Cisco Visual Networking Index:
Forecast and Methodology, 2015–2020

This forecast is part of the Cisco® Visual Networking Index™ (Cisco 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 in this paper, refer to the companion document *The Zettabyte Era–Trends and Analysis* or the VNI Forecast Highlights tool.

Executive Summary

Annual global IP traffic will surpass the zettabyte (ZB; 1000 exabytes [EB]) threshold in 2016, and will reach 2.3 ZB by 2020. Global IP traffic will reach 1.1 ZB per year or 88.7 EB (one billion gigabytes [GB]) per month in 2016. By 2020, global IP traffic will reach 2.3 ZB per year, or 194 EB per month.

Global IP traffic will increase nearly threefold over the next 5 years, and will have increased nearly a hundredfold from 2005 to 2020. Overall, IP traffic will grow at a compound annual growth rate (CAGR) of 22 percent from 2015 to 2020.

Busy-hour Internet traffic is growing more rapidly than average Internet traffic. Busy-hour (or the busiest 60-minute period in a day) Internet traffic increased 51 percent in 2015, compared with 29-percent growth in average traffic. Busy-hour Internet traffic will increase by a factor of 4.6 between 2015 and 2020, while average Internet traffic will increase twofold.

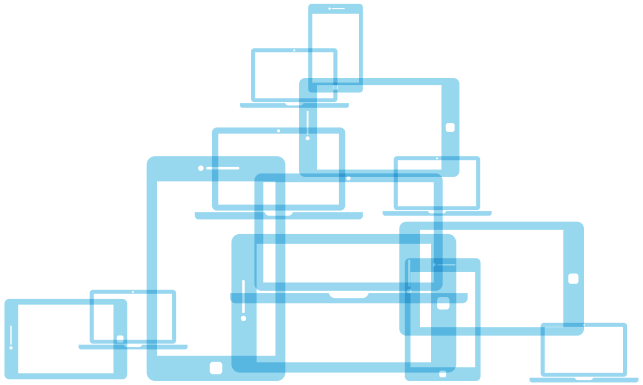
Smartphone traffic will exceed PC traffic by 2020. In 2015, PCs accounted for 53 percent of total IP traffic, but by 2020 PCs will account for only 29 percent of traffic. Smartphones will account for 30 percent of total IP traffic in 2020, up from 8 percent in 2015. PC-originated traffic will grow at a CAGR of 8 percent, while TVs, tablets, smartphones, and machine-to-machine (M2M) modules will have traffic growth rates of 17 percent, 39 percent, 58 percent, and 44 percent, respectively.

Traffic from wireless and mobile devices will account for two-thirds of total IP traffic by 2020. By 2020, wired devices will account for 34 percent of IP traffic, while Wi-Fi and mobile devices will account for 66 percent of IP traffic. In 2015, wired devices accounted for the majority of IP traffic at 52 percent.

Global Internet traffic in 2020 will be equivalent to 95 times the volume of the entire global Internet in 2005. Globally, Internet traffic will reach 21 GB per capita by 2020, up from 7 GB per capita in 2015.

The number of devices connected to IP networks will be three times as high as the global population in 2020. There will be 3.4 networked devices per capita by 2020, up from 2.2 networked devices per capita in 2015. Accelerated in part by the increase in devices and the capabilities of those devices, IP traffic per capita will reach 25 GB per capita by 2020, up from 10 GB per capita in 2015.

Broadband speeds will nearly double by 2020. By 2020, global fixed broadband speeds will reach 47.7 Mbps, up from 24.7 Mbps in 2015.



The number of devices connected to IP networks will be

3X

as high as the global population in 2020.

It would take an individual more than

5,000,000 YEARS

to watch the **amount of video** that will cross global IP networks **each month in 2020**.

Video Highlights

It would take an individual more than 5 million years to watch the amount of video that will cross global IP networks each month in 2020. Every second, nearly a million minutes of video content will cross the network by 2020.

Globally, IP video traffic will be 82 percent of all consumer Internet traffic by 2020, up from 70 percent in 2015. Global IP video traffic will grow threefold from 2015 to 2020, a CAGR of 26 percent. Internet video traffic will grow fourfold from 2015 to 2020, a CAGR of 31 percent.

Internet video surveillance traffic nearly doubled in 2015, from 272 petabytes (PB) per month at the end of 2014 to 516 PB per month in 2015. Internet video surveillance traffic will increase tenfold between 2015 and 2020. Globally, 3.9 percent of all Internet video traffic will be due to video surveillance in 2020, up from 1.5 percent in 2015.

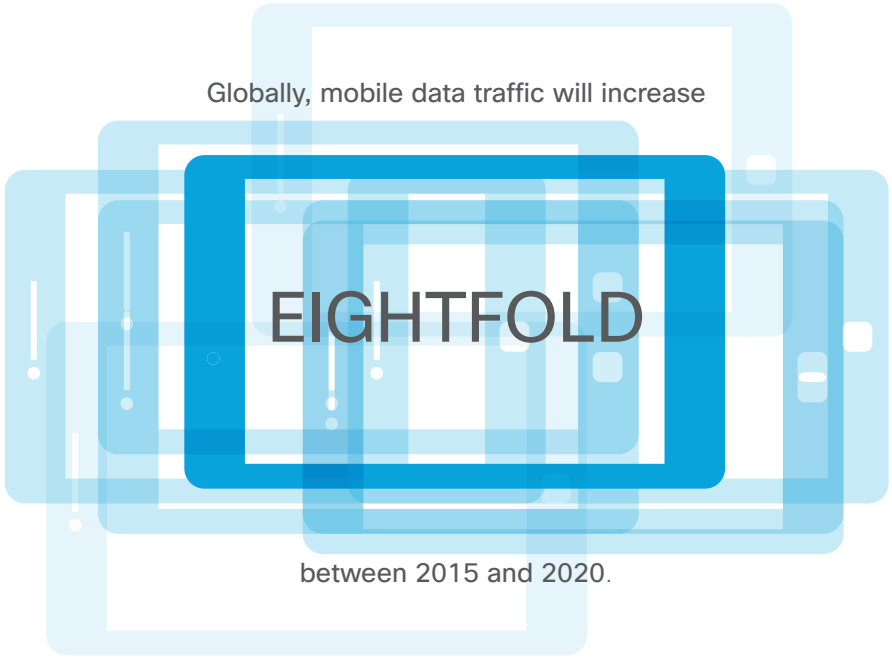
Virtual-reality traffic quadrupled in 2015, from 4.2 PB per month in 2014 to 17.9 PB per month in 2015. Globally, virtual-reality traffic will increase 61-fold between 2015 and 2020, a CAGR of 127 percent.

Internet video to TV grew 50 percent in 2015. Internet video to TV will continue to grow at a rapid pace, increasing 3.6-fold by 2020. Internet video-to-TV traffic will be 26 percent of consumer Internet video traffic by 2020, up from 24 percent in 2015.

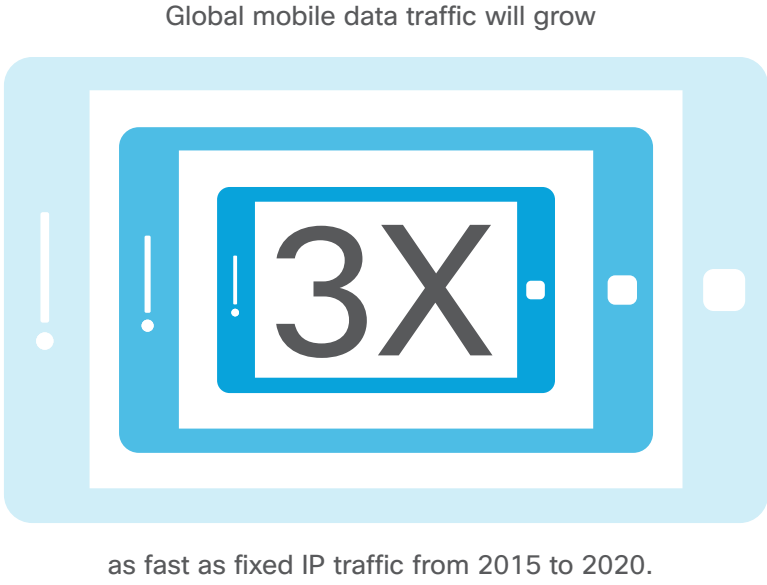
Consumer VoD traffic will nearly double by 2020. Ultra-high definition (UHD) will be 20.7 percent of IP video-on-demand (VoD) traffic in 2020, up from 1.6 percent in 2015.

Content-delivery network (CDN) traffic will carry nearly three-fourths of all Internet video traffic by 2020. By 2020, 73 percent of all Internet video traffic will cross CDNs, up from 61 percent in 2015.

Mobile Highlights

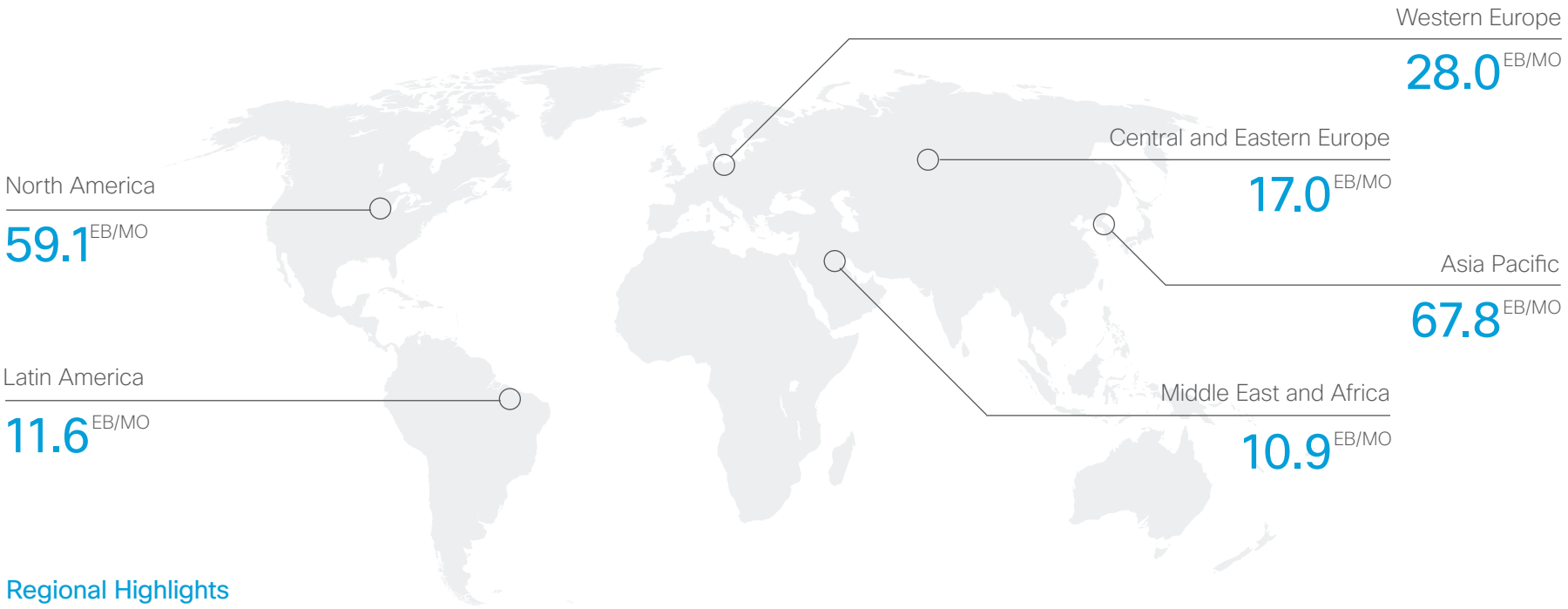


Mobile data traffic will grow at a CAGR of 53 percent between 2015 and 2020, reaching 30.6 EB per month by 2020.



Global mobile data traffic was 5 percent of total IP traffic in 2015, and will be 16 percent of total IP traffic by 2020.

IP Traffic in 2020



Regional Highlights

IP traffic is growing fastest in the Middle East and Africa, followed by Asia Pacific. Traffic in the Middle East and Africa will grow at a CAGR of 41 percent between 2015 and 2020.

IP traffic in North America will reach 59.1 EB per month by 2020, at a CAGR of 19 percent. Monthly Internet traffic in North America will generate 11 billion DVDs' worth of traffic, or 44.7 EB per month.

IP traffic in Western Europe will reach 28.0 EB per month by 2020, at a CAGR of 20 percent. Monthly Internet traffic in Western Europe will generate 6 billion DVDs' worth of traffic, or 24.1 EB per month.

IP traffic in Asia Pacific will reach 67.8 EB per month by 2020, at a CAGR of 22 percent. Monthly Internet traffic in Asia Pacific will generate 14 billion DVDs' worth of traffic, or 56.4 EB per month.

IP traffic in Latin America will reach 11.6 EB per month by 2020, at a CAGR of 21 percent. Monthly Internet traffic in Latin America will generate 2 billion DVDs' worth of traffic, or 9.9 EB per month.

IP traffic in Central and Eastern Europe will reach 17.0 EB per month by 2020, at a CAGR of 27 percent. Monthly Internet traffic in Central and Eastern Europe will generate 4 billion DVDs' worth of traffic, or 15.9 EB per month.

IP traffic in the Middle East and Africa will reach 10.9 EB per month by 2020, at a CAGR of 27 percent. Monthly Internet traffic in the Middle East and Africa will generate 3 billion DVDs' worth of traffic, or 10.3 EB per month.

Global Business Highlights

Business Internet traffic will grow at a faster pace than IP WAN.

CAGR by 2020

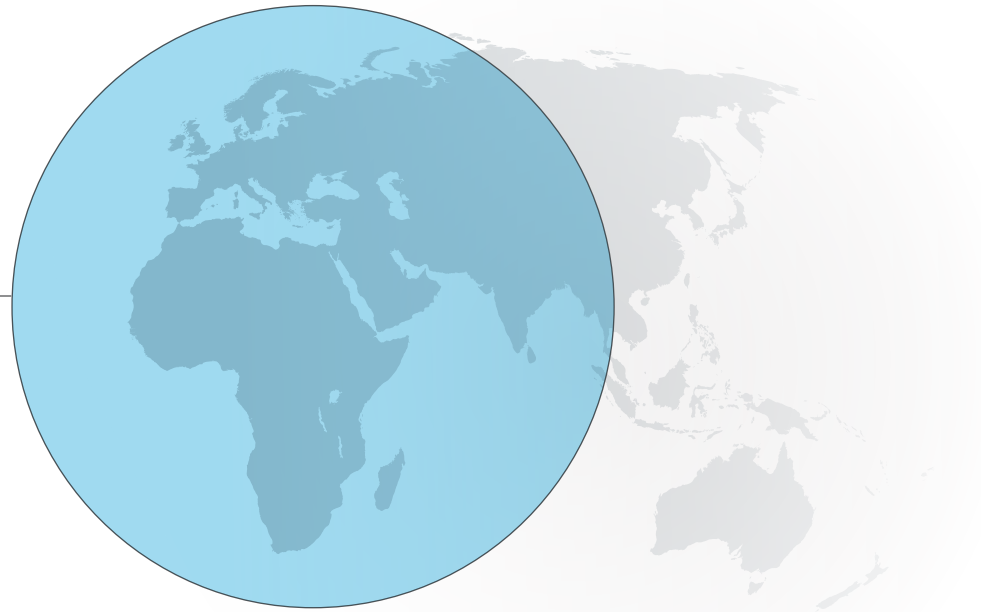
6%	21%	47%
IP WAN	Fixed business Internet	Mobile business Internet

Business IP traffic will grow at a CAGR of

18%

from 2015 to 2020.

Increased adoption of advanced video communications in the enterprise segment will cause business IP traffic to grow by a factor of 2 between 2015 and 2020.

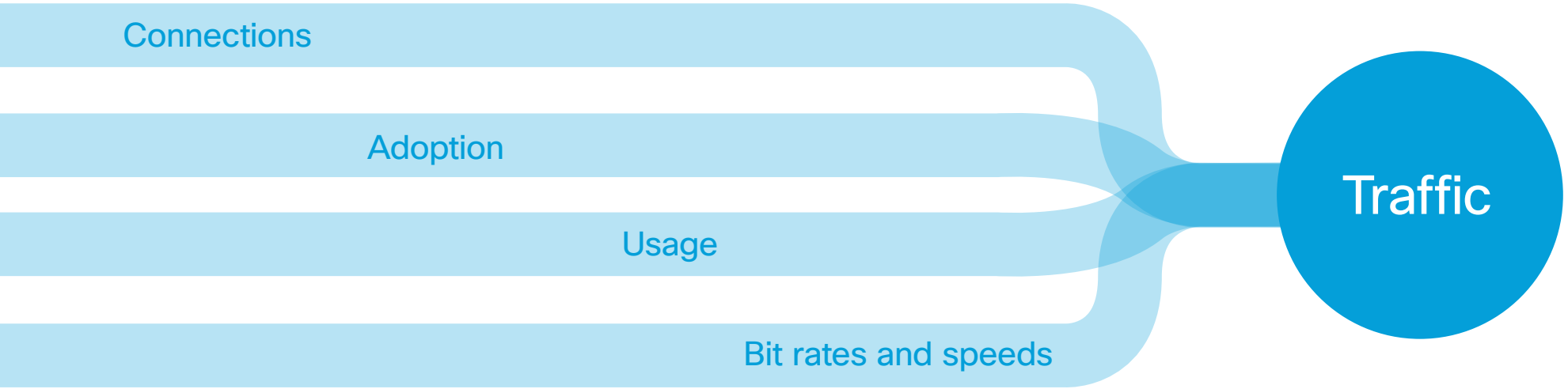


Business IP traffic will grow fastest in the Middle East and Africa. Business IP traffic in the Middle East and Africa will grow at a CAGR of 21 percent, a faster pace than the global average of 18 percent. In volume, Asia Pacific will have the largest amount of business IP traffic in 2020, at 11.4 EB per month. North America will be the second at 9.1 EB per month.

Overview of VNI Methodology

The Cisco VNI methodology has been developed based 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, Gartner, AMI, Verto Analytics, Ookla Speedtest.net, Strategy Analytics, Screen Digest, Dell'Oro Group, Synergy, comScore, Nielsen, Maravedis, Machina Research, ACG Research, ABI Research, Media Partners Asia, IHS, International Telecommunications Union (ITU), CTIA, UN, telecommunications regulators, 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 bit-rate 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 Methodology Incorporates Fundamental Enablers of Adoption and Usage



Following is the methodology through each step for a single application category (in this case, Internet video) where the estimation process is illustrated.

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 assess, because few analyst firms segment the number of users by both segment (consumer versus business) and network (mobile versus fixed). 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

After 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. The number of Internet video users who watch long-form video (based partially on comScore Video Metrix figures for video sites whose average viewing time is longer than 5 minutes), live video, ambient video, and Internet personal video recorder (PVR) is estimated.

Step 3. Minutes of Use

For each application subsegment, minutes of use (MOU) are estimated. Multiple sources are used to determine MOU: The Cisco Data Meter 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- and mobile-based MOU for online video. Special care is taken to help 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. Bit Rates

After MOU have been estimated for each subsegment of video, the next step is to apply kilobytes (KB) per minute. To calculate KB per minute, first the regional and country average broadband speeds are estimated for the years 2015 through 2020. For each application category, a representative bit rate is established, and this representative bit rate grows at approximately the same pace as the broadband speed. For video categories, a 7-percent annual compression gain is applied to the bit rate. Local bit rates 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 bit rates that are then applied to the MOU.

Step 5: Rollup

The next step in the methodology is to multiply the bit rates, MOU, and users together to get average PB 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 sections that follow present quantitative results of the forecast and details of the methodology for each segment and type.

Global IP Traffic, 2015–2020

Table 1 shows the top-line forecast. According to this forecast, global IP traffic in 2015 stands at 72.5 EB per month and will nearly triple by 2020 to reach 194.4 EB per month. Consumer IP traffic will reach 162.2 EB per month and business IP traffic will surpass 32.2 EB per month by 2020.

IP Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Type (PB per Month)							
Fixed Internet	49,494	60,160	73,300	89,012	108,102	130,758	21%
Managed IP	19,342	22,378	25,303	28,155	30,750	33,052	11%
Mobile data	3685	6180	9931	14,934	21,708	30,564	53%
By Segment (PB per Month)							
Consumer	58,539	72,320	89,306	109,371	133,521	162,209	23%
Business	13,982	16,399	19,227	22,729	27,040	32,165	18%
By Geography (PB per Month)							
Asia Pacific	24,827	30,147	36,957	45,357	55,523	67,850	22%
North America	24,759	30,317	36,526	43,482	50,838	59,088	19%
Western Europe	11,299	13,631	16,408	19,535	23,536	27,960	20%
Central and Eastern Europe	5205	6434	8116	10,298	13,375	17,020	27%
Latin America	4500	5491	6705	8050	9625	11,591	21%
Middle East and Africa	1930	2698	3822	5380	7663	10,865	41%
Total (PB per Month)							
Total IP traffic	72,521	88,719	108,533	132,101	160,561	194,374	22%

Table 1 Global IP Traffic 2015–2020

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

Global IP Traffic, 2015–2020 (Cont.)

Table 2 shows cross-tabulations of end-user segment and network type for the final year of the forecast period (2020). Consumer Internet remains the primary generator of IP traffic, but mobile data has the highest growth rate and begins to generate significant traffic by 2020 (Table 2).

	Consumer	Business	Total
Internet	107	23	131
Managed IP	29	4	33
Mobile data	26	4	31
Total	162	32	194

Table 2 Exabytes per Month as of Year End 2020

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 2020.

	Consumer	Business	Total
Internet	1288	281	1569
Managed IP	345	52	397
Mobile data	313	54	367
Total	1947	386	2332

Table 3 Exabytes per Year as of Year End 2020

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).

	Consumer	Business
Internet	66%	73%
Managed IP	18%	13%
Mobile data	16%	14%
Total	100%	100%

Table 4 Traffic Share by End-User Segment as of Year End 2020

Global IP Traffic, 2015–2020 (Cont.)

Consumer traffic accounts for the majority of IP traffic in every network type segment. Consumer traffic will be 82 percent of all fixed Internet traffic, 87 percent of all of managed IP traffic, and 85 percent of all mobile data traffic (Table 5).

	Consumer	Business	Total
Internet	82%	18%	100%
Managed IP	87%	13%	100%
Mobile data	85%	15%	100%
Total	83%	17%	100%

Table 5 Traffic Share by Network Type as of Year End 2020

Consumer Internet traffic will represent more than half of all IP traffic, followed by consumer-managed IP (VoD), which represents 15 percent of traffic (Table 6).

	Consumer	Business	Total
Internet	55%	12%	67%
Managed IP	15%	2%	17%
Mobile data	13%	2%	16%
Total	83%	17%	100%

Table 6 Overall Traffic Share as of Year End 2020

Global Consumer IP Traffic, 2015–2020

As shown in Table 7, global consumer IP traffic is expected to reach 162 EB per month in 2020. Most of today's consumer IP traffic is Internet traffic.

Consumer IP Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Type (PB per Month)							
Fixed Internet	39,345	48,223	59,294	72,442	88,399	107,375	22%
Managed IP	16,166	18,969	21,686	24,320	26,687	28,754	12%
Mobile data	3027	5127	8326	12,609	18,436	26,080	54%
By Geography (PB per Month)							
Asia Pacific	19,869	24,359	30,138	37,265	45,942	56,494	23%
North America	21,240	26,071	31,398	37,244	43,291	50,008	19%
Western Europe	8922	10,896	13,277	15,899	19,222	22,876	21%
Central and Eastern Europe	3753	4769	6229	8143	10,787	13,885	30%
Latin America	3502	4365	5450	6649	8069	9838	23%
Middle East and Africa	1253	1860	2815	4172	6209	9108	49%
Total (PB per Month)							
Consumer IP traffic	58,539	72,320	89,306	109,371	133,521	162,209	23%

Table 7 Global Consumer IP Traffic, 2015–2020

Global Consumer Internet Traffic, 2015–2020

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 will grow to more than 80 percent of all consumer Internet traffic by 2020 (Table 8).

Consumer Internet Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Network (PB per Month)							
Fixed	39,345	48,223	59,294	72,442	88,399	107,375	22%
Mobile	3027	5127	8326	12,609	18,436	26,080	54%
By Subsegment (PB per Month)							
Internet video	28,768	38,116	50,512	66,263	86,708	109,907	31%
Web, email, and data	7558	9170	11,061	12,752	14,060	17,006	18%
File sharing	5965	5938	5858	5742	5645	5974	0%
Online gaming	82	126	189	294	421	568	47%
By Geography (PB per Month)							
Asia Pacific	14,534	18,052	22,955	29,193	37,012	46,709	26%
North America	13,097	16,659	20,793	25,520	30,720	36,780	23%
Western Europe	6957	8618	10,712	13,088	16,180	19,723	23%
Central and Eastern Europe	3481	4424	5764	7561	10,079	13,056	30%
Middle East and Africa	1192	1770	2692	4013	6013	8874	49%
Latin America	3111	3828	4704	5675	6831	8312	22%
Total (PB per Month)							
Consumer Internet traffic	42,372	53,351	67,621	85,051	106,834	133,454	26%
Total IP traffic	72,521	88,719	108,533	132,101	160,561	194,374	22%

Table 8 Global Consumer Internet Traffic, 2015–2020

Definitions

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

File sharing – Includes peer-to-peer (P2P) traffic from all recognized P2P systems such as BitTorrent and eDonkey, as well as traffic from web-based file-sharing systems

Online gaming – Includes casual online gaming, networked console gaming, and multiplayer virtual-world gaming

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)

Global Consumer Internet Traffic, 2015–2020: Web, Email, and Data

This general category 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.

Consumer Web, Email, and Data Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Network (PB per Month)							
Fixed web and data	6310	7210	8142	8779	8948	10,629	11%
Mobile web and data	1248	1961	2919	3973	5112	6377	39%
By Geography (PB per Month)							
Asia Pacific	2670	3245	3991	4766	5407	6475	19%
North America	2142	2512	2854	2995	3032	3633	11%
Central and Eastern Europe	682	959	1300	1644	1987	2401	29%
Western Europe	1269	1435	1593	1695	1692	2021	10%
Middle East and Africa	300	459	677	935	1191	1586	40%
Latin America	495	561	646	718	751	890	12%
Total (PB per Month)							
Consumer web, email, and data	7558	9170	11,061	12,752	14,060	17,006	18%

Table 9 Global Consumer Web, Email, and Data Traffic, 2015–2020

Global Consumer Internet Traffic, 2015–2020: 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 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 2015 to 2020. 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.

Consumer File Sharing, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Network (PB per Month)							
Fixed	5942	5909	5829	5713	5616	5939	0%
Mobile	22	28	29	29	29	35	9%
By Segment (PB per Month)							
P2P file transfer	4798	4550	4224	3840	3438	3633	-5%
Other file transfer	1166	1388	1634	1902	2207	2340	15%
By Geography (PB per Month)							
Asia Pacific	2335	2269	2186	2098	2004	2098	-2%
North America	1015	1137	1260	1371	1478	1576	9%
Western Europe	1124	1105	1096	1075	1053	1131	0%
Central and Eastern Europe	829	763	691	646	621	666	-4%
Latin America	554	573	558	514	454	463	-4%
Middle East and Africa	107	91	68	39	34	39	-18%
Total (PB per Month)							
Consumer file sharing	5965	5938	5858	5742	5645	5974	0%

Table 10 Global Consumer File-Sharing Traffic, 2015–2020

Global Consumer Internet Traffic, 2015–2020: 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 11). 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.

Consumer Internet Video 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Type (PB per Month)							
Fixed	27,011	34,978	45,134	57,656	73,413	90,239	27%
Mobile	1756	3138	5378	8607	13,295	19,668	62%
By Segment (PB per Month)							
Video	22,344	29,046	38,297	50,596	67,423	86,704	31%
Internet video to TV	6424	9070	12,215	15,667	19,284	23,203	29%
By Geography (PB per Month)							
Asia Pacific	9516	12,519	16,749	22,285	29,537	38,052	32%
North America	9894	12,939	16,574	20,989	25,973	31,251	26%
Western Europe	4545	6047	7978	10,247	13,334	16,433	29%
Central and Eastern Europe	1969	2701	3771	5267	7464	9980	38%
Middle East and Africa	785	1219	1945	3036	4783	7243	56%
Latin America	2059	2691	3496	4438	5617	6947	28%
Total (PB per Month)							
Consumer Internet video	28,768	38,116	50,512	66,263	86,708	109,907	31%

Table 11 Global Consumer File-Sharing Traffic, 2015–2020

Definitions

Internet video to TV – Video delivered through the Internet to a TV screen by way of an Internet-enabled STB (for example, Roku) or equivalent device (for example, Microsoft Xbox 360), Internet-enabled TV, or PC-to-TV connection

Video – Video includes the following underlying categories:

- **Short form** – User-generated video and other video clips generally less than 7 minutes in length
- **Video calling** – Video messages or calling delivered on fixed Internet initiated by smartphones, nonsmartphones, and tablets
- **Long form** – Video content generally greater than 7 minutes in length
- **Live Internet TV** – P2P TV (excluding P2P video downloads) and live television streaming over the Internet
- **Internet PVR** – Recording of live TV content for later viewing
- **Ambient video** – Nanny cams, pet cams, home security cams, and other persistent video streams
- **Mobile video** – All video that travels over a second-, third-, or fourth-generation (2G, 3G, or 4G, respectively) network

Global Content-Delivery Network Traffic, 2015–2020

With the emergence of popular video-streaming services that deliver Internet video to the TV and other device endpoints, CDNs have prevailed as a dominant method to deliver such content. Globally, 64 percent of all Internet traffic will cross CDNs by 2020, up from 45 percent in 2015. Globally, 73 percent of all Internet video traffic will cross CDNs by 2020, up from 61 percent in 2015 (Table 12).

CDN Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Geography (PB per Month)							
North America	11,080	15,094	20,113	26,382	33,829	41,292	30%
Asia Pacific	5590	7807	10,924	15,115	20,711	27,628	38%
Western Europe	5025	6798	9096	11,903	15,744	19,817	32%
Central and Eastern Europe	1086	1649	2473	3656	5429	7648	48%
Latin America	853	1207	1662	2210	2890	3877	35%
Middle East and Africa	285	478	797	1286	2066	3734	67%
Total (PB per Month)							
CDN Internet traffic	23,919	33,033	45,065	60,553	80,670	103,996	34%

Table 12 Global Content-Delivery Network Internet Traffic, 2015–2020

Global Consumer-Managed IP Traffic, 2015–2020

Managed IP video is IP traffic generated by traditional commercial TV services (Table 13). This traffic remains within the footprint of a single service provider, so it is not considered Internet traffic. (For Internet video delivered to the STB, refer to Internet video to TV in the section "Global Consumer Internet Traffic, 2015–2020.")

Consumer-Managed IP Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Network (PB per Month)							
Fixed	16,166	18,969	21,686	24,320	26,687	28,754	12%
By Geography (PB per Month)							
North America	8143	9412	10,604	11,724	12,572	13,227	10%
Asia Pacific	5335	6308	7183	8072	8930	9785	13%
Western Europe	1965	2278	2565	2811	3042	3153	10%
Latin America	392	537	746	974	1238	1526	31%
Central and Eastern Europe	272	344	465	581	709	829	25%
Middle East and Africa	61	90	123	159	196	234	31%
Total (PB per Month)							
Managed IP video traffic	16,166	18,969	21,686	24,320	26,687	28,754	12%

Table 13 Global Consumer-Managed IP Traffic, 2015–2020

Business IP Traffic, 2015–2020

The enterprise forecast is based on the number of network-connected computers worldwide. In our experience, this basis 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 14).

Business IP Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Network (PB per Month)							
Business Internet traffic	10,149	11,937	14,006	16,570	19,704	23,383	18%
Business managed IP traffic	3176	3409	3617	3834	4063	4298	6%
Business mobile data traffic	658	1053	1605	2325	3273	4484	47%
By Geography (PB per Month)							
Asia Pacific	4958	5788	6820	8092	9581	11,356	18%
North America	3518	4246	5129	6238	7547	9080	21%
Western Europe	2377	2735	3131	3636	4313	5084	16%
Central and Eastern Europe	1453	1665	1887	2155	2588	3135	17%
Middle East and Africa	678	838	1007	1209	1454	1758	21%
Latin America	998	1127	1255	1400	1556	1752	12%
Total (PB per Month)							
Business IP traffic	13,982	16,399	19,227	22,729	27,040	32,165	18%

Table 14 Business IP Traffic, 2015–2020

Definitions

Business Internet traffic – All business traffic that crosses the public Internet

Business 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, 2015–2020

Mobile data traffic includes handset-based data traffic, such as text messaging, multimedia messaging, and handset video services (Table 15). Mobile Internet traffic is generated by wireless cards for portable computers and handset-based mobile Internet usage. The term "mobile data" includes both the data traffic and the Internet traffic on mobile networks.

Mobile Data Traffic, 2015–2020							
	2015	2016	2017	2018	2019	2020	CAGR 2015–2020
By Geography (PB per Month)							
Asia Pacific	1579	2677	4423	6725	9772	13,713	54%
Central and Eastern Europe	546	946	1511	2243	3249	4442	52%
Middle East and Africa	294	570	1039	1723	2778	4314	71%
North America	557	831	1199	1700	2328	3208	42%
Western Europe	432	708	1045	1477	2061	2795	45%
Latin America	276	448	715	1066	1521	2092	50%
Total (PB per Month)							
Mobile data	3685	6180	9931	14,934	21,708	30,564	53%

Table 15 Mobile Data Traffic, 2015–2020

For More Information

For more information, refer to the companion document *The Zettabyte Era—Trends and Analysis*. Several interactive tools are available to help you create custom highlights and forecast charts by region, by country, by application, and by end-user segment (refer to the Cisco VNI Forecast Highlights tool and the Cisco VNI Forecast Widget tool). Inquiries can be directed to traffic-inquiries@cisco.com.

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