

Cisco Visual Networking Index: Forecast and Methodology, 2009–2014



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This forecast is part of the Cisco® Visual Networking Index (VNI), an ongoing initiative to track and forecast the impact of visual networking applications. The purpose of this paper is to lay out the details of the Cisco VNI global IP traffic forecast and the methodology behind it. For a more analytical look at the implications of the data presented below, please refer to the companion document to this paper entitled [“Hyperconnectivity and the Approaching Zettabyte Era.”](#)

Executive Summary

Annual global IP traffic will exceed three-quarters of a zettabyte (767 exabytes) in four years. Global IP traffic grew 45 percent during 2009 to reach an annual run rate of 176 exabytes per year or 15 exabytes per month. In 2014, global IP traffic will reach 767 exabytes per year or 64 exabytes per month. The average monthly traffic in 2014 will be equivalent to 32 million people streaming Avatar in 3D, continuously for the entire month.

Global IP traffic will quadruple from 2009 to 2014. Overall, IP traffic will grow at a compound annual growth rate (CAGR) of 34 percent.

It would take over two years to watch the amount of video that will cross global IP networks every second in 2014. It would take 72 million years to watch the amount of video that will cross global IP networks during calendar year 2014.

Global Internet video traffic will surpass global peer-to-peer (P2P) traffic by the end of 2010. For the first time since 2000, P2P traffic will not be the largest Internet traffic type.

The global online video community will surpass 1 billion users by the end of 2010. This number of people is exceeded only slightly by the populations of China (1.3 billion) and India (1.1 billion), making this user group equivalent to the third largest country in the world.

Global Internet Highlights

In 2014, the Internet will be four times larger than it was in 2009. By year-end 2014, the equivalent of 12 billion DVDs will cross the Internet each month.

Peer-to-peer is growing in volume, but declining as a percentage of overall IP traffic. P2P file-sharing networks are now carrying 3.5 exabytes per month and will continue to grow at a moderate pace with a CAGR of 16 percent from 2009 to 2014. Other means of file sharing, such as one-click file hosting, will grow rapidly at a CAGR of 47 percent and will reach 4 exabytes per month in 2014. Despite this growth, P2P as a percentage of consumer Internet traffic will drop to 17 percent of consumer Internet traffic by 2014, down from 39 percent at the end of 2009.

Global Video Highlights

Internet video is now over one-third of all consumer Internet traffic, and will approach 40 percent of consumer Internet traffic by the end of 2010, not including the amount of video exchanged through P2P file sharing.

The sum of all forms of video (TV, video on demand, Internet, and P2P) will continue to exceed 91 percent of global consumer traffic by 2014. Internet video alone will account for 57 percent of all consumer Internet traffic in 2014.

Advanced Internet video (3D and HD) will increase 23-fold between 2009 and 2014. By 2014, 3D and HD Internet video will comprise 46 percent of consumer Internet video traffic.

Video communications traffic growth is accelerating. Though still a small fraction of overall Internet traffic, video over instant messaging and video calling are experiencing high growth. Video communications traffic will increase sevenfold from 2009 to 2014.

Real-time video is growing in importance. By 2014, Internet TV will be over 8 percent of consumer Internet traffic, and ambient video will be an additional 5 percent of consumer Internet traffic. Live TV has gained substantial ground in the past few years. Globally, P2P TV is now over 280 petabytes per month.

Video-on-demand (VoD) traffic will double every two and a half years through 2014. Consumer IPTV and CATV traffic will grow at a 33 percent CAGR between 2009 and 2014.

Global Mobile Highlights

Globally, mobile data traffic will double every year through 2014, increasing 39 times between 2009 and 2014. Mobile data traffic will grow at a compound annual growth rate (CAGR) of 108 percent between 2009 and 2014, reaching 3.6 exabytes per month by 2014.

Almost 66 percent of the world's mobile data traffic will be video by 2014. Mobile video will grow at a CAGR of 131 percent between 2009 and 2014. Mobile video has the highest growth rate of any application category measured within the mobile data portion of the Cisco VNI Forecast at this time.

The Middle East and Africa will have the strongest mobile data traffic growth of any region at 133 percent CAGR, followed by Asia Pacific at 119 percent and North America at 117 percent.

Regional Highlights

IP traffic is growing fastest in Latin America, followed closely by the Middle East and Africa. Traffic in Latin America will grow at a CAGR of 51 percent between 2009 and 2014.

IP traffic in North America will reach 19 exabytes per month by 2014 at a CAGR of 30 percent. Monthly Internet traffic in North America will generate 2.8 billion DVDs worth of traffic, or 11.3 exabytes per month.

IP traffic in Western Europe will reach 16 exabytes per month by 2014 at a CAGR of 36 percent. Monthly Internet traffic in Western Europe will generate 3.1 billion DVDs worth of traffic, or 12 exabytes per month.

IP traffic in Asia Pacific will reach 17 exabytes per month by 2014 at a CAGR of 35 percent. Monthly Internet traffic in Asia Pacific will generate 3.7 billion DVDs worth of traffic, or 14.9 exabytes per month.

IP traffic in Japan will reach 4 exabytes per month by 2014 at a CAGR of 32 percent. Monthly Internet traffic in Japan will generate 0.7 billion DVDs worth of traffic, or 2.8 exabytes per month.

IP traffic in Latin America will reach 3.5 exabytes per month by 2014 at a rate of 51 percent. Monthly Internet traffic in Latin America will generate 751 million DVDs worth of traffic, or 3 exabytes per month.

IP traffic in Central and Eastern Europe will reach 2.5 exabytes per month by 2014 at a rate of 38 percent. Monthly Internet traffic in Central and Eastern Europe will generate 514 million DVDs worth of traffic, or 2.1 exabytes per month.

IP traffic in the Middle East and Africa will reach 1 exabyte per month by 2014 at a rate of 45 percent. Monthly Internet traffic in the Middle East and Africa will generate 182 million DVDs worth of traffic, or 727 petabytes per month.

Global Business Highlights

Business IP traffic will grow at a CAGR of 21 percent from 2009 to 2014. Increased adoption of advanced video communications in the enterprise segment will cause business IP traffic to grow by a factor of 2.6 between 2009 and 2014.

Business Internet traffic will grow at a faster pace than IP WAN. IP WAN will grow at a CAGR of 17 percent, compared to a CAGR of 20 percent for business Internet and 93 percent for business mobile data traffic.

Business video conferencing will grow ten-fold over the forecast period. Business videoconferencing traffic is growing almost three times as fast as overall business IP traffic, at a CAGR of 57 percent from 2009–2014.

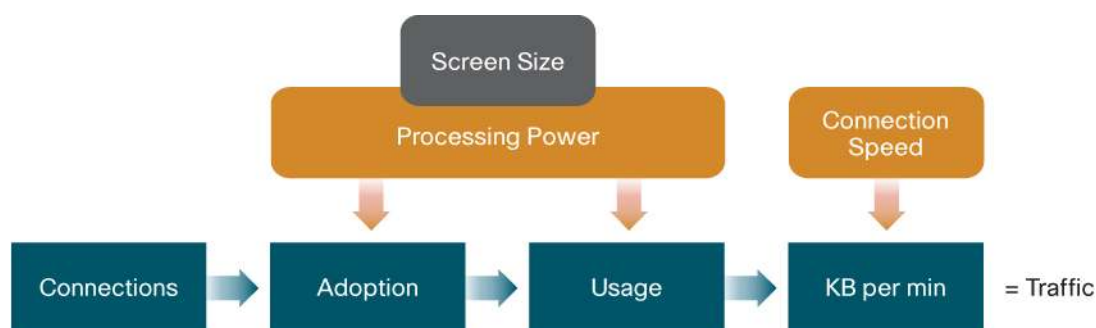
Web-based video conferencing will grow 180-fold from 2009–2014. Web-based video conferencing is the fastest growing sub-category (183 percent CAGR from 2009–2014) within the business portion of the Cisco VNI Forecast.

HD video conferencing will account for over half (57 percent) of business video conferencing traffic in 2014, up from 31 percent in 2009. Over one-half of business videoconferencing traffic will travel over the Internet by 2014.

Business IP traffic will grow fastest in the Middle East and Africa. Business IP traffic in the Middle East and Africa will grow at a CAGR of 30 percent, a faster pace than the global average of 21 percent. North America, Western and Central Europe, and Japan will have slower growth rates. In volume, North America will have the largest amount of business IP traffic in 2014 at 2.3 exabytes per month. Western Europe will be a close second to North America at 2.2 exabytes per month.

Overview of VNI Methodology

The Cisco Visual Networking Index Forecast methodology rests on a foundation of analyst projections for Internet users, broadband connections, video subscribers, mobile connections, and Internet application adoption. Analyst forecasts come from SNL Kagan, Ovum, Informa Telecoms & Media, Infonetics, IDC, Frost & Sullivan, Gartner, ABI, AML, Screen Digest, Parks Associates, Yankee Group, Dell'Oro Group, Synergy, comScore, Nielsen, and others. Upon this foundation are layered Cisco's own estimates for application adoption, minutes of use, and kilobytes per minute. The adoption, usage, and bitrate assumptions are tied to fundamental enablers such as broadband speed and computing speed. Figure 1 shows a sketch of the forecast methodology.

Figure 1. Cisco VNI Forecast Methodology Incorporates Fundamental Enablers of Adoption and Usage

Source: Cisco VNI, 2010

Following the methodology through each step for a single application category (in this case, Internet video-to-TV) will illustrate the estimation process.

Step 1: Number of Users

The forecast for Internet video-to-PC begins with estimations for the number of Internet video users, taken from a variety of sources. Table 1 lists the assumptions and sources used to quantify Internet video users in 2009 and 2014.

Table 1. Internet Video Users, 2009–2014

Country	2009	2014	Source
Rest of Asia Pacific	73,425,842	133,690,246	IDC Worldwide DMM, 2010
Brazil	28,179,584	53,082,985	Brazil's CETIC estimates that 53% of Internet users watch video online. This percentage was used to calculate the 2009 figure.
Canada	22,525,000	26,466,495	IDC Worldwide DMM, 2010
Rest of Central and Eastern Europe	42,077,334	59,988,328	IDC Worldwide DMM, 2010
China	198,849,000	414,262,812	comScore, 2010 IDC Worldwide DMM, 2010
France	40,744,000	53,410,975	comScore, 2010 IDC Worldwide DMM, 2010
Germany	45,830,000	59,537,237	comScore, 2010 IDC Worldwide DMM, 2010
India	14,658,327	42,131,143	The 2009 number is based on data from India's information ministry along with survey results from Cisco's Connected Life Market Watch.
Italy	20,653,531	32,631,831	comScore, 2010 IDC Worldwide DMM, 2010
Japan	60,365,000	69,818,083	comScore, 2010 IDC Worldwide DMM, 2010
Korea	34,044,217	37,145,839	IDC Worldwide DMM, 2010
Rest of Latin America	30,887,509	67,250,488	IDC Worldwide DMM, 2010
Rest of Middle East and Africa	20,004,649	60,227,267	IDC Worldwide DMM, 2010
Mexico	19,438,586	38,628,153	IDC Worldwide DMM, 2010
Russia	16,309,150	28,617,664	IDC Worldwide DMM, 2010
United Kingdom	36,788,000	46,441,504	comScore, 2010 IDC Worldwide DMM, 2010
United States	177,851,000	218,530,216	comScore, 2010 IDC Worldwide DMM, 2010
Rest of Western Europe	52,167,470	72,377,296	IDC Worldwide DMM, 2010

Country	2009	2014	Source
South Africa	1,542,890	3,461,910	Cisco estimates based on South Africa's regional share of Internet PCs, as quantified by Gartner.

Step 2: Application Adoption

Once the number of Internet video users has been established, the number of users for each video sub-segment must be estimated. It was assumed that all Internet video users are short-form video users, on average 50 percent of Internet video users watch long-form content (based largely on comScore Video Metrix figures for video sites whose average viewing time is longer than 5 minutes in duration), 30 percent watch some form of live content, 2.4 percent are ambient video watchers, and 3 percent are Internet PVR users. These figures are global averages; regional adoption rates for the application sub-segments can vary significantly.

Step 3. Minutes of Use

For each application sub-segment, minutes of use (MOU) are estimated. Multiple sources are used to determine MOU: the Cisco VNI Usage data collection program provides a minute-per-subscriber baseline for many applications, the Cisco Connected Life Market Watch survey provides MOU for markets that are not covered by the Usage program, and comScore Video Metrix provides PC-based MOU for online video. Special care is taken to ensure that the total number of Internet video minutes is well within the total number of video minutes (including television broadcast) for each user. For example, if the average individual watches a total of 4 hours of video content per day, the sum of Internet, managed IP, and mobile video hours should be a relatively small portion of the total 4 hours.

Step 4. Bitrates

Once MOU have been estimated for each sub-segment of video, the next step is to apply kilobytes (KB) per minute. In order to arrive at kilobytes per minute, first the regional and country average broadband speeds are estimated for the years 2009 through 2014. For each application category, a representative bitrate is established, and this representative bitrate grows at approximately the same pace as the broadband speed. For video categories, a 7 percent annual compression gain is applied to the bitrate. Local bitrates are then calculated based on how far the average broadband speed in the country differs from the global average, how much digital screen real estate the country has, and how much computing power the average device in the country has. Combining these factors yields bitrates such as those in Table 2.

Table 2. Megabytes per Minute for Internet Video, 2009–2014

(MB per Minute)	2009	2010	2011	2012	2013	2014
Internet High-Definition Video						
Italy	16	19	24	25	26	27
Germany	27	31	33	31	29	27
France	27	31	33	31	29	27
United Kingdom	22	25	33	31	29	27
Rest of WE	24	28	33	31	29	27
Canada	26	28	33	31	29	27
United States	26	28	33	31	29	27
China	8	8	8	8	8	9
Korea	32	33	33	31	29	27
India	8	8	8	8	7	7
Rest of APAC	18	19	20	22	24	26
Russia	11	13	14	16	18	20
Rest of CEE	11	13	14	16	18	21

(MB per Minute)	2009	2010	2011	2012	2013	2014
Brazil	8	8	8	8	10	13
Mexico	8	8	8	9	11	15
Rest of LATAM	8	8	8	9	11	15
South Africa	8	8	8	9	10	11
Rest of MEA	8	8	8	9	10	11
Japan	32	33	33	31	29	27
Internet Standard-Definition Video						
Italy	8	9	12	12	12	12
Germany	13	15	16	17	18	18
France	13	15	16	17	18	18
United Kingdom	11	12	16	16	16	16
Rest of WE	12	14	16	17	18	18
Canada	13	14	16	15	16	18
United States	13	14	16	15	16	18
China	3	3	4	4	5	6
Korea	14	15	16	17	18	18
India	3	3	4	4	5	6
Rest of APAC	9	9	10	10	11	12
Russia	6	6	7	7	8	9
Rest of CEE	6	6	7	7	8	9
Brazil	3	3	4	4	5	6
Mexico	3	4	4	4	5	7
Rest of LATAM	3	3	4	4	5	7
South Africa	3	3	4	4	5	6
Rest of MEA	3	3	4	4	5	6
Japan	14	15	16	17	18	18
Internet Short-Form Video and User-Generated Content						
Italy	4	4	6	6	7	7
Germany	5	5	6	7	7	8
France	5	5	6	7	7	8
United Kingdom	5	5	6	7	7	8
Rest of WE	5	5	6	7	7	8
Canada	5	5	6	7	7	8
United States	5	5	6	7	7	8
China	2	2	2	2	2	2
Korea	5	5	6	7	7	8
India	2	2	2	2	2	2
Rest of APAC	4	5	5	6	6	7
Russia	3	3	3	4	5	5
Rest of CEE	3	3	3	4	5	5
Brazil	2	2	2	2	3	3
Mexico	2	2	2	2	3	4
Rest of LATAM	2	2	2	2	3	4
South Africa	2	2	2	2	3	3
Rest of MEA	2	2	2	2	3	3

(MB per Minute)	2009	2010	2011	2012	2013	2014
Japan	5	5	6	7	7	8

Step 5: Rollup

The penultimate step in the methodology is to multiply the bitrates, MOU, and users together to get an average PB per month. Each application's traffic share is cross-checked against the results from Cisco VNI Usage.

Step 6: Traffic Migration Assessment

The final step is to reconcile the Internet, managed IP, and mobile segments of the forecast. The portion of mobile data traffic that has migrated from the fixed network is subtracted from the fixed forecast, and the amount of mobile data traffic offloaded onto the fixed network through dual-mode devices and femtocells is added back to the fixed forecast.

The quantitative results of the forecast and details of the methodology for each segment and type can be found in the sections that follow.

Global IP Traffic Growth, 2009–2014

Table 3 shows the top-line forecast. According to this forecast, global IP traffic in 2009 stands at 15 exabytes per month, and more than quadruples by 2014, to approach 64 exabytes per month. Consumer IP traffic will exceed 56 exabytes per month and business IP traffic will approach 8 exabytes per month.

Table 3. Global IP Traffic, 2009–2014

IP Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Type (PB per Month)							
Internet	10,942	15,205	21,181	28,232	36,709	47,176	34%
Managed IP	3,652	4,963	6,771	8,851	11,078	13,199	29%
Mobile Data	91	228	538	1,158	2,132	3,528	108%
By Segment (PB per Month)							
Consumer	11,602	16,534	23,750	32,545	43,117	55,801	37%
Business	3,083	3,862	4,740	5,697	6,801	8,103	21%
By Geography (PB per Month)							
North America	5,115	7,091	10,051	12,988	16,136	19,019	30%
Western Europe	3,495	4,818	6,712	9,261	12,417	16,158	36%
Asia Pacific	3,920	5,367	7,295	9,815	12,985	17,421	35%
Japan	1,068	1,539	2,149	2,855	3,591	4,300	32%
Latin America	438	680	1,026	1,527	2,274	3,479	51%
Central Eastern Europe	493	678	938	1,306	1,815	2,510	38%
Middle East and Africa	157	223	319	490	700	1,018	45%
Total (PB per Month)							
Total IP traffic	14,686	20,396	28,491	38,242	49,919	63,904	34%

Source: Cisco VNI, 2010

Definitions

Consumer: Includes fixed IP traffic generated by households, university populations, and Internet cafés

Business: Includes fixed IP WAN or Internet traffic generated by businesses and governments

Mobile: Includes mobile data and Internet traffic generated by handsets, notebook cards, and mobile broadband gateways

Internet: Denotes all IP traffic that crosses an Internet backbone

Managed IP: Includes corporate IP WAN traffic, IP transport of TV/VoD

The following tables show cross-tabs of end-user segment and network type for the final year of the forecast period (2014). Consumer Internet remains the primary driver of IP traffic, but mobile data has the highest growth rate and begins to generate significant traffic by 2014.

Table 4. Exabytes per Month as of Year End 2014

	Consumer	Business	Total
Internet	42.1	5.1	47.2
Managed IP	10.9	2.3	13.2
Mobile Data	2.9	0.67	3.5
Total	55.8	8.1	63.9

Source: Cisco VNI, 2010

Table 5 shows the same data as Table 4, but in terms of annual traffic run rates. These run rates are based on the monthly traffic at the end of 2014.

Table 5. Exabytes per Year as of Year End 2014

	Consumer	Business	Total
Internet	504.8	61.3	566.1
Managed IP	130.5	27.9	158.4
Mobile Data	34.3	8.1	42.3
Total	669.5	97.2	766.9

Source: Cisco VNI, 2010

Consumer and business traffic are both dominated by Internet traffic, though business traffic is more evenly distributed across public Internet and managed IP.

Table 6. Traffic Share by End-User Segment as of Year End 2014

	Consumer	Business
Internet	75.39%	63.02%
Managed IP	19.49%	28.69%
Mobile Data	5.12%	8.29%
Total	100.00%	100.00%

Source: Cisco VNI, 2010

Consumer traffic accounts for the majority of IP traffic in every network type segment: consumer traffic is 89 percent of all Internet traffic, 81 percent of all mobile data traffic, and 82 percent of managed IP traffic.

Table 7. Traffic Share by Network Type as of Year End 2014

	Consumer	Business	Total
Internet	89.2%	10.8%	100%
Managed IP	82.4%	17.6%	100%

Mobile Data	81.0%	19.1%	100%
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Source: Cisco VNI, 2010

Consumer Internet traffic represents two-thirds of all IP traffic, followed by consumer managed IP (VoD), which represents 17 percent of traffic.

Table 8. Overall Traffic Share as of Year End 2014

	Consumer	Business	Total
Internet	66%	8%	74%
Managed IP	17%	4%	21%
Mobile Data	4%	1%	6%
Total	87%	13%	100%

Source: Cisco VNI, 2010

Consumer IP Traffic, 2009–2014

As shown in Table 9, global consumer IP traffic is expected to reach 56 exabytes per month in 2014. The majority of today's consumer IP traffic is Internet traffic.

Table 9. Global Consumer IP Traffic, 2009–2014

Consumer IP Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Type (PB per Month)							
Internet	8,930	12,684	18,092	24,546	32,361	42,070	36%
Managed IP	2,606	3,680	5,248	7,095	9,059	10,875	33%
Mobile Data	66	170	410	904	1,697	2,856	112%
By Geography (PB per Month)							
North America	4,095	5,831	8,539	11,219	14,100	16,676	32%
Western Europe	2,672	3,802	5,495	7,815	10,658	13,994	39%
Asia Pacific	3,421	4,701	6,434	8,735	11,661	15,820	36%
Japan	735	1,126	1,633	2,229	2,856	3,459	36%
Latin America	315	519	810	1,246	1,920	3,043	57%
Central Eastern Europe	311	468	700	1,040	1,518	2,173	47%
Middle East and Africa	53	87	139	259	404	636	64%
Total (PB per Month)							
Consumer IP Traffic	11,602	16,534	23,750	32,545	43,117	55,801	37%

Source: Cisco VNI, 2010

Consumer Internet Traffic, 2009–2014

This category encompasses any IP traffic that crosses the Internet and is not confined to a single service provider's network. P2P traffic, still the largest share of Internet traffic today, will decrease as a percentage of overall Internet traffic. Internet video streaming and downloads are beginning to take a larger share of bandwidth, and will grow to nearly 60 percent of all consumer Internet traffic in 2014.

Table 10. Global Consumer Internet Traffic, 2009–2014

Consumer Internet Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Sub-Segment (PB per Month)							
File Sharing	4,091	5,075	6,197	7,492	9,125	11,340	23%
Internet Video	2,776	4,725	7,718	11,026	14,838	19,468	48%
Internet Video to TV	107	263	711	1,502	2,686	4,075	107%
Web/Data	1,688	2,273	3,006	3,930	4,933	6,134	29%
Video Calling	83	128	199	284	407	599	48%
Online Gaming	63	86	120	167	226	307	37%
VoIP	122	134	141	144	145	146	4%
By Geography (PB per Month)							
North America	2,279	3,351	5,015	6,495	8,096	9,652	33%
Western Europe	2,277	3,179	4,538	6,361	8,541	11,143	37%
Asia Pacific	3,251	4,416	5,961	7,944	10,475	13,856	34%
Japan	474	730	1,062	1,457	1,857	2,286	37%
Latin America	297	482	744	1,132	1,727	2,726	56%
Central Eastern Europe	304	447	651	941	1,336	1,893	44%
Middle East and Africa	49	78	120	216	329	515	60%
Total (PB per Month)							
Consumer Internet Traffic	8,930	12,684	18,092	24,546	32,361	42,070	36%

Source: Cisco VNI, 2010

Definitions**Web, email, and data:** Includes web, email, instant messaging, and other data traffic (excluding file sharing)**File sharing:** Includes peer-to-peer traffic from all recognized P2P systems such as BitTorrent, eDonkey, etc., as well as traffic from web-based file sharing systems**Gaming:** Includes casual online gaming, networked console gaming, and multiplayer virtual world gaming**Video communications:** Includes PC-based video calling, webcam viewing, and web-based video monitoring**VoIP:** Includes traffic from retail VoIP services and PC-based VoIP, but excludes wholesale VoIP transport**Internet video to PC:** Free or pay TV or VoD viewed on a PC, excludes P2P video file downloads**Internet video to TV:** Free or pay TV or VoD delivered via Internet but viewed on a TV screen using an STB or media gateway**Web, Email, and Data**

This is a general category that encompasses web browsing, email, instant messaging, data (which includes file transfer using HTTP, FTP, etc.) and other Internet applications. Note that “data” may include the download of video files that are not captured by the “Internet video to PC” forecast. It includes traffic generated by all individual Internet users. An Internet user is here defined as someone who accesses the Internet through a desktop or laptop at home, school, Internet café, or other location outside the context of a business.

Table 11. Global Consumer Web and Data Traffic, 2009–2014

Consumer Web, Email, and Data Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Sub-Segment (PB per Month)							
Web/Data	1,595	2,162	2,868	3,765	4,732	5,878	30%
Software Updates	93	111	139	165	202	256	22%
By Geography (PB per Month)							
North America	634	809	996	1,221	1,454	1,645	21%
Western Europe	481	668	906	1,215	1,491	1,771	30%
Asia Pacific	364	495	683	920	1,214	1,637	35%
Japan	93	133	185	252	336	443	37%
Latin America	57	91	136	193	269	401	48%
Central Eastern Europe	48	61	77	99	126	181	30%
Middle East and Africa	11	16	22	31	43	55	38%
Total (PB per Month)							
Consumer Web, Data	1,688	2,273	3,006	3,930	4,933	6,134	29%

Source: Cisco VNI, 2010

File Sharing

This category includes traffic from P2P applications such as BitTorrent and eDonkey, as well as web-based file sharing. Note that a large portion of P2P traffic is due to the exchange of video files, so a total view of the impact of video on the network should count P2P video traffic (estimated to be approximately 70 to 80 percent of P2P in 2009) in addition to the traffic counted in the “Internet Video to PC” and “Internet Video to TV” categories. Table 12 shows the forecast for consumer P2P traffic from 2009 to 2014. NOTE: The P2P category is limited to traditional file exchange and does not include commercial video-streaming applications that are delivered through P2P, such as PPStream or PPLive.

Table 12. Global Consumer File-Sharing Traffic, 2009–2014

Consumer File Sharing, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Sub-Segment (PB per Month)							
P2P file Transfer	3,510	4,157	4,839	5,531	6,305	7,303	16%
Other File Transfer	581	918	1,358	1,961	2,820	4,037	47%
By Geography (PB per Month)							
North America	664	796	958	1,155	1,396	1,691	21%
Western Europe	1,198	1,421	1,637	1,830	2,086	2,414	15%
Asia Pacific	1,708	2,181	2,726	3,390	4,225	5,386	26%
Japan	179	218	262	313	370	435	19%
Latin America	119	160	207	257	329	450	30%
Central Eastern Europe	195	262	359	487	653	868	35%
Middle East and Africa	27	37	47	60	67	95	29%
Total (PB per Month)							
Consumer File Sharing	4,091	5,075	6,197	7,492	9,125	11,340	23%

Source: Cisco VNI, 2010

Internet Gaming

The “Internet Gaming” category primarily includes the traffic generated from gameplay. The download of the game is included in “Web, Email, and Data.” Table 13 shows the forecast for Internet gaming from 2009 to 2014.

Table 13. Global Consumer Internet Gaming Traffic, 2009–2014

Consumer Gaming, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Geography (PB per Month)							
North America	10	13	18	24	30	35	29%
Western Europe	15	21	28	37	48	59	31%
Asia Pacific	31	43	62	89	127	184	43%
Japan	4	5	7	9	11	14	28%
Latin America	1	2	3	4	5	8	46%
Central Eastern Europe	1	1	2	3	4	6	42%
Middle East and Africa	0	0	0	1	1	2	53%
Total (PB per Month)							
Consumer Gaming	63	86	120	167	226	307	37%

Source: Cisco VNI, 2010

Voice over IP (VoIP)

This category includes phone-based VoIP services direct from a service provider, phone-based VoIP services offered by a third-party but transported by a service provider, and softphone-based Internet VoIP applications such as Skype. Table 14 shows the global forecast for consumer VoIP to 2014.

Table 14. Global Consumer VoIP Traffic, 2009–2014

Consumer Voice-over-IP Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Geography (PB per Month)							
North America	19	21	22	22	22	21	3%
Western Europe	58	62	62	61	59	57	–1%
Asia Pacific	20	25	29	32	35	38	13%
Japan	17	17	17	16	16	15	–3%
Latin America	5	6	7	8	9	9	15%
Central Eastern Europe	2	2	3	3	3	4	17%
Middle East and Africa	1	1	2	2	2	3	21%
Total (PB per Month)							
Consumer VoIP	122	134	141	144	145	146	4%

Source: Cisco VNI, 2010

Video Communications

The “Video Communications” category includes Internet video calling, video instant messaging, video monitoring, and webcam traffic. This segment is relatively small for the forecast period, but is included for tracking purposes, because it is expected to experience substantial long-term growth in the 2014–2019 timeframe.

Table 15. Global Consumer Internet Video Communications, 2009–2014

Consumer Internet Video Communications, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Geography (PB per Month)							
North America	6	11	18	24	34	50	51%
Western Europe	12	22	45	65	96	153	66%
Asia Pacific	15	24	39	62	96	144	58%
Japan	45	61	80	103	131	163	30%
Latin America	2	4	7	12	20	32	74%
Central Eastern Europe	3	6	10	16	28	54	76%
Middle East and Africa	0	0	1	2	3	4	67%
Total (PB per Month)							
Consumer Video Communications	83	128	199	284	407	599	48%

Source: Cisco VNI, 2010

Internet Video to PC

“Internet Video to PC” refers to online video that is downloaded or streamed for viewing on a PC screen. It excludes peer-to-peer downloads, and is distinct from Internet-delivery of video to a TV screen through a set-top box (STB) or equivalent device. Much of the video viewed on PC is short-form content, and a large part of it is made up of free clips, episodes, and other content offered by traditional content producers such as movie studios and television networks.

Table 16. Global Consumer Internet Video-to-PC Traffic, 2009–2014

Consumer Internet Video to PC, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Category (PB per Month)							
Short Form	717	997	1,415	2,011	2,754	3,727	39%
Long Form SD	1,132	1,707	2,286	2,534	2,687	3,286	24%
Long Form HD	405	989	2,195	3,541	5,068	6,432	74%
Long Form 3D	0	2	13	43	106	226	259%
Internet Video—Live TV	285	449	702	1,033	1,456	1,928	47%
Internet PVR	99	218	357	628	1,026	1,600	74%
Ambient Video	137	364	750	1,236	1,740	2,270	75%
By Geography (PB per Month)							
North America	892	1,574	2,639	3,301	3,873	4,375	37%
Western Europe	482	907	1,670	2,775	4,090	5,680	64%
Asia Pacific	1,102	1,623	2,345	3,243	4,355	5,728	39%
Japan	126	270	447	635	783	913	49%
Latin America	112	218	380	646	1,064	1,749	73%
Central Eastern Europe	53	112	191	310	468	679	66%
Middle East and Africa	9	22	46	115	205	343	107%
Total (PB per Month)							
Consumer Video to TV	2,776	4,725	7,718	11,026	14,838	19,468	48%

Source: Cisco VNI, 2010

Definitions

Short form: User-generated video and other video clips generally less than 7 minutes in length

Long form: Video content generally greater than 7 minutes in length

Live TV: Peer-to-peer TV and live television streaming over the Internet

Internet PVR: Recording live TV content for later viewing

Ambient video: Nannycams, petcams, home security cams, and other persistent video streams

Internet Video to TV

“Internet Video to TV” includes video delivered via Internet to a TV screen, by way of an Internet-enabled set-top box or equivalent device. Examples of devices now available include Microsoft’s Xbox 360 and the Roku digital video player, through which users can download film and television content.

Table 17. Global Consumer Internet Video-to-TV Traffic, 2009–2014

Consumer Internet Video to TV, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Category (PB per Month)							
Gaming Consoles Streaming Video	47	112	277	488	776	1,063	86%
Internet-Enabled TVs	1	5	27	108	316	686	285%
Internet-Enabled non-SP STBs	3	10	25	49	88	141	110%
Internet-Enabled SP STBs	47	118	343	799	1,417	2,062	113%
PC-TV Connections	5	11	24	40	61	84	73%
Placeshifting—Standalone	3	7	15	18	28	40	67%
By Geography (PB per Month)							
North America	54	128	365	749	1,288	1,833	103%
Western Europe	29	79	190	378	672	1,010	103%
Asia Pacific	11	25	77	208	423	739	133%
Japan	11	26	65	128	209	303	93%
Latin America	0	1	4	12	32	76	177%
Central Eastern Europe	1	3	9	24	54	101	152%
Middle East and Africa	0	1	2	4	8	13	107%
Total (PB per Month)							
Consumer Video to TV	107	263	711	1,502	2,686	4,075	107%

Source: Cisco VNI, 2010

Consumer Managed IP Traffic, 2009–2014

“Managed IP Video” refers to IP traffic generated by traditional commercial TV services. This traffic remains within the footprint of a single service provider, so it is not considered Internet traffic. (For Internet video delivered to the set-top box, please see “Internet Video to TV” in the previous section.)

Table 18. Global Consumer Managed IP Traffic, 2009–2014

Consumer Managed IP Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Application Category (PB per Month)							
IPTV VoD	329	504	714	948	1,209	1,463	35%
Cable VoD	2,277	3,176	4,534	6,147	7,850	9,411	33%
By Sub-Segment (PB per Month)							
IPTV SD VoD Traffic	250	334	391	397	386	428	11%
IPTV HD VoD Traffic	79	169	323	549	821	1,031	67%
Cable SD VoD Traffic	1,309	1,558	1,758	1,850	1,874	2,200	11%
Cable HD VoD Traffic	945	1,551	2,601	3,906	5,237	6,039	45%
Hybrid IP Cable SD VoD Traffic	12	31	59	92	122	174	69%
Hybrid IP Cable HD VoD Traffic	10	36	115	296	608	982	148%
IPTV 3D VoD Traffic	0	0	1	1	3	5	183%
Hybrid IP Cable 3D VoD Traffic	0	0	0	0	1	2	330%
Cable 3D VoD Traffic	0	0	2	4	8	13	169%
By Geography (PB per Month)							
North America	1,804	2,447	3,432	4,507	5,606	6,356	29%
Western Europe	373	567	821	1,159	1,550	1,953	39%
Asia Pacific	157	252	399	627	848	1,291	52%
Japan	248	367	513	662	822	921	30%
Latin America	16	28	44	68	107	170	61%
Central Eastern Europe	6	15	34	65	118	172	97%
Middle East and Africa	3	4	6	7	9	12	34%
Total (PB per Month)							
Managed IP Video Traffic	2,606	3,680	5,248	7,095	9,059	10,875	33%

Source: Cisco VNI, 2010

Business IP Traffic

The enterprise forecast is based on the number of network-connected computers worldwide. In our experience, this provides the most accurate measure of enterprise data usage. An average business user might generate 4 GB per month of Internet and WAN traffic. A large-enterprise user would generate significantly more traffic, 8–10 GB per month.

Table 19. Business IP Traffic, 2009–2014

Business IP Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Network Type (PB per Month)							
Business Internet Traffic	2,013	2,522	3,089	3,687	4,348	5,106	20%
Business Managed IP Traffic	1,046	1,283	1,523	1,756	2,019	2,325	17%
Business Mobile Data	25	58	128	254	435	672	93%
By Geography (PB per Month)							
North America	1,021	1,260	1,512	1,769	2,036	2,343	18%
Western Europe	822	1,015	1,217	1,445	1,759	2,164	21%
Asia Pacific	499	666	861	1,080	1,324	1,601	26%
Japan	333	413	516	625	735	840	20%
Latin America	123	161	216	281	354	437	29%
Central Eastern Europe	181	210	237	266	298	336	13%
Middle East and Africa	104	137	180	231	295	382	30%
Total (PB per Month)							
Business IP Traffic	3,083	3,862	4,740	5,697	6,801	8,103	21%

Source: Cisco VNI, 2010

Definitions**Business Internet traffic:** All business traffic that crosses the public Internet**Business managed IP:** All business traffic that is transported over IP but remains within the corporate WAN**Business mobile data:** All business traffic that crosses a mobile access point**Mobile Data and Internet Traffic**

Mobile data traffic includes handset-based data traffic, such as text messaging, multimedia messaging, and handset video services. Mobile Internet traffic is generated by wireless cards for portable computers and handset-based mobile Internet usage.

Table 20. Mobile Data and Internet Traffic, 2009–2014

Mobile Data and Internet Traffic, 2009–2014							
	2009	2010	2011	2012	2013	2014	CAGR 2009–2014
By Geography (PB per Month)							
North America	17	47	125	282	504	839	117%
Western Europe	29	69	164	355	683	1,084	106%
Asia Pacific	17	45	100	216	427	814	116%
Japan	18	40	83	158	250	350	80%
Latin America	4	12	29	59	109	182	111%
Central Eastern Europe	3	8	21	44	81	133	114%
Middle East and Africa	2	6	17	44	78	127	133%
Total (PB per Month)							
Mobile Data and Internet	91	228	538	1,158	132	3,528	108%

Source: Cisco VNI, 2010

For More Information

For more information, see the companion paper "[Hyperconnectivity and the Approaching Zettabyte Era.](#)" Inquiries can be directed to traffic-inquiries@cisco.com.



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