

## Cisco Visual Networking Index: Forecast and Methodology, 2010–2015



June 1, 2011

This forecast is part of the Cisco® Visual Networking Index (VNI), an ongoing initiative to track and forecast the impact of visual networking applications. This document presents 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, [Reaching the Zettabyte Threshold](#), or the [online forecast highlights tool](#).

### Executive Summary

**Annual global IP traffic will reach the zettabyte threshold (966 exabytes or nearly 1 zettabyte) by the end of 2015.** In 2015, global IP traffic will reach 966 exabytes per year or 80.5 exabytes per month.

**Global IP traffic has increased eightfold over the past 5 years, and will increase fourfold over the next 5 years.** Overall, IP traffic will grow at a compound annual growth rate (CAGR) of 32 percent from 2010 to 2015.

**In 2015, the gigabyte equivalent of all movies ever made will cross global IP networks every 5 minutes.** Global IP networks will deliver 7.3 petabytes every 5 minutes in 2015.

**The “terabyte club” will reach 6 million by 2015.** In 2015, there will be 6 million Internet households worldwide generating over a terabyte per month in Internet traffic, up from just a few hundred thousand in 2010. There will be over 20 million households generating half a terabyte per month in 2015.

**The number of devices connected to IP networks will be twice as high as the global population in 2015.** There will be two networked devices per capita in 2015, up from one networked device per capita in 2010. Driven in part by the increase in devices and the capabilities of those devices, IP traffic per capita will reach 11 gigabytes per capita in 2015, up from 3 gigabytes per capita in 2010.

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**A growing amount of Internet traffic is originating with non-PC devices.** In 2010, only 3 percent of Internet traffic originated with non-PC devices, but by 2015 the non-PC share of Internet traffic will grow to 15 percent. PC-originated traffic will grow at a CAGR of 33 percent, while TVs, tablets, smartphones, and machine-to-machine (M2M) modules will have growth rates of 101 percent, 216 percent, 144 percent, and 258 percent, respectively.

**Traffic from wireless devices will exceed traffic from wired devices by 2015.** In 2015, wired devices will account for 46 percent of IP traffic, while Wi-Fi and mobile devices will account for 54 percent of IP traffic. In 2010, wired devices accounted for the majority of IP traffic at 63 percent.

**Busy-hour traffic is growing more rapidly than average traffic.** Busy-hour traffic will increase fivefold by 2015, while average traffic will increase fourfold. During an average hour in 2015, the traffic will be equivalent to 200 million people streaming high-definition video continuously. During the busy hour in 2015, the traffic will be equivalent to 500 million people streaming high-definition video continuously.

#### Video Highlights

**Global Internet video traffic surpassed global peer-to-peer (P2P) traffic in 2010, and by 2012 Internet video will account for over 50 percent of consumer Internet traffic.** As anticipated, as of 2010 P2P traffic is no longer the largest Internet traffic type, for the first time in 10 years. Internet video was 40 percent of consumer Internet traffic in 2010 and will reach 50 percent by year-end 2012.

**It would take over 5 years to watch the amount of video that will cross global IP networks every second in 2015.** Every second, 1 million minutes of video content will cross the network in 2015.

**Internet video is now 40 percent of consumer Internet traffic, and will reach 62 percent by the end of 2015,** not including the amount of video exchanged through P2P file sharing. The sum of all forms of video (TV, video on demand [VoD], Internet, and P2P) will continue to be approximately 90 percent of global consumer traffic by 2015.

**Internet video to TV tripled in 2010.** Internet video to TV will continue to grow at a rapid pace, increasing 17-fold by 2015. Internet video to TV will be over 16 percent of consumer Internet video traffic in 2015, up from 7 percent in 2010.

**Video-on-demand traffic will triple by 2015.** The amount of VoD traffic in 2015 will be equivalent to 3 billion DVDs per month.

**High-definition video-on-demand will surpass standard definition by the end of 2011.** By 2015, high-definition Internet video will comprise 77 percent of VoD.

#### Mobile Highlights

**Globally, mobile data traffic will increase 26 times between 2010 and 2015.** Mobile data traffic will grow at a CAGR of 92 percent between 2010 and 2015, reaching 6.3 exabytes per month by 2015.

**Global mobile data traffic will grow three times faster than fixed IP traffic from 2010 to 2015.** Global mobile data traffic was 1 percent of total IP traffic in 2010, and will be 8 percent of total IP traffic in 2015.

#### 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 50 percent between 2010 and 2015.

**IP traffic in North America will reach 22 exabytes per month by 2015, at a CAGR of 30 percent.** Monthly Internet traffic in North America will generate 4 billion DVDs' worth of traffic, or 14.5 exabytes per month.

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**IP traffic in Western Europe will reach 19 exabytes per month by 2015, at a CAGR of 32 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 24 exabytes per month by 2015, at a CAGR of 35 percent.** Monthly Internet traffic in Asia Pacific will generate 4 billion DVDs' worth of traffic, or 15.6 exabytes per month.

**IP traffic in Japan will reach 4.8 exabytes per month by 2015, at a CAGR of 27 percent.** Monthly Internet traffic in Japan will generate 0.9 billion DVDs' worth of traffic, or 3.8 exabytes per month.

**IP traffic in Latin America will reach 4.7 exabytes per month by 2015, at a CAGR of 48 percent.** Monthly Internet traffic in Latin America will generate 1 billion DVDs' worth of traffic, or 4.3 exabytes per month.

**IP traffic in Central and Eastern Europe will reach 3.7 exabytes per month by 2015, at a CAGR of 39 percent.** Monthly Internet traffic in Central and Eastern Europe will generate 0.8 billion DVDs' worth of traffic, or 3.1 exabytes per month.

**IP traffic in the Middle East and Africa will reach 2 exabytes per month by 2015, at a CAGR of 52 percent.** Monthly Internet traffic in the Middle East and Africa will generate 440 million DVDs' worth of traffic, or 1.8 exabytes per month.

#### Global Business Highlights

**Business IP traffic will grow at a CAGR of 24 percent from 2010 to 2015.** Increased adoption of advanced video communications in the enterprise segment will cause business IP traffic to grow by a factor of 2.7 between 2010 and 2015.

**Business Internet traffic will grow at a faster pace than IP WAN.** IP WAN will grow at a CAGR of 18 percent, compared to a CAGR of 19 percent for fixed business Internet and 79 percent for mobile business Internet.

**Business video conferencing will grow sixfold over the forecast period.** Business videoconferencing traffic is growing significantly faster than overall business IP traffic, at a CAGR of 41 percent from 2010–2015.

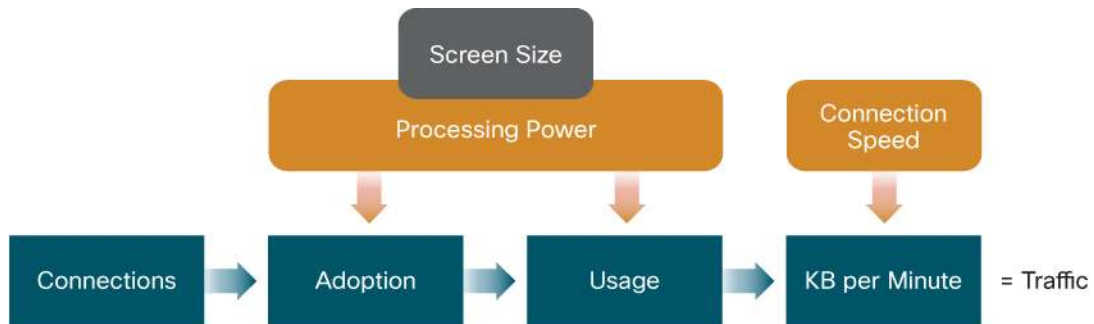
**Web-based video conferencing will reach 50 percent of total business video conferencing traffic in 2010.** Web-based video conferencing will grow faster than average business video conferencing, at a CAGR of 45 percent.

**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 24 percent. In volume, North America will have the largest amount of business IP traffic in 2015 at 2.9 exabytes per month. Western Europe will be a close second to North America at 2.7 exabytes per month.

#### Overview of VNI Methodology

The Cisco Visual Networking Index Forecast methodology rests on a combination of analyst projections, in-house estimates and forecasts, and direct data collection. The analyst projections for broadband connections, video subscribers, mobile connections, and Internet application adoption come from SNL Kagan, Ovum, Informa Telecoms & Media, Infonetics, IDC, Frost & Sullivan, Gartner, ABI, AMI, Strategy Analytics, 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. All usage and traffic results are then validated using data shared with Cisco from service providers. Figure 1 shows 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) will illustrate the estimation process.

### Step 1: Number of Users

The forecast for Internet video begins with estimations of the number of consumer fixed Internet users. Even such a basic measure as consumer fixed Internet users can be difficult to come by, as few analyst firms segment the number of users by both segment (consumer versus business) and network (mobile versus fixed). This year, the number of consumer fixed Internet users was not taken directly from an analyst source but was estimated from analyst forecasts for consumer broadband connections, data on hotspot users from a variety of government sources, and population forecasts by age segment. The number of Internet video users was collected and estimated from a variety of sources, and the numbers were then reconciled with the estimate of overall Internet users. Table 1 lists the assumptions and sources used to quantify Internet video users in 2010 and 2015.

**Table 1.** Internet Video Users, 2010–2015

Country	2010	2015	Source
Australia	4,313,00	6,938,600	VNI estimates based on Australia telecom regulator data for current year and IDC for forecast
Brazil	26,284,600	49,628,400	VNI estimates based on Brazil telecom regulator data for current year and IDC for forecast
Canada	3,259,300	21,187,800	VNI estimates based on comScore, Nielsen, IDC
China	283,980,000	501,680,000	VNI estimates based on China telecom regulator data for current year and IDC for forecast
France	17,356,450	22,068,600	IDC, Ovum
Germany	17,785,740	24,820,810	IDC, Ovum
India	9,574,400	70,860,760	IDC, Ovum
Italy	13,051,400	21,232,100	IDC, Ovum
Japan	40,473,650	46,139,300	IDC, Ovum
Korea	15,830,600	26,643,500	IDC, Ovum
Mexico	12,515,400	25,963,500	IDC, Ovum
New Zealand	770,300	1,447,500	VNI estimates based on adoption rates from various consumer surveys
Russia	19,266,000	44,046,000	VNI estimates based on adoption rates from various consumer surveys
South Africa	1,879,053	4,045,000	VNI estimates based on adoption rates from various consumer surveys
United Kingdom	15,665,259	23,633,000	VNI estimates based on UK telecom regulator data for current year and IDC for forecast
United States	149,561,804	180,431,000	IDC, Nielsen
Rest of	29,351,066	54,720,000	VNI modification of analyst projections

Country	2010	2015	Source
Asia Pacific			
Rest of Central and Eastern Europe	18,757,366	38,634,000	VNI modification of analyst projections
Rest of Latin America	19,830,008	50,624,000	VNI modification of analyst projections
Rest of Middle East and Africa	50,556,342	192,679,000	VNI modification of analyst projections
Rest of Western Europe	42,277,708	51,488,000	VNI modification of analyst projections

### Step 2: Application Adoption

Once the number of Internet video users has been established, the number of users for each video subsegment must be estimated. It was assumed that all Internet video users view short-form video in addition to other forms of video they may watch. On average 37 percent of Internet video users watch long-form content (based partially on comScore Video Metrix figures for video sites whose average viewing time is longer than 5 minutes in duration), 23 percent watch some form of live content, 3 percent are ambient video watchers, and 4 percent are Internet personal video recorder (PVR) users. These figures are global averages; regional adoption rates for the application subsegments can vary significantly.

### Step 3. Minutes of Use

For each application subsegment, 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 subsegment of video, the next step is to apply kilobytes (KB) per minute. To calculate kilobytes per minute, first the regional and country average broadband speeds are estimated for the years 2010 through 2015. 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 much the average broadband speed in the country differs from the global average, digital screen size in the country, and the computing power of the average device in the country. Combining these factors yields bitrates that are then applied to the minutes of use.

### Step 5: Rollup

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

## Step 6: Traffic Migration Assessment

The next 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.

## Step 7: Validation with Actual Data

The final step is to compare the results of the forecast with actual broadband traffic data from service providers. More than a dozen service providers worldwide share anonymized traffic data with the Cisco VNI team. In the event of inconsistencies between the forecast results and the actual data, the forecast results and assumptions are adjusted.

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, 2010–2015

Table 2 shows the top-line forecast. According to this forecast, global IP traffic in 2010 stands at 20.2 exabytes per month and quadruples by 2015, to reach 80.5 exabytes per month. Consumer IP traffic will reach 70 exabytes per month and business IP traffic will surpass 10 exabytes per month.

**Table 2.** Global IP Traffic, 2010–2015

IP Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Type (PB per Month)</b>							
Fixed Internet	14,955	20,650	27,434	35,879	46,290	59,354	32%
Managed IP	4,989	6,839	9,014	11,352	13,189	14,848	24%
Mobile data	237	546	1,163	2,198	3,806	6,254	92%
<b>By Segment (PB per Month)</b>							
Consumer	16,221	23,130	31,592	42,063	54,270	70,045	34%
Business	3,930	4,894	6,011	7,357	8,997	10,410	22%
<b>By Geography (PB per Month)</b>							
North America	6,998	9,947	12,978	16,116	18,848	22,274	26%
Western Europe	4,776	6,496	8,819	11,774	15,187	18,858	32%
Asia Pacific	5,368	7,317	9,847	13,341	18,060	24,150	35%
Japan	1,414	1,923	2,540	3,283	4,019	4,762	27%
Latin America	665	993	1,465	2,158	3,238	4,681	48%
Central and Eastern Europe	708	1,004	1,413	1,955	2,700	3,713	39%
Middle East and Africa	253	366	550	802	1,235	2,019	52%
<b>Total (PB per Month)</b>							
Total IP traffic	20,151	28,023	37,603	49,420	63,267	80,456	32%

Source: Cisco VNI, 2011

## 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 and IP transport of TV and VoD

The following tables show cross-tabulations of end-user segment and network type for the final year of the forecast period (2015). Consumer Internet remains the primary generator of IP traffic, but mobile data has the highest growth rate and begins to generate significant traffic by 2015 (Table 3).

**Table 3.** Exabytes per Month as of Year End 2015

	Consumer	Business	Total
Internet	53.3	6.1	59.4
Managed IP	11.8	3.0	14.8
Mobile data	4.9	1.3	6.3
<b>Total</b>	<b>70.0</b>	<b>10.4</b>	<b>80.5</b>

Source: Cisco VNI, 2011

Table 4 shows the same data as Table 3, but in terms of annual traffic run rates. These run rates are based on the monthly traffic at the end of 2015.

**Table 4.** Exabytes per Year as of Year End 2015

	Consumer	Business	Total
Internet	639.4	72.9	712.3
Managed IP	142.0	36.2	178.2
Mobile data	59.2	15.9	75.0
<b>Total</b>	<b>840.6</b>	<b>124.9</b>	<b>965.5</b>

Source: Cisco VNI, 2011

Consumer and business traffic are both dominated by Internet traffic, although business traffic is more evenly distributed across public Internet and managed IP (Table 5).

**Table 5.** Traffic Share by End-User Segment as of Year End 2015

	Consumer	Business
Internet	76%	58%
Managed IP	17%	29%
Mobile data	7%	13%
<b>Total</b>	<b>100%</b>	<b>100%</b>

Source: Cisco VNI, 2011

Consumer traffic accounts for the majority of IP traffic in every network type segment. Consumer traffic will be 90 percent of all Internet traffic, 79 percent of all mobile data traffic, and 80 percent of managed IP traffic (Table 6).

**Table 6.** Traffic Share by Network Type as of Year End 2015

	Consumer	Business	Total
Internet	90%	10%	100%
Managed IP	80%	20%	100%
Mobile data	79%	21%	100%

Source: Cisco VNI, 2011

Consumer Internet traffic will represent two-thirds of all IP traffic, followed by consumer managed IP (VoD), which represents 15 percent of traffic (Table 7).

**Table 7.** Overall Traffic Share as of Year End 2015

	Consumer	Business	Total
Internet	66%	8%	74%
Managed IP	15%	4%	18%
Mobile data	6%	2%	8%
<b>Total</b>	<b>87%</b>	<b>13%</b>	<b>100%</b>

Source: Cisco VNI, 2011

## Consumer IP Traffic, 2010–2015

As shown in Table 8, global consumer IP traffic is expected to reach 70 exabytes per month in 2015. Most of today's consumer IP traffic is Internet traffic.

**Table 8.** Global Consumer IP Traffic, 2010–2015

Consumer IP Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Type (PB per Month)</b>							
Internet	12,355	17,467	23,618	31,318	40,842	53,282	34%
Managed IP	3,692	5,263	7,116	9,090	10,499	11,832	26%
Mobile data	174	399	858	1,654	2,930	4,931	95%
<b>By Geography (PB per Month)</b>							
North America	5,723	8,402	11,145	13,970	16,334	19,415	28%
Western Europe	3,746	5,245	7,300	9,877	12,795	16,141	34%
Asia Pacific	4,684	6,411	8,681	11,864	16,187	21,901	36%
Japan	958	1,360	1,857	2,457	3,063	3,751	31%
Latin America	500	770	1,170	1,777	2,752	4,117	52%
Central Eastern Europe	495	759	1,131	1,630	2,317	3,275	46%
Middle East and Africa	115	183	309	488	822	1,446	66%
<b>Total (PB per Month)</b>							
Consumer IP traffic	16,221	23,130	31,592	42,063	54,270	70,045	34%

Source: Cisco VNI, 2011

## Consumer Internet Traffic, 2010–2015

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 together with Internet video calling will grow to over 60 percent of all consumer Internet traffic in 2015 (Table 9).

**Table 9.** Global Consumer Internet Traffic, 2010–2015

Consumer Internet Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed	12,355	17,467	23,618	31,318	40,842	53,282	34%
Mobile	174	399	858	1,654	2,930	4,931	95%
<b>By Subsegment (PB per Month)</b>							
File sharing	4,968	6,017	7,277	8,867	11,040	13,797	23%
Internet video	4,672	8,079	12,146	17,583	24,357	33,620	48%
Web, email, and data	2,393	3,113	4,146	5,325	6,769	8,592	29%
Video calling	308	442	659	905	1,251	1,736	41%
Online gaming	49	68	95	133	187	290	43%
Voice over IP (VoIP)	138	147	153	157	160	168	4%
Other	0	1	1	3	8	11	132%
<b>By Geography (PB per Month)</b>							
North America	3,301	5,000	6,579	8,306	10,012	12,537	31%
Western Europe	3,147	4,360	6,075	8,224	10,841	13,896	35%
Asia Pacific	4,403	6,006	8,142	11,129	15,249	20,758	36%
Japan	638	932	1,317	1,807	2,344	2,968	36%
Latin America	482	735	1,106	1,667	2,577	3,850	52%
Central and Eastern Europe	454	667	971	1,381	1,963	2,805	44%
Middle East and Africa	103	166	286	459	784	1,399	68%
<b>Total (PB per Month)</b>							
Consumer Internet traffic	12,528	17,866	24,476	32,973	43,771	58,214	36%

Source: Cisco VNI, 2011

### Definitions

**Web, email, and data:** Includes web, email, instant messaging, and other data traffic (excludes file sharing)

**File sharing:** Includes peer-to-peer traffic from all recognized P2P systems such as BitTorrent and eDonkey, 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 Internet video calling over instant messenger and soft-client video calling programs such as Skype

**VoIP:** Includes traffic from retail VoIP services and PC-based VoIP, but excludes wholesale VoIP transport

**Internet video:** Includes short-form Internet video (for example, YouTube), long-form Internet video (for example, Hulu), live Internet video, Internet-video-to-TV (for example, Netflix through Roku), online video purchases and rentals, webcam viewing, and web-based video monitoring (excludes P2P video file downloads)

### Web, Email, and Data

This is a general category that encompasses web browsing, email, instant messaging, data (which includes file transfer using HTTP and FTP) and other Internet applications (Table 10). Note that data may include the download of video files that are not captured by the Internet video to PC forecast. This category 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 computer at home, school, Internet café, or other location outside the context of a business.

**Table 10.** Global Consumer Web, Email, and Data Traffic, 2010–2015

Consumer Web, Email, and Data Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed web and data	2,339	2,993	3,905	4,900	6,084	7,508	26%
Mobile web and data	54	119	241	426	685	1,084	82%
<b>By Geography (PB per Month)</b>							
North America	883	1,021	1,272	1,541	1,781	2,443	23%
Western Europe	682	940	1,286	1,618	1,962	2,197	26%
Asia Pacific	511	705	957	1,284	1,761	2,301	35%
Japan	136	190	269	379	518	684	38%
Latin America	92	138	200	285	433	541	43%
Central and Eastern Europe	63	82	109	146	218	286	35%
Middle East and Africa	27	37	52	72	97	139	39%
<b>Total (PB per Month)</b>							
Consumer web, email, and data	2,393	3,113	4,146	5,325	6,769	8,592	29%

Source: Cisco VNI, 2011

### 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 2010) in addition to the traffic counted in the Internet video to PC and Internet video to TV categories. Table 11 shows the forecast for consumer P2P traffic from 2010 to 2015. Note that 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 11.** Global Consumer File-Sharing Traffic, 2010–2015

Consumer File Sharing, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed	4,943	5,967	7,188	8,728	10,834	13,487	22%
Mobile	25	49	88	138	206	310	65%
<b>By Sub-Segment (PB per Month)</b>							
P2P file transfer	4,051	4,659	5,315	6,042	6,983	8,117	15%
Other file transfer	917	1,357	1,961	2,824	4,057	5,680	44%
<b>By Geography (PB per Month)</b>							
North America	674	785	919	1,081	1,280	1,522	18%
Western Europe	1,424	1,609	1,814	2,084	2,425	2,720	14%
Asia Pacific	2,206	2,764	3,448	4,311	5,513	7,082	26%
Japan	201	235	275	317	367	460	18%
Latin America	162	210	261	335	461	732	35%
Central and Eastern Europe	264	363	495	667	890	1,184	35%
Middle East and Africa	38	49	64	72	103	98	21%
<b>Total (PB per Month)</b>							
Consumer file sharing	4,968	6,017	7,277	8,867	11,040	13,797	23%

Source: Cisco VNI, 2011

## Internet Gaming

The Internet gaming category primarily includes the traffic generated from game play. Game downloads are included in the web, email, and data category. Table 12 shows the forecast for Internet gaming from 2010 to 2015.

**Table 12.** Global Consumer Internet Gaming Traffic, 2010–2015

Consumer Gaming, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed	47	64	85	114	153	214	35%
Mobile	2	4	10	19	34	76	110%
<b>By Geography (PB per Month)</b>							
North America	18	24	32	43	53	82	35%
Western Europe	11	15	21	29	39	53	37%
Asia Pacific	12	17	26	38	61	99	52%
Japan	5	6	9	12	16	22	36%
Latin America	1	2	3	4	6	11	55%
Central and Eastern Europe	1	2	2	4	7	11	58%
Middle East and Africa	1	1	2	3	6	13	71%
<b>Total (PB per Month)</b>							
Consumer gaming	49	68	95	133	187	290	43%

Source: Cisco VNI, 2011

## Voice over IP

This category includes phone-based VoIP services obtained directly 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 13 shows the global forecast for consumer VoIP from 2010 to 2015.

**Table 13.** Global Consumer VoIP Traffic, 2010–2015

Consumer Voice-over-IP Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed	135	143	146	147	148	148	2%
Mobile	3	5	7	9	12	20	46%
<b>By Geography (PB per Month)</b>							
North America	21	22	23	23	23	23	2%
Western Europe	63	64	64	63	61	61	-1%
Asia Pacific	27	31	35	38	41	45	11%
Japan	18	18	18	18	17	17	-1%
Latin America	6	7	9	9	10	11	13%
Central and Eastern Europe	2	3	3	4	4	5	17%
Middle East and Africa	1	2	2	3	3	5	29%
<b>Total (PB per Month)</b>							
Consumer VoIP	138	147	153	157	160	168	4%

Source: Cisco VNI, 2011

## 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 2015–2020 timeframe (Table 14).

**Table 14.** Global Consumer Internet Video Communications, 2010–2015

Consumer Internet Video Communications, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed	304	434	641	873	1,199	1,638	40%
Mobile	4	9	17	31	52	97	90%
<b>By Geography (PB per Month)</b>							
North America	80	108	154	198	254	333	33%
Western Europe	72	100	147	195	257	346	37%
Asia Pacific	86	131	204	303	449	637	49%
Japan	26	36	48	63	80	102	31%
Latin America	19	29	44	59	79	110	41%
Central and Eastern Europe	18	28	43	60	83	115	45%
Middle East and Africa	7	11	18	27	49	94	69%

Consumer Internet Video Communications, 2010–2015							
Total (PB per Month)							
Consumer video communications	308	442	659	905	1,251	1,736	41%

Source: Cisco VNI, 2011

## Internet Video

With the exception of the Internet video to TV subcategory, all of the Internet video subcategories consist of online video that is downloaded or streamed for viewing on a PC screen (Table 15). Internet video to TV is Internet delivery of video to a TV screen through a set-top box (STB) or equivalent device. Much of the video streamed or downloaded through the Internet consists of free clips, episodes, and other content offered by traditional content producers such as movie studios and television networks.

**Table 15.** Global Consumer Internet Video, 2010–2015

Consumer Internet Video, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed	4,587	7,866	11,652	16,556	22,423	30,287	46%
Mobile	85	213	493	1,028	1,933	3,333	108%
<b>By Category (PB per Month)</b>							
Short form	697	931	1,254	1,665	2,208	2,976	34%
Long form	2,936	4,984	6,932	9,255	11,980	15,879	40%
Internet video to TV	342	838	1,626	2,786	4,165	5,911	77%
Live Internet TV	480	777	1,185	1,754	2,477	3,417	48%
Ambient video	93	258	521	860	1,207	1,523	75%
Internet PVR	40	78	134	237	387	581	71%
Mobile video	85	213	493	1,028	1,933	3,333	108%
<b>By Geography (PB per Month)</b>							
North America	1,625	3,039	4,179	5,419	6,619	8,130	38%
Western Europe	896	1,632	2,742	4,234	6,095	8,515	57%
Asia Pacific	1,561	2,357	3,472	5,156	7,424	10,594	47%
Japan	252	447	698	1,017	1,344	1,680	46%
Latin America	202	349	590	975	1,589	2,444	65%
Central and Eastern Europe	106	190	317	501	761	1,205	63%
Middle East and Africa	29	66	147	281	525	1,051	105%
<b>Total (PB per Month)</b>							
Consumer Internet video	4,672	8,079	12,146	17,583	24,357	33,620	48%

Source: Cisco VNI, 2011

## 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

**Internet video to TV:** video delivered through the Internet to a TV screen, by way of an Internet-enabled set-top box (for example, Roku) or equivalent device (for example, Microsoft Xbox 360), Internet-enabled TV, or PC-to-TV connection

**Live Internet TV:** Peer-to-peer TV (excluding P2P video downloads) 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

**Mobile video:** All video that travels over a 2G, 3G, or 4G network

### Consumer Managed IP Traffic, 2010–2015

Managed IP video is IP traffic generated by traditional commercial TV services (Table 16). 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, see Internet video to TV in the previous section.)

**Table 16.** Global Consumer Managed IP Traffic, 2010–2015

Consumer Managed IP Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network (PB per Month)</b>							
Fixed	3,692	5,263	7,116	9,090	10,499	11,832	26%
<b>By Subsegment (PB per Month)</b>							
IPTV VoD	612	878	1,177	1,497	1,770	2,041	27%
Cable digital VoD	3,042	4,310	5,791	7,321	8,309	9,212	25%
Cable hybrid IP VoD	38	75	148	271	420	579	72%
<b>By Content Type (PB per Month)</b>							
Standard-definition VoD	1,965	2,274	2,359	2,379	2,556	2,654	6%
High-definition VoD	1,727	2,987	4,753	6,700	7,923	9,140	40%
3D VoD	1	2	5	11	20	38	137%
<b>By Geography (PB per Month)</b>							
North America	2,421	3,402	4,566	5,665	6,322	6,878	23%
Western Europe	599	886	1,225	1,653	1,954	2,244	30%
Asia Pacific	281	405	539	734	938	1,143	32%
Japan	320	428	540	650	719	783	20%
Latin America	18	35	64	110	175	267	71%
Central and Eastern Europe	41	92	160	249	354	470	63%
Middle East and Africa	11	17	23	30	37	47	33%
<b>Total (PB per Month)</b>							
Managed IP video traffic	3,692	5,263	7,116	9,090	10,499	11,832	26%

Source: Cisco VNI, 2011

## 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 17).

**Table 17.** Business IP Traffic, 2010–2015

Business IP Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Network Type (PB per Month)</b>							
Business Internet traffic	2,574	3,167	3,816	4,561	5,431	6,071	19%
Business managed IP traffic	1,293	1,580	1,890	2,254	2,690	3,017	18%
Business mobile data	63	147	305	543	876	1,323	84%
<b>By Geography (PB per Month)</b>							
North America	1,275	1,545	1,833	2,145	2,513	2,859	18%
Western Europe	1,030	1,250	1,518	1,898	2,391	2,717	21%
Asia Pacific	684	906	1,166	1,477	1,855	2,249	27%
Japan	425	541	676	818	955	1,011	19%
Latin America	164	223	295	381	486	564	28%
Central and Eastern Europe	213	245	281	325	382	437	15%
Middle East and Africa	138	184	241	313	413	573	33%
<b>Total (PB per Month)</b>							
Business IP traffic	3,930	4,894	6,011	7,357	8,997	10,410	22%

Source: Cisco VNI, 2011

### Definitions

**Business Internet traffic:** All business traffic that crosses the public Internet

**Business managed IP traffic:** All business traffic that is transported over IP but remains within the corporate WAN

**Business mobile data traffic:** All business traffic that crosses a mobile access point

## Mobile Data Traffic

Mobile data traffic includes handset-based data traffic, such as text messaging, multimedia messaging, and handset video services (Table 18). Mobile Internet traffic is generated by wireless cards for portable computers and handset-based mobile Internet usage.

**Table 18.** Mobile Data and Internet Traffic, 2010–2015

Mobile Data and Internet Traffic, 2010–2015							
	2010	2011	2012	2013	2014	2015	CAGR 2010–2015
<b>By Geography (PB per Month)</b>							
North America	49	118	235	416	675	986	82%
Western Europe	64	146	326	635	1,073	1,632	91%
Asia Pacific	55	128	269	530	997	1,837	102%
Japan	40	86	172	289	425	578	70%
Latin America	12	26	60	127	257	488	111%
Central and Eastern Europe	10	25	56	110	201	346	102%
Middle East and Africa	6	17	44	90	179	387	129%
<b>Total (PB per Month)</b>							
Mobile data and Internet	237	546	1,163	2,198	3,806	6,254	92%

Source: Cisco VNI, 2011

### For More Information

For more information, see the companion document [Reaching the Zettabyte Threshold](#). Inquiries can be directed to [traffic-inquiries@cisco.com](mailto:traffic-inquiries@cisco.com).



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