
Iceland	<0.1%	168,745	7.4	38.7	13%	69%
Ireland	0.1%	1,868,246	10.4	38.1	26%	64%
Italy	0.4%	19,815,167	5.2	21.6	4.9%	57%
Luxembourg	<0.1%	169,886	6.5	27.4	8.7%	75%
Netherlands	2.7%	9,181,935	12.4	43.6	45%	87%
Norway	<0.1%	3,832,092	8.7	32.1	25%	54%
Poland	0.4%	8,932,697	7.5	31.3	19%	71%
Portugal	0.1%	3,498,671	6.0	37.2	10%	66%
Romania	0.9%	3,067,595	7.2	50.6	15%	76%
Russia	1.5%	18,369,348	7.4	35.8	21%	73%
Slovakia	<0.1%	1,082,612	6.6	31.7	13%	60%
Spain	0.5%	14,013,229	6.6	31.2	13%	70%
Sweden	0.2%	6,753,978	10.5	42.1	30%	73%
Switzerland	<0.1%	3,615,606	12.0	44.2	42%	91%
Turkey	0.4%	9,870,318	4.3	28.9	2.0%	44%
United Kingdom	0.3%	28,679,676	9.4	43.5	30%	79%
Asia/Pacific						
Australia	0.1%	8,726,302	5.8	35.2	9.7%	54%
China	43%	120,626,188	3.4	13.8	1.8%	29%
Hong Kong	0.3%	3,062,575	12.2	68.0	37%	81%
India	0.7%	17,844,839	1.5	10.9	0.4%	3.6%
Indonesia	5.7%	7,225,893	1.6	12.5	0.1%	1.8%
Japan	0.4%	40,370,608	12.8	53.7	47%	83%
Malaysia	0.1%	2,136,588	3.0	30.0	1.7%	25%
New Zealand	<0.1%	2,139,109	5.3	21.6	6.7%	55%
Singapore	0.1%	1,563,139	7.9	59.1	19%	67%
South Korea	0.6%	20,382,592	21.9	64.4	71%	94%
Taiwan	3.4%	11,001,109	8.3	50.9	23%	68%
Vietnam	0.3%	5,985,212	1.8	12.6	0.1%	2.7%
Middle East & Africa						
Egypt	0.1%	4,738,718	1.3	10.6	0.1%	0.6%
Israel	0.1%	2,311,537	8.2	54.6	21%	83%
Kuwait	<0.1%	837,464	3.0	33.3	1.2%	8.9%
Saudi Arabia	0.1%	3,977,349	2.7	22.4	0.1%	6.9%
South Africa	<0.1%	6,829,616	2.3	9.1	1.3%	7.4%
Sudan	<0.1%	447,992	1.8	7.6	<0.1%	1.6%
Syria	<0.1%	638,384	1.4	8.7	<0.1%	2.6%
United Arab Emirates (UAE)	0.1%	1,509,917	4.2	41.7	3.5%	39%
Latin & South America						
Argentina	0.3%	7,311,643	3.1	19.7	1.4%	23%
Brazil	1.1%	37,012,238	2.7	20.4	0.8%	22%
Chile	0.1%	4,449,946	3.4	20.3	1.2%	26%
Colombia	0.2%	8,589,318	2.9	16.8	0.3%	15%
Mexico	0.3%	11,719,422	4.0	21.2	2.0%	35%
Peru	0.1%	1,235,110	2.7	18.3	0.2%	6.0%
Venezuela	0.7%	3,589,910	1.5	10.4	0.1%	1.4%
North America						
Canada	10%	13,948,440	9.0	40.5	26%	82%
Costa Rica	<0.1%	437,146	2.1	13.1	0.4%	4.0%
United States	19%	164,904,690	10.0	43.7	34%	75%

SECTION 12:
Endnotes

[1] https://code.google.com/p/skipfish/
[2] http://subgraph.com/products.html
[3] http://www.exploit-db.com/exploits/2295/
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