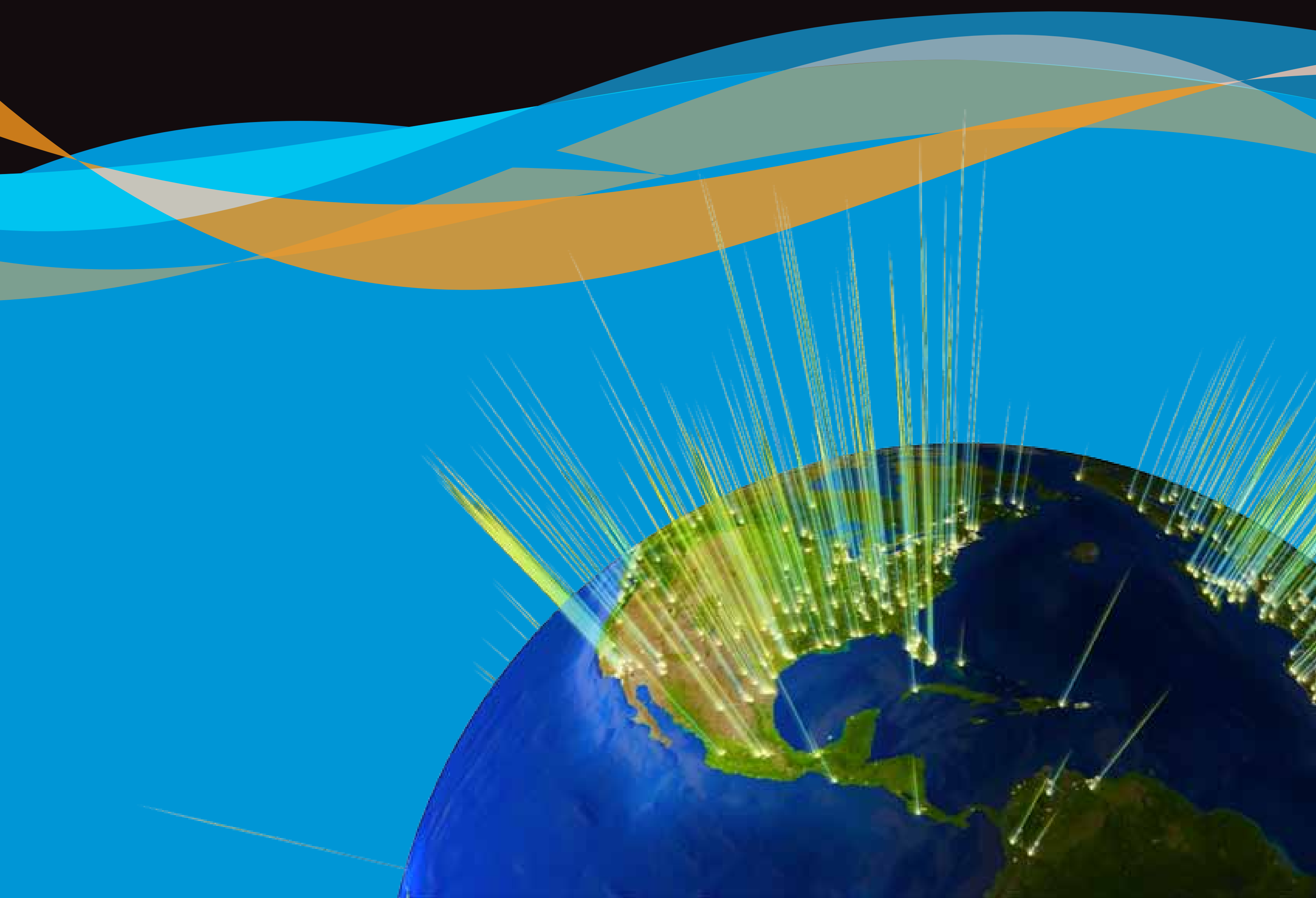
Akamai

Volume 2, Number 1

REPORT

1st Quarter, 2009

The State of the Internet



The "spinning globe" featured in the Akamai NOCC represents where Akamai servers are located and how much traffic they are seeing.

Executive Summary

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

During the first quarter of 2009, Akamai observed attack traffic originating from 68 unique countries around the world. The United States and China were the two largest attack traffic sources, accounting for nearly 50% of observed traffic in total. Once again, Akamai observed attack traffic targeted at more than 20,000 unique ports, with the top 10 ports seeing roughly 90% of the observed attack traffic. (The additional concentration in the first quarter was likely related to traffic related to the Conficker worm.) Numerous Web site hacks and Web-based exploits were reported during the quarter, as were distributed denial of service attacks targeted at DNS infrastructure. The Conficker worm continued to spread throughout the quarter, spawning several variants, each more damaging than the previous.

Comparatively minor network outages and routing issues were reported in the first quarter. Web site outages during the quarter impacted popular cloud computing platforms, social media sites, and Web hosting providers.

A number of new submarine cable projects were announced or deployed in the first quarter. These deployments are ultimately expected to improve Internet connectivity for countries in Africa, Europe, South America & the Caribbean, and Oceania. New WiMAX projects and deployments will bring broadband wireless connectivity to countries in Eastern Europe, Africa, Asia, and the former Soviet Union. Fiber-to-the-home efforts announced in the first quarter will benefit users in New Zealand, Australia, Bali, Latvia, Scotland, and England.

The first quarter also saw nominal advances in IPv6 adoption, as Google launched access to a broad set of Google services over IPv6, and seven more country-level domains enabled their DNS servers for IPv6. In the United States, and countries around the globe, "stimulus funding" was allocated in the first quarter to help improve broadband availability in rural areas.

Akamai observed a nearly five percent increase (from the fourth quarter 2008) globally in the number of unique IP addresses connecting to Akamai's network. From a global connection speed perspective, Japan unseated South Korea for the highest levels of "high broadband" (>5 Mbps) connectivity, though South Korea maintained the highest average connection speed, at 11 Mbps. In the United States, Delaware also maintained its top position, with 62% of connections to Akamai occurring at 5 Mbps or greater, and the highest average connection speed in the United States, at 7.2 Mbps.

The Inauguration of United States President Barack Obama in January drove record levels of streaming and HTTP traffic across the World Wide Web, and also impacted the usage of online retail, messaging, and search sites.

Table of Contents

Introduction

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

In the first quarter of 2009, observed distributed denial of service (DDoS) attack traffic continued to target a consistent set of ports, though attacks likely related to the Conficker worm were responsible for an overwhelming percentage of the observed attacks. Monthly peaks in observed attack traffic were also once again roughly correlated with the publication of Microsoft Security Bulletins. The Conficker worm spread aggressively, infecting computers around the world, although Akamai and third-party measurements indicated a relatively large Conficker presence in Russia.

Cloud computing platform providers experienced availability issues during the first quarter, highlighting the challenges associated with moving data and applications "into the cloud," and reinforcing the need for cloud optimization services, such as those offered by Akamai.

Global connectivity continued to become more robust, with new WiMAX mobile broadband services announced or launching in a number of countries, new fiber-to-the-home initiatives bringing higher speed connectivity to subscribers in multiple countries, and new submarine cable projects increasing global Internet capacity and improving Internet connectivity around the world. So-called "broadband stimulus" funding in the United States and abroad announced in the first quarter is intended to improve the availability of broadband Internet connections to users in more rural areas.

In the first quarter, eight countries connected to Akamai's network at speeds in excess of 5 Mbps, and many countries continued to experience significant increases in their levels of high broadband (>5 Mbps) adoption. Decreases in the percentage of narrowband (<256 Kbps) connections to Akamai were also seen both internationally and in the United States, likely due, in part, to the growth in availability of, and options for, broadband connectivity.

The Inauguration of United States President Barack Obama in January drove record levels of streaming and HTTP traffic across the World Wide Web, and also had an observable impact on the usage of online retail, messaging, and search sites.

SECTION 2: Security

Akamai maintains a distributed set of agents deployed across the Internet that serve to monitor attack traffic. Based on the data collected by these agents, Akamai is able to identify the top countries from which attack traffic originates, as well as the top ports targeted by these attacks. (Ports are network layer protocol identifiers.) This section, in part, provides insight into Internet attack traffic, as observed and measured by Akamai, during the first quarter of 2009. While some quarter-over-quarter trending may be discussed, it is expected that both the top countries and top ports will change on a quarterly basis.

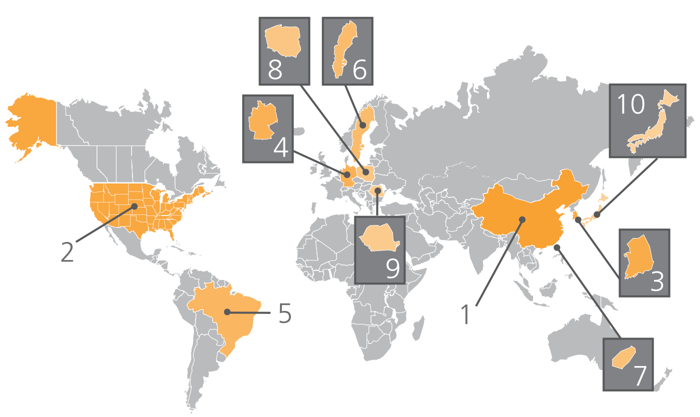
This section also includes information on selected DDoS attacks, Web site hacking attempts, Web-based exploits, and other attacks and events as published in the media during the first quarter of 2009. It also includes a discussion of the spread of the Conficker worm across the Internet during the first quarter, as well as noting the progress that has been made around DNSSec deployment. Note that Akamai does not release information on attacks on specific customer sites and that selected published reports are simply compiled here.

2.1 Attack Traffic, Top Originating Countries

Akamai observed attack traffic originating from 68 unique countries around the world.

During the first quarter of 2009, Akamai observed attack traffic originating from 68 unique countries around the world, down nearly 65% from the fourth quarter count of 193 countries. In the first quarter, the United States moved back into the second place slot, after being ranked first in the fourth quarter of 2008. Poland and Romania moved back into the top 10, while Argentina and Russia dropped out of it. In addition, the trend in attack traffic distribution is fairly consistent with 2008 levels, with the top 10 countries as the source for 73% of observed attack traffic, as highlighted in Figure 1.

While the number of countries observed to be originating attack traffic dropped significantly during the first quarter of 2009, it is not clear what caused this decrease. There are certainly a number of possible reasons (more aggressive network filtering by ISPs, reduced spoofing of IP addresses, etc.), but nothing that can be definitively stated as the cause.



	Country	% Traffic	Q4 08 %
1	China	27.59	19.30
2	United States	22.15	22.85
3	South Korea	7.53	2.52
4	Germany	2.95	2.15
5	Brazil	2.60	1.68
6	Sweden	2.48	10.67
7	Taiwan	2.22	5.61
8	Poland	1.87	0.99
9	Romania	1.83	0.73
10	Japan	1.79	2.00
–	OTHER	26.99	–

Figure 1: Attack Traffic, Top Originating Countries

For the fourth consecutive quarter, attacks targeted at Port 445 were responsible for the highest percentage of the observed attacks.

2.2 Attack Traffic, Top Target Ports

During the first quarter of 2009, Akamai observed attack traffic targeted at just over 20,400 unique ports, roughly similar to the level seen in the fourth quarter of 2008. Owing to a significant portion of the observed attack traffic (two-thirds) being targeted at Port 445, likely due to the Conficker worm, the concentration of attack traffic in the first quarter was significantly greater than in prior quarters, with the top 10 target ports accounting for approximately 90% of the traffic, as shown in Figure 2.

The United States is clearly the key culprit in driving up the unique port counts, recording attacks targeted at over 19,700 ports. China has the next highest count, but only accounts for 800 ports.

Looking at the underlying data, we can develop some thresholds to filter out the "noise," as many ports saw very few attacks. At a threshold of 10 attempted attacks, more than 19,600 ports would be removed from the overall count, while a higher threshold of 100 attempted attacks would filter out over 20,300, leaving approximately 100 ports that were the target of 100 or more attempted attacks. With a threshold of 100 attacks, the concentration levels obviously increase — Port 445 becomes 72% of the attack traffic, while the top 10 ports account for just over 95% of the attack traffic. Many of the ports in the "long tail," with lower attack counts, are likely not the targets of organized or intentional attacks, but possibly port scans or misconfigured applications.

For the fourth consecutive quarter, attacks targeted at Port 445 were responsible for the highest percentage of the observed attacks. Unsuprisingly, it also had the highest attack counts in each of the top 10 countries, with counts ranging from 2.2x to 28.7x higher than the next most attacked port. As noted above and in the *4th Quarter, 2008 State of the Internet* report, Port 445 is associated with the Conficker worm, which spread across the Internet in the first quarter of 2009, and which is discussed in more detail in Section 2.4 below.

Destination Port	Port Use	% Traffic	Q4 08 %
445	Microsoft-DS	67.80	22.96
139	NetBIOS	6.20	11.56
22	SSH	4.40	10.78
135	Microsoft-RPC	3.60	7.15
23	Telnet	2.40	1.77
80	WWW	1.30	14.51
5900	VNC Server	1.30	2.07
1433	Microsoft SQL Server	1.00	2.46
25	SMTP	0.80	1.89
4899	Remote Administrator	0.60	1.32
Various	OTHER	10.50	–

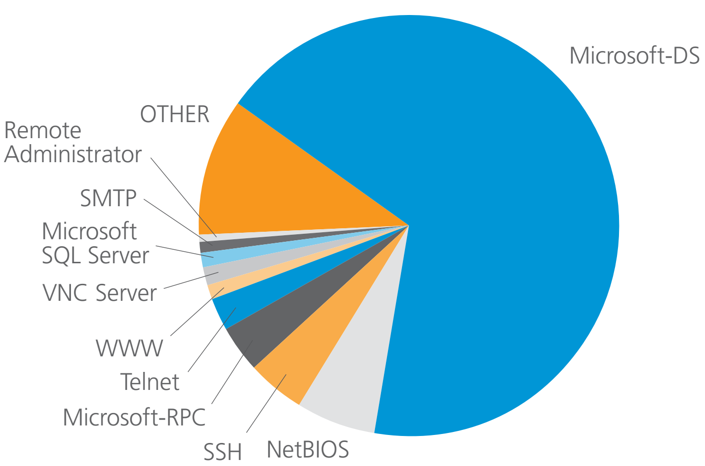


Figure 2: Attack Traffic, Top Target Ports

Monthly peaks in February and March are also coincidental with the publication of Microsoft Security Bulletins for those months.

2.3 Attack Traffic, By Day

In the fourth quarter of 2008, Akamai examined observed attack traffic, aggregated by day of week, in an effort to test a hypothesis that higher volumes of attack traffic were seen on Wednesdays, as attackers attempted to exploit vulnerabilities that were addressed by "Patch Tuesday" updates released by Microsoft, before they could be applied. In practice, a somewhat wave-like pattern emerged, with Wednesday actually representing the lowest percentage of attacks over the course of the week.

In looking at the first quarter of 2009, as shown in Figure 3, a roughly similar pattern appears to emerge, though the deltas between peak and valley are smaller than in the fourth quarter. In the first quarter, only 2.17% separates Monday and Saturday, the highest and lowest days of the week. In the fourth quarter, 3.91% separated Monday and Sunday, which were the highest and lowest days of the week in that quarter.

Figure 4 provides a quarter-long view of attack traffic. The quarterly peak on January 12 could be related to Microsoft Security Bulletin MS09-001,[1] which was issued on January 13 — attackers attempting to exploit the critical vulnerability described in the bulletin ahead of the patch release. Monthly peaks in February and March are also coincidental with the publication of Microsoft Security Bulletins for those months.[2,3]

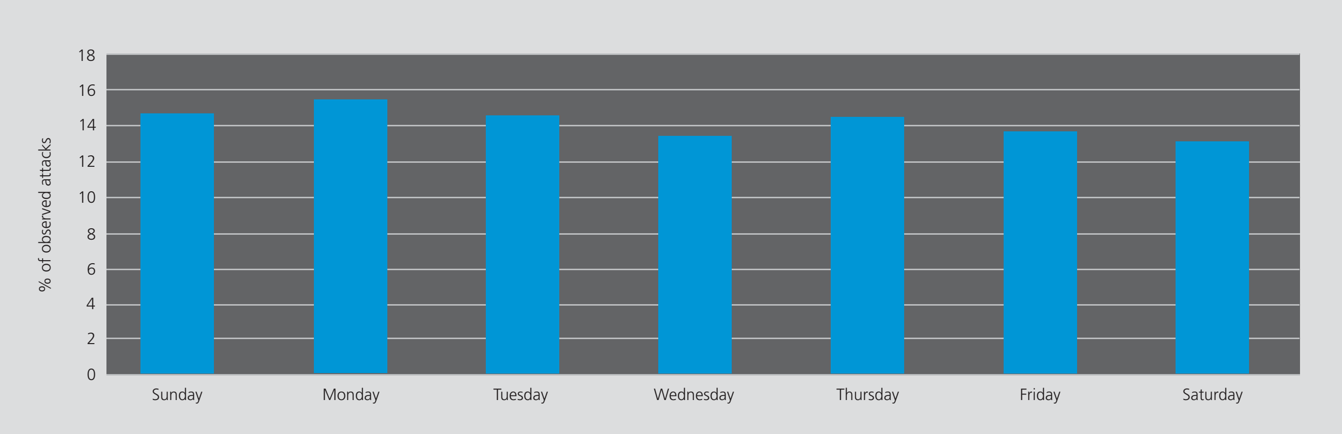


Figure 3: Attack Traffic, Aggregated by Day of Week

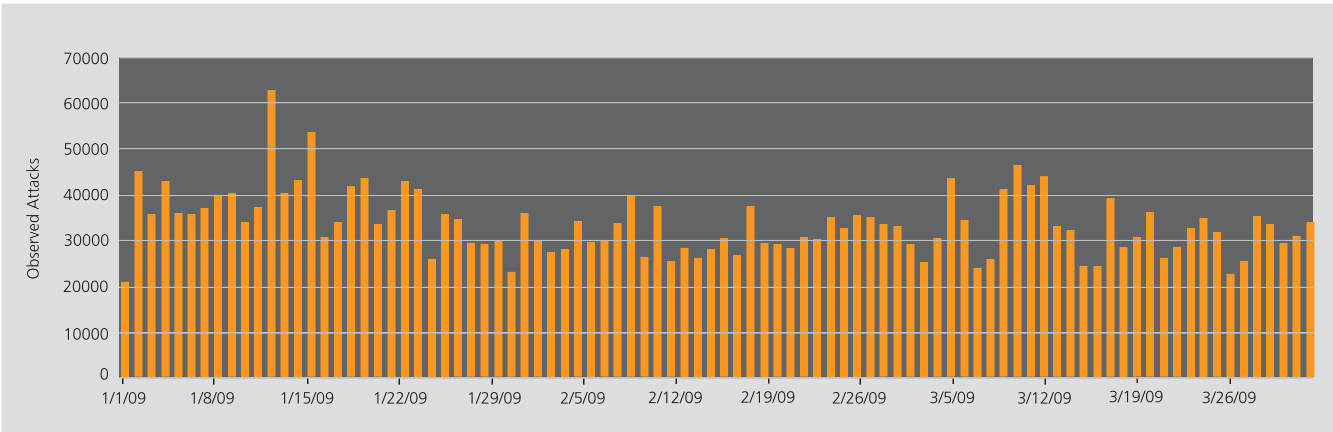


Figure 4: Attack Traffic, by Day of Quarter

2.4 Conficker

Following its emergence in the fourth quarter of 2008, the worm known as Downadup, or more popularly, Conficker, continued to spread rapidly in the first quarter of 2009, and spawned multiple variants, known as A, B, B++, and C. Conficker exploited a vulnerability addressed in Microsoft Security Bulletin MS08-067, which was issued in October 2008. However, despite an available patch, and removal tools published by multiple security software vendors, Conficker spread aggressively across the Internet. A January 16 blog post[4] from security firm F-Secure noted that the number of infections, as estimated by such firm, grew from 2.4 million infected machines to over 8.9 million in just four days.

Conficker, continued to spread rapidly in the first quarter of 2009, and spawned multiple variants, known as A, B, B++, and C.

Additional coordinated efforts were made to stem the spread of the worm. In February, DNS service provider OpenDNS announced that it would be preventing customer systems that were infected with Conficker from reaching the worm's control servers, and that it would also alert network administrators at customer sites if PCs on the administrators'

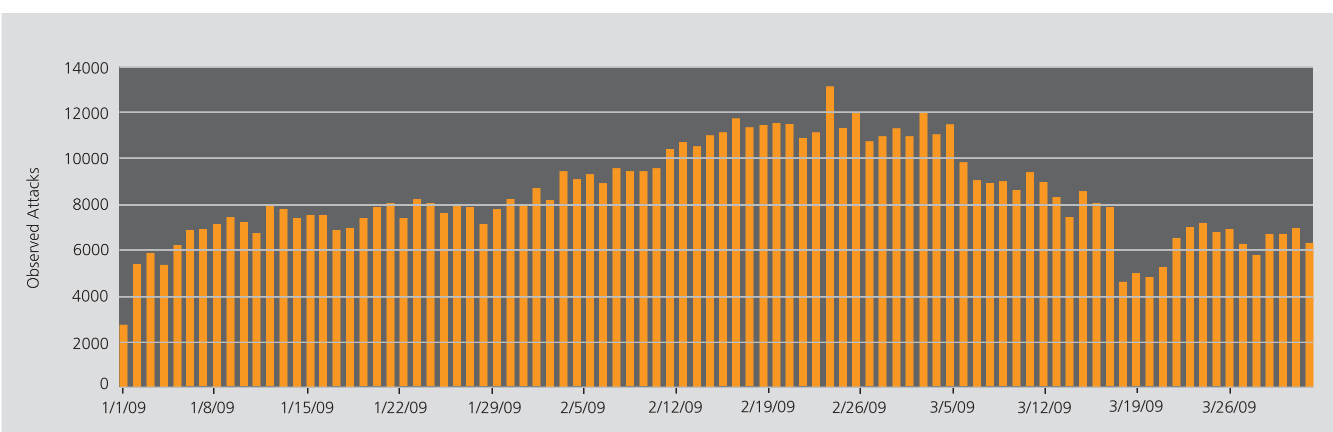


Figure 5: Port 445 Attack Traffic by Day of Quarter

	Country	% Traffic
1	Russia	12.5
2	United States	9.0
3	Italy	5.7
4	Brazil	5.7
5	South Korea	5.2
6	Germany	4.9
7	Taiwan	4.7
8	China	4.6
9	Romania	3.5
10	Argentina	3.2
-	Other	41.0

Figure 6: Top Countries Originating Observed Port 445 Attack Traffic

Russia was responsible for one-eighth of the observed traffic to port 445 during the first quarter.

networks tried to connect to Conficker-related addresses.[5] Also in February, Microsoft announced an industry-wide collaboration intended to address the Conficker threat. Known informally as the "Conficker Cabal," partners in the effort included ICANN, NeuStar, VeriSign, Afilias, Public Internet Registry, AOL, Symantec, F-Secure, Arbor Networks, and others.[6] In March, the registrar that manages the .ca (Canada) ccTLD noted that it would be preemptively registering domain names that Conficker C was expected to attempt to generate and register.[7]

The significant drop in observed attacks on March 17, as highlighted in Figure 5, matches a decline in observed TCP Port 445 scanning activity observed by SRI,[8] which it noted coincides with the rise in UDP and TCP P2P activity from Conficker C. In Addendum C[9] to its "An Analysis of Conficker C"[10] report, SRI also noted that this drop in activity was corroborated by similar drops in observed by CAIDA's UCSD Network Telescope,[11] which serves a function similar to the set of Akamai servers that collect attack traffic data. In addition, in a forum post[12] on March 6, a representative of security firm Symantec, in writing about Conficker C, noted, "These early findings may suggest that the Downadup authors are now aiming for increasing the longevity of the existing Downadup threat on infected machines. Instead of trying to infect further systems, they seem to be protecting currently infected Downadup machines from antivirus software and remediation." A general decline in attacks on Port 445 during that time frame, as shown above in Figure 5, would appear to support that conjecture.

While recognizing that not all attacks targeted at Port 445 are necessarily associated with Conficker, it is interesting to look at which countries originated the largest amounts of observed traffic to that port. As shown in Figure 6, Russia topped the list, responsible for one-eighth of the observed traffic to port 445 during the first quarter. Online coverage of Conficker suggests that large numbers of Conficker-infected machines may be located in Russia,[13] while other research[14] indicates that the malware may have originated in the Ukraine. In addition, research by SRI[15] found the highest number of IP addresses infected

A large-scale DDoS attack against the DNS servers of domain registrar Network Solutions ultimately impacted access to hundreds of thousands of Web sites.

by Conficker to be in China and Brazil — Russia was third on the list. The top 10 countries observed by Akamai all rank within the top 15 on the list derived from SRI's research.

According to data posted[16] by IBM's Internet Security Systems division in late March, only 6 percent of the known Conficker infections at the time were in North America. In contrast, nearly 45 percent of infected systems were in Asia, while Europe accounted for 32 percent. Infected systems in South America accounted for approximately 14 percent, and just over 1 percent in Africa.

2.5 Distributed Denial of Service (DDoS) Attacks

In late January, a large-scale DDoS attack against the DNS servers of domain registrar Network Solutions caused significant latency, and in some cases, query timeouts, for requests to these DNS servers. This attack ultimately impacted access to hundreds of thousands of Web sites.[17] A post[18] to the Network Solutions blog noted that they experienced traffic spikes in DNS queries lasting between 2 to 4 hours on January 22 & 23 that caused intermittent disruption of normal DNS query resolution.

In February, security researchers warned[19] of a new type of DDoS attack known as "DNS amplification," which had already been seen in use against pornography and gambling Web sites. This DNS amplification attack spoofs the source of a DNS query, using the IP address of the target. A small query is issued for the "." domain, which results in a large response being sent to the target containing a list of all domain root servers.

In late February, Time Warner Cable's DNS servers were targeted by a DDoS attack that lasted for at least seven days. An update posted[20] by a company spokesman noted that the company had identified several hundred customers whose machines were used to perpetrate this attack, and that their access to Timer Warner's network was temporarily suspended to prevent future attacks.

Closing out a quarter that appeared to see a significant number of DDoS attacks targeted at DNS infrastructure, in late March, NeuStar confirmed that some of its UltraDNS managed DNS service customers were knocked offline for several hours by a DDoS attack.[21]

Starting on January 18, and continuing for several weeks, the former Soviet republic of Kyrgyzstan was targeted with numerous DDoS attacks, and published reports note that three of the four main Internet service providers in the country were taken offline by these attacks.[22]

In an effort to demonstrate the threats from botnets, the BBC acquired a "low value" botnet and used it to flood specially created Gmail and Hotmail accounts with e-mail, as well as launching a DDoS attack against a test site owned by security company Prevx.[23]

In late January, the digital TV news site Techwatch was taken down by a 446 Mbps DDoS attack that surged to 2 Gbps at times. The DDoS attack was accompanied by blackmail demands that were posted on Techwatch's forum through compromised systems.[24] Security Web site Metasploit, along with several other related sites, was targeted in early February with a DDoS attack from hundreds of thousands of IPs. The attack consisted of a flood of TCP SYN and HTTP GET requests targeting port 80.[25] Web hosting provider GoGrid suffered a DDoS attack in late March that affected approximately half of their customers for several hours.[26] In early March, the BitTorrent site Mininova was hit by a large-scale DDoS attack that caused a total of 14 hours of downtime. The attack reportedly generated 2 Gbps traffic, overloading Mininova's Internet connections.[27]

2.6 Web Site Hacks & Web-Based Exploits

For a brief period, it appeared, through Google's search results at least, that the whole Web had been hacked — a disconcerting thought.

In an effort to warn users against visiting sites that might be harmful to their systems, Google's search engine will tag suspect sites included in search results with a note stating, "This site may harm your computer." However, for approximately an hour on the morning of January 31, Google essentially flagged the entire World Wide Web as potentially harmful due to human error during an update to the list of potentially harmful sites.[28] While not an actual Web site hack, for a brief period, it appeared, through Google's search results at least, that the whole Web had been hacked — a disconcerting thought.

Web sites belonging to several Internet and Web security companies were the target of hacking attempts during the first quarter of 2009. In early February, it was reported that a Web site belonging to Kaspersky Lab was hacked through a SQL injection attack.[29] Shortly thereafter, the Portugal site of BitDefender was breached using the same techniques, and a similar attack targeted a marketing Web site owned by F-Secure.[30]

Quite a few security alerts were issued in the first quarter by security firm Websense. The RSS feed[31] for these alerts contained information on the compromise of more than 50 Web sites, including those belonging to organizations such as the Consulate of the Republic of Kazakhstan in Toronto, my.barackobama.com, Rajshri Productions, the Embassy of Portugal in India, and automobile maker Peugeot.

The fourth quarter of 2008 saw SSL come under attack through a vulnerability in the MD5 algorithm used to sign some SSL certificates, which could make it easier for an attacker to create a rogue certificate that appeared to be legitimate. In the first quarter, a security researcher released a software tool for performing "man-in-the-middle" attacks on seemingly secure Web sites, including banking sites, Web e-mail or e-commerce sites.[32] The Web page[33] for the tool notes that "It will transparently hijack HTTP traffic on a network, watch for HTTPS links and redirects, then map those links into either look-alike HTTP links or homograph-similar HTTPS links," and that it supports a mode in which the attacker can make use of a "favicon" that looks like the browser padlock, in order to trick a user into thinking that the connection is still secure.

A new variant of the Koobface worm surfaced during the first quarter.[34] "Koobface.az," as the variant is known, looks through a compromised system for browser cookies associated with 10 different social networking sites (including bebo.com, Facebook, Friendster, fubar.com, hi5.com, LiveJournal, MySpace, myYearbook, Netlog and Tagged), uses the usernames and passwords within those cookies to log on to each service, searches for the infected user's friends, and then sends those people messages that include a link to the worm. In addition, security firms note that this new variant is harder to remove from infected systems, as it leverages a rootkit attack to bury it deep within the computer's operating system, and resists attempts to remove it.[35]

Cross-site scripting (XSS) flaws continued to be an issue as well. The RSS feed[36] for Web site xssed.com, which provides XSS information and alerts on vulnerable sites, highlighted vulnerabilities in more than 100 Web sites during the first quarter. The feed contained information on XSS flaws in such high profile social networking sites as Facebook and MySpace, sites belonging to messaging tool providers Meebo and Digsby, numerous United States and international government sites, and sites associated with gaming providers including Valve and Electronic Arts. In addition, in mid-February, a new wave of phishing attacks surfaced that combined wildcard DNS records with XSS vulnerabilities to enable attackers to steal eBay user credentials from victims.[37] In March, a proof-of-concept Twitter worm was demonstrated that exploited an XSS vulnerability to post a message to a victim's profile.[38]

2.7 DNSSEC

During the first quarter of 2009, a new DNS flaw emerged that impacted elements of DNSSEC, where attackers could theoretically spoof answers returned from DNS zones that used specific encryption algorithms. However, industry experts noted that the flaw was less severe than the critical flaw discovered in 2008 by security researcher Dan Kaminsky.[39]

United States federal agencies were required to deploy DNS Security Extensions (DNSSEC) on the .gov top-level domain by January 2009 and on all sub-domains by December 2009 under an Office of Management and Budget (OMB) mandate issued last year. The United States government missed the January deadline for rolling out DNSSEC on the .gov top-level domain;[40] however, a post on security blog CircleID noted that DNSSEC was implemented on .gov in early February.[41]

Also in February, the Internet Corporation for Assigned Names and Numbers (ICANN) moved ahead with an alternative approach to allow DNSSEC deployment without the DNS root zone being signed. Known as a Trust Anchor Repository, it serves as a centralized clearinghouse for top-level domains to share their DNSSEC public keys. ICANN officials noted that their Trust Anchor Repository would be disabled as soon as the United States Department of Commerce requires root zone operators to deploy DNSSEC.[42]

Along those lines, VeriSign, which operates two of the 13 server clusters that carry the DNS root zone data, promised to deploy DNSSEC across all of its top-level domains by 2011. In addition to operating two root servers, VeriSign also operates two of the Internet's most popular top-level domains: .com and .net.[43]

Finally, in an effort to drive DNSSEC adoption through the DNS registrar community, in March, the DNSSEC Industry Coalition announced the formation of its Registrar Review Team, which will serve to provide the industry coalition with information about DNSSEC from the registrar's perspective. According to a press release[44] issued by the organization, the Registrar Review Team initially consisted of Name.com, Names Beyond, DynDNS, Corporation Service Company (CSC), and MarkMonitor.

VeriSign promised to deploy DNSSEC across all of its top-level domains by 2011.

SECTION 3: Networks and Web Sites: Issues & Improvements

Twenty years ago, in March 1989, Sir Tim Berners-Lee authored a report titled "Information Management: A Proposal"[45] while working as a software consultant at CERN outside of Geneva, Switzerland.[46] According to Berners-Lee, the proposal was an attempt to persuade CERN management that a global hypertext system was in CERN's interests. The name wasn't adopted until May 1990, but this document ultimately laid the foundation for what has become known as the World Wide Web. Without this groundwork, the issues and improvements highlighted here would likely be of less interest and importance.

3.1 Network Outages

The first quarter of 2009 saw fewer widely-reported non-attack-related network outages than in prior quarters.

It appears that the first quarter of 2009 saw fewer widely-reported non-attack-related network outages than in prior quarters. In February, a Primus Telecommunications datacenter in Melbourne, Australia, experienced a datacenter power outage that affected many of the country's Internet Service Providers, including Westnet, iiNet, Netspace, Internode and TPG Internet.[47] In March, Internet service for Fairpoint Communications customers in New Hampshire was down for several hours.[48]

However, during the quarter, the reasons for past Internet outages and the process for fixing them were examined in two articles: "Why the Mediterranean is the Achilles' heel of the Web"[49] in *New Scientist*, and "Who Protects the Internet"[50] in *Popular Science*. These articles examined the fragility of physical Internet infrastructure, the problems this infrastructure faces, and steps being taken by those responsible for it to secure and strengthen the infrastructure to reduce the potential for problems going forward.

3.2 Routing Issues

The most significant routing issue in the first quarter was caused by a Czech network provider called Supro (AS 47868), which sent out a routing update on February 16 that reportedly caused routers at other service providers around the world to fail, or to drop traffic.[51,52] According to published reports, Supro sent out a routing update with an extremely long AS path, which triggered a five-year old bug in the operating system on Cisco routers. (The bug, which was in older versions of the OS and has since been patched, improperly handled exceedingly long AS paths and would cause failures when such updates were received.) Supro's update, and the impact of this update on older/unpatched Cisco routers across the Internet triggered widespread routing system instability and underlying connectivity issues for several hours, and reportedly caused customer downtime at Web hosting companies Media Temple and iWeb.

A follow up post[53] on the Renesys blog notes that while the global routing instability was largely due to the prevalence of Cisco routers within the Internet, there were two other culprits: a bug in the router used by Supro, made by MikroTik, a router vendor from Latvia, and the fact that most ISPs do not filter out routing update announcements with excessively long AS paths.

3.3 Web Site Outages

As more data and applications migrate into "the cloud," availability of these applications and the underlying infrastructure will become increasingly more important. During the first quarter of 2009, a number of high profile cloud applications and cloud computing platforms experienced periods of downtime lasting from just a few minutes to nearly a day.

Microsoft's Windows Azure cloud platform suffered a 22-hour outage in mid March.[54] According to a post[55] on Microsoft's Windows Azure blog, "During a routine operating system upgrade on Friday (March 13th), the deployment service within Windows Azure began to slow down due to networking issues. This caused a large number of servers to time out and fail." Microsoft suggested that developers run more than one instance of their application on Azure because those with multiple instances were less likely to fail.

In late February, consumer and business users of Google's Gmail service were hit with a four-hour outage, during which time they were unable to access their e-mail.[56] According to a post on The Official Gmail Blog, the outage was related to routine maintenance in one of Google's European data centers, and unexpected side effects of some newly deployed code caused a data center overload that cascaded from one data center to another.[57] Several weeks later, the BBC reported[58] that a "small subset of users" experienced another Gmail outage.

Leading cloud computing provider Salesforce.com experienced a 40-minute outage in early January, which left nearly 900,000 subscribers without access to their applications. The downtime was reportedly due to a network device that failed due to memory allocation errors.[59] Intuit's Quickbooks Online service went offline for several hours in early February, which left customers of the service without access to their financial records.[60]

Social media sites had their share of challenges in the first quarter as well. Social news site Digg experienced an outage on March 20 that was likely related to a planned data center migration.[61] It appears that this downtime wasn't necessarily completely unexpected, as a Digg blog post[62] noted that glitches related to the migration may cause site slowness or unavailability. Professional social networking site LinkedIn experienced several multi-hour availability issues in early February, reportedly related to their message queuing services.[63] According to monitoring service Pingdom, blog hosting company blog.com suffered an 8-hour outage in mid-January.[64]

Thousands of shared hosting Web sites hosted by GoDaddy were unavailable in mid January, reportedly due to a DDoS attack.[65] Customers of Web hosting company Media Temple's (gs) Grid-Service hosting service experienced a 38-hour outage that began on February 28.[66] The company expected to issue approximately $100,000 in service credits related to the outage, which was due to multiple failures in a storage system.

Problems dealing with "flash crowd" traffic also caused outages at a number of Web sites during the first quarter. A surge of traffic to a picture of US Airways Flight 1549 in the Hudson River brought down photo sharing site TwitPic,[67] which hosts an application that allows users to take pictures from their mobile phones and append them to Twitter posts. The service was reportedly back up within two hours. An increase in filings for unemployment benefits crashed online application systems in early January in North Carolina, Ohio, New York, and Kentucky, causing them to be unavailable for 1-2 days.[68] Web site Wikileaks was "overloaded by global interest" in late March, failing due to increased traffic related to the purported availability of an updated 'blacklist' from the Australian Communications and Media Authority.[69] Web sites can leverage the on-demand capacity available through Akamai's site delivery services to help them avoid traffic-related site downtime or the need to add additional server capacity.

Four submarine cables that will run down the African coast could ultimately add significant capacity to the area.

3.4 Significant New Connectivity — Undersea Cables

In its March issue, *Capacity Magazine* highlighted[70] plans for four submarine cables that will run down the African coast, which, if and when completed, will ultimately add significant capacity to the area. Of the four cables:

- The Glo-1 cable from Nigerian operator Globacom was due to go live in March. It will have approximately 640 Gbps of capacity, and will land in Nigeria, Ghana, Senegal, Portugal and the UK, with the potential for other countries to be connected later.
- The Main One cable is funded by Nigerian-based private investors. It is planned to be activated in Fall 2010 with a 1.92 Tbps capacity, connecting Lagos and Accra to Portugal in it's first phase, with connections to Morocco, Senegal, and the Cote D'Ivoire planned for later phases.
- The Africa Coast to Europe (ACE) cable was announced by Orange France Telecom. Due to go live in 2011, ACE will land in 20 countries down to Gabon and may eventually extend to South Africa.
- The West African Cable System (WACS) plans to follow the same route as the existing Sat-3 cable and is likely to be owned by a similar if smaller consortium of major operators. When completed, it will link directly into the United Kingdom.

Also in Africa, the Seacom cable landed at Mombasa in Kenya in March, and is expected to become fully operational in July 2009. The cable will eventually run up the coast of East Africa from South Africa to Yemen and Egypt, with additional links to India.[71] Contracts were also signed by Tunisie Telecom for a submarine cable that will link Tunisia to Europe. The cable is expected to be operational by the end of 2009.[72]

Go-1, the second submarine cable linking Malta to Sicily, was expected to become operational early in 2009 following work to lay the cable between St Paul's Bay, Malta and Mazara Del Vallo, south of Palermo. With the completion of this cable, Maltese provider Go will be in the unique position of being the only provider in Malta owning and running two international submarine cable systems independent of each other.[73] As the first cable suffered a cut in December 2008, the path diversity of this second cable is critical for maintaining connectivity to the island nation.

In January, Hibernia Atlantic announced[74] that it had been selected to deploy a new cable network for the Department of Enterprise, Trade and Investment (DETI) for Northern Ireland and the Department of Communications, Energy and Natural Resources (DCENR) for the Republic of Ireland as part of Project Kelvin. Hibernia said the proposed terrestrial fiberoptic network will connect 13 cities in Northern Ireland to Southern Ireland (via Dublin), and will connect to Canada and the United States via its TransAtlantic submarine cable system, as well as connecting to Europe. The company claims the new terrestrial network will be the first of this kind connecting Northern Ireland to Canada, the United States and Europe and will offer complete diversity to reach Ireland directly from London.

In March, a consortium of eleven telecom carriers signed a contract to upgrade Pan-American Cable System, which connects the west coast of South America and the Caribbean through Panama. The consortium members include AT&T (United States), Telmex (Mexico), CANTV (Venezuela), Cable & Wireless Panama, Embratel (Brazil), Ecuador's Corporacion Nacional de Telecomunicaciones (CNT), Entel Chile, Telefonica Colombia, SETAR (Aruba), Antelecom and Cable Andino. The Pan-American Cable System was first installed in 1999, and work on the upgrade is scheduled to be completed by the end of 2009.[75]

Also during the first quarter, PT Telekomunikasi Indonesia awarded a $100 million contract to Fujitsu Limited and its German partner Norddeutsche Seekabelwerke to install a submarine cable system for the islands of Kalimantan, Sulawesi, Java, Bali and Lombok.[76] This cable deployment is scheduled to be completed in the first quarter of 2010. The Federated States of Micronesia Telecommunications Corporation contracted with Tyco Telecommunications to construct a submarine cable connecting Micronesia to Guam, financed by a loan from the United States Department of Agriculture Rural Utilities Service, and is expected to be completed in March 2010.[77]

3.5 Significant New Connectivity — Wireless

As previously discussed in the *4th Quarter, 2008 State of the Internet* report, Clearwire officially launched its "Clear" WiMAX service in Portland, Oregon on January 6, 2009.[78] In its 1st quarter, 2009 earnings release, Clearwire noted that it was set to launch in Atlanta in June 2009, and had development work underway to enable WiMAX coverage of up to 120 million Americans across 80 markets by the end of 2010.[79] This includes an investment of between $1.5 billion and $1.9 billion in 2009 to deploy WiMAX networks in Atlanta, Las Vegas, Chicago, Charlotte, Dallas/Fort Worth, Honolulu, Philadelphia and Seattle, in addition to rolling out services in cities such as New York, Boston, Washington DC, Houston and San Francisco in 2010.[80]

In addition to Clearwire's plans in the United States, in the first quarter of 2009, telecom companies around the world announced the awarding of contracts to vendors for equipment to power the deployment of WiMAX services later this year and into next year. In addition, a number of WiMAX networks were commercially launched, or went into testing, in the first quarter.

In Eastern Europe, Azerbaijan's Delta Telecom planned to introduce the country's first WiMAX network by the end of January.[81] Czech telecom operator Ceske Radiokomunikace (CRa) reportedly launched a new WiMAX service in Prague in January as well.[82] In February, WiMAX Telecom launched commercial WiMAX broadband services in Croatia.[83] In early March, Lithuanian Radio and TV Centre (LRTC) commercially launched what it claimed to be the country's first WiMAX service.[84]

In Africa, Foris Telecom announced in February that it had completed acceptance tests on its WiMAX network in Maputo, Mozambique. The Foris network was expected to launch commercially in April.[85] In March, Mada Communications announced the commercial launch of a WiMAX network in Jordan. Initially, the network has coverage of Amman, Irbid and Zaraq, although Mada has plans to expand to the rest of the country.[86]

Satellite connectivity provider O3b Networks also continued to sign contracts with African providers otherwise starved for wired broadband connectivity. O3b reportedly signed

In its 1st quarter, 2009 earnings release, Clearwire noted that it had development work underway to enable WiMAX coverage of up to 120 million Americans across 80 markets by the end of 2010.

a multi-year, multi-million dollar contract with Quark Communications to bring high-speed connectivity to Guyana, with planned service activation in late 2010.[87] In addition, O3b announced that it signed a similar contract with Microcom, the Democratic Republic of Congo's largest Internet Service Provider.[88] Finally, Direct On PC Ltd (DOPC), a leading Internet and Intranet Services Provider in Nigeria and West Africa, also signed on with O3b, in an effort to enable the provider to quickly deploy fiber-like connectivity services anywhere in Nigeria quickly and economically.[89]

In Asia, WiMAX operator Packet One Networks (P1) extended its coverage in January to additional regions of Malaysia,[90] as well as Penang Island.[91] In addition, by the end of January, Red Link's WiMAX network was expected to have coverage of almost every township in Myanmar's capital of Yangon.[92] In late February, FPT Telecom announced that it had successfully tested WiMAX services in the Vietnamese capital of Hanoi.[93] Also in late February, BSNL launched WiMAX services in the Indian state of Gujarat.[94] In March, Globe Telecom became the first operator in the Philippines to launch WiMAX broadband service nationwide.[95]

In the former Soviet Union, Comstar UTS announced in mid-January that it had soft launched a WiMAX network in Moscow.[96] The Kazakh ISP AsiaBell launched its WiMAX network in the Karaganda region of central Kazakhstan.[97] Georgian cellco MagtiCom launched a WiMAX service for residential and business customers in February, and by the end of 2009 it plans to cover all major cities and regional areas of Georgia with WiMAX broadband services.[98] In March, Armenian broadband provider iCON Communications (iCON) announced the launch of WiMAX broadband services in the Armenian capital of Yerevan.[99]

3.6 Significant New Connectivity — Fixed Broadband

In a comprehensive report[100] titled *"Fiber to the World: A State of the Union Report on FTTH,"* Yankee Group analysts noted that "…for broadband to be a game-changer, fiber must be delivered as close as possible to the home to overcome the current limitations of the copper network." To this end, in looking at FTTx deployments worldwide, Yankee Group found that:

- Asia-Pacific has been leading FTTx developments, and millions of customers, especially in Japan and South Korea, already have access to next-generation access. However, the analysts noted that the service ecosystem has not yet truly adapted to capabilities of the new infrastructure.
- Europe is trying to catch up, although some countries, and especially those in Scandinavia, already have significant FTTx deployments and are accelerating rollouts boosted in part by municipal- and utility-driven projects. Unfortunately, the rest of Europe is still struggling with finding the right regulatory model to incentivize telecom providers to invest while avoiding the development of new broadband monopolies.
- In North America, a single broadband provider, Verizon, represents the large majority of deployment; apparently no other Tier 1 North American carrier has committed to FTTH. However, in a nod to the efforts of smaller carriers, Yankee Group did note that FTTH in North America got its start among smaller Tier 3 providers in the United States that saw such technology as more of a community development tool.

During the first quarter, higher-speed broadband connections were promised, planned, or launched in a number of countries around the world. In January, Auckland, New Zealand provider Orcon planned to go live with a "super charged" network delivering download speeds of 5 Mbps or more.[101] In February, Australian broadband provider Internode announced plans to offer 100 Mbps FTTH services to residential customers in suburbs across the country.[102] Internet connection speeds of up to 15 Mbps became available to selected Biznet Networks customers in Bali with the initial rollout of FTTH technology.[103]

Lattelecom Group, the national operator in the Baltic republic of Latvia, said in January that it planned to roll out the fastest broadband service in Europe, offering access speeds of up to 500 Mbps by the end of 2009, and boasting that its "Network of the Future" will ultimately deliver downlink speeds of up to 10 Gbps.[104]

In the United Kingdom, Communications minister Lord Carter introduced a universal service obligation (USO) for broadband, with a requirement to provide services at up to 2 Mbps, in his 'Digital Britain' review released in January. However, pundits noted the use of the term "up to" in the requirement, and also noted that such a plan could widen the so-called digital divide, providing extremely high-speed services to subscribers in urban areas, while more rural users would be stuck with the lower speeds available through an aging broadband infrastructure.[105]

Regardless, the United Kingdom saw a number of announcements in the first quarter of 2009 related to the availability of higher-speed connections. In Scotland, the Fibrecity project in Dundee invited local residents and businesses in January to connect to its city-wide network for free. The fiber optic network will allow more than 70,000 households and businesses in Dundee to benefit from next generation services including broadband speeds of up to 100 Mbps.[106] In addition, in March, BT revealed new information about its planned Openreach service, which will ultimately make FTTx broadband available to as many as 10 million UK homes (40%) by 2012. BT noted that Scotland would become one of the first places to benefit from the service in early 2010, with more than 34,000 homes and businesses in Edinburgh and Glasgow receiving speeds of up to 40 Mbps and potentially up

For broadband to be a game-changer, fiber must be delivered as close as possible to the home to overcome the current limitations of the copper network.

to 60 Mbps.[107] Similar connectivity would also become available to subscribers in 29 local UK telephone exchanges in the same time frame.[108] In addition, in March, Virgin Media announced that its cable-based ISP services would be able to offer connection speeds of up to 150 Mbps by 2012.[109]

3.7 IPv6

IPv6 continued along the long path to broader adoption during the first quarter. In January, AT&T disclosed that it is building a production-quality IPv6 data network for the United States Army in Germany that will cost approximately $23 million when it is completed next year.[110] IPv6 support is now mandated for all United States military telecommunications equipment purchases, and the entire United States federal government is upgrading its network infrastructure to support IPv6. January also saw NTT America expand its operations in Switch and Data facilities in Atlanta, Dallas, New York, Seattle, and Palo Alto to provide ISP customers in those data centers with direct access to NTT's international IPv6 backbone. In addition, hosting provider SoftLayer Technologies announced that it had implemented native IPv6 support across all its data centers, customer portal and API.[111]

Also in January, Google launched "Google over IPv6," which provides access to a broader set of Google services over IPv6 to users on networks that have good IPv6 connectivity to Google.[112,113] (In March 2008, Google began offering search over IPv6 on IPv6-only Web sites like ipv6.google.com, but other Google products were not generally available over IPv6.) In addition, during a panel discussion at a March meeting of the Internet Engineering

Task Force, Google engineers said it was not expensive and required only a small team of developers to enable all of the company's applications to support IPv6, noting that Google engineers worked on the IPv6 effort as a 20% project (in addition to their regular work) from July 2007 until January 2009.[114]

In March, a post[115] to Internet infrastructure blog CircleID highlighted additional first quarter developments in IPv6 adoption, including:

- Netflix receiving an IPv6 allocation
- DNS provider DynDNS announcing an IPv6 implementation plan, and highlighting its progress towards the implementation of that plan
- A pricing policy change by Cisco whereby it will no longer be charging extra for IPv6 features in IOS, its router operating system
- Seven more ccTLDs IPv6 enabling their DNS servers, including bs (Bahamas), .gw (Guinea-Bissau), .mv (Maldives), .mx (Mexico), .no (Norway), .pr (Puerto Rico), and .tt (Trinidad & Tobago)

3.8 DNS

According to the first quarter 2009 Domain Name Industry Brief, published by Verisign,[116] the quarter ended with nearly 183 million domain name registrations across all of the Top Level Domains (TLDs). This represents a three percent increase over the fourth quarter of 2008 and a 12 percent increase over the same quarter from last year. The report also noted that Country Code TLDs (ccTLDs) registrations increased to 74.1 million domain names during the first quarter, a four percent improvement over the previous quarter and an 18 percent increase year over year.

The quarter ended with nearly 183 million domain name registrations across all of the Top Level Domains.

Former United States Vice President Al Gore announced that he was partnering with two Internet entrepreneurs to back the establishment of the ".eco" TLD, which is intended "for individuals to express their support for environmental causes, for companies to promote their environmental initiatives, and for environmental organizations to maintain their Web sites in a namespace that is more relevant to their core missions."[117] Related to the introduction of additional generic top level domains (gTLDs), in February, ICANN issued[118] a document titled "New gTLD Draft Applicant Guidebook: Analysis of Public Comment" in which it detailed and analyzed the hundreds of comments it received about its plan for increasing the number of gTLDs. Within the document, ICANN says it is looking at several ways to protect trademark holders. In addition, ICANN's board has asked two of its committees to study the effects on Domain Name System security and stability that the gTLD proposal will have, and ICANN will conduct a study on the demand for new gTLDs.[119]

3.9 "Broadband Stimulus" in the United States & Internationally

In February, the United States Congress passed, and President Obama signed, the $789 billion American Reinvestment and Recovery Act. Within this legislation, $7.2 billion was allocated for broadband funding. According to a summary published[120] on the GigaOM blog, key points around the broadband funding included:

- The $7.2 billion being split among two agencies — the National Telecommunications and Information Administration (NTIA) administering $4.7 billion, and the Department of Agriculture's Rural Utilities Service (RUS) administering $2.5 billion.
- The removal of speed requirements, which means the United States federal government, which currently defines broadband at 768 Kbps, is responsible for determining appropriate speeds for the underserved areas getting grants.

- The grants must all be dispersed by Sept. 30, 2010, and those receiving them have two years to build out infrastructure. Additionally, the FCC has one year to come up with a comprehensive national broadband plan to provide universal coverage and encourage citizens to use the network.
- Grant recipients must adhere to "non-discrimination and network interconnection obligations," which means, at a minimum the principles contained in the FCC broadband policy statement[121] that was issued in August 2005.
- The Commerce Committee must gather much-needed data on broadband penetration within the next two years and create a publicly, available searchable database on the NTIA Web site.

After passage of the Recovery Act, and the allocation of $7.2 billion for broadband funding, much virtual ink was spilled about the definition of key terms, such as "unserved" and "underserved," about public meetings and policy planning processes, and the involvement and potential influence of large telecom companies in the broadband mapping process. Looking ahead, if the funds are distributed in what is generally accepted to be an equitable manner, and higher-speed Internet connectivity becomes more generally available across the United States, then the creation and consumption of digital media will likely continue to grow, as will traffic to Web sites and applications. In addition, levels of Internet and broadband adoption and penetration, as highlighted in later sections of this report, should continue to trend in a positive direction.

In May, after the end of the first quarter, the NTIA quietly delayed its plans to begin approving grant applications and distributing the $4.7 billion in broadband stimulus funds for which it was responsible.[122] In March, the NTIA had noted that it planed to accept grant applications in

Governments in many countries put up money to improve local broadband availability.

April and May, and start distributing funding in June. The delay pushed the grant application period back to September, with grant distributions starting in December. Given that the American Reinvestment and Recovery Act mandates that the grants be issued by Sept. 10, 2010, the multi-month delay should not impact that goal.

While much was being made of "broadband stimulus" in the United States, governments in many other countries did not stand still in the first quarter, with many putting up money to improve local broadband availability. In late January, it was reported that the European Commission (EC) intends to spend €1 billion on upgrading and extending broadband Internet services in rural communities around Europe, distributing the funds via the EU's existing Rural Development Fund.[123] In South Korea, the Korea Communications Commission announced in early February that it planned to spend 34.1 trillion won (USD$24.6 billion) over the next five years to improve the nation's overall IT infrastructure, upgrading existing high-speed Internet and wireless broadband services to 1 Gbps broadband and 10 Mbps respectively.[124] In March, the Australian government announced that it had set aside AUD$60 million (USD$38.4 million) for regional, rural and remote telecommunications projects.[125] The New Zealand government also announced in March that it planned to invest NZD$1.5 billion (USD$845.6 million) in its own national broadband network initiative; it also noted that it expected private investment to match the amount. The initiative is expected to connect 25 towns and cities, ultimately providing broadband coverage to 75% of the population.[126]

SECTION 4: Internet Penetration

4.1 Unique IP Addresses Seen By Akamai

Through a globally-deployed server network, and by virtue of the billions of requests for Web content that it services on a daily basis, Akamai has unique visibility into the levels of Internet penetration around the world. In the first quarter of 2009, nearly 420 million unique IP addresses connected to the Akamai network — almost five percent more than in the fourth quarter of 2008, and nearly 28 percent more than the same quarter a year ago. The yearly growth rate was consistent with that seen in the fourth quarter of 2008 as well. For the fourth consecutive quarter, the United States and China continued to account for nearly 40% of the observed IP addresses. The Top 10 countries remained the same quarter-over-quarter.

	Country	Q1 09 Unique IP's	Q1 09–Q4 08 Change	YoY Change
-	Global	419,566,722	+4.56%	+27.51%
1	United States	116,189,177	+1.81%	+19.80%
2	China	44,568,138	+11.06%	+37.37%
3	Japan	29,420,722	+6.37%	+18.79%
4	Germany	28,550,725	+4.35%	+25.95%
5	France	19,573,890	+5.33%	+19.12%
6	United Kingdom	18,791,675	+5.68%	+18.26%
7	South Korea	14,404,588	-1.38%	+6.33%
8	Canada	11,189,620	+6.90%	+14.11%
9	Spain	9,908,951	+4.34%	+21.26%
10	Brazil	9,267,553	+3.71%	+40.51%

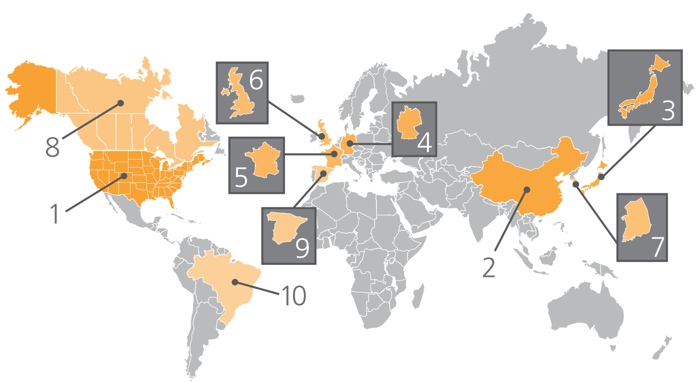


Figure 7: Unique IP Addresses Seen By Akamai

In the first quarter of 2009, nearly 420 million unique IP addresses connected to the Akamai network.

As shown in Figure 7, China once again demonstrated the largest quarterly growth in the number of unique IP addresses seen by Akamai, posting an 11% gain. The first quarter of 2009 also saw South Korea break its quarterly growth/loss cycle related to unique IP's, as Akamai saw fewer IP addresses from South Korea than in the previous quarter for the second consecutive quarter. On a year-over-year basis, South Korea also has the lowest level of growth among the top 10 countries.

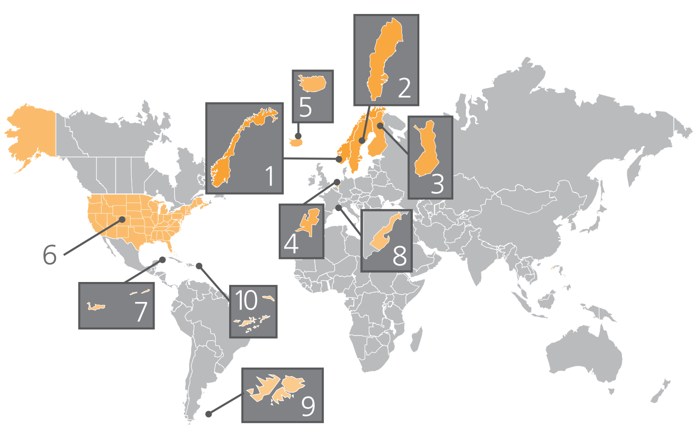
Looking at the "long tail," there were 184 countries with fewer than 1 million unique IP addresses connecting to Akamai in the first quarter of 2009, 141 with under 100,000 unique IP addresses, and 34 with fewer than 1,000 unique IP addresses. All three counts saw slight declines as compared to prior quarters.

4.2 Global Internet Penetration

How does the number of unique IP addresses seen by Akamai compare to the population of each of those countries? Asked another way, what is the level of Internet penetration in each of those countries? Using the most recent global population data from the United States Census Web site[127] as a baseline, levels of Internet penetration for each country around the world were calculated based on Akamai's view into Internet traffic. These per capita figures should be considered as an approximation, as the population figures used to calculate them are static estimates — obviously, they will change over time, and it would be nearly impossible to obtain exact numbers on a quarterly basis. In addition, individual users can have multiple IP addresses (handheld, personal/home system, business laptop, etc.). Furthermore, in some cases, multiple individuals may be represented by a single IP address (or small number of IP addresses), as they access the World Wide Web through a firewall proxy server. Akamai believes that it sees approximately 1 billion users per day, though we see only approximately 420 million unique IP addresses.

Akamai believes that it sees approximately 1 billion users per day.

In comparing the unique IP per capita figures for the first quarter of 2009, as shown in Figure 8, to those from the fourth quarter of 2008, we see that six countries (Norway, Finland, Netherlands, Iceland, the United States, and the British Virgin Islands) experienced gains, two countries (Sweden and the Cayman Islands) experienced losses, and two new countries (Monaco and the Falkland Islands) entered the top 10. However, Akamai saw just over 1,000 unique IPs from the Falkland Islands during the first quarter, so the rate of Internet penetration within the country should be considered relative to those of more populous countries.



	Country	Unique IP's Per Capita
-	Global	0.08
1	Norway	0.46
2	Sweden	0.42
3	Finland	0.40
4	Netherlands	0.39
5	Iceland	0.39
6	United States	0.38
7	Cayman Islands	0.36
8	Monaco	0.36
9	Falkland Islands	0.35
10	British Virgin Islands	0.34

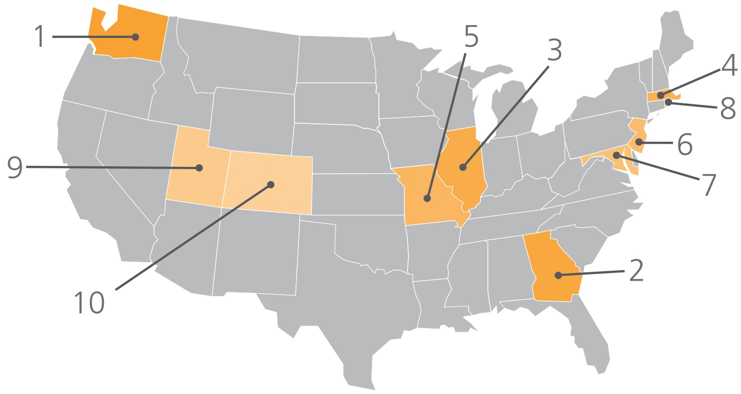
Figure 8: Global Internet Penetration

Internet penetration levels generally grew quarter-over-quarter.

4.3 United States Internet Penetration

For the third consecutive quarter, Akamai is examining the level of Internet penetration within the United States. Using state population estimates available from the United States Census Web site,[128] and the number of unique IP addresses from each state that Akamai saw during the first quarter of 2009, we calculated the levels of Internet penetration on a state-by-state basis — the top 10 states are shown in Figure 9. The same caveats noted immediately above in section 4.2, regarding per capita figures as an approximation, apply here as well.

Internet penetration levels generally grew quarter-over-quarter — Massachusetts was the only state in the top 10 that maintained a constant level of unique IP's per capita. The *4th Quarter, 2008 State of the Internet* report noted that Virginia and New Jersey had experienced significant decreases between the third and fourth quarters. It appears that this may have been a one-time anomaly, as both states saw modest increases in Internet penetration between the fourth quarter of 2008 and the first quarter of 2009.



	State	Unique IP's Per Capita
1	Washington	0.62
2	Georgia	0.62
3	Illinois	0.57
4	Massachusetts	0.54
5	Missouri	0.53
6	New Jersey	0.51
7	Maryland	0.48
8	Rhode Island	0.47
9	Utah	0.46
10	Colorado	0.43

Figure 9: Internet Penetration in the United States

SECTION 5: Geography

Through its globally deployed server network and by virtue of the billions of requests for Web content that it services on a daily basis, Akamai has a unique level of visibility into the connection speeds of the systems issuing the requests, and as such, of broadband adoption around the globe. Because Akamai has implemented a distributed network model, deploying servers within edge networks, it can deliver content more reliably and more consistently at those speeds, in contrast to centralized competitors that rely on fewer deployments in large data centers. For more information on why this is possible, please see Akamai's *How Will The Internet Scale?* White Paper.[129]

The data presented on the following pages was collected during the first quarter of 2009 through Akamai's globally-deployed server network and includes all countries and U.S. states that had more than 1,000 average monthly unique IP addresses make requests to Akamai's network during the fourth quarter. For purposes of classification in this report, the "broadband" data included below is for connections greater than 2 Mbps, and "high broadband" is for connections of 5 Mbps or greater. In contrast, the "narrowband" data included below is for connections slower than 256 Kbps. Note that the percentage changes reflected below are not additive — they are relative to the prior quarter(s). (That is, a Q4 value of 50% and a Q1 value of 51% would be reflected here as a +2% change.) A quarter-over-quarter change is shown within the tables in several sections below in an effort to highlight general trends. A year-over-year change is also shown in some tables in an effort to highlight longer-term trends.

As the quantity of HD-quality media increases over time, and the consumption of that media increases, end users are likely to require ever-increasing amounts of bandwidth. A connection speed of 2 Mbps is arguably sufficient for standard-definition TV-quality video content, and 5 Mbps for standard-definition DVD-quality video content, while Blu-Ray (1080p) video content has a maximum video bit rate of 40 Mbps, according to the Blu-Ray FAQ.[130] This quarter, in order to provide additional insight into where users have connection speeds that would allow them to be able to effectively consume this higher quality media, we will also begin to look at how the "high broadband" connections are distributed across speed groupings ranging from 5 to >25 Mbps.

On a global basis, the average connection speed increased by approximately 11%, and, more than 120 countries had average connection speeds under 1 Mbps.

5.1 Global Average Connection Speeds

Examining the data for the second consecutive quarter, as expected, the overall trend is generally towards higher average connection speeds as levels of broadband adoption continue to grow. Current highlights and historical trends for average connection speeds on a global basis can be found in Akamai's "Broadband Adoption Trends" data visualization tool, available at http://www.akamai.com/dv5.

As highlighted in Figure 10, on a quarter-over-quarter and year-over-year basis, most countries are trending towards higher average connection speeds, and this is true for the global aggregate as well. Quarterly gains among the top 10 countries range from modest (Belgium, 3.3%) to significant (Sweden, 23%). The lone, and notable, exception is well-connected South Korea, which experienced quarterly and yearly declines in average connection speed (in addition to a decline in unique IP addresses seen by Akamai, as shown in Section 4.1).

On a global basis, the average connection speed increased by approximately 11%, growing to 1.7 Mbps. More than 120 countries had average connection speeds under 1 Mbps, the slowest being Niue at 109 Kbps. Even at these slower average speeds, many of these counties showed rather significant quarterly increases, which would appear to demonstrate that higher speed connections, whether fixed or mobile in nature, are becoming more widely available in these areas.

	Country	Q1 09 Mbps	Q1 09–Q4 08 Change	YoY Change
-	Global	1.7	+11%	+29%
1	South Korea	11	-28%	-1.1%
2	Japan	8.0	+14%	+10%
3	Hong Kong	7.6	+9.5%	+29%
4	Sweden	6.9	+23%	+42%
5	Romania	5.8	+3.1%	+51%
6	Switzerland	5.7	+12%	+30%
7	Netherlands	5.4	+10%	+28%
8	Denmark	5.1	+14%	+39%
9	Czech Republic	5.0	+14%	+36%
10	Belgium	4.9	+3.3%	+19%
…				
18	United States	4.2	6.4%	+15%

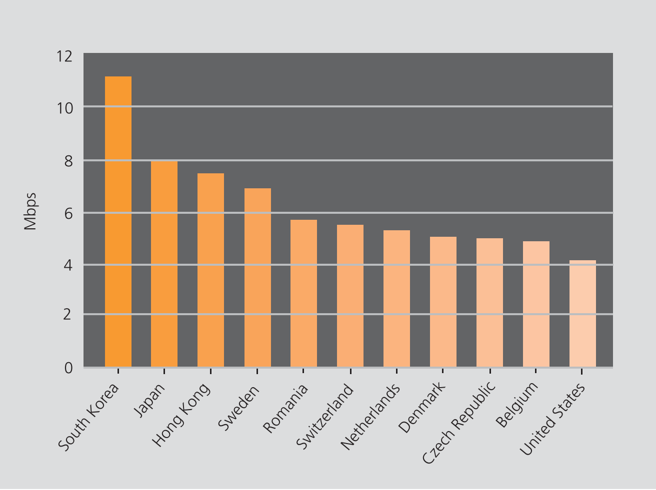


Figure 10: Average Internet Connection Speed by Country

5.2 United States Average Connection Speeds

In the *4th Quarter, 2008 State of the Internet* report, Akamai began to examine the average connection speeds of individual states within the United States, and also compared it to similar research done by industry publication *PCMag* as well as a study done by the Communications Workers of America.

In looking at Figure 11, which shows the top 10 states with the highest average connection speeds, we find that the East Coast of the United States is well represented. This comes as no surprise, as these same states have generally ranked in the top 10 for High Broadband connectivity as well.

State	Q1 09 Kbps
Delaware	7210
New Hampshire	6576
Nevada	6060
New York	5722
Oklahoma	5591
Rhode Island	5555
District of Columbia	5539
Utah	5511
Vermont	5426
Maine	5405

Figure 11: Average Measured Connection Speed by State

The states that had the largest quarterly increases are more distributed, as shown in Figure 12. Hawaii's average measured connection speed was 26% higher in the first quarter of 2009 than in the prior quarter. Nine states saw quarterly increases of 10% or more, while five other states saw quarterly declines.

State	Q1 09–Q4 08 Change
Hawaii	26%
Arizona	17%
Nevada	17%
Idaho	13%
West Virginia	12%
District of Columbia	10%
Iowa	10%
Utah	10%
Wyoming	10%
Kentucky	9.9%

Figure 12: Largest Quarterly Increases in Measured Connection Speed

5.3 Global High Broadband Connectivity

One-fifth of the Internet connections around the world were at speeds greater than 5 Mbps.

In the first quarter of 2009, one-fifth of the Internet connections around the world were at speeds greater than 5 Mbps. This represents a modest 5% increase over the prior quarter, and a nearly 30% increase over the same period a year prior.

For the first time since Akamai began publishing the *State of the Internet* report, in the first quarter of 2009, South Korea no longer had the largest percentage of connections to Akamai at speeds above 5 Mbps, with a significant 25% decline. South Korea's first quarter decline continues its quarterly decrease/increase cycle for high broadband connectivity, which was established throughout the course of 2008. As discussed in previous sections, Akamai also saw fewer unique IP addresses from South Korea during the first quarter, as well as a lower average connection speed. As shown in Figure 13, the first place slot was taken by Japan, with 57% of connections to Akamai at high broadband levels, and a modest 6% increase over the first quarter.

The United States reversed the minor decline experienced in the fourth quarter of 2008, posting a nominal increase in high broadband penetration, despite slipping to 12th place globally. Also of note in the first quarter are the double digit quarterly percentage gains seen in Sweden, the Netherlands, Denmark, Switzerland, and the Czech Republic. It appears that FTTH efforts in these countries, as discussed in prior editions of Akamai's *State of the Internet* report, are bearing fruit, driving higher more connections at high broadband speeds.

	Country	% above 5 Mbps	Q1 09–Q4 08 Change	YoY Change
-	Global	20%	+5.0%	+29%
1	Japan	57%	+6.0%	+21%
2	South Korea	52%	-25%	-11%
3	Sweden	49%	+28%	+71%
4	Romania	40%	-9.5%	+101%
5	Hong Kong	39%	+1.4%	+11%
6	Netherlands	36%	+30%	+80%
7	Denmark	36%	+31%	+148%
8	Switzerland	34%	+52%	+199%
9	Belgium	34%	+8.7%	+66%
10	Czech Republic	33%	+54%	+144%
…				
12	United States	26%	2.9%	31%

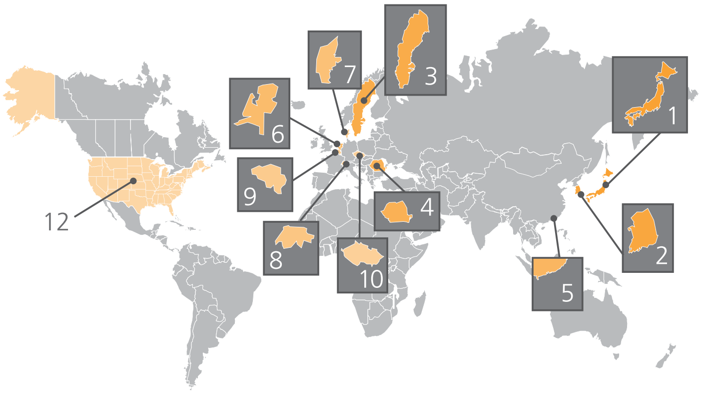


Figure 13: High Broadband Connectivity, Fastest Countries

5.4 Global High Broadband Connectivity: Speed Distribution

As we examined the levels of high broadband connectivity around the world, questions frequently came up about the distribution of connections at speeds above 5 Mbps. In an effort to answer these questions, starting with this edition of the *State of the Internet* report, Akamai will perform more detailed analysis on connections above 5 Mbps and publish more detailed data on the distribution of connection speeds, aggregated into 5 Mbps 'buckets.'

As noted above in Section 5.3, in the first quarter of 2009, Japan had the highest percentage of connections to Akamai (57%) at speeds above 5 Mbps. Taking a deeper look at these connections, we find that nearly a third of Japan's connections to Akamai are at speeds between 5-10 Mbps, and then tail off from there, as shown in Figure 14. Sweden showed a similar percentage of connections between 5-10 Mbps, while other countries in the top 10 saw levels below 30%.

Nearly a third of Japan's connections to Akamai are at speeds between 5-10 Mbps.

	Country	% above 5 Mbps	5-10 Mbps	10-15 Mbps	15-20 Mbps	20-25 Mbps	>25 Mbps
1	Japan	57%	32%	13%	6%	3%	3%
2	South Korea	52%	22%	9%	5%	4%	12%
3	Sweden	49%	33%	8%	3%	2%	3%
4	Romania	40%	28%	7%	2%	1%	2%
5	Hong Kong	39%	21%	6%	4%	2%	5%
6	Netherlands	36%	29%	4%	1%	0%	2%
7	Denmark	36%	29%	4%	1%	0%	1%
8	Switzerland	34%	29%	3%	1%	0%	2%
9	Belgium	34%	29%	3%	0%	0%	0%
10	Czech Republic	33%	27%	3%	1%	1%	2%
…							
12	United States	26%	21%	3%	1%	0%	1%

Figure 14: High Broadband Connectivity, Distribution of Speeds

While South Korea fell to second place for high broadband connectivity in the first quarter, its distribution of speeds was not quite as lopsided as in other countries. In addition, 12% of connections to Akamai were at speeds greater than 25 Mbps — more than in any other country. It will be interesting to watch the trending of speed distribution in South Korea, regardless of the overall percentage of high broadband connections, to see if the percentage greater than 25 Mbps continues to grow.

Just over a quarter of connections to Akamai from the United States were at speeds over 5 Mbps, and the overwhelming majority of those were at speeds between 5-10 Mbps. Just 1% of the connections were at speeds greater than 25 Mbps. We expect that as the adoption and rollout of DOCSIS 3.0 technology by cable Internet providers, as well as other FTTH initiatives by telecom providers, become more widespread that the percentage of connections in the highest 'bucket' will grow over time. (Of course, this assumes that these providers are pricing the highest speed tiers of service at a level that subscribers find affordable.)

In looking at connections above 25 Mbps, we see that South Korea stood alone in the first quarter as the only country with more than 10% of its connections to Akamai at that level. As shown in Figure 15, the percentages drop off quickly, and as also shown in the table, these extremely high speed connections are somewhat rare, as Switzerland closes out the top 10 list with only 1.5% of connections in that 'bucket.'

	Country	% Above 25 Mbps
1	South Korea	12%
2	Hong Kong	5.4%
3	Ireland	3.6%
4	Sweden	3.0%
5	Japan	2.9%
6	Taiwan	2.7%
7	Latvia	2.0%
8	Slovakia	1.7%
9	Romania	1.7%
10	Switzerland	1.5%
…		
16	United States	1.0%

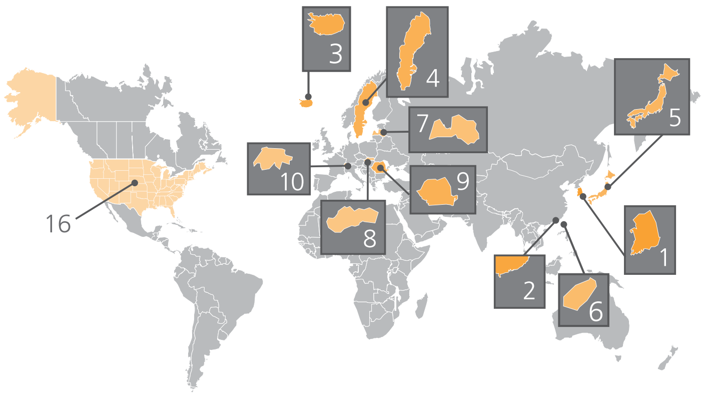
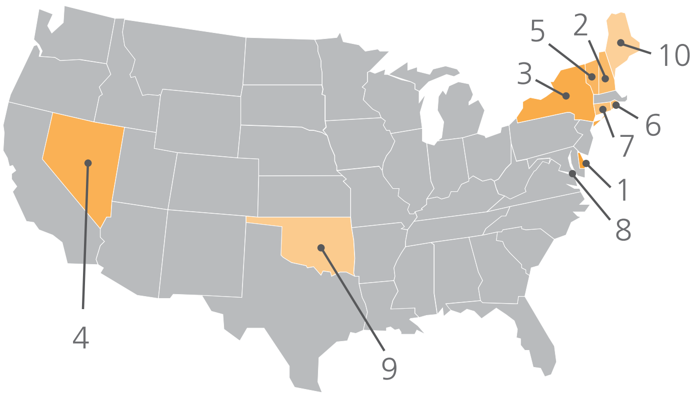


Figure 15: Countries with Highest Percentage of Connections over 25 Mbps

In looking at connections above 25 Mbps, we see that South Korea stood alone in the first quarter as the only country with more than 10% of its connections to Akamai at that level.

5.5 United States High Broadband Connectivity

Continuing the trend that was established throughout 2008, the East Coast of the United States continues to lead the country in the greatest levels of high broadband connectivity, with eight of the top 10 states on the list. Quarterly changes among the top 10 states were mixed, as shown in Figure 16, with three states seeing increases greater than 10%, and two states seeing minor quarterly declines. The range of year-over-year changes is pretty significant, with Rhode Island experiencing almost no change, with a 0.5% increase, to Maine, which has nearly quadrupled its percentage of high broadband connections to Akamai since the first quarter of 2008.



	State	% above 5 Mbps	Q1 08–Q4 08 Change	YoY Change
1	Delaware	62%	+0.6%	+6.7%
2	New Hampshire	59%	+5.1%	+100%
3	New York	49%	+5.8%	+38%
4	Nevada	45%	+16.2%	+36%
5	Vermont	44%	+3.9%	+128%
6	Rhode Island	42%	+4.3%	+0.5%
7	Connecticut	42%	-1.2%	+30%
8	District of Columbia	41%	+15%	+51%
9	Oklahoma	40%	+12%	+22%
10	Maine	38%	-1.1%	+371%

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

Looking at the levels of high broadband penetration across the United States as calculated for the first quarter, shown in Figure 17, we see that the penetration rates are fairly consistent with the prior quarter — no state among the top 10 saw a significant increase in the number of high broadband IP's per capita.

However, among states outside of the top 10, there were more marked quarterly increases, with 21 states seeing a change of more than 10%. In addition, six states saw quarterly decreases, ranging from 2% to 14%.

	State	High Broadband IP's Per Capita
1	Massachusetts	0.20
2	New York	0.20
3	Rhode Island	0.19
4	Washington	0.15
5	Nevada	0.14
6	Oregon	0.14
7	New Hampshire	0.14
8	New Jersey	0.14
9	Maryland	0.14
10	Connecticut	0.12

Figure 17: High Broadband Penetration in the United States

5.6 United States High Broadband Connectivity: Speed Distribution

The majority of the high broadband connections measure between 5-10 Mbps, with the next largest grouping between 10-15 Mbps.

In looking at the ten states with the highest levels of high broadband connectivity, we find that the distribution of connection speeds above 5 Mbps generally follows a similar pattern. Unsurprisingly, the majority of the high broadband connections measure between 5-10 Mbps, with the next largest grouping between 10-15 Mbps. After that the faster 'buckets' struggle to achieve even 3% of connections, as shown in Figure 18. This distribution of speeds is not surprising, as most residential broadband options offer connections in the 5-15 Mbps downstream range, with higher speed options available only in limited areas or at significantly higher prices. We expect that as the adoption and rollout of DOCSIS 3.0 technology by cable Internet providers, as well as other FTTH initiatives by telecom providers, become more widespread that the percentage of connections in the highest 'bucket' will grow over time, and that competitive market pressures will drive providers to price the highest speed tiers of service at a level that subscribers find affordable.

	State	% above 5 Mbps	5-10 Mbps	10-15 Mbps	15-20 Mbps	20-25 Mbps	>25 Mbps
1	Delaware	62%	49%	7.2%	2.7%	1.4%	1.9%
2	New Hampshire	59%	48%	6.9%	1.5%	0.8%	1.5%
3	New York	49%	39%	6.8%	1.2%	0.5%	0.9%
4	Nevada	45%	31%	9.6%	2.4%	0.9%	1.1%
5	Vermont	44%	35%	6.3%	1.6%	0.5%	0.6%
6	Rhode Island	42%	36%	2.9%	0.9%	0.5%	1.5%
7	Connecticut	42%	33%	6.7%	1.4%	0.4%	0.3%
8	District of Columbia	41%	29%	6.8%	2.0%	0.9%	1.7%
9	Oklahoma	40%	28%	7.9%	1.6%	0.5%	1.3%
10	Maine	38%	33%	2.6%	0.9%	0.5%	1.5%

Figure 18: High Broadband Connectivity, Distribution of Speeds

While eight of the top 10 states for high broadband connectivity are on the East Coast, it is interesting to see that of the top 10 states with the highest percentage of connections to Akamai at speeds above 25 Mbps, eight of them are not on the East Coast, as illustrated in Figure 19. While none of these states have a significant percentage of connections above 25 Mbps, they are the highest in the country, and are also fairly well distributed across the United States. There is also no strong correlation between the states listed here and the states with the highest average connection speeds, as listed in Section 5.2, which indicates, as would be expected, that the relative paucity of extremely high speed connections is not significantly impacting the average connection speed.

	State	% Above 25 Mbps
1	Utah	4.5%
2	Iowa	2.8%
3	West Virginia	2.2%
4	Indiana	2.2%
5	Delaware	1.9%
6	North Carolina	1.9%
7	North Dakota	1.9%
8	Wisconsin	1.8%
9	District of Columbia	1.7%
10	California	1.6%

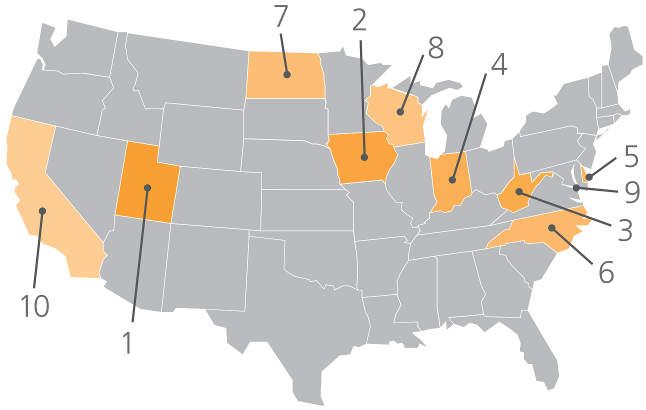
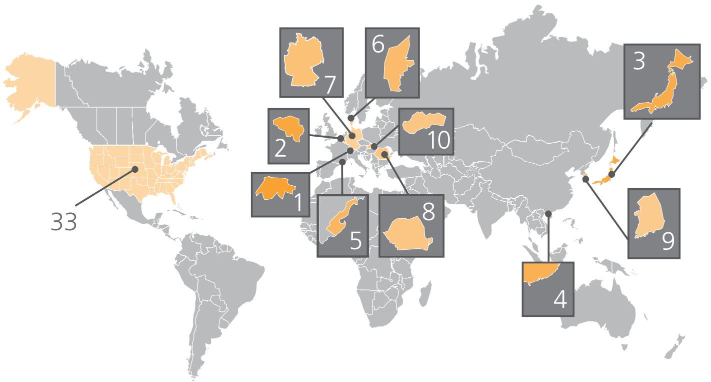


Figure 19: States with Highest Percentage of Connections over 25 Mbps

5.7 Global Broadband Connectivity

In contrast to the quarterly gains seen among the fastest international countries for high broadband connectivity, most of the top 10 countries for broadband connectivity saw minor quarterly declines in the percent of connections to Akamai at speeds over 2 Mbps. While that may seem counterintuitive, given that the high broadband connections are incorporated within the broadband data, the likely culprit is that a larger number of connections fell just below 2 Mbps during the first quarter of 2009, dragging down the percentages. As illustrated in Figure 20, Denmark, Germany, and Romania were the only three countries within the top 10 that saw quarterly increases — up 0.5%, 1.2% and 3.8% respectively. From a yearly viewpoint, South Korea was the only country within the Top 10 that showed a year-over-year decline.

Seven of the top 10 countries for broadband connectivity saw minor quarterly declines in the percent of connections to Akamai at speeds over 2 Mbps.



	Country	% above 2 Mbps	Q1 09–Q4 08 Change	YoY Change
–	Global	56%	-0.2%	+4.5%
1	Switzerland	92%	-2.7%	+1.9%
2	Belgium	90%	-0.4%	+5.4%
3	Japan	90%	-0.4%	+1.5%
4	Hong Kong	88%	-0.7%	+38%
5	Monaco	85%	+0.5%	+18%
6	Denmark	85%	+1.2%	+17%
7	Germany	85%	+3.8%	+21%
8	Romania	84%	-12%	-3.1%
9	South Korea	83%	-2.7%	+7.9%
10	Slovakia	83%	-0.2%	+4.5%
…				
33	United States	63%	-0.6%	2.8%

Figure 20: Broadband Connectivity, Fast Countries

Despite the third consecutive quarterly percentage decline, the United States did manage to move up two places in the global rankings, from 35th in the fourth quarter of 2008 to 33rd in the first quarter of 2009. Tunisia, which had vaulted to the first place spot in the fourth quarter of 2008 fell out of the top 10 list this quarter, falling down to #15 with an 18% decline.

Consistent with prior quarters, Europe continued to demonstrate some of the highest levels of broadband penetration, as shown in Figure 21. Although South Korea recorded a nominal quarterly increase in broadband IP's per capita, it wasn't large enough to keep them in the top 10. It appears that many countries saw significant increases quarter-over-quarter, enough to drive many new countries into the top 10, and enough to push the United States down to 26th in the first quarter, from 11th in the prior quarter.

	Country	Broadband IP's Per Capita
-	Global	0.02
1	Norway	0.44
2	Iceland	0.39
3	Netherlands	0.38
4	Sweden	0.38
5	Monaco	0.37
6	Finland	0.36
7	Denmark	0.35
8	Germany	0.34
9	Cayman Islands	0.32
10	France	0.30
…		
26	United States	0.24

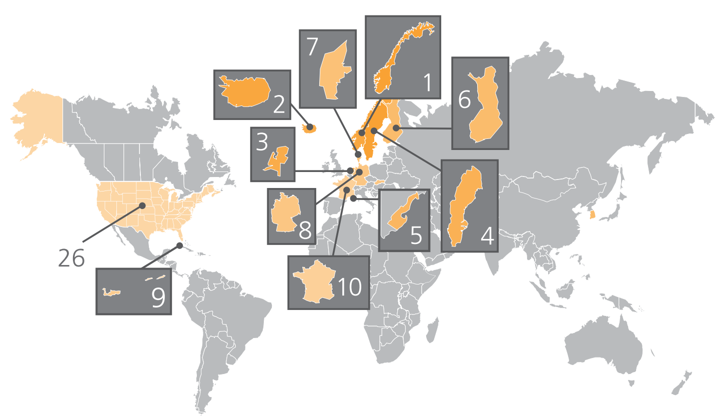


Figure 21: Global Broadband Penetration

5.8 United States Broadband Connectivity

Similar to the global trend seen in Section 5.7, many of the top U.S. states for broadband connectivity saw quarterly declines as well in the first quarter of 2009, as shown in Figure 22. Only New Hampshire, Nevada, and Hawaii managed meager increases, with Hawaii's 5.6% gain dwarfing those seen in the other two states.

	State	% above 2 Mbps	Q1 09–Q4 08 Change	YoY Change
1	Delaware	97%	-0.4%	+4.1%
2	New Hampshire	89%	+0.6%	+22%
3	Rhode Island	86%	-2.1%	+1.4%
4	Maine	85%	-0.4%	+22%
5	Nevada	85%	+0.1%	+3.9%
6	Connecticut	85%	-3.5%	+6.9%
7	Hawaii	83%	+5.6%	+16%
8	Vermont	82%	-0.2%	+43%
9	New York	80%	-0.8%	+4.0%
10	Oklahoma	79%	-1.1%	+3.9%

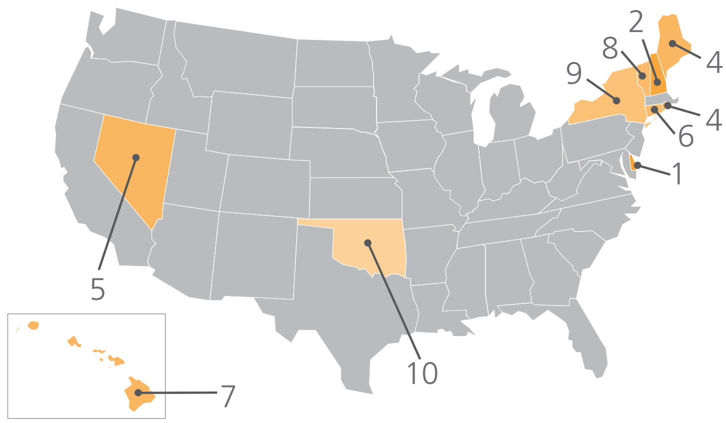


Figure 22: Broadband Connectivity, Fast U.S. States

As noted earlier, the quarterly losses for broadband connectivity may be due to an increasing number of connections that were previously at speeds just over 2 Mbps losing just a few Kbps due to increasing last mile congestion — just enough to drop them below the 2 Mbps threshold. Across the whole country, only 21 states saw quarterly increases in the percentage of connections to Akamai at broadband levels — Idaho and Montana saw the biggest jumps at approximately 13%. Mississippi saw the greatest decline, at nearly 7%.

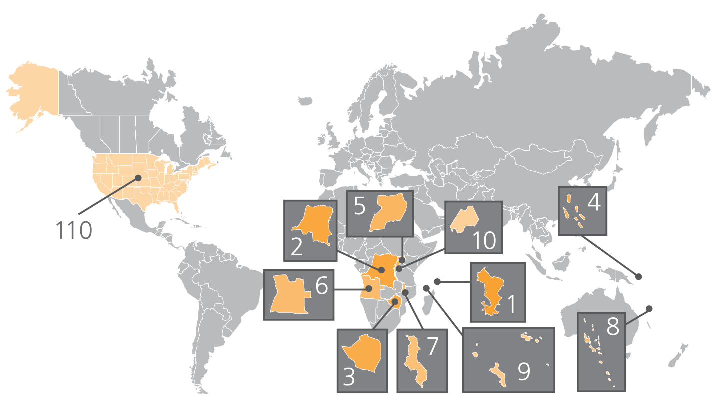
Across the whole country, only 21 states saw quarterly increases in the percentage of connections to Akamai at broadband levels.

All of the top 10 narrowband countries saw quarterly percentage declines in the first quarter of 2009, and eight of the top 10 saw yearly declines as well.

5.9 Global Narrowband Connectivity

In looking at narrowband connectivity, in contrast to the high broadband and broadband rankings, quarterly and yearly declines are considered to be a positive trend, as it likely indicates that higher speed connectivity is becoming more generally available, and more widely adopted. However, while broadband adoption continues to increase in many countries across the world, many other countries are still stuck with low-speed Internet connections, with large percentages of their connections to Akamai occurring at speeds below 256 Kbps.

Consistent with prior quarters, many of the countries with the largest percentages of connections to Akamai at speeds below 256 Kbps were either island nations or on the African continent. All of the top 10 narrowband countries saw quarterly percentage declines in the first quarter of 2009, and eight of the top 10 saw yearly declines as well, as highlighted in Figure 23. The United States saw a significant quarterly decline, with less than four percent of connections to Akamai in the first quarter at speeds below 256 Kbps. In contrast to the fourth quarter of 2008, Akamai did not see any countries with average connection speeds below 100 Kbps, though Niue just barely made the cutoff, with an average connection speed of 109 Kbps, ranking it as the slowest country for the first quarter of 2009.

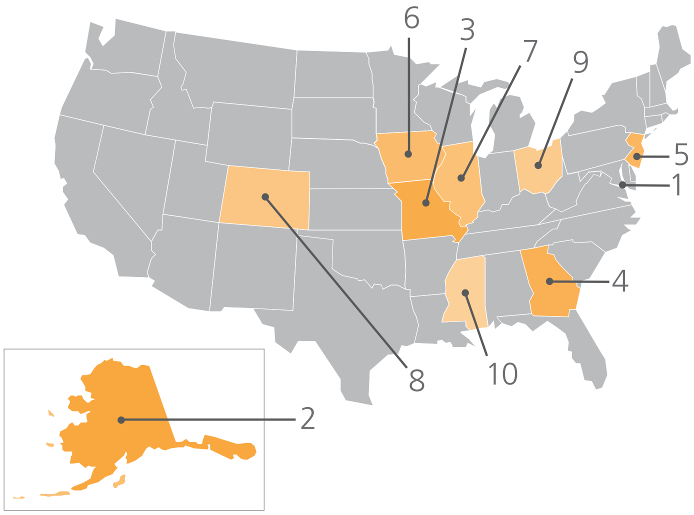


	Country	% below 256 Kbps	Q1 09–Q4 08 Change	YoY Change
–	Global	4.7%	-5.3%	-39%
1	Mayotte	82%	-17%	-1.6%
2	Dem Rep of Congo	81%	-7.4%	+2.8%
3	Zimbabwe	80%	-12%	-5.5%
4	Solomon Islands	78%	-5.4%	-15%
5	Uganda	78%	-11%	-3.9%
6	Angola	77%	-10%	+31%
7	Malawi	77%	-17%	-14%
8	Vanatu	75%	-16%	-13%
9	Seychelles	75%	-20%	-11%
10	Rwanda	75%	-22%	-21%
	…			
110	United States	3.9%	-20%	-50%

Figure 23: Narrowband Connectivity, Slowest Countries

5.10 United States Narrowband Connectivity

The District of Columbia once again had the highest percentage of narrowband connections in the first quarter as observed by Akamai, and the percentage continues to trend in the right direction, with a significant 16% quarterly decline. All of the states in the Narrowband Top 10 demonstrated quarterly declines, with eight of them seeing double digit declines, and five of them declining 20% or more, as seen in Figure 24. Across the country in the first quarter, four states (Maryland, Nebraska, North Carolina, and Rhode Island) saw increasing narrowband percentages. Maryland was the only state to record an increased percentage on a yearly basis.



	Country	% below 256 Kbps	Q1 09–Q4 08 Change	YoY Change
1	District of Columbia	7.8%	-16%	-54%
2	Alaska	7.2%	-12%	-35%
3	Missouri	6.4%	-22%	-15%
4	Georgia	6.3%	-14%	-58%
5	New Jersey	6.1%	-5.0%	-3.6%
6	Iowa	5.8%	-20%	-43%
7	Illinois	5.3%	-22%	-64%
8	Colorado	5.3%	-21%	-34%
9	Ohio	5.0%	-7.9%	-28%
10	Mississippi	5.0%	-26%	-33%

Figure 24: Narrowband Connectivity, Slowest U.S. States

All of the states in the Narrowband Top 10 demonstrated quarterly declines, with eight of them seeing double digit declines, and five of them declining 20% or more.

SECTION 6: The Obama Inauguration

While other events have driven significant amounts of Web traffic in the past, the Inauguration of Barack Obama as President of the United States on January 20, 2009 saw Web site and streaming media traffic jump to unprecedented levels on the World Wide Web, as well as on Akamai's network.[131] The event was streamed live on many news and United States government Web sites, as well as on sites catering to users with mobile devices, and the traffic levels set new records at many Web sites.[132]

Streaming traffic volume on the Akamai network reached a new peak as well, hitting 1 Terabit per second.

6.1 The View From Akamai's EdgePlatform

According to a press release[133] issued by Akamai on January 20, it was the largest day ever for the delivery of concurrent live streaming over the Akamai EdgePlatform, with a peak of over 7 million active simultaneous streams (the majority being live streams) at approximately 12:15 p.m. ET, as shown in Figure 25.

The release noted that total traffic on the Akamai network surpassed a rate of more than 2 Terabits per second (Tbps) at approximately 12:15 p.m. ET, and that Akamai also delivered over 12 million requests per second at the same time. Within that total traffic figure, streaming traffic volume on the Akamai network reached a new peak as well, hitting 1 Terabit per second, as shown in Figure 26. According to the press release, January 20 also represented a single-day peak on the Akamai EdgePlatform for concurrent live streams utilizing Adobe® Flash® technology, serving over 800 Gbps of Flash streaming.

While viewership of the Inauguration itself drove unprecedented bandwidth consumption across Akamai's network, there was apparently less impact on traffic to news sites than other prior events, as it was not the news event that drove the highest number of peak visitors per minute to Akamai, according to the Akamai Net Usage Index for News, available on Akamai's Web site at http://www.akamai.com/html/technology/nui/news/index.html. As illustrated in Figure 27, Akamai's network saw a peak of just over 5.4 million visitors/minute to

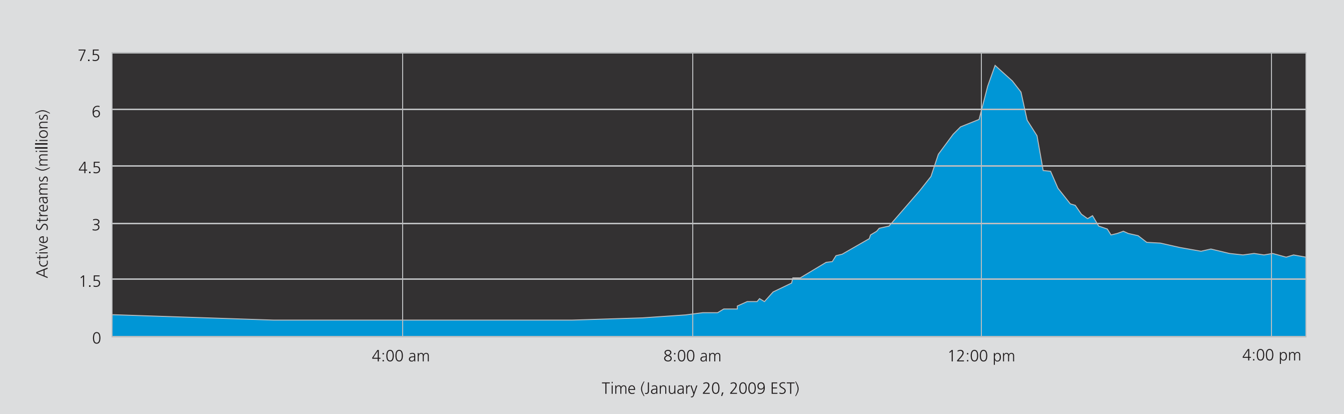


Figure 25: Active streams on the Akamai network, Inauguration Day 2009

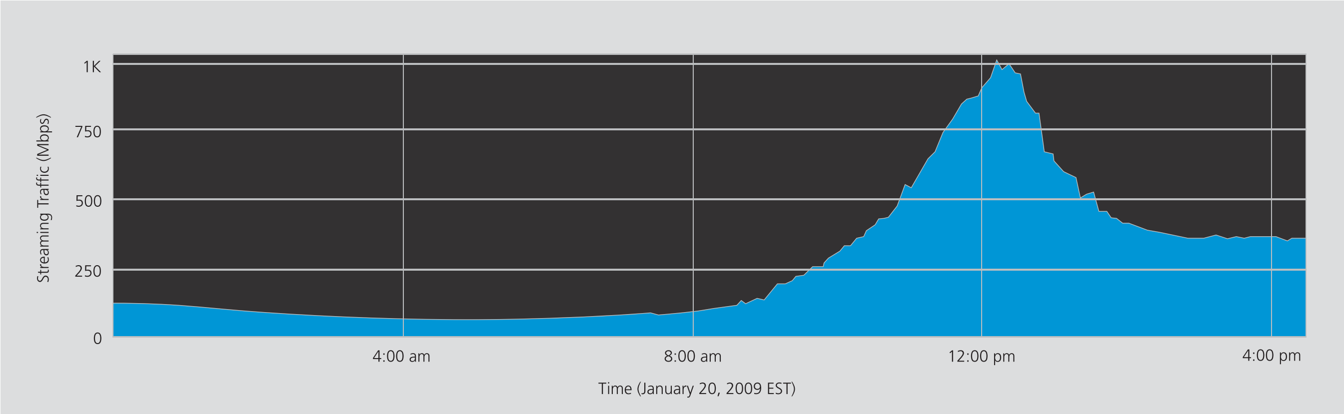


Figure 26: Streaming traffic on the Akamai network, Inauguration Day 2009

news sites globally during the Inauguration, ranking it only the seventh most compelling news event within the Index. According to the Net Usage Index, Obama's election on November 4, 2008 was the first most compelling news event, driving more than 8.5 million visitors/minute to news sites that use Akamai. Interestingly, the intermediate five news events were all sports-related.

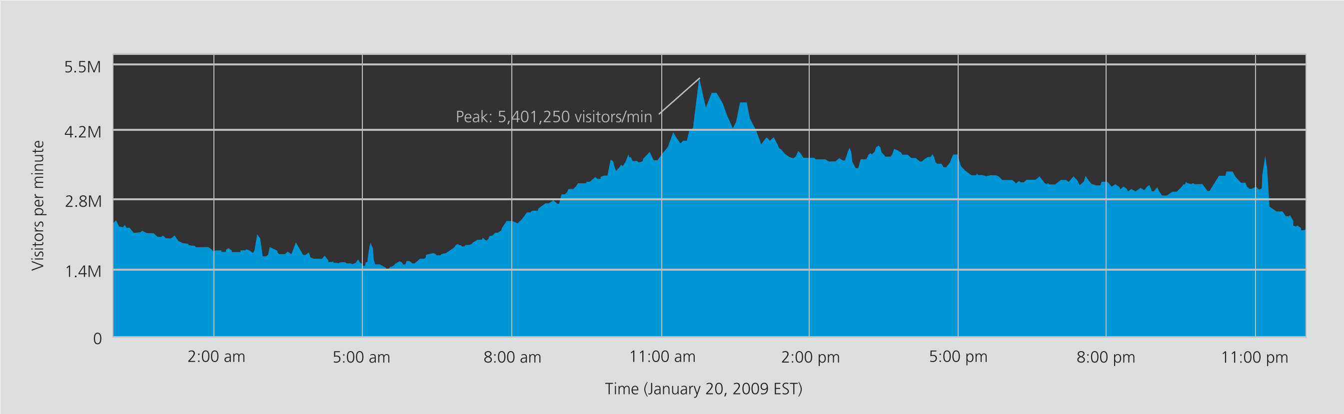


Figure 27: Akamai Net Usage Index for News, Inauguration Day 2009

Highlighting the level of attention given to the Inauguration as it was occurring, the Akamai Net Usage Index for Retail measured a significant drop in traffic among Akamai's retail customers during the Inauguration. As illustrated in Figure 28, the number of visitors per minute to some of the Web's largest retail sites, which are accelerated by Akamai, dropped significantly during the Inauguration, hitting its lowest point at approximately 12:15pm ET — the same time that overall traffic on the Akamai network reached its peak. This traffic pattern was experienced by smaller retailers as well — a published report[134] noted that traffic to MerchantCircle, which hosts small business Web sites, saw a dramatic drop in traffic to its sites during the Inauguration.

The Akamai Net Usage Index for Retail measured a significant drop in traffic among Akamai's retail customers during the Inauguration.

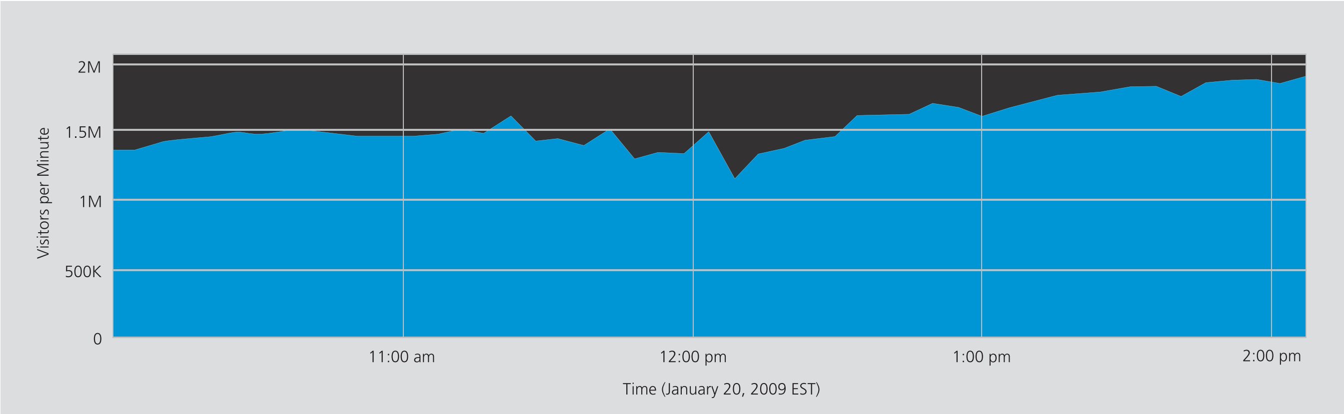


Figure 28: Retail activity on Akamai during the Obama Inauguration

6.2 Third-Party Data

As would be expected, streaming of the Inauguration created traffic spikes across the rest of the Internet as well. According to data published by Arbor Networks,[135] Flash streaming traffic across ten of the largest United States ISPs participating in Arbor's ATLAS Internet Observatory traffic sharing initiative reached a peak of nearly 3 Tbps during the Inauguration, as seen in Figure 29. The Arbor Networks blog post noted that "Flash traffic spiked by more than 60% in most providers and by 400% in a few of the larger cable operators."

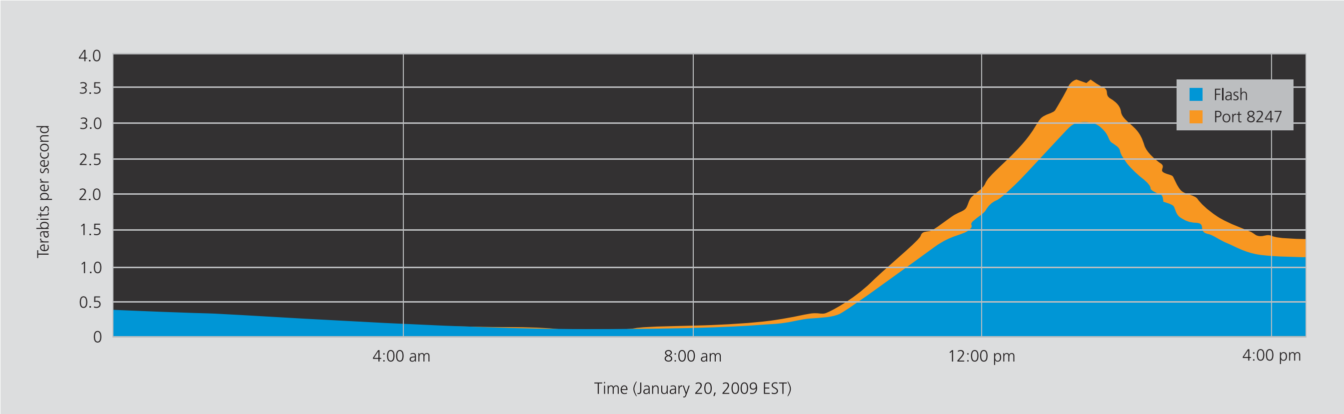


Figure 29: Obama Inauguration Streaming Video Traffic (Arbor ATLAS data from 10 U.S. Consumer ISPs)

With the growth in social media over the last several years, various social media platforms and applications were used heavily by those who viewed the Inauguration online. CNN Live and Facebook Connect provided an integrated experience, which allowed CNN viewers

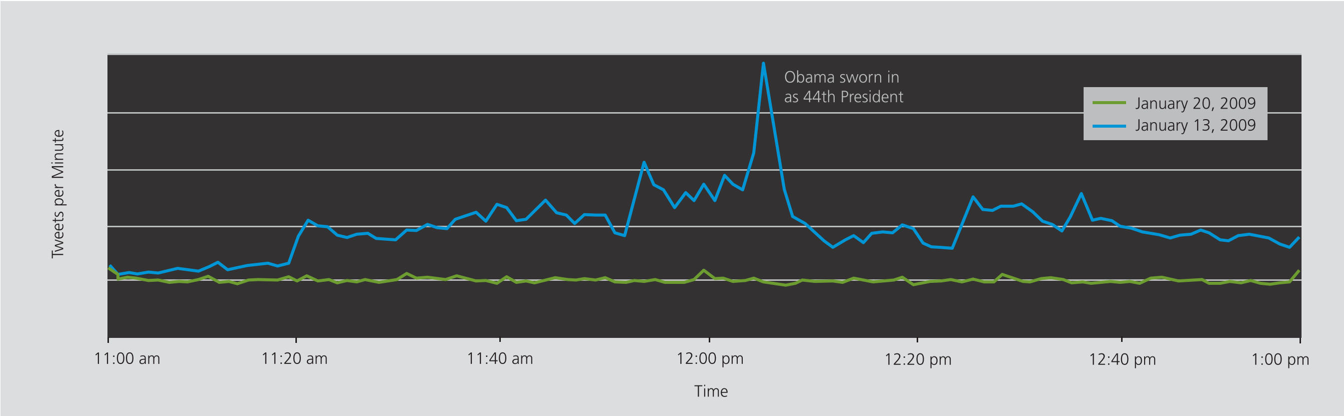


Figure 30: Twitter traffic reached 4x normal volume during Obama Inauguration

with Facebook accounts to watch the Inauguration live on the World Wide Web and participate in a real-time chat with other viewers around the world.[136] Another leading social media site, Twitter, was also heavily used during the Inauguration, and a post[137] to the Twitter Blog notes that during the Inauguration, tweets/second traffic was 5x normal levels, and tweets/minute traffic was 4x normal levels, as illustrated in Figure 30.

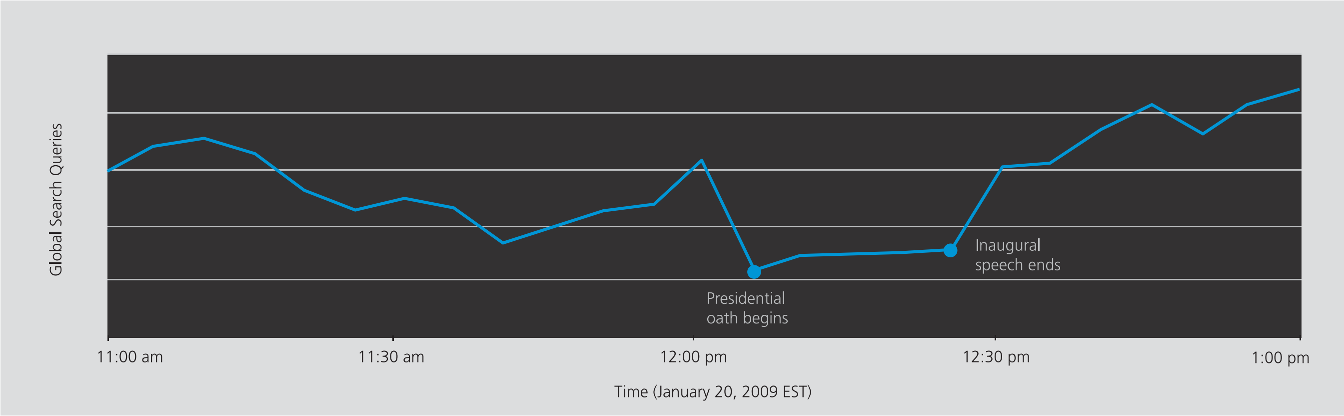


Figure 31: Google search query volume dropped during the Obama Inauguration

However, similar to the trends in retail traffic discussed above, Google found that its search query traffic dropped significantly during the Inauguration, which the company discussed in a post[138] to The Official Google Blog. As shown in Figure 31, search query volume hit its lowest point as the Presidential oath began, and remained low during the course of Obama's inaugural speech. Once the speech ended, search query volume increased rapidly, and within a half-hour, exceeded the volume of queries seen before the Inauguration began.

SECTION 7: Appendix

REGION	% ATTACK TRAFFIC	UNIQUE IP ADDRESSES	UNIQUE IPs PER CAPITA	AVG SPEED (KBPS)	% ABOVE 5 MBPS	HIGH BB IPs PER CAPITA	% ABOVE 2 MBPS	BB IPs PER CAPITA	% BELOW 256 KBPS
Europe									
Austria	0.2%	1,853,605	0.23	3729	19%	0.04	68%	0.21	1.6%
Belgium	0.4%	2,887,055	0.28	4891	34%	0.09	90%	0.27	0.6%
Czech Republic	0.7%	1,508,202	0.15	4999	33%	0.05	78%	0.14	2.0%
Denmark	0.3%	1,985,268	0.36	5063	36%	0.13	85%	0.35	0.7%
Finland	0.1%	2,125,497	0.41	3429	19%	0.08	50%	0.36	1.1%
France	1.5%	19,573,890	0.31	3439	10%	0.03	78%	0.30	0.7%
Germany	3.0%	28,550,725	0.35	4213	23%	0.08	85%	0.34	1.4%
Greece	0.2%	1,818,414	0.17	2827	8%	0.01	53%	0.16	2.6%
Iceland	0.1%	120,709	0.40	4423	23%	0.09	81%	0.39	1.1%
Ireland	0.2%	1,045,842	0.25	4108	11%	0.03	52%	0.22	3.3%
Italy	1.2%	8,490,518	0.15	2752	5%	0.01	66%	0.13	2.5%
Luxembourg	0.6%	157,537	0.32	2686	5%	0.02	64%	0.30	1.8%
Netherlands	1.2%	6,606,740	0.40	5362	36%	0.14	81%	0.38	1.3%
Norway	0.4%	2,129,227	0.46	4659	25%	0.11	77%	0.44	1.2%
Portugal	0.2%	1,781,614	0.17	3635	19%	0.03	76%	0.15	0.9%
Spain	0.7%	9,908,951	0.24	2637	4%	0.01	64%	0.23	1.5%
Sweden	2.5%	3,728,527	0.41	6853	49%	0.20	79%	0.38	1.7%
Switzerland	0.2%	2,312,816	0.31	5665	34%	0.10	92%	0.29	1.6%
United Kingdom	1.3%	18,791,675	0.31	3734	11%	0.03	80%	0.30	1.2%
Asia/Pacific									
Australia	0.4%	7,173,109	0.34	2806	13%	0.05	49%	0.27	5.2%
China	18%	44,568,138	0.03	821	1%	<0.01	4.8%	0.01	11%
Hong Kong	1.3%	1,952,401	0.28	7584	39%	0.11	88%	0.27	0.9%
India	1.6%	3,070,047	<0.01	898	1%	<0.01	5.3%	<0.01	23%
Japan	1.8%	29,420,772	0.23	7990	57%	0.13	90%	0.22	1.6%
Malaysia	0.3%	1,012,876	0.04	918	1%	<0.01	3.2%	0.02	13%
New Zealand	0.1%	1,084,296	0.26	2790	6%	0.02	61%	0.22	7.2%
Singapore	0.4%	943,930	0.20	3759	24%	0.05	66%	0.18	2.9%
South Korea	7.5%	14,404,588	0.30	10956	52%	0.15	83%	0.29	0.4%
Taiwan	2.2%	5,212,762	0.23	4608	24%	0.05	57%	0.20	1.7%
Middle East									
Egypt	0.4%	715,500	0.01	527	0%	<0.01	1.3%	<0.01	21%
Israel	0.1%	1,765,102	0.25	2748	4%	0.01	52%	0.24	0.4%
Kuwait	n/a	19,548	0.08	1730	4%	<0.01	27%	0.05	9.7%
Saudi Arabia	n/a	950,187	0.03	1514	3%	<0.01	19%	0.02	3.5%
Sudan	n/a	17,580	<0.01	480	0%	<0.01	n/a	<0.01	22%
Syria	n/a	30,808	<0.01	318	0%	<0.01	n/a	<0.01	72%
United Arab Emirates (UAE)	n/a	458,608	0.10	1638	6%	<0.01	17%	0.05	12%
Latin & South America									
Argentina	0.7%	2,736,898	0.07	1361	0%	<0.01	18%	0.05	5.3%
Brazil	2.6%	9,267,553	0.05	1134	1%	<0.01	12%	0.03	18%
Chile	0.7%	1,520,406	0.09	2407	4%	<0.01	54%	0.08	2.2%
Colombia	1.0%	1,865,808	0.04	1499	1%	<0.01	23%	0.03	3.9%
Mexico	1.2%	6,211,701	0.06	1037	0%	<0.01	6.1%	0.04	3.5%
Peru	0.2%	5,16,973	0.02	833	0%	<0.01	1.7%	0.01	4.4%
Venezuela	0.2%	1,617,472	0.06	892	0%	<0.01	2.1%	0.04	6.0%
North America									
Canada	1.0%	11,189,620	0.34	3840	23%	0.08	74%	0.25	2.1%
United States	22%	116,189,177	0.39	4163	26%	0.10	63%	0.24	3.9%

SECTION 8: Endnotes

[1] http://www.microsoft.com/technet/security/bulletin/ms09-001.mspx
[2] http://www.microsoft.com/technet/security/bulletin/ms09-feb.mspx
[3] http://www.microsoft.com/technet/security/bulletin/ms09-mar.mspx
[4] http://www.f-secure.com/weblog/archives/00001584.html
[5] http://news.slashdot.org/article.pl?sid=09/02/08/1233228
[6] http://news.prnewswire.com/DisplayReleaseContent.aspx?ACCT=104&STORY=/www/story/02-12-2009/0004971471&EDATE=
[7] http://www.cbc.ca/technology/story/2009/03/24/tech-090314-conficker.html?ref=rss
[8] http://mtc.sri.com/Conficker/addendumC/index.html#fig-445tcp-scan-drops
[9] http://mtc.sri.com/Conficker/addendumC/index.html
[10] http://mtc.sri.com/Conficker/
[11] http://www.caida.org/research/security/telescope/
[12] https://forums2.symantec.com/t5/Malicious-Code/W32-Downadup-C-Digs-in-Deeper/ba-p/393245
[13] http://www.eset.com/threat-center/blog/?p=941
[14] http://mtc.sri.com/Conficker/
[15] Ibid.
[16] http://blogs.iss.net/archive/conficker.c.html
[17] http://royal.pingdom.com/2009/01/26/dns-attack-slowed-down-hundreds-of-thousands-of-websites/
[18] http://blog.networksolutions.com/2009/potential-latency-on-network-solutions-dns/
[19] http://www.scmagazineus.com/New-style-of-DNS-amplification-can-yield-powerful-DDoS-attacks/PrintArticle/126839/
[20] http://a.longreply.com/65742
[21] http://www.networkworld.com/news/2009/033109-ultradns-service-attacked.html?t51hb
[22] http://www.telegeography.com/cu/article.php?article_id=27048
[23] http://news.cnet.com/8301-1009_3-10195550-83.html?part=rss&subj=news&tag=2547-1_3-0-20
[24] http://www.theregister.co.uk/2009/01/30/techwatch_ddos/
[25] http://asert.arbornetworks.com/2009/02/metasploit-and-other-sites-ddosed/
[26] http://news.cnet.com/8301-1009_3-10208732-83.html?part=rss&subj=news&tag=2547-1_3-0-20
[27] http://royal.pingdom.com/2009/03/10/the-anatomy-of-a-ddos-attack/
[28] http://www.businessinsider.com/2009/1/how-google-flagged-the-whole-web-as-harmful-goog
[29] http://news.cnet.com/8301-1009_3-10159640-83.html?part=rss&subj=news&tag=2547-1009_3-0-20
[30] http://news.cnet.com/8301-1009_3-10161874-83.html
[31] http://securitylabs.websense.com/content/alertsRSS.xml
[32] http://www.forbes.com/2009/02/18/black-hat-hackers-technology-security_0218_blackhat.html
[33] http://www.thoughtcrime.org/software/sslstrip/
[34] http://www.networkworld.com/news/2009/030309-koobface-worm-to-users-be.html
[35] http://www.internetnews.com/webcontent/article.php/3808551
[36] http://www.xssed.com/rss
[37] http://news.netcraft.com/archives/2009/02/17/new_phishing_attacks_combine_wildcard_dns_and_xss.html
[38] http://www.readwriteweb.com/archives/twitter_worm_could_take_over_your_computer.php#more
[39] http://www.internetnews.com/security/article.php/3795311/Another+DNS+flaw.htm
[40] http://www.networkworld.com/news/2009/020909-dns-security-deadline.html
[41] http://www.circleid.com/posts/20090204_first_gtld_signed_dot_gov/
[42] http://www.networkworld.com/news/2009/022309-dns-security.html?hpg1=bn
[43] http://www.networkworld.com/news/2009/022409-verisign-dns-security.html?hpg1=bn
[44] http://finance.yahoo.com/news/The-DNSSEC-Industry-Coalition-iw-14604956.html
[45] http://www.w3.org/History/1989/proposal.html
[46] http://news.cnet.com/8301-10787_3-10195512-60.html

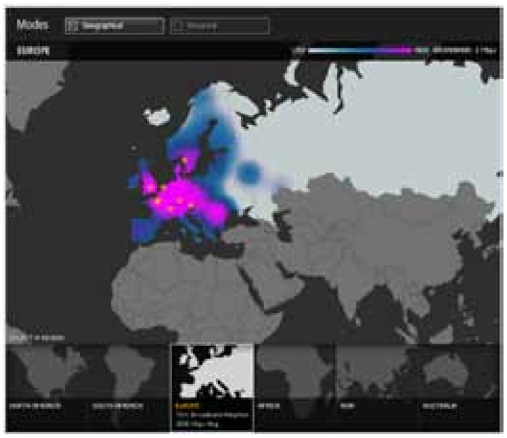
[47] http://www.t1r.com/client/print_view.php?rid=56780
[48] http://www.networkworld.com/news/2009/032509-fairpoint-internet-outage-affects-all.html
[49] http://www.newscientist.com/article/dn16394-why-the-mediterranean-is-the-achilles-heel-of-the-web.html?full=true&print=true
[50] http://www.popsci.com/scitech/article/2009-03/who-protects-intrnet
[51] http://asert.arbornetworks.com/2009/02/ahh-the-ease-of-introducing-global-routing-instability/
[52] http://www.datacenterknowledge.com/archives/2009/02/16/routing-snafu-causes-downtime-for-web-hosts/
[53] http://www.renesys.com/blog/2009/02/longer-is-not-better.shtml
[54] http://www.datacenterknowledge.com/archives/2009/03/16/22-hour-outage-for-windows-azure/
[55] http://blogs.msdn.com/windowsazure/archive/2009/03/18/the-windows-azure-malfunction-this-weekend.aspx
[56] http://news.cnet.com/8301-17939_109-10170636-2.html?part=rss&subj=news&tag=2547-1_3-0-20
[57] http://gmailblog.blogspot.com/2009/02/update-on-todays-gmail-outage.html
[58] http://news.bbc.co.uk/2/hi/technology/7934443.stm
[59] http://www.datacenterknowledge.com/archives/2009/01/08/the-salesforcecom-outage-and-dashboards/
[60] http://news.cnet.com/8301-17939_109-10155708-2.html?part=rss&subj=news&tag=2547-1_3-0-20
[61] http://royal.pingdom.com/2009/03/20/digg-goes-down-people-start-talking/
[62] http://blog.digg.com/?p=553
[63] http://www.techcrunch.com/2009/02/03/oops-linkedin-goes-down-cant-get-up/
[64] http://royal.pingdom.com/2009/01/19/blogcom-down-for-almost-8-hours/
[65] http://www.t1r.com/client/print_view.php?rid=56566
[66] http://weblog.mediatemple.net/weblog/2009/03/02/incident-resolved-service-credits-being-issued/
[67] http://news.cnet.com/8301-1023_3-10143736-93.html?part=rss&subj=news&tag=2547-1_3-0-20
[68] http://www.datacenterknowledge.com/archives/2009/01/07/unemployment-claims-crash-state-web-sites/
[69] http://www.securecomputing.net.au/Tools/Print.aspx?CIID=140636
[70] http://bit.ly/GoVtm
[71] http://www.telegeography.com/cu/article.php?article_id=27519
[72] http://www.telegeography.com/cu/article.php?article_id=27343
[73] http://www.capacitymedia.com/images/library/files/JAN_09_News__Views_pg_4-6+8-9+11-12_V5.pdf
[74] http://www.telegeography.com/cu/article.php?article_id=26651
[75] http://www.telegeography.com/cu/article.php?article_id=27826
[76] http://www.telegeography.com/cu/article.php?article_id=26870
[77] http://www.telegeography.com/cu/article.php?article_id=27148
[78] http://www.dslreports.com/shownews/Clear-Launches-In-Portland-100059
[79] http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1288116&highlight=
[80] http://www.telegeography.com/cu/article.php?article_id=27616
[81] http://www.telegeography.com/cu/article.php?article_id=26718
[82] http://www.telegeography.com/cu/article.php?article_id=26890
[83] http://www.telegeography.com/cu/article.php?article_id=27263
[84] http://www.telegeography.com/cu/article.php?article_id=27534
[85] http://www.telegeography.com/cu/article.php?article_id=27418
[86] http://www.telegeography.com/cu/article.php?article_id=27835
[87] http://content.yudu.com/Library/A15qkq/CapacityMarch09/resources/7.htm
[88] http://www.telegeography.com/cu/article.php?article_id=26741
[89] http://www.reuters.com/article/pressRelease/idUS79066+24-Mar-2009+BW20090324
[90] http://www.telegeography.com/cu/article.php?article_id=26723
[91] http://www.telegeography.com/cu/article.php?article_id=26865
[92] http://www.telegeography.com/cu/article.php?article_id=26797

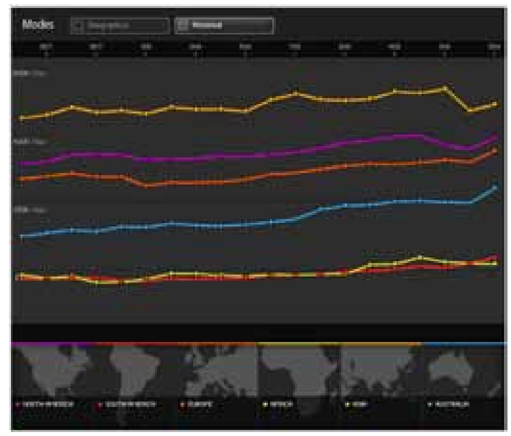
[93] http://www.telegeography.com/cu/article.php?article_id=27401
[94] http://www.telegeography.com/cu/article.php?article_id=27470
[95] http://www.telegeography.com/cu/article.php?article_id=27825
[96] http://www.telegeography.com/cu/article.php?article_id=26809
[97] http://www.telegeography.com/cu/article.php?article_id=27193
[98] http://www.telegeography.com/cu/article.php?article_id=27200
[99] http://www.telegeography.com/cu/article.php?article_id=27728
[100] http://www.yankeegroup.com/ResearchDocument.do?id=50930
[101] http://www.stuff.co.nz/technology/it-telcos/780797
[102] http://www.telegeography.com/cu/article.php?article_id=27426
[103] http://www.telegeography.com/cu/article.php?article_id=27723
[104] http://www.lightreading.com/document.asp?doc_id=170584&print=yes
[105] http://www.thinkbroadband.com/news/3834-2meg-broadband-to-become-universal.html
[106] http://www.ispreview.co.uk/news/EkFkVuyFklefnYRAof.html
[107] http://www.ispreview.co.uk/story/2009/03/21/bt-reveals-first-fibre-optic-broadband-rollout-plans.html
[108] http://www.ispreview.co.uk/story/2009/03/23/bt-reveals-more-fibre-optic-uk-broadband-rollout-plans.html
[109] http://www.ispreview.co.uk/story/2009/03/24/virgin-media-plans-150mbps-broadband-for-2012.html
[110] http://www.networkworld.com/news/2009/010609-ipv6-us-army-att.html
[111] http://www.datacenterknowledge.com/archives/2009/01/21/ipv6-expansions-at-ntt-america-softlayer/
[112] http://tech.slashdot.org/article.pl?sid=09/01/08/1330216&from=rss
[113] http://www.google.com/intl/en/ipv6/
[114] http://www.networkworld.com/news/2009/032509-google-ipv6-easy.html?hpg1=bn
[115] http://www.circleid.com/posts/20090309_slow_mainstreaming_of_ipv6/
[116] http://www.verisign.com/static/DNIB_09_0529web.pdf
[117] http://news.cnet.com/8301-13578_3-10190119-38.html?part=rss&subj=news&tag=2547-1_3-0-20
[118] http://www.icann.org/en/topics/new-gtlds/agv1-analysis-public-comments-18feb09-en.pdf
[119] http://www.pcworld.idg.com.au/article/277326/icann_responds_gtld_plan_comments
[120] http://gigaom.com/2009/02/13/broadband-stimulus-package-nears-finish-line/
[121] http://www.techlawjournal.com/topstories/2005/20050805.asp
[122] http://gigaom.com/2009/05/21/government-delays-broadband-grants/
[123] http://www.ispreview.co.uk/news/EkFFkElAEybQjAOIvm.html
[124] http://joongangdaily.joins.com/article/view.asp?aid=2900490
[125] http://www.telegeography.com/cu/article.php?article_id=27571
[126] http://www.telegeography.com/cu/article.php?article_id=27897
[127] http://www.census.gov/ipc/www/idb/tables.html, http://www.census.gov/ipc/www/popclockworld.html (12/15/08 estimate)
[128] Ibid.
[129] http://www.akamai.com/dl/whitepapers/How_will_the_internet_scale.pdf
[130] http://www.blu-ray.com/faq/
[131] http://newteevee.com/2009/01/14/where-to-watch-obamas-inauguration-online/
[132] http://news.cnet.com/8301-13577_3-10145923-36.html
[133] http://www.akamai.com/html/about/press/releases/2009/press_012009.html
[134] http://news.cnet.com/8301-17939_109-10146798-2.html
[135] http://asert.arbornetworks.com/2009/01/the-great-obama-traffic-flood/
[136] http://newteevee.com/2009/01/20/facebook-cnn-is-future-of-tv/
[137] http://blog.twitter.com/2009/01/inauguration-day-on-twitter.html
[138] http://googleblog.blogspot.com/2009/01/search-findings-from-us-presidential.html

SECTION 9: Data Visualizations

Data Visualization: Broadband Adoption Trends

Akamai's Broadband Adoption data visualization uses Akamai's EdgeScapeTM location and bandwidth profiling solution to map broadband adoption by geographic regions with historical trending. The bandwidth data is collected from end user connections to Akamai's servers and aggregated on a monthly basis. The peak bandwidth seen from each IP address over the course of the month is grouped by city and broken down into bandwidth buckets. This data visualization can be seen at *http://www.akamai.com/html/technology/dataviz5.html.*





Data Visualization: Real-Time Web Monitor

Akamai monitors global Internet conditions around the clock through data collected by traffic to our global network of servers and agents. The Real-Time Web Monitor data visualization identifies the global regions, as observed by Akamai, with the greatest attack traffic, cities with the slowest connections, and geographic areas with the most Web traffic. The Attack Traffic Overview, below left, highlights the current number of network attacks by geographical region, as well as a global average trend. The Network Traffic Overview, below right, highlights the percentage of Akamai's global network traffic being delivered to countries around the world. These data visualizations can be seen at *http://www.akamai.com/html/technology/dataviz1.html.*

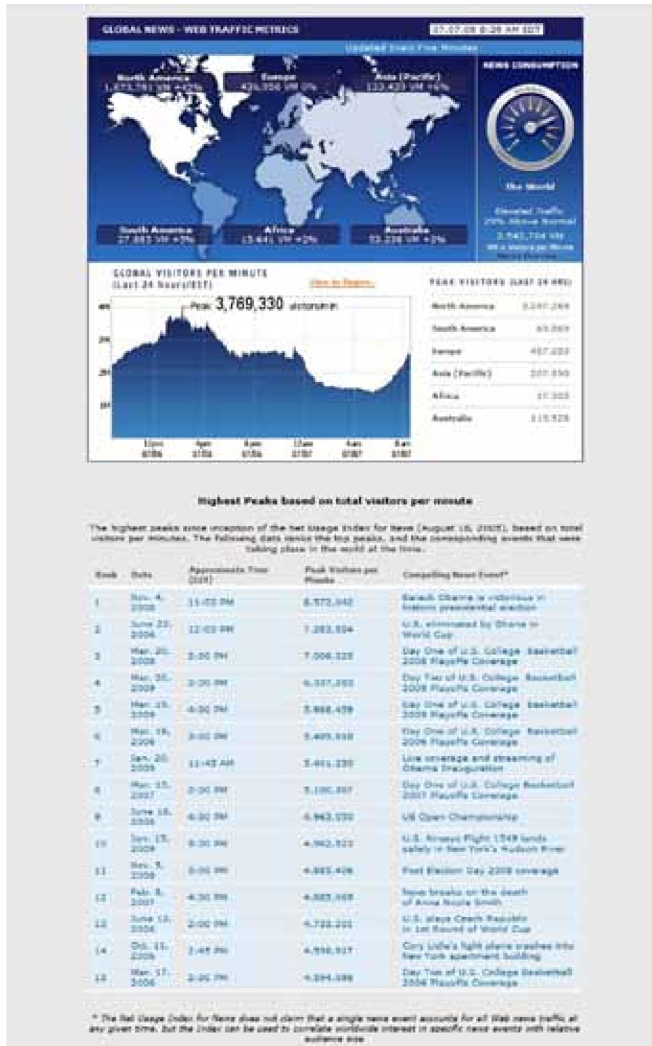
Data Visualization: Net Usage Index for News

The Akamai Net Usage Index for News enables users to monitor global news consumption 24x7, providing a real-time visualization of the impact of current events on online media consumption. The Index features:

- Sociological and geographic trends — who's consuming news when and where
- Traffic by number of visitors per minute-viewed by geographic region or global composite
- Traffic by percentage above or below average-viewed by geographic region or global composite

Data for the Index is derived from traffic to a selection of global online news Web sites that are Akamai customers.

In addition, the Net Usage Index for News features a list of the fifteen news events associated with the largest numbers of visitors to news sites that have occurred since the Index launched in August 2005. As of early July 2009, the list is comprised of a mix of sports, political, and entertainment-related events.



This data visualization can be seen at:
http://www.akamai.com/html/technology/nui/news/index.html

Additional Net Usage Indices for Retail and Music can be found at:
http://www.akamai.com/html/technology/nui/retail/index.html
http://www.akamai.com/html/technology/nui/music/index.html

The Akamai Difference

Akamai® provides market-leading managed services for powering rich media, dynamic transactions, and enterprise applications online. Having pioneered the content delivery market one decade ago, Akamai's services have been adopted by the world's most recognized brands across diverse industries. The alternative to centralized Web infrastructure, Akamai's global network of tens of thousands of distributed servers provides the scale, reliability, insight and performance for businesses to succeed online. An S&P 500 and NASDAQ 100 company, Akamai has transformed the Internet into a more viable place to inform, entertain, interact, and collaborate.

Acknowledgements

EDITOR: David Belson
CONTRIBUTOR: Jon Thompson
CONTRIBUTOR: Patrick Gilmore
CONTRIBUTOR: Alloysius Gideon
EXECUTIVE EDITOR: Brad Rinklin
EXECUTIVE EDITOR: Tom Leighton

Please send comments, questions, and corrections to stateoftheinternet@akamai.com

Follow @akamai_soti on twitter.

Akamai | Powering A Better Internet™
For more information, visit **www.akamai.com**

Akamai Technologies, Inc.

U.S. Headquarters
8 Cambridge Center
Cambridge, MA 02142
Tel 617.444.3000
Fax 617.444.3001
U.S. toll-free 877.4AKAMAI
(877.425.2624)
www.akamai.com

International Offices
Unterfoehring, Germany
Paris, France
Milan, Italy
London, England
Madrid, Spain
Stockholm, Sweden
Bangalore, India
Sydney, Australia
Beijing, China
Tokyo, Japan
Seoul, Korea
Singapore

Akamai
Powering a Better Internet