

Cisco Visual Networking Index: Forecast and Methodology, 2011–2016



May 30, 2012

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, [The Zettabyte Era](#), or the [VNI Forecast Highlights tool](#).

Executive Summary

Annual global IP traffic will surpass the zettabyte threshold (1.3 zettabytes) by the end of 2016. In 2016, global IP traffic will reach 1.3 zettabytes per year or 110.3 exabytes per month.

Global IP traffic has increased eightfold over the past 5 years, and will increase threefold over the next 5 years. Overall, IP traffic will grow at a compound annual growth rate (CAGR) of 29 percent from 2011 to 2016.

In 2016, the gigabyte equivalent of all movies ever made will cross global IP networks every 3 minutes. Global IP networks will deliver 12.5 petabytes every 5 minutes in 2016.

The number of devices connected to IP networks will be nearly three times as high as the global population in 2016. There will be nearly three networked devices per capita in 2016, up from over one networked device per capita in 2011. Driven in part by the increase in devices and the capabilities of those devices, IP traffic per capita will reach 15 gigabytes per capita in 2016, up from 4 gigabytes per capita in 2011.

A growing amount of IP and Internet traffic is originating with non-PC devices. In 2011, 22 percent of IP traffic originated with non-PC devices, but by 2016 the non-PC share of IP traffic will grow to 31 percent. In 2011, only 6 percent of consumer Internet traffic originated with non-PC devices, but by 2016 the non-PC share of consumer Internet traffic will grow to 20 percent. PC-originated traffic will grow at a CAGR of 28 percent, while TVs, tablets, smartphones, and business Internet machine-to-machine (M2M) modules will have growth rates of 42 percent, 116 percent, 119 percent, and 86 percent, respectively.

Traffic from wireless devices will exceed traffic from wired devices by 2014. In 2016, wired devices will account for 39 percent of IP traffic, while Wi-Fi and mobile devices will account for 61 percent of IP traffic. In 2011, wired devices accounted for the majority of IP traffic at 55 percent.

Busy-hour traffic is growing more rapidly than average traffic. Busy-hour Internet traffic will increase nearly fivefold by 2016, while average traffic will increase nearly fourfold. Busy-hour Internet traffic will reach 720 Tbps in 2016, the equivalent of 600 million people streaming Internet high-definition video simultaneously.

Video Highlights

It would take over 6 million years to watch the amount of video that will cross global IP networks each month in 2016. Every second, 1.2 million minutes of video content will cross the network in 2016.

Globally, Internet video traffic will be 55 percent of all consumer Internet traffic in 2016, up from 51 percent in 2011. This does not include video exchanged through peer-to-peer (P2P) file sharing. Video exceeded half of global consumer Internet traffic by year-end 2011. The sum of all forms of video (TV, video on demand [VoD], Internet, and P2P) will be approximately 86 percent of global consumer traffic by 2016.

Internet video to TV doubled in 2011. Internet video to TV will continue to grow at a rapid pace, increasing six fold by 2016. Internet video to TV traffic will be 12 percent of consumer Internet video traffic in 2016, up from 8 percent in 2011.

Video-on-demand traffic will triple by 2016. The amount of VoD traffic in 2016 will be equivalent to 4 billion DVDs per month.

High-definition video-on-demand surpassed standard definition by the end of 2011. By 2016, high-definition Internet video will comprise 79 percent of VoD.

Mobile Highlights

Globally, mobile data traffic will increase 18-fold between 2011 and 2016. Mobile data traffic will grow at a CAGR of 78 percent between 2011 and 2016, reaching 10.8 exabytes per month by 2016.

Global mobile data traffic will grow three times faster than fixed IP traffic from 2011 to 2016. Global mobile data traffic was 2 percent of total IP traffic in 2011, and will be 10 percent of total IP traffic in 2016.

Regional Highlights

IP traffic is growing fastest in the Middle East and Africa, followed by Latin America. Traffic in the Middle East and Africa will grow at a CAGR of 57 percent between 2011 and 2016.

IP traffic in North America will reach 28 exabytes per month by 2016, at a CAGR of 22 percent. Monthly Internet traffic in North America will generate 5 billion DVDs' worth of traffic, or 18.2 exabytes per month.

IP traffic in Western Europe will reach 24.4 exabytes per month by 2016, at a CAGR of 27 percent. Monthly Internet traffic in Western Europe will generate 5 billion DVDs' worth of traffic, or 20.4 exabytes per month.

IP traffic in Asia Pacific will reach 41.1 exabytes per month by 2016, at a CAGR of 31 percent. Monthly Internet traffic in Asia Pacific will generate 9 billion DVDs' worth of traffic, or 37.6 exabytes per month.

IP traffic in Latin America will reach 7.6 exabytes per month by 2016, at a CAGR of 49 percent. Monthly Internet traffic in Latin America will generate 2 billion DVDs' worth of traffic, or 7 exabytes per month.

IP traffic in Central and Eastern Europe will reach 6 exabytes per month by 2016, at a CAGR of 39 percent. Monthly Internet traffic in Central and Eastern Europe will generate 1 billion DVDs' worth of traffic, or 5.1 exabytes per month.

IP traffic in the Middle East and Africa will reach 3.7 exabytes per month by 2016, at a CAGR of 57 percent. Monthly Internet traffic in the Middle East and Africa will generate 836 million DVDs' worth of traffic, or 3.3 exabytes per month.

Global Business Highlights

Business IP traffic will grow at a CAGR of 22 percent from 2011 to 2016. Increased adoption of advanced video communications in the enterprise segment will cause business IP traffic to grow by a factor of 3 between 2011 and 2016.

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 23 percent for fixed business Internet and 66 percent for mobile business Internet.

Business videoconferencing will grow six fold over the forecast period. Business videoconferencing traffic is growing significantly faster than overall business IP traffic, at a CAGR of 48 percent between 2011 and 2016.

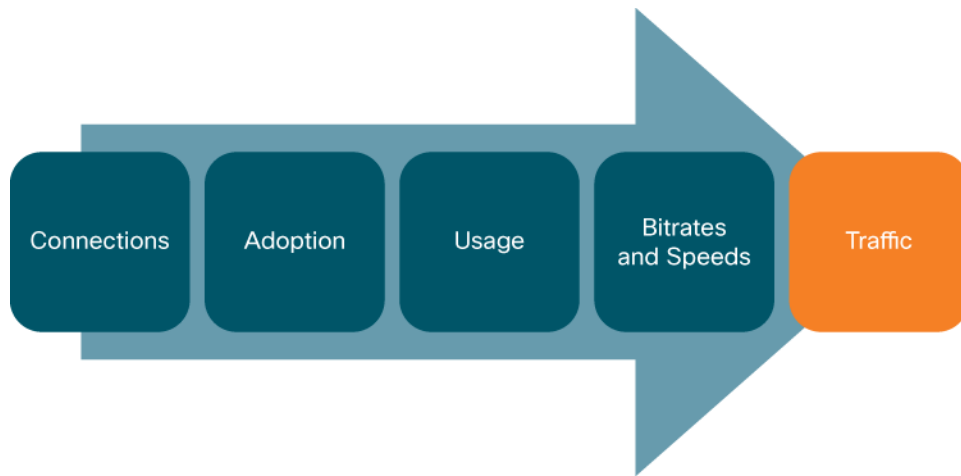
Web-based videoconferencing was 56.3 percent of total business videoconferencing traffic in 2011. Web-based videoconferencing will grow faster than overall business videoconferencing, at a CAGR of 45 percent.

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 36 percent, a faster pace than the global average of 22 percent. In volume, Asia Pacific will have the largest amount of business IP traffic in 2016 at 4.1 exabytes per month. North America will be a close second at 3.6 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, Arbitron Mobile, Ookla, 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



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.

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 2011 through 2016. 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.

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.

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, 2011–2016

Table 1 shows the top-line forecast. According to this forecast, global IP traffic in 2011 stands at 30.7 exabytes per month and will grow threefold by 2016, to reach 110.3 exabytes per month. Consumer IP traffic will reach 97.2 exabytes per month and business IP traffic will surpass 13.1 exabytes per month.

Table 1. Global IP Traffic, 2011–2016

IP Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Type (PB per Month)							
Fixed Internet	23,288	32,990	40,587	50,888	64,349	81,347	28%
Managed IP	6,849	9,199	11,846	13,925	16,085	18,131	21%
Mobile data	597	1,252	2,379	4,215	6,896	10,804	78%
By Segment (PB per Month)							
Consumer	25,792	37,244	47,198	59,652	76,103	97,152	30%
Business	4,942	7,613	9,375	11,227	13,130	7,613	22%
By Geography (PB per Month)							
North America	10,343	14,580	17,283	19,796	23,219	27,486	22%
Western Europe	7,287	10,257	13,026	16,410	20,176	24,400	27%
Asia Pacific	10,513	14,792	18,976	24,713	31,990	41,105	31%
Latin America	1,045	1,570	2,333	3,495	5,208	7,591	49%
Central and Eastern Europe	1,162	1,673	2,290	3,196	4,419	5,987	39%
Middle East and Africa	384	601	903	1,417	2,320	3,714	57%
Total (PB per Month)							
Total IP traffic	30,734	43,441	54,812	69,028	87,331	110,282	29%

Source: Cisco VNI, 2012

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 (2016). Consumer Internet remains the primary generator of IP traffic, but mobile data has the highest growth rate and begins to generate significant traffic by 2016 (Table 2).

Table 2. Exabytes per Month as of Year End 2016

	Consumer	Business	Total
Internet	74.2	7.1	81.3
Managed IP	14.6	3.5	18.1
Mobile data	8.3	2.5	10.8
Total	97.2	13.1	110.3

Source: Cisco VNI, 2012

Table 3 shows the same data as Table 2, but in terms of annual traffic run rates. These run rates are based on the monthly traffic at the end of 2016.

Table 3. Exabytes per Year as of Year End 2016

	Consumer	Business	Total
Internet	891.0	85.2	976.2
Managed IP	175.1	42.5	217.6
Mobile data	99.8	29.9	129.7
Total	1,165.8	157.6	1,323.4

Source: Cisco VNI, 2012

Consumer and business traffic are both dominated by Internet traffic, although business traffic is more evenly distributed across public Internet and managed IP (Table 4).

Table 4. Traffic Share by End-User Segment as of Year End 2016

	Consumer	Business
Internet	76%	54%
Managed IP	15%	27%
Mobile data	9%	19%
Total	100%	100%

Source: Cisco VNI, 2012

Consumer traffic accounts for the majority of IP traffic in every network type segment. Consumer traffic will be 91 percent of all Internet traffic, 77 percent of all mobile data traffic, and 80 percent of managed IP traffic (Table 5).

Table 5. Traffic Share by Network Type as of Year End 2016

	Consumer	Business	Total
Internet	91%	9%	100%
Managed IP	80%	20%	100%
Mobile data	77%	23%	100%

Source: Cisco VNI, 2012

Consumer Internet traffic will represent two-thirds of all IP traffic, followed by consumer managed IP (VoD), which represents 13 percent of traffic (Table 6).

Table 6. Overall Traffic Share as of Year End 2016

	Consumer	Business	Total
Internet	67%	7%	74%
Managed IP	13%	3%	16%
Mobile data	8%	2%	10%
Total	88%	12%	100%

Source: Cisco VNI, 2012

Consumer IP Traffic, 2011–2016

As shown in Table 7, global consumer IP traffic is expected to reach 96.4 exabytes per month in 2016. Most of today's consumer IP traffic is Internet traffic.

Table 7. Global Consumer IP Traffic, 2011–2016

Consumer IP Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Type (PB per Month)							
Internet	20,121	29,095	35,943	45,372	57,991	74,247	30%
Managed IP	5,269	7,270	9,482	11,202	12,953	14,592	23%
Mobile data	402	879	1,717	3,116	5,213	8,313	83%
By Geography (PB per Month)							
North America	8,795	12,700	15,023	17,070	20,017	23,819	22%
Western Europe	6,018	8,686	11,032	13,893	17,245	21,198	29%
Asia Pacific	9,058	12,871	16,690	21,939	28,606	36,974	32%
Latin America	815	1,260	1,946	3,017	4,640	6,938	53%
Central and Eastern Europe	908	1,375	1,934	2,758	3,895	5,374	43%
Middle East and Africa	197	352	573	975	1,700	2,848	71%
Total (PB per Month)							
Consumer IP traffic	25,792	37,244	47,198	59,652	76,103	97,152	30%

Source: Cisco VNI, 2012

Consumer Internet Traffic, 2011–2016

This category encompasses any IP traffic that crosses the Internet and is not confined to a single service provider's network. Internet video streaming and downloads are beginning to take a larger share of bandwidth, and together with Internet video calling will grow to over 54 percent of all consumer Internet traffic in 2016 (Table 8).

Table 8. Global Consumer Internet Traffic, 2011–2016

Consumer Internet Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed	20,121	29,095	35,943	45,372	57,991	74,247	30%
Mobile	402	879	1,717	3,116	5,213	8,313	83%
By Subsegment (PB per Month)							
File sharing	6,013	7,403	9,153	11,569	14,758	18,892	26%
Internet video	10,423	16,880	20,904	26,722	34,755	45,280	34%
Web, email, and data	3,863	5,422	7,274	9,783	13,119	17,583	35%
Online gaming	77	115	170	251	404	630	52%
Voice over IP (VoIP)	147	154	159	163	169	174	3%
By Geography (PB per Month)							
North America	5,394	8,041	9,022	10,294	12,499	15,646	24%
Western Europe	5,132	7,463	9,311	11,822	14,796	18,233	29%
Asia Pacific	8,220	11,795	15,266	20,204	26,515	34,553	33%
Latin America	780	1,196	1,833	2,835	4,352	6,506	53%
Central and Eastern Europe	817	1,211	1,686	2,398	3,392	4,699	42%
Middle East and Africa	180	328	542	935	1,649	2,783	73%
Total (PB per Month)							
Consumer Internet traffic	20,523	29,974	37,660	48,488	63,204	82,560	32%

Source: Cisco VNI, 2012

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 9). 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 9. Global Consumer Web, Email, and Data Traffic, 2011–2016

Consumer Web, Email, and Data Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed web and data	3,708	5,072	6,582	8,525	11,124	14,272	31%
Mobile web and data	155	350	692	1,258	1,995	3,311	85%
By Geography (PB per Month)							
North America	1,245	1,637	2,119	2,657	3,743	5,300	34%
Western Europe	1,156	1,663	2,120	2,724	3,304	4,013	28%
Asia Pacific	1,123	1,622	2,282	3,236	4,404	5,963	40%
Latin America	168	256	392	583	801	1,079	45%
Central and Eastern Europe	137	188	270	434	620	826	43%
Middle East and Africa	34	56	90	148	246	401	64%
Total (PB per Month)							
Consumer web, email, and data	3,863	5,422	7,274	9,783	13,119	17,583	35%

Source: Cisco VNI, 2012

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 2011) in addition to the traffic counted in the Internet video to PC and Internet video to TV categories. Table 10 shows the forecast for consumer P2P traffic from 2011 to 2016. 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 10. Global Consumer File-Sharing Traffic, 2011–2016

Consumer File Sharing, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed	5,967	7,337	9,093	11,524	14,658	18,698	26%
Mobile	46	66	84	106	142	194	33%
By Subsegment (PB per Month)							
P2P file transfer	4,656	5,401	6,234	7,314	8,627	10,215	17%
Other file transfer	1,357	2,002	2,942	4,315	6,174	8,677	45%
By Geography (PB per Month)							
North America	785	935	1,119	1,349	1,636	2,006	21%
Western Europe	1,609	1,845	2,154	2,552	2,918	3,181	15%
Asia Pacific	2,997	3,789	4,794	6,201	8,100	10,660	29%
Latin America	210	266	347	485	786	1,276	43%
Central and Eastern Europe	363	504	690	937	1,266	1,699	36%
Middle East and Africa	49	64	73	105	96	71	8%
Total (PB per Month)							
Consumer file sharing	6,013	7,403	9,177	11,629	14,801	18,892	26%

Source: Cisco VNI, 2012

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 11 shows the forecast for Internet gaming from 2011 to 2016.

Table 11. Global Consumer Internet Gaming Traffic, 2011–2016

Consumer Gaming, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed	73	107	158	233	369	581	52%
Mobile	4	8	12	19	35	49	63%
By Geography (PB per Month)							
North America	23	32	46	65	116	206	55%
Western Europe	13	18	26	37	55	75	43%
Asia Pacific	37	58	88	132	202	305	53%
Latin America	1	2	3	5	8	12	59%
Central and Eastern Europe	2	2	4	7	11	15	56%
Middle East and Africa	2	2	4	6	11	17	62%
Total (PB per Month)							
Consumer gaming	77	115	170	251	404	630	52%

Source: Cisco VNI, 2012

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 12 shows the global forecast for consumer VoIP from 2011 to 2016.

Table 12. Global Consumer VoIP Traffic, 2011–2016

Consumer Voice-over-IP Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed	143	149	153	157	161	164	3%
Mobile	4	5	5	5	8	10	19%
By Geography (PB per Month)							
North America	22	23	23	23	23	24	2%
Western Europe	64	64	64	63	62	62	-1%
Asia Pacific	49	53	56	59	63	66	6%
Latin America	7	9	9	10	11	12	10%
Central and Eastern Europe	3	3	4	4	5	5	15%
Middle East and Africa	2	2	3	3	4	5	22%
Total (PB per Month)							
Consumer VoIP	147	154	159	163	169	174	3%

Source: Cisco VNI, 2012

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 13). 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 13. Global Consumer Internet Video, 2011–2016

Consumer Internet Video 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed	10,230	16,430	19,980	24,994	31,722	40,532	32%
Mobile	193	450	924	1,729	3,033	4,749	90%
By Category (PB per Month)							
Short form	1,211	1,688	2,263	2,997	4,023	5,306	34%
Long form	6,372	9,922	10,959	12,438	14,489	17,250	22%
Internet video to TV	853	1,689	2,283	3,152	4,300	5,484	45%
Live Internet TV	989	1,608	1,900	2,441	2,929	3,580	29%
Ambient video	265	591	1,026	1,463	1,901	2,247	53%
Internet PVR	82	156	291	494	792	1,200	71%
Mobile video	308	737	1,546	2,918	4,882	7,615	90%
By Geography (PB per Month)							
North America	3,319	5,414	5,715	6,201	6,980	8,109	20%
Western Europe	2,290	3,845	4,947	6,446	8,457	11,042	37%
Asia Pacific	4,014	6,241	8,058	10,593	13,760	17,559	34%
Latin America	393	664	1,082	1,751	2,746	4,099	60%
Central and Eastern Europe	312	513	719	1,016	1,491	2,154	47%
Middle East and Africa	94	204	384	716	1,322	2,289	89%
Total (PB per Month)							
Consumer Internet video	10,423	16,880	20,904	26,722	34,755	45,280	34%

Source: Cisco VNI, 2012

Definitions

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

Video calling: Video messages/calling delivered on fixed Internet initiated by smartphones, non-smartphones, and tablets

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, 2011–2016

Managed IP video is IP traffic generated by traditional commercial TV services (Table 15). 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 14. Global Consumer Managed IP Traffic, 2011–2016

Consumer Managed IP Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network (PB per Month)							
Fixed	5,269	7,270	9,482	11,202	12,953	14,592	23%
By Subsegment (PB per Month)							
IPTV VoD	879	1,202	1,577	1,880	2,219	2,571	24%
Cable digital VoD	4,315	5,917	7,676	8,817	9,990	11,102	21%
Cable hybrid IP VoD	75	151	287	467	691	919	65%
By Content Type (PB per Month)							
Standard-definition VoD	2,271	2,403	2,534	2,692	2,856	3,006	6%
High-definition VoD	2,995	4,861	6,993	8,451	10,003	11,504	31%
3D VoD	2	5	11	21	41	82	109%
By Geography (PB per Month)							
North America	3,402	4,660	6,001	6,775	7,518	8,173	19%
Western Europe	886	1,251	1,724	2,071	2,449	2,825	26%
Asia Pacific	838	1,108	1,424	1,735	2,091	2,422	24%
Latin America	35	65	113	182	287	432	65%
Central and Eastern Europe	92	163	248	360	502	675	49%
Middle East and Africa	17	23	31	40	51	65	31%
Total (PB per Month)							
Managed IP video traffic	5,269	7,270	9,538	11,164	12,899	14,592	23%

Source: Cisco VNI, 2012

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 15).

Table 15. Business IP Traffic, 2011–2016

Business IP Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Network Type (PB per Month)							
Business Internet traffic	3,167	3,894	4,644	5,515	6,359	7,100	18%
Business managed IP traffic	1,580	1,929	2,308	2,761	3,186	3,539	18%
Business mobile data	195	374	662	1,099	1,683	2,491	66%
By Geography (PB per Month)							
North America	1,548	1,880	2,261	2,727	3,201	3,667	19%
Western Europe	1,269	1,571	1,993	2,517	2,931	3,202	20%
Asia Pacific	1,455	1,889	2,286	2,774	3,384	4,131	23%
Latin America	230	309	387	478	568	652	23%
Central and Eastern Europe	253	298	357	438	524	613	19%
Middle East and Africa	187	250	330	442	619	866	36%
Total (PB per Month)							
Business IP traffic	4,942	6,198	7,613	9,375	11,227	13,130	22%

Source: Cisco VNI, 2012

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 16). Mobile Internet traffic is generated by wireless cards for portable computers and handset-based mobile Internet usage.

Table 16. Mobile Data and Internet Traffic, 2011–2016

Mobile Data and Internet Traffic, 2011–2016							
	2011	2012	2013	2014	2015	2016	CAGR 2011–2016
By Geography (PB per Month)							
North America	119	259	493	844	1,305	1,964	75%
Western Europe	180	366	684	1,161	1,705	2,438	68%
Asia Pacific	206	438	832	1,503	2,614	4,323	84%
Latin America	40	77	146	267	455	738	79%
Central and Eastern Europe	34	68	134	253	439	706	83%
Middle East and Africa	18	45	91	187	378	635	104%
Total (PB per Month)							
Mobile data and Internet	597	1,252	2,379	4,215	6,896	10,804	78%

Source: Cisco VNI, 2012

For More Information

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



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